01 - GENERAL REQUIREMENTS

013200 - CONSTRUCTION PROGRESS DOCUMENTATION

A. Receipts for all materials, supplies and professional services shall be provided to the Construction Manager, whether or not reimbursement for expenses is required.

B. Photographs depicted completed elements of the Work shall be provided in digital form to the Construction Manager. Photographs shall be of sufficient quality and scope to verify the correct completion of each element of the Work.

C. Photographs showing the location of all services (plumbing, wiring, etc.) which shall be hidden by subsequent elements of the Work (drywall, etc.) shall be provided in digital form to the Construction Manager. Recognizable reference points shall be included in the photographs so as to allow unambiguous identification and location of hidden elements.

D. All elements requiring inspection by responsible authorities (University, Local, State, Competition Organizers) shall be left open until said inspections are complete, and shall not be hidden by other elements of the Work.

END SECTION 013200

013300 - SUBMITTAL PROCEDURES

A. All Submittals required by other sections of this document shall be provided in both digital and printed (hardcopy) form to the Construction Manager.

B. All warranties, performance specifications, installation and operating instructions which normally accompany products incorporated into the Work shall be provided to the Construction Manager, whether or not said materials are specifically mentioned in other sections of this document.

C. Upon request from the Construction Manager, Project Manager, Project Architect or Project Engineer, the manufacturer or their authorized reseller shall provide test data to verify the performance of any given product, whether or not this requirement is specifically cited in other sections of this document.

END SECTION 013300

017300 - EXECUTION

A. All products shall be installed according to instructions from the product manufacturer. Any discrepancies or differences between manufacturer instructions and those found in other sections of this document or in the Drawings shall be called to the attention of the Construction Manager and the Project Architect for resolution before that element of the Work is started.

B. Execution of all elements of the Work shall be performed in compliance with all applicable laws, building codes and Competition rules. If discrepancies or conflict are noted between said regulations and other sections of this document or in the Drawings, they shall be called to the

attention of the Construction Manager and the Project Architect for resolution before that element of the Work is started.

END SECTION 017300

017400 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

A. A Construction Waste Management Plan shall be developed and submitted to and approved by the Construction Manager and the Project Manager prior to commencement of the Work. This Plan shall include measures for diverting at least 99 % of materials from the landfill for composting, recycling or reuse. This Plan shall identify collection locations for various waste streams at the Construction Site.

B. A Construction Waste Management Plan shall be submitted by each supplier of materials that constitute more than 5% of the Work by weight or value. These Plans shall identify measures taken by the supplier to divert materials from the landfill.

END SECTION 017400

017500 - HEALTH & SAFETY PLANS

A. A Health and Safety Plan shall be developed and submitted to and approved by the Health and Safety Officer(s), the Project Manager and the Construction Manager prior to commencement of the Work. This Plan shall clearly identify all equipment and procedures for assuring the health and safety of workers and visitors to the Construction Site, and the Competition Site. The H&S Plan shall also specify training requirements for responsible safety officers and for all workers on site.

B. Personnel found to regularly or willfully violate provisions of the H&S Plan shall be barred from the Construction Site and/or the Competition Site.

END SECTION 017500

018100 - SUSTAINABLE CERTIFICATION DOCUMENTATION

A. The Project Manager, Construction Manager and Project Architect shall review the documentation requirements for the LEED for Homes certification system and shall identify measures to meet all prerequisites and sufficient credits to achieve a Platinum level of certification. All documentation requirements normally associated with LEED certification at this level shall be provided during the Construction, assembly, operation and disassembly of the Work and Competition.

B. The Project Manager, Construction Manager and Project Architect shall review the documentation and compliance requirements for Full Certification under the International Living Future Institute's (ILFI's) Living Building Challenge and Living Product Challenge systems. All documentation requirements normally associated with LBC and LPC Certification shall be provided during the Construction, assembly, operation and disassembly of the Work and Competition.

C. For each product and material used in the Work, the manufacturers shall provide either : a) a comprehensive list of constituent chemicals sufficiently detailed to verify Compliance with the ILFI Red List OR b) an ILFI Declare label for the product or material.

END SECTION 018100

019100 - SUSTAINABLE MATERIAL REQUIREMENTS

A. All materials and products used in the Work shall be ILFI RedList Compliant unless otherwise approved in writing by the Project Architect.

END SECTION 019100

05 - METALS

051200 – STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SCOPE

Steel structural framing will be used in the house frame as needed.

1.2 SECTION REQUIREMENTS

A. Structural Performance: Design, engineer, fabricate, and install structural steel framing and weldments to withstand structural loads required by International Residential Code 2015 and all applicable codes.

1.3 SUBMITTALS

1. Shop Drawings
2. Structural Analysis

1.4 STANDARDS

A. All structural steel work shall conform to the following governing standards:
    1. American Society for Testing and Materials:
        a. ASTM Specifications for Structural Steel
        b. ASTM Specification for Pipe, Welded and Seamless
        c. ASTM Specification for Cold-Formed Welded and Seamless Steel Structural Tubing in Rounds and Shapes
        d. ASTM Specification for Hot-Formed Welded and Seamless Steel Structural Tubing
    2. American Welding Society:
        a. AWS Structural Welding Code
        b. AWS Specifications for Welding Rods and Bare Electrodes
    3. Industrial Fasteners Institute:
        a. IFS Handbook on Bolt, Nut, and Rivet Standards

PART 2 - PRODUCTS

2.1 PRE-FABRICATED STRUCTURAL STEEL FRAMING

A. Hot Rolled Steel Provided by Gutierrez Studios

1. 4” x 4” and 6” x 4”, 1/4” thick structural steel tube to be used in fabrication of primary load-bearing structure for deck pergola.

2. System to be constructed per drawings, using appropriate fastenings and hardware.

3. Steel components will support 6 photovoltaic panels mounted to unirac system, and shall mount onto primary structural members of pergola decking system.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Prepare ground surface by cleaning, removing projections, filling voids, and as otherwise recommended in steel manufacturer's written instructions.
B. Set units level, plumb, and true to line, without warp or rack of frames and panels and anchor securely in place using appropriate fastening methods.
C. Separate dissimilar metals and metal products from contact with wood or cementitious materials, by painting each metal surface in area of contact with a bituminous coating or by other permanent separation.
D. Correct deficiencies in or remove and reinstall any steel framing that does not comply with requirements.
E. Repair, refinish, or replace aluminum extrusions and connecting hardware damaged during installation, as directed by Architect.

END SECTION 051200

051300 – STRUCTURAL ALUMNIUM FRAMING

PART 1 – GENERAL

1.1 SCOPE

Aluminum will serve as the main structural metal for this house. It will be used in the framing of the entire house.

1.2 STANDARDS

A. Federal Specifications:
   1. TT-P-645 – Paint, Aluminum, Heat Resisting

B. Aluminum Association:
   1. Aluminum Design Manual

C. ASTM International:
   1. ASTM B308 / B308M
      a. Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles
   2. ASTM B221
      a. Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
   3. ASTM B429
      a. Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube

D. American Welding Society:
   1. AWS D1.2 - Structural Welding Code, Aluminum.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Rolled and Extruded Members: Alloy and temper [6016-T6] [unless otherwise indicated on the Drawings].
B. Aluminum Tubing: Alloy and temper 6016-T6.
C. Bolts, Nuts, and Washers:
   b. Bolts and Nuts in Structural Connections: [alloy 6061-T6] [unless otherwise indicated on the Drawings].
   c. Flat Washers: Alclad 2024-T4.
   d. Spring Washers: [alloy 7075-T6][AISI 316 stainless steel].
E. Rivetsin Structural Connections: Alloy 6061-T6.
F. Welding Materials:
   a. Filler Metals: AWS D1.2.
   b. Electrodes and Equipment Settings: As recommended by the filler metal manufacturer for the position, thickness and conditions of use.
   c. Furnish written verification to the University that filler metal is appropriate to the materials and welding process

2.2 CONNECTIONS

A. Unless otherwise indicated on the Drawings, weld or rivet shop and field connections , except moment connections that shall be bolted. Weld in accordance with approved welding procedures.

2.3 FABRICATION

A. Fabricate aluminum members in accordance with the approved Shop Drawings. Where practical, fabricate and assemble in the shop.

PART 3 – EXECUTION

3.1 ERECTION

A. Where members can not be properly assembled due to misfabrication or deformation due to handling or transportation, report the condition to the University with a proposed method of correction for approval. Erect structure to the lines and grades indicated on the Drawings and in accordance with the Shop Drawings.

B. Do not field cut or alter structural members without approval of the University.

3.2 INSPECTION AND TESTING

A. Inspection and testing will be performed under provisions of Division 01 Section "Special Procedures". The Subcontractor shall be responsible for in-house visual inspection and implementing a quality control program.

B. Notify the University of the fabrication and erection schedules and permit the University's representative to observe shop assembly, make visual inspections, nondestructive tests of welds, observe erection and perform field testing. Correct defective work, rejected by the University at no additional cost to the University.

C. A certified welding inspector employed by the University's Independent Testing Laboratory will verify that welds are made in accordance with approved welding procedures and visually inspect shop and field welding operations as directed by the University.

END SECTION 051300

END SECTION 05

06 - WOOD, PLASTICS & COMPOSITES

061000 – STRUCTURAL INSULATED PANELS

PART 1 – GENERAL

1.1 SCOPE

Structural Insulated Panels (SIPs) are anchored to the structural frame, and constitute the primary thermal envelope of the house. SIPs provide lateral stability for the walls (wind and seismic), and support floor and roof spans under gravity loads (dead and live).

SIPs are comprised of an insulated core with attached stress skin panels on both interior and exterior surfaces.

1.2 PERFORMANCE REQUIREMENTS

A. Provide at least R-35 insulation with an 8 inch thick panel.

B. Provide at least R-60 insulation with a 12 inch thick panel.

C. Shall support a clear span of at least 12’-0” with an 8 inch thick panel.

D. Shall support a cantilever of at least 6’-0” with a 12 inch thick panel.

E. Shall be capable of including tapered edges of up to 3’-0” width for roof overhangs.

F. Sheathing on each side of the panel (stress skin) shall have a 1-hour fire rating.

1.3 SUBMITTALS

A. Manufacturer shall provide qualified test data supporting advertised thermal performance.

B. Manufacturer shall provide qualified test data supporting advertised structural performance.

C. Manufacturer shall provide qualified test data supporting advertised fire-rating performance.

PART 2 - PRODUCTS

2.1 HONEYCOMB CORE SIPS

A. Acceptable Products: Gorilla Composites, Inc. Composite Panel

B. For more information, see http://www.gorillacomposites.com/

C. Composite panels shall be custom fabricated with cellulose insulation as required to meet thermal performance requirements list above. Added thermal insulation shall be treated to maintain unmodified panel’s fire rating and insect resistance.

D. Composite panels shall be custom fabricated to include connection hardware as indicated in the Drawings. Connection hardware shall be provided to the manufacturer by the University of Maryland.

END SECTION 061000

07 - THERMAL & MOISTURE PROTECTION

072100 – THERMAL INSULATION (general purpose site installed)

PART 1 - GENERAL

1.1 SCOPE

Wet blown cellulose insulation is composed of wood fiber (typically paper) with a binding agent intended to improve cohesion, reduce settling and improve adhesion to the structure. It is used primarily for wall cavity insulation as indicated in the Drawings.

1.2 PERFORMANCE REQUIREMENTS

A. Insulation shall have a minimum thermal resistance (R-value) of 3.8 BTU/ft2/deg.F/hr per inch of thickness.
B. All insulation materials (not just surface) shall be treated with borate or other approved insect repellent to prevent insect infestation.
C. All insulation materials (not just surface) shall be treated with a fire-retardant chemical as required to meet International and local building codes.
D. Neither the cellulose, nor the insect-repellent, nor the fire-retardant, nor the binding agent shall contain VOCs which will lead to off-gassing to the interior after installation (post-occupancy).
E. Blowing agents for the insulation shall not include CFCs or HCFCs.
F. The vapor permeability of the insulation, when installed, shall have be greater than 55 perms per inch of thickness (such that the total perm rating for the installed cavity insulation is greater than 10).

1.3 SUBMITTALS

A. The Contractor shall provide the Architect with technical details of materials data sheets and installation instructions sufficient to verify the performance requirements cited above.
B. The Contractor shall provide the Owner with a warranty certificate covering materials AND installation of the Insulation.

PART 2 - PRODUCTS

2.1 Acceptable Manufacturers and Products

A. None specified
B. Contractor shall specify a product and installer for this material as part of their proposal, and shall provide the documentation indicated in Section 1.2 – Submittals above.

PART 3 - EXECUTION

A. Insulation shall fill all voids around framing, blocking, fixtures, plumbing and junction boxes.
B. Insulation shall fill the framing cavity unless otherwise indicated on the Drawings, but shall not significantly overfill the cavities.
C. Excess insulation (where accidental overfilling of the framing cavities occurs) shall be removed as required for installation of finishes without damaging the remaining installed insulation

END SECTION 072100

SECTION 072500 – WEATHER RESISTIVE BARRIERS

PART 1 - GENERAL

1.1 SCOPE

Weather Resistive Barriers (WRBs) are applied to the exterior face of wall and roof sheathing, behind the exterior cladding. WRBs serve as an air barrier and drainage plane for exterior moisture.

1.2 PERFORMANCE REQUIREMENTS

A. Impermeable to air infiltration.
B. Wall WRB shall be water vapor permeable – 10 perms or greater
C. Impermeable to liquid water.
D. Self-adhesive roll sheeting or liquid applied
E. UV stable for at least 90 days.
F. Self-healing around small penetrations like screws or nails.

1.3 SUBMITTALS

A. Cut sheets documenting performance as noted above.

PART 2 - PRODUCTS

2.1 Self-Adhering Elastomeric Sheeting

A. For use on walls only.
B. Acceptable Products
    1. Henry BlueSkin VP100
    2. Alternate products may be used with prior written approval of the Project Architect.

2.2 Liquid Applied Membranes

A. For use on walls only.
B. Acceptable Products
    1. Prosoco R-Guard Cat 5
    2. Alternate products may be used with prior written approval of the Project Architect.

2.3 Self-Adhering Roof Underlayment

A. For use under metal roofing
B. Acceptable Products
    1. GRACE SELECT
    2. FABRAL RoofSeal
    3. Alternative products which are more sustainable are encouraged, with prior written approval of the Project Architect.

2.4 ACCESSORIES – Sealing Tape

A. For use sealing joints between WRB sheets, sealing top edges of metal flashing, sealing seams in wood panels, etc.
B. Acceptable Products
    1. First Choice – ProClima TESCON VANA Sealoing Tape
    2. Subject to investigation of material incompatibilities, alternate sealing tape selection will be according to WRB manufacturer recommendations.

2.5 ACCESSORIES – Termination Mastic

A. Used to terminate the top edges of flashing and/or sealing tape.
B. Select termination mastic per manufacturer recommendations.

END SECTION 072500

SECTION 072600 – VAPOR RETARDERS

Part 1 – GENERAL

1.1 SCOPE

Prevents the migration of air and water vapor. Used in this project only under the floor framing to prevent rising damp from ground.

1.2 PERFORMANCE REQUIREMENTS

A. Maximum perm rating of 0.1
B. Preferred per rating < 0.01.
C. Minimum thickness: 6 mil (0.006")
D. Shall be tear resistant

Part 2 – PRODUCTS

2.1 ELASTOMERIC VAPOR RETARDER

A. Acceptable Products
    1. InsulationSolutions Inc. - Viper CS Crawl Space Vapor Barrier
        a. Thickness : 10 mil (0.01 in).
        b. Perm Rating (English) : 0.0016 perms
B. Alternative products with similar performance may be substituted with written approval of the Project Architect.

Part 3 EXECUTION

Limit perforation of the membrane for plumbing and attachement. Seal around all penetrations with approved liquid-applied sealant, mastic or tape (approved by membrane manufacturer).

END SECTION 072600

SECTION 073100 – WOOD SIDING

Part 1 – GENERAL

1.1 SCOPE

Wood siding is used an exterior cladding for walls. For specific information regarding the use of wood siding on this project, refer to the Drawings.

1.2 APPLICABLE STANDARDS

A. International Living Future Institute (ILFI) Living Building Challenge (LBC)
B. ILFI Declare Products
C. ILFI RedList Compliance

1.2 REQUIREMENTS

A. Shall be FSC Certified as being sustainably harvested from manage forests.
B. Shall be ILFI RedList Compliant – including any special insect resistance treatments, stains, sealants or paints that are factory applied.
C. No exotic hardwoods or old growth materials shall be used in the Work.
D. Wood shall resist infestation by insects.
E. Wood shall be treated (including stains, coatings and sealants) to resist fading and discoloration (from time, sunlight, UV light, rain, etc.).

1.4 SUBMITTALS

A. FSC Chain of Custody documentation shall be provided to the Construction Manager.
B. Comprehensive list of chemicals, include factory-applied insect-resistance, stains, sealers and paints shall be provided to the Construction Manager sufficient to verify RedList Compliance
C. A copy of the ILFI Declare label (if applicable) shall be provided to the Construction Manager.

Part 2 – PRODUCTS

A. Acceptable Products
    1. Kebony #1243 Scots Pine 21x148 mm Cladding
B. Alternative Products may be substituted with prior written approval of the Project Architect.
C. Stains and other coatings and sealants shall be selected and approved in writing by the Project Architect.

Part 3 – EXECUTION

A. Wood siding shall be applied over a suitable drainage plane to prevent moisture build-up and rot.
B. Wood siding shall be fastened to the substrate using approved fasteners to prevent warping, popping and corrosion.

END SECTION 073100

SECTION 074100 – STANDING SEAM METAL PANELS

Part 1 – GENERAL

1.1 SCOPE

Standing seam metal panels include a cleat that is securely fastened to the substrate, and overlapping seams that can be securely snapped, crimped or clamped to the cleats. Panels may have additional ribs intended to reduce oil-canning or for aesthetic effect. Standing seal metal panels may be made of steel or aluminum and are typically protected by a Kynar finish. Standing seam metal panels are used primarily as roofing panels on this project, but may be considered for vertical (wall) applications as well.

1.2 REQUIREMENTS

A. Minimum warranty service life of 50 years.
B. Low-emissivity coatings and materials shall be used to create a "cool roof" application.
C. Standing seams must be capable of supporting the attachment of clamps for mounting of solar panels.
D. Standing seams must be designed to allow removal and reinstallation of sections of the roofing for house assembly and disassembly.
E. Panel sizes (seam spacing) shall as indicated on the Drawings.

1.3 SUBMITTALS

A. A copy of the warranty shall be provided to the Construction Manager.
B. A letter or other official document shall be provided by the manufacturer or their authorized reseller or installer to verify the attachment of solar panels without voiding the warranty (using hardware proposed by the Project Architect). This documentation shall be provided to the Construction Manager and to the Project Architect.
C. Instructions for removal and reinstallation of panels shall be provided by the manufacturer, their authorized reseller or installer to the Construction Manager and Project Architect.
D. Samples of all colors noted under Products below shall be provided to the Project Architect for final selection and approval (in writing).

Part 2 – PRODUCTS

2.1 STANDING SEAM METAL PANELS

A. Acceptable Products
    1. Peterson PAC-CLAD
        a. SnapClad Panels
        b. Colors: Cityscape, Anodic Clear, Silversmith.
    2. FABRAL Panels
        a. Model : 1-½" SSR 150
        b. Color : Galvalume Acrylic Coated
B. Alternate products may be proposed, subject to written approval by the Project Architect. Technical specifications and color samples shall be provided for all suggested alternate products.

Part 3 – EXECUTION

A. Standing seam metal panels shall be installed without damaging the protective finishes.
B. Panels shall be installed so as to prevent oil-canning or warping, including from thermal expansion or contraction
C. Installer shall demonstrate methods for removing and reinstalling panels without damage.

END SECTION 074100

SECTION 074600 – CORRUGATED METAL PANELS

Part 1 – GENERAL

1.1 SCOPE

Corrugated metal panels exhibit a regular pattern of ridges and valleys, which may be rounded or flattened depending on specific products selected. The panels are generally installed by overlapping panel edges (one or two corrugation widths) and attaching to the substrate through a valley, using exposed fasteners. Corrugated metal panels are typically protected by a Kynar finish.

Corrugated metal panels are used primarily on walls in this project with the corrugations running either vertically or horizontally as indicated on the Drawings, but applications to roofs is also permitted.

1.2 REQUIREMENTS

A. Minimum warranty service life of 50 years.
B. Low-emissivity coatings and materials shall be used to create a "cool wall" or "cool roof" application.
C. Panel sizes (corrugation widths) shall as indicated on the Drawings.

1.3 SUBMITTALS

A. A copy of the warranty shall be provided to the Construction Manager.
B. Samples of all colors noted under Products below shall be provided to the Project Architect for final selection and approval (in writing).

Part 2 – PRODUCTS

A. Acceptable Products
    1. Petersen PAC-CLAD
        a. 7/8" Corrugated Metal Panels
    2. Petersen PAC-CLAD
        a. 7.2 Corrugated Metal Panels
B. Alternate products may be proposed, subject to written approval by the Project Architect. Technical specifications, corrugation shape and color samples shall be provided for all suggested alternate products.

Part 3 – EXECUTION

A. Matching color exposed fasteners shall be used for attachmment of the panels unless otherwise approved in writing by the Project Architect
B. Exposed fasteners shall be of materials that are compatible with the panels (without causing corrosion of either panel or fastener).

END SECTION 074600

SECTION 075300 – EPDM MEMBRANE

Part 1 – GENERAL

1.1 SCOPE

Ethylene Propylene Diene Monomer (EPDM) rubber membranes are in common usage as waterproof protective coverings for roofs and terraces.

EPDM is used in this project primarily as a protective waterproof layer on the floor of the mechanical room.

Part 2 – PRODUCTS

2.1 EPDM Membranes

A. Acceptable Products
    1. Firestone RubberGard EPDM
        a. Website: http://firestonebpco.com/roofing/epdm-roofing-systems/rubbergard-epdm-roofing-systems/

2.2 ACCESSORIES

A. Acceptable Products
    1. For Firestone RubberGard
    2. Firestone QuickSeam
    3. Firestone RubberGard EPDM Solvent-Free Bonding Adhesive

Part 3 – EXECUTION

A. Use only accessories and adhesives approved for use with the EPDM membrane manufacturer.
B. Use only details (such as for floor drains) approved by the membrane manufacturer.
C. Seal all seams with an approved sealing "tape" or flashing membrane.
D. Terminate the top edge of the membrane (where used on floors or roof rakes) to the wall using an approved mechanical termination strip (bar).
E. Seal the top edge of the termination bar using an approved caulk or mastic.

END SECTION 075300

SECTION 076200 - METAL FLASHING AND TRIM

Part 1 – GENERAL

1.1 SCOPE

Metal flashing is used to cover edges and seams in order to exclude moisture from entering the structure.

Metal trim is generally used for decorative purposes, but may simultaneously serve a role similar to flashing.

1.2 APPLICABLE STANDARDS

A. SMACNA – Architectural Sheet Metal Manual

1.3 REQUIREMENTS

A. All metal flashing used in the Work shall be stainless steel.
B. All fasteners used to attach flashing shall be stainless steel.
C. All flashings and fascia shall have clear, straight (or smoothly curving) edges, without wrinkles, waviness or oil-canning.
D. Metal flashing shall be attached and sealed to other elements of the Work as indicated in the Drawings.
E. All metal flashings and fascia shall be of an appropriate gage as determined by the Contruction Manager and installer to achieve acceptable results as defined above.

Part 2 – PRODUCTS

No specific products are required or preferred by this Specification. Contractor or Installer may select sources and manufacturers, provided that a high level of quality in materials and workmanship is maintained.

END SECTION 076200

END SECTION 07

SNAP-CLAD PANEL

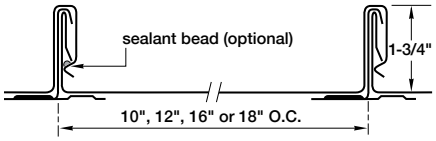
MATERIALS

.032 aluminum
16 oz. copper*
24 gauge steel*
22 gauge steel*

SPECS

10", 12", 16" or 18" O.C.
1-3/4" High

UL-90



PRODUCT FEATURES

- Architectural/structural panel
- Herr-Voss corrective leveled
- Factory-applied sealant available
- Continuous interlock
- Labor-saving one-piece design
- Stiffener beads upon request
- Striations upon request
- Factory eave notching available
- 30-year-non-prorated finish warranty
- Maximum factory-produced panel length is 64' (check w/factory for longer lengths)
- Weathertightness warranty available
- 38 stocked colors (24 gauge steel)
- 15 stocked colors (22 gauge steel)
- 36 stocked colors (.032 aluminum)
- 20 stocked colors (.040 aluminum)
- Panels available in Galvalume Plus and 16 oz. copper

UL CLASSIFICATION

- UL-580 Class 90 wind uplift
- UL-1897 wind uplift
- UL-790 Class A fire rated
- UL-263 fire resistance rated
- UL-2218 impact resistance rated
- UL-90 rated aluminum panel up to 16" O.C.

ASTM TESTS

- ASTM E1592 tested
- ASTM E283/1680 tested
- ASTM E331/1646 tested

FLORIDA BUILDING & MIAMI-DADE PRODUCT APPROVALS

Please refer to pac-clad.com or your local factory for specific product approval numbers for Snap-Clad.

Note: UL 90 is available on steel panels up to 18" on center, and on aluminum and copper panels up to 16" on center.

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FABRAL

ROOFSEAL by FABRAL

Fabral offers the total system solution with RoofSeal underlayment. By combining superior performance and protection with skid-resistant traction, RoofSeal helps you get the job done right.

RoofSeal Features:

- **Durability:** stronger than traditional felt
- **Quality:** skid-resistant traction
- **Performance**: UV exposure up to 180 days
- **Peace of mind**: 50 year warranty against leaking

UNDERLAYMENT SPECS

- Width: 4’
- Length: 250’
- Weight: 32 lbs
- Thickness: 13.25 mils
- UV exposure up to 180 days
- Water Vapor Permeance: .06 perms
- QAI & ICC-ES building code compliant
- Contributes to LEED and NGBP ratings
- 100% inorganic, will not rot or mold
- 10 squares per roll
- 36 rolls per pallet

FABRAL®

STANDING SEAM PRODUCT OFFERING

Solutions for Today's Metal Roofing Customer

1 1/2" SSR 150

This classic style metal roof protects against all weather conditions while delivering value, beauty and performance. Featuring 24 gauge steel, this panel is designed to perform at optimum levels year after year.

Factory Applied Sealant
Shadow Lines Standard; Flat Pan & Stiffening Ribs Available

HORIZON® S 100

This economical standing seam panel with a snap-lock design features pre-punched fastener slots simplfying installation. Standard shadow lines enhance the appearance of this 26 gauge panel.

Factory Applied Sealant
Shadow Lines Standard; Stiffening Ribs Available

PANEL SPECS

- Ideal for Residential, Agricultural and Light Commercial applications
- Concealed clip fastening system for 1 1/2" SSR
- Industry leading warranties
- High performance Enduracote® paint system features ENERGY STAR® approved colors
- Minimum pitch required 1:12 for 1 1/2" SSR
- Minimum pitch required 3:12 for Horizon S
- UL 790 Class A Fire Resistance Rating
- UL 2218 Class 4 Hail Impact Resistance
- UL 580 Class 90 Uplift Test Rating
- Custom cut to lengths up to 40'

COLOR OFFERING

All colors are ENERGY STAR® approved.

White 899 ■

Evergreen 875 ■▲

Caribbean Blue 881 ■

Brick Red 898 ■▲

Classic Burgundy 853 ■▲

Hickory Moss 870 ■

Antique Bronze 854 ■▲

Light Gray 850 ▲

Charcoal Gray 851 ■▲

True Black 882 ■▲

Bright Copper Penny 949 ■▲

Acrylic Coated Galvalume ■▲

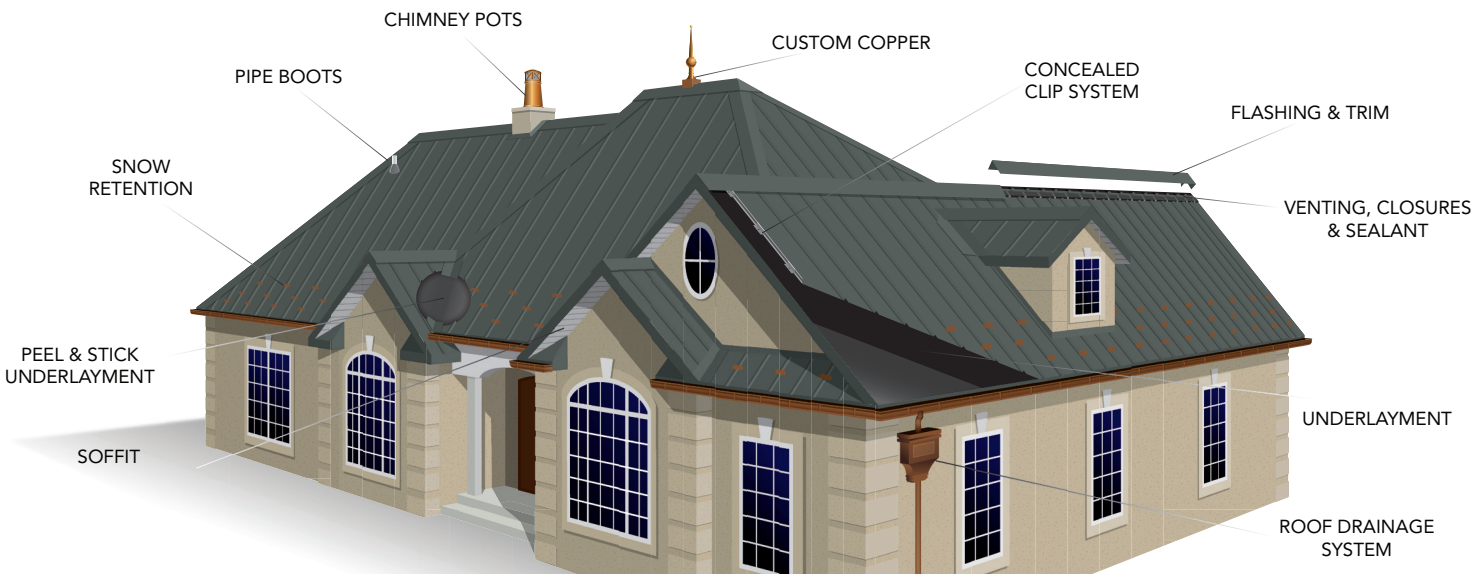
Visualize Your Project

■ 1 1/2" SSR 150 Color Availability ▲ Horizon S 100 Color Availability

Colors are as actual as allowed by the printing process. Actual metal samples are available; request samples prior to installation.
Note: colors vary depending on position and angles.
Panel substrate is high strength Galvalume® steel.

TOTAL SYSTEMS

The best metal clad buildings use integrated system components. Fabral always thinks about the whole project, engineering solutions that consider all of the materials needed.



WARRANTY

Fabral offers some of the most competitive, enduring warranties in the industry.

- Lifetime film integrity for walls and roofs (peeling and cracking)
- 30-year warranty against fade and chalk for walls and roofs
- 20-year non-perforation warranty for unpainted galvalume

Galvalume is the trademark of BIEC International Inc.
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Fabral.com
800.477.2741

FABRAL

98-32-084 6/13

gcp applied technologies

GRACE SELECT™

ROOFING UNDERLAYMENT

The Performance Alternative to Granulars

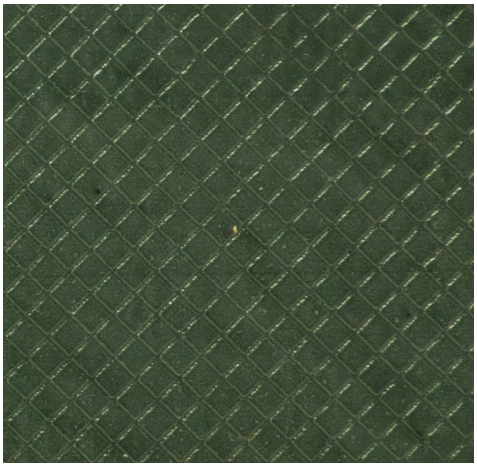
- Offers performance benefits at a great value
- Protects roofs against wind driven rain and ice dams
- From the makers of Grace Ice & Water Shield® – the name roofing professionals trust

Grace Select™ smooth surface roofing underlayment is composed of a rubberized asphalt adhesive laminated to a strong slip-resistant film. This lightweight product makes it faster and easier to install than granulars while meeting industry standards for self-adhered roofing underlayments.

"After using several brands of granular underlayments over the years, I am glad I discovered Grace Select™. Select is definitely better than any granular nderlayments out there and does a much better job. Since it is lightweight, it is easier to work with. Also, it is made by Grace, which gives me peace of mind that my clients' roofs are well protected. Overall, I am very satisfied with Grace Select™."

— Mario Sousa, Caliber Construction

Why Grace Select™ Roofing Underlayment?



GRACE SELECT™

GRANULARS

Developed by the the recognized leader in self-adhered roofing underlayments and the manufacturer of Grace Ice & Water Shield®

Roll Weight	32 lbs.
Roll Size	195 ft²
Roll Length	65 ft.
Roll Width	36 in.

GRACE SELECT™	GRANULARS
Light weight — Great performance with minimal weight *Fast and easy installation*	**Double weight** — Difficult to handle during installation
Superior lap adhesion — Better protection against leaks *Job done well the first time*	**Granular surface may inhibit watertight laps** — May require special treatment of the laps
Re-roofable — Shingles can be easily removed from existing Grace Select™ underlayment during re-roofing *Easier & less costly retrofit applications*	**Not re-roofable** — Shingles cannot be easily removed from the existing granular underlayment when re-roofing; more difficult and costly retrofit jobs
Higher adhesive content; no fillers — Strong defense against wind-driven rain and ice dams *Protection against costly call backs*	**Lower adhesive and higher filler content is typical**
Proprietary film surface — Superior foot traction without loose granules; scuff free surface *Safe & Clean Installation*	**Granular surface** — Loose granules may cause slip hazards; may be vulnerable to scuffing in hot weather

gcpat.com | For Technical Assistance Call: 1-866-333-3726

We hope the information here will be helpful. It is based on data and knowledge considered to be true and accurate, and is offered for consideration, investigation and verification by the user, but we do not warrant the results to be obtained. Please read all statements, recommendations, and suggestions in conjunction with our conditions of sale, which apply to all goods supplied by us. No statement, recommendation, or suggestion is intended for any use that would infringe any patent, copyright, or other third party right.

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THE BRAND
YOU KNOW AND TRUST
HAS A NEW NAME

GRACE | gcp applied technologies

TECHNICAL DATA SHEET

Blueskin® VP100

Self-Adhered Water-Resistive Air Barrier Membrane

Physical Properties

-Color	Blue
-Water Vapor Permeance ASTM E96, Method A WVP	33 Perms
-Average Dry Breaking Force ASTM D 5034	55 / 245N MD 48 / 214N CD
-Accelerated Aging ICC-ES AC48 25 cycles	Pass
-Cycling and Elongation ICC-ES AC48 100 cycles at -20°F (-29°C)	Pass
-Application Temperature See Limitations	40°F (5°C)
-Service Temperature Range	-40°F to +180°F (-40°C to +82°C)
-Thickness TAPPI T-410	Nominal 19 mils

-Flame Spread Index ASTM E 84	5, Class A
-Smoke Developed ASTM E 84	125, Class A
-Air Permeance ASTM E 2178 Maximum 0.02 l/m² @ 75Pa (0.004 cfm/ft² @ 1.57pcf)	Pass
-Acceptance Criteria for Water-Resistive Barriers ICC – ES AC38	Pass
-Low Temp Flexibility ICC – ES AC38/3.3.4	Pass
-Peel-adhesion to Unprimed Plywood ICC-ES AC48	Pass
Control baseline	62 lbf/ft – 905N/m
After 7 day water immersion	54 lbf/ft – 786N/m
After accelerated aging	72 lbf/ft – 1049N/m
After UV exposure	77 lbf/ft – 1125N/m
-Water Penetration Resistance around Nails AAMA 711-05, ASTM D1970 mod	Pass

Compliance Standards

ESR-2975	**ICC** AC38	**CGSB** 51.32	**AAMA** 711-05	**ASTM** E331

Packaging

-Roll Length	100 ft (30.48 m)	-Roll Width/color/sku	**48 in** (1.22 m) Blue HE100GUSA940 **12 in** (300mm) Blue HE100GUSA987 **9 in** (225mm) Blue HE100GUSA984 **6 in** (150mm) Blue HE100GUSA995 **4 in** (100mm) Blue HE100GUSA994

Description

Blueskin® VP100 is a residential and multi-family self-adhered vapor permeable, water-resistive air barrier membrane consisting of an engineered film and a patented, permeable adhesive technology with split-back poly-release film. **Blueskin® VP100** is fully adhered to the wall substrate in a 'weatherboard' method without mechanical attachment. Covered by US patent 6,901,712; Canadian patent 2,413,550.

Features

- Brings commercial air barrier technology and expertise to residential construction
- Meets and exceeds industry standards for water-resistive barrier
- Sheds water while allowing vapor to pass through allowing walls to drain and substrates to dry
- Creates a continuous plane of air-tightness improving building thermal performance
- Fully adhered to substrates, eliminating water migration
- Easy to apply with common hand tools

Henry Company, 999 N. Sepulveda, Ste. 800 El Segundo CA 90245
Tel: 800-486-1278 **Email:** techservices@henry.com
www.henry.com

REV: August 31, 2015

Uses

Designed for residential and wood-framed multi-family applications, **Blueskin® VP100** creates a water-resistive barrier and air barrier when applied outside of the wall sheathing and behind the exterior wall cladding. Used for transitions, rough openings, fenestration and full-wall applications.

Storage

Store rolls on original pallets or elevated platform. Protect from weather or store in an enclosed area not subject to heat over 120°F (49°C). In cold weather, it is recommended to warm rolls to 50°F (18°C) or above prior to application to assure best adhesion to substrate.

Limitations

Membrane must be rolled after application to ensure adhesion to substrate and laps. Not designed for permanent exposure, protect installed membrane as soon as possible. Maximum exposure not to exceed 150 days. See Guide Specifications for further limitations. Excessive moisture in substrate or laps can inhibit adhesion or result in loss of adhesion prior to installation of cladding. Do not expose the backside of the substrate to moisture or rain. Protect exposed back-up walls against wet weather conditions during and after application of membrane, including wall openings and construction activity above completed air barrier installation.

For installations less than 40°F (5°C), an approved Henry primer as listed below in the Surface Preparation section is always required for all substrates. For more information, please review the Henry BlueskinVP® Cold Weather Application Tech-Talk which is available on the Henry website or contact your local Henry representative.

Surface Preparation

Acceptable substrates are plywood, OSB, wood, exterior-grade gypsum sheathing board such as DensGlass®, precast or cast-in-place concrete, concrete block, steel, aluminum and galvanized metal. All surfaces to receive **Blueskin® VP100** must be dry and clean of oil, dust, frost, bulk water and other contaminates that would be detrimental to adhesion of membrane. Strike masonry joints full-flush. Concrete surfaces must be smooth and without large voids, spalled areas or sharp protrusions. Concrete must be cured a minimum of 14 days. Curing compounds and release agents used in concrete construction must be resin based without oil or wax.

Approved adhesive-primers include **Blueskin® Adhesive**, **Blueskin® LVC Adhesive**, or **Aquatac Primer**. In addition, **Blueskin® Spray Prep Primer** can be used with light coats that are allowed to dry fully prior to covering.

Conditions not typically requiring adhesive-primers:

- Application above 40°F (5°C) to clean & dry wood and sheathing boards such as plywood and OSB. Ensure substrate and membrane temperatures are above 40°F (5°C)

Conditions requiring use of adhesive-primers:

- Metal, DensGlass® products, exterior grade gypsum board, Concrete, CMU and other masonry substrates. Application at or below 40°F (5°C) requires primer for all substrates including OSB and plywood.

Note: if appropriate adhesion is not obtained due to conditions beyond the control of the installer, the adhesion can be aided by continuous application of adhesive-primer to the substrate and laps as per published BlueskinVP® Installation Guidelines. Ensure all primed surfaces are covered in the same day.

Application

Refer to **Blueskin® VP100** Installation Guidelines for detailed application information available at **www.henry.com** website. **Blueskin® VP100** must be installed in a consecutive weatherboard method starting at bottom or base of wall and working up; providing minimum of 2-in (5cm) side laps and 3-in (7.6cm) end laps. Cut to manageable lengths, position membrane for alignment, remove protective poly-film using split release and firmly apply pressure to ensure adhesion. Eliminate all fishmouths, wrinkles or gaps, roll entire membrane surface (including seams) with a counter top or "J-roller" with adequate pressure to ensure full contact and adhesion. Seal membrane terminations, heads of mechanical fasteners, masonry tie fasteners, around penetrations: duct work, electrical and other apparatus extending through the **Blueskin® VP100** water-resistive air barrier membrane and around the perimeter edge of membrane terminations at window and door frames with a feathered edge of **Henry 925 or 212 BES Sealant**. Insulation clips and brick-ties should be mechanically fastened through the membrane into solid backing and sealed with **Henry 925** or **212 BES Sealant**.

Cover rough openings and transitions with **Blueskin® VP100** per Guide Specification details. Fenestrations (window and doors) must be flashed per window/door manufacturers' recommendations, local building code requirements, ASTM 2112 and AAMA guidelines. Use pre-cut rolls of **Blueskin® WB** or **Butyl Flash** for sill pan flashings or other approved Henry flashing products per Henry published window flashing guidelines.

Varied installation methods such as vertical application of **Blueskin® VP100** and "Method B" flashing installation for integral flanged windows are acceptable as long as the appropriate lap dimensions are maintained and the laps are installed in a sequential overlapping weatherboard method where applicable. Refer to **Blueskin® VP100** Installation Guidelines for detailed instructions.

Limited Warranty

Many factors which affect the results obtained from this product – such as weather, workmanship, equipment utilized, and prior condition of the substrate – are all beyond our control. We, the manufacturer, warrant only that we will replace, at no charge, any product proved to have a material defect in original manufacturing within 12-months of purchase, provided the product has been applied in accordance with our written directions for uses we recommended as suitable for this product. Proof of purchase must be provided. **DISCLAIMER OF WARRANTIES AND LIMITATION OF LIABILITY**: THIS LIMITED WARRANTY IS IN LIEU OF ANY OTHER CONDITIONS OR WARRANTIES EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED CONDITION OR WARARNTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. NO ONE, INCLUDING THE MANUFACTURER, SHALL HAVE ANY LIABILITY OF ANY KIND, INCLUDING FOR NEGLIGENCE OR FOR DIRECT, CONSEQUENTIAL, OR INCIDENTAL DAMAGES, RESTULTING FROM ANY MISUSE, DEFECTS, ANY DELAYS CAUSED BY REPLACEMENT, OR OTHERWISE BEYOND PRODUCT REPLACEMENT. IF PURCHASER DOES NOT ACCEPT THESE TERMS, PURCHASER MAY RETURN ALL CONTAINERS OR PACKAGES OR PRODUCT PURCHASED FOR A FULL REFUND (PROVIDED THE CONTAINERS OR PACKAGING IS UNOPENED AND LESS SHIPPING CHARGES IF ANY) WITHIN 30-DAYS OF PURCHASE. RETENTION OF PRODUCT BEYOND 30-DAYS OR USE OF PRODUCT SHALL CONSTITUTE ACCEPTANCE OF THESE TERMS, CONDITIONS, AND DISCLAIMERS. THIS LIMITED WARRANTY AND LIABILITY DISCLAIMER PROVIDES THE PURCHASER'S EXCLUSIVE REMEDY, FROM ANYONE, FOR ANYTHING RELATED TO THE PRODUCT. To the extent that any part of this LIMITED PRODUCT WARRANTY AND LIABILITY DISCLAIMER is determined unenforceable under the law of the place of purchase of the product, that part is severed and the remainder of these terms remain in full force and effect. To the extent permitted by law, the duration of any implied conditions or warranties is limited to the duration of Henry's express warranty. For further details of Henry's product warranty, see our website at www.henry.com/warranty.

STATEMENT OF RESPONSIBILITY

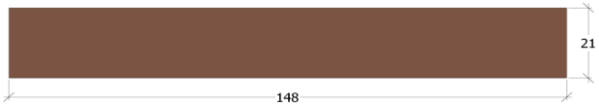
The technical and application information herein is based on the present state of our best scientific and practical knowledge. As the information herein is of a general nature, no assumption can be made as to a product's suitability for a particular use or application and no warranty as to its accuracy, reliability or completeness either expressed or implied is given other than those required by law. The user is responsible for checking the suitability of products for their intended use. Henry Company data sheets are updated on a regular basis; it is the user's responsibility to obtain and to confirm the most recent version. Information contained in this data sheet may change without notice.

Product datasheet
2016-08-11
Item no: 1243

Kebony Norge AS
+47 06125
www.kebony.com
info@kebony.com

Kebony Character

Kebony Scots Pine rectangular cladding smooth 21 x 148 mm



Product description

Kebony Character products are made from FSC®-certified Pinus Sylvestris, which have been treated with a bio-based liquid.

The patented Kebony® technology gives a unique wood product with outstanding durability and an exclusive appearance containing knots.

Kebony Character products can be cross cut to length as untreated woods but exposed end grain should be treated with a wood preserver. They should not be further machined as untreated heartwood will appear.

Heartwood content will vary. The given data in this datasheet represent Kebony Character with a heartwood content of approximately 50 %.

Quality

Profile	Rectangular
Dimension	21 x 148 mm *
Length	3,3 - 5,4 m
Knots	Contains only live knots
Cupping	Max 2,5 % of width
Crook	Max 5 mm / 2 m
Moisture	7-10 %
Cracks	Surface cracks maybe visible
Wane	May occur on the back

* Because of the Kebony® process, the dimension may vary up to ± 3 %

Appearance

The Kebony® technology gives a deep rich brown colour. After exposure to sun and rain the wood develops a natural silver-gray patina.

Technical data	Kebony	Untreated	Unit
Density (12 % mc)	570	490	Kg/m^3
Hardness (EN 1534)	2,1-3,1	2	Brinell
Max swelling (dry to wet, tangential direction)	6	8	%
Decay resistance (EN 350)	1-2***	5	Durability class 1-5
Use class (EN 335)	3*	1**	

* Suitable for outdoor applications above ground
** Not suitable for outdoor applications
*** Sapwood (Heartwood of scots pine has dur. class 3)

Relevant documents and information

Kebony installation guide for cladding
CE marked according to EN 14915:2006
Norwegian technical approval TG 2493
FSC CU-COC-813689
Nordic Ecolabel 2086 0001
EPD: NEPD-409-288-EN – www.epd-norge.no

CE EN 14915:2006 FSC www.fsc.org The mark of responsible forestry FSC® C074349 NORDIC ECOLABEL 2086 0001 TEKNISK GODKJENNING TG 2493 SINTEF Byggforsk epd

Environment

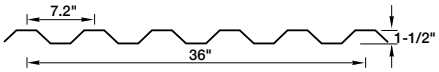
The product is exempted from the EU's biocide directive (76/769/EEC).
Waste handling as ordinary wood.

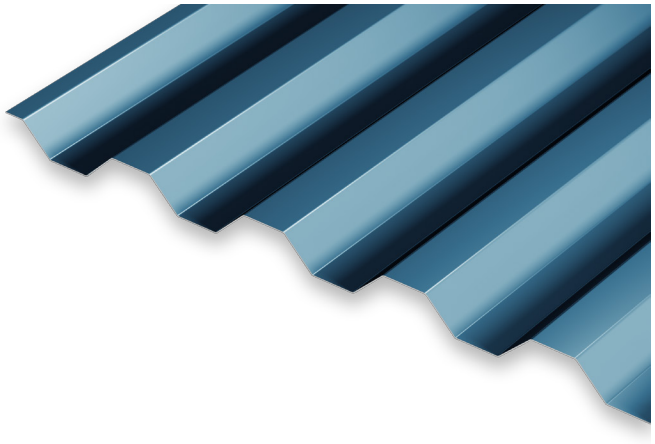
Disclaimer

Kebony is a natural wood product. For outdoor applications the appearance will be influenced by local environmental conditions over time. Colour changes and surface cracks will occur due to natural weathering. The manufacturer cannot be held liable for any of such variations in colour and surface appearance. This will not influence durability and overall performance of the product.

Kebony Norge AS is continuously working on product development. Information in this datasheet may be changed without further notice.

7.2 PANEL





PRODUCT FEATURES

- 30-year non-prorated finish warranty
- Matching screws and rivets
- Closure strips available
- Precut short lengths (5'-0" minimum) (2'-0" on the M-42 and R-41)
- Panel lengths up to 38'

MATERIAL

- 38 stocked colors (24 gauge steel)
- 15 stocked colors (22 gauge steel)
- 36 stocked colors (.032 aluminum)
- 20 stocked colors (.040 aluminum)
- 29 stocked colors (.050 aluminum)
- Galvalume Plus available

FLORIDA BUILDING PRODUCT APPROVALS

Please refer to pac-clad.com or your local factory for specific product approval numbers for exposed fastener panels.

AVAILABILITY

M-42 and R-41 are only available in 24 ga. steel and .032 aluminum.

*Note: The M-36, M-42 and the R-41 Panels are not intended for use in the construction of metal buildings or structural roof applications. Please consult with Petersen Aluminum regarding the application of this panel. A complete specification is available online at pac-clad.com.

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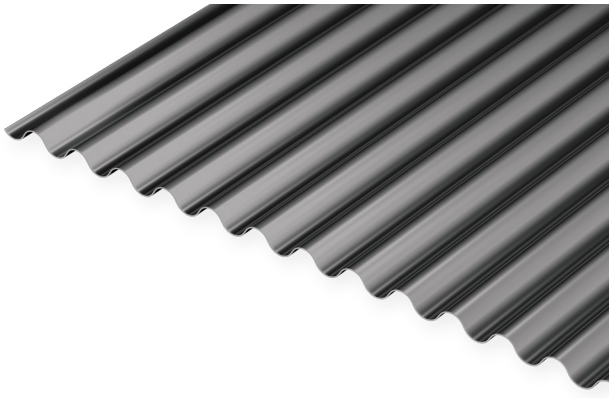
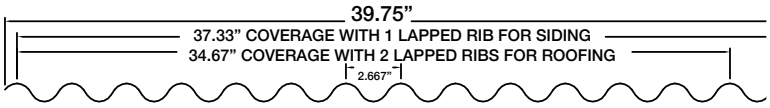
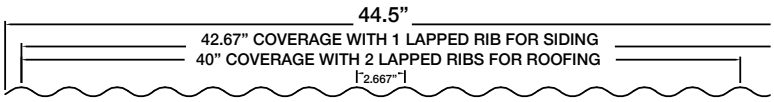
1/2" & 7/8" CORRUGATED PANEL



7/8" CORRUGATED



1/2" CORRUGATED



PRODUCT FEATURES

- 30-year non-prorated finish warranty
- Matching screws and rivets
- Closure strips available
- Precut short lengths (5'-0" minimum) (2'-0" on the M-42 and R-41)
- Panel lengths up to 38'

MATERIAL

- 38 stocked colors (24 gauge steel)
- 15 stocked colors (22 gauge steel)
- 36 stocked colors (.032 aluminum)
- 20 stocked colors (.040 aluminum)
- 29 stocked colors (.050 aluminum)
- Galvalume Plus available

FLORIDA BUILDING PRODUCT APPROVALS

Please refer to pac-clad.com or your local factory for specific product approval numbers for exposed fastener panels.

AVAILABILITY

M-42 and R-41 are only available in 24 ga. steel and .032 aluminum.

*Note: The M-36, M-42 and the R-41 Panels are not intended for use in the construction of metal buildings or structural roof applications. Please consult with Petersen Aluminum regarding the application of this panel.

A complete specification is available online at pac-clad.com.

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SNAP-CLAD PANEL

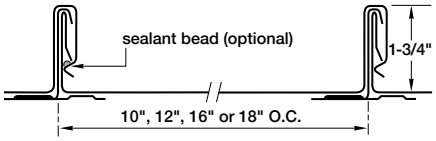
MATERIALS

.032 aluminum
16 oz. copper*
24 gauge steel*
22 gauge steel*

SPECS

10", 12", 16" or 18" O.C.
1-3/4" High

UL-90



PRODUCT FEATURES

- Architectural/structural panel
- Herr-Voss corrective leveled
- Factory-applied sealant available
- Continuous interlock
- Labor-saving one-piece design
- Stiffener beads upon request
- Striations upon request
- Factory eave notching available
- 30-year-non-prorated finish warranty
- Maximum factory-produced panel length is 64' (check w/factory for longer lengths)
- Weathertightness warranty available
- 38 stocked colors (24 gauge steel)
- 15 stocked colors (22 gauge steel)
- 36 stocked colors (.032 aluminum)
- 20 stocked colors (.040 aluminum)
- Panels available in Galvalume Plus and 16 oz. copper

UL CLASSIFICATION

- UL-580 Class 90 wind uplift
- UL-1897 wind uplift
- UL-790 Class A fire rated
- UL-263 fire resistance rated
- UL-2218 impact resistance rated
- UL-90 rated aluminum panel up to 16" O.C.

ASTM TESTS

- ASTM E1592 tested
- ASTM E283/1680 tested
- ASTM E331/1646 tested

FLORIDA BUILDING & MIAMI-DADE PRODUCT APPROVALS

Please refer to pac-clad.com or your local factory for specific product approval numbers for Snap-Clad.

Note: UL 90 is available on steel panels up to 18" on center, and on aluminum and copper panels up to 16" on center.

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PROSOCO®

R•Guard

AIR & WATER BARRIER

Cat 5®

INDOOR ADVANTAGE GOLD
BUILDING MATERIALS

PROSOCO R-Guard® Cat 5® is a fluid applied, waterproofing, and air and water barrier membrane that combines the best of silicone and polyurethane properties. This single component, Silyl-Terminated-Polymer (STP) is roller applied to produce a highly durable, seamless, elastomeric weatherproofing membrane on exterior sheathing, CMU back-up walls, and pre-cast concrete. Cat 5® is proven to prevent water and air penetration of the building envelope in conditions ranging from everyday weather to the drenching rains and 155 mph winds of a Category 5 hurricane.

Cat 5® can be applied in unfavorable weather conditions to dry or damp substrates. This feature eliminates many weather-related construction delays and accelerates the "drying in" of new buildings. The durable, elastomeric membrane adheres to most surfaces, is immediately waterproof and is compatible with most sealants and waterproofing or air barrier components.

ADVANTAGES

- **Silane functional polymer provides superior long term adhesion, crack bridging and weathering characteristics. Self seals fastener penetrations.**
- **Bonds to most common building materials without priming to produce a durable, weatherproof membrane. Easy to repair if damaged.**
- **Will not tear or lose effectiveness when exposed to weather during construction.**
- **Bonds and cures in wet weather and on damp substrates.**
- **May be fully exposed to UV and weather for up to 12 months. If longer, contact for inspection.**
- **Service temperature from -75°F to 300°F (-59°C to 149°C).**
- **Single component – saves time.**
- **Easy roller application in all climates.**
- **Breathable. Allows damp surfaces to dry.**
- **Solvent free. Isocyanate free. Phthalate free.**
- **No shrinkage. No staining. No yellowing.**
- **Will not support mold growth.**
- **Stops penetration of air and water under normal and extreme weather conditions.**
- **Air Barrier Association of America (ABAA) approved product.**
- **Illustrations depicting the use of PROSOCO R-Guard® products are available at www.prosoco.com by downloading the R-Guard Installation Guidelines.**

Limitations

- Not for use as a liquid flashing membrane. Use R-Guard FastFlash®.
- Not for use in place of appropriate through-wall flashing. See R-Guard SS ThruWall product literature.
- Not for use below grade or in locations designed to be continuously immersed in water.

REGULATORY COMPLIANCE

VOC Compliance

R-Guard Cat 5® is compliant with the following national, state and district AIM VOC regulations:

X	US Environmental Protection Agency
X	California Air Resources Board SCM Districts
X	South Coast Air Quality Management District
X	Maricopa County, AZ
X	Northeast Ozone Transport Commission

SAFETY INFORMATION

Always read full label and SDS for precautionary instructions before use. Use appropriate safety equipment and job site controls during application and handling.

24-Hour Emergency Information:
INFOTRAC at 800-535-5053

TYPICAL TECHNICAL DATA

FORM	viscous liquid, mild odor light brown color
SPECIFIC GRAVITY	1.35–1.50
pH	not applicable
WT/GAL	11.6 lbs
TOTAL SOLIDS	99%
VOC CONTENT	<30 g/L
FLASH POINT	>200° F (>93° C)
FREEZE POINT	not applicable
SHELF LIFE	1 year in tightly sealed, unopened container

Cured Properties

Hardness, Shore A	20–25
Tensile Strength	>100 psi
Elongation at Break*	>250% (ASTM D 412)
Water Vapor Transmission	18 perms (ASTM E 96)
Transfer Free Time	2–4 hours

*Elongation per ASTM D 412 is not a requirement of the Air Barrier Association of America's (ABAA) Acceptance Criteria for Liquid Applied Membranes nor is it a requirement of the International Code Council Evaluation Service's Acceptance Criteria for Water-Resistive Coatings used as Water-Resistive Barriers over exterior Sheathing (ICC-ES AC212). Elongation is not a requirement of the AAMA 714 Specification for Liquid Applied Flashing used to Create a Water-Resistive Seal Around Exterior Wall Openings. There is no data to support that certain levels of elongation must be achieved to perform as a fluid applied WRB or as a fluid applied flashing. Specifications should be based upon performance test results like those required from the referenced organizations.

Refer to the R-Guard Cat 5® Product Test Results for a complete list of performance test results.

PREPARATION

Protect people, vehicles, property, plants and all other surfaces not intended for application. Apply to clean surfaces free of contaminants. Chemical residues, surface coatings or films may adversely affect adhesion. Pressure-treated wood and other contaminated surfaces should be cleaned with a solvent wipe before application.

Remove and replace damaged sheathing. On exterior sheathing, treat cracks with R-Guard Joint & Seam Filler and/or R-Guard FastFlash®, as needed.

In rough openings and outside corners, prime all raw gypsum board edges with R-Guard PorousPrep. Use R-Guard Joint & Seam Filler and/or R-Guard FastFlash® on joints, seams and all other interfaces, as needed. Let Joint & Seam Filler and/or FastFlash® skin over before applying Cat 5®.

Surface & Air Temperatures

Surface and ambient temperatures should be 40°F (4°C) and rising and below 110°F (43°C) during application and drying. Wind and high temperatures will accelerate drying.

Hot Weather Precautions: If air or surface temperatures exceed 95°F (35°C), apply to shaded surfaces and before daytime air and surface temperatures reach their peak. Hot surfaces may be cooled with a mist of fresh water. Keep containers closed and out of direct sunlight when not in use.

Cold Weather Conditions: May be applied to frost-free substrates at temperatures below 32°F (0°C). Product will not start curing and drying until temperature rises to and remains above 32°F (0°C).

Low Humidity Conditions: Curing may take longer than 12 hours. Lightly misting treated surfaces with fresh water will accelerate curing. Uncured material may delay construction.

Though Cat 5® may be applied to damp surfaces and tolerates rain immediately after application, do not apply to surfaces with standing water or frost. *Contact PROSOCO if conditions are questionable.*

Equipment

Apply using standard ¼ inch to 3/8 inch nap rollers.

Storage & Handling

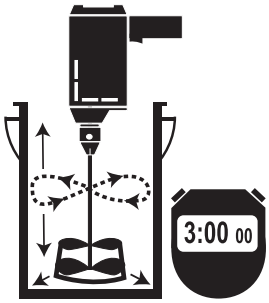
Store in a cool, dry place. Keep container tightly closed when not dispensing. Do not open container until preparation work has been completed. Do not alter or mix with other chemicals. When stored at or below 80°F (27°C) Cat 5® has a shelf life of 12 months after the date of manufacture. This shelf life assumes upright storage of factory-sealed containers. Do not double stack pallets. Dispose of unused product and container in accordance with local, state and federal regulations.

APPLICATION

Read "Preparation" and the Safety Data Sheet before use.

Dilution & Mixing

Apply as packaged. Do not dilute or alter, or use for applications other than specified. Using a low-speed drill and paddle, mix well from top to bottom and side-to-side for a minimum of 3 minutes before use. Avoid mixing air into the product.



Coverage Rates

Coverage rates will vary depending on surface porosity, moisture uptake, and other factors. Unless otherwise required by the referenced test method, test results cited were achieved when the product was applied at 12 wet mils to DensGlass® gold fiberglass mat gypsum sheathing. Many gypsum sheathing products require additional material to achieve hide and the desired mil thickness for a pinhole free coating. In some cases, particularly on CMU, two coats may be required to achieve a pinhole free coating. Actual rates must be determined through mock-up applications.

For more information regarding coverage rates as it pertains to glass-mat sheathing, please consult the AMT Laboratories Technical Bulletin available at www.prosoco.com/literature-library.

Cat 5® is sold in 5 gallon containers.

- *Exterior Gypsum Board, OSB and Plywood*: 50–100 sq.ft. per gallon
- *CMU*: 50–80 sq.ft. per gallon

Application Instructions

1. Roller apply to exterior wall assembly using vertical strokes with a slight diagonal slant. Ensure there are no pinholes, voids or gaps in the membrane. ***NOTE***: If air or surface temperatures exceed 95°F (35°C), apply to shaded surfaces and before daytime air and surface temperatures reach their peak.
2. Seal masonry ties and properly prepared penetrations as work progresses. Some substrates will require additional material to achieve a continuous coating. Inspect surface after initial application and touch-up as needed. CMU, OSB and exceptionally porous gypsum sheathing may require two coats.

BEST PRACTICES

Cat 5® bonds tenaciously. Carefully protect all nearby surfaces not intended for treatment. Immediately clean up incidental contact using mineral spirits or similar solvent.

Always use Joint & Seam Filler, FastFlash® and AirDam® where required. Do not substitute.

Prepare all rough openings with Joint & Seam Filler and/or FastFlash®. Allow to skin over before installing Cat 5®. Overlap Cat 5® onto FastFlash® by 2 inches or more. A slightly diagonal vertical application stroke provides best coverage.

Coverage rates will vary depending on surface porosity, moisture uptake, and other factors. Many gypsum sheathing products require additional material to achieve hide and the desired mil thickness for a pinhole free coating. In some cases, two coats may be required. Actual rates must be determined through mock-up applications.

For more information regarding coverage rates as it pertains to glass-mat sheathing, please consult the AMT Laboratories Technical Bulletin available at www.prosoco.com/literature-library.

Wind, high temperatures and high humidity accelerate drying. At 70°F (21°C) and 50% relative humidity, product will skin in approximately 2 hours and cure in approximately 12 hours when applied at 12 mil thickness.

Low temperatures and low relative humidity will extend cure time. Mist surfaces with fresh water to accelerate cure.

Illustrations depicting the use of PROSOCO R-Guard® products are available at www.prosoco.com by downloading the R-Guard Installation Guidelines.

To schedule field technical support, contact your PROSOCO Technical Customer Care toll-free at 800-255-4255. Field visits by PROSOCO personnel are for the purpose of making technical recommendations only. **PROSOCO is not responsible for providing job site supervision or quality control**. Proper application is the responsibility of the applicator.

3. Allow product to cure and dry. Wind, high temperatures and high humidity will accelerate drying. Low temperatures and low relative humidity will extend cure time. Lightly mist treated surfaces with fresh water to accelerate cure.
4. Inspect membrane before covering to ensure a void- and pinhole-free surface. Repair any deep gouges, punctures or damaged areas with FastFlash® or Joint & Seam Filler. If the surface of the primary air barrier or liquid flashing membrane is damaged during construction, remove all loose surface contaminants before selective re-coating with additional FastFlash®, Joint & Seam Filler or Cat 5®. Overlap repairs, penetration treatments, transitions, SS ThruWall, rigid flashing and other air barrier components to ensure positive drainage and continuity of the air and water barrier.

Cleanup

Clean tools and equipment with mineral spirits or similar solvent immediately after use.

Curing and Drying

At 70°F (21°C) and 50% relative humidity, product skins in approximately 2 hours and cures in approximately 12 hours when applied at 12 mil thickness.

Cat 5® is moisture curing. Low temperatures and low relative humidity slow cure time. Wind, high temperatures and high humidity accelerate drying.

WARRANTY

The information and recommendations made are based on our own research and the research of others, and are believed to be accurate. However, no guarantee of their accuracy is made because we cannot cover every possible application of our products, nor anticipate every variation encountered in masonry surfaces, job conditions and methods used. The purchasers shall make their own tests to determine the suitability of such products for a particular purpose.

PROSOCO, Inc. warrants this product to be free from defects. **Where permitted by law, PROSOCO makes no other warranties with respect to this product, express or implied, including without limitation the implied warranties of merchantability or fitness for particular purpose**. The purchaser shall be responsible to make his own tests to determine the suitability of this product for his particular purpose. PROSOCO's liability shall be limited in all events to supplying sufficient product to re-treat the specific areas to which defective product has been applied. Acceptance and use of this product absolves PROSOCO from any other liability, from whatever source, including liability for incidental, consequential or resultant damages whether due to breach of warranty, negligence or strict liability. This warranty may not be modified or extended by representatives of PROSOCO, its distributors or dealers.

CUSTOMER CARE

Factory personnel are available for product, environment and job-safety assistance with no obligation. Call 800-255-4255 and ask for Customer Care – technical support.

Factory-trained representatives are established in principal cities throughout the continental United States. Call Customer Care at 800-255-4255, or visit our web site at www.prosoco.com, for the name of the PROSOCO representative in your area.

PRODUCT TEST RESULTS
R-Guard Cat 5®

PROSOCO

ICC-ES AC212[1]
Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers Over Exterior Sheathing

TEST	METHOD	CRITERIA	RESULTS
Tensile Bond	ASTM C 297	Minimum 15 psi (105 kPa)	Pass
Freeze-Thaw	ICC-ES AC212	No cracking, checking, crazing, erosion, delamination or other deleterious effects	Pass
Water Resistance	ASTM D 2247	No cracking, checking, crazing, erosion, delamination, or other deleterious effects	Pass
Water Vapor Transmission	ASTM E 96 Wet Cup	Measure	18 perms at 12 mils
Water Penetration	ASTM E 331	No visible water penetration at the sheathing joints as viewed from the back of the panel	Pass
Structural, Racking, Restrained Environmental Conditioning & Water Penetration	ASTM E 1233 A ASTM E 72 ICC-ES AC212 ASTM E 331	No cracking of the coating	Pass
Weathering	ICC-ES AC212 AATCC[2] 127	No cracking of the coating; no water penetration	Pass
Air Permeance	ASTM E 2178	≤ 0.02 L / s·m² at 75 Pa (≤ 0.004 cfm / ft² at 1.57 psf)	Pass: 0.0009 L / s·m² at 75 Pa (0.00018 cfm / ft² at 1.57 psf)

ABAA: Air Barrier Association of America Acceptance Criteria for Liquid Applied Membranes

TEST	METHOD	CRITERIA	RESULTS
Air Permeance	ASTM E 2178	≤ 0.02 L / s·m² at 75 Pa (≤ 0.004 cfm / ft² at 1.57 psf)	Pass: 0.0009 L / s·m² at 75 Pa (0.00018 cfm / ft² at 1.57 psf)
Air Leakage of Air Barrier Assemblies	ASTM E 2357	≤ 0.2 L / s·m² at 75 Pa (≤ 0.04 cfm / ft² at 1.57 psf)	Pass: 0.0105 L / s·m² at 75 Pa (0.0021 cfm / ft² at 1.57 psf)
Water Resistance	AATCC 127	No water infiltration after exposure to 55 cm head of water for 5 hours	Pass
Fastener Sealability	ASTM D 1970	No water infiltration	Pass
Pull Adhesion	ASTM D 4541	110 kPa (16 psi) or substrate failure	Pass
ICC-ES AC212	Entire Suite of Tests	Pass	Pass
Crack Bridging	ASTM C 1305	Pass	Pass
Water Vapor Permeance at applied thickness	ASTM E 96	Report in Ng/(Pa·s·m2)	Wet: 1015 Ng/(Pa·s·m²) Dry: 860 Ng/(Pa·s·m²)

Fire Testing

TEST	METHOD	CRITERIA	RESULTS
Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies	NFPA[3] 285	Must resist flame propagation and flame spread	Pass[4]
Determining Ignitability of Exterior Wall Assemblies	NFPA 268	Cannot exhibit sustained flaming when exposed to radiant heat flux of 12.5 kW/m² ± 5% for 20 minutes	Pass[5]
Surface Burning Characteristics	ASTM E 84	Criteria for ICC and NFPA Class A Building Material: Flame Spread ≤ 25 Smoke Developed ≤450	Meets Class A Building Material Flame Spread: 10 Smoke Developed: 0

All testing conducted by independent, accredited laboratories.

NOTES:
1: International Code Council Evaluation Service Acceptance Criteria 212
2: American Association of Textile Chemists and Colorists
3: National Fire Protection Association
4: Southwest Research Institute Report No. 01.17421.01.001
5. Southwest Research Institute Report No. 01.17421.01.002

TESCON VANA

All-round adhesive tape with fleece backing

Technical data

	Substance
Backing	special PP fleece
Adhesive	waterproof SOLID adhesive
Release film	siliconized paper

Attribute	Regulation	Value
Colour		dark blue
Exposure time		6 months
Application temperature		above -10 °C; 14 °F
Temperature resistance		permanent -40 °C to 90 °C ; -40 °F to 194 °F
Storage		cool and dry

Area of application

Inside: Airtight bonding of vapour check and airtightness membrane as well as airtight wood-based panels.

Outside: Airtight bonding of roof-mounted vapour check and refurbishment vapour check and airtightness membrane. Windproofing of sarking membrane, roof lining membrane and wall lining membrane (e.g. pro clima SOLITEX). Wind-proof bonding of wood-based panels used as sarking boards.

All bonding, indoor and outdoor, can be between the same material as well as with adjacent structural components with a smooth, non-mineral surface (e.g. pipe penetrations, roof windows).

Advantages

- ✔ All-round adhesive tape for internal and external use, 6 months of outdoor exposure
- ✔ Easy to tear off by hand with the soft fleece backing
- ✔ Can be plastered over
- ✔ For airtight bonds according to DIN 4108-7, SIA 180 and OENORM B 8110-2
- ✔ Lowest VOC rating in hazardous substance test

Substrates

Before sticking, subsurfaces should be brushed off, wiped clean with a cloth or cleaned using compressed air.
Adhesion to frozen surfaces is not possible. There must be no water-repellent substances (e.g. grease or silicone) on materials to be bonded.
Subsurfaces must be sufficiently dry and have sufficient load-bearing capacity.

Permanent adhesion is achieved on all pro clima interior and exterior membranes, other vapour retarder and airtight membranes (e.g. those made of PE, PA, PP and aluminium) as well as other underlay/sarking and wall lining membranes (e.g. those made of PP and PET).
Adhesion and joints can be carried out on planed and painted wood, hard plastics and metal (e.g. pipes, windows etc.), hard wood-based panels (chipboard, OSB and plywood panels, MDF board and softwood fibre sub-roof panels).
Wood fibre sub-roof panels and smooth mineral subsurfaces require pre-treatment with TESCON PRIMER RP before bonding. Concrete or plaster subsurfaces must not be sandy or crumbling.

The best results in terms of structural stability are achieved on high-quality subsurfaces.
It is your responsibility to check the suitability of the subsurface; adhesion tests are recommended in certain cases.
Pretreatment with TESCON PRIMER RP is recommended in the case of subsurfaces with insufficient load-bearing capacity.

General conditions

The bonds should not be subjected to tensile strain.
After sealing the vapour retarding membranes, the weight of the insulating material must be borne by lathing. Adhesion should be supported by battens if necessary.
Press firmly to secure the adhesive tape. Ensure there is sufficient back-pressure. Windproof, airtight or rainproof seals can only be achieved on vapour retarding membranes, roof lining membranes or façade membranes that have been laid without folds or creases. Ventilate regularly to prevent build-up of excessive humidity and use a dryer if necessary.

The information provided here is based on practical experience and the current state of knowledge. We reserve the right to make changes to the recommended designs and processing or to make alterations due to technical developments and associated improvements in the quality of our products. We would be happy to inform you of the current technical state of the art at the time you use our products.

Further information about the application and construction can be found in the pro clima planning documentation. For queries please call the pro clima technical hotline on +49 (0)6202 278245.

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pro clima®

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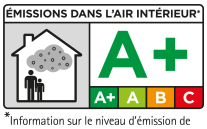
testé avec succès
weltweit einzigartig
unique worldwide
unique au monde
TESCON VANA I TESCON No.1 I UNI TAPE



*Information sur le niveau d'émission de substances volatiles dans l'air intérieur, présentant un risque de toxicité par inhalation, sur une échelle de classe allant de A+ (très faibles émissions) à C (fortes missions)

Made in Germany
developed and produced by
pro clima

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pro clima®

SPECIFICATION INFORMATION

VIPER® CS 10-mil

Vapor Retarders
Division: 03300
Division: 07260

Revision #2

1.0 Product Name

Viper® CS 10
Crawl-Space Vapor Barrier.

2.0 Manufacturer

InsulationSolutions®
Insulation Solutions Inc.
401 Truck Haven Road.
East Peoria, IL 61611

Engineering Assistance
Toll Free: 866-698-6562
Fax: 309-698-0065
www.insulationsolutions.com

3.0 Product Description

3.1 Basic Use:

Viper® CS 10 is a high performance crawl-space vapor barrier designed to prevent moisture migration from the soil into the crawl-space. Viper® CS 10 helps guard against mold, mildew, allergens, fungus, radon gas, methane gas, heat loss due to damp insulation, wood rot and overall degradation of the crawl-space.

3.2 Composition & Materials:

Viper® CS 10 is a white, 10-mil triple ply, extrusion coated, virgin polyethylene membrane. Viper® CS 10 is manufactured using woven high-density fibers yielding the highest strength to weight ratio, tensile strength, tear resistance, bursting strength and puncture resistance of any product produced of its kind.

3.3 Size:

Viper® CS 10 is available in 2400 sq. ft. rolls (12' X 200').

3.4 Weight:

Viper® CS 10 weighs approximately 36 lbs. per 1000 sq. ft.

4.0 Technical Data

4.1 Applicable Standards

American Society for Testing & Materials (ASTM)

- ***ASTM E 1745*** *Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs*
- ***ASTM E 154*** *Standard Test Methods for Water Vapor Retarders used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover*
- ***ASTM D 1709*** *Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method /* ***ASTM D 5602*** *Standard Test Methods for Static Puncture Resistance of Roofing/Under Slab Membrane Specimens*
- ***ASTM E 96*** *Standard Test Methods for Water Vapor Transmission of Materials*
- ***ASTM D 882 / ASTM D 751*** *Standard Test Method for Coated Fabrics*
- ***ASTM E 1643*** *Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs*

Note: To the best of our knowledge, these are typical property values and are intended as guides only, not as specification limits. Insulation Solutions Inc.® makes no warranties as to the fitness for a specific use or merchantability of products referred to, no guarantee of satisfactory results from reliance upon contained information or recommendations and disclaims all liability for resulting loss or damage.

PROPERTIES	TEST METHOD	VIPER® CS 10	
Test Results - Independent Test Facility		*English*	*Metric*
Thickness, Nominal		10-mil	0.25 mm
Weight Per MSF		36 lbs	16.3 kg
Classification	ASTM E 1745	CLASS A, B, C	
Tensile Strength (New Material)	ASTM E 154, Sec. 9	136 lbf./in. (MD) 134 lbf./in. (TD)	61.7 kg 60.8 kg
Tensile Strength (After Soaking)	ASTM E 154, Sec. 9	140 lbf./in. (MD) 133 lbf./in. (TD)	63.5 kg 60.3 kg
Tear Strength	ASTM D 751 Tongue	54 lbs. (warp) 57 lbs. (weft)	24.5 kg 25.8 kg
Bursting Strength	ASTM D 751 Mullen	318 lbs.	144 kg
Puncture Resistance	ASTM D 1709	15,839 grams	
Puncture Resistance	ASTM D 5602	76 lbs.	34,473 g
Maximum Use Temperature Minimum Use Temperature		180° F -70° F	82° C -57° C
Water Vapor Permeance	ASTM E 96 / 154 Sec. 7	.0016 perms .00058 WVTR	.0010 perms CLASS A

4.2 Environmental Considerations:

Viper® CS 10 can be used as a radon and methane gas barrier.

4.3 Physical Properties

Viper® CS 10 exceeds all ASTM E 1745 Class A, B and C requirements for under-slab vapor retarders.

5.0 Installation

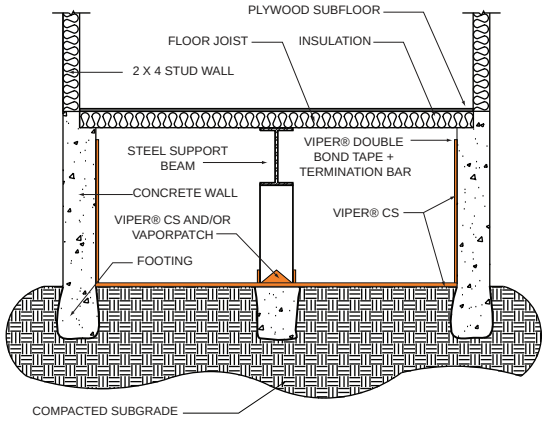
VIPER® CS 10 PLACEMENT

5.1 If sump pump is present or is to be installed, slightly slope grade in the direction of the sump pit to allow for proper drainage. Tamp or roll sub base or granular base.

5.2 Unroll Viper® CS 10 in correlation with the longest dimension of the crawl-space area. Unfold to twelve foot width.

5.3 Install Viper® CS 10 by means of Viper® Double Bond Tape, mechanical fasteners, termination bar and or high grade construction adhesive to the upper portion of the block/concrete wall. Leave at least a three inch gap from the sill to the top of the Viper® CS 10 for future termite inspection. Seal the top edge of Viper® CS 10 with urethane caulk.

5.4 Holes or openings through Viper® CS 10 should be effectively sealed with all weather Viper® VaporTape, white polyethylene tape, Viper® VaporPatch and/or mastic to maintain the integrity of the vapor barrier. Overlap joints a minimum of six inches. Seal overlap together with all weather Viper® VaporTape or white polyethylene tape.



PROTECTION

5.5 Proper care should be taken when installing Viper® CS 10. Carelessness during installation can damage even the most puncture resistant vapor retarders.

5.6 Viper® CS 10 will help guard against possible punctures and tears present from rigorous construction traffic.

5.7 Avoid driving stakes through Viper® CS 10. If this cannot be avoided, each individual hole must be repaired.

Note: These are very general installation instructions. Instructions on architectural or structural drawings should be reviewed and followed as well. Detailed installation instructions accompany each roll of Viper® CS 10.

6.0 Availability & Cost

Viper® CS 10 is sold through construction supply houses across the United States and Canada.

Viper® CS 10 current cost information can be obtained by calling our corporate sales office at 866-698-6562.

7.0 Warranty

To the best of our knowledge, the specification chart on page one lists typical property values and are intended as guides only, not as specification limits. INSULATION SOLUTIONS INC. MAKES NO WARRANTIES AS TO THE FITNESS FOR A SPECIFIC USE OR MERCHANTABILITY OF PRODUCTS REFERRED TO, NO GUARANTEE OF SATISFACTORY RESULTS FROM RELIANCE UPON CONTAINED INFORMATION OR RECOMMENDATIONS AND DISCLAIMS ALL LIABILITY FOR RESULTING LOSS OR DAMAGE.

8.0 Maintenance

Viper® CS 10 requires no maintenance once installed.

9.0 Technical Services

Technical Information and detailed test results can be obtained by calling our corporate office at 866-698-6562.

10.0 Filing Systems

Additional Information is available from the manufacturer.

08 – OPENINGS

810000 - WINDOWS

PART 1 - GENERAL

1.1 Scope

There are interior and exterior windows used in the awning, casement, and skylight. They are used to increase the day lighting within the interior of the house to reduce the need for artificial lighting.

1.2 Performance Requirements

A. Structural Performance: Provide wood windows engineered, fabricated, and installed to withstand normal thermal movement, wind loading, and impact loading without failure, as demonstrated by testing manufacturer's standard window and door assemblies representing types, grades, and sizes required for this Project according to test methods indicated.
B. Design wind velocity at Project site is 60 mph.
C. Performance Requirements: Testing shall demonstrate compliance with requirements indicated in NWWDA I.S. 2 for water penetration, and structural performance for the type and performance grade of window units required. Where required design pressure exceeds the minimum for the specified window grade, comply with requirements of NWWDA I.S. 2, Article 6, "Optional Performance Classifications," for higher than minimum performance grades.
D. Standards: Performance requirements for operating force, air infiltration, water penetration, structural performance, and forced-entry resistance for wood windows are those specified in NWWDA I.S. 2, "Industry Standard for Wood Window Units."
E. Test Criteria: Testing shall be performed by a qualified independent testing agency based on the following criteria:
F. Test Procedures: Test window units according to ASTM E 283 for air infiltration, ASTM E 547 for water penetration, and ASTM E 330 for structural performance.
G. Air-Infiltration Rate for Windows: Not more than 0.05 cfm/sq. ft. for an inward test pressure of 6.24 lbf/sq. ft. (295 Pa).
H. Water Penetration for Windows: No water penetration as defined in the test method at a static pressure of 12 p.s.f. after 15 minutes with water applied at a rate of five gallons per hour per square foot.
I. Structural Performance: No failure or permanent deflection in excess of 0.4 percent of any member's span after removing the imposed load, for a positive (inward) and negative (outward) test pressure of 22.5 lbf/sq. ft. (1077 Pa).

1.3 Submittals

A. Product Data sheets
B. Shop Drawings
C. Manufacturer approval for installation

1.4 References

A. General: Standards listed by reference form a part of this specification section. Standards listed are identified by issuing authority, abbreviation, designation number, title or other designation. Standards subsequently referenced in this Section are referred to by issuing authority abbreviation and standard designation.

B. American Architectural Manufacturers Association (AAMA):
   1. AAMA 450 - Voluntary Performance Rating Method for Mulled Fenestration Assemblies.
   2. AAMA 502 - Voluntary Specification for Field Testing of Newly Installed Fenestration Products.
   3. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
   4. AAMA 902 - Voluntary Specification for Sash Balances.
   5. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
   6. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
   7. NAFS - North American Fenestration Standard/Specification for windows, doors and skylights.

C. ASTM International (ASTM):
   1. ASTM C1036 - Standard Specification for Flat Glass.
   2. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
   3. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
   4. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.
   5. ASTM E1886 - Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.
   6. ASTM E1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.
   7. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.
   8. ASTM F2090 - Standard Specification for Window Fall Prevention Devices with Emergency Escape (Egress) Release Mechanisms.

PART 2 – PRODUCTS

2.1 Acceptable products

A. Acceptable products
   1. Product: Push Out Awning E-series Window
      a. Manufacturer: Anderson Windows
      b. Dimensions: 1’ 6” X 3’ (custom built up to 4’ X 4’)
      c. Materials: Wood Interior, Aluminum Exterior (finishes optional)

d. Glazing Options: Low-E4®/Low-E4® Sun/Low-E4® SmartSun™/Low-E4®
e. PassiveSun/Triple-Pane/Dual-Pane

2. Product: Casement E-Series Casement Window
   a. Manufacturer: Anderson Windows
   b. Dimensions: 4’ 4” X 3’ (custom built up to 6’ X6’)
   c. Materials: Wood Interior, Aluminum Exterior (finishes optional)
   d. Glazing Options: Low-E4®/Low-E4® Sun/Low-E4® SmartSun™/Low-E4®
   e. PassiveSun/Triple-Pane/Dual-Pane
3. Product: Fresh Air Electric Deck Mount Skylight
   a. Manufacturer: VELUX
   b. Glass: Laminated low-e3 glass
   c. Dimensions: 21” x 45-3/4”
   d. Warrant: 10 years
   e. Control: touch screen control
4. Product: Sun tunnel skylight
   a. Manufacturer: VELUX
   b. Model: TCR
   c. Daylight area: 138 in^2
   d. Curb metal flashing

PART 3 - EXECUTION

3.1 FABRICATION

A. General: Fabricate wood window units to comply with indicated standards. Include a complete system for assembly of components and anchorage of window and door units.
   1. Comply with requirements of NWWDA I.S. 2 , I.S. 610, and I.S. 620 for moisture content of lumber at time of fabrication.
   2. Fabricate.
B. Provide weather stripping at perimeter of each operating sash.
C. Factory-Glazed Window and Door Units: Except for light sizes in excess of 100 united inches (2500 mm width plus length), glaze window and door units in the shop before delivery, unless factory glazing is not available from manufacturer. Comply with requirements of NWWDA I.S.
D. Mullions: Provide mullions and cover plates as shown, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Provide mullion and cover plates capable of withstanding design loads of window units.

3.02 INSTALLATION

A. Check with manufacturer on installation guidelines for all products and provide installation requirements to the Contractor and Architect for approval.
B. Prepare substrate by cleaning, removing projections, filling voids, sealing joints, and as otherwise recommended in manufacturer's written instructions.
C. Set units level, plumb, and true to line, without warp or rack of frames and panels and anchor securely in place.
D. Fasten door and window frames securely in place, with provisions for thermal and structural movement. Install with concealed fasteners, unless otherwise indicated.

E. Separate dissimilar metals and metal products from contact with wood or cementations materials, by painting each metal surface in area of contact with a bituminous coating or by other permanent separation.
F. Correct deficiencies in or remove and reinstall windows, doors, glazing, or hardware that does not comply with requirements.
G. Repair, refinish, or replace windows and doors damaged during installation, as directed by Architect.
H. Adjust operating parts and hardware for smooth, quiet operation and weather tight closure. Lubricate hardware and moving parts.

END SECTION 810000

083000 - DOORS

PART 1 – GENERAL

1.1 SCOPE

There are wood entry doors located along the interior exterior of the house as well as two special feature glass doors that are included in the courtyard area.

1.2 Performance Requirements

A. Provide doors engineered, fabricated, and installed to withstand normal thermal movement, wind loading, and impact loading without failure, as demonstrated by testing manufacturer's standard door assemblies representing types, grades, and sizes required for this Project according to test methods indicated.

B. No failure or permanent deflection in excess of 0.4 percent of any member's span after removing the imposed load, for a positive (inward) and negative (outward) test pressure of 22.5 lbf/sq. ft. (1077 Pa).

1.3 Submittals:

A. Product Data.

B. Shop Drawings.

C. Testing verification.

1.4 Test Criteria:

A. Testing shall be performed by a qualified independent testing agency based on the following criteria:

1. Design wind velocity at Project site is 60 mph.
2. Test Procedures: Test door units according to ASTM E 283 for air infiltration, ASTM E 547 for water penetration, and ASTM E 330 for structural performance.

C. Testing shall demonstrate compliance with requirements indicated in NWWDA I.S. 2 for water penetration and structural performance for the type and performance grade of window and door units required. Where required design pressure exceeds the minimum for the specified window grade, comply with requirements of NWWDA I.S. 2, Article 6, "Optional Performance Classifications," for higher than minimum performance grades.

1.5 Air-Infiltration Rate for Doors:

A. Not more than 0.15 cfm/sq. ft. for an inward test pressure of 1.57 lbf/sq. ft. (75 Pa).

1.6 Water Penetration for Doors:

A. No water penetration as defined in the test method at a static pressure of 4.16 p.s.f. after 15 minutes with water applied at a rate of five gallons per hour per square foot.

PART 2 – PRODUCTS

A. Acceptable products

1. Exterior Doors
    a. Product: 82 – Traditional Panel Exterior Door
        i. Manufacturer: Simpson Door Company
        ii. Dimensions: 80” X 36”
        iii. Panels: 3/8” VG Flat Panel

iv. Door size: 1 ¾” double sticking
v. Profile: Ovolo Sticking

b. Product: 7502 – Thermal Sash(TDL)
i. Manufacturer: Simpson Door Company
ii. Type: Exterior French & Sash
iii. Dimensions: 80” X 36”
iv. Panels: 1-7/16" Innerbond® Double Hip-Raised Panel Glass:
v. Glass: 3/4" Insulated Glazing
vi. Privacy Ration: 1

2. Interior Doors
a. Product: 20 – Interior Panel Door
i. Manufacturer: Simpson Door Company
ii. Dimension: 80” X 36”
iii. Type: Interior panel
iv. Panels: 3/8” VG Flat Panel
v. Profile: Ovolo Sticking

PART 3 – EXECUTION

3.1 Fabrication

A. General: Fabricate wood door units to comply with indicated standards. Include a complete system for assembly of components and anchorage of door units.

B. Comply with requirements of NWWDA I.S. 2 , I.S. 610, and I.S. 620 for moisture content of lumber at time of fabrication.

3.02 INSTALLATION

A. Prepare substrate by cleaning, removing projections, filling voids, sealing joints, and as otherwise recommended in manufacturer's written instructions.
B. Set units level, plumb, and true to line, without warp or rack of frames and panels and anchor securely in place.
C. Correct deficiencies in or remove and reinstall doors, glazing, or hardware that does not comply with requirements.
D. Repair, refinish, or replace doors damaged during installation, as directed by Architect.

END SECTION 083000

083100 – FOLDING GLASS DOOR SYSTEM

PART 1 – GENERAL

1.1 SCOPE

Floor track supported, sliding-folding, thermally broken, aluminum-framed glass panel system to be installed between courtyard and indoor living area

1.2 SUBMITTALS

A. Detail Drawings: Indicate dimensioning, direction of swing, configuration, swing panels, typical head jamb, side jambs and sill details, type of glazing material, and handle height.
B. Product Data: Manufacturer's literature including independently tested data listing performance criteria and Owner's Manual with installation instructions.
C. Contract Closeout Submittal: Submit Owner's Manual from manufacturer. Identify with project name, location and completion date, type and size of unit installed.

1.3 QUALITY ASSURANCE

A. Manufacturer: Provide complete, precision built, engineered, pre-fitted unit by a single source manufacturer with at least 20 years experience in providing folding/sliding door systems for large openings in the North American market.
    1. The manufacturer must have a quality management system registration to the ISO 9001: 2008 standard.
B. Performance Requirements: Provide from manufacturer that has independently tested typical units. Testing results to include air infiltration in accordance with ASTM E 283 and NFRC 400, water penetration in accordance with ASTM E 547 and E 331, structural loading in accordance with ASTM E 330, and forced entry in accordance with AAMA 1304.
C. Thermal Performance U factor: Unit to be rated, certified and labeled in accordance with NFRC 100, shown in manufacturer's latest published data for the glazing, sill, and direction of opening specified.
D. Solar Heat Gain Coefficient: Unit to be rated, certified and labeled in accordance with NFRC 200, shown in manufacturer's latest published data for the glazing, sill, and direction of opening specified.
    1. If desired, Energy Star ratings can be achieved by the use of proper glass with the unit. See NanaWall's Performance data for details.
E. Installer Qualifications: Installer experienced in the installation of manufacturer's products or other similar products for large openings. Installer to provide reference list of at least 3 projects of similar scale and complexity successfully completed in the last 3 years.

1.4 WARRANTY

A. Provide manufacturer's standard warranty against defects in materials and workmanship.
B. Warranty Period: Ten years for rollers and for seal failure of insulated glass supplied. For all other components, one year (two years if unit is installed by manufacturer's certified trained installer) from date of delivery by manufacturer.

1.5 SITE CONDITIONS, DELIVERY, STORAGE AND HANDLING

A. In addition to general delivery, storage and handling requirements specified in Section 01600, comply with the following:
   1. Deliver materials to job site in sealed, unopened cartons or crates. Protect units from damage. Store material under cover, protected from weather and construction activities.

PART 2 - PRODUCTS

2.1 Acceptable manufacturer

A. NanaWall Systems, Inc., which is located at 100 Meadowcreek Drive #250 Corte Madera, CA 94925; Toll Free Tel: 800-873-5673; Tel: 415-383-3148; Fax: 415-383-0132; Website: www.nanawall.com; Email: info@nanawall.com
B. Frame and Panels: From manufacturer's standard profiles, provide head track, side jambs, and panels with dimensions shown on drawings.
   1. Provide panels with: Standard one lite
   2. Provide standard bottom rail.
   3. Aluminum Extrusion: Extrusions with nominal thickness of .078" (2.0 mm). Alloy specified as AlMgSi0.5 with strength rated as 6063-T5 or F-22 (European standard). Anodized conforming to AAMA 611 or powder coated conforming to AAMA 2604.
   4. Thermally broken with a wide Polyamide plastic reinforced with glass fibers. Polyamide plastic less than 7/8 (22 mm) wide or pour and de-bridge thermal break will not be accepted.
C. Product will be selected by the Contractor in accordance to the Work, and approved by the Architect

PART 3 - EXECUTION

3.1 FABRICATION

A. Use extruded aluminum frame and panel profiles with male-female interlocking, corner connectors and hinges, sliding and folding hardware, locking hardware and handles, glass and glazing and weather stripping as specified herein to make a folding glass wall. Factory pre-assemble as is standard for manufacturer and ship with all components and installation instructions.
B. Sizes and Configurations: See drawings for selected custom dimensions within maximum frame sizes possible as indicated in manufacturer's literature. See drawings for selected number of panels and configuration. Inward [OR outward] opening unit. On configurations with a pair of swing panels, looking from inside, primary swing panel on the left [OR right].

3.2 ERECTION

A. Because of the large dimensions involved and the weight and movement of the panels, verify the structural integrity of the header such that the deflection with live load and dead loads is limited to the lesser of L/720 of the span and 1/4 (6 mm). Structural support for lateral loads (both wind load and eccentric load when the panels are stacked open) must be provided. It is recommended that all building dead loads be applied to the header prior to installing the NanaWall. If so and if a reasonable amount of time has been allowed for the effect of this dead load on the header, then only the building's live load can be used to meet the above requirements of L/720 or 1/4 (6 mm). If not, both the dead and live loads need to be considered.

B. It is recommended that all building dead loads be applied to the header prior to installing the NanaWall. If so and if a reasonable amount of time has been allowed for the effect of this dead load on the header, then only the building's live load can be used to meet the above requirements of L/720 or 1/4 (6 mm). If not, both the dead and live loads need to be considered.

3.2 INSTALLATION

A. Install frame in accordance with manufacturer's recommendations and installation instructions.
B. Properly flash and waterproof around the perimeter of the opening.
C. Installer to provide appropriate anchorage devices and to securely and rigidly fit frame in place, absolutely level, straight, plumb and square. Install frame in proper elevation, plane and location, and in proper alignment with other work.

END OF SECTION 083100

083200 - RESIDENTIAL HANGER DOOR

PART 1 – GENERAL

1.1 SCOPE

Automated hanger door to be installed in courtyard

1.2 PERFORMANCE REQUIREMENTS

A. The door must be constructed to fit within the dimensions of the courtyard
B. A sufficient seal must be provided to prevent moisture from entering the interior of the house
C. The door must be equipped with a locking mechanism
D. The door width must not exceed 30 ft.

1.3 SUBMITTALS

A. Product Data: Manufacturer's data sheets on all products to be used, including:
    1. Preparation instructions and recommendations
    2. Storage and handling requirements and recommendations
    3. Installation instructions
    4. Cleaning and maintenance instructions
B. Structural Analysis: Provide confirmation of the capability and adequacy of the structure to carry the dead and live load weights required

PART 2 - PRODUCTS

2.1 ACCEPTABLE PRODUCTS

A. PRODUCT: WILSON CLEAR-VUE DOOR
    1. Acceptable Manufacturer: Wilson Industrial Doors, which is located at PO Box 246 Franksville, WI 53126; Tel: 262-732-5042; Fax: 262-835-2660; Email: request info (info@wilsondoors.com); Web: www.wilsondoors.com
    2. Frame: ¼" thick 6061-T6 Aluminum Alloy Tubing
    3. Seals: rubber top seal, neoprene side seals, hinge seal, rubber floor seal conforms to contour of the ground
    4. Covering: any specified material, to be provided by other manufacturer
    5. Lift Cables: galvanized steel, custom-sized to provide a 5:1 safety factor
    6. Drive Shaft and Cable Drums: heavy-duty galvanized tubing; 6"x4" mounting angle; mounted above the door and runs the width of the door
    7. Locking Mechanism: dual handle manual locking mechanism; lock switch shuts off power to motor until door is unlocked (optional auto lock)
    8. Power Operator: electrical controls designed to meet National Electrical Code Section 513
    9. Control Box: programmable drive; momentary contact, 3-button controls (Up/Down/Stop standard)
    10. Over Travel Switch: back-up switch to prevent the door from reaching its upper limit

END OF SECTION 083200

084000 – VENTS

PART 1 – GENERAL

1.1 SCOPE

Vent openings to be indicated in the drawings. The openings include bathroom ventilation, kitchen, and living areas.

1.2 Submittals:

A. Product Data

1.3 Standards

A. ASTM B26 – Aluminum-Alloy Sand Castings.
B. ASTM B85 – Aluminum-Alloy Die Castings.

PART 2 - PRODUCTS

2.1 No product specified, and needs to be supplied to the Architect for approval

2.2 FINISHES

A. Wall vent finish: anodized aluminum.

PART 3 - EXECUTION

3.1 COORDINATION

A. Coordinate supply of vents with construction of walls to ensure proper sizing and placement of vent openings.

3.2 INSTALLATION

A. Install vents and dampers in accordance with manufacturer's installation instructions and approved shop drawings
B. Do not install bent, scratched, or otherwise damaged vents. Remove damaged components from site and replace
C. Install vents secure, level, plumb, and flush with wall surface.

3.3 CLEANING

A. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.
B. Wash exposed surfaces with solution of mild detergent applied with soft cloth. Take care to remove dirt from corners. Wipe surfaces clean.

END OF SECTION 084000

END OF SECTION 08

82 — TRADITIONAL PANEL

SERIES: Traditional Exterior Doors
TYPE: Exterior Traditional
APPLICATIONS: Can be used for a swing door, with barn track hardware, with pivot hardware, in a patio swing door or slider system and many other applications for the home's exterior.

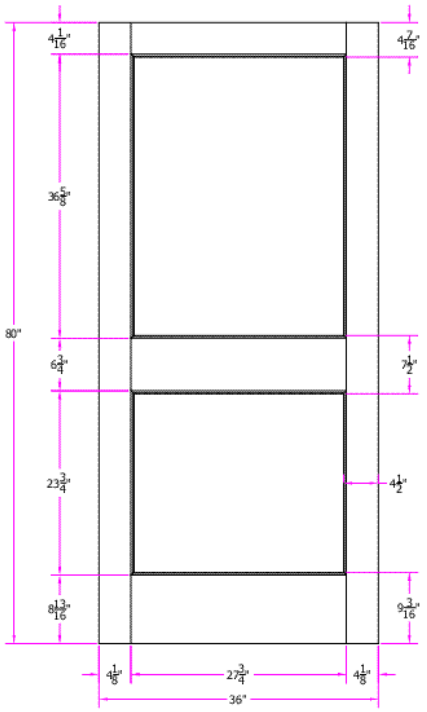
Construction Type:
Engineered All-Wood Stiles and Rails with Dowel Pinned Stile/Rail Joinery

Panels: 3/8" VG Flat Panel
Profile: Ovolo Sticking

STANDARD FEATURES

- Any Wood Species
- Virtually Any Size

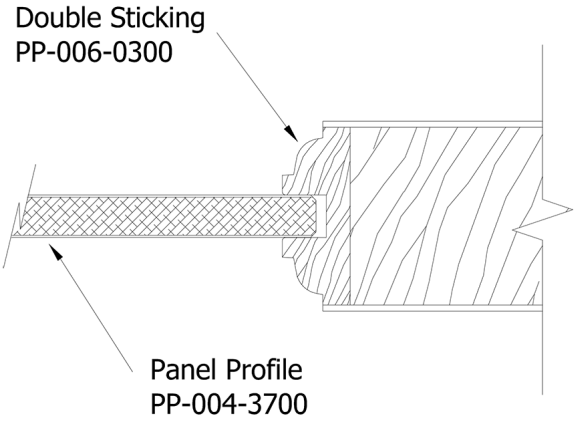
DETAILED DRAWING



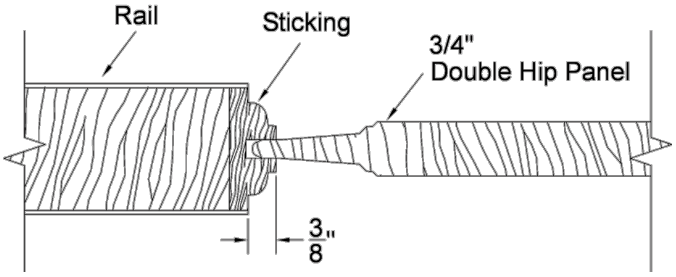
DETAILS

1 3/4" Door with 3/8" Flat Panel (FP)

SD-0300-045



(Standard)



(Optional)

7502 — THERMAL SASH (TDL)

SERIES: Exterior French & Sash Doors
TYPE: Exterior French & Sash
APPLICATIONS: Can be used for a swing door, with barn track hardware, with pivot hardware, in a patio swing door or slider system and many other applications for the home's exterior.

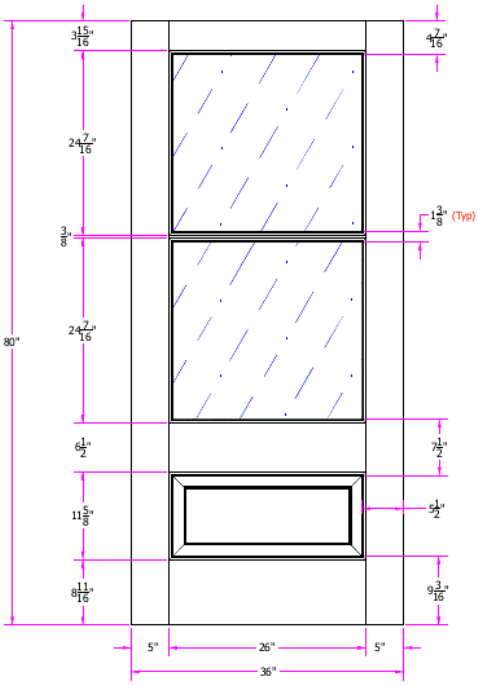
Construction Type:
Engineered All-Wood Stiles and Rails with Dowel Pinned Stile/Rail Joinery

Panels: 1-7/16" Innerbond® Double Hip-Raised Panel
Glass: 3/4" Insulated Glazing

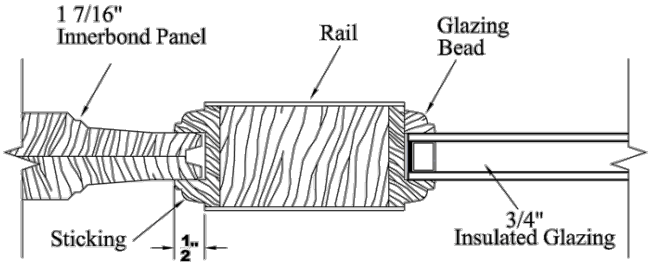
STANDARD FEATURES

- Any Wood Species
- Virtually Any Size
- Glass Options
- Privacy Rating: 1

DETAILED DRAWING



DETAILS



(Standard)

20 — INTERIOR

SERIES: Interior Panel Doors
TYPE: Interior Panel
APPLICATIONS: Can be used for a swing door, pocket door, by-pass door, with barn track hardware, with pivot hardware and for any room in the home.

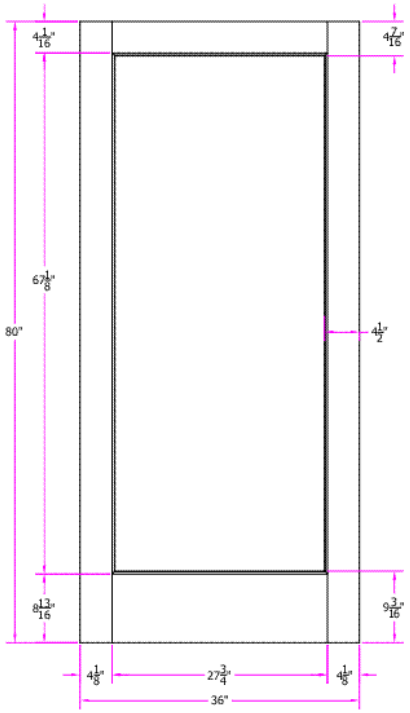
Construction Type:
Engineered All-Wood Stiles and Rails with Dowel Pinned Stile/Rail Joinery

Panels: 3/8" VG Flat Panel
Profile: Ovolo Sticking

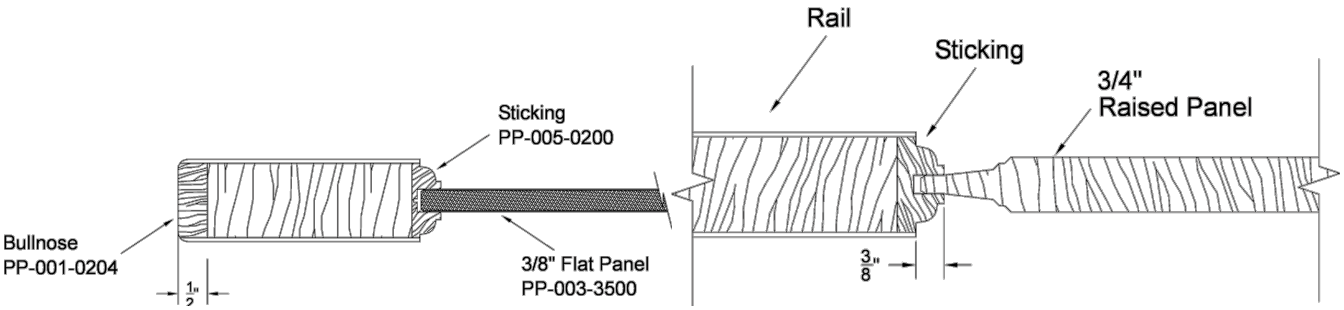
STANDARD FEATURES

- Any Wood Species
- Virtually Any Size

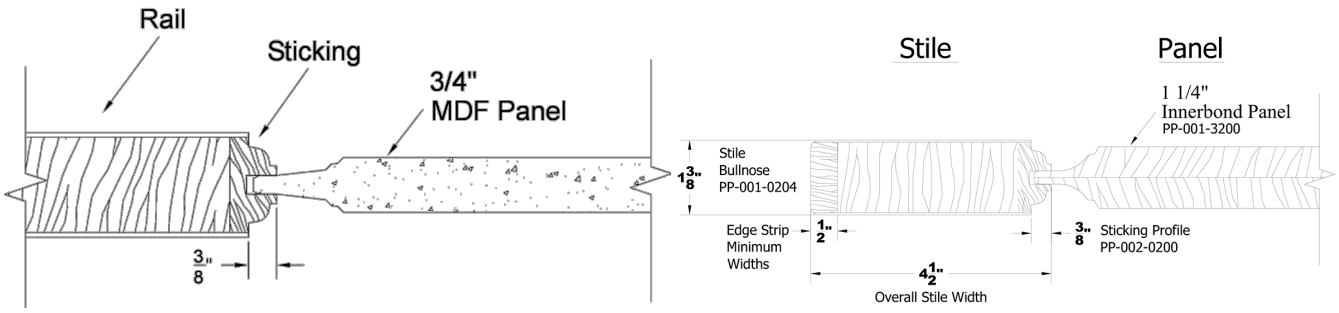
DETAILED DRAWING



DETAILS



(Standard) (Optional)



Clear-Vue Custom Designed Doors

WILSON INDUSTRIAL DOORS

Clear-Vue custom doors from Wilson bring creativity and functionality together for unique openings in a range of applications. Combining glass with aluminum framing, Clear-Vue doors add architectural interest most people wouldn't expect from commercial rolling doors.

Wilson is the preferred manufacturer of custom commercial doors among contemporary American architects, specifiers and building professionals.

IDEAL FOR COMMERCIAL AND RESIDENTIAL INSTALLATIONS

- Open Air Restaurants and Bars
- Retail Store Fronts
- Greenhouses
- Pool Houses
- Residential Patios
- Garages

Completely Customizable

Wilson Clear-Vue doors are completely customizable to provide the aesthetic your design demands. The doors can be covered with essentially any material (provided by others), and you can choose your preferred door configuration. Let your imagination run wild!

Style with Function

Clear-Vue doors are constructed of 1/4" thick 6061-T6 Aluminum Alloy tubing. The aircraft grade aluminum frame resists corrosion and maintains a crisp, clean raw aluminum finish for years to come.

Clear-Vue Custom Designed Doors
Specifications:

POWER OPERATOR – All electrical controls are designed to meet National Electrical Code Section 513. The gear motor is equipped with an electric brake and will hold the door in any position during its travel. A magnetic starter with momentary pushbutton controls is standard. Heavy-duty rotary limit switch is weather proof. All controls are factory tested.

CONTROL BOX – Momentary contact, 3-button controls (Up/Down/Stop) standard. All electrical components are pre-wired and tested at the factory.

LIFT CABLES – Galvanized steel cables are sized and numerous enough to provide a 5:1 safety factor.

DRIVE SHAFT – The drive shaft is mounted above the door on the header and runs continuously along the entire width of the door. The cable drums are an integral part of the drive shaft, ensuring an even lift of the door at all times. The shaft and drums are heavy-duty galvanized tubing.

MATERIAL CONSTRUCTION – 6061-T6 aircraft aluminum alloy construction is lighter, yet stronger than steel, reducing the need for shoring up the building structure. Simple bolt-together, modular construction.

SEALS – Doors are furnished with full perimeter seals: a soft rubber top seal, neoprene side seals and a bottom loop that hugs the contour of the ground and center seal.

COMPONENTS – Hinges are extruded aluminum. All glazing and covering is provided by others.

LOCKING MECHANISM – A dual handle manual locking mechanism is standard. A "lock switch" is standard and shuts off the power to the motor until the door is unlocked, eliminating the risk of damage. Optional auto-locks lock and unlock the door with a push of a button.

OVER TRAVEL SWITCH – This back-up switch stops the door to ensure the door never exceeds its upper limit.

PROGRAMMABLE DRIVE WITH DOOR CONTROLLER – The variable speed drive provides for a smooth start and stop, which minimizes wear on the motor and components. Features Up/Down/Stop buttons.

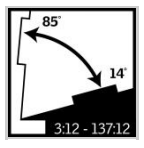
Please note: Wilson Industrial Doors, does not supply sheathing or framing for the door opening. Wilson Industrial Doors reserves the right to change door specifications without notice.

Wilson Bi-Fold Door Comparison	Premier™	Clear-Vue
CONSTRUCTION		
Aluminum	•	•
STANDARD FEATURES		
Auto locks	•	OPTION
Manual Jamb Locks	OPTION	•
Lift Cable & Drive Mechanism	•	•
Cable Guards	•	
Full Width Drive Shaft	•	•
Weather Seal	•	•
Photo Eye	•	OPTION
Over Travel Switch	•	•
Radio Control	•	OPTION
Programmable Drive w/Controller	•	•
3 Button Controller	•	•
Installation Services Available		•
SIZE/WIDTH LIMITATIONS		
Up to 30 ft.		•
Up to 70 ft.	•	

Wilson Industrial Doors • PO Box 246, Franksville, WI 53126 • info@wilsondoors.com
www.wilsondoors.com • 800-558-5974 • Fax: 262-835-2660

Scan to request a quote.

Model # VSE C06 2004 Internet #202842433



VELUX

21 in. x 45-3/4 in. Fresh Air Electric Venting Deck-Mount Skylight with Laminated Low-E3 Glass

Write the first Review Questions & Answers (11)

- Glass stays cleaner longer with Neat glass coating
- Laminated glass meets building codes in out of reach applications
- 10-year Hail Warranty against glass breakage

$1,045.00 /each

Rough Opening (W x H)
21 in x 45.75 in

Quantity - 1 +

Not in Your Store - We'll Ship It There

Add to Cart

We'll send it to Cumberland for free pickup

Available for pickup
December 1 - December 6

Change Pickup Store

We'll Ship It to You

Add to Cart

Free Shipping

Expect it
December 1 - December 5

See Shipping Options

Or buy now with PayPal

We're unable to ship this item to:
AK,GU,HI,PR,VI

Easy returns in store and online
Learn about our return policy

Product Overview

VELUX Fresh Air skylights are an energy-efficient way to bring both fresh air and sunlight into a home and make dark rooms come to life. Bringing natural light into a home through a skylight decreases the need for electricity while maintaining privacy. Installing a skylight is one of the most impactful ways to enhance both the brightness and beauty of a room.

- Qualifies for a 10-year no leak installation warranty when installed with VELUX flashing (required, sold separately) on a roof pitch between 14° and 85°
- Features laminated clean, quiet and safe glass with a neat glass coating that keeps your skylight cleaner, reduces unwanted outside noise, is energy efficient, and has an extra glass pane for added safety

Info & Guides

FAQ

Installation Guide

SDS

Use and Care Manual

Warranty

You will need Adobe® Acrobat® Reader to view PDF documents.
Download a free copy from the Adobe Web site.

- Operated by a VELUX INTEGRA control pad (included) with easy touch screen control
- An integrated rain sensor will close the skylight automatically, in case of inclement weather
- Consider adding a VELUX solar powered blind (sold and shipped separately) which is eligible for up to a 30% solar tax credit and allows you to control the light
- Consider upgrading to a VELUX solar powered fresh air skylight (model VSS) to bring both natural light and fresh air into your home using only the power of the sun, plus it is eligible for up to a 30% solar tax credit, making it very affordable
- Click below to view and purchase compatible VELUX flashing models:
- Click here to view/purchase VELUX shingle, shake, and slate roof flashing model EDL C06 0000
- Click here to view/purchase VELUX tile roof flashing model EDW C06 0000
- Click here to view/purchase VELUX metal sheet roof flashing model EDM C06 0000
-

FRESH AIR
Venting skylights can be opened to improve air quality by letting out stale air, as well as improve air circulation within the home.

ENERGY EFFICIENCY
VELUX skylights maximize the amount of incoming light while maintaining energy efficiency with the use of LoE3, argon gas-filled dual glass panes.

THE NO LEAK SKYLIGHT™
When installed with VELUX flashing, this skylight qualifies for a 10-year No Leak installation warranty no matter who installs it.

WEATHERTIGHT
Our engineered flashing system is designed to ensure safe rainwater drainage. You never have to worry even in the harshest weather.

- Click here for more information on Electronic Recycling Programs

Specifications

Dimensions

Daylight area (sq. ft.)	4.38	Product Width (in.)	21.5
Product Depth (in.)	5	Rough Opening Height	45.75
Product Height (in.)	46.25	Rough Opening Width	21

Details

Cladding Type	Aluminum	Operation	Push button
Color Family	Gray	Operation Type	Electric
Color Family	Grays	Product Weight (lb.)	61.6 lb
Flashing Included	No	Remote Control	Yes
Frame Material	Wood	Returnable	90-Day
Glazing type	Laminated glass	Rotates for Cleaning	No

Hardware Included	Yes	Severe weather ready	Yes
Insect screen	Yes	Skylight Mounting Type	Deck Mount
Low-E (Y,N)	Yes	Skylight material	Glass
Material	Glass	Telescoping control rod	No
Maximum roof pitch (degrees)	85	U-Factor	0.42
Minimum roof pitch (degrees)	14	UV protection (%)	99.9

Warranty / Certifications

Energy Star Qualified	North-Central,Northern,South-Central,Southern		

How can we improve our product information? Provide feedback.

VELUX SUN TUNNEL™ skylights

Flat glass - TLR
Curb metal flashing - TCR

Flat glass - TLR

Curb metal flashing - TCR

Benefits:

- Low profile glass design creates sleek appearance on any roofline.
- Perfect for developments where local ordinances do not allow acrylic dome tubular skylights.
- Available in 14-in. rigid only.
- Prefabricated light tunnel makes it easy to install.
- One piece metal curb mounted flashing.
- Low profile dome - acrylic or polycarbonate.
- Pivoting tunnel system.

Model TLR	14° - 60° 3:12 - 20:12		014
Outside flashing		in.	25 3/8 x 30 1/2
Rough opening (ceiling)		in.	14 1/2
Rough opening (roof deck)		in.	14 1/2 x 17 3/4
Daylight area		sq. in.	138
Net wt (w/ acrylic)		lbs.	29
Standard tubing kit length		in.	48
Maximum recommended install length & orientation dependent		ft.	30

Model TCR	0° - 60° 0:12 - 20:12		014
Outside flashing		in.	20 7/8 x 20 7/8
Rough opening (ceiling)		in.	14 1/2
Rough opening (roof deck)		in.	16 3/4 x 16 3/4
Daylight area		sq. in.	138
Net wt (w/ acrylic)		lbs.	29
Standard tubing kit length		in.	48
Maximum recommended install length		ft.	30

09 – FINISHES

093100 - COUNTERTOPS

Part 1 – GENERAL

1.1 SCOPE

To be used in the kitchen for the cabinet counters and bathroom vanity.

1.2 PERFORMANCE REQUIREMENTS

A. Shall contain recycled content
B. Shall be GREENGUARD certified
C. Shall receive LEED certification for sustainable design

1.3 RECIEVEING, INSPECTION, STORAGE

A. Sheet Inspection upon Arrival at storage
B. Check to ensure the lot numbers are in sequence or within allowable tolerance (+/- 50)
C. Check for visual defects on the surface or edges once peel coat is removed. Please note that color may vary slightly from run to run and from the sample itself. Lists of inspection items that should be checked;
    1. Color difference within same lot.
    2. Scratches
    3. Bending
    4. Pin hole
    5. Crack
    6. Thickness difference

Do not cut the materials before visible inspection and matching process is completed in shop.

Part 2 - PRODUCTS

2.1 ENGINEERED STONE

A. Acceptable Products
    1. Hausys HI-MACS Eden Plus – Recycled Content
        a. Manufacturer: LG
        b. Recycled content: 12%
        c. Thickness: ½”
        d. Sheet width: 30”
        e. Sheet length: 145”
        f. Color: Select color in accordance to other requirements and indicated in drawings

2.2 ADHESIVE

A. Bulk adhesive cartridges typically provide 1000mm of seaming.
B. Normal cure time is about 40 minutes in 21 degrees C. If hotter, your working time is greatly reduced and, if cooler, your working time is extended. Consider this as you begin assembly. You do not want to get too far ahead of yourself if it is warm.
C. Remember to consider scuff-sanding joints for better bonding using 60 grit sandpaper.

D. Before applying the adhesive, clean all areas being bonded with denatured alcohol and a clean white rag. Inspect for dirt, pencil marks, and oily fingerprints on all bonding surfaces and remove them.
E. Assemble the cartridge in the seaming gun with a fresh disposable mixing tip. After each use, remove and replace this tip. The adhesive in the tip will set up just as the seams do on your materials. If you are finished gluing for the day, you can leave the tip on and place it in the storage refrigerator. The next time you use it you only need to change the tip.
F. As you get ready to apply adhesive and begin assembly of your HI-MACS top, remember to purge the tip. This is done by squeezing out a bead of approximately the length of the tip. This ensures trapped air has worked itself from the mixing tip and that the catalyst and adhesive have properly mixed and are ready

Part 3 - EXECUTION

A. Product needs to be cut according to drawings and installed according to manufacturers specifications

END SECTION 093100

092900 – GYPSUM BOARD

PART 1 – GENERAL

1.1 SCOPE
Use on interior wall and ceiling surfaces. Generally finished and painted.

1.2 PERFORMANCE REQUIREMENTS
- A. Minimum 1 hour fire rating (1/2" thick board)
- B. Products manufactured in China shall not be used in the Work.
- C. Locally sourced materials (within 400 miles of construction site) are preferred.
- D. Shall have GREENGUARD Indoor Air Quality certificate status.

1.3 APPLICABLE STANDARDS
- A. Manufacturing
  1. ASTM C 1396 section 5 (C 36)
  2. Federal Specification SS-L-30D Type III, Grade X
- B. Installation
  - a. ASTM C 840
  - b. Gypsum Association GA-216
  - c. Gypsum Association GA-214
- C. Surface Burning Characteristics
  - a. ASTM E 84
  - b. Flame Spread 15
  - c. Smoke Developed 0

1.4 SUBMITALS
- A. Product data

PART 2 – PRODUCTS
- A. GYPSUM BOARD
  1. Acceptable Products
     - a. Product: FIREBLOC® Type X Gypsum Board
       - i. Manufacturer: American Gypsum
       - ii. Thickness: 5/8"
       - iii. Width: 54"
       - iv. Length: 12'

END SECTION 092900

096400 – FLOORING

Part 1 – GENERAL

1.1 SCOPE

The hardwood is to be used in the main wings of the house as indicated on the drawings. The flooring tile will be used in the kitchen, bathroom and courtyard as indicated on the drawings.

1.2 PERFORMANCE REQUIREMENTS

A. Reclaimed or Salvaged
B. Shall be FSC certified

1.3 SUBMITTALS

A. Product data
B. Sample colors

PART 2 – PRODUCTS

A. HARDWOOD FLOORING
    a. Acceptable Products
        i. Barn Siding
        ii. Mixed Species
        iii. Manufacturer: Stone and Source

B. TILE FLOORING
    a. Acceptable Products
        i. Limestone
        ii. Manufacturer: Stone and Source
        iii. Size: 2’x2’

END SECTION 096400

093010 – CERAMIC TILE

PART 1 – GENERAL

1.1 SCOPE

Wall tiling will be used on the bathroom shower stall walls and the kitchen back splash.

1.2 STANDARDS

A. ASTM
   1. ASTM C-373
   2. ASTM C-99
   3. ASTM C-501
   4. ASTM E-228
   5. ASTM C-484
   6. ASTM C-1028

1.3 SUBMITTALS

A. Product data

PART 2 – PRODUCTS

A. WALL TILING
   1. ACCEPTABLE PRODUCTS
      a. ECO-GRES ASIA
         i. Recycled Ceramic Tile
         ii. Manufacturer: Fire Clay Tile
         iii. Available sizes: 1” X 6” or 3” X 6” on 12” X 12” sheet in grid or block pattern

Part 3 - EXECUTION

END SECTION 093010

END SECTION 09

LG Hausys

HI-MACS®
FABRICATION GUIDE

HI-MACS®

THE NEW GENERATION OF INSPIRATION

© 2012 LG Hausys America, Inc. SKU: 1212HMFAB

HI-MACS Fabrication Guidelines

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1. SELLING POINT & ADVANTAGES OF Hi-MACS®

1.1. What are the key selling points of HI-MACS®?

What is HI-MACS®?

HI-MACS® is an acrylic solid surface countertop product. Acrylic is a more durable material when compared to polyester, which can be brittle and may damage easily. The product is manufactured using state-of-the-art technology and produced in sheets.

HI-MACS® is non-porous

Your countertops are safe for food preparation and carry full NSF (National Sanitation Foundation) certification. When a material or seam is porous, food particles can be trapped in the material, becoming a breeding ground for bacteria and contamination.

HI-MACS® appears seamless (inconspicuous seams)

Because there are no grout lines, your countertop looks like continuous material –– making it ideal for both beauty andcleanliness.

HI-MACS® is renewable

No matter the nick, scratch or stain, HI-MACS® can be restored to its original state by a certified professional.

HI-MACS® is the optimal design

½ inch thicknesses are ideal for countertops, shelving, surrounds and other horizontal applications.

HI-MACS® is affordable luxury

- HI-MACS® brings elegance into your home, not only allowing you to step up from lower cost materials but also bringing a beautiful finish to more parts of your home.

- Due to the most modern equipment and manufacturing processes in the industry, solid surface is a better value than similar products.

- The superior quality of HI-MACS® results in extremely low warranty claims and minimal call backs. HI-MACS® is backed by a fully transferable 15-year warranty

- This outstanding warranty will give your customers even more confidence in their purchase.

- Fully transferable, meaning their investment becomes an excellent selling feature of their home. HI-MACS® is manufactured in a state-of-the-art facility located in Georgia, USA

- Our preferred kitchen and bath dealers have many collections and patterns available for you to choose from.

- All colors are available for both horizontal and vertical applications, which means you can choose any color that is right for your design with confidence. Your style can then extend beyond the countertop into backsplashes, secondary counters adjacent to the kitchen, built-in desks - you name it. Installed by certified fabricators

- All fabricators are certified to fabricate and install HI-MACS®. This means they are proven professionals which is reflective of the quality and service expectations of LG Hausys.

1.2. Hi-MACS® Advanges

See For Yourself Why You Should Choose HI-MACS®

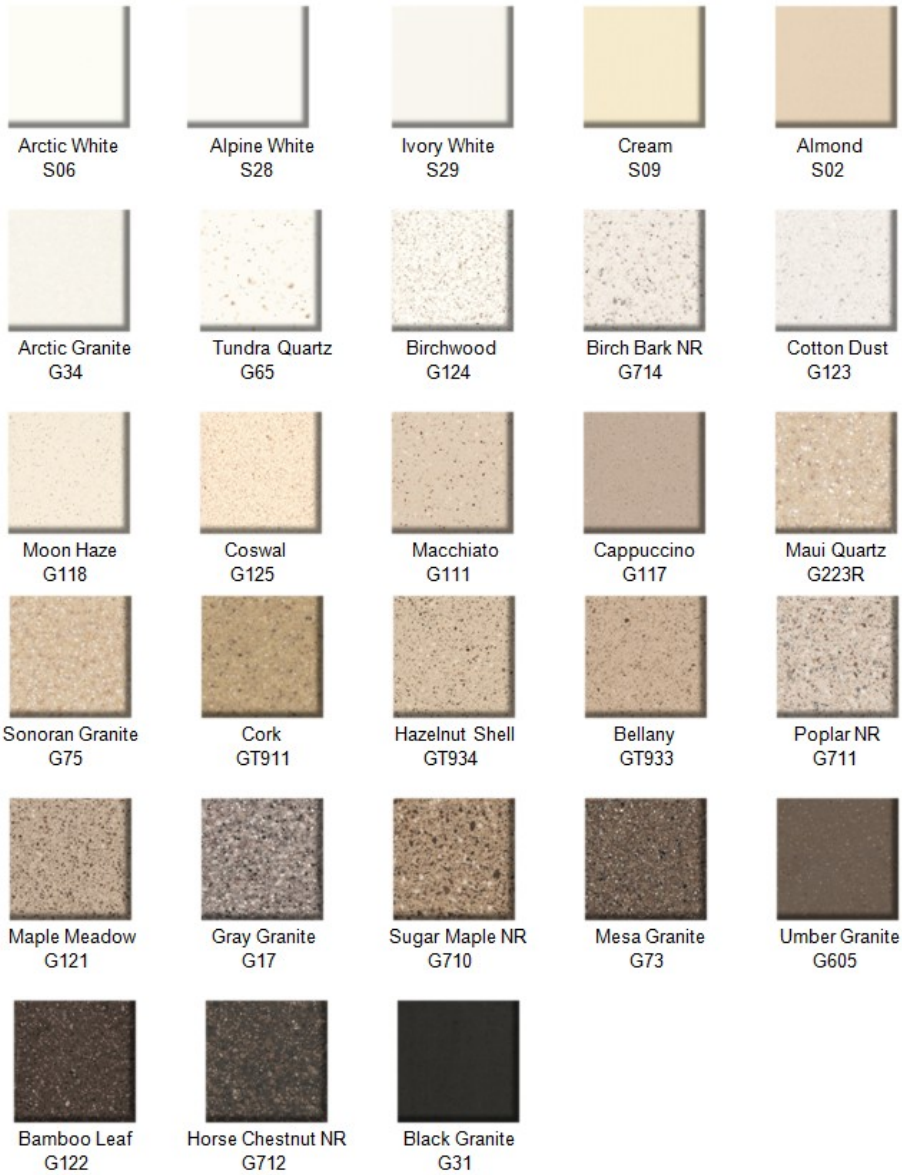
	HI-MACS®	Other Solid Surface	Plastic Laminate	Granite	Synthetic Stone	Tile
WARRANTY HI-MACS® offers a 15-year fully transferable warranty.	15 yr.	10 yr.	–	–	10 yr.	–
VALUE Because of the affordability of HI-MACS®, you can stretch your design dollars in other areas.	$$	$$$	$	$$$$	$$$	$$$
VERSATILITY HI-MACS® combines beautifully with stainless steel, wood, chrome, brass, glass and more. All colors are available in ½ inch thickness for use in horizontal and vertical applications.	☺	☺	☺	😐	☺	☹
STAIN RESISTANCE Thanks to its unique technology, HI-MACS® withstands most everyday stains.	☺	☺	☹	😐	☺	😐
RENEWABLE No matter what the scratch, nick or stain, HI-MACS® can be restored to its original state by a certified professional.	☺	☺	☹	☹	☹	😐
NON-POROUS/EASY TO CLEAN HI-MACS® is easy to clean. It is non-porous and as a result, it will not promote the growth of mold, mildew or bacteria, making it ideal for kitchens and baths.	☺	☺	😐	😐	☺	☹

2. PRODUCT SPECIFICATION

2.1. HI-MACS® Product Families

1) Classic

Soft or loud, subtle or staggering, HI-MACS® CLASSIC's shades and particulate patterns will let your space speak in exciting and original ways.



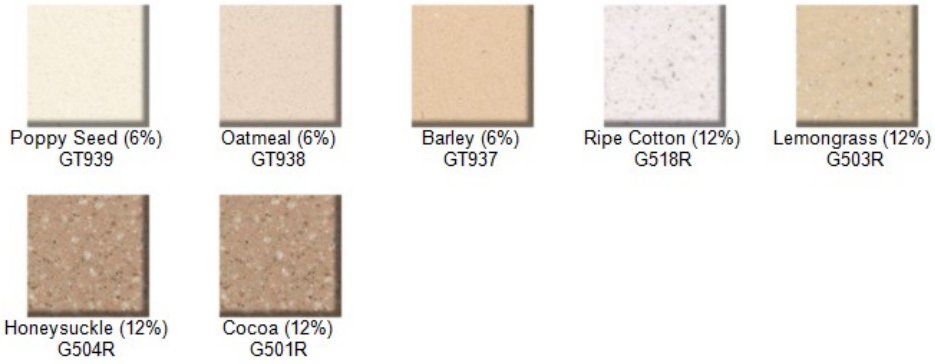
2) Classic - Never Compromise Collection

Soft or loud, subtle or staggering, HI-MACS® CLASSIC's shades and particulate patterns will let your space speak in exciting and original ways.

3) Classic - Designer Solid Collection

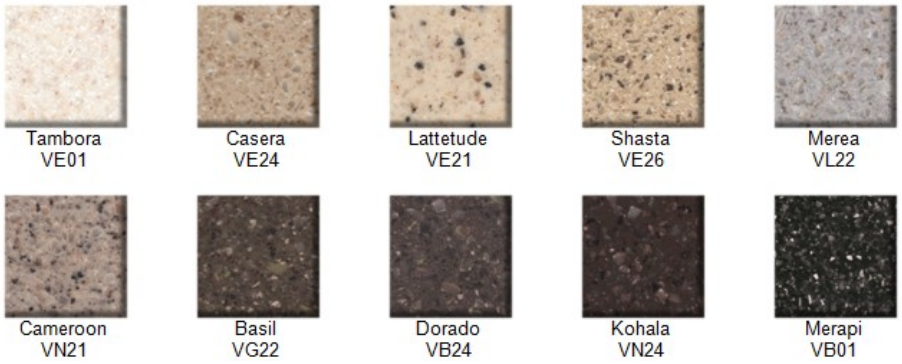
4) Eden Plus - Recycled Content

Explore sustainable design with HI-MACS® Eden Plus Surfaces. Our HI-MACS® Eden Plus Surfaces are environmentally conscious, featuring certified pre-consumer recycled material. HI-MACS® Eden Plus Surfaces are GREENGUARD certified for indoor air quality and can receive LEED credits in sustainable design.



5) Volcanics

Large translucent chips in HI-MACS® Volcanics Solid Surface create dazzling color options, giving your surface breathtaking beauty, clarity and depth.

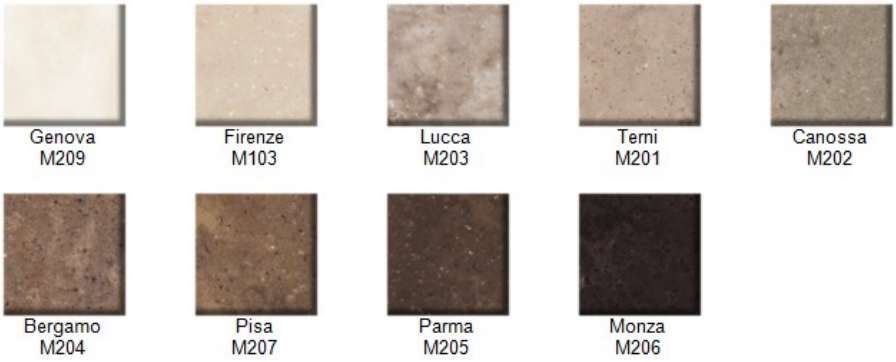


6) Galaxy

Introducing HI-MACS® Galaxy the next dimension in solid surface. Out of this world colors are fused with large transparent chips to emphasize today's new quartz styles while maintaining all of the features and functionality of solid surface.

7) Marmo

Introducing HI-MACS® Marmo, a contemporary solid surface that embodies the organic look of natural stone. A captivating combination of veined patterns and translucent chips, solid surface has never looked so natural.

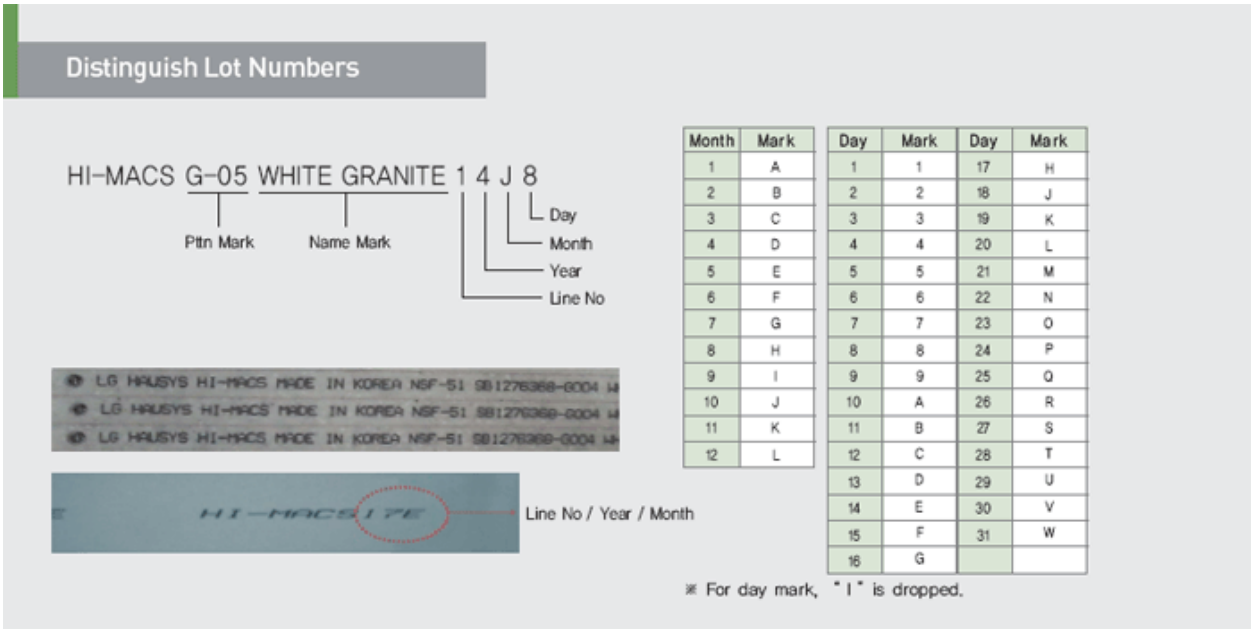


2.2. Product Size

HI-MACS sheets are an acrylic based product, either 100% acrylic or acrylic with a proprietary blended specialty chip (such as the Galaxy and Volcanics product line). All sheets are manufactured using strict quality assurances to ensure that the customer receives the highest possible quality product.
Volcanics, Eden Plus, Marmo, and Galaxy series are not produced in ¼'' (6mm).

Sheet thickness	Sheet width(mm)	Sheet length(mm)	
¼" 6mm	30" 760mm	98" 2490mm	
½" 12mm	30" 760mm		145" 3680mm

Thickness	Size(mm)	Weight(kg)	
		Solid	Granite
½"	30" x 145"	134 lbs	126 lbs



Month	Mark
1	A
2	B
3	C
4	D
5	E
6	F
7	G
8	H
9	I
10	J
11	K
12	L

Day	Mark	Day	Mark
1	1	17	H
2	2	18	J
3	3	19	K
4	4	20	L
5	5	21	M
6	6	22	N
7	7	23	O
8	8	24	P
9	9	25	Q
10	A	26	R
11	B	27	S
12	C	28	T
13	D	29	U
14	E	30	V
15	F	31	W
16	G		

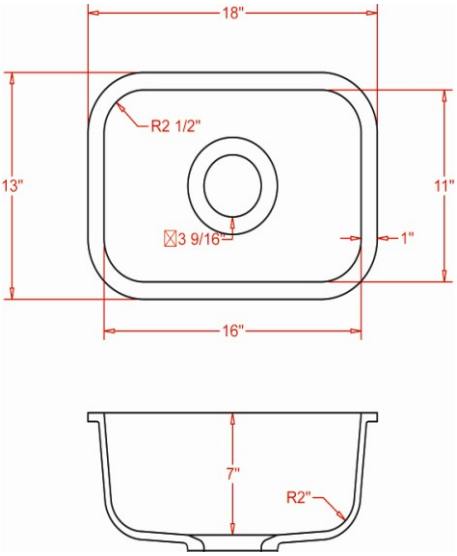
※ For day mark, " I " is dropped.

2.3. Shaped Materials

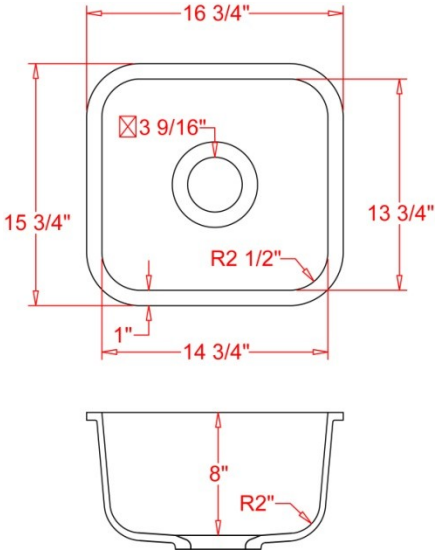
LG Hausys offers a complete line of vanity and kitchen sinks. These models are all easily seamed to the HI-MACS countertop you are creating and will provide a beautiful smooth, clean and well designed countertop or vanity.

1) Acrylic Sinks

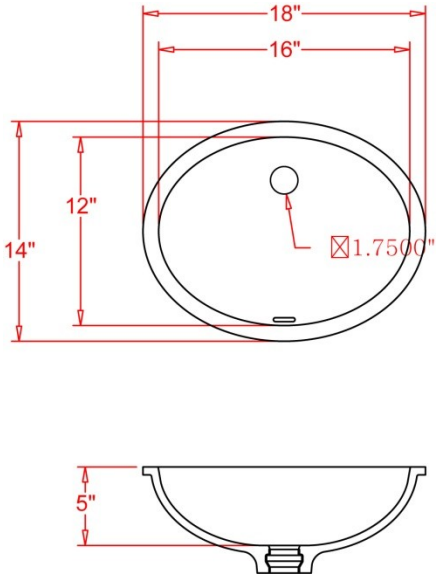
Single Bowl Kitchen Sink 1318



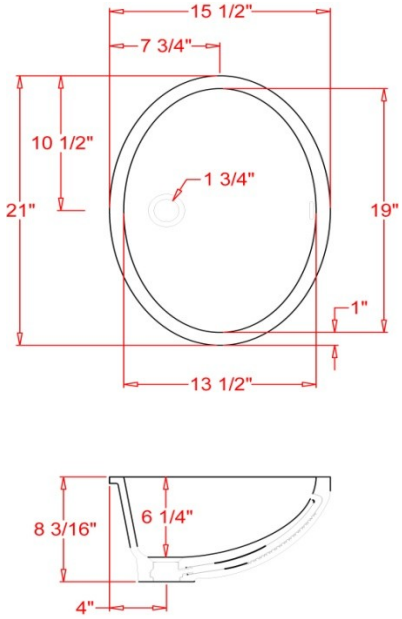
Single Bowl Kitchen Sink 1517



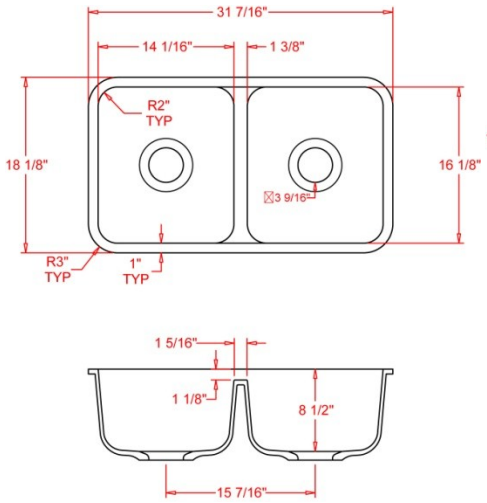
Oval Sink 1612



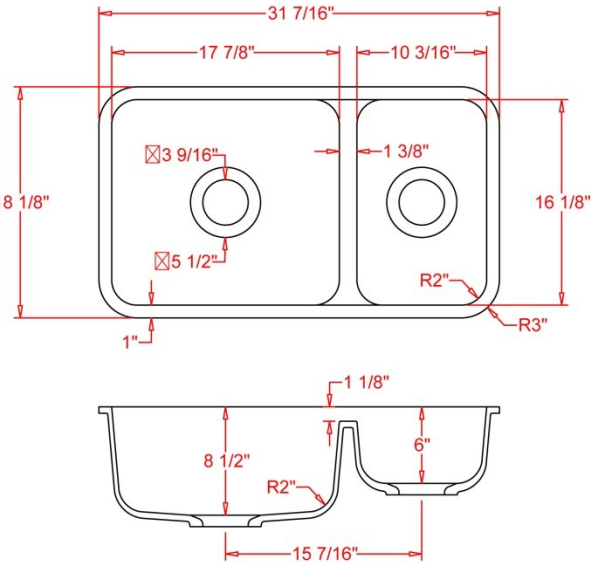
Oval Sink 1914



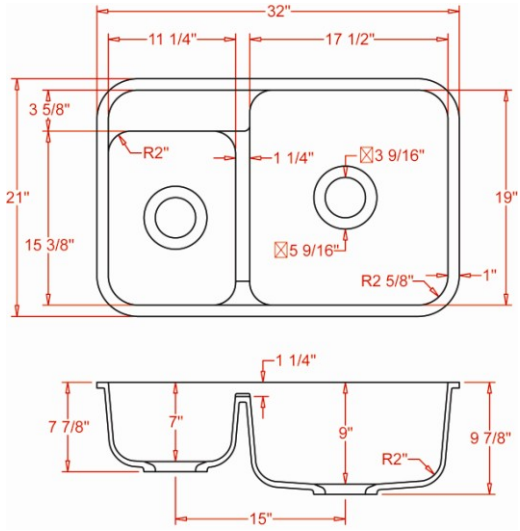
Double Bowl Kitchen Sink 3118



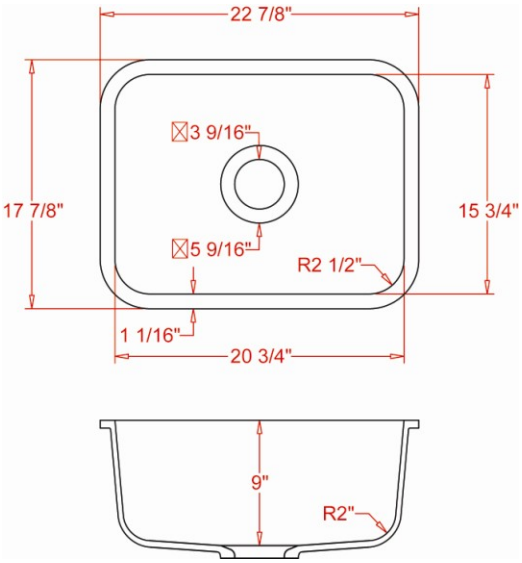
Double Bowl Kitchen Sink 3218



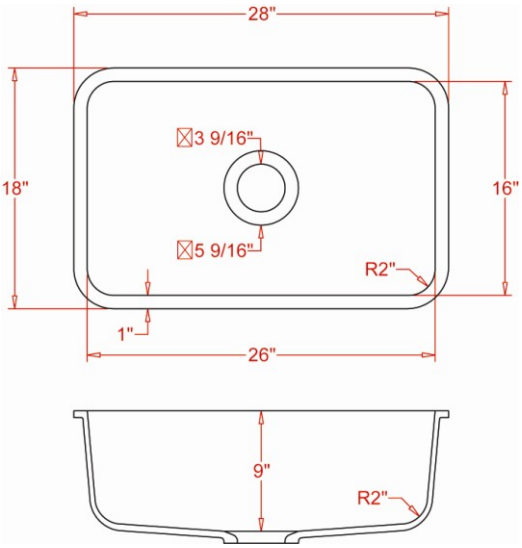
Double Bowl Kitchen Sink 3221



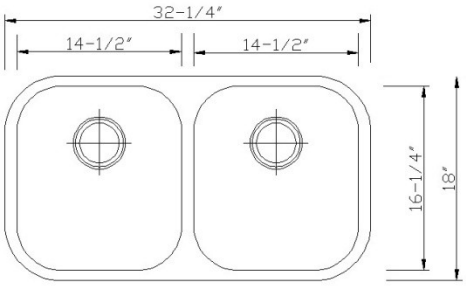
Single Bowl Kitchen Sink 2318



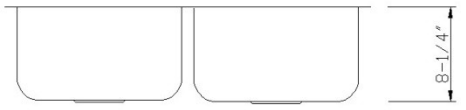
Single Bowl Kitchen Sink 2818

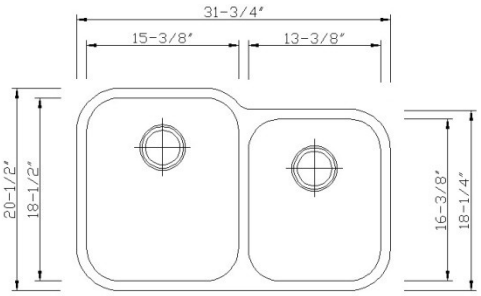


2) Lovello® Stainless Steel Sinks



SS55-3318





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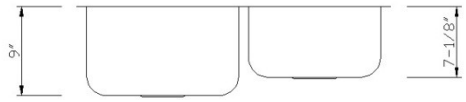

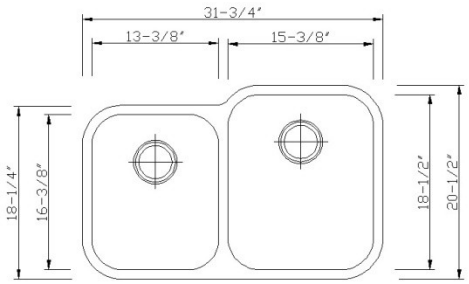

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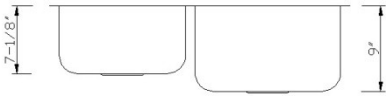
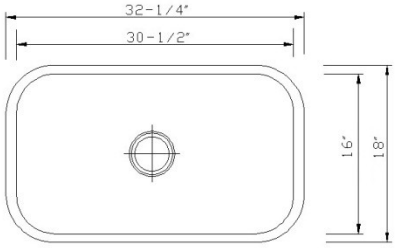
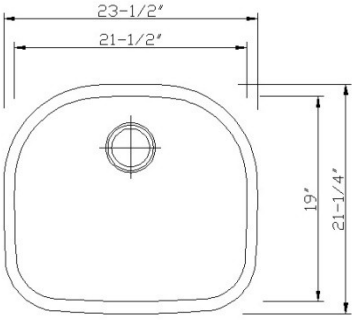




SS1-3219



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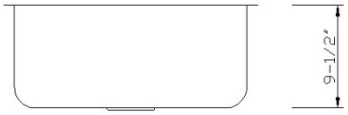
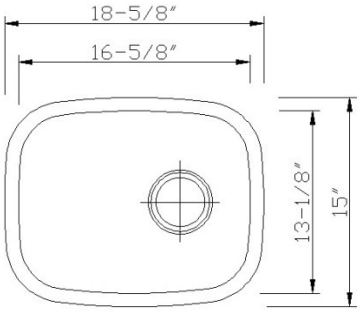
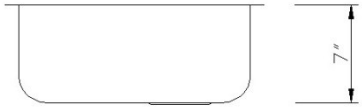
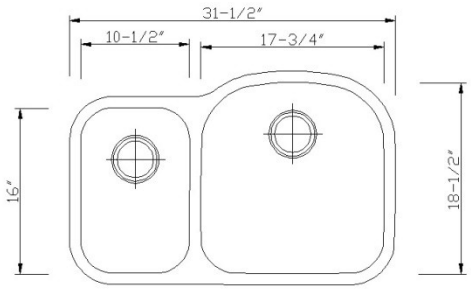




SS-1915





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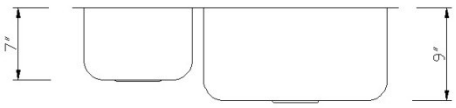

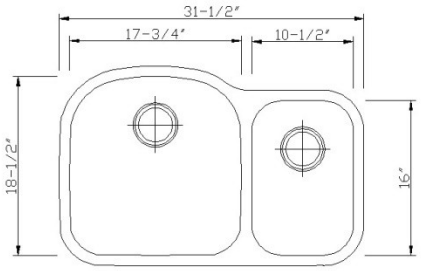

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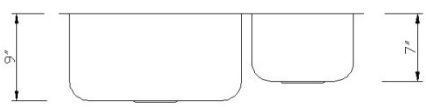

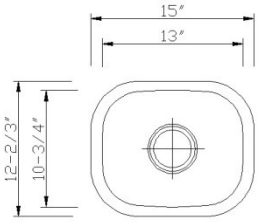

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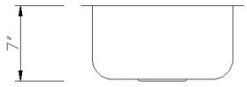

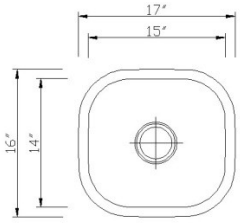

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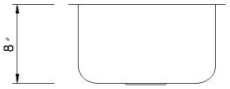
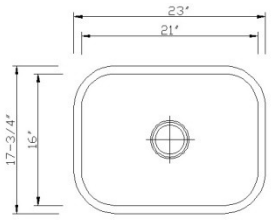




SS1-2318

2.4. Adhesive

Be sure to use an adhesive color selection chart to review the properly coded adhesive for the HI-MACS® sheet color selected. It is important to comply with the recommendations set forth. This will ensure proper color match of the finished seam.

- Bulk adhesive cartridges typically provide 1000mm of seaming.
- Normal cure time is about 40 minutes in 21 degrees C. If hotter, your working time is greatly reduced and, if cooler, your working time is extended. Consider this as you begin assembly. You do not want to get too far ahead of yourself if it is warm.
- Remember to consider scuff-sanding joints for better bonding using 60 grit sandpaper.
- Before applying the adhesive, clean all areas being bonded with denatured alcohol and a clean white rag. Inspect for dirt, pencil marks, and oily fingerprints on all bonding surfaces and remove them.
- Assemble the cartridge in the seaming gun with a fresh disposable mixing tip. After each use, remove and replace this tip. The adhesive in the tip will set up just as the seams do on your materials. If you are finished gluing for the day, you can leave the tip on and place it in the storage refrigerator. The next time you use it you only need to change the tip.
- As you get ready to apply adhesive and begin assembly of your HI-MACS® top, remember to purge the tip. This is done by squeezing out a bead of approximately the length of the tip. This ensures trapped air has worked itself from the mixing tip and that the catalyst and adhesive have properly mixed and are ready

2.5. Adhesive Color List

SOLID			
HI-MACS		ADHESIVE	
NO	COLOR	NO	COLOR
S02	ALMOND	H04	PEANUT
S06	ARCTIC WHITE	T03	CLEAR WHITE
S09	CREAM(VANILLA)	H20	CREAM
S29	IVORY WHITE	H32	IVORY
S28	ALPINE WHITE	H16	ALPINE WHITE
ST903	HAZELNUT	H70	FLESH
S103	Concrete Grey	H53	Concrete Grey
S207	Marta Grey	H92	MARTA GREY
S215	Mazarin Blue	H102	MAZARIN BLUE
S205	Florida Orange	H108	FLORIDA ORANGE
S209	Steel Grey	H101	SMOKE GREY
S208	Festival Pink	H106	FESTIVAL PINK
S216	Lilac Haze	H103	LILAC HAZE

SAND & PEARLS / QUARTZ & GRANITE			
HI-MACS		ADHESIVE	
NO	COLOR	NO	COLOR
G01	DESERT SAND	H04	PEANUT
G02	GRAY SAND	H03	GRAY
G04	WHITE QUARTZ	H36	SILVER
G05	WHITE GRANITE	H03	GRAY
G06	ROSE QUARTZ	H05	APRICOT
G07	PLATINUM GRANITE	H03	GRAY
G08	ALMOND PEARL	H04	PEANUT
G09	BLACK SAND	H42	MERAPI
G10	BLACK PEARL	H07	BLACK
G15	MIDNIGHT PEARL	H10	BLUE
G17	GRAY GRANITE	H03	GRAY

VOLCANICS			
VB-01	MERAPI	H42	MERAPI
VE-01	TAMBORA	H20	CREAM
VE-11	AMBERGLOW	H04	PEANUT
VG-11	VETRO	H71	GREEN HAZE
VW-11	POWDER	H36	SILVER
VY-11	ZAFFRE	H72	DOVE GRAY
VE-12	MOONMIST	H01	SATIN WHITE
VE-13	KAFFA	H73	MILKY PINK

VOLCANICS (NATURAL)			
VE21	LATTETUDE	H04	PEANUT
VL21	SANTORINI	H10	BLUE
VN21	CAMEROON	H64	CLASSIC ROSE
VN22	DOMINICA	H46	HEKLA
VN24	KOHALA	H50	KOHALA
VR21	STELLER	H47	STELLER
VE-24	CASERA	H04	PEANUT
VG-22	BASIL	H13	O/YELLOW
VL-22	MEREA	H21	P/WHITE
VN-23	CASTLE	H22	P/GREY
VW-21	FRESH	H02	A/WHITE
VG-23	MARIN	H03	GREY
VB24	DORADO	H74	DORADO
VE26	SHASTA	H75	SHASTA

***** Clear color is available to order (H00-Clear)**

SAND & PEARLS / QUARTZ & GRANITE			
HI-MACS		ADHESIVE	
NO	COLOR	NO	COLOR
G18	ROSE GRANITE	H05	APRICOT
G22	BEIGE SAND	H03	GRAY
G23	NATURAL GRANITE	H03	GRAY
G24	AQUA GRANITE	H08	GREEN
G26	APPLE GREEN SAND	H11	SAGE GREEN
G29	TERRA QUARTZ	H05	APRICOT
G30	IVORY QUARTZ	H04	PEANUT
G31	BLACK GRANITE	H07	BLACK
G32	STEEL SAND	H03	GRAY
G33	AZTEC QUARTZ	H04	PEANUT
G34	ARCTIC GRANITE	H36	SILVER
G38	SEA OAT QUARTZ	H04	PEANUT
G39	AZURE QUARTZ	H03	GRAY
G40	CELEBRATION GRANITE	H07	BLACK
G42	VENETIAN SAND	H26	SAND BROWN
G43	VERDE QUARTZ	H08	GREEN
G44	SEA FOAM QUARTZ	H11	SAGE GREEN
G48	BEACH SAND	H04	PEANUT
G50	TAPIOCA PEARL	H36	SILVER
G58	MOONSCAPE QUARTZ	H04	PEANUT
G59	SPICED JAVA SAND	H14	SEPHIA
G62	OREGANO SAND	H13	OLIVE YELLOW
G63	ALLSPICE QUARTZ	H14	SEPHIA
G64	FOLIAGE QUARTZ	H15	SAND
G65	TUNDRA QUARTZ	H02	A-WHITE
G70	DELTA SAND	H15	SAND
G72	SIENNA QUARTZ	H12	LIGHT BROWN
G73	MESA GRANITE	H14	SEPHIA
G74	MOCHA GRANITE	H37	MOCHA
G75	SONORAN GRANITE	H04	PEANUT
G223	MAUI QUARTZ	H04	PEANUT
G102	CRYSTAL GRANITE	H61	OYSTER
G103	GRAPHITE GRANITE	H62	STEEL GRAY
G122	Bamboo Leaf	H39	LATTE
G124	Birchwood	H01	S/White
G117	Cappuccino	H03	GREY
G118	Moon Haze	H32	IVORY
G125	Coswal	H88	LEATHER BEIGE
G123	Cotton Dust	T03	CLEAR WHITE
G111	Macchiato	H36	SILVER
G121	Mapple Meadow	H80	BEIGE
G601	EUCALYPTUS GRANITE	H65	OLIVE DRAB
G602	STORM GRANITE	H66	SKY GRAY
G603	SADDLE GRANITE	H67	GAMET
G604	TIMBERWOLF GRANITE	H68	TERRA COTTA
G605	UMBER GRANITE	H69	CHESTNUT BROWN
G606	ANNATO GRANITE	H70	FLESH
GT907	STONEWALL	H26	SANDED BROWN
GT908	HARVEST	H70	FLESH
GT909	ARMADILLO	H79	DARK BRONZE
GT910	EGG WHITE	H36	SILVER
GT911	CORK	H75	SHASTA
GT912	TRAIL GREY	H68	TERRA COTTA
GT913	VANILLA SUGAR	H04	PEANUT
GT914	MERINO	H36	SILVER
GT915	METEOR	H42	MERAPI
GT918	VOLCANIC ICE	H62	STEEL GRAY
GT921	CHAMOIS	H91	PALE APRICOT
GT923	SNOWBIRD	H36	SILVER
GT924	PEPPER BLANCO	H36	SILVER
GT925	STARRY NIGHT	H42	MERAPI
GT927	Cayenne	H93	CAYENNE
GT933	Bellany	H04	PEANUT
GT934	Hazelnut Shell	H88	LEATHER BEIGE

EDEN PLUS			
HI-MACS		ADHESIVE	
#	COLOR	#	COLOR
G501R	COCOA	H67	GAMET
G502R	IVY GRANITE	H13	OLIVE YELLOW
G503R	LEMONGRASS	H04	PEANUT
G504R	HONEY SUCKLE	H46	HEKLA
G511R	POPLAR	H04	PEANUT
G515R	PECAN	H80	BEIGE
G512R	HORSE CHESTNUT	H86	CHOCOLATE
G517R	MOUNTAIN ASH	H04	PEANUT
G510R	SUGAR MAPLE	H75	SHASTA
G516R	HICKORY	H04	PEANUT
G514R	BIRCH BARK	H01	S/WHITE
G513R	WALNUT	H69	CHESTNUT BRN
G518R	RIPE COTTON	H85	LIGHT GRAY
G519R	PURE SNOW	H36	SILVER
G520R	PURE FROST	H36	SILVER
GT937	Barley	H70	FLESH
GT938	Oat Meal	H88	LEATHER BEIGE
GT939	Poppy Seed	H01	S/WHITE

SPECTRUM			
S04	APRICOT	H05	APRICOT
S05	GREY	H03	GREY
S22	BLACK	H45	V/BLACK
S25	FIERY RED	H18	RED
S26	BANANA	H17	BANANA
S27	ORANGE	H19	ORANGE
S100	COFFEE BROWN	H37	MOCHA
S101	JASMINE GREEN	H51	JASMINE GREEN
G107	PEBBLE PEARL	H03	GREY
G108	LUNAR SAND	H36	SILVER
S204	VENUS GREEN	H11	SAGE GREEN
S102	BABYLON BEIGE	H80	BEIGE
S104	TOFFEE BROWN	H81	BROWN OLIVE
S203	SKY BLUE	H82	SKY

LUCENT			
S302	OPAL	T02	OPAL
S303	SAPPHHIRE	H76	FOG
S304	RUBY	H77	PEACH BLOSSOM
S305	EMERALD	H78	SEA GRASS

GALAXY			
T01	Venus	H32	IVORY
T02	Cosmos	H04	PEANUT
T03	Saturn	H04	PEANUT
T04	Mercury	H75	SHASTA
T05	Pluto	H75	SHASTA
T06	Phobos	H03	GRAY
T07	Jupiter	H87	COCOA WHIP
T08	Blackhole	H53	C/GRAY
T09	Milky Way	H36	SILVER

MARMO			
M103	Firenze	H32	IVORY
M201	Terni	H88	LEATHER BEIGE
M202	Canossa	H15	SAND
M203	Lucca	H06	PINK
M204	Bergamo	H26	SANDED BROWN
M205	Parma	H39	LATTE
M206	Monza	H07	BLACK
M207	Pisa	H26	SAND BROWN
M209	Genova	H36	SILVER

3. SAFETY

3.1. Standard safety practices and procedures

1. Always wear appropriate clothing. Serious injury can occur if safety precautions are not followed in the workplace or on the jobsite.

2. Follow safety instructions and warnings on all MSDS sheets for all products used in the shop.

3. Follow all manufacturers safety guidelines for all tools and equipment used in the shop.

4. Safety boots are recommended. LG HI-MACS sheets are heavy and even heavier when fabricated into a monolithic counter top.

5. Always use eye protection with side shielding. Dust, particles, and routing materials can get into the eye and irritate or damage the eye. Power tools, sanding disks, blades and bits can also be a source of danger to your eyes. Unprotected exposure to such dangers can result in serious injury or blindness.
6. When handling sheets, leather work gloves should be used to protect to your hands. Additionally, the edges of the LG HI- MACS sheets may be sharp and you may cut yourself. Leather work gloves also offer you a better grip on the sheets when moving or carrying them throughout the shop.

7. While working with seaming adhesive or inlay materials, latex or rubber gloves will limit the exposure of the adhesive material to bare skin. Should the skin come in contact with the adhesive or catalyst, thoroughly wash it clean using warm soap and water. If it comes in contact with the eyes, flush eyes immediately with water and seek medical attention.

8. It is recommended to provide hearing protection when working around shop machinery and shop power tools. The decibel level of most machinery and power tools can exceed the safe limits of 85 decibels for an extended period of time, typically 8 hours. If in doubt as to your respective shop noise limits, please have your shop tested. Exceeding these limits can damage your hearing, resulting in hearing loss over time.

9. The dust from cutting and fabricating LG HI-MACS is non-toxic and otherwise referred to as nuisance dust. Regardless, routing, sawing, cutting, and sanding over a long period of time can result in irritation to the eyes, skin, and respiratory system. It is extremely important to establish adequate ventilation and dust collection equipment to prevent the dust levels from exceeding permissible levels of 15mg/m3. Additional precautionary measures will include disposable dust masks and approved NOISH respirators. I f the eyes are irritated by the dust, flush them for a period of 15 minutes with cool fresh water.

10. Adhesive items have an element of combustibility. Make certain to keep the work areas well ventilated and do not allow it to be put in contact with heat, sparks or flames.

11. Review your shop and actions being performed in your facility to ensure that you have the necessary protection and that safety requirements are being met or exceeded. The added precautionary dollars spent will far benefit the cost of loss or injury to yourself or an employee.

12. Reference your local OSHA guidelines for additional Local, State and Federal Safety Guidelines.

3.2. Safety guidelines

- Provide and maintain adequate first aid supplies
- Protective dust masks, eye and ear protection provided or required
- Safety boots or shoes required
- Protective work gloves provided or required
- Establish a policy on no jewelry, bracelets or chains while fabricating
- No smoking in work areas
- Policy on limited bare skin exposure to adhesive materials
- M.S.D.S. sheets reviewed and understood by all employees
- Entrance and Exit passage ways are not obstructed and are visibly displayed
- Fire doors are clear from blockage. i.e. Security chains, etc.
- Explosion proof cabinets for solvents and chemicals
- Adequate cold storage for seaming materials (refrigerator)
- Properly specified fire suppression or extinguisher system including sprinklers
- Inspection of fire equipment on a regular basis
- Fire evacuation plan and responsibility assignments
- Maintenance of ventilation and dust extraction equipment including routinely cleaning/replacing filters, keep work tables and floors clean, swept and orderly. Extraction of dust and particles should be placed in a covered receptacle.
- Designate a tool crib for hand tools, bits and supplies to maintain production efficiency
- Remove or contain dust by approved dust collection equipment, accessories, and systems
- Designate a special place for disposal of hazardous chemicals, waste seam adhesive, etc.
- Establish a policy of not disposing liquids, adhesives or chemicals in common trash unless catalyzed. Rags with chemicals should be cared for so as not to create fire hazard.
- Avoid operating equipment with dull blades and bits

• Purchase proper equipment for the job and routine production of LG HI-MACS

• Make certain to eliminate slip factors on the floor surfaces, and thoroughly wipe up spills to eliminate accidental slips and falls

• Install proper electrical service requirements for specified shop equipment

• Install safety mechanisms on power equipment for emergency shut offs

• Clearly mark and identify shop circuits on electrical panel

• Make certain all equipment cords and electrical extension cords are in perfect working order and are free from defects, frays, and bare wiring that could result in a shock or short. Make certain electrical cords are rolled and outlets are clean and operational. Any defect should be serviced and replaced immediately upon notice of deficiency.

• Portable electrical hand tools are double-grounded, ground fault equipped

• Make sure junction boxes and wiring are to code and are covered and closed

• Lighting is adequate for working conditions and maintained

• Always comply with OSHA and all local safety standards.

4. MATERIAL HANDLING

4.1. Receiving, inspection, handling, storage

Sheet Inspection upon Arrival at storage

- Check to ensure the lot numbers are in sequence or within allowable tolerance (+/- 50)
- Check for visual defects on the surface or edges once peel coat is removed. Please note that color may vary slightly from run to run and from the sample itself. Lists of inspection items that should be checked;
- Color difference within same lot.
- Scratches
- Bending
- Pin hole
- Crack
- Thickness difference

Do not cut the materials before visible inspection and matching process is completed in shop.

HANDLING

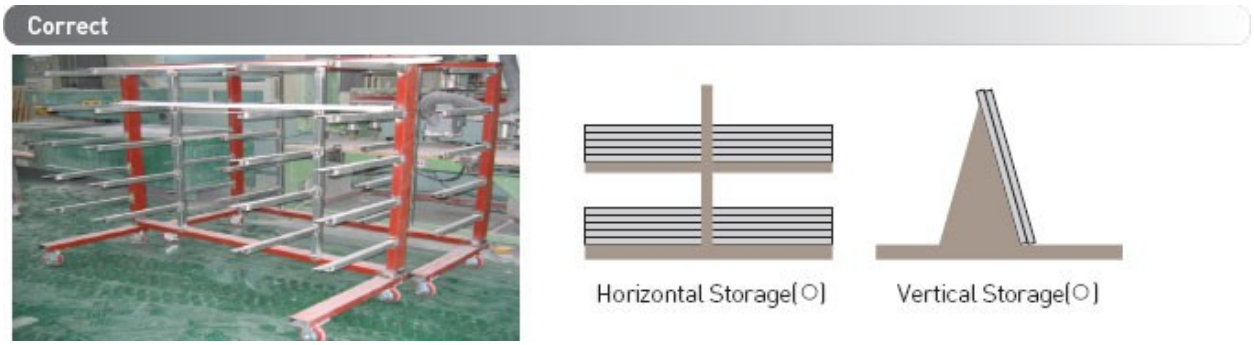
Safety is the main precursor to fabrication and movement of materials. Remember, LG HI-MACS sheets weigh approximately 4.4 pounds per square foot in half-inch material, and approximately 2.2 pounds per square foot in quarter-inch sheet materials. With that being said, use common sense and do not move these sheets by hand alone.

Workers should wear leather work gloves for better grip and ease on wear and tear on the hands and fingers. Two workers should tip the sheet along the width from horizontal to vertical. The sheet should then be transported to the fabrication area vertically with the edge of the long ends of the sheets parallel to the ground

A fork lift is an essential tool for a safe work environment. A forklift is an efficient method and must be used when moving or transporting multiple sheets. It is best suited to have a fork lift that has adequate capacity to move an entire skid of material at once (approximately 2,100 pounds) on half-inch materials. It is further recommended to purchase fork boots comprised of steel that fit over the standard forks. They are approximately 8 feet in length and can pick up the pallet from the end rather than the side

STORAGE

HI-MACS sheets should be stored flat or in approved horizontal racks (See Below). If temporarily stored, place sheeting on a completely flat floor or non- damaged transportation pallet. Vertical storage should be limited to an "A" frame designation to eliminate the possibility of warping.



HI-MACS should be stored indoors. Storage of sheets outdoor is not recommended. If necessary, any outdoor storage of HI-MACS should be limited short durations of time and not under extreme temperatures. The range of temperature should be 59-77 degrees F and not in direct sunlight. Additionally, the temperature of the sheet and time needed to equalize in outside to inside temperature of the fabrication shop may vary. When using sheets that have been stored outdoors, note that adhesive reaction time and bond may vary.

5. TOOLING

5.1. Equipment and Tooling

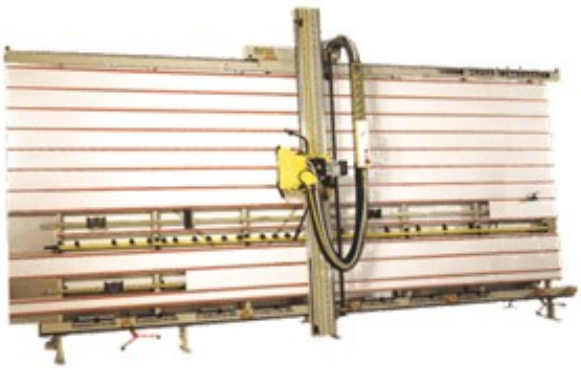
Any shop fabricating HI-MACS solid surface should have adequate equipment and hand tools to be able to fabricate and produce a professional finished product. The following is an overview of the tooling required. This list is not intended to be all inclusive and is subject to change of modification as new types of equipment or tooling becomes available.

- Table Saw
- Vertical Panel Saw
- Radial Arm Saw
- 1 ½ HP Routers
- 3 HP Routers
- Orbital Sanders
- Palm Sanders
- Stationary Belt Sander

In addition any fabrication shop must have a dust collection / extraction system. Even though HI-MACS dust is non-toxic, dust collection should be provides at all cutting locations, and if possible, at each piece of equipment.

An advanced fabrication facility may also contain some of the following equipment;

- V-groover
- C.N.C. router
- C.N.C. panel saw
- Shaper



5.2. Blades & Bits

Saw blades and router bits are essential for proper fabrication. These items are subject to wear and should be sharpened regularly and replaced when necessary. There are a large variety of blades and router bits available specifically for the solid surface industry. Over time you will determine which brands and types produce the best results for your shop.

Caution: Any minor cuts or chips can lead to stress risers that can cause the sheet to crack.

5.3. Other Tooling

This list is a basic overview and is not meant to list all tools required for a fabrication shop.

- Clamps and clamping systems
- Straightedges
- Work tables
- Storage racks
- Hole saw
- Hot glue
- Adhesive guns
- Shop vacuum
- Grounded extension cords
- Abrasive pads
- Sandpaper (various grits)

Be aware that there are many types and grades of sandpaper being used today. Refer to section 14 FINISHING for more details.

Tools that should ***NEVER*** be used for fabrication of HI-MACS:

- Jig Saw
- Reciprocating saw
- Hack saw
- Auger bit

6. TEMPLATE

6.1. Template Methods and Materials

Templates are made to accurately transfer the dimensions and conditions from the project site to the fabrication shop. For the most basic job, field measurements may suffice. Due to the complexities of most kitchen countertops, a template representing the actual layout of the countertop to be constructed is preferred.

The first step in capturing information on any project is to sketch a plan view of the job. This is the basis of all of the work to be performed. On a typical kitchen countertop, include the following:

- Sink location
- Cooktop location
- Appliance locations
- Finished edges
- Overhangs
- Corner radius
- Pass through's
- Backsplash
- Special cut-outs
- Any unusual conditions

Templates can be made from any type of rigid material that retains dimensional stability during transport and handling. Styrene, wood, plastic, and cardboard are just a few of the templating materials that have been used for this purpose.

Use the template material to construct a dimensionally exact representation of what the HI-MACS countertop will be when complete. Place notes on templates to aid in fabrication – for example "corner out of square". Avoid notes such as "add 2 inches" as this could be missed and cause the top to be fabricated incorrectly.

Check the templates to make sure all pieces fit together and account for the complete job. Where appropriate, label the templates with numbers or letters that correspond to the job sketch.

Always put the project name or customer name on each template.

There are numerous electronic templating methods available which all share the advantage of providing output as electronic files for CNC's. Each method has features and benefits that should be carefully evaluated prior to selecting an electronic templating system.

7. LAYOUT

7.1. Layout of Job

Before cutting any sheets of HI-MACS, calculate the number, lengths, widths and elevation to double check the amount of material you will need to finish the entire project. If you come up short it may create yield problems and dye lot concerns if more material must be ordered. You must also remember to consider cutouts, backsplash materials and buildup strips. As you look at all of these factors consider the cutout sizes and locations, substructure requirements, seam locations, possible inlay issues and specialty fabrication, such as a cove backsplash or thermoformed surface requirement.

7.2. Color Matching, Sheet direction

Inspect all material prior to fabrication. Note that some veined material has a directional pattern or veining. Layout HI-MACS sheets to provide the customer with the best visual appearance.

- Inspect run numbers
- Color match is guaranteed within 50 consecutive run numbers
- Remove peel coat and inspect for color variation, color match and defects
- Veined or directional patterns will require more specialized layout
- With directional patterns, consider also edge build up and backsplash matching

For Marmo sheets cut both sides of the sheet approximately ½" to ¾" to obtain consistent pattern and veining characteristics. This cut off material can also be used for the build-up strips, seam blocks, etc.

7.3. Seam Location, Inside Corner Restrictions

- Determine seam locations. Avoid locations;
  - Within cutouts
  - Less than 3” from a cooktop or sink cutout
  - Over dishwashers
  - In corners
- Wet the edges between sheets to be seamed to help determine color match.

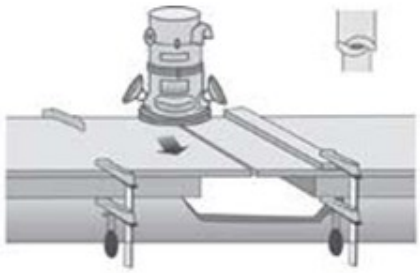
Seams in corners must be offset by a minimum of 3”. A minimum corner radius of 1” is also required.
See section 8 SEAMING for additional information.

8. SEAMING

8.1. Seam Placement

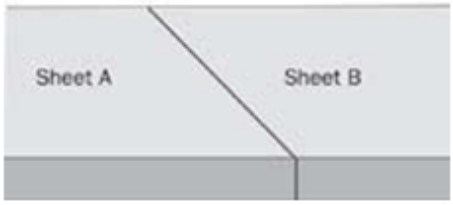
Careful placement of seams can be the difference between a great job and one that becomes a disaster. Traditionally, seams in solid colors are the hardest and leave the least amount for error. It is very important when seaming solids that you thoroughly clean the seams and prepare a precise mirror cut. Seaming with particulate colors (Sand & Pearls, Quartz & Granite, Volcanics, etc.) of HI-MACS are more forgiving. Seams in corners must be offset by a minimum of 3". A minimum corner radius of 1" is also required.

The best seam will typically be 2mm thick or less. Anything up to about 5mm is acceptable, but may be more visible depending on color used. Any seam greater than 5mm will generally be visible and produce a line the same color as the adhesive used. Since the adhesive is solid in color, it becomes very visible with colors containing particulate.



8.2. Seam Preparation

Here are two acceptable methods that will ensure a great seam.

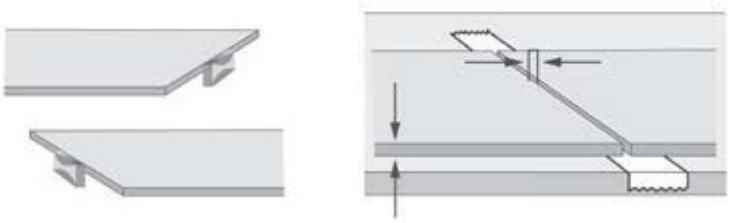


1.) Mirror cut the two pieces to be seamed together and do so at the same time. This is performed by setting a straight edge in place on one of the pieces to be seamed and also clamping down the two pieces to be seamed. Maintain a gap approximately 1⁄4" greater than the shank of the bit. It will take approximately 1/8" off each of the pieces that will be seamed. A square base router will help the accuracy. With one controlled pass of the router, you will make these two "mirror" edges simultaneously. The two pieces will fit together exactly.

2.) The other method is to do the exact same procedure, but use a wavy bit instead of a standard plunge bit. Using a wavy bit suggests a greater surface area for bonding.

You can also achieve extremely accurate cuts by using a C.N.C., Vertical Panel Saw, or V- Groover.

Scuff-sand the edges with a 90 degree block plane or right angle block and 60 grit sandpaper. This will ensure a greater bonding surface than if you do not.



Make sure to clean the joining edges with denatured alcohol and a clean white rag. Apply a strip of box tape or packing tape to the underside of the area to be joined, half on each side of the two pieces. This will create a bridge. Leave about 1/8" between pieces before applying the tape.

8.3. Adhesive Use

Assemble the cartridge in the seaming gun with a fresh disposable mixing tip. After each use, remove and replace this tip. The adhesive in the tip will set up just as the seams do on your materials. To ensure the best bond, remember to keep up the maintenance of your mixing tip. If you are finished gluing for the day, you can leave the tip on and place it in your storage refrigerator. The next time you use it you only need to change the tip. As you get ready to apply adhesive and begin assembly of your LG HI-MACS top, remember to purge the tip. This is done by squeezing out a bead of approximately the length of the tip. This ensures that any trapped air has worked itself from the mixing tip and that the catalyst and adhesive have properly mixed and are ready.

Normal cure time is about 40 minutes in 70 degree F, 21 degrees C. If the temperature is hotter, your working time is greatly reduced and, if cooler, your working time is lengthened.

Bulk adhesive cartridges typically provide 40' of seaming.

8.4. Clamping Systems

There are a number of clamping systems in use today including spring clamps, bar clamps, "C" clamps, PVC rings, and vacuum systems. Each type is suitable in one or more applications in the HI-MACS fabrication process. By-and-large, it is a matter of individual preference.

Clamping Tips

- Do not use excessive pressure. This will create a dry seam (squeezing all the glue from the seam)
- Clamp pressures should be tight enough to allow a bead of adhesive to squeeze out.
- The adhesive will shrink slightly, so do not completely clean off the seam of excess adhesive.
- Look for glue voids and air pockets. Take care of this before the seam adhesive sets up.

- Inspect the seam to ensure a tight fit.

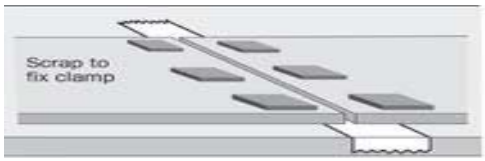
Let the adhesive cure for a minimum of 40 minutes in normal conditions or until hard to your fingernail touch. Remove the excess adhesive by “Leveling” the seam with a router with a set of skis and a small leveling bit. Do ***not*** use a belt sander to perform this operation. Excessive heat will weaken the integrity or fail the seam all together. Finish sanding all surfaces to specified finish.

8.5. Seam Reinforcement

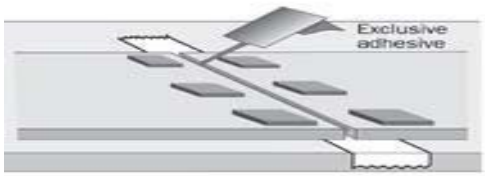
Seam reinforcement materials should be fabricated from 1⁄2” (13mm) HI-MACS materials. The reinforcement must be continuous along the entire seam. This 3” reinforcement strip must be beveled to 45 degrees and sanded smooth to reduce the stress riser. Avoid stress risers. A stress riser is a sharp or rough cut or corner that weakens over time as the top expands and contracts. This weakening effect will eventually fail the top and a crack in the countertop will occur. Locate reinforced seams where full support is available. Reinforcements can sometimes get in the way of the overall support structure. Keep the nearest edge of the seam support a minimum of 3” from inside corners.

Note:

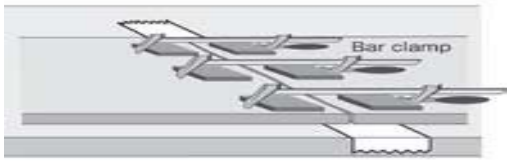
- Do not place a seam over a dishwasher
- Do not place a seam through a sink



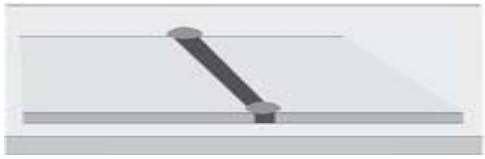
Attach scrap material or wooden blocks with hot melt glue.



Apply adhesive into the seam.



Use clamping devices to pull the pieces together. Do not over tighten. This will cause a starved or “dry” seam.



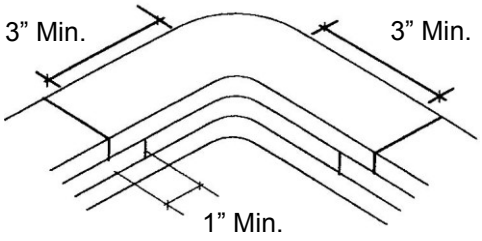
Remove clamps and blocks after seam has set.

Rout off the adhesive squeeze-out using a router with skis – set to

rout just above the material surface.

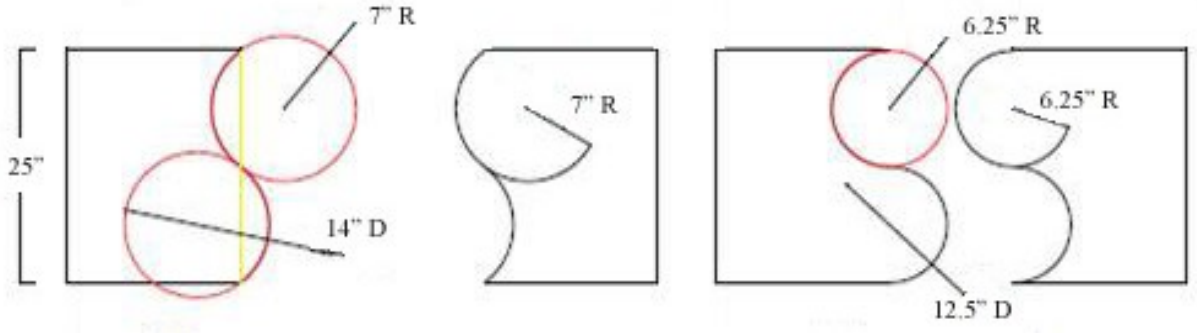
Sand the seam flush using an orbital sander.

LG HI-MACS requires a minimum 1” radius on all drop edge inside corners.
(Bottom View Diagram
indicates recommended build-up)



1) S – Shaped Seam

This method is an alternate procedure that can be used in fabrication of HI-MACS with veining or directional pattern (such as the Marmo collection). Cut the Marmo material to an ‘S-shaped’ configuration using a template or NC machine and join the surfaces in the same manner as shown below.



Cut both pieces to be seamed with an identical “S shaped” pattern. When seamed together the offset seam will not be as visible as a straight line seam.

9. CUTOUTS

9.1. Sink

You can either bevel mount or undermount your HI-MACS sink or vanity to your HI-MACS countertop or vanity to create a monolithic appearance smooth to the touch and crisp and clean to the appearance.

9.2. Top Mount

• Cut the opening in the countertop approximately 1" larger in length and width than the sink is to be mounted. Make this cutout with a router only! This opening should then be sanded to a smooth finish.
• Apply a 1⁄4" (6mm) bead of 100% silicone to the bottom edge of the self rimming sink flange and also to the edge of the routed cutout.
• Position the sink into the cutout so that the flange rests on the deck. Make certain to install the clips or clamps supplied, but remember not to screw anything directly into or onto the HI-MACS materials. Attach to the underlayment at the sink opening or adhere wooden blocks when necessary.

9.3. Under Mount

The most typical dissimilar sink or vanity will be comprised of Stainless Steel, Porcelain, Cast Iron, Ceramic or Glass. These sinks can be top mount, self rimming or under mount.

- Make a template if one is not provided of the required size for the cutout.
- Sand and finish the routed edges to provide a smooth surface.
- Leave enough room at the back of the countertop for the faucet assembly, edge buildup backsplash, and respective sink flange.

Note; the following steps are usually performed at the project site.

- Apply a 1⁄4" (6mm) bead of 100% silicone to the top of the sink flange and to the bottom of the HI-MACS counter top at the flange perimeter edge.
- Position the sink equally around the cutout and install sink clips or clamps supplied, but remember not to screw anything directly into or onto the HI-MACS materials. Use a wooden block when necessary. Always use mechanical fasteners with dissimilar material sinks. Never depend solely on glue, epoxy, or caulk for adhesion.
- When under mounting a cast iron sink, it must be supported from the cabinet. Often a cradle must be constructed inside the sink base cabinet to support the sink from the walls and floor of the cabinet. Never try to under mount a cast iron sink from the cabinet sub top or support strips.

9.4. Mounting HI-MACS sinks to HI-MACS sheet materials

A seam mount in solid surfacing is gluing the top of the sink flange with adhesive to the bottom of HI-MACS sheet materials. For this reason, all typical bonding steps are performed on an inverted or flipped sheet, thus exposing the bottom of your countertop.

• Most fabricators will perform all steps in an inverted fashion, with the exception of final trimming with the router and finish sanding.

• It may be helpful to make sure you have a work table/bench with an opening wide enough in the center to flip the top into once the sink is installed for final trimming and finishing. Such a table/bench will provide proper support all around the sink and countertop.

• Mark the center location of the bottom of the sheet where the sink will also be centered in the sink base cabinet.

• Once you dry fit the bowl into final position, draw an outline around the sink/bowl.

• Completely sand and then clean the surface of the sink flange and the area on the bottom of the sheet inside the outline that will have adhesive placed on it.

• Place the sink/bowl back into position inside your outline.

• Attach blocks made of wood or scrap LG HI-MACS material with hot melt glue against the outside edge of the flange. Once the glue has dried the sink will remain in position.

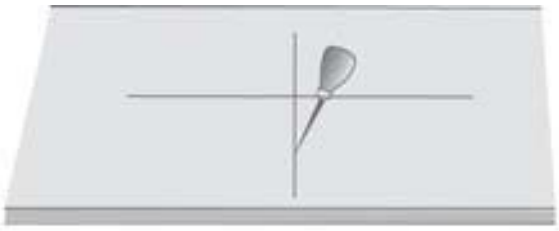
• At this point you can place a bead of adhesive on the flange of the sink or bowl and on the outline on the sheet.

• Place the bowl inside the positioning blocks and attach clamps or weights to ensure adequate and equal pressures as the adhesive is setting up. Depending on the bowl, it may be necessary or required to install sink clips or brackets to aid in the sink support. It can be noted that if you notch the positioning blocks to produce an “L” block, you can create your own support bracket.

• Once the adhesive is dry, carefully flip the top upright. Place your router in the center of the bowl and plunge an approximate 1” hole through the sheet. Make sure you now put a bottom bearing bit in the router and follow the interior of the bowl as a guide. The bearing will follow it and the excess cutout material will be removed.

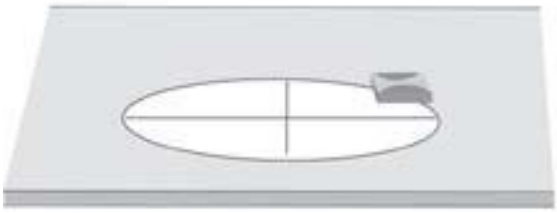
• Change your bit to a finish profile bit with a bottom bearing guide and finish routing the final profile to the deck and bowl. It can be a smooth transition appearing as a monolithic top and bowl or a small bullnose to provide a transition lip.

1 Scribe the centerlines

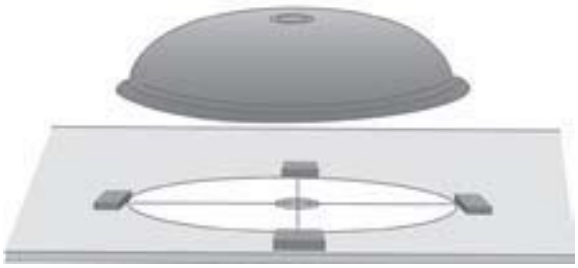


2 Scribe the outline

3 Sand the sheet in the area to receive the sink flange



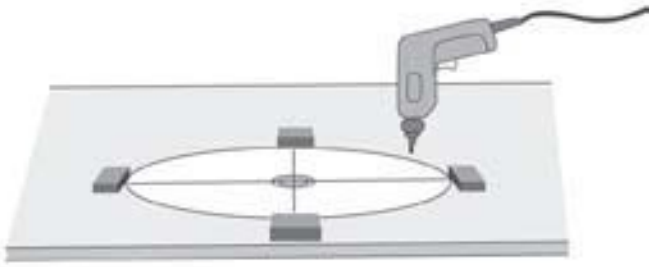
4 Attach blocks w/ hot melt glue



5 Sand the sink flange

6 Clean with denatured alcohol

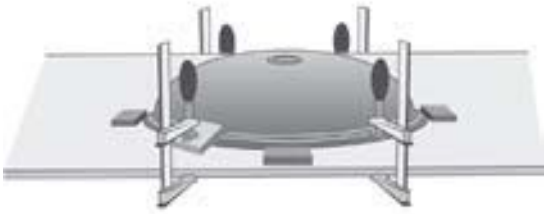
7 Plunge cut a hole in the center of the cutout



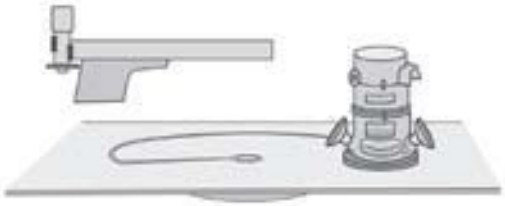
8 Apply the adhesive to the bowl flange

9 Place and attach the bowl

10 Attach with clamps until the adhesive has set

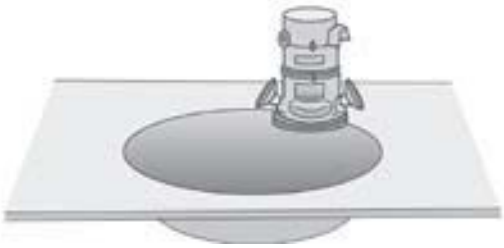


11 turn the assembly over and route the sink hole



12. Various edge profiles are possible using different

Router bits



9.5. Cook top

Countertops and heat generating appliance applications remain one of the biggest challenges to Solid Surfacing. The heat generated in various types of appliances constantly challenges the limits of solid surfacing materials. Fabrication techniques have improved over time and a lot has been learned to avoid most failures in such conditions. It remains true that solid surfacing can take the heat, but must have an outlet for venting or dispersion in order to keep the temperature under critical performance limits.

PLEASE NOTE THAT DEVIATIONS FROM THESE FABRICATION PRACTICES WILL RESULT IN VOIDING THE PRODUCT WARRANTY

• Only use a router to cut out the countertop.

• Make certain you ease the top and bottom of the cutout with a 1/8" (3mm) roundover.

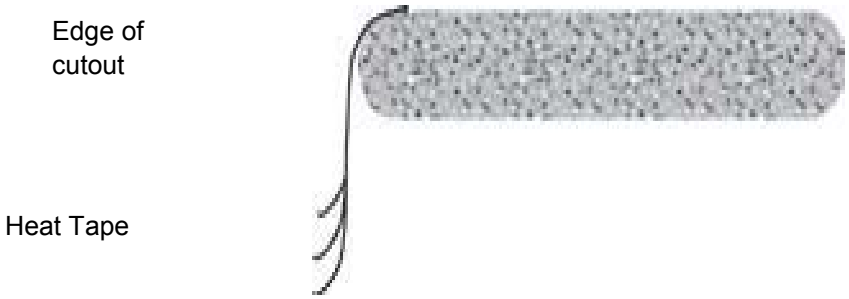
• After rounding the cutout profile, remember to finish sand any chatter smooth to 150 Grit.

• Make sure to make the cutout as large as possible, keeping in mind that it must still have the ability to properly support the cook top.

• Create a 1" radius (13mm) at all inside corners.

• Apply a minimum of 1 layer of heat conductive foil tape (preferably two or three layers as illustrated below) to the edge of the cutout. Place these layers so that the first layer of tape rests on the entire flange of the countertop. You can carefully trim any excess tape after final installation.

• As you apply the second and third layer of tape, remember to fan them out like fins. This will increase the surface area for the heat to travel, and this increased surface area will also assist in faster dissipation of trapped heat. This will serve to minimize the exposure of HI-MACS to heat.



Reinforce corner cutouts using corner blocks. It is recommended to reinforce corners of cooktop cutouts using corner blocks.

• A corner block is placed at each corner of the radius cut cooktop cutout and should be installed just after the cut out is routed. These blocks are placed on the bottom side of the sheet and will be adhered to the cooktop with adhesive. Do not ease the cutout or finish sanding until these blocks have been installed.

• 4 blocks are prepared by using pieces of HI-MACS ½” sheet materials. These blocks should be a typically 6” square.

• Once the blocks have been cut, make sure you bevel or chamfer the edge to 45 degrees and round the square corners to eliminate the chance of creating a stress riser. Scuff-sand and clean the surface area of the blocks and bottom of the sheet to be bonded.

• Place adhesive on the block thoroughly and position the block so that a 3” X 3” surface area of the block, extends from the routed cooktop cutout. Clamp in place until adhesive is set.

• Trim the excess material from the blocks on the inside of the cooktop and any extensions or protrusions in the front or back edges of the deck.

• Ease the top and bottom of the cutout and support block materials with a router and finish sand to a 150 Grit finish.

• Apply the three layers of heat tape as previously described.

9.6. Accessories

Cutouts for accessories should follow the same process and procedures as outlined in sections 10.2. to 10.5.

10. EDGES

Please follow the following standards when fabricating and profiling HI-MACS edges.

10.1. Horizontal Stack

• Scuff-sand all surface areas to be bonded or adhered to using 60 grit sandpaper.
• Clean all sanded areas with denatured alcohol.
• Make certain that your build-up strips are the same width. Do not allow the bottom build-up strip to be wider than the middle strip. This will cause a stress riser.
• Once you have applied the seam adhesive, place a spring clamp every two inches from the center at a minimum. It is recommended that all the spring clamps are the same size in order to ensure consistent pressure. Slippage is a common phenomenon. When you clamp the edges down, they have a tendency to slide or slip a bit. If you are having a hard time controlling this, place a small block behind the seaming strips and hot melt this in place. This should stabilize the slipping and keep your front edge straight while the glue dries. When finished, remove the block from behind the strips.
• Take extra care and attention to detail when fabricating inside and outside corners. These corners provide an important structural integrity to the countertop and its longevity.
• It is recommended that you use a small bar or pipe clamps at the inside corner using moderate pressure.
• Do not leave glue voids on butt seams. Make certain these seams are scuff-sanded, cleaned and completely covered with adhesive to avoid inadvertent stress risers being built into your inside corner.
• Whether you stack the edge or sandwich it, remember to create at least 1⁄2" to 3⁄4" of adhesive between the deck and build-up strip. If you stack a 1" piece of build-up to the edge of the deck, remember to include a support block made of wood. Leave a 1/8" gap between the wood strip and build-up strip to fill with silicone for expansion. Also chamfer or bevel the wood to allow the adhesive of your build-up strip to have an area to create a bead of excess adhesive. Please remember that dissimilar materials coming into contact with one another must use 100% silicone adhesive to buffer them.
• Do not use the square block method when you have an outside radius. You want to alternate the stacking of the build-up strips in a weaving manner. Remember to scuff sand and clean all edges and surfaces to receive adhesive.

10.2. Vertical Drop

In this type of edge, a vertical strip of HI-MACS is adhered to the underside of the deck. Typically this can accommodate taller flat edges or aprons. Fewer types of profiles can be applied to this type of edge.
A support strip of wood must be used behind this build-up strip after it is glued in place. This wooden strip should be adhered with 100% silicone 1/8" behind the drop edge build-up on your countertop.

• Scuff-sand all surface areas to be bonded or adhered to using 60 grit sandpaper.
• Clean all sanded areas with denatured alcohol.
• Make certain that your build-up strips are the same width.
• Place small stop blocks behind the drop edge strips and hot melt in place.
• Apply the seam adhesive and place clamps every few inches from the center. Take care to maintain consistent pressure.

• Take extra care and attention to detail when fabricating inside and outside corners. These corners provide an important structural integrity to the countertop and its longevity. Fabricate laminated corner blocks from HI-MACS sized to accommodate the corner radius and maintain sufficient interior or exterior corner support after profiling.
• Alternately, you can used a thermoformed corner piece formed to the specified radius.

10.3. V-Grooved

• A V-Groove machine can be also used to produce drop edges, coved backsplash, etc.
• Follow the manufacturer's recommendations to set up and cut the HI-MACS components.
• Clean the v-grooved areas with denatured alcohol and apply adhesive in the groove.
• Fold the edges and clamp in place until the adhesive sets.

10.4. Inside Corners

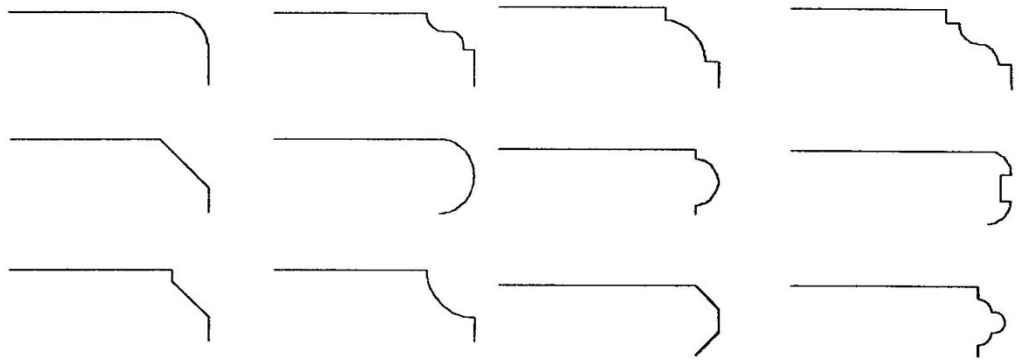
• When creating an inside corner, it is best to stack the edge build-up by alternating layers with a 1" offset between butt joints on these layers.
• Remember when building an inside corner to place the buildup strip butt joint a minimum of 3 - 4 inches from the center line of the corner itself in either direction and alternate the second and third layer with a minimum of 1" offset between butt joints. All typical bonding steps are performed on an inverted sheet.
• Corner blocks of laminated HI-MACS should span the depth of the edge strips plus 1" beyond the dimension of the corner radius.

10.5. Outside Corners

• When creating an outside corner, lay out your build-up strips by overlapping the second and third layers below the deck (typical for creating a 1 - 1⁄2" edge).
• An alternate method of creating an outside corner is to copy the inside corner method. When stacking the outside corner build-up strips, make sure to maintain a 1" offset at a minimum between butt joints on alternate layers. You must maintain a minimum of 1" on an outside radius using this method and no more than a 5" radius without using a wider build-up strip.

10.6. Profiles

HI-MACS solid surface has the unique ability of providing the machining ability for fabricators to exercise their design creativity when producing edges. With the multitude of bits available to the fabricator and terrific adhesives, there are almost endless possibilities for edge profiles.
The fabricator skill level will come into play when considering the level of difficulty in executing edge ideas. Edge build-ups are typically 1 - 1⁄2" and occasionally 2" thick. Aprons for commercial work are a generally 3" but can be larger depending on the application.



Variety of Edges

11. BACKSPLASH

11.1. Loose

For installation of Backsplash materials from 2”- 6”, follow these directions:

• Cut the splash from the same materials that were used on the countertop fabrication when necessary.
• If you produce back splash materials from strips purchased at your distributor or with materials purchased at a different time, they may not match in color. Always check for color match before fabricating.
• Prepare the strip by sanding and edge-profiling, if required, prior to installing.
• Dry fit the splash materials to ensure all joints and edges are tight.
• Scribe the back splash to the wall or countertop if necessary.
• Install the backsplash materials with 100% silicone adhesive. Place dabs of silicone every 4 - 6 inches on the back side of the splash materials that will come in contact with the wall. Prior to setting the splash into position, run a thin bead of clear or color matched silicone on the back surface edge of the countertop where the splash will rest.
• Put the splash material in place and remove excess silicone squeeze from the joints and finish caulking operation.

11.2. Coved

Cove backsplashes are fabricated in the shop. Specialty routers, tools and procedures are necessary to successfully fabricate a coved backsplash. It should be noted, however, that standard solid surfacing routers and saws can be used, providing the fabricator is skillful and patient. The most important thing to note is the time necessary to create a coved splash, which typically reflects in the cost to your customer. This cost will vary depending on shop equipment, frequency, and proficiency with this type of work as well as the time necessary for finish sanding.

• In order to make a cove backsplash, it is recommended to rabbit into the backside of the counter deck in 1” from the back edge of the counter deck. This notch should be approximately 1/8” at a minimum depth. This will create a pocket for a LG HI-MACS 1” square cove strip to be placed into.
• Cut two 1” X 1⁄2” thick pieces LG HI-MACS and glue them to the counter deck in the notch (Rabbit) you have created. You will need to prep the materials with denatured alcohol and a clean white rag on the deck and strips. Place the adhesive thoroughly in the deck notch and place the first strip flat into the rabbit created. (Place the 1” strip in the 1” rabbit flat on the edge using the 1.2” thickness) Once the first strip is put in place, apply adhesive to the top of the first strip and place the second strip on top in a horizontal stack method as used in edge build-ups. Place the spring clamps into position using the clamping procedures outlined in this manual.
• After the adhesive has dried from the strips, it is time to cut the backsplash material you wish to incorporate into the top. This backsplash can be standard, full height or a custom height selected by the customer. Remember, the full height splash is much more difficult to control as you fabricate it in place and in the transportation and installation process.
• As you apply the desired backsplash strip, remember to thoroughly clean the edge you wish to apply adhesive to. Put the adhesive to the back face of the top strip you adhered earlier and place the strip on the glue line. Use bar or pipe clamps to hold the splash in place as the

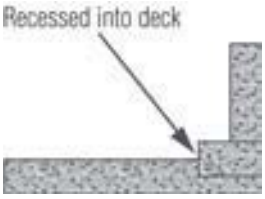
adhesive dries, and remember to use a square to adjust pressures so that the backsplash will remain straight and at a right angle from the countertop surface.

• Once this has dried, you will want to remove the excess material with a cove router. The depth and arc angle of the cut should be tangent to both the deck and backsplash.

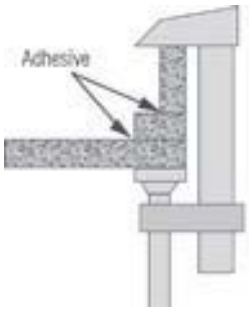
• The balance of this operation is sanding the cove you have created. There are power sanders that have been developed, but some hand-sanding will be required for the best results and quality of finish.

• Use the same procedure and steps to create the inside corner cove on an “L” shaped return on the countertop. Another method is to create an inside corner cove block that is prefabricated. It can then be bonded to the inside corner, which is finished in the same manner.

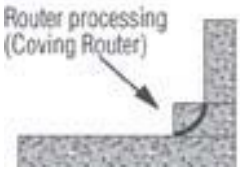
On coved splash (Type A) the cove strip assembly must be recessed into the deck 1/8” to eliminate “feather” at glue line.



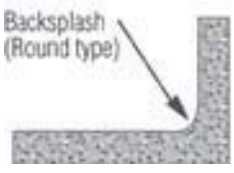
Apply adhesive to assembly as shown



Use specialty cove router to fabricate



Sand profile after fabrication



11.3. Full Height

The same steps and procedures are used when installing full height backsplash materials with a few exceptions:

• If using full height splash in either 1⁄4" (6mm) or 1⁄2" (13mm) LG HI-MACS materials, remember to allow a 1/8" (3mm) gap below the upper cabinets for expansion.
• Make cut-outs only with a router and maintain a 1⁄2" (13mm) minimum radius on all inside corners.
• Adhere to wall with silicone - never use panel adhesive

11.4. Tile Backsplash and other dissimilar materials

When tile or other backsplash materials are placed above a HI-MACS countertop, always provide an expansion joint between the dissimilar materials. The recommended gap should be $^{1}/_{8}$" to ¼" and filled with 100% silicone caulk.

12. COUNTERTOP SUPPORT

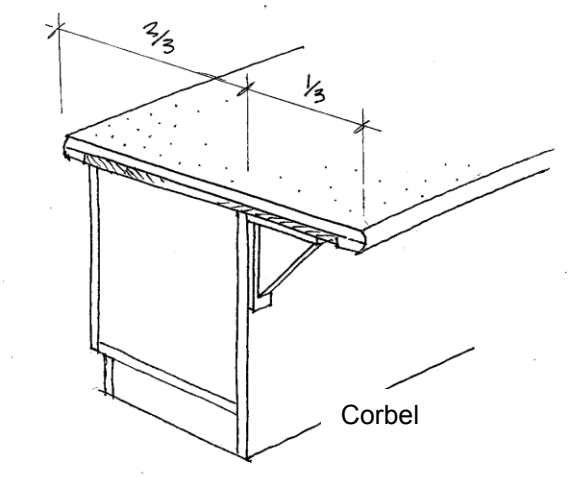
The best substrate for a HI-MACS countertop is made from moisture resistant plywood, solid hardwood lumber, or tubular steel. Other wood products may be acceptable as long as they are moisture resistant. Support strips should be attached to the cabinets in a “ladder frame” configuration. Always avoid MDF, Particle board or Flake board. These materials are not stable and are subject to warpage and expansion with the presence of moisture. Follow the procedure below using any of the approved support materials.

12.1. Support Structures

• Do not use solid substrates, especially around heat generating appliances in the installation. Wood and related wood products do not conduct or dissipate heat produced by heat generating appliances.
• Substrate materials to avoid are MDF, Particle Board, OSB, and any non water resistant composite wood products.
• If the cabinet has full dust covers, it is recommended to remove at least one half of the cover prior to top installation.
• You can use a full substrate with approved wood or wood product materials on furniture, table tops or related service counters, provided that no heat generation appliance is present.
• All cabinets must be leveled and shimmed as necessary to 1/16” tolerances prior to countertop final installation.
• Apply perimeter support strips to the cabinet surfaces. You will need to install center support stringer materials across the cabinets for support. These support strips can be nailed with a finish nail and countersunk, or screwed into place provided the head is below the surface of the wood support that will come in contact with the HI-MACS countertop deck.
• Place stringer/support strips 12” apart.
• Do not span any unsupported opening over 24”.
• Any leveling necessary should be performed between the cabinets and the support strips.
• After the support system is installed and leveled, you will be ready to begin installation of the HI MACS top.
• Use 100% silicone adhesive to bond LG HI-MACS surfacing materials to dissimilar materials such as wood, steel, aluminum, etc. Do not use Liquid Nails or similar non flexible panel adhesives. The purpose of the silicone is to allow the top to expand/contract as it needs to. Silicone allows for this to take place. Panel adhesive restricts this motion resulting in failure to the top and voiding the warranty.

12.2. Overhangs

Never allow more than 1/3 of the width to overhang while two thirds of the width should be supported. If this rule cannot be followed, you must install legs for necessary support.



• Using support strips, a maximum of 6” overhang is allowable without corbels. A full substrate on a overhang with a web support over the cabinets is the preferred method of support.

• For overhangs greater than 6” but less than 16” use corbels spaced no more than 24” apart. Alternately you can use a 1” tube steel framework spaced no more than 24” for support.
• An overhang of more than 16” will require legs.
• Other types or combinations of support methods may be possible. The HI-MACS warranty will not be voided as long as all of the following criteria are met:

1. The overhang does not exceed 1/3 of the supported width of the top.
2. Maximum edge deflection does not exceed ¼” under an applied load of 100 lbs.
3. No portion of the HI-MACS spans more than 24” without support.

Note; As a manufacturer of solid surface sheet product, LG Hausys does not review and/or approve specific details for project specific applications.

12.3. Miscellaneous Support

• Support must be provided at the back of the cabinet (where it meets the wall) in all cases. If there is no support (for example, at the back of a dishwasher opening), a cleat needs to be securely fastened to the wall level with the cabinets. This gap cannot be spanned by support strips alone.
• In many cases, corner cabinets with lazy susan’s do not provide adequate support or have excessive spans. Additional support may need to be added prior to installation of countertops.
• Never screw through support strips into the HI-MACS material. This will void the warranty as it will eventually cause the material to crack.
• Do not attach appliances such as dishwashers, directly to a HI-MACS countertop. Use side clips to attach to the cabinet whenever possible.

13. FINISHING

HI-MACS sheet materials are factory sanded prior to the protective peel coat application. The result of this superior quality factory finish translates to less final sanding time in the shop or on the jobsite. Sanding is a very important part of the fabrication process. Finish considerations can make or break the aesthetic value of your surface. Be very sure to sell a finish that is right for the color and lifestyle of the customer. Do not oversell the performance of a specific finish, especially in a darker color selection and in a satin or gloss finish. The result could be expectations that can never be met. Clearly explain the performance of a finish option to the customer.

Caution; Satin or gloss finish will show scratches more readily than a matte finish. Matte is the finish recommended by LG Hausys for most surfacing applications.

Caution; All dark colors of any surface material, including HI-MACS require more maintenance to maintain their appearance. Under ordinary use, darker colors will show dirt, dust, scratches, rubs, fingerprints and watermarks more readily than lighter colors and patterns. For this reason, we recommend periodic professional maintenance in order to renew surfaces to their original finish.

13.1. Overview

The sanding and finishing process can be the most time consuming process of fabrication.
Additionally, it can be confusing to the fabricator because of the multitude of sanding equipment, systems and sand paper companies available to the fabricator. As you decide the best equipment and sanding papers to incorporate into your fabrication process, remember to purchase good quality sanding equipment and sandpapers.

• Make sure to remove excess adhesives with a surfacing router equipped with a system of skis. Avoid use of a belt sander as it generates a great deal of heat and can fail a seam. Furthermore, the belt sanding equipment is very aggressive and can remove material quickly. You can quickly create more problems for your countertop fabrication if more material is removed than is supposed to be. You want to maintain control in the sanding process.
• An important step in the process of sanding is to thoroughly clean the top between steps or grit changes. You can do so with a spray bottle of water or preferably denatured alcohol and a clean white rag. Cleaning off sanding dust between steps allow for a more consistent and high quality finish.
• Apply equal pressure and overlapping coverage in both directions of the top. For example, left to right and front to back. Complete one direction before starting the other.
• Change or clean your sandpaper as you sand as it will get loaded and become less efficient. As you get to a more detailed finish the sandpapers will load more quickly. If care is not taken to keep the sandpaper clean, it will impair your ability to achieve a high quality, consistent finish. In a gloss situation, you may never achieve it.

13.2. Matte Finish (Preferred)

• To achieve a matte finish, you can either use a grit or a micron system. Remember the numbering system or grades of papers between grit and micron systems are opposite to one another.

• First, use a 120 Grit or 100 micron abrasive. Once this step has been completed, remember to clean the top and switch papers to a 180 or 220 Grit or 60 Micron paper.
• Finally, clean the top once again and surface the top with a #7447 Scotchbrite pad.
• If you are working with a dark or black color, you may have to add an additional third step in sanding. This will require a 320-400 Grit or 30 micron paper. If this is done, you will then want to clean the top and then surface the top with a #7448 Ultra Fine Scotch brite pad.

13.3. Satin Finish

• If you wish to achieve a satin finish follow the same steps expressed to achieve a Matte Finish on a dark color. Use a 120 Grit/IOO Micron, then switch to a 180-220 Grit/60 Micron. Remember to clean the top between steps.

- Next -

• You will want sand the top using 320-400 Grit/30 Micron paper. Clean the top.
• Finally, you will surface the top with a #7448 Ultra Fine Scotch brite pad. Clean the top once again and examine the final finish.

13.4. Gloss Finish

• Follow the steps to the Satin Finish specification, but do not use the #7448 pad yet. As you reach the 320-400 Grit/30 Micron step, you will need to add a few additional steps.

- Next -

• Sand the top using 600-900 Grit/15 Micron paper. Thoroughly clean the top. Remember to check the loading of your paper during the process and replace it frequently as necessary to maintain a consistent finish.

- Next - Polishing Procedures

• Remember to note that HI-Gloss finishes on dark colors are not recommended in high traffic areas, as the finish will show wear very quickly and require constant maintenance.
• Remember the polisher will build a lot of heat as you buff the surface with the polishing compounds. Maintain moderate consistent pressure to prevent overheating of the top and burnishing of the gloss finish.
• Use a 10” (254mm) variable speed polisher. Black and Decker offers a few models that can maintain 2500 RPM’s and 8-10 amps of power.
• Install a 3M Buff Adapter to the polishing equipment. This is important so as not to allow the arbor to damage the surface in the polishing process.
• You must now install a white 3M Super Duty 2 + 2 Pad to the polisher assembly.
• Apply 3M Marine Paste Compound to the top. This paste is abrasive and will remove swirls to 30 Micron. You may need to repeat this step. Keep the buffer moving in a controlled fashion across the countertop and then from front to back across the countertop.
• Clean all compound residue from the polished surface. You can do so by reversing the white pad. Then clean the top with denatured alcohol and a clean soft white rag.
• Take off the White 3M Super Duty 2 + 2 Pad and replace it with a Yellow 3M Super Buff Polishing Pad.
• Apply 3M “Finesse-It” (#81235) Polishing Material to the countertop. Remove any remaining swirls to produce a high gloss surface.
• Clean all polishing residue from the polished surface. You can reverse the Yellow Pad to remove any residue left behind from this step.

14. THERMOFORMING

Thermoforming allows a fabricator to explore virtually limitless possibilities by heating and forming a sheet of HI-MACS into 3 dimensional shapes. HI-MACS sheet materials are well suited to use with thermoforming technology. A variety of shapes and configurations are possible by thermoforming the HI-MACS sheets. Sheets or cut pieces must be uniformly heated to achieve the desired results. Ovens used for thermoforming must be capable of fully containing the entire piece to be formed, and maintaining a consistent temperature during the heating process.

Caution – Large chip products are not thermoformable (Volcanics, Galaxy, Eden Plus).

Thickness of HI-MACS	¼”	½”
Oven temperature (°F)	320~374	320~374
Heating Time (Minutes)	20	40
Minimum Curve Radius (inch)	R=2”	R=3”

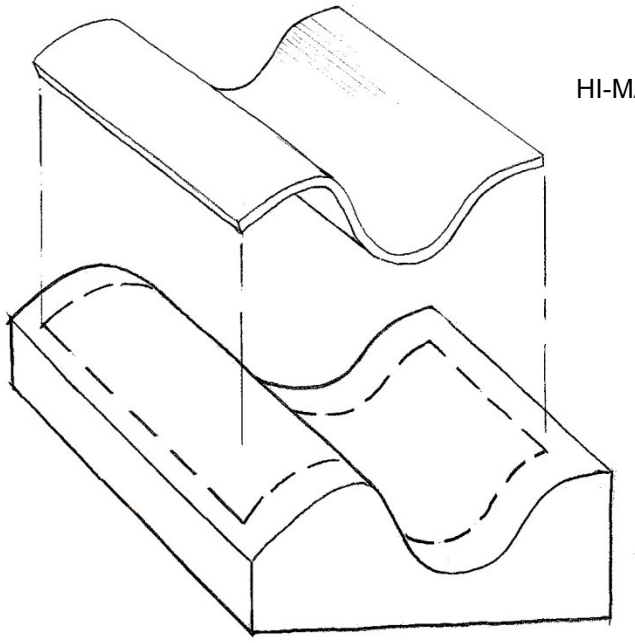
14.1. Overview

• Construct a mold of the shape required using plywood or MDF.
• Depending on the shape and configuration, male and female molds may be necessary. Molds can be simple or very complex.
• The quality of the mold constructed will affect the finished product.
• Any imperfections in the mold will be transferred to the HIMACS sheet being formed.
• The sheets need to be heated to a temperature of 320-370^{O}F, but should never exceed 392^{O}F.
• Heat 10 ~20 minutes, or more if you need the product with minimum curve.
• Please note that a whitening effect can be generated on the surface of the product if the temperature is too high or the heating is prolonged. Also be aware that the darker the color, and the smaller the radius, the more whitening there may be.
• Once heated to the required temperature remove work piece with heat resistant gloves from the oven and place directly into a mold. Allow heated material to shrink in the mold.
• Using moderate pressure, slowly form the work piece to the shape of the mold. This can be accomplished on basic shapes by using a series of clamps and hand pressure. More complex shapes may require helper pieces or even a vacuum forming press with a rubber membrane.
• Leave the sheet in the mold until the sheet has cooled down to 175^{O}F (typically 20-40 minutes, for ½” material). Always wear heat-protection gloves for this operation.
• Never attempt any shock cooling as this can cause stress to the material.
• Attempting to bend HI-MACS at lower temperatures or shortening the heating cycles will often result in "whitening" or cracking at the radius bend.
• Do not take the thermoformed shape from the mold before the temperature reaches 175^{O}F. The shape of product is maintained at temperatures below 175^{O}F, even if the product is not supported by the mold.
• Normal sanding and finishing of the formed material can be carried out once the material is fully rigid.

Thickness of HI-MACS	¼”	½”
Cooling Time (Minutes)	10~20	20~40

14.2. Other Considerations

• Thermoforming using specialized equipment such as a heated platen press and a vacuum membrane press can yield superior results. Often the thermoforming process can be done quicker using this type of equipment. Please comply with all manufacturers guidelines – including all safety precautions.
• Do not thermoform pieces that have been seemed.
• Allow for shrinkage of material when thermoforming. this will vary depending on the shape, but can be 5% to 7%.
• There is a possibility of color change due to the heating process. Test form a sample to determine if the color of the finished product will be acceptable. If you are working with dark colors, you may see visible whitening of the material, particularly at sharp bends and tight radiuses.
• Defects, or irregularities in the mold will transfer to the sheet being thermoformed.



NOTE:

LG Hausys warranty covers manufacturing defects. All sheet goods should be inspected and any defects should be recognized prior to thermoforming. HI- MACS sheets transformed into three dimensional shapes are the responsibility of the fabricator. Furthermore, LG Hausys makes no warranty that the finished product is suitable for the intended application or purpose.

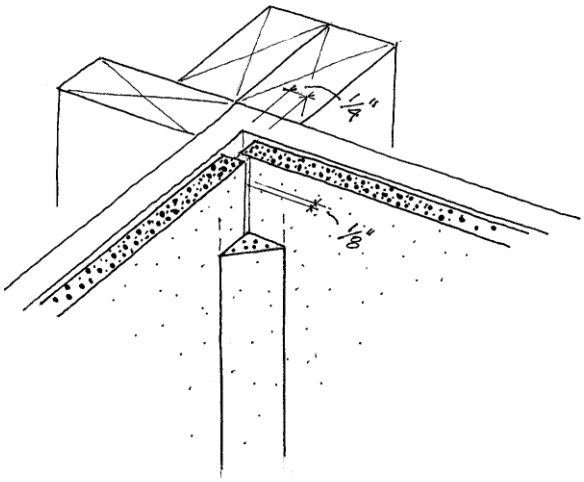
15. VERTICAL APPLICATIONS

HI-MACS sheets can be vertically mounted using either horizontal or vertical seams. Wall cladding pieces can be seamed together or joined using 100% silicone sealant. Either ¼" or ½" sheet material may be used, however the ½" thick material will generally prove more durable.

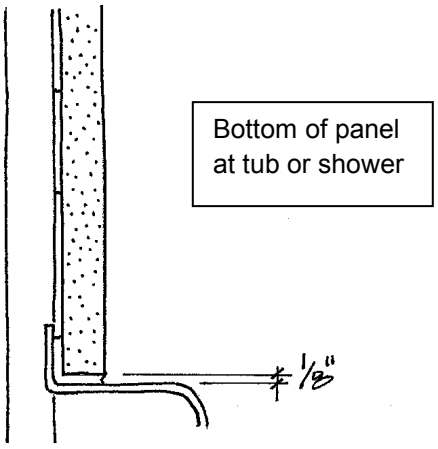
Ensure that the wall surface that the HI-MACS sheets are being attached to is of sound construction and free of defects. If there is an expansion joint in the wall, an expansion joint of the same size and location will be required in the HI-MACS wall panel. Additionally gaps for expansion must also occur at inside corners, wall to floor, and wall to ceiling interfaces.

Please note that LG Hausys does not provide design review of drawings for any specific application or purpose. Nor will LG Hausys approve or reject a design as being a suitable use of our manufactured acrylic sheet product.

15.1. Wet wall



Corner condition

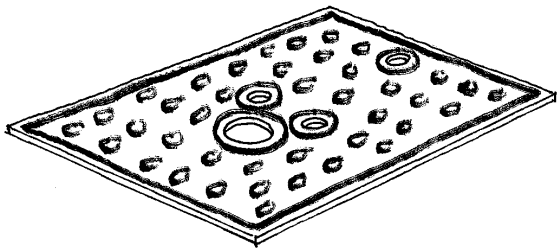


Bottom of panel at tub or shower

The variety of shower and tub configurations available in the marketplace are too numerous to cover in any manual. These guidelines will provide the basic instructions that will apply to all applications.

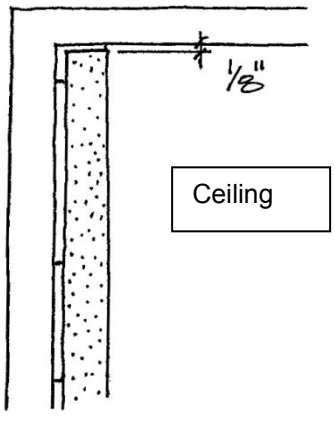
• Ensure that the walls that the panels are to be attached to are clean, smooth, plumb, and free of moisture. Do not attach HI-MACS to a wall that has damage caused by moisture.
• Cut panes to size using a router. Scribe to wall where necessary.
• Allow ¼" gap at inside corners from HI-MACS sheet to wall surface. Allow 1/8" minimum gap from HI-MACS sheet to adjacent HI-MACS sheet.
• Provide a minimum of 1/8" expansion space (to be caulked with 100% silicone) at bottom of panel and interface of tub or shower pan.
• Provide a minimum of 1/8" expansion space at top of panel / ceiling interface.

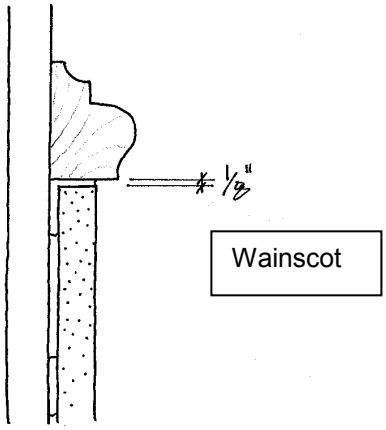
• Cut all holes for faucets and plumbing using a router. Maintain at least ½" clearance around all items penetrating the wall panel.
• Attach the HI-MACS wall panel using 1" dia. spots or 2" circles of 100% clear silicone caulk, approximately 4" to 6" apart in all directions. Also apply a continuous bead of silicone at the perimeter and the edge of all cutouts.
• Press firmly into place and secure while silicone caulk sets. Hot melt glue can be used to aid this process, however because it sets rapidly, do not apply prior to placing the panel on the wall.
• Repeat this process for additional wall panels.
• Do not use a dark color of caulk on light colored panels. This could be visible as there is some translucence to certain HI-MACS colors.
•When finished, caulk all perimeter panels (including inside corners) with 100% silicone.
• Add corner trim, batten strips, etc., using color matched silicone caulk.



100% silicone caulk applied to the back of a HI-MACS wall panel

15.2. Wall and Wainscot





• Ensure that the walls that the panels are to be attached to are clean, smooth, plumb, and free of defects or damage. Do not attach HI-MACS to a wall that has moisture or damage caused by moisture.
• Cut panes to size using a router. Scribe to wall where necessary.
• Allow ¼" gap at inside corners from HI-MACS sheet to wall surface. Allow 1/8" minimum gap from HI-MACS sheet to adjacent HI-MACS sheet.

• Provide a minimum of 1/8” expansion space (to be caulked with 100% silicone) at bottom of panel.
• Provide a minimum of 1/8” expansion space at top of panel / ceiling interface.
• For wainscot, leave a gap of 1/8” between the HI-MACS panel and any chair rail or transition material.
• Make cutouts for electrical outlets, etc. using a router. Maintain at least ½” clearance around all items penetrating the wall panel.
• Attach the HI-MACS wall panel using 1” dia. spots or 2” circles of 100% clear silicone caulk, approximately 4” to 6” apart in all directions. Also apply a continuous bead of silicone at the perimeter and the edge of all cutouts.
• Press firmly into place and secure while silicone caulk sets. Hot melt glue can be used to aid this process, however because it sets rapidly, do not apply prior to placing the panel on the wall.
• Repeat this process for additional wall panels.
• Do not use a dark color of caulk on light colored panels. This could be visible as there is some translucence to certain HI-MACS colors.
• Panels can be seamed together using seam adhesive. Do not attempt to adhesive seam wall panels while on the wall. All seams should be made horizontally on a flat surface, and sanded prior to placement on the wall. Refer to section 8 SEAMING for additional information. Alternately, panels can be seamed in place (on the wall) by using color matched silicone caulk.
•When finished, caulk all perimeter panels (including inside corners) with 100% silicone.
• Add corner trim, batten strips, etc., using color matched silicone caulk.

NOTE:
Saunas and steam rooms (including steam showers) are not approved applications for HI-MACS sheets to be used. HI-MACS Sheets used in these applications will crack. The LG Hausys warranty does not cover these applications.

16. TRANSPORTATION and INSTALLATION

HI-MACS countertops and other materials should be fabricated in the shop to the greatest extent possible, however components should not be so large as to be a burden in transport and handling.
Substructure, reinforcements, supports, backsplashes and field seams are all items either installed or finished at the jobsite. Before leaving the fabrication shop, carefully clean the fabricated materials and remove as much of the dust as possible. Cover or protect all finished components during transport.

16.1. Tools and Equipment

There is a variety of tools that can be utilized for installation of HI-MACS and ultimately, the selection is one of personal preference. The following list includes most basic tools but this list is not meant to be all inclusive.

- Hole saw
- A variety of clamps
- Variable speed polisher with buffing pads (stop to 3000 RPM)
- Hot glue gun
- Bulk adhesive gun
- Caulking gun
- 3 HP and 1 ½ HP Routers
- Orbital and belt sanders
- Electric drill
- Electric brad nailer
- Electric saw
- Good metal straight edges, 4’ (1.2m), 8’ (2.4m), 12’ (3.7m) and inside corner Radius edge
- Squares and levels
- Tape measures
- Templates and guides
- Sanding blocks, both right angle and straight
- Screwdrivers and pliers/channel locks
- Shop vacuum broom and dust pan
- Extension cords
- Disposable dust masks and gloves
- Heat tape and packing tape
- Denatured alcohol
- White cotton or terry cloth rags
- Safety goggles or glasses and ear protection
- Scotch Brite pads
- Silicone caulking

Suggested Substructure Materials:

- 1” Square steel tubing
- 1⁄2” and 3⁄4” moisture resistant plywood or 3” and 4” solid hardwood
- LG HI-MACS Solid Surfacing reinforcing seam strips/blocks

16.2. Loading and Delivery

Vehicles used for transportation should not only be adequately outfitted for safely hauling material, they are a reflection on your business and your company. Keep them neat, clean, and well maintained.

• Review all job paperwork prior to loading to determine the scope of the installation. Inspect all HI-MACS pieces to check for finish, color match, edges, etc.
• Wear closed-toed shoes or boots when loading. LG HI-MACS sheets are heavy and even more so when fabricated into a monolithic counter top for installation.
• When handling sheets, workers should use leather work gloves to reduce the wear and tear on your hands. The edges of the LG HI- MACS sheets can be sharp. Always work safely.
• Transport large components vertically or on "A" frames. Use carpet or padding to protect the finished edges. Tie down and secure all components during transport.
• Do not try to load or unload the materials by yourself.
• Always plan for adequate manpower for handling and lifting at the jobsite.
• Brace all cutouts during transit.
• Be on time. Call the customer if you are running late.
• Allow the materials to reach room temperature before fabricating and installing. You should allow up to 2 hours if temperature differential is dramatic. During this time the materials will expand or contract depending on the circumstances.
• Seam materials work best in a temperature range of 60 degrees F (15 C) to 90 degrees F (32 C).

16.3. Support

• As previously mentioned in this manual, do not to apply solid substrates, especially around heat generating appliances in the installation. Wood and related wood products do not conduct or dissipate heat produced by heat generating appliances.
• Substrate materials to avoid Particle Board, OSB, ETC.
• If the cabinet has full dust covers, it is recommended to remove at least one half of the cover prior to top installation.
• You can use a full substrate with approved wood or wood product materials on furniture, table tops or related service counters, provided that no heat generation is present to accentuate the expansion and contraction properties of the top.
• Remember that the cabinets must be leveled and shimmed where necessary to 1/16" tolerances prior to countertop final installation.
• Apply perimeter support strips to the cabinet surfaces. You will need to install center support stringer materials across the cabinets for support. These support strips can be nailed with a finish nail or screwed into place provided the head is below the surface of the wood support that will come in contact with the HI-MACS countertop deck.
• Place stringer/support strips 12" apart.
• After the support system is installed and leveled, you will be ready to begin installation of the HI-MACS top.

16.4. Field Seams

Please note that all of the items in chapter 8 about seams and seam placement also apply to field seams. Refer to chapter 8 SEAMING for addition details and instructions.

• HI-MACS tops and components should be seamed in the fabrication shop to the greatest extent possible. field seams should be made to reduce handling and provide for ease of installation.
• Keep seams 3-4 inches from inside or outside corners.
• Leave 3-4 inches between the seams and sink or countertop cutouts. Do not place a seam above the dishwasher.
• Make sure to clean the joining edges with denatured alcohol and a clean white rag.
• Create sharp, accurate seams and tight glue lines. Do not construct the seam too tight. You want to ensure the adhesive is not all squeezed out.
• Apply seam adhesive evenly and thoroughly so that all seaming surface areas are properly covered.
• Allow the seam adhesive to completely cure before finish sanding.

16.5. Tolerances

Install countertops to fit as closely as possible to adjacent finishes.
Fabrication and installation tolerances, if not specified elsewhere in this manual, should comply with the following;

• Provide a 1/16” minimum expansion gap at the interface of all walls, cabinets, or dissimilar materials. Maximum gap for expansion should be 1/8”. Scribe countertops to the wall to achieve this tolerance. Caulk all gaps with 100% silicone sealant.
• Seams should be inconspicuous. They should not be visible from a distance of 6’ away.
• Tops should be installed level. Maximum variation should be +/- 1/16” in 6’. Note: If cabinets are not level (+/- 1/16”) have this corrected prior to installation of HI-MACS top.
• As long as base cabinets are in a straight plane, standard overhangs (front edge) should vary no more than ¼” in 8’ Non-standard overhangs (over 2”) should comply with the chart in Chapter 12.2.

16.6. Caulking

Caulk all HI-MACS countertops to non HI-MACS material using 100% Silicone sealant.

• Provide a 1/16” to 1/8” expansion gap at the interface of all walls, cabinets, or dissimilar materials. These expansion gaps should be caulked.
• Caulk loose HI-MACS backsplash to the countertop using a color matched silicone caulk. Make sure to caulk behind faucets. Smooth or “rake” the caulk joint to remove excess sealant and provide a finished appearance.
• Backsplash should be caulked to the wall. Gaps at this interface have the potential to exceed the maximum allowable due to variations in the wall surface.

16.7. Completion

Fabricators that pay close attention to details and quality throughout the fabrication process will ensure their customer's satisfaction and minimize costly call backs while at the same time maximizing the relationship for future work and/or referrals from the customer.
Establish a procedure of good will after the job is completed by providing them with the following information and reassurances;

• Inspect the entire job upon completion with customer. Review any quality check list you may have The customer will get a chance to appreciate the craftsmanship and care you put into their top.
• Review care, maintenance, and longevity procedures with the customer.
• Review maintenance procedures and your recommendations for the finish they have chosen.
• Describe the dangers of placing hot pots, pans, etc on the countertop. Also, review the negative effects of heat generating issues in sinks dishwashers and countertops.
• Leave color-matched materials in a trivet or cutting board or fixed color match materials below the sink on the cabinet wall and stress their importance for future repairs.
• Contact the customer after a month or two to see if they have any questions or concerns.
• Provide your company sticker or label to the inside cabinet door or inside cabinet wall below the sink for future maintenance or top refinishing or questions relating to their top. This is helpful especially after the original customer has moved.
• Thank the customer for their business.

The impression you leave on your customers is a reflection of LG Hausys. Your professionalism will help us to attain the highest level of customer satisfaction, which will benefit your company as well as ours.

17. TECHNICAL DATA

17.1. Specifications

Product Features

• Available in a wide spectrum of standard colors and patterns, as well as Custom Colors

• Ease of fabrication due to double-sided sanding of the top and bottom of every sheet to ensure premium quality and consistency

• Non-porous surface

• No grout lines, installation appears to be seamless

Specification

HI-MACS Acrylic Solid Surface is a product of LG Hausys.

HI-MACS is produced in Korea and in our state-of-the-art manufacturing plant in Adairsville, GA using a single-belt, continuous-cast line. The product is then shipped from the factory to domestic warehouses where it is distributed to retailers, fabricators, and customers on demand.

Solid surface materials combine two ingredients: a natural mineral (the "filler") and a resin (the "binder"), along with various additives. Alumina trihydrate, or "ATH", is the filler of choice in most solid surfaces including HI-MACS. ATH is refined from bauxite ore through the Bayer process. ATH is what gives solid surface its chemical, stain and water resistance. ATH also lends the product its Class A Fire Rating. Two main families of resins are used to make solid surface: acrylic and polyester. HI-MACS solid surface is made from acrylic-based resin, Methyl methacrylate or "MMA". The acrylic-based resin in HI MACS yields a sheet that is thermoformable, which can be heated, bent to a new shape, and cooled without any loss of its performance characteristics.

HI-MACS is manufactured by combining the ATH filler and MMA acrylic resin with additives and particulates, pouring the mixture into a mold, and curing the resulting sheet. Curing is a critical part of the manufacturing process because it allows the chemical reactions time to complete leaving a stable, inert material with all its performance properties intact.

Standard Sheet Thicknesses: 1⁄4" (6mm nominal), 1⁄2" (13mm nominal)

Sheet Dimensions: 1⁄4" (6mm nominal)
30" x 98" (762mm x 2,489mm)

Sheet Dimensions: 1⁄2" (13mm nominal)
30" x 145" (762mm x 3,683mm)

Food Service
HI-MACS is ideal in the food service industry. Countertops, table surfaces, work stations and restrooms need to take the traffic and abuse that servers, kitchen staff, and customers parcel out on a busy day. HI-MACS gives restaurants, bars, buffets, and cafeterias the durability and the resistance to stains and bacteria needed in the food service industry. HI-MACS products have passed all NSF testing allowing its use with all food types.

Restaurant

HI-MACS is not only functional; it is also elegant. When patrons sit down for a nice dinner together, atmosphere and ambiance are everything. The details matter. Whether it is the touch and feel of the bar tops and table tops or the appearance of the restroom vanities and bowls, the little things are what make an impression. These features combine to make HI-MACS the ideal surface for all types of restaurants. Because of the elegant appearance of LG HI-MACS, along with its stain resistance and durability, it becomes a perfect match for any restaurant. And HI-MACS is renewable, meaning the appearance will retain its beauty and functionality as long as necessary – no matter who is cooking in the kitchen.

Lodging

In the lodging industry, a room becomes a guest's home away from home. Impressions matter. After a few days of living in their rooms, hotel guests begin to notice everything- from the grout in their showers to the torn laminate on the nightstand. HI-MACS is a perfect surface for hotel suites and rooms, superior to laminate for its ability to portray elegance (without the cost) while maintaining the long-term durability necessary for this kind of heavy traffic area. HI-MACS has been used for everything from sink bowls and vanity tops, to shower and bath surrounds, to windowsills, to nightstand counter tops, to the trim on doors. The thermoformability of HI-MACS gives added design freedom for ADA compliance in specially equipped bathrooms that provide ample mobility and aid to the handicapped guests. HI-MACS is not just for use in hotel rooms, reception counters, hotel restaurants and bars; entertainment and recreation areas can all benefit from the durability, elegance, and design flexibility of LG HI-MACS.

Healthcare

Because HI-MACS is resistant to stains, bacteria, and chemical spills, it is ideal for use in healthcare settings. It is inviting to the touch, elegant and beautiful, as well as fully capable of handling the requirements of a bacteria-intensive and chemical-rich environment. HI-MACS has been used in patient and public restroom vanities and bowls, patient bath and shower surrounds, laboratory sinks and work surfaces, cafeteria counters and tables, operating room walls, nurse's stations and transaction
counters. Anywhere sanitary codes are an issue, HI-MACS is a valuable product because of its ability to combine safety with an aesthetically pleasing design. HI-MACS also has incredible design flexibility because of its thermoformability. Designers and architects have the freedom to design with ADA-compliance in mind providing patients with ample mobility, aid and other necessary requirements.

Retail

HI-MACS is a unique alternative from other surfaces when consistency, durability, and elegance are the combination your retail client is looking for. The affordability of HI-MACS allows your client to incorporate an upgraded solid surface product into their branded appearance, combining beauty with functionality. HI-MACS is ideal for shop signage and wall cladding, cosmetic counters, displays, transaction counters, and any other place customers roam. With a color palette that is professionally designed and maintained, the availability of 1⁄4" and 1⁄2" thicknesses allow coordinated designs to flow seamlessly through the environment. LG HI-MACS' "Custom Color" program offers a unique opportunity in your design. HI-MACS works well for high traffic areas that require a counter to be both durable and beautiful.

Commercial

Libraries, airports, museums, aquariums and other busy places need surfaces that are long lasting and can handle heavy traffic. HI-MACS is, by design, a highly durable surface, made especially for heavy traffic areas. As an acrylic solid surface, it is impact and scratch resistant and requires very little maintenance over the course of its lifetime. Unlike other solid surface products, HI-MACS offers customers a 15 year commercial limited warranty – a vital guarantee for any application that aims for permanence. LG HI-MACS' durability and renewability makes it an ideal surface for transaction areas and public restrooms. HI-MACS can be fabricated to fit most any custom built work area, such as teller lines, transaction counters, restroom partitions and stalls, and entertainment applications. Unlike other materials, its durability is exceeded only by its elegant beauty. HI-MACS versatile color palette is available in either 1⁄4" or 1⁄2" thicknesses, allowing the seamless flow of your design. HI-MACS offers you a unique opportunity to enhance and individualize your creative work with its "Custom Color" program.

Education

HI-MACS is engineered to withstand the wear and tear of an active student lifestyle. Each semester, year in and year out, the school's facilities appear brand new. Given the need for schools and their various accompanying facilities to be long-lasting while minimizing lifetime costs, it's necessary to go with a material that is durable, aesthetically pleasing and cost-effective. HI-MACS is ideal for these types of environments – for use in shower stalls, dormitories, laboratories, public restrooms, sinks and bowls, and even areas of prestige like the dean's office

Military

Military housing units see a lot of turn-over in any given year, these installations need to be durable and easy to care for. Our military personnel deserve a place that looks and feels like home – a place to live that will make their time at the base enjoyable and pleasant. HI-MACS appearance and versatility make it an ideal choice for military housing, barracks, showers and wall surrounds as well as for other types of government applications. It is durable and resistant to scratching and staining. An HI-MACS surface is easily renewable with little maintenance over its lifetime. A solid surface countertop speaks of permanence. Expect residents to feel at home in a kitchen covered with beautiful and durable HI-MACS surfaces. Applications in the past have included vanity tops and bowls, showers and wall surrounds, kitchen countertop and windowsills. Also, "Buy American" lists Korea as an approved material supplier for Government installations.

Vertical – Wet Wall

HI-MACS is a perfect solution for bathtubs or showers whether it is in a commercial or residential setting. HI-MACS extensive color line offers solid surface in both 1⁄4" and 1⁄2" thicknesses that fit in any bathroom design. And, because HI-MACS is thermoformable, the designs for showers and bathtubs can fit ADA mandated requirements for added mobility and aid. HI-MACS non-porous, seamless surface is easy to clean and durable. HI-MACS is functionality and beauty combined in a very affordable package.

- Residential Tub and Shower
- Hospital Bath
- Hotel Room Tub and Shower

Property	Result	Test
Consistency of Color (same sheet)	Pass	ISSFA SST 2.1-00
Cleanability Stain Rating	Pass	ISSFA SST 3.1-00
Visual Defects	Pass	ISSFA SST 5.1-00
Light Resistance	No Effect/Pass	ISSFA SST 7.1-00
Boiling Water Resistance	No Effect/Pass	ISSFA SST 8.1-00 re: NEMA LD3-3.5
High Temperature Resistance	No Effect/Pass	ISSFA SST 9.1-00 re: NEMA LD3-3.6
Flammability Rating	Class 1/Class A	ASTM E-84
Fungal/Bacterial Resistance	Approved for use in all food zones	ANSI/NSF Standard 51

Property	Unit	Result	Test
Density	lbs/in3	0.06	ASTM D-792
Rockwell Hardness		90	ASTM D-785
Barcol Hardness		65	ASTM D-2583
Tensile Strength	psi	5,500	ASTM D-638
Tensile Modulus	psi	1.35 x 10 6	ASTM D-638
Flexural Strength	psi	11,424	ASTM D-790
Flexural Modulus	psi	1.34 x 106	ASTM D-790
Izod Impact Strength	ft.lbs/in	0.26	ASTM D-256
Water Absorption	% (1⁄2" sheet)	0.04	ASTM D-570
Heat Distortion Temperature	°F	220-230	ASTM D-648
Linear Thermal Expansion	in/in °F	2.12 x 10-5	ASTM E-228-95
Weatherability	1000 hr test	No change	ASTM D-1499
Radiant Heat Resistance	seconds	600+ (pass)	NEMA LD3-3.10
Impact Resistance	in.	60 (pass)	ISSFA SST 6.1-00
Flatness of Sheets	in.	Thickness=0.46450 (pass) Length: <0.010 Width: <0.020	ISSFA SST 4.1-00

17.2. Technical and Test Data

<Chemical Resistance>

Conc Hydrochloric acid	No Effect
Hydrochloric Acid (HCL) 20%	No Effect
Sulfuric Acid (H2SO4) 20%	No Effect
Ammonia (NH3) 28%	No Effect
Sodium Hydroxide (NaOH) 40%	No Effect
Methyl Alcohol	No Effect
Toluene	No Effect

Xylene (C8H10)	No Effect
Conc Nitric acid	Light marking with smooth surface
20%(v/v) Nitric acid	No Effect
60%(v/v) Perchloric acid	No Effect
85%(v/v) Phosphoric acid	No Effect
17%(v/v) Phosphoric acid	No Effect
30%(m/v) Photassium Hydroxide	No Effect
Acetone	No Effect
Bleach (NaOCl, Household)	No Effect
3%(v/v) Hydrogen Peroxide	No Effect
3.5% aq Iodine	No Effect
Bromine (Sat aq)	No Effect
5%(v/v) Silver Nitrate	No Effect
1%(v/v) Silver Nitrate	No Effect
Lead Acetate(Sat aq)	No Effect

Chemical Resistance after 24 hours

<Stain Resistance>

Milk, whiskey, distilled water, vegetable oil, citric acid(10%), lye, Ammonia, urine, iodine fluid(10%), vinegar, pine oil, ketchup, naphtha, hydrogen peroxide(3%), bleach, lipstick, trisodium phosphate(5%), isopropyl alcohol(90%).	Removed with water and household detergent
Crayon, #2 pencil, coffee, mustard, ethyl alcohol(90%)	Removed with cleanser
Permanent marker, black paste shoe polish, ball point pen, wet tea bag, acetone, fingernail polish remover	Removed with cleanser and Scotch Brite® pad

<Fire Rating : ASTM E84>

Class	Flame Spread	Smoke Developed
A	0-25	0-450
B	26-75	0-450
C	76-200	0-450

Test Result : Class A (Flame Spread – 20, Smoke Developed – 30)

17.3. MSDS

1) Chemical Product & Manufacturer's Information

a. Chemical Product Name

HI-MACS®

b. Usage

Countertops, other solid surface applications

c. Chemical Type

Acrylic Solid Surface

d. Manufacturer

900 Circle 75 Parkway, Suite 1500, Atlanta, GA 30339

e. In Case of Emergency

Tel: 866.544.4622

2) Ingredients

Name	CAS Number	% by Weight	TLV/PEL	LC50/LD50
Alumina trihydrate	21645-51-2	52-62	15mg/m3 OSHA PEL;10mg/m3 ACGIH TLV	Not available
Butyle Acrylate-methyl methacrylate	25852-37-3	30-50	Not available	Not available
Copolymer colorants	Not available	1-5	Not available	Not available

3) Health Hazard Data

The product is a solid sheet of varying color and, as such, has no health hazards associated with it.
However, dust generated from cutting, sanding, or routing may cause mechanical irritation to the skin, eyes and respiratory tract.

a. Eyes

Dust generated during fabrication may irritate eyes.

b. Skin

Any sharp edges will cut or abrade the skin. Dust generated by fabrication may cause skin sensitization.
(Methyl Methacrylaate has been shown to cause allergic responses at high concentrations.)

c. Respiratory Tract

Dust generated during fabrication may cause irritation to respiratory tract, characterized by sneezing and coughing.
May cause headache in case of long term exposure.

4) First Aid Measures

a. Eye contact

Upon contact with nuisance dust particles, flush eyes immediately with large amounts of water for a minimum of 15 minutes. Seek medical attention.

b. Skin Contact

Not expected to be a problem. May cause skin sensitization.

Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap.

If irritation persists, seek medical attention.

c. Inhalation

Repeated or prolonged inhalation of dust may lead to chronic respiratory irritation.

Allow the victim to rest in a well ventilated area.

Oxygen may be administered if breathing is difficult. Seek medical attention.

d. Ingestion

Not applicable.

5) Fire and Explosion Data

a. Flammability

Non-flammable

b. Flash Point

Not available

c. Auto-Ignition Temperature

Not available

d. Products of Combustion

Some metallic oxides.

e. Fire Hazards in Presence of Various Substances

Non-flammable in presence of shocks, heat, oxidizing materials, reducing materials, combustible materials, organic materials, metals, acids, alkalis and moisture.

f. Explosion Hazards in Presence of Various Substances:

Not considered as a risk of explosion.

g. Fire Fighting Media

SMALL FIRE: use DRY chemicals, COO, water spray or foam

LARGE FIRE: use water spray, fog, or foam.

DO NOT use water jet.

6) Spill Procedures & Waste Disposal

a. Small Spill

Use appropriate tools to put the spilled solid in a convenient waste disposal container.

b. Large Spill

No additional information

c. Waste Disposal

Use appropriate tools to put the spilled solid in a convenient waste disposal container.

7) Handling, Storage & Transport

a. Handling

Do not breathe dust. If user operations generate dust, use ventilation to keep airborne contaminates below the exposure limit.

b. Storage

No specific storage is required. Be sure that it is not necessary to strain to reach materials, and that shelves are not overloaded.

c. DOT/TDG Classification

Not a DOT controlled material

8) Special Protection Information

a. Eye

Safety glasses

b. Hands

Gloves to protect against cuts and abrasions are highly recommended.

c. Respirator

Wear appropriate respirator when ventilation is inadequate (NIOSH approved) because of generated dust.

9) Physical & Chemical Properties

a. Appearance

Solid

b. Odor

Odorless

c. pH

Not applicable

d. Specific Gravity

1.75

e. Evaporation Rate

Not available

f. Vapor Pressure

Not available

g. Solubility in Water

Insoluble

h. Solubility in Solvents

Insoluble in methanol, diethyl ether, n-octanol, acetone

10) Stability & Reactivity Data

a. Stability

The product is stable

b. Chemical Instability/Materials to Avoid

Not considered to be reactive according to our database

c. Corrosivity

Not considered to be corrosive for metals and glass according to our database

d. Hazardous Decomposition

Not available

e. Hazardous Polymerization

Yes

11) Potential Chronic Health Effects

The product is NOT toxic to blood, kidneys, lungs, the nervous system, the reproductive system, liver, or mucous membranes.

a. Chronic Effects

Not available

b. Mutagenic Effects

Not available

c. Teratogenic Effects

Not available

12) Ecological Information

a. Ecotoxicity Not

Not available

b. BODS and COD

Not available

c. Toxicity of the Products of Biodegradation

Not available

13) Federal Regulations

a. TSCA (Toxic Substance Control Act)

All components of this product are listed on the TSCA inventory

b. HMIS (Hazardous Material Information System)

Health Hazard : 1

Fire Hazard : 0

Reactivity : 0

Personal Protection : A

c. National Fire Protection Association (USA)

Hazard Rating : 4 = Extreme, 3 = High,

2 = Moderate, 1 = Slight, 0 = Minimal (Insignificant)

14) Other Information

The data contained in this MSDS and recommendations presented herein are based upon information considered to be accurate, as of this date. However, LG Hausys makes no guarantee or warranty, either expressed or implied, of the completeness of this data and recommendations, and assumes no liability in connection with any use of this information.

17.4. Certifications

NSF International

RECOGNIZES

LG CHEMICAL, LTD.
Plant at: CHEONG JU CITY, HUNG BAK, KOREA

AS COMPLYING WITH ANSI/NSF 51.
PRODUCTS APPEARING IN THE NSF OFFICIAL LISTING ARE
AUTHORIZED TO BEAR THE NSF MARK.

NSF

SCIENTIFIC CERTIFICATION SYSTEMS

SCS does hereby certify that an independent assessment has been conducted on behalf of:

LG Hausys America, Inc.

310 LG Drive SE, P.O. Box 569, Adairsville, GA, USA

For the following product(s):

LG Eden Collection:
Cocoa, Honeysuckle, Ivy, Lemongrass, and Ripe Cotton

This product meets all of the necessary qualifications to be certified for the following claim:

Minimum 10% Pre-consumer Recycled Resin Content
Conforms to the SCS Recycled Content Standard V4-1

SCS CERTIFIED
Minimum 10% Recycled Content
Pre-consumer
SCIENTIFIC CERTIFICATION SYSTEMS
SCS-MC-01491

Registration # SCS-MC-01491
Valid from: February 1, 2012 to January 31, 2013

SCS SCIENTIFIC CERTIFICATION SYSTEMS
Setting the standard for sustainability™

Robert J. Hrubes, Ph.D., Senior Vice President
Scientific Certification Systems
2000 Powell Street, Suite 600, Emeryville, CA 94608 USA

SCIENTIFIC CERTIFICATION SYSTEMS

SCS does hereby certify that an independent assessment has been conducted on behalf of:

LG Hausys America, Inc.

LGCIM, 310 LG Drive SE, P.O. Box 569, Adairsville, GA, USA

For the following product(s):

LG Eden Collection:
Pure Snow, and Pure Frost

SCS CERTIFIED
Minimum 20% Recycled Content
Pre-consumer
SCIENTIFIC CERTIFICATION SYSTEMS
SCS-MC-02581

This product meets all of the necessary qualifications to be certified for the following claim:

Minimum 20% Pre-consumer Recycled Resin Content
Conforms to the SCS Recycled Content Standard V4-1

Registration # SCS-MC-02581
Valid from: February 1, 2012 to January 31, 2013

SCS SCIENTIFIC CERTIFICATION SYSTEMS
Setting the standard for sustainability™

Robert J. Hrubes, Ph.D., Senior Vice President
Scientific Certification Systems
2000 Powell Street, Suite 600, Emeryville, CA 94608 USA

SCIENTIFIC CERTIFICATION SYSTEMS

SCS does hereby certify that an independent assessment has been conducted on behalf of:

LG Hausys America, Inc.

310 LG Drive SE, P.O. Box 569, Adairsville, GA, USA

For the following product(s):

LG Eden Collection:
Sugar Maple, Poplar, Horse Chestnut, Walnut, Birch Bark, Pecan, Hickory, and Mountain Ash

SCS CERTIFIED
Minimum 35% Recycled Content
Pre-consumer
SCIENTIFIC CERTIFICATION SYSTEMS
SCS-MC-02322

This product meets all of the necessary qualifications to be certified for the following claim:

Minimum 35% Pre-consumer Recycled Resin Content
Conforms to the SCS Recycled Content Standard V4-1

Registration # SCS-MC-02322
Valid from: February 1, 2012 to January 31, 2013

SCS SCIENTIFIC CERTIFICATION SYSTEMS
Setting the standard for sustainability™

Robert J. Hrubes, Ph.D., Senior Vice President
Scientific Certification Systems
2000 Powell Street, Suite 600, Emeryville, CA 94608 USA

Certificate of Compliance

Certification Details:

Certificate No: 4007-410

Status: Certified

Period: 08/2007 - 08/2012

Restrictions: with or without LG HI-MACS® joint adhesive

LG HI-MACS

LG Hausys America, Inc.

This product has been certified according to the GREENGUARD Indoor Air Quality (IAQ) Certification Program for Low Emitting Products

Reference Standard: GGPS.001 GREENGUARD IAQ Standard for Building Materials, Finishes, and Furnishings Furnishings

Product Type: Furniture Components/Materials, Seating, and Free Standing Furniture and Furnishing Units

Criteria	Allowable Limits
TVOC[1]	≤ 0.25 µg/m³
Formaldehyde	≤ 0.025 ppm
Total Aldehydes[2]	≤ 0.05 ppm
Individual VOCs[3]	≤ 0.1 TLV
4-phenylcyclohexene	≤ 0.0033 µg/m³
Listing of measured carcinogens and reproductive toxins as identified by California Proposition 65, the U.S. National Toxicology Program (NTP), and the International Agency on Research on Cancer (IARC) must be provided.	
Any pollutant regulated as a primary or secondary outdoor air pollutant must meet a concentration that will not generate an air concentration greater than that promulgated by the National Ambient Air Quality Standard (U.S. EPA, code of Federal Regulations, Title 40, Part 50).	

See referenced standard for a complete technical explanation.

[1] Defined to be the total response of measured VOCs falling within the C_6–C_{16} range, with responses calibrated to a toluene surrogate.

[2] Defined to be the total response of a target list of aldehydes (2-butenal; acetaldehyde; benzaldehyde; 2, 5-dimethylbenzaldehyde, 2-methylbenzaldehyde; 3-and/or 4-methylbenzaldehyde; butanal; 3-methylbutanal; formaldehyde; hexanal; pentanal; propanal), with each individually calibrated to a compound specific standard.

[3] Any pollutant not listed must produce an air concentration level no greater than 1/10 the Threshold Limit Value (TLV) industrial work place standard (Reference: American Conference of Government Industrial Hygienists, 6500 Glenway, Building D-7, Cincinnati, Ohio 45211-4438).

Seating complies with ANSI/BIFMA X7.1-2011, ANSI/BIFMA M7.1-2011, and ANSI/BIFMA e3-2010 Credit 7.6.1

GREENGUARD Certification affirms that products meet the criteria of the referenced standard and the requirements of the specific certification program. Certification testing is conducted according to a consistent, defined protocol. The testing does not evaluate emissions under usage conditions other than those defined in the protocol and does not address potential environmental impact other than chemical and particle emissions.

The GREENGUARD Environmental Institute (GEI) is an industry independent, third-party certification organization that qualifies products for low chemical emissions. GREENGUARD Certification programs use defined product standards, test methodologies, product sample collection and handling procedures, program application processes and on-going verification procedures. GREENGUARD standards, methods, and procedures are available at www.GREENGUARD.org.

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GGPC.001D

Certificate of Compliance

Certification Details:

Certificate No: 4007-420

Status: Certified

Period: 08/2007 - 08/2012

Restrictions: with or without LG HI-MACS® joint adhesive

LG HI-MACS

LG Hausys America, Inc.

This product has been certified according to the GREENGUARD Children & Schools Certification Program for Low Emitting Products

Reference Standard: GGPS.002 GREENGUARD Children & Schools℠ Standard

Product Type: All Products

Criteria	Allowable Limits
Individual VOCs[1],[2]	≤ 1/100 TLV and ≤ ½ CA chronic REL (Office Seating ≤ 1/100 TLV and ≤ ¼ CA CREL)
Formaldehyde	≤ 0.0135 ppm /13.5 ppb (Office Seating ≤ 0.00675 ppm / 6.75 ppb)
TVOC[3]	≤ 0.22 µg/m³
Total Aldehydes[4]	≤ 0.043 ppm /43 ppb
Total Phthalates[5]	≤ 0.01 µg/m³
Total Particles[6]	≤ 0.02 µg/m³

See referenced standard for a complete technical explanation.

[1] Any VOC not listed must produce an air concentration level no greater than 1/100 the Threshold Limit Value (TLV) industrial work place criterion (Reference: American Conference of Government Industrial Hygienists, 6500 Glenway, Building D-7, Cincinnati, Ohio 45211-4438) and no greater than 1/2 the CA Chronic Reference Exposure Level (CREL) http://www.oehha.ca.gov/air/chronic_rels/AllChrels.html - (CRELs) Adopted by the State of California Office of Environmental Health Hazard Assessment (OEHHA), December 2008).

[2] 1-Methyl-2-Pyrrolidinone must be ≤ 0.16 µg/m³ for Office Furniture or ≤ 0.080 µg/m³ for Office Seating.

[3] Defined to be the total response of measured VOCs falling within the C_6–C_{16} range, with responses calibrated to a toluene surrogate.

[4] Defined to be the total response of a target list of aldehydes (2-butenal; acetaldehyde; benzaldehyde; 2, 5-dimethylbenzaldehyde, 2-methylbenzaldehyde; 3-and/or 4-methylbenzaldehyde; butanal; 3-methylbutanal; formaldehyde; hexanal; pentanal; propanal), with each individually calibrated to a compound specific standard.

[5] Total phthalates include dibutyl (DBP), diethylhexyl (DEHP), diethyl (DEP), butylbenzyl (BBP), di-octyl (DOP), and dimethyl (DMP) phthalates.

[6] Particles are only applicable to fibrous, particle-releasing products with exposed surface area in air streams.

Seating, Workstations and Casegood Systems complies with ANSI/BIFMA e3-2010 Credit 7.6.2.

Complies with California Department of Health Services' "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers" Version 1.1 (CA section 01350)

GREENGUARD Certification affirms that products meet the criteria of the referenced standard and the requirements of the specific certification program. Certification testing is conducted according to a consistent, defined protocol. The testing does not evaluate emissions under usage conditions other than those defined in the protocol and does not address potential environmental impact other than chemical and particle emissions.

The GREENGUARD Environmental Institute (GEI) is an industry independent, third-party certification organization that qualifies products for low chemical emissions. GREENGUARD Certification programs use defined product standards, test methodologies, product sample collection and handling procedures, program application processes and on-going verification procedures. GREENGUARD standards, methods, and procedures are available at www.GREENGUARD.org.

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GGPC.002

18. CARE & MAINTENANCE

HI-MACS Cleaning, Care & Repair

HI-MACS® solid surfaces are stain resistant, easy to clean and hygienic, ideal for kitchen countertops, vanity tops, and other surfaces subject to the hazards of moisture and heavy wear.
Even the most used areas won't succumb to coffee, ink, or other stains.
No special cleaning products are needed to keep HI-MACS® looking beautiful day in and day out.
While HI-MACS® is extremely tough and durable, like any other fine material it can be damaged if abused or mistreated.

Reviewing these care and cleaning instructions can assist you in understanding how easy it is to care for your new HI-MACS® surface and how you can prevent more severe damage that may require special repairs.
With a little knowledge, you can enjoy the elegance and beauty of HI-MACS® for years to come.

Normal Cleaning

HI-MACS® is non-porous, so it can be wiped clean with a damp cloth or sponge and mild detergents or general purpose cleaners such as Mr. Clean.
If you have a matte finish, abrasive cleaners like Ajax or comet may also be used.
Periodically it may also be helpful to go over the entire surface in a circular motion with an abrasive cleaner or wet Scotch Brite pad to maintain a uniform appearance.

Care

Do not place hot pans directly from the burner or oven on the HI-MACS® surface.
Even though HI-MACS® can withstand sustained temperatures up to 225 °F, prolonged or extreme heat could cause yellowing.
A trivet should always be used under heated appliances, such as crock pots, electric frying pans, etc. A chopping board should always be used when using knives or any sharp objects with higher hardness than HI-MACS® to prevent scratches on the surface.
Although minor cuts and scratches in HI-MACS® can be repaired, deep cuts will require the services of professional.
Strong acids such as those found in drain, toilet bowl, and oven cleaners should be used cautiously around HI-MACS®.
If these items are accidentally spilled, wipe them up at once. Some of these items, when left on the surface, may cause whitening, which can be difficult to remove.

Spills and Stains

While most everyday spills can be removed with the cleaning techniques listed, some troublesome spills and stains such as food dye, tea, and fruit drinks may require more aggressive cleaning. These items can be removed with full strength bleach followed by a general cleanser.

Bleach should only come in contact with the surface for two to five minutes. On a matte finish, if you prefer, you can scrub with an abrasive cleaner. Even nail polish can be removed from HI-MACS® with nail polish remover or an abrasive cleanser.

Cigarettes

While HI-MACS® will not burn, should a lighted cigarette accidentally come in contact with the surface, it could leave a nicotine stain or scorch mark. Either of these can be removed by cleaning with an abrasive cleanser or buffing in a circular motion with a Scotch Brite pad.

Repairing Scratches

For removing superficial scratches, rub in a circular motion with a wet # 7448 Scotch Brite buffing pad until the scratches are removed. Clean thoroughly with soap and water and let dry.

For added protection, or if any additional luster is desired, after the surface is dry apply a non-wax polish such as Hope's Countertop Polish for Solid Surface or Countertop Magic, Deep scratches or scratches on a high gloss finish should be removed by a professional fabricator.

Dark Colors

All dark colors of any solid surface material require more maintenance. Under ordinary use, darker colors will show dirt, dust, scratches, rubs, fingerprints and watermarks more readily than lighter colors and patterns. Naturally, these colors require more care to maintain their appearance. For this reason, we recommend periodic professional maintenance in order to renew surfaces to their original matte finish.

19. Warranty - HI-MACS®

HI-MACS sheets are backed by a 15 year warranty that covers all manufacturing defects.

1) Warranty

HI-MACS® Residential/Commercial 15-Year Warranty

Congratulations on your new purchase of LG Hausys® solid surface product. LG Hausys expressly warrants that it will repair or replace this product, free of charge, if it fails due to any manufacturing defect during the first 15 years (excludes the Expressions sink line which carries a 10 year warranty) after initial installation. If it is determined by LG Hausys or its authorized warranty service agent that a defect in the material exists within the fifteen year period, LG Hausys will, at its sole option, repair or replace the defective HI-MACS→ materials in accordance with the following warranty provisions and exclusions.

This warranty applies to HI-MACS surfacing products installed after May 20, 2010.

2) Terms and Conditions

1. The 15 year limited warranty applies to HI-MACS® surfacing materials only ; and
2. The 15 year limited warranty applies to HI-MACS® surfacing materials that have been fabricated and installed in accordance with the Fabrication Guide Book for transportation, storage, handling, fabrication, and installation. Improper fabrication or installation is the responsibility of the fabricator/installer; and
3. This warranty applies to HI-MACS® surfacing materials that have been properly maintained in accordance with the Care & Maintenance Guidelines; and
4. This warranty applies to HI-MACS® surfacing materials that have been permanently installed and have not been moved from the original location.

3) Exclusions

This warranty shall not apply to :

1. Products and/or materials that have not been paid in full.
2. Issues or occurrences that are inherent characteristics of HI-MACS® surfacing, regardless of whether viewed as a defect by the purchaser.
3. Damage caused by faulty or improper fabrication and installation, including but not limited to, seams, seam performance, and caulking.
4. Damage caused by any instability or improper support occurring in the property in which the product has been installed, including but not limited to, shifting, settling, or movement of the substrate.
5. Damage caused to any materials that have been moved, removed or relocated from its original place of installation.
6. Damage caused by any form of abuse, accidents, or misuse, including but not limited to, scratches, burns, stains, or cracks.

7. Damage caused by exposure to heat, including but not limited to, white rings or marks, and cracking that occurs near a cook top that transmits heat through a cooking device that extends over or near the countertop for an extended period of time.
8. Damage or cracking caused by thermal shock.
9. Color variance or variations in color and/or pattern on repairs. Exact matching of color on repair work performed in conjunction with this warranty is not guaranteed.

LG Hausys is not responsible for damage or injury caused in whole or part by acts of God, job site conditions, architectural or engineering design, structural movement, acts of vandalism, or accidents.

This warranty is extended to the original purchaser and may be transferred or assigned. A purchase receipt or other acceptable proof purchase will be required before warranty service is rendered. If transferred, a new warranty registration must be submitted with proof of the original purchase. The new warranty will be valid for the remaining time since the original purchase.

No other express or implied warranties of merchantability or fitness for a particular purpose are made by this warranty except for those expressly provided herein. Under no circumstances shall LG Hausys be liable for any loss or damage arising from the purchase, use or inability to use this product, or for any special, indirect, incidental or consequential damages.

This warranty entitles the purchaser to specific legal rights. Other rights may also be available, which may vary from state to state. Some states do not permit the exclusion or limitation of implied warranties or of incidental or consequential damages, so the above limitation or exclusion may not apply to you. To know what your legal rights are, consult your local or state consumer affairs office or your state's Attorney General.

To obtain service under this limited 15-year warranty, please contact the source from which you purchased your HI-MACS® product. You must permit your Certified Installer or LG Hausys authorized agents to inspect your HI-MACS® product, and you must reasonably cooperate with your installer and LG Hausys agents in the efforts to provide service in conjunction with this limited 15-year warranty. If the problem is not handled to your satisfaction, please contact our representative directly by writing or calling:

LG Hausys America Inc.
900 Circle 75 Pkwy, Suite 1500
Atlanta GA, 30339

www.lghausys.com

(866) 544-4622

Please include your name, address, a description of the problem, and the phrase "HI-MACS®, 15 year limited warranty" in all correspondence. We will respond to all inquires within 30 days.

20. FAQ's

Q. Can I place a hot pan/pot on my HI-MACS® surface?
A. Do not place hot pans/pots directly from the burner or oven onto your countertops. Prolonged or extreme heat can cause yellowing. Hot pads and trivets are recommended to protect the surface when using any high temperature electronic cookware.

Q. How much heat can HI-MACS® take?
A. Although HI-MACS® countertops can withstand temperatures of up to 225ºF, prolonged or extreme heat can cause yellowing.

Q. Will my HI-MACS® have seams?
A. Like all solid surface products, placement of seams may be required at the discretion of the fabricator. If seams are necessary, solid surface seams will be inconspicuous (not invisible).

Q. Do dark colors show wear and tear?
A. All dark colors of any solid surface material, including HI-MACS®, require more maintenance. Under ordinary use, darker colors will show dirt, dust, scratches, rubs, fingerprints and watermarks more readily than lighter colors or patterns. Naturally, these colors require more care to maintain their appearance.

Q. What if I damage my solid surface countertop?
A. HI-MACS® is repairable. No matter the nick, scratch, stain or crack, HI-MACS® can be restored to its original state by a certified professional.

Q. Can I use HI-MACS® as a cutting board?
A. No, it is not recommended. Although minor scratches can be easily removed, regular cutting on your countertop will necessitate more maintenance by the customer. A separate cutting board is recommended.

Q. Will anything stain my HI-MACS® countertop?
A. Due to unique technology, HI-MACS® withstands most everyday stains. HI-MACS® is also non-porous so it doesn't promote growth of mildew, mold or bacteria. Customers receive a Care and Maintenance sheet to show them how to care for their countertop.

Q. Is there any special care needed for HI-MACS®?
A. No. Due to its non-porous attribute, there is no wax or sealant required. Normal cleaning only requires a damp cloth and a mild cleanser. Avoid using strong acidic cleansers (like those designed for drains, toilets or ovens). Some of them can cause whitening, which can be difficult to remove.

Q. What does my 15-year fully transferable warranty cover?
A. HI-MACS® expressly warrants that it will repair or replace its product, free of charge, if it fails due to any manufacturing defect during the first 15 years after installation. HI-MACS® obligation is limited solely to the repair and/or replacement of the product including reasonable and necessary labor charges.

Q. What about environmental issues?
A. LG Hausys is committed to providing environmentally sensitive products that meet the demands of everyone from its employees to designers, installers and consumers. LG Hausys installed state-of-the-art, air quality control equipment when building its U.S. plant, so its air treatment programs exceed environmental minimums established by the EPA. Made from high quality acrylic ingredients, HI-MACS® is GREENGUARD Indoor Air Quality Certified® for low emissions, making it ideal for sensitive areas like kitchens, bathrooms, classrooms and laboratories. Additionally, it is renewable and can be recycled at the end of its life.

Q. What are vertical applications with HI-MACS®?
A. HI-MACS sheets can be vertically mounted using either horizontal or vertical seams. Wall cladding pieces can be seamed together or joined using 100% silicone sealant. Either ¼" or ½" sheet material may be used, however the ½" thick material will generally prove more durable.
For details, refer to Vertical Applications page.

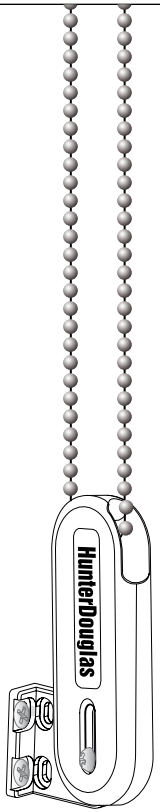
Q. What is the impact strength and flexural strength of HI-MACS®?
A. The impact strength is determined by test number ASTM D-256, which measures Izod impact strength. This test measures how much force it takes to break the slab when the weight swings to the slab, like a pendulum. HI-MACS® withstands the force up to 0.26 ft.lbs/in.
The flexural strength measures the amount of force product can withstand by slightly bending before breaking. This is measured by test number ASTM D-790, and the force is measured at 11,424 psi.

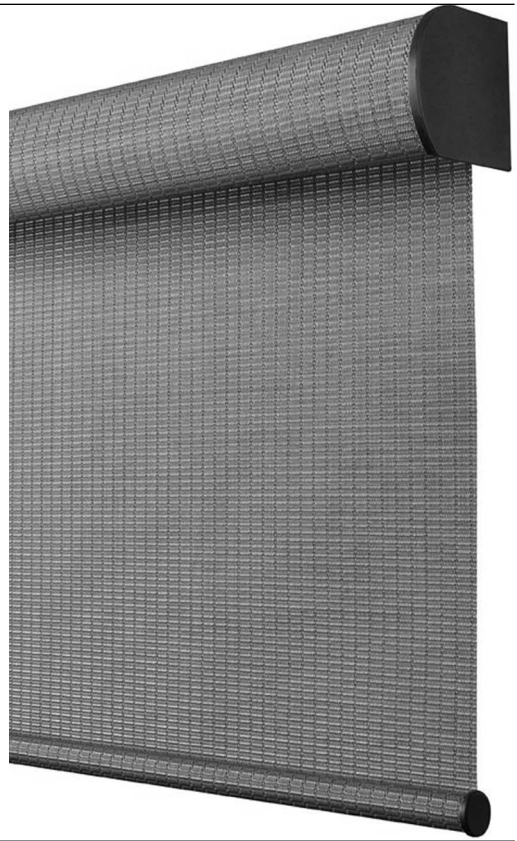
Q. What is the recommended temperature for thermoforming HI-MACS®?
A. Refer to the table below.

Thickness of HI-MACS	¼"	½"
Oven temperature (°F)	320~374	320~374
Heating Time (Minutes)	20	40
Minimum Curve Radius (inch)	R=2"	R=3"
Cooling Time (Minutes)	10~20	20~40

HunterDouglas

Installation • Operation • Care





Alustra® Woven Textures® Roller Shades,
Designer Roller and Screen Shades
with Custom Clutch

Standard, Cassette, Dual Roller Standard,
Fascia, and Pocket Shades

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Questions?

Call the Hunter Douglas Customer Information Center at
1-888-501-8364.

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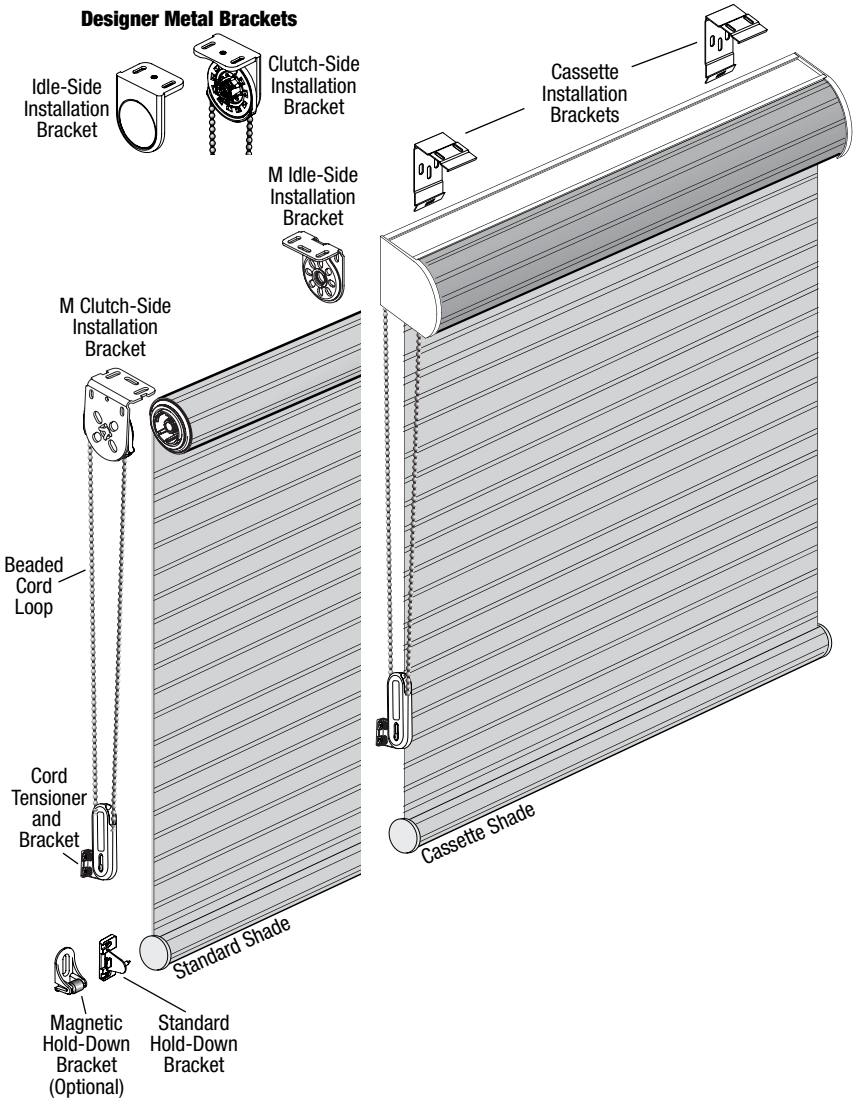
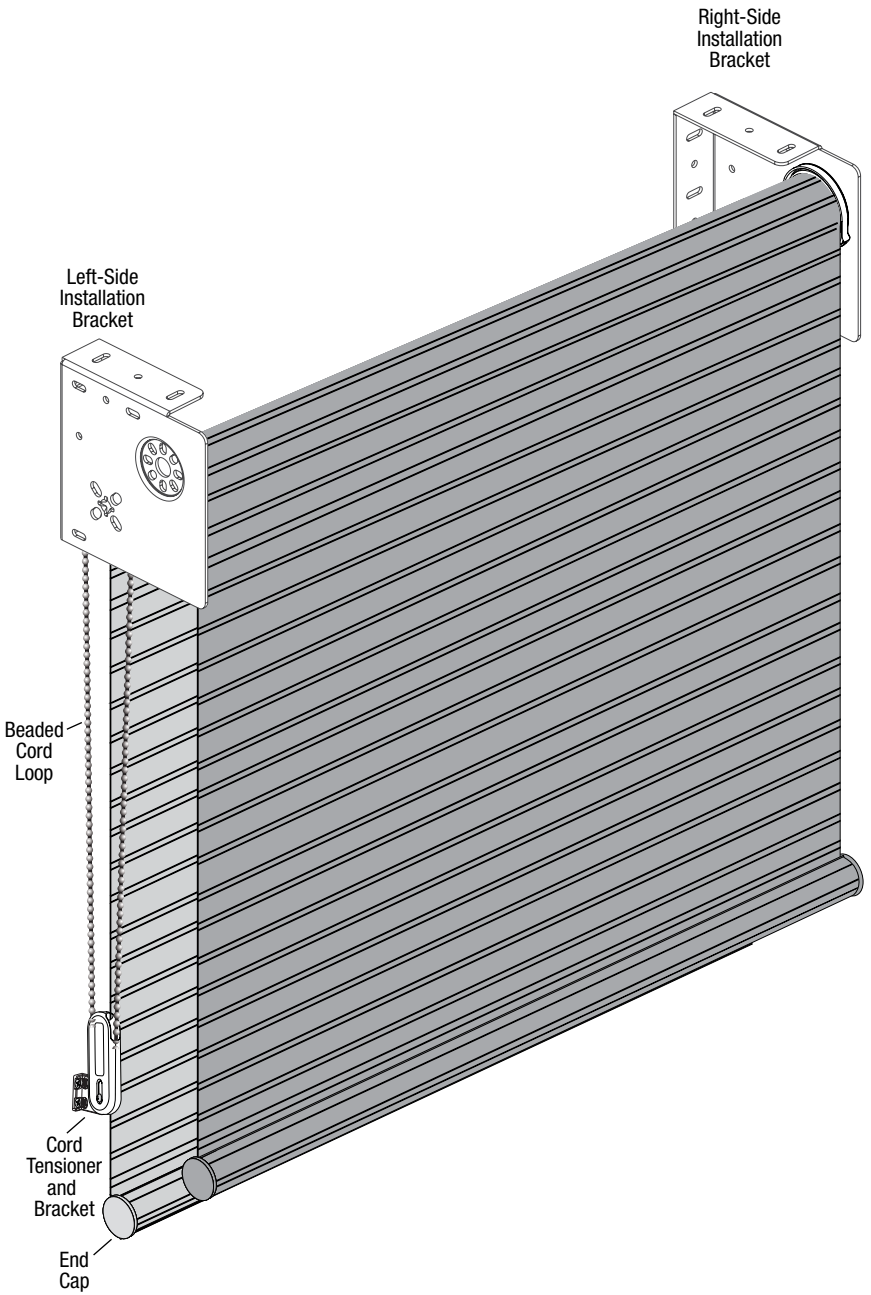
Product View — Standard and Cassette

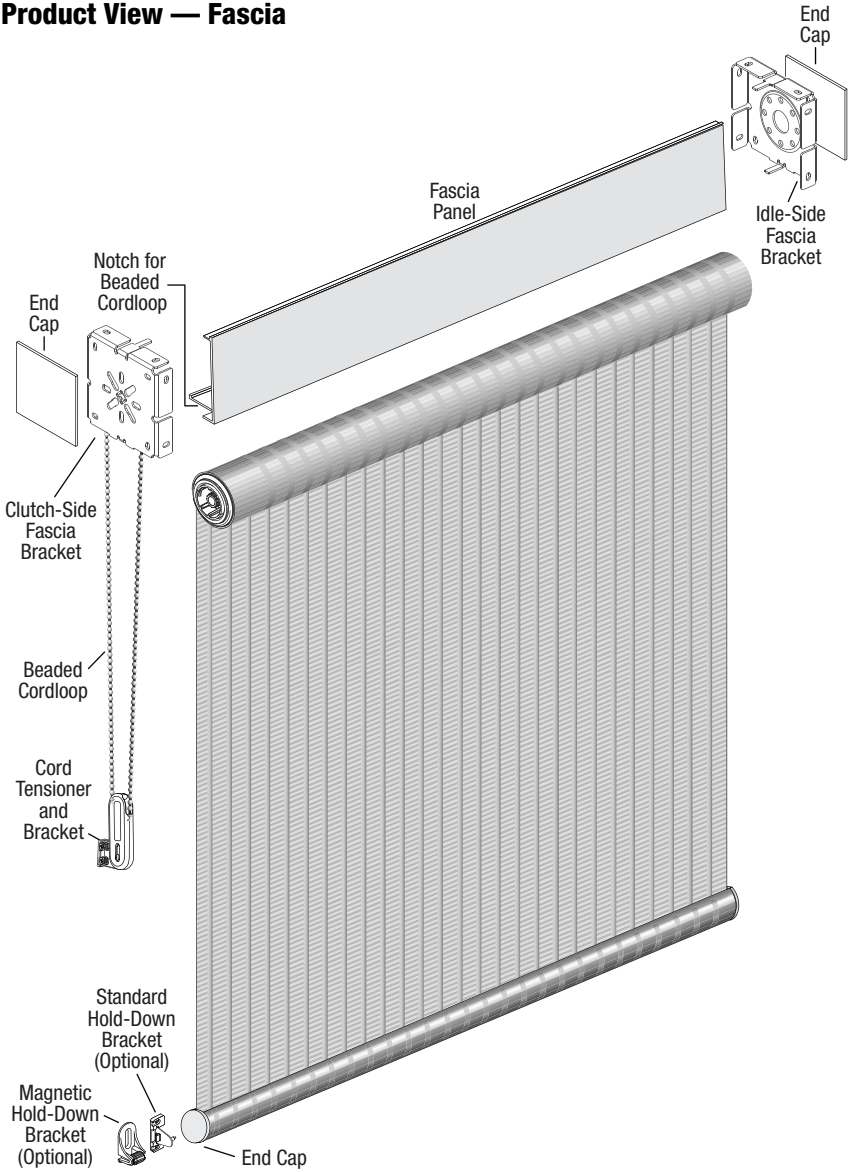


L Brackets not shown

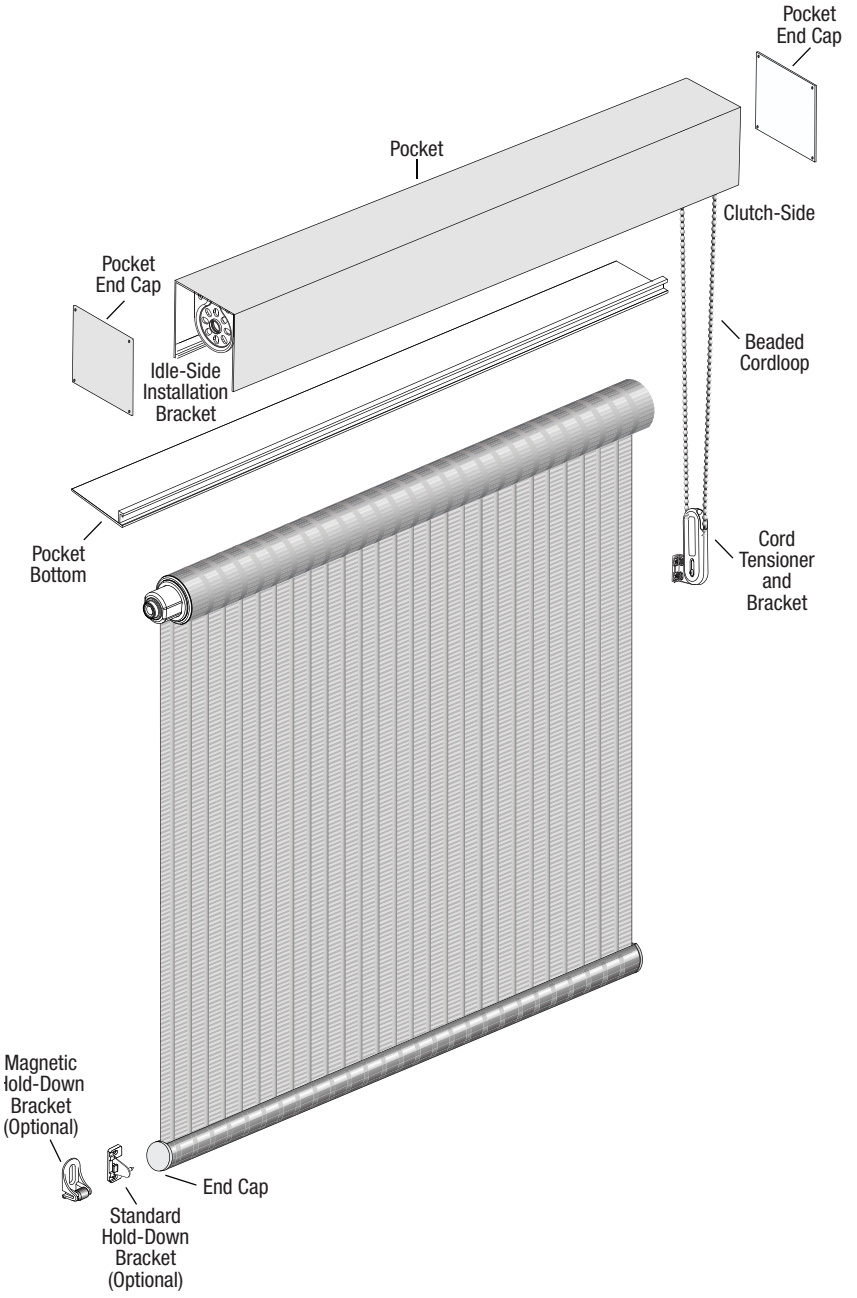
Product View — Dual Roller Standard



Product View — Fascia



Product View — Pocket

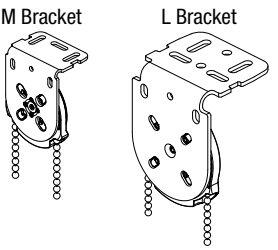


L Brackets not shown

Thank you for purchasing Hunter Douglas Roller or Screen Shades. With proper installation, operation, and care, your new shades will provide years of beauty and performance. Please thoroughly review this instruction booklet before beginning the installation.

Identify the Shade Type — Standard Shades Only

Standard shades may come with M brackets or L brackets. To identify the tools needed for installation, use the illustration to identify your shade type.



Tools and Fasteners Needed

- #1 Flat blade and #2 Phillips screwdriver
- Level (laser level is recommended)
- Measuring tape and pencil
- **For Standard M, Designer Metal, Cassette Shades and Pocket Shades.** Power drill, 3/32" drill bit and a 1/4" hex driver
- **For Standard L.** Power drill, 1/8" drill bit for cassette shades, and 1/4" hex driver
- **For Dual Roller Standard and Fascia Shades.** Power drill, 1/8" drill bit for cassette shades, and 5/32" hex driver

In addition, you will need fasteners designed to work with your specific mounting surface(s).

- **For Standard M Clutch, Designer Metal, Cassette Shades and Pocket Shades — #6 Hex Head Screws (Provided).** Two 1½" screws are provided per installation bracket.
- **For Standard L Clutch — #10 Hex Head Screws with Washer (Provided).** Two 1½" screws are provided per installation bracket.
- **For Dual Roller Standard and Fascia Shades — #10 Hex Head screws (Provided).** Two 1½" screws are provided per installation bracket.
- **For Pocket Shades — #10 Hex Head Screws (Not Provided).** See "Pocket Installation" on page 16.

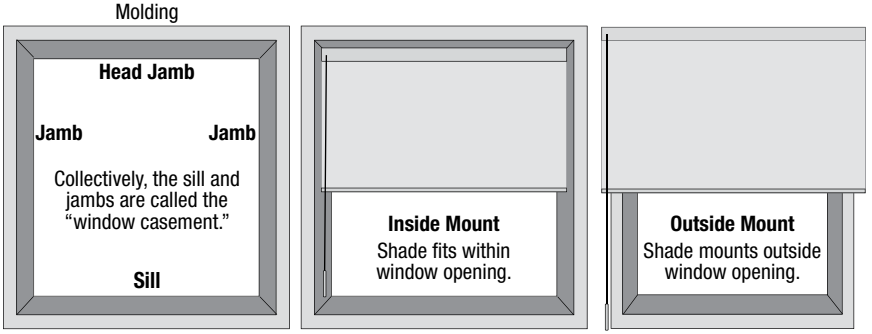
#6 x 1½" Hex Head Screw

#10 x 1½" Hex Head Screw

#10 x 1½" Hex Head Screw with Washer

Mounting Types and Window Terminology

If the installation brackets are mounted correctly, the rest of the installation process will follow easily. To prepare for this important first step, review the mounting types and basic window terminology illustrated below.

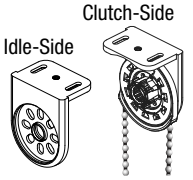


- Refer to the appropriate page below based on your order:
  - **Inside Mount for Designer Metal/Standard Shades — below**
  - **Outside Mount for Designer Metal/Standard Shades — page 8**
  - **Inside Mount for Cassette — page 9**
  - **Outside Mount for Cassette — page 10**
  - **Inside for Dual Roller Standard — page 12**
  - **Outside for Dual Roller Standard — page 13**
  - **Fascia — page 15**
  - **Pocket — page 16**

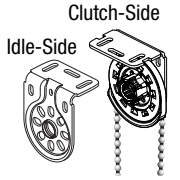
Mount the Installation Brackets Designer Metal/Standard — Inside/End Mount

The installation brackets are supplied in pairs: clutch side with the beaded cord loop and idle. Identify which side each of the brackets will go on the shade based on your order. Standard M brackets are shown, all other brackets follow the same installation instructions.

Designer Metal Brackets



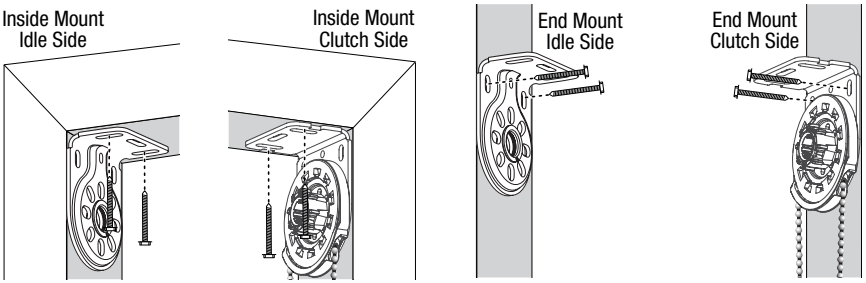
Standard Brackets M and L (L not shown)



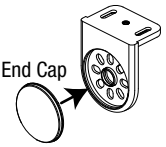
- Check the orientation of the chain guide. The chain hangs from the bottom of the chain guide. If it is not, see "Change the Chain Guide Orientation" on page 23.
- Place each of the brackets on the inside of the window casement, oriented as shown. Mark the screw holes.
  - **For end mount shades.** See illustration below for screw placement.

- The minimum mounting depth required and fully recessed depth is 2" or 2 7/8" for Standard L shades.

  IMPORTANT: The front edges of the installation brackets must be level and aligned to each other.



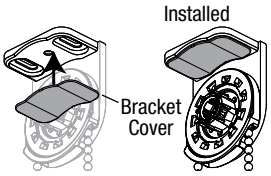
- Drill the screw holes using a 3/32" drill bit or 1/8" bit for standard L shades.
- Use a level to check that the mounting surface is level.
- **For Designer Metal Shades.** Install the end cap into the back of the bracket.



- Attach the installation brackets using the screws provided.

WARNING: Product is heavy. Mount into wood/metal studs or into concrete with concrete anchors. Drywall anchors are not recommended.

- **Designer Metal Brackets Only.** Install the screw covers over screw holes by pushing into place.

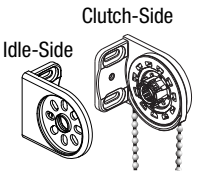


Proceed to "Install the Shade" on page 17.

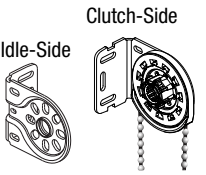
Mount the Installation Brackets Designer Metal/Standard — Outside Mount

The installation brackets are supplied in pairs: clutch side with the beaded cord loop and idle. Identify which side each of the brackets will go on the shade based on your order. Standard M brackets are shown, all other brackets follow the same installation instructions.

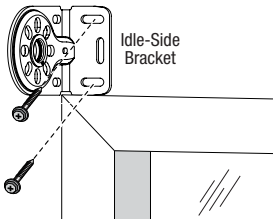
Designer Metal Brackets

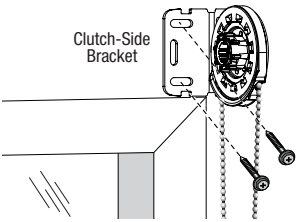


Standard Brackets M and L (L not shown

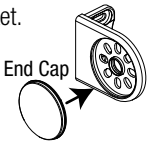


- Check the orientation of the chain guide. The chain hangs from the bottom of the chain guide. If it is not, see "Change the Chain Guide Orientation" on page 23.
- Center the ordered width measurement over the window and mark its location.
- Place the outside edge of the brackets on the previously made marks.
- Mark the screw holes and drill the screw holes using a $^{3}/_{32}$" drill bit or $^{1}/_{8}$" bit for standard L shades.





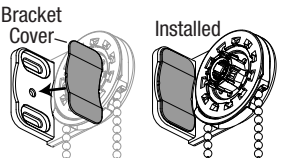
  - ➤ A minimum $2^{1}/_{8}$" flat vertical surface for M shades and 3" for L shades is required to mount the brackets.
  - ➤ The top of the installation brackets should be at the desired height. The brackets should be level and aligned.
- Use a level to check that the mounting surface is level.
- **For Designer Metal Shades.** Install the end cap into the back of the bracket.



- Attach the installation brackets using the screws provided.

WARNING: Product is heavy. Mount into wood/metal studs or into concrete with concrete anchors. Drywall anchors are not recommended.

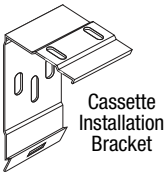
- **Designer Metal Brackets Only.** Install the screw covers over screw holes by pushing into place.



Proceed to "Install the Shade" on page 17.

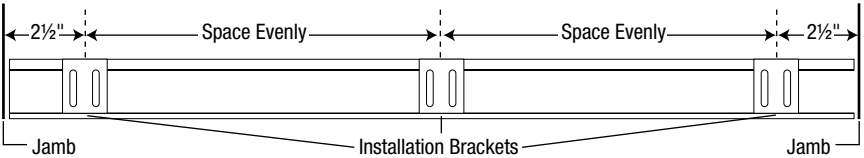
Mount the Installation Brackets Cassette — Inside Mount

The number of installation brackets required varies depending on the shade width, as shown in the table.

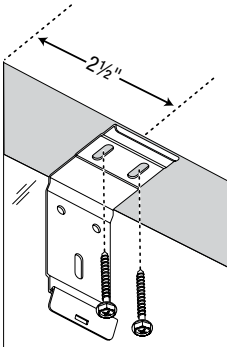


Cassette Shade	
Shade Width	**Brackets Required**
Up to 36"	2
36 1/8" – 66"	3
66 1/8" – 90"	4
90 1/8" – 120"	5

- Mark 2½" in from each jamb for bracket location.
  - ➤ If more than two installation brackets came with your order, space additional bracket(s) evenly between the two end brackets and mark their location. Mount into wood whenever possible.



- Center the brackets on your marks and mark the screw holes.
  - ➤ The minimum depth required for mounting is 1 5/8". Fully recessed mounting requires 4" for the large cassette and 3½" for the small cassette to be flush with the front of the window opening.



IMPORTANT: The front edges of the installation brackets must be level and aligned to each other.

- Drill the screw holes with a 3/32" drill bit.

WARNING: Product is heavy. Mount into wood/metal studs or into concrete with concrete anchors. Drywall anchors are not recommended.

- Use a level to check that the mounting surface is level. Shim the brackets if necessary. Shims are not provided.
- Attach the installation brackets using the screws provided.

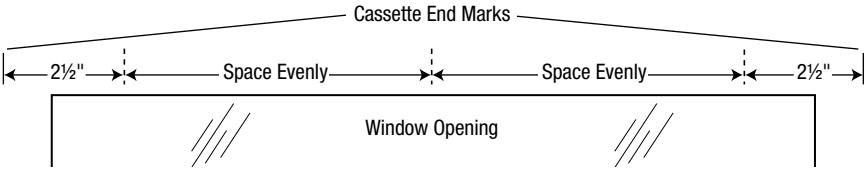
Proceed to "Install the Shade" on page 17.

Mount the Installation Brackets Cassette — Outside Mount

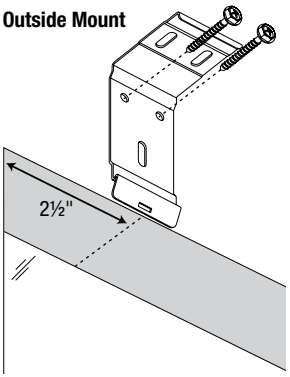
The number of installation brackets required varies depending on the shade width, as shown in the table.

Cassette Shade	
Shade Width	**Brackets Required**
Up to 36"	2
36 1/8" – 66"	3
66 1/8" – 90"	4
90 1/8" – 120"	5

- Center the cassette over the window opening at the desired height. Use a pencil to lightly mark each end of the cassette.
  - ➤ Alternatively, measure the width of the headrail and use that width to mark the headrail end points over the window opening.



- Mark 2½" in from each end of the cassette.
  - ➤ If more than two installation brackets came with your order, space additional bracket(s) evenly between the two end brackets and mark their location. Mount into wood whenever possible.
- Center the brackets on your marks and mark the screw holes.
  - ➤ A minimum 4" flat vertical surface is required for large cassettes and 3¼" for small cassettes to mount the brackets.
  - ➤ The top of the installation brackets should be at the desired height. The brackets should be level and aligned.



IMPORTANT: The front edges of the installation brackets must be level and aligned to each other.

- Drill the screw holes with a 3⁄32" drill bit.

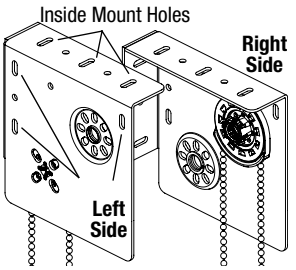
WARNING: Product is heavy. Mount into wood/metal studs or into concrete with concrete anchors. Drywall anchors are not recommended.

- Use a level to check that the mounting surface is level. Shim the brackets if necessary. Shims are not provided.
- Attach the installation brackets using the screws provided.

Proceed to "Install the Shade" on page 17.

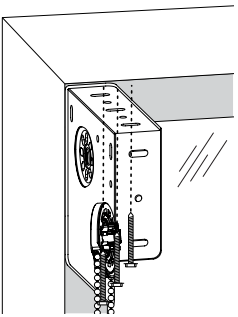
Mount the Installation Brackets — Dual Roller Inside/End Mount

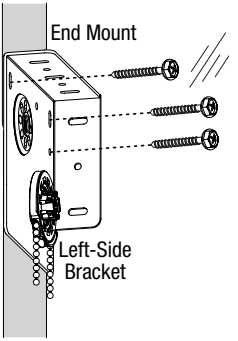
The installation brackets are always mounted so that the inner surfaces face each other, as shown. The brackets must be mounted so the shade is level when installed.



- Place the left-side bracket against the left jamb of the window opening. Mark the screw holes.
  - ➤ The minimum depth required for mounting is 3¼". The fully recessed depth is 5½".

Inside Mount – Left Side

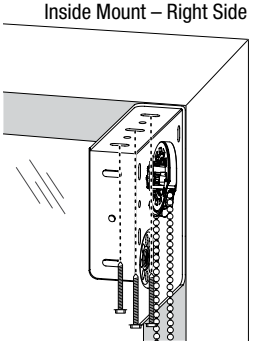




- Place the right-side bracket against the right jamb of the window opening. Mark the screw holes. End mount shades use the same holes shown above.

  IMPORTANT: The front edges of the installation brackets must be level and aligned to each other.

Inside Mount – Right Side



- Use a ⅛" drill bit to drill the screw holes.

  WARNING: Product is heavy. Mount into wood/ metal studs or into concrete with concrete anchors. Drywall anchors are not recommended.

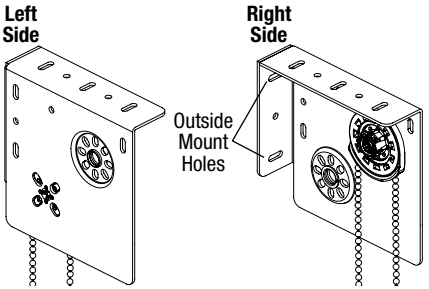
- Check that the mounting surface is level. Shim the brackets if necessary. Shims are not provided.
- Attach the installation brackets using the screws provided.

Proceed to "Install the Shade" on page 17.

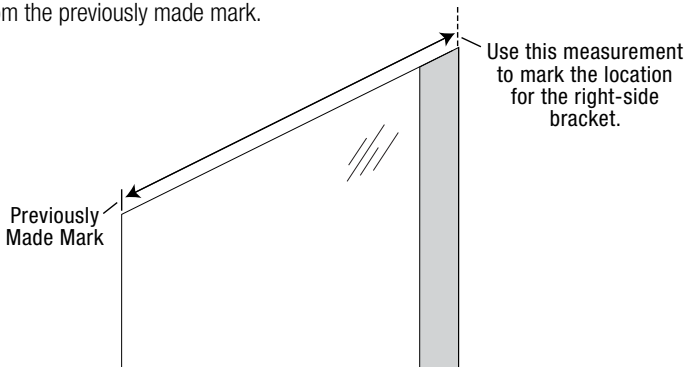
Mount the Installation Brackets — Dual Roller Outside Mount

Installation Brackets for Standard Shades. The installation brackets are supplied in pairs.

The installation brackets are always mounted so that the inner surfaces face each other, as shown. The brackets must be mounted so the shade is level when installed.

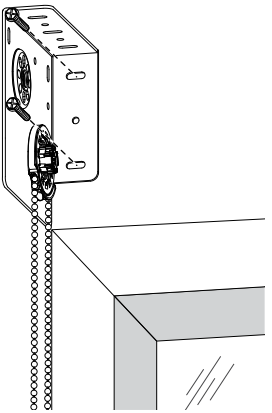


- Center the rear shade (the clutch is on the left) over the window opening at the desired height and make a mark on the end of the clutch side of the shade.
- Measure and mark the ordered width of the shade from the previously made mark.



- Place the outside edge of the left-side bracket on the first mark, then mark the screw holes.
  - ➤ A minimum 5½" flat vertical surface is required to mount the brackets.
  - ➤ The top of the installation brackets should be at the desired height. The brackets should be level and aligned.

Outside Mount – Left Side



- Place the outside edge of right-side bracket on the second mark, then mark the location of the screw holes.

  ➤ The top of the installation brackets should be at the desired height.

  IMPORTANT: The top of the installation brackets must be level and aligned to each other.

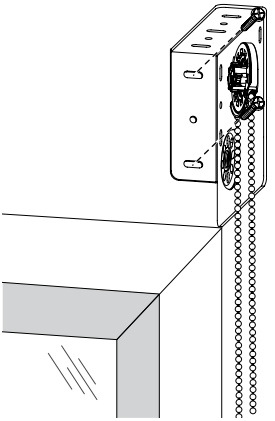
- Use a ⅛" drill bit to drill the screw holes.

  WARNING: Product is heavy. Mount into wood/ metal studs or into concrete with concrete anchors. Drywall anchors are not recommended.

- Use a level to check that the mounting surface is level. Shim the brackets if necessary. Shims are not provided.

- Attach the installation brackets using the screws provided.

Outside Mount – Right Side

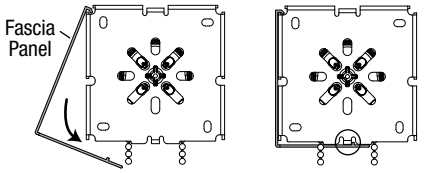


Proceed to "Install the Shade" on page 17.

Mount the Installation Brackets — Fascia

- Assemble the two end brackets and the fascia panel.

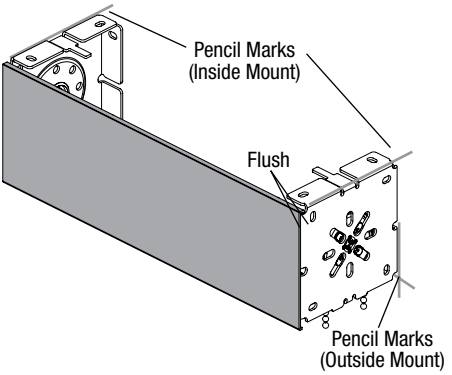
  ➤ Place the top of the fascia panel into the top indention of the brackets. Rotate the panel down and snap it into place.



- Check that the outer surfaces of the brackets are flush with the ends of the panel.
- Hold the bracket and panel assembly in place at the window.
- Use a level against the bottom edge to make sure the assembly is level. Inside mounts may require a shim between the brackets and the mounting surface.

  ➤ **For Outside Mount.** Use a pencil to mark the bottom and outside edges of the brackets on the mounting surface.

  ➤ **For Inside Mount.** Use a pencil to mark the outside edges of the brackets on the mounting surface.



- Remove the assembly from the window.
- Remove the brackets from the fascia panel.
- Use your marks to position each bracket and mark the screw holes.

  IMPORTANT: The brackets should be level and aligned.

- Drill the screw holes using a $\frac{1}{8}$" drill bit.
- Attach the installation brackets to the mounting surface using the screws provided.

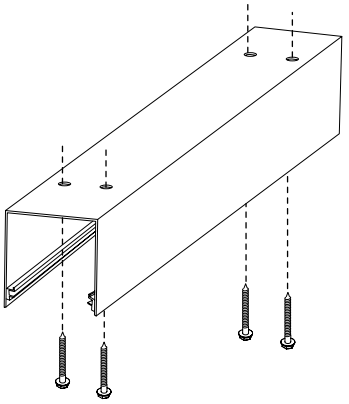
WARNING: Product is heavy. Mount into wood/metal studs or into concrete with concrete anchors. Drywall anchors are not recommended.

Pocket Installation

CAUTION: Hunter Douglas strongly recommends that shades in a pocket be mounted through wood or metal studs by a professional installer.

The number of #10 x 1½" Phillips hex washer head screws (not provided) required will vary depending on the width of the shade, as shown in the table below.

Shade Width	Screws Required
Up to 36"	4
36⅛" – 66"	6
66⅛" – 90"	8
90⅛" – 120"	10
120⅛" – 150"	12
150⅛" – 180"	14



Brackets Removed for Clarity

- Locate the studs or other substantial material for your mounting surface.
- Mark the pocket for the locations you have chosen for the screw holes.
- Drill the screw holes into the pocket and the mounting surface using a ⅛" drill bit.
- Fasten the pocket to the mounting surface using the screws.

Install the Shade

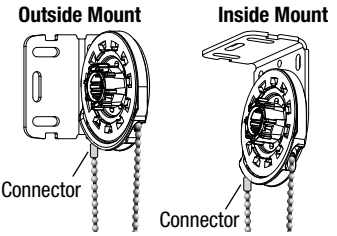
Standard, Designer Metal, Dual Roller Standard, Fascia and Pocket Shades

Standard brackets shown. All other brackets follow the same installation procedure.

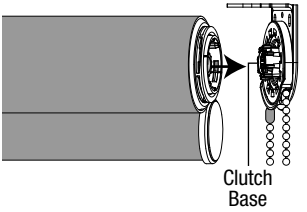
Install Clutch End

IMPORTANT: For Dual Roller Shades, install the rear shade first. (Clutch is on the left side.)

- Position the bead chain connector.
  - ➤ Ensure the bead chain connector is pulled to the back of the chain wheel for a standard shade (shade fabric rolls off the back) and to the front for a reverse roll (shade fabric rolls off the front).

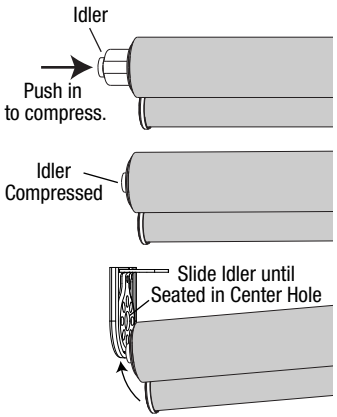


- Push the clutch end of the roller with the clutch base on the bracket.

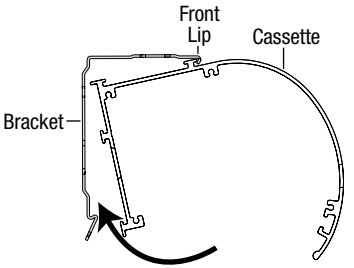


Install Idler End

- Push in the spring idler to compress.
- Slide the idler onto the bracket and slide to the center hole. Idler will expand and will engage the bracket to secure the shade into the bracket.
- After installing the shade, remove the paper banding that is used to prevent the shade from unrolling.
- If the light gap is not even. See “Troubleshooting” on page 21.



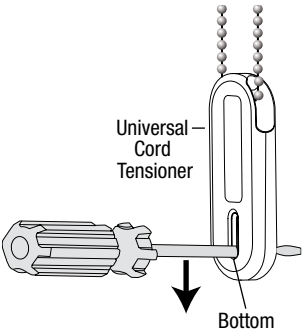
Cassette Shades



- Angle the cassette back and then bring the cassette forward to catch the front lip of the bracket.
- Push the cassette back to snap it into the lower lip on the bracket.

Attach the Universal Cord Tensioner (UCT)

Before doing anything, you must first slide the cord tensioner to the bottom of the beaded cord loop.



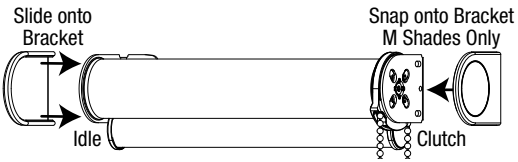
- Insert a small screwdriver, punch, or awl through the screw hole at the bottom of the cord tensioner.
- While holding the cord tensioner, move screw hole all the way down to the bottom of the cord tensioner to release the safety mechanism.
- Slide the cord tensioner down to the bottom of the beaded cord loop.

WARNING: It is imperative that the cord tensioner be properly secured to the wall or window frame to reduce children's access to the cord loop. Young children can strangle in cord loops. They can also wrap cords around their necks and strangle.

CAUTION: The shade will not operate properly unless the cord tensioner is secured. A cord tensioner installation kit has been included with your shade. Follow the instructions in the kit to correctly secure the cord tensioner.

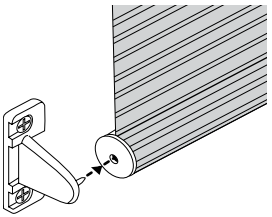
Install the Bracket Cover — Standard Brackets (Outside Mount Only)

- Install the idle-side bracket cover by aligning the bracket with the channels in the bracket cover and sliding it onto the bracket. For shades standard L shades, the clutch-side bracket will install the same way, by sliding it onto the bracket. To determine if you have standard L shade, see "Identify the Shade Type — Standard Shades Only" on page 5.
- **Standard M shades only.** Install the clutch-side bracket cover by snapping it onto the bracket.



Attach the Standard Hold-Down Brackets (Optional)

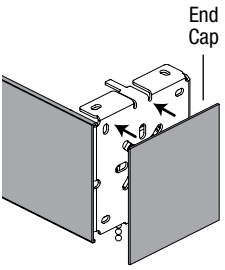
The standard hold-down brackets may be used with outside mount shades only.



- With the shade fully lowered, insert the pin on the hold-down bracket into the hole on the bottom rail end cap.
- Mark the hole locations on the mounting surface.
- Center the hold-down brackets over the mounting hole locations and check their alignment. Attach using two screws.

IMPORTANT: Disconnect the bottom rail from the hold-down brackets to raise the shade.

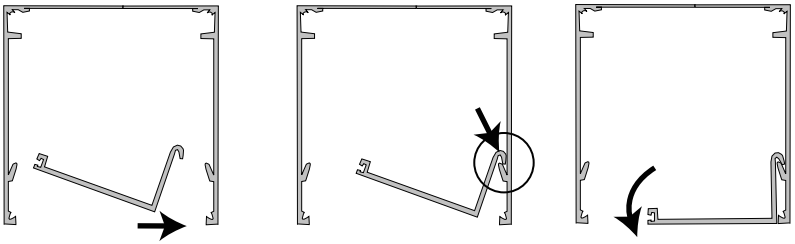
Attach the End Caps — Fascia Shades Only (Optional)



- Attach the fascia panel.
- **For Outside Mount Shades Only.** Install the fascia end caps.
  - ➤ Remove the double-sided tape from the back of the fascia end caps.
  - ➤ Press the end cap onto the fascia bracket.

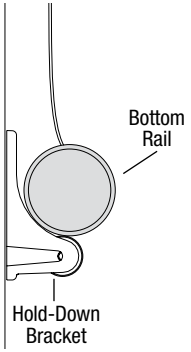
Install the Pocket — Pocket Shades Only (Optional)

- Attach the bottom of the pocket.
  - ➤ Place the bottom into the pocket at an angle.
  - ➤ Hook the bottom to the ledge inside the pocket.
  - ➤ Rotate it down to secure it into place.



Brackets/Shade Removed for Clarity

Attach the Magnetic Hold-Down Brackets (Optional)



- Lower the shade.
- Place the magnetic hold-down bracket onto the bottom rail just inside the end cap, oriented as shown.
- Hold the bracket while opening and closing the shade slightly (it may be necessary to have someone assist you). Adjust the bracket to the best overall position using the mounting options shown below.

Outside Mount

Preferred

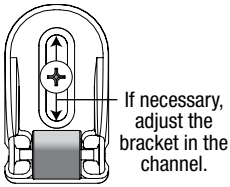
Alternate

Inside Mount

Preferred

Alternate

- Mark the screw location.
  - ➤ The screw should be placed in the middle of the channel. This will allow for adjustment.
- Drill the screw holes using a $^{3}/_{32}$" drill bit.
- Attach the hold-down brackets to the mounting surface using the screws provided.
- If necessary, adjust the bracket location in the channel for best operation.



Operate the Shade

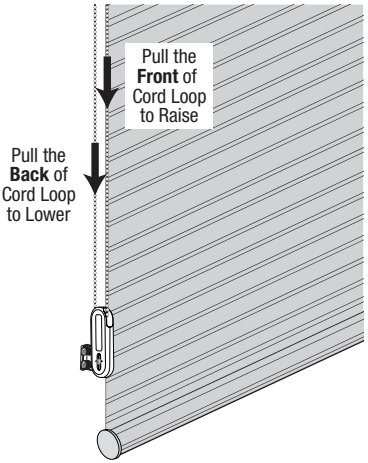
Standard shades shown. Reverse roll shades will operate opposite of what is shown.

To Lower the Shade

- Pull the back of the cord loop to lower the shade.
- Pull until the shade is at the desired height.

To Raise the Shade

- Pull the front of the cord loop to raise the shade.
- Pull until the shade is at the desired height.



Troubleshooting

Problem	The shades raises or lowers unevenly.
Solution	■ Check that the installation brackets are level and aligned. Shim the brackets, if necessary. Shims are not provided. ■ Roll up the shade until the bottom rail is fully raised. ➤ Reinstall the shade.
Problem	The universal cord tensioner has climbed to the top of the shade.
Solution	■ Pull down on the spring to relieve tension and pull the universal cord tensioner to the bottom of the cord loop. Properly mount the cord tensioner. See *Universal Cord Tensioner Installation Instructions* in the kit included with your shade.
Problem	The universal cord tensioner grabs onto the cord upon operation.
Solution	■ Check that the universal cord tensioner is mounted properly. Reinstall, if necessary. See the *Universal Cord Tensioner Installation Instructions* that came with your Cord Tensioner Kit.

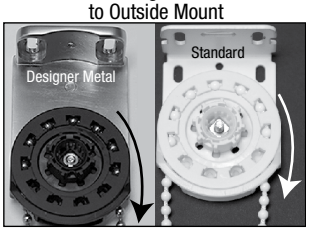
Problem	The shade does not operate.
Solution	■ Check that the shade is installed so the bead chain hangs straight down from the clutch.
Problem	Shade hangs too low at the top.
Solution	■ Remove the shade from the brackets. See “Removing the Shade (If Necessary)” on page 24. ■ Lay the shade on a clean surface; then roll the shade up completely. ■ Install the shade. See “Install the Shade” on page 17.
Problem	The shade is slightly long or short.
Solution	Raise the shade completely (until the bead chain connector touches the back of the clutch). ➤ For a shorter drop, move the bead stop two to four beads up. ➤ For a longer drop, move the bead stop two to four beads down. **IMPORTANT:** Maximum adjustment is 1¾", or eight to nine beads.
Problem	The light gap is not even.
Solution	■ If the light gap is larger on idle side, move the clutch-side bracket in by half the distance to make it even. ■ For end mount shades, shim (not provided) the clutch-side bracket.

Problem	The chain wheel orientation needs to be changed.
Solution	**Change the Chain Guide Orientation**

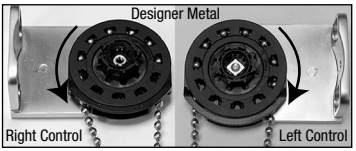
- Remove the screw and washer from the bracket. Be sure to keep the nut in place. A spare screw has been provided if needed.

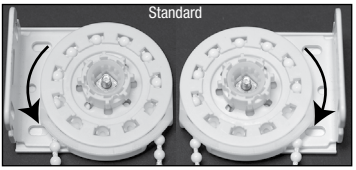
- Remove the chain wheel by pulling it up from the base of the bracket. Turn the chain wheel to the new orientation and press back onto the base.

Inside Mount Orientation
Turn to Change Orientation to Outside Mount



Outside Mount Orientation
Turn to Change Orientation to Inside Mount



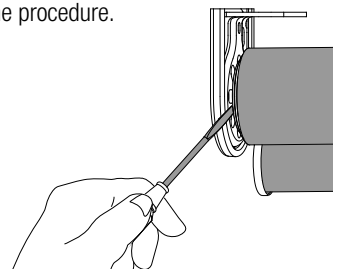


- Install the washer and the screw.
- Replace the bracket cover.

Removing the Shade (If Necessary)

Standard, Designer Metal, Dual Roller Standard, Fascia and Pocket Shades

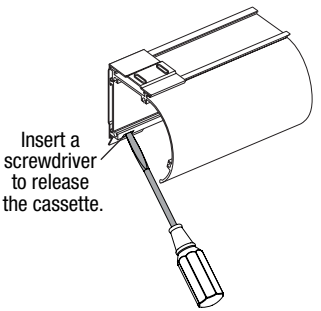
Standard brackets shown. All other brackets follow the same procedure.



- While holding the top of the shade, insert a flat blade screwdriver into the idle installation channel between the spring idle and the bracket.
- With the screwdriver, push the spring idle toward the shade to release it from the bracket.
- Remove the shade from the brackets.

Cassette Shades

- Insert the tip of a flat head screwdriver into the screwdriver slot provided on the bracket.
- Press down to release the cassette.
- Roll the cassette forward and then down to remove.



Cleaning Procedures

Roller Shades are made from dust-resistant materials which repel dirt and dust. The following options are available if your shade needs cleaning.

Dusting

- Regular light dusting with a feather duster is all the cleaning needed in most circumstances.

Vacuuming

- Use a hand-held vacuum with low suction for more thorough dust removal.

Compressed Air/Hair Dryer (Cool Setting)

- Use compressed air or a hair-dryer on a cool setting to blow dust and dirt off of shades.

Spot-Cleaning

CAUTION: Do not spot-clean Alustra® Woven Textures® fabrics, Aerial, Antigua, Echo, Fiji, Fiji Dimout, and Raffia fabrics.

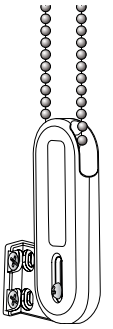
- Prepare a solution of warm water and a mild detergent.
- Dampen a clean cloth in the solution and wring it out.
- Dab the spot with the dampened cloth until it is removed. Do not rub the fabric.
- Allow the shade to dry in the completely lowered position.

WARNING

For more safety information call 1-888-501-8364 in the U.S. or 1-866-662-0666 in Canada.

Young children can STRANGLE in cord loops. They can also wrap cords around their necks and STRANGLE.

Cord Loop Shades



- **Attach the cord tensioner on the cord loop to the wall or window casement. See "Attach the Universal Cord Tensioner (UCT)" on page 18. This can prevent children from pulling cord loops around their necks.**
- **Hunter Douglas provides a cord tensioner installation kit with instructions for attaching the cord tensioner. For the shade to operate properly, the cord tensioner must be correctly mounted and secured.**
- **Fasteners provided in this kit may not be appropriate for all mounting surfaces. Use appropriate anchors for mounting surface conditions.**
- **Only Hunter Douglas supplied cord tensioners and hardware should be used. Replacement parts may be obtained by contacting the Hunter Douglas Customer Information Center at 1-888-501-8364.**

NOTE: The warning labels on the bottom rails of corded window coverings contain important safety information. These warning labels are designed to be permanent, in accordance with the industry's safety standards, and must not be removed.

LIFETIME GUARANTEE

The Hunter Douglas® Lifetime Guarantee is an expression of our desire to provide a thoroughly satisfying experience when selecting, purchasing and living with your window fashion products. If you are not thoroughly satisfied, simply contact Hunter Douglas at (888) 501-8364 or visit hunterdouglas.com. In support of this policy of consumer satisfaction, we offer our Lifetime Limited Warranty as described below.

COVERED

BY A LIFETIME LIMITED WARRANTY

- Hunter Douglas window fashion products are covered for defects in materials, workmanship or failure to operate for as long as the original retail purchaser owns the product (unless shorter periods are provided below).
- All internal mechanisms.
- Components and brackets.
- Fabric delamination.
- Operational cords for a full 7 years from the date of purchase.
- Repairs and/or replacements will be made with like or similar parts or products.
- Hunter Douglas motorization components are covered for 5 years from the date of purchase.

NOT COVERED

BY A LIFETIME LIMITED WARRANTY

- Any conditions caused by normal wear and tear.
- Abuse, accidents, misuse or alterations to the product.
- Exposure to the elements (sun damage, wind, water/moisture) and discoloration or fading over time.
- Failure to follow our instructions with respect to measurement, proper installation, cleaning or maintenance.
- Shipping charges, cost of removal and reinstallation.

Hunter Douglas (or its licensed fabricator/distributor) will repair or replace the window fashion product or components found to be defective.

TO OBTAIN WARRANTY SERVICE

1. Contact your original dealer (place of purchase) for warranty assistance.
2. Visit hunterdouglas.com for additional warranty information, frequently asked questions and access to service locations.
3. Contact Hunter Douglas at (888) 501-8364 for technical support, certain parts free of charge, for assistance in obtaining warranty service or for further explanation of our warranty.

NOTE: In no event shall Hunter Douglas or its licensed fabricators/distributors be liable or responsible for incidental or consequential damages or for any other indirect damage, loss, cost or expense. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above exclusion or limitation may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Different warranty periods and terms apply for commercial products and applications.

HunterDouglas

hunterdouglas.com

LIT888264A 2/16

ECO-GRES™ ASIA

COVERINGSETC

ECO-GRES™ ASIA

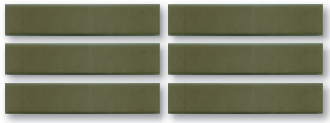
800.720.7814 www.coveringsetc.com

STANDARD

Aurora Beige

Babylon Grey

Belmont Black


Bergen Brown

Brewster Brown

Carmel Yellow

Geneva Green**

Monticello Grey

Olean Yellow

Seaford Blue**

Waterloo White

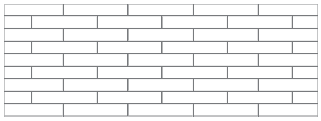
Yonkers Grey

OVERVIEW

Encounter the perfect blend of 'eco' and 'upscale' with Eco-Gres™ tiles and mosaics. ECO-GRES™ Asia is a Future-Friendly™ material made of through-body, unglazed porcelain. Highly sustainable, easy to install and maintain. Slip resistant, scratch resistant, stain and fade resistant. No need to seal or wax. Contains pre-consumer recycled content; may help contribute toward LEED® credits with USGBC project certification.

AVAILABLE SIZES

1" x 6" tiles mounted on 12" x 12" sheet in grid or brick pattern*
3" x 6" tiles



SPECIFICATIONS

Water absorption	ASTM C-373	ISO 10545-3	>0.1%
Breaking Strength		ISO 10545-4	1800 N
Modulus of Rupture	ASTM C-99	ISO 10545-4	50 N/mm²
Abrasion Resistance	ASTM C-501	ISO 10545-7	128 mm³
Linear Thermal Expansion	ASTM E-228	ISO 10545-8	6,6 x 10-6 C-1
Thermal Shock Resistance	ASTM C-484	ISO 10545-9	Conforms
Coefficient of Friction	ASTM C-1028		Dry 0.89, Wet 0.75
Stain Resistance		ISO 10545-12	No permanent stains
Chemical Resistance		ISO 10545-13	Conforms

ECOVERINGS "Future Friendly"

U.S. GREEN BUILDING COUNCIL MEMBER

COVERINGSETC

* Brick pattern is a special order item
* Only standard colors available in 3" x 6"
* Approximate laboratory test values.
* Colors may not print accurately. Please request sample.

10 - SPECIALTIES

108100 – COMPONSTING TOILET

PART 1 – GENERAL

1.1 SCOPE

Included in this section are the specifications to a composting toilet that allows waste to be recycled into compost. This is a self-contained system used in the bathroom.

1.2 REQUIREMENTS

A. System will be self-contained.
B. System will have the capacity for the household.
C. System will use AC power

1.3 SUBMITTALS

A. Product owner manual and maintenance
B. Instructions on setup and instillation

PART 2 – PRODUCT

2.1 COMPOSTING TOILET

A. Model: Excel
B. Manufacturer: Sun-Mar
C. Website: http://www.sun-mar.com/prod_self_exce.html
D. Dimensions (H x W x D): 32" x 22 1/2" x 33"
    1. Product Weight: 60 lbs
    2. Depth Required to Remove Drawer: 48"
    3. Vent outlet center distance from right side: 10"
    4. Height to center of vent: 28 3/8"
    5. Vent Pipe: 2" PVC Thinwall, or comparable
    6. Drains (Required or Optional Hookup): 1" Drain Required for Residential
E. Power Requirement
    1. Maximum Amps (With Heater On): 2.4
    2. Fan Watts: 35 Required
    3. Heater Watts: 250
    4. Average Power Use in Watts (Heater on 1/2 time): 150
F. Water Consumption: no water consumption
G. Color: White or Bone
H. Temperature Requirement: Above 55 degrees Fahrenheit
I. Accessories: Compost Quick, Microbe Mix, Compost Sure, Vent Kit, AC Fan Speed Control.

PART 3 – EXECUTION

A. Venting pipe must be installed according to Work and connected to the system.

END SECTION 108100

108200 – WATER FILTRATION SYSTEM

PART 1 – GENERAL

1.1. SCOPE

Included in this section is the water filtration system that will get our light grey water coming from water appliances (i.e. washing machine, shower, and bathroom sink) into potable water. Integrated with the entire house according to drawings.

1.2. REQUIREMENTS

A. Solar Decathlon Rules
    1. Rule 9. Liquids
    2. Contest 6. Water
B. Solar Decathlon Building Codes
    1. Section 9. Plumbing
C. Living Building Challenge
    1. Living Building Challenge 3.1. Water Petal
    2. Toward Net Zero Water – Best Management Practices

1.3. SUBMITTALS

A. Products: Customized Water Filtration System, Biosand filter, Microbag filters, carbon filter, ceramic filter, UV system, pumps, and sensors
    1. Purpose
    2. Specifications
    3. Warranty
    4. Maintenance
    5. Installation process and requirements
B. Layout in House
C. Connections (i.e. plumbing)
    1. Based off plumbing section for potable water, greywater/rainwater, waste water
D. Data on Water Quality
    1. Sensors
        i. Reference to automation section for specifications
    2. Actual production of potable water in the competition will not occur. However, after the competition we will expect our house to produce potable water, so we want to be able to test that before the competition to show that it works.

PART 2 – PRODUCTS

2.1 Customized Water Filtration System

A. Purpose: Addition filtration of incoming potable water to remove VOC (Volatile Organic Chemicals), Heavy Metals, Chloramine, Chlorine and Fluoride
B. Components
    1. VOC removal filter
    2. Heavy Metal/Fluoride filter
    3. Nitrate filter
    4. Sediment Filter
    5. Alkalizer Filter

6. Diverter tubing
7. Attached Spigot
8. Triple Crown housing

C. Website: https://www.cwrenviro.com/crown-triple-undercounted-filter
D. Manufacturer: CWR Environmental
E. Dimensions(LxWxH): (17"x5.75"x12.5')
F. Power Requirement: N/A
G. Maintenance: Replace filters every ~1 year depending on usage levels. To replace, just take out old filters and replace with new.
H. Warranty (Life Expectancy): Depending

2.2 BIOSAND FILTER

A. Purpose: Allows for sedimentation to remove larger particles and filtration to remove smaller particles. This will kill pathogens.
B. Components
1. Lid
2. Filter Body
3. Diffuser
4. Filter Tube
5. Filtration Sand Layer
6. Separating Gravel Layer
7. Drainage Gravel Layer

C. Website: http://www.sswm.info/sites/default/files/reference_attachments/CAWST%202009%20Biosand%20Filter%20Manual.pdf
D. Manufacturer: UMD (Student Produced)
E. Dimensions (H x D): 34.25” x 23.25”
F. Power Requirement: N/A
G. Maintenance: Sand grains may get clogged up after a long period of cleaning, it is recommended that the top layer of sand be taken off. Biological layer (e.g. top layer) will take 20 to 30 days to develop in order to work properly.
H. Warranty (Life Expectancy): Depending

2.3 MICROBAG FILTERS

A. Purpose: Filtering particles and bacteria as small as ½ micron.
B. Website: https://www.freshwatersystems.com/specifications/EV9328-06SPEC.pdf
C. Manufacturer: Everpure
D. Dimensions (H x W x D): 25.59” x 30” x 6.74”
E. Power Requirement: N/A
F. Flow Rate: 5.0 GPM
G. Warranty: Limited

2.4 CERAMIC FILTER

A. Purpose: Further filtration of water that has been acknowledged by the WHO. It is good at removing bacteria since we do not have a reverse osmosis system for this house.
B. Website: https://www.freshwatersystems.com/specifications/CeraMetix-10in-spec.pdf
C. Manufacturer: CeraMetrix
D. Dimensions: 10”
E. Power Requirement: N/A
F. Flow Rate: Depending on the contaminants that is being removed from the water.

2.5 CARBON FILTER

A. Purpose: Designed for the removal of chemicals, pesticides, heavy metals, tastes and odors.
B. Website: https://www.uswatersystems.com/pdf/USWaterFusionBackwashingFilterManual1110-8-14.pdf
C. Manufacturer: Fusion
D. Dimensions (H x Diameter): 14” x 65”
E. Power Requirement:
    1. Input: 120 V, 60 Hz
    2. Output: 12 V, 650 mA
F. Flow Rate: Max. 15 GPM

2.6 UV STERILIZATION SYSTEM

A. Purpose: Disinfection system of our water system design. This will destroy all of the bacteria that we could not get rid of in the systems prior to the UV.
B. Website: http://buyultraviolet.com/pdf/981518.pdf
C. Manufacturer: Bio-logic
D. Dimensions (L x W x H): 14-1/4” x 3-11/16” x 3-3/8”
E. Power Requirement: 16.5 W
F. Flow Rate: 1.5 GPM

2.7 OBS-3+ TURBIDITY SENSOR

A. Purpose: Measures the amount of light scattered by the suspended solids in the water. The smaller the total suspended solids (TSS) in the water, the lower the turbidity level. That is what the sensor is suppose to achieve. If the sensor goes over a certain level, the water will be sent back to go through the whole filtration process again.
B. Website: https://www.campbellsci.com/obs-3plus
C. Manufacturer: Campbell
D. Dimensions (H x Diameter): 5.56" x .98"
E. Power Requirement: 2000 μW
F. Flow Rate: N/A

2.8 WATER QUALITY SENSOR

A. Purpose: Measures dissolved oxygen (DO), pH, temperature, and conductivity.
B. Website: https://www.pasco.com/file_downloads/Downloads_Manuals/PASPORT-Advanced-Water-Quality-Sensor-Manual-PS-2230.pdf
C. Manufacturer: PASCO
D. Dimensions: N/A
E. Power Requirement: N/A
F. Flow Rate: N/A

PART 3 – EXECUTION

3.1 MICROBAG FILTER

A. Location
    1. Mounting location that can support the whole weight
    2. Follow after biosand filter
B. Position
    1. Install vertically with cartridges hanging down
    2. 2-1/2” open area below for replacement of cartridges CARBON FILTER

A. Location
    1. Do not install in direct sunlight or in areas that are below freezing

2. Should not be exposed to any type of weather
3. On the ground
4. As close to pressure tank as possible or water meter

B. Temperature Requirements
1. Less than 100 F

C. Other requirements
1. Connect the filter to the main water supply pipe before the water filter

3.2 UV STERILIZATION SYSTEM

A. Website: http://buyultraviolet.com/pdf/981523.pdf

B. Location
1. Indoors only

C. Positioning
a. Horizontal

D. Temperature Requirements
a. 35 F and 100 F

E. Other requirements
a. Shut off valves should be installed on both the inlet and outlet sides of the water purifier.
b. Should only be connected to cold water line only.
c. 5-micron filter should be installed before the UV system.
d. Unions or connectors should be installed on both the inlet and outlet of the water purifier.

3.3 OBS-3+ TURBIDITY SENSOR

A. Website: https://s.campbellsci.com/documents/us/manuals/obs-3+.pdf

B. Location: Before the UV system which is located in the "spine" area of the house.

END SECTION 108200

SECTION 108300 - HYDROPONIC SYSTEM

PART 1 - GENERAL

1.1 SCOPE

A wall-mounted system for growing plants without soil using nutrient rich water. Used along south wall of the core.

1.2 PERFORMANCE REQUIREMENTS

A. Use a sustainable non-soil or soil alternative.

B. Must be partially automatic, leaving room for occupants to interact and care for the system.

C. Will fit within the dimensions of 5' w X 8"d X 8' h, aligned with the immovable portion of the wall.

D. Will not interfere with ADA accessibility of hallway.

E. System must be anchored or stabilized.

F. System will be safe, and produce food that is also safe to eat.

1.3 SUBMITTALS

A. Components: Shelving or support system, gutter container, submersible pump, reservoir, tubing, growing media

1. Specifications
2. Warranty
3. Who will install and maintain them
4. Directions on how to maintain the system.

B. Accessories: pH tester kit, pH adjusters, hydroponic nutrients

1. Specifications
2. Warranty
3. Directions on how to maintain the system.

C. List of indicators to be aware of to monitor plant health, and system functionality.

PART 2 – PRODUCTS

2.1 SHELVING OR SUPPORT SYSTEM

A. Acceptable manufacturers and products

1. Product: 8" d, 48" w, 84" h Wire Shelving with 5 Shelves
   a. Manufacturer: Shelving, Inc
   b. Website: https://www.shelving.com/SI-8-d-x-48-w-5-Shelf-Wire-Shelving-Unit-Five-p/sc84872-5p.htm
   c. Dimensions: 8" depth, 48" width, 84" height
   d. Weight capacity: 800 lbs per shelf, evenly distributed
2. Product: Ceiling to Floor Shelving Kit
   a. Manufacturer: udizine Innovative Displays
   b. Website: http://www.udizine.com/shelving/suspended-shelving/cable-system-ctf/cable-kit-for-5-wood-shelves
   c. Dimensions: Can be sized to the dimensions needed
3. Other equivalents will be chosen based off of the area available for the system and the weight requirements of the system.

2.2 GUTTER CONTAINER

A. Acceptable manufacturers and products

1. Product: White Aluminum Gutter
    a. Manufacturer: Amerimax Home Products
    b. Website: http://www.homedepot.com/p/Amerimax-Home-Products-5-in-x-10-ft-K-Style-30-Degree-White-Aluminum-Gutter-24002010120/205627125?MERCH=REC-_-rv_search_plp_rr-_-NA-_-205627125-_-N
    c. Dimensions: 5” w, 10’ l
    d. Requirements: Cut or ordered in size needed
    e. Additional: Right and left gutter caps

2. Other equivalents will be chosen based on the width of the system and the amount of food producing area required.

2.3 SUBMERSABLE PUMP

A. Acceptable manufacturers and products

1. Product: 210-GPH Pond pump
    a. Manufacturer:
    b. Website: http://www.homedepot.com/p/Total-Pond-210-GPH-Pond-Pump-DD11210/202017028
    c. Dimensions: 4.27” depth, 5.16” width, 9.96” height
    d. Warranty: 1 year
    e. Voltage: 120, Horsepower: 0hp
    f. Requirements: must be able to reach the max height of the system

2. Other equivalents will be chosen based on the height of the system and the amount of water required for the amount of food producing area.

2.4 RESERVOIR

A. Acceptable manufacturers and products

1. Product: Deluxs Slim Jim Trash Can – 23 gallon, Black
    a. Manufacturer: Rubbermaid
    b. Website: https://www.uline.com/Product/Detail/H-2894BL/Trash-Cans/Rubbermaid-Deluxe-Slim-Jim-Trash-Can-23-Gallon-Black?pricode=WY639&gadtype=pla&id=H-2894BL&gclid=CIycx52krNACFQlWDQod3ZgCMA&gclsrc=aw.ds
    c. Dimensions: fit within the 8” depth, or be located close to the system.
    d. Requirements: Must not allow light to penetrate the water. Must have the capacity to hold all the water used within the system and the pump. Be able to hold at least 20 gallons.

2. Other equivalents will be chosen based on the area to store the reservoir.

2.5 TUBING

A. Acceptable manufacturers and products

1. Product: ¾ in. 20 ft tubing
    a. Manufacturer: Total Pond
    b. Website: http://www.homedepot.com/p/Total-Pond-3-4-in-x-20-ft-Corrugated-Tubing-C16015/202017062
    c. Dimensions: ¾ in diameter

d. Requirements: Must not allow light to penetrate the water in the tubing. Must allow for the water to most fast enough as to not cause the back up of water between levels within the system.

2.6 GROWING MEDIA

A. Acceptable manufacturers and products

1. Product: Coco Coir SKU: 1308060
   a. Manufacturer: Arbico Organics
   b. Website: http://www.arbico-organics.com/product/3097/organic-soil-conditioners?gclid=CPyjtMqurNACFc9MDQodkWgE8A
   c. Dimensions: 4 – 650 g bricks, around 10 gal of material

2.7 ACCESSORIES

A. Acceptable manufacturers and products

1. Product: Digital LCD PH Meter Tester Pool Aquarium Hydroponic Water Monitor Laboratory
   a. Manufacturer:
   b. Website: http://www.tmart.com/Digital-LCD-PH-Meter-Tester-Pool-Aquarium-Hydroponic-Water-Monitor-Laboratory_p336815.html?cc=USD&fixed_price=us_us&gclid=CPL4ptewrNACFQhMDQod2fADIA
2. Product: GH1514 pH Control Kit
   a. Manufacturer: General Hydroponics
   b. Website: https://www.freshwatersystems.com/p-12189-general-hydroponics-gh1514-ph-control-kit.aspx
3. Product: Hydroponic nutrients
   a. Manufacturer: General Hydroponics
   b. Website: http://generalhydroponics.com/nutrients/

Part 3 – Execution

3.1 INSTALLATION

A. Shelving structure will be built first

B. Gutters system containing the growing medium will be placed on the shelving

1. Gutters will be connected to each other by the tubing
2. Top gutter will be connected to the inflow pump.
3. Bottom gutter will be connected to the reservoir

C. Reservoir will hold the pump and the water for the system

1. Pump will be connected to the tubing leading to the top of the system.
2. The power cord must have a drip loop to make sure water has a location to drip off the cord, avoiding contact with the electrical outlet.

D. The pH tester kit, pH adjusters, hydroponic nutrients will be used as needed, determined by the instructions.

END SECTION 108300

SECTION 108400 – PAVER SUPPORT SYSTEM

1.1 SCOPE

Paver support system facilitates installation of concrete pavers on top of a conventionally framed floor, without requiring a sheathing layer on top of the framing. Water falling on the pavers are allowed to fall through to the ground below. The system is used primarily in the Courtyard.

1.2 REQUIREMENTS

1. Shall work with conventional framing, either metal or wood joists.
2. Shall support a regular grid of pavels, maintaining separation between panels to allow water to pass between them.
3. Shall attach firmly to framing to prevent movement of the pavers.

2. PRODUCTS

A. Acceptable Products

1. ODF elePHOOT PK21pf pedestal system.

END OF SECTION 108400

SECTION 108500 – BARREL COMPOST SYSTEM

PART 1 – GENERAL

1.1 SCOPE

This tumbler, barrel shaped, composting system will be placed on the back porch in an area which is easily accessible to the residents.

1.2 REQUIREMENTS

A. System will be self-contained.
B. System will have the capacity for the household.
C. System will be easy to access.

1.3 SUBMITTALS

A. Product owner manual and maintenance
B. Instructions on setup and installation

PART 2 – PRODUCTS

2.1 BARREL COMPOST SYSTEM

A. ACCEPTABLE PRODUCTS
B. Model #: IM4000
C. Manufacturer: YIMBY
D. Website: http://www.homedepot.com/p/Tumbling-Composter-with-Two-Chambers-for-Efficient-Batch-Composting-IM-4000/202672114
E. Dimensions (H x W x D): 36” x 28” x 26”
F. Product Weight: 60 lbs
G. Capacity: 37 gallons

PART 3 – EXECUTION

3.01 BARREL COMPOST SYSTEM

A. The system will produce compost for the resident's gardens and landscaping.

END SECTION 108500

SECTION 109000 – ADJUSTABLE JACK

1.1 SCOPE

Adjustable Jacks support the weight of the house and connect the structure to the pad footings.

1.2 REQUIREMENTS

1. Shall support foundation loads at each location as specified in Structural Calculations (see Project Manual).
2. Shall provide positive anchorage to the foundation to prevent uplift and overturning.
3. Shall be adjustable between 18" and 30" total length.
4. Shall facilitate fine adjustment in height under load.uper S-Series

2. PRODUCTS

A. Acceptable Products
    1. Tiger Brand Super S-series

3. EXECUTION

1. Locate pad footings on the site
2. Locate high point(s) using laser level or other tool.
3. Adjust highest point jack to achieve finished floor elevation indicated in the Drawings.
4. Using laser level or other similar tool, adjust all other jacks to match.

END OF SECTION 109000

END SECTION 10

Bio-Logic®

ULTRAVIOLET WATER PURIFIERS

Available with *Pure Water Pack*™

Model BIO-1.5
1.5 GPM

Model BIO-1.5
1.5 GPM with
Pure Water Pack™

ATLANTIC ULTRAVIOLET CORPORATION®

ABOUT US

Since 1963, Atlantic Ultraviolet Corporation has pioneered the discovery and development of beneficial uses of ultraviolet energy. Over the years these efforts have led to the development of valuable, cost effective and environmentally sound techniques and products now known and respected throughout the world. Atlantic Ultraviolet's application specialists assist customers in the selection of germicidal lamps and equipment. Their specialized knowledge is a valuable resource in formulating effective and cost-conscious ultraviolet solutions. Extensive inventories and a dedicated staff enable Atlantic Ultraviolet to fulfill its commitment to provide fast deliveries and responsive customer service.

Model BIO-1.5
1.5 GPM

Model BIO-3.0
3.0 GPM

Model BIO-1.5 PWP
1.5 GPM

GERMICIDAL ULTRAVIOLET

Ultraviolet water purification is a unique and rapid method of water disinfection without the use of heat or chemicals.

Bio-Logic® Ultraviolet Purifiers utilize germicidal ultraviolet lamps that produce short wave radiation lethal to bacteria, viruses and other microorganisms present in water.

Through the years ultraviolet technology has become well established as a method of choice for effective and economical water disinfection.

Bio-Logic® Ultraviolet Water Purifiers are the ideal solution for an ever growing range of water treatment applications.

ATLANTIC ULTRAVIOLET CORPORATION

ADVANTAGES

Effective
Virtually all microorganisms are susceptible to **Bio-Logic®** ultraviolet disinfection

Economical
Hundreds of gallons are purified for each penny of operating cost

Safe
No danger of overdosing, no addition of chemicals

Fast
Water is ready for use as soon as it leaves the purifier – no further contact time required

Easy
Simple installation and maintenance. Compact units require minimum space

Automatic
Provides continuous disinfection without special attention or measurement

Chemical Free
No chlorine taste or corrosion problems

Versatile
Capacities available from 1.5 to 3 gallons per minute (g.p.m.)

PRINCIPLE OF OPERATION

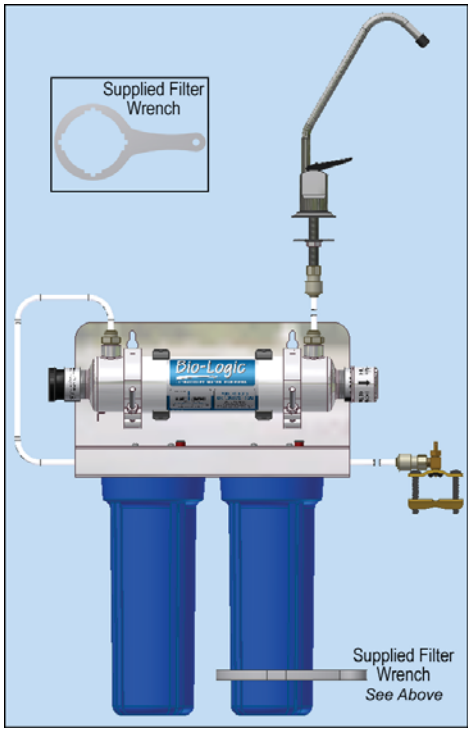
The **Bio-Logic®** has been carefully conceived to provide adequate germicidal dosage throughout the disinfection chamber.

Model BIO-1.5
1.5 GPM

1. Water enters the ultraviolet purifier and flows into the annular space between the quartz sleeve and the chamber wall.
2. Suspended microorganisms are exposed to the ultraviolet rays emitted by the germicidal lamp.
3. The LED indicator light, located on the ballast, provides visual indication of germicidal lamp operation.
4. Water leaving the purifier is ready for use, no further contact time is required.

The **Bio-Logic® Pure Water Pack™** has been designed to provide adequate filtering and germicidal ultraviolet dosage.

1. Water enters the sediment filter and traps the particulates, rust, scale and residue that affect the taste and appearance of water supply.
2. Water continues into the carbon filter and reduces chlorine, unpleasant tastes, odors and other organic chemicals and turbidity.
3. Filtered water enters the ultraviolet purifier and flows into the annular space between the quartz sleeve and the chamber wall.
4. Suspended microorganisms are exposed to the ultraviolet rays emitted by the germicidal lamp.
5. Water leaving the purifier is ready for use, no further contact time is required.



Model BIO-1.5 PWP
1.5 GPM

SPECIAL FEATURES

Models BIO-1.5, BIO-1.5 PWP and BIO-3.0

• **Construction - Bio-Logic®** chamber is constructed of type 316 stainless steel and is electropolished and passivated for an attractive finish and dependable service.

• **Quick Lamp Change -** Exclusive Easy-Off™ Retainer Cap enables effortless lamp replacement without shut down of water pressure or drainage of tank. No tools required.

• **Dual Heads -** Constructed of type 316 stainless steel, heads may be removed and rotated and individually oriented for versatility during installation.

• **Fused Quartz Sleeve -** Insures optimum lamp output at normal potable water temperature.

• **Mounting Brackets -** allow for easier install to secure surface.

Model BIO-1.5
1.5 GPM

Model BIO-1.5 PWP

• **Dual Filter Housing -** Sturdy, 5 micron sediment filter cartridge removes dirt, rust, scale, silt, sand and other water suspended particles while the 5 micron carbon filter removes chlorine, THM's, pesticides and other related volatile organic hydrocarbons.

• **Installation Kit -** Includes everything necessary to hook up entire system - tubing, saddle valve (saddle valve fits feed pipes between 3/8" to 1/2") and long reach faucet.

• **Mounting Bracket -** Stainless steel bracket with all system components factory installed. Unit is ready for hook up under the sink as soon as it's removed from carton.

Model BIO-1.5 PWP
1.5 GPM

INSTALLATION & MAINTENANCE

The purifier is installed horizontally as close as possible to the point of use. Connection of the inlet and outlet to water supply and insertion of power plug into 3-wire grounded GFCI outlet is all that is required.

Ordinary maintenance consists of routine cleaning the quartz sleeve (once monthly or more or less frequently where conditions dictate). Lamp replacement is recommended every 10,000 hours of operation (approximately 14 months of continuous service).

Typical filter cartridge replacement is recommended every 12 months.

PWP (Pure Water Pack™) version requires install of long reach faucet (included) and connection to sink or ice maker.

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OPTIONAL ACCESSORIES and MONITORING OPTIONS

The SENTRY™ Safety Sensor provides constant monitoring of the water purifier's ballast and germicidal lamp operation to give an indication of ballast and germicidal lamp status. The SENTRY™ Safety Sensor is capable of operating an optional audio alarm and/or solenoid valve.

- Easy installation
- Plug SENTRY™ into an electrical outlet, then plug water purifier into SENTRY™
- Operates optional Solenoid Valve and/or Audio Alarm
- Easily adaptable for use with other water purifier brands
- Warns of lamp failure
- Available for 120v 50/60Hz or 220v 50/60Hz water purifiers operating with electronic ballasts
- Available for use with most **Bio-Logic®**, **MINIPURE®**, **MIGHTYPURE®** and **SANITRON®** models

Audio Alarm
Activated by the Sentry™ - alerts user to any malfunction detected

Elapsed Time Indicator
Real-time, non-resettable display of accumulated operating hours.

Solenoid Valves
Operates in conjunction with SENTRY™ and prevents flow during detected malfunctions. Available in nylon or brass.

Time Delay Mechanism
Operates with SENTRY™ and solenoid valve to provide a 2-minute warm-up period for lamp to achieve full germicidal output.

Flow Control Valves
Limits water flow to rated capacities. Available in PVC and stainless steel.

Options may be obtained along with **Bio-Logic®** unit or added at a later date. For further details visit our website at **www.ultraviolet.com**.

ULTRAVIOLET DOSAGE

Germicidal lamps provide effective protection against microorganisms. A small cross-section is shown below.

ORGANISM	ALTERNATE NAME	TYPE	DISEASE	DOSE*
Bacillus subtilis spores	*B. subtilis*	Bacteria	————	22,000
Bacteriophage	Phage	Virus	————	6,600
Coxsackie virus	————	Virus	Intestinal infection	6,300
Shigella spores	————	Bacteria	Bacterial Dysentery	4,200
Escherichia coli	*E. coli*	Bacteria	Food poisoning	6,600
Fecal coliform	————	Bacteria	Intestinal infection	6,600
Hepatitis A virus	Infectious Hepatitis virus	Virus	Hepatitis of the liver	8,000
Influenza virus	Flu virus	Virus	Influenza	6,600
Legionella pneumophila	————	Bacteria	Legionnaires' Disease	12,300
Salmonella typhi	————	Bacteria	Typhoid Fever	7,000
Staphylococcus aureus	Staph	Bacteria	Food poisoning, Toxic Shock Syndrome, etc.	6,600
Streptococcus spores	Strep	Bacteria	Strep throat	3,800

When used as directed to disinfect clear water, **Bio-Logic®** Water Purifiers provide an ultraviolet dosage in excess of 30,000 microwatt seconds per square centimeter (µWSec/cm2).

* Nominal Ultraviolet dosage (µWSec/cm2) necessary to inactivate better than 99% of specific microorganism. Consult factory for more complete listing.

STANDARD MODELS

Model BIO-1.5 PWP
1.5 GPM

Model BIO-1.5
1.5 GPM

WATER QUALITY RECOMMENDATIONS

Maximum Concentration Levels Before Ultraviolet

Turbidity	*5 NTU*
Suspended Solids	*10 mg/L*
Color	*None*
Iron	*0.3 mg/L*
Manganese	*0.05 mg/L*
pH	*6.5 - 9.5*
Hardness	*6 gpg*

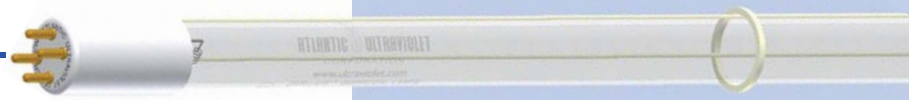
Effectively treating water with higher concentration levels than listed above can be accomplished, but may require added measures to improve water quality to treatable levels.

Model	Gallons per Minute	Gallons per Hour	Inlet and Outlet ①	Replacement Lamps	Power Consumption ②	Unit Dimensions (Inches)			Shipping Data (lbs.)	
						Length	Width	Height	Gross Wt.	Net Wt.
BIO-1.5	1.5	90	3/8" NPT	05-1366-R	16.5 Watts	14-¼	3-$^{11}/_{16}$	3-⅜	8	5
BIO-1.5 PWP	1.5	90	3/8" NPT	05-1366-R	16.5 Watts	15	5-⅝	17-½	18	12
BIO-3	3.0	180	3/8" NPT	05-1370-R	25 Watts	20-⅛	3-$^{11}/_{16}$	3-⅞	9	6

① All inlets and outlets are female pipe threads.
② Total power consumption including ballast loss.

- Maximum recommended operating pressure for all purifiers is 100 PSI.
- Pressure drop at maximum recommended flow rate is less than 5 PSI.
- Flow rates are based on Maximum Concentration Levels.
- 120 Volt and 220 Volt units are standard, 12 and 24 Volt units are also available.
- **Bio-Logic®** is available for operation on public power supplied throughout the world.
- Consult factory with specific power requirements.

GERMICIDAL LAMP DATA



Lamp Number	Purifier Model No.	Nominal Lamp Length	Power Consumption ①	Ultraviolet Output ②	Rated Effective Life
05-1366-R	BIO-1.5	11-$^{19}/_{64}$" (287mm)	14 Watts	4.0 Watts	10,000 Hrs.
05-1366-R	BIO-1.5 PWP	11-$^{19}/_{64}$" (287mm)	14 Watts	4.0 Watts	10,000 Hrs.
05-1370-R	BIO-3.0	17-$^{5}/_{32}$" (436mm)	21 Watts	7.3 Watts	10,000 Hrs.

① Wattage is lamp watts only and does not include ballast loss (approximate).
② Maximum rated output at 254 nanometers.

The lamps listed above have been especially developed and are recommended for use with **Bio-Logic®** Water Purifiers.

All ***STER-L-RAY®*** lamps used in **Bio-Logic®** units are low pressure type which afford the maximum efficiency in producing the required germicidal rays. In addition has advantage of high efficiency and low power requirements.

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COMPARISON OF ATLANTIC ULTRAVIOLET WATER PURIFIERS

FEATURES [S] - Standard [O] - Optional [**X**] - Yes	**Bio-Logic®** Pure Water Pack™ 1.5 GPM	**MINIPURE®** 1 to 9 GPM	**MightyPure®** 3 to 20 GPM	**SANITRON®** 3 to 20 GPM	**SANITRON®** 40 to 416 GPM	**MEGATRON®** 90 to 450 GPM
Stainless Steel Construction	S	S	S	S	S	S
Germicidal Ultraviolet Lamp with10,000 Hours Rated Effective Life	S	S	S	S	S	S
Quick Lamp Change with the Easy Off™ Retainer Cap	S	S	S	S	S	S
Fused Quartz Sleeve	S	S	S	S	S	S
Lamp Out Indicator Light(s)	S	S	-	-	-	S
Sight Port to View Lamp Operation	-	-	S	S	S	S
Drain Fitting	-	-	S	S	S	S
Patented Dual Action Wiper Mechanism - Manual	-	-	-	S	S	S
Patented Dual Action Wiper Mechanism - Automatic	-	-	-	-	-	O
Head(s) that can be removed or rotated	S	-	-	S	S	S
Sediment and Carbon Filter	S	-	-	-	-	-
Mounting Kit / Bracket	S	O	O	O	O ①	-
Guardian™ Ultraviolet Monitor	-	-	O	O	O	S
Sentry™ Safety Sensor	O	O	O	O	O	-
Audio Alarm	O	O/S ③	O	O	O	O
Solenoid Valves	-	O	O	O	O	-
Flow Control Valves	-	O	O	O	O	-
Elapsed Time Indicator	O	O	O	O	O	S
Time Delay Mechanism	-	O	O	O	O	-
Residential use	X	X	X	X	X	-
Commercial Use	-	-	X	X	X	X
CE Certified ②	-	-	X	X	X	-

NOTE: This list depicts options for 120v 60Hz operation. Consult factory for options with other power requirements.

① Model S10,000C & larger come equipped with mounting rack.

② MightyPure® MP36C and SANITRON® S37C, S2400C, S5000C, S10,000C, S15,000C and S20,000C are available CE Certified.

③ Standard feature in some MINIPURE units

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THE STANDARD OF EXCELLENCE IN ULTRAVIOLET

Manufacturers / Engineers / Sales / Service

ATLANTIC ULTRAVIOLET CORPORATION®

375 Marcus Boulevard • Hauppauge, NY 11788 • 631.273.0500 • Fax: 631.273.0771 • E-mail: info@ultraviolet.com • ultraviolet.com

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CAMPBELL SCIENTIFIC®
WHEN MEASUREMENTS MATTER

OBS-3+ and OBS300

Turbidity Sensors

Accurate, Rugged

Compact, low-power sensors is field-proven

Benefits and Features

- Measures suspended solids and turbidity for up to 4000 NTUs
- Provides a compact, low-power probe that is field proven
- Compatible with all Campbell Scientific dataloggers (including the CR200(X) series)
- Accurate and rugged
- Stainless-steel body allows use down to 500 m in fresh water
- Titanium body allows use down to 1500 m in fresh or salt water
- Fitted with MCBH-5-FS, wet-pluggable connector—multiple mating cable length options available
- Offers an optional 5-point sedimentation calibration (must send Campbell Scientific a dry sample of sedimentation from the water that will be monitored)

Overview

The OBS-3+ and OBS300 use OBS® technology to measure suspended solids and turbidity for up to 4000 NTUs. They are submersible sensors. With the stainless steel body, these turbidity sensors can be submerged in fresh water to a depth of 500 meters. With the titanium body, the sensors can be submerged in both fresh and salt water to a maximum depth of 1500 meters.

Applications

- Gage rivers and streams
- Monitor dredging and mining operations
- Control water quality in settling ponds and tanks
- Support sediment transport research
- Provide laboratory measurements

Technical Details

OBS Technology

The OBS3+ and the OBS300 use the innovative OBS method for monitoring suspended sediment and turbidity. With this method, the probe uses its optics to emit a near-infrared light into the water. It then measures the light that bounces back from the water's suspended particles. If an obstruction is in the emitted light's range, the light will scatter back and the turbidity reading will be too high.

Model Description

The OBS-3+ has optics on the side of its body, which allows you to avoid obstructions above or below the probe. The OBS300 has optics on the end of its body, which allows you to avoid obstructions around the sides of the probe.

Channels

Each OBS sensor has two channels—one channel measures the lower turbidity range and the other channel measures the higher turbidity range. When the OBS sensor has a current output, the channel with the 4-20 mA output measures the lower turbidity range, and the channel with the 0 to 5 V output measures the upper turbidity range.

Ordering Information

Turbidity Sensors

When ordering an OBS-3+ or OBS300, you must choose a body option, output option, and turbidity option.

OBS-3+ Turbidity Sensor with optics on side of its body.

OBS300 Turbidity Sensor with optics at the end of its body.

Body Options (choose one)

-SB Stainless Steel Body (fresh water only; maximum submersion depth of 500 m)

-TB Titanium Body (fresh or salt water; maximum submersion depth of 1500 m)

Output Options (choose one)

-2.5 Supports our CR200(X)-series, CR510, or CR10(X) dataloggers; both channels have an output range of 0 to 2.5 V.

-5 Supports our CR800, CR850, CR1000, CR3000, CR5000, and CR9000(X) dataloggers; both channels have an output range of 0 to 5 V.

-20 Low channel has an output range of 4-20 mA, and the high channel has an output range of 0 to 5 V. A CURS100 is required.

Turbidity Range Options (choose one)

-T1 Measures the lower range of 0 to 250 NTUs or higher range of 0 to 1000 NTUs.

-T2 Measures the lower range of 0 to 500 NTUs or higher range of 0 to 2000 NTUs.

-T3 Measures the lower range of 0 to 1000 NTUs or higher range of 0 to 4000 NTUs.

-T4 Measures the lower range of 0 to 2000 NTUs or higher range of 0 to 4000 NTUs.

-T5 Measures the range of 0 to 4000 NTUs on both channels.

Cables for Datalogger Attachment

Several cable choices are off ered for attaching the OBS sensor to the datalogger. The cables differ in their length.

21094 Cable with 5-m (16 ft) length

21307 Cable with 10-m (32 ft) length

21308 Cable with 15-m (49 ft) length.

21309 Cable with 20-m (66 ft) length.

21310 Cable with 25-m (82 ft) length.

21311 Cable with 30-m (98 ft) length.

Mechanical Wipers for the OBS-3+

A wiper can help ensure accurate measurements by preventing algae and other fouling from covering the lens of the OBS-3+.

HYDRO-WIPER-C Battery-powered, mechanical wiper with integrated timer and 1 m (3 ft) cable.

HYDRO-WIPER-D Datalogger-controlled wiper with a 5-m (16 ft) cable. It uses the datalogger's power supply.

HYDRO-WIPER-D-L Datalogger-controlled wiper with user-specified cable length; enter length, in meters, after the -L. A user-specified cable length takes more time to manufacture; delivery time is 4 to 6 weeks. This wiper uses the datalogger's power supply.

Other Accessories

21098 OBS-3+ or OBS300 Carrying Case (holds 2)

20915 5-Point Sedimentation Calibration (must send Campbell Scientific a dry sample of sedimentation from the water that will be monitored)

CURS100 Current Shunt Module is required for our dataloggers to read a 4-20 mA signal (output option -20)

Specifications

- Operating Temperature Range: 0° to 40°C
- Drift Over Time: <2% per year
- Maximum Data Rate: 10 Hz
- Operating Wavelength: 850 nm ±5 nm
- Daylight Rejection: -28 dB (re: 48 mW cm^{-2})
- Optical Power: 2000 µW
- Turbidity Accuracy: 2% of reading or 0.5 NTU (whichever is larger)
- Housing material: 316 stainless steel or titanium
- Warm Up Time: 2 s
- Connector: MCBH-5-FS, wet-pluggable
- Diameter: 2.5 cm (0.98 in)
- Height
  OBS-3+: 14.1 cm (5.56 in)
  OBS300: 13.1 cm (5.15 in)
- Weight: 181.4 g (0.4 lb)

Maximum Depth

- Stainless-Steel Body: 500 m (1640.5 ft)
- Titanium Body: 1500 m (4921.5 ft)

Concentration

	Mud	Sand
Maximum Range*	5,000 mg/l to 10,000 mg/l	50,000 mg/l to 100,000 mg/l
Accuracy	2% of reading or 1 mg/l (whichever is larger)	4% of reading or 10 mg/l (whichever is larger)

Power

	Voltage Output	Current Output
Input Voltage	5 to 15 Vdc	9 to 15 Vdc
Current Drain	5 mA	45 mA

**Maximum concentration depends on sediment size, particle shape, and reflectivity.*

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Campbell Scientific, Inc.
July 20, 2016

FUSION
SUPERFILTER

US Water Systems Fusion Superfilters Chemsorb, Calcite, Carbon, Bone Char and Katalox-Light

USWater systems.com

Owners Manual

1. **Read all instructions carefully before operation.**
2. **Avoid pinched o-rings during installation by applying (provided with install kit) NSF certified lubricant to all seals.**
3. **This system is not intended for treating water that is microbiologically unsafe or of unknown quality without adequate disinfection before or after the system.**

US Water Systems
1209 Country Club Road
Indianapolis, IN 46234
1-800-608-8792
WWW.USWATERSYSTEMS.COM

REVISION # 1.2
REVISION DATE October 23, 2014

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Unpacking / Inspection

Be sure to check the entire unit for any shipping damage or missing parts. Also note damage to the shipping cartons. Contact US Water Systems at 1-800-608-8792 for all damage and loss claims. A damage claim must be made within 24 hours of receipt of the unit or the claim may not be honored.
Small parts, needed to install the softener, are in a parts bag. To avoid loss of the small parts, keep them in the parts bag until you are ready to use them.

Safety Guide

For your safety, the information in this manual must be followed to minimize the risk of electric shock, property damage or personal injury.

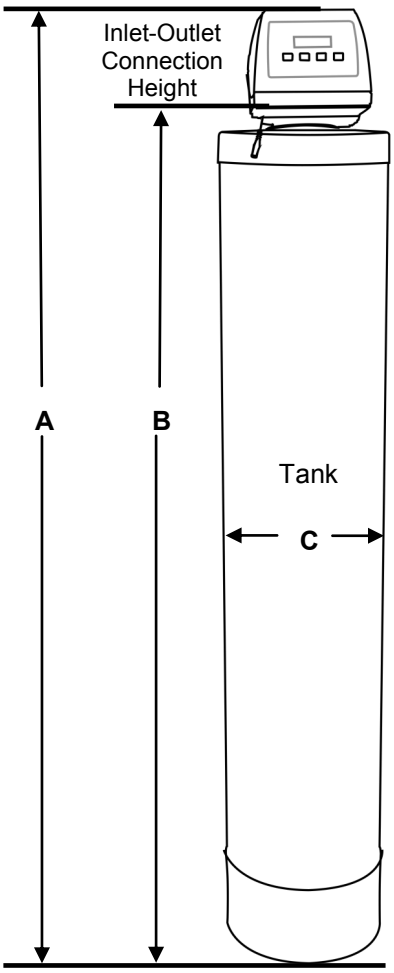
- Check and comply with your provincial / state and local codes. You must follow these guidelines.
- Use care when handling the filter tank. Do not turn upside down, drop, drag or set on sharp protrusions.
- The system works on 12 volt-60 Hz electrical power only. Be sure to use only the included transformer.
- Transformer must be plugged into an indoor 120 volt, grounded outlet only.
- **WARNING**: This system is not intended for treating water that is microbiologically unsafe or of unknown quality without adequate disinfection before or after the system.

Proper Installation

This water filter system must be properly installed and located in accordance with the Installation Instructions before it is used.

- ***Do not*** install or store where it will not be exposed to temperatures below freezing or exposed to any type of weather. Water freezing in the system will break it. Do not attempt to treat water over 100°F.
- ***Do not*** install in direct sunlight. Excessive sun or heat may cause distortion or other damage to non-metallic parts.
- Properly ground to conform with all governing codes and ordinances.
- Use only *lead-free solder and flux* for all sweat-solder connections, as required by state and federal codes.
- Maximum allowable inlet water pressure is 125 psi. If daytime pressure is over 80 psi, night time pressure may exceed the maximum. Use a pressure reducing valve to reduce the flow if necessary.
- ***WARNING:*** Discard all unused parts and packaging material after installation. Small parts remaining after the installation could be a choke hazard.

Overall System



Model	Tank Size	A	B	C
FSF-150	10” X 54”	60.25”	57.25”	10”
FSF-200	12” X 52”	58.25”	55.25”	12”
FSF-250	13” X 54”	60.25”	57.25”	13”
FSF-300	14” x 65”	72.25”	68.25”	14”
FSF-400	16” x 65”	72.25”	68.25”	16”
FSF-500	18” x 65”	72.25”	68.25”	16”

Specifications

Specifications	CHEMSORB SEDIMENT FILTER			
	FSF-150	FSF-200	FSF-250	FSF-300
Service Flow Rates				
Normal	6.0 GPM	7.0 GPM	10.0 GPM	15 GPM
Peak	8.0 GPM	10.0 GPM	15.0 GPM	20.0 GPM
Micron Rating	5 micron	5 micron	5 micron	5 micron
Backwash Flow Rate	7.0 GPM	9.0 GPM	11.0 GPM	No Button
Filter Media Volume - Cubic Feet	1.5 FT3	2.0 FT3	2.5 FT3	3.0 FT3
Filter Tank Size	10" X 54"	12" X 52"	13" X 54"	14" X 65"
Tank Jacket	YES	YES	YES	NO
Plumbing Connections	3/4" or 1"			
Electrical Requirements	Input 120V 60 Hz - Output 12V 650mA			
Water Temperature	Min 39 - Max. 100 degrees Fahrenheit			
Water Pressure	Min. 20 - Max 125 psi			

Specifications	GAC AND CATALYTIC CARBON FILTER				
	FSF-150	FSF-200	FSF-250	FSF-300	FSF-400
Service Flow Rates					
Normal	6.0 GPM	8.0 GPM	10.0 GPM	12.0 GPM	15.0 GPM
Peak	8.0 GPM	10.0 GPM	13.0 GPM	15.0 GPM	20.0 GPM
Backwash Flow Rate	5.0 GPM	7.0 GPM	11.0 GPM	No Button	No Button
Filter Media Volume - Cubic Feet	1.5 FT3	2.0 FT3	2.5 FT3	3.0 FT3	4.0 FT3
Filter Tank Size	10" X 54"	12" X 52"	13" X 54"	14" X 65"	16" X 65"
Tank Jacket	YES	YES	YES	NO	NO
Plumbing Connections	3/4" or 1"				
Electrical Requirements	Input 120V 60 Hz - Output 12V 650mA				
Water Temperature	Min 39 - Max. 100 degrees Fahrenheit				
Water Pressure	Min. 20 - Max 125 psi				

Specifications	CALCITE				
	FSF-150	FSF-250			
Service Flow Rates					
Normal	4.0 GPM	8.0 GPM			
Peak	6.0 GPM	10.0 GPM			
Backwash Flow Rate	5.0 GPM	11.0 GPM			
Filter Media Volume - Cubic Feet	1.5 FT3	2.5 FT3			
Filter Tank Size	10" X 54"	13" X 54"			
Tank Jacket	NO	NO			
Plumbing Connections	3/4" or 1"				
Electrical Requirements	Input 120V 60 Hz - Output 12V 650mA				
Water Temperature	Min 39 - Max. 100 degrees Fahrenheit				
Water Pressure	Min. 20 - Max 125 psi				

Specifications

Specifications	BONE CHAR				
	FSF-150	FSF-200	FSF-250	FSF-300	FSF-400
Service Flow Rates					
Normal	6.0 GPM	8.0 GPM	10.0 GPM	12.0 GPM	15.0 GPM
Peak	8.0 GPM	10.0 GPM	13.0 GPM	15.0 GPM	20.0 GPM
Backwash Flow Rate	5.0 GPM	7.0 GPM	11.0 GPM	No Button	No Button
Filter Media Volume - Cubic Feet	1.5 FT3	2.0 FT3	2.5 FT3	3.0 FT3	4.0 FT3
Filter Tank Size	10" X 54"	12" X 52"	13" X 54"	14" X 65"	16" X 65"
Tank Jacket	YES	YES	YES	NO	NO
Plumbing Connections	3/4" or 1"				
Electrical Requirements	Input 120V 60 Hz - Output 12V 650mA				
Water Temperature	Min 39 - Max. 100 degrees Fahrenheit				
Water Pressure	Min. 20 - Max 125 psi				

Specifications	KATALOX LIGHT				
	FSF-100	FSF-150	FSF-200	FSF-250	
Service Flow Rates					
Normal	3.0 GPM	6.0 GPM	12.0 GPM	15.0 GPM	
Peak	5.0 GPM	10.0 GPM	15.0 GPM	20.0 GPM	
Backwash Flow Rate	5.0 GPM	5.0 GPM	7.0 GPM	11.0 GPM	
Filter Media Volume - Cubic Feet	1.0 FT3	1.5 FT3	2.0 FT3	2.5 FT3	
Filter Tank Size	9" X 48"	10" X 54"	12" X 52"	13" X 54"	
Tank Jacket	YES	YES	YES	YES	
Plumbing Connections	3/4" or 1"				
Electrical Requirements	Input 120V 60 Hz - Output 12V 650mA				
Water Temperature	Min 39 - Max. 100 degrees Fahrenheit				
Water Pressure	Min. 20 - Max 125 psi				

- Continuous operation at flow rates greater than the service flow rate may affect capacity and efficiency performance.
- The manufacturer reserves the right to make product improvements which may deviate from the specifications and descriptions stated herein, without obligation to change previously manufactured products or to note the change.
- Peak flow rates are intended for intermittent use only and are for residential application only
- At the stated service flow rates, the pressure drop through these devices will not exceed 15 psig

Before Starting Installation

Tools, Pipe, and Fittings, Other Materials

- Pliers
- Screwdriver
- Teflon tape
- Razor knife
- Two adjustable wrenches
- Additional tools may be required if modification to home plumbing is required.
- Plastic inlet and outlet fittings are included with the filter. To maintain full valve flow, 3/4” or 1” pipes to and from the filter fittings are recommended. It is important to maintain the same, or larger, pipe size as the water supply pipe, up to the softener inlet and outlet.
- Use copper, brass, or PEX pipe and fittings.
- Some codes may also allow PVC plastic pipe.
- ALWAYS install the included bypass valve, or 3 shut-off valves. Bypass valves let you turn off water to the filter for repairs if needed, but still have water in the house pipes.
- 5/8” OD drain line is needed for the valve drain.

Sizing Requirements

Water Pressure

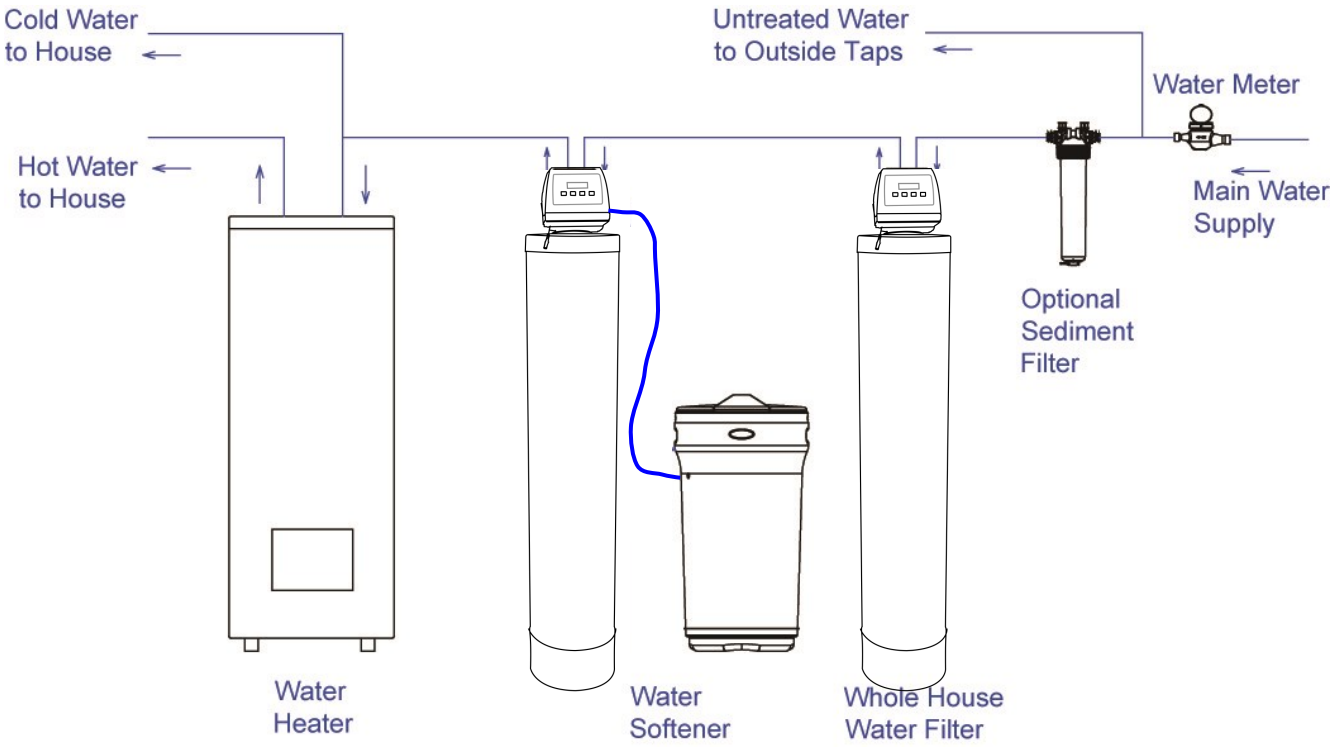
The water system must have a pump large enough to deliver the recommended backwash rate with a minimum pressure at the inlet of the filter of 30 psi. If the existing system cannot do this, it must be upgraded to do so. Whenever possible, the water system should be adjusted to deliver at least 30 psi for even more satisfactory results.

Backwash Flow Rates

The most important criteria in sizing a filter is the capacity of the pump. The water must pass through the filter media at the proper service flow rate. The filter must also be backwashed at a flow rate sufficient to dislodge and remove the captured particles. Failure to provide sufficient water will cause a build-up of particles in the filter media, impairing its ability. In order for your filter to backwash and rinse properly, your pump must be capable of providing the backwash flow rates indicated on page 4 & 5.

Where To Install The Filter

- Place the filter tank as close as possible to the pressure tank (well system) or water meter (city water).
- Place the filter tank as close as possible to a floor drain, or other acceptable drain point (laundry tub, sump, standpipe, etc.).
- Connect the filter to the main water supply pipe BEFORE the water heater. **DO NOT RUN HOT WATER THROUGH THE FILTER**. Temperature of water passing through the filter must be less than 100 deg. F.
- Do not install the filter in a place where it could freeze. **Damage caused by freezing is not covered by the warranty.**
- Put the filter in a place water damage is least likely to occur if a leak develops. The manufacturer will not repair or pay for water damage.
- A 120 volt electric outlet, to plug the included transformer into, is needed within 6 feet of the filter. The transformer has an attached 6 foot power cable. **Be sure the electric outlet and transformer are in an inside location, to protect from wet weather.**
- If installing in an outside location, you must take the steps necessary to assure the filter, installation plumbing, wiring, etc., are as well protected from the elements, contamination, vandalism, etc., as when installed indoors.
- **Keep the filter out of direct sunlight**. The sun's heat may soften and distort plastic parts.



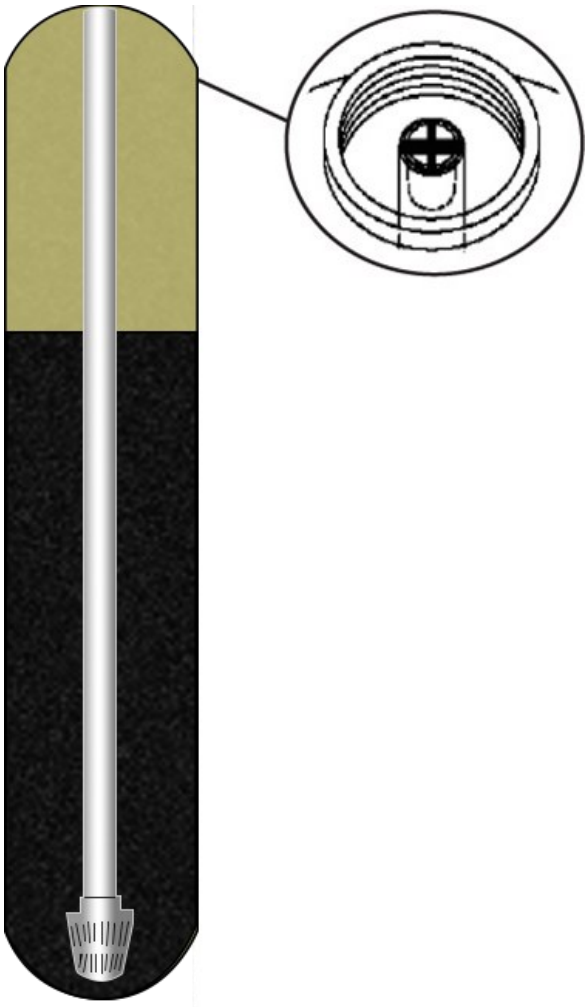
Filter Preparation

Fusion Backwashing Filter Tank Installation Instructions

WATER PRESSURE: A minimum of 20 pounds of water pressure is required for regeneration valve to operate effectively.
ELECTRICAL FACILITIES: An uninterrupted alternating current (A/C) supply is required. Note: Other voltages are available. Please make sure your voltage supply is compatible with your unit before installation.
EXISTING PLUMBING: Condition of existing plumbing should be free from lime and iron buildup. Piping that is built up heavily with lime and/or iron should be replaced.
LOCATION OF FUSION NLT TANK AND DRAIN: The Infusion tank should be located close to a drain to prevent air breaks and back flow.
CAUTION: Water pressure is not to exceed 80 psi, water temperature is not to exceed 110°F (43°C), and the unit cannot be subjected to freezing conditions.

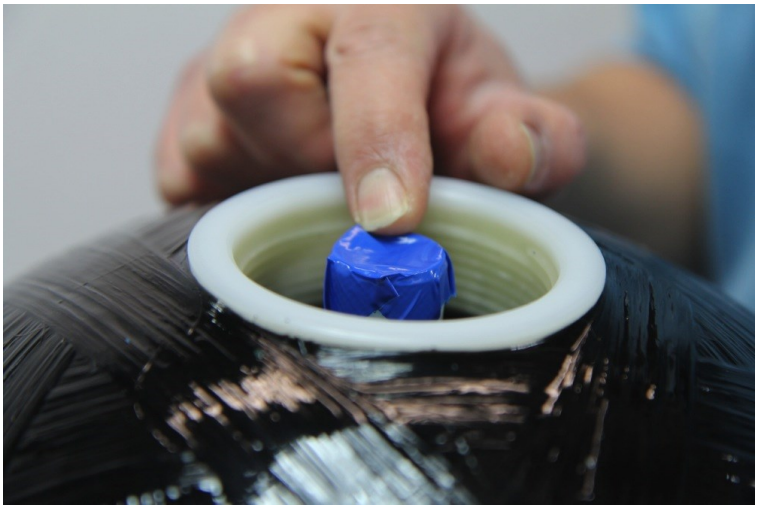
Media Installation

1) Remove the tank from carton.
2) Verify the riser tube is centered in the bottom center of the tank. A flashlight may be necessary. The distributor tube will be flush with the top of the tank when it is centered.



Filter Preparation

3) Place a piece of duct tape over the riser tube so no media enters the riser while filling.

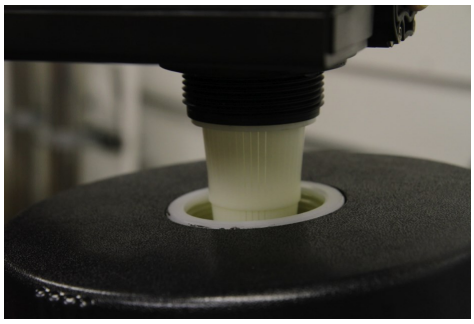
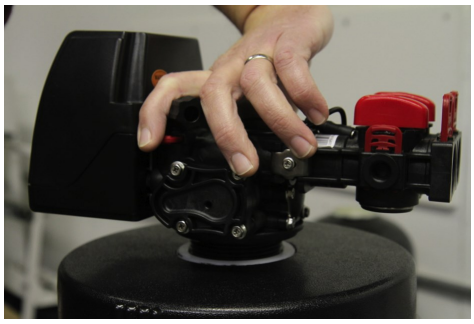
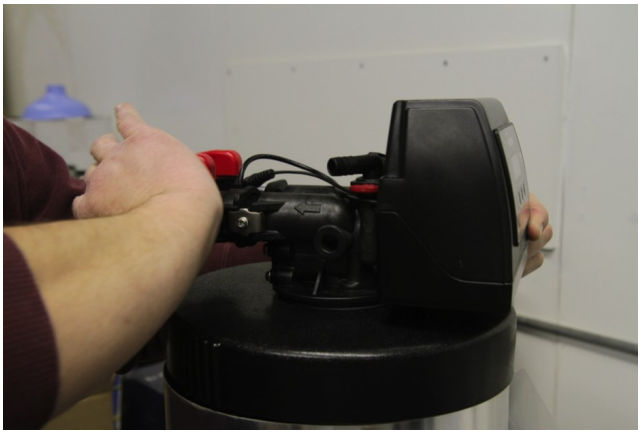


4) Use the Blue Funnel provided, to pour the gravel and media into the tank. Pour the gravel into the tank first, then the media. Pour the gravel and media evenly around the hole to ensure it is well distributed in the tank and pour slow enough, to keep from plugging the hole. A helper may be needed to hold the funnel during the filling process. It is recommended that a dust mask and safety goggles be worn to prevent possible injury. A shop vacuum can be used to capture dust during the filling procedure. Pour all the gravel and all the media shipped with the unit into the tank. US Water does not send extra/unused media.

5) When media is installed move tank side to side to settle the media. Remove the funnel and tape from the distributor tube.

Filter Preparation

6) Lubricate the distributor O-ring and the tank O-ring on the bottom of the control valve. Then install the upper basket on the bottom of the valve by lining up the tabs then turning the basket clockwise to lock it in place. Place the upper basket over the distributor tube and push the valve on the tank. Thread the valve on the tank by turning it clockwise. Be sure not to cross-thread the valve on the tank. Tighten the valve hand tight, then snug it further by tapping it with the palm of the hand. DO NOT use tools to tighten the valve or damage could occur.

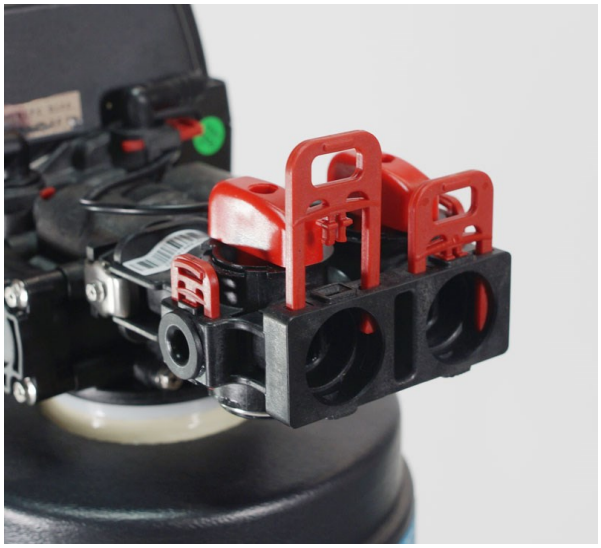
Installation Instructions

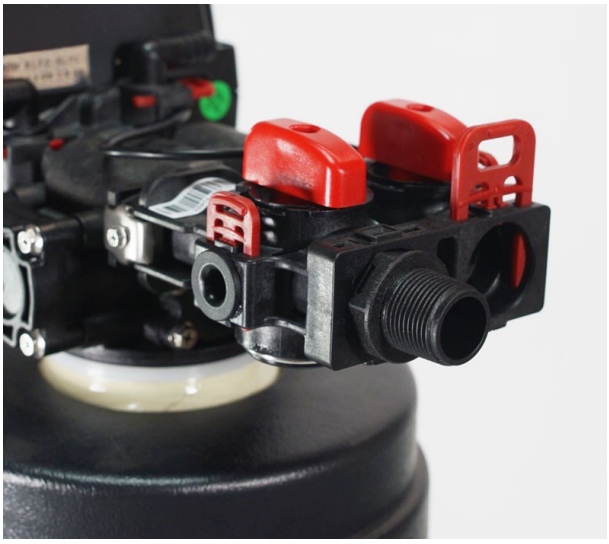
1. If your hot water tank is electric, turn off the power to it to avoid damage to the element in the tank.
2. If you have a private well, turn the power off to the pump and then shut off the main water shut off valve. If you have municipal water, simply shut off the main valve. Go to the faucet, (preferably on the lowest floor of the house) turn on the cold water until all pressure is relieved and the flow of water stops.
3. Locate the filter tank close to a drain where the system will be installed. The surface should be clean and level.
4. Connect the inlet and outlet of the filter using appropriate fittings. Perform all plumbing according to local plumbing codes. Pressure gauges should be added in some applications. There is a drawing on page 27 that shows gauge location.
    - **ON COPPER PLUMBING SYSTEMS BE SURE TO INSTALL A GROUNDING WIRE BETWEEN THE INLET AND OUTLET PIPING TO MAINTAIN GROUNDING WHEN APPLICABLE.**

Any solder joints being soldered near the valve must be done before connecting any piping to the valve. Always leave at least 6" (152 mm) between the control valve and joints being soldered when soldering pipes that are connected to the valve. Failure to do this could cause damage to the valve.

The Fusion Backwashing Filter is equipped with 1” removable connectors. It is recommended that these connectors are installed in the plumbing fitting using Teflon tape then lubricate the o-ring on the connector. Remove the red clips and push the connectors into the bypass valve once they are tight in the plumbing fitting. The red clips can then be re-installed to secure the connectors in the bypass valve.

The inlet and outlet can be identified on the bypass valve. There are arrows stamped in the bypass valve showing flow (See page 18 diagram). The arrow pointing toward the valve is the inlet and the arrow pointing away from the valve is the outlet.



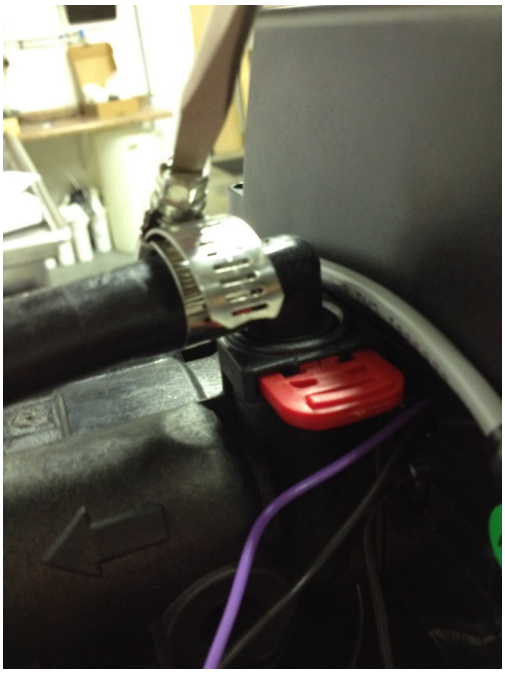


All piping should be secured to prevent stress on the bypass valve and connectors.

Installation Instructions

5. Connect the drain hose to the filter valve and secure it with a hose clamp. Run the drain hose to the nearest laundry tub or floor drain. This can be ran overhead or down along the floor. Drain hose should be a minimum of 1/2". If running the drain line more than 20 ft overhead, it is recommended to increase the hose size to 3/4". A DIRECT CONNECTION INTO A WASTE DRAIN IS NOT RECOMMENDED. A PHYSICAL AIR GAP OF AT LEAST 1.5" SHOULD BE USED TO AVOID BACTERIA AND WASTEWATER TRAVELING BACK THROUGH THE DRAIN LINE INTO THE FILTER.

Hose barb fitting for drain line. Be sure to use a hose clamp to secure the line.



Be sure to secure the drain line. The softener will drain with force and it should be secured to prevent a leak. Hose clamps should be used to secure the drain line at the connection points.

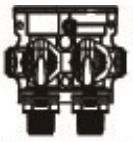
Installation Instructions

6. Using the Allen Key (included), place the unit in the bypass position (See page 18 for by-pass valve handle placement). Slowly turn on the main water supply. At the nearest cold treated water tap nearby remove the faucet screen, open the faucet and let water run a few minutes or until the system is free of any air or foreign material resulting from the plumbing work.

7. Make sure there are no leaks in the plumbing system before proceeding. Close the water tap when water runs clean.
8. Proceed to start up instructions.

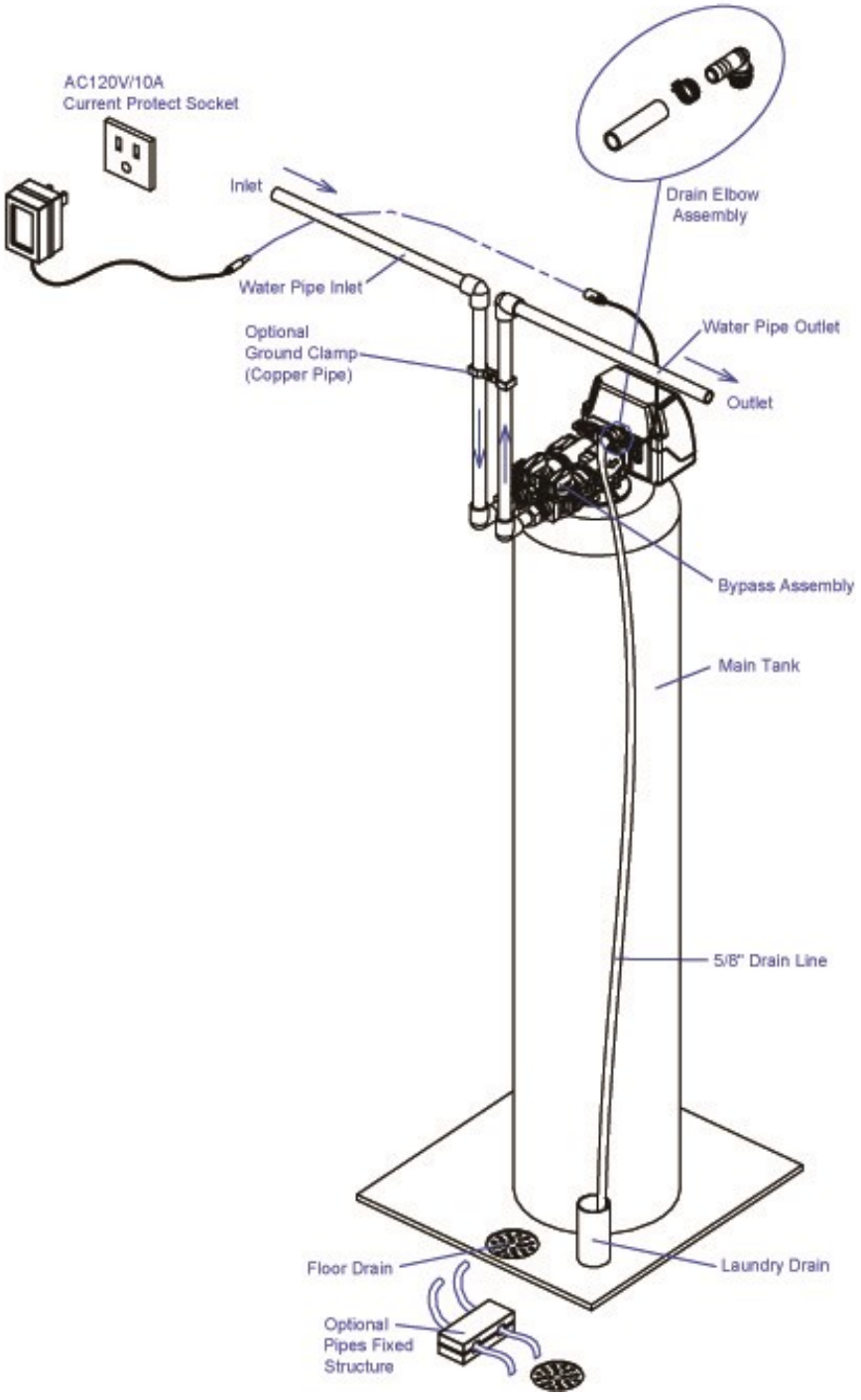
Note: The unit is not ready for service until you complete the start-up instructions.

Filter Installation



Service Position

Bypass Position



System Start-Up

Key Pad Configuration

SET-TINGS	This function is to enter the basic set up information required at the time of installation.
MANUAL REGEN	This function is to initiate an immediate or delayed manual regeneration.
DOWN / UP	Increase or decrease the value of the settings while in the programming mode.

Manual Regeneration (Step / Cycle Valve)

DELAYED REGENERATION

Press and release the MANUAL REGEN. Button to set a delayed regeneration that will occur at the regeneration time. The main display page will show DELAYED REGEN ON. To cancel press and release the MANUAL REGEN. Button. The main display page will show DELAYED REGEN OFF.

IMMEDIATE REGENERATION

To start an immediate regeneration (or step valve through each position), press and hold the MANUAL REGEN. Button for 3 seconds (until beeps). The valve will start an immediate regeneration. Press any key to skip to the next cycle.

Start-up Instructions

1. Plug the valve into an approved power source.
2. When power is supplied to the control, the screen will display “INITIALIZING WAIT PLEASE” while it finds the service position.
3. Start an Immediate Manual Regeneration. The valve will immediately start moving to the BACKWASH position.
4. Partially open the inlet on the bypass valve **slowly** and allow water to enter the unit. Allow all air to escape from the unit before turning the water on fully then allow water to run to drain for 3-4 minutes or until all media fines are washed out of the softener indicated by clear water in the drain hose.

KATALOX SYSTEMS SHOULD BE BACKWASHED FOR A MINIMUM OF 1 HOUR. IN SOME CASES ADDITIONAL RINSING MAY BE NEEDED. For Katalox filters, when the valve is in the backwash position, unplug the power cord for the valve. This will keep the unit in the backwash cycle. Allow the system to backwash for 1 hour, then plug the power cord back in and go to step 5. All other media types can use the general backwash in Step 4.

5. Press any button to advance to the RINSE position. Slowly open the bypass inlet valve during the rinse cycle until it is fully opened. Check the drain line flow. Allow the water to run for 3-4 minutes or until the water is clear.
6. The valve will automatically advance to the SERVICE position after the RINSE cycle is complete. Open the outlet valve on the bypass, then open the nearest treated water faucet and allow the water to run until clear, close the tap and replace the faucet screen.
7. Program time, date, and number of days between regenerations into controller using the following Programming Instructions

Backwash Frequency

Contact US Water Systems at 1-800-608-8792 to help with the backwash frequency setting. This can be adjusted by the home owner to suite their individual needs with frequencies available from 1 – 99 days.

Programming Instructions

Settings

Press SETINGS key (3 SECONDS / BEEP)

VALVE MODE
B.W. FILTER

TIME OF DAY
12:01 PM

YEAR
2012

MONTH
AUGUST

DAY
21

REGEN DAYS
3 DAYS

GALLONS
OFF

REGEN TIME
12:00 AM

PROGRAMMING COMPLETE

TIME OF DAY, YEAR, MONTH, DAY,
Time of day is for normal operation of system and the scheduling of the regeneration time. The date is used in a diagnostic function to track the last time the system regenerated.

REGEN DAYS
This value is the number of days between regenerations or back washes to clean the filters.

GALLONS
Default value is OFF. This should not be changed.

REGEN TIME
This setting determines the time of day to perform a scheduled regeneration. The normal regen time for a filter is 12:00 AM.

FUSION SUPERFILTER PROGRAMMING	
Press and hold the Manual and Settings buttons for 3-5 seconds	
Languge	English
Units	Gallons
Vac Mode	Off
Press and hold the Up and Down arrows for 3-5 seconds	
Valve Mode	B.W. Filter
BW	10
RR	10
Press and hold the Settings button for 3-5 seconds	
Time of Day and Date	Set by Customer
Regen Days	3
Gallons	Off
Regen Times	Set by Customer

About The System

Control Operation During A Power Failure

In the event of a power failure, the valve will keep track of the time and day for 48 hours. The programmed settings are stored in a non-volatile memory and will not be lost during a power failure. If power fails while the unit is in regeneration, the valve will finish regeneration from the point it is at once power is restored. If the valve misses a scheduled regeneration due to a power failure, it will queue a regeneration at the next regeneration time once power is restored.

Main Display

The main display page will pause on the Date and Time page for 5 seconds. Then it will continually scroll through all of the system diagnostic display pages. Depending on the Valve Type some pages will not be displayed. To manually scroll through the diagnostics, press the down or up key. To reset the TOTAL REGENS, TOTAL GALLONS OVER RUN TOTAL, or PEAK flow rates, press and hold the MENU until the value changes to zero.

PARAMETER	DESCRIPTION
JULY/17/2012 8:30 PM	Month, Day, Year, Time
TOTAL 1,500 GAL REMAIN 1,200 GAL	The total amount is the system capacity when fully regenerated. The remaining is the capacity left in the system.
LAST REGEN 9/24/12	The date of the last regeneration.
TOTAL REGENS 10	The total number of regenerations.
TOTAL GALLONS 001590 GAL	The total amount of gallons treated by the system.
TOTAL 4 DAYS REMAIN 3 DAYS	The number of days remaining before regeneration. This option is only in filter mode.
OVER RUN TOTAL 0000 GAL	The total amount of water that has exceeded the system capacity over the last 4 regenerations. When remaining goes to zero, the gallons used will be added to over run total.
CURRENT 1.5 GPM PEAK 6.5 GPM	The current flow rate and the peak flow rate since the last regeneration.
DELAYED REGEN OFF	Advises whether a delayed regeneration has been scheduled manually or automatically.
REGEN TIME 12:00 AM	The current setting for regeneration time.
VALVE MODE B.W. FILTER	The current setting of the valve mode.

Regeneration Process

Periodically the filter will require a back wash to clean the trapped particles and unpack the filter bed to restore the system flow rates. The table below explains the regeneration steps.

Step	Name	Description
#1	Back Wash	Fresh water is introduced to the bottom of the tank flowing upwards expanding the filter media to rinse out any dirt or small particles to the drain and to un-compact the bed to restore full service flow rates.
#2	Rinse	Fresh water is introduced from the top of the tank flowing down through the filter bed rinsing any unfiltered water to the drain.

New Sounds

You may notice new sounds as your filter operates. The regeneration cycle lasts up to 30 minutes. During this time, you may hear water running intermittently to the drain.

Automatic Raw Water Bypass During Regeneration

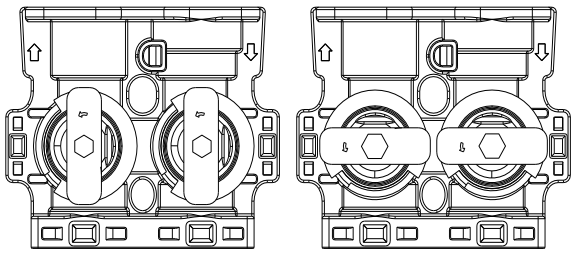
The regeneration cycle can last 30 minutes after which filtered water service will be restored. During regeneration, un-filtered water is automatically bypassed for use in the household. Hot water should be used as little as possible during this time to prevent un-filtered water from filling the water heater. This is why automatic regeneration is set for sometime during the night and manual regenerations should be performed when little or no water will be used in the household.

Normal regeneration time is 2:00 AM.

Manual Bypass

In the case of emergency you can isolate your water filter from the water supply using the bypass valve located at the back of the control. In normal operation the bypass is open with the on/off knobs in line with the inlet and outlet pipes.

To isolate the filter, simply rotate the knobs clockwise (as indicated by the word BYPASS and arrow) until they lock. You can use your water related fixtures and appliances as the water supply is bypassing the filter. However, the water you use will be hard. To resume water service, open bypass valve by rotating the knobs counterclockwise.



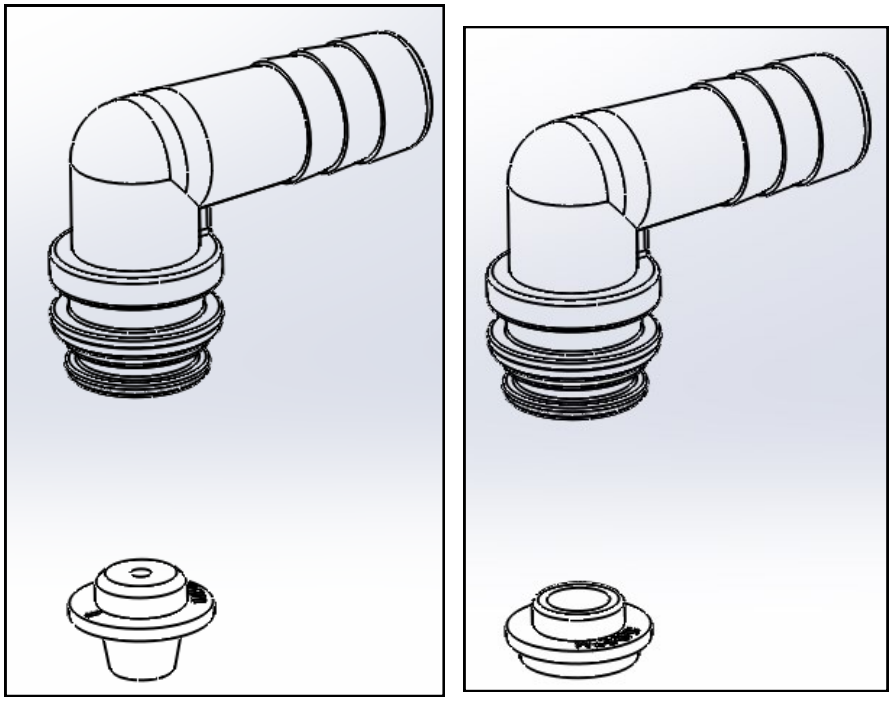
SERVICE POSITION BYPASS POSITION

Maintenance

Maintenance of your new water filter requires very little time or effort but it is essential. Regular maintenance will ensure many years of efficient and trouble-free operation.

1. Periodically make sure your pump is performing satisfactorily to ensure sufficient water is available for backwashing the filter.
2. Periodically test your raw and filtered water to ensure conditions are still the same for your original settings and that the unit is working they way it is intended to. Water testing is often the best way to determine when the filter media will require replacement.
3. Periodically check that the drain line is clear and free from any obstructions.

Replacing Drain Line Flow Control (DLFC)

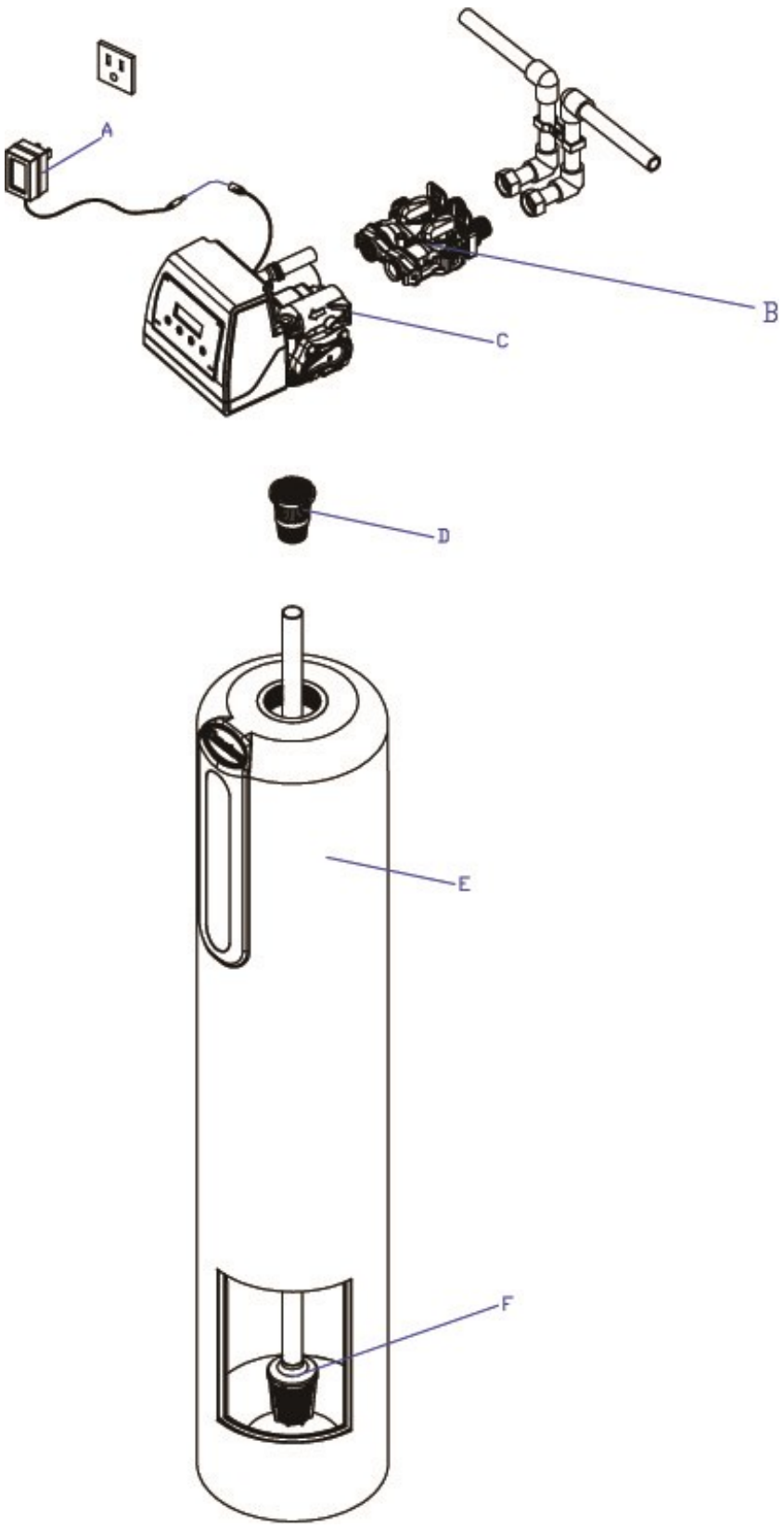


1. Remove the red clip that secures the drain line elbow.
2. Remove the BLFC washer from the elbow fitting.
3. Reassemble using the reverse procedure.

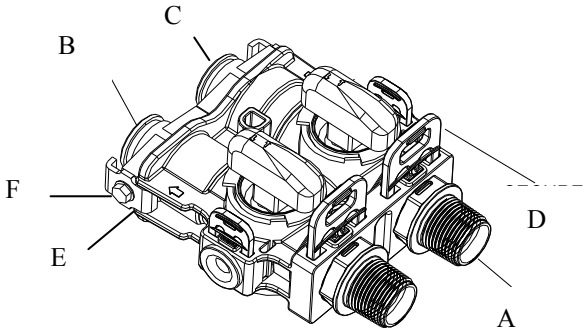
Main Repair Parts

REPLACEMENT PARTS - FILTER			
Replacement Part Number	Part Description	DWG #	Quantity
60010052	POWER TRANSFORMER 120V-12V	A	1
60010002	BYPASS / METER	B	1
10010063	485 UP DOWN FLOW FILTER VALVE	C	1
60010048	TOP CONE	D	1
25020041	844 TANK (75)	E	1
25020042	948 TANK (100)	E	1
25020043	1054 TANK (150)	E	1
25010058	1252 TANK (200)	E	1
25030007	1465 TANK (300)	E	1
50010005	DISTRIBUTOR 1X54	F	1

Filter Exploded View

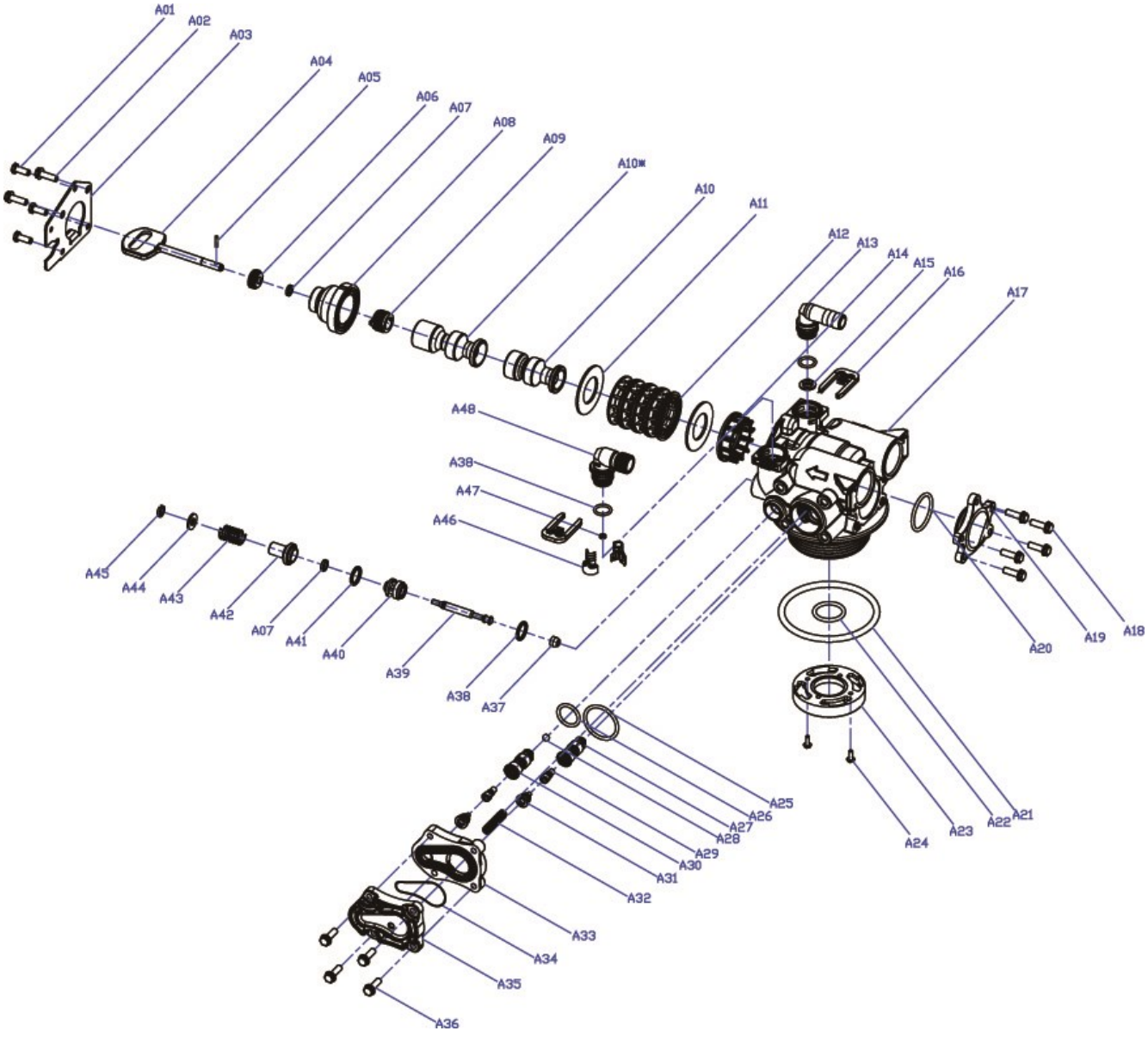


Main Repair Parts - Connectors



REPLACEMENT PARTS - CONNECTORS			
Replacement Part Number	Part Description	DWG #	Quantity
60010020	3/4" NPT ELBOW	A	2
60010019	1" NPT STRAIGHT	A	2
60010023	3/4" NPT STRAIGHT	A	2
60010079	VALVE COUPLING INLET	B	1
60010101	VALVE COUPLING OUTLET (METER SIDE)	C	1
60010025	PLASTIC SECURE CLIP	D	2
60010046	BYPASS SS CLIP	E	2
60010047	BYPASS SS SCREW	F	2

Control Valve Exploded View

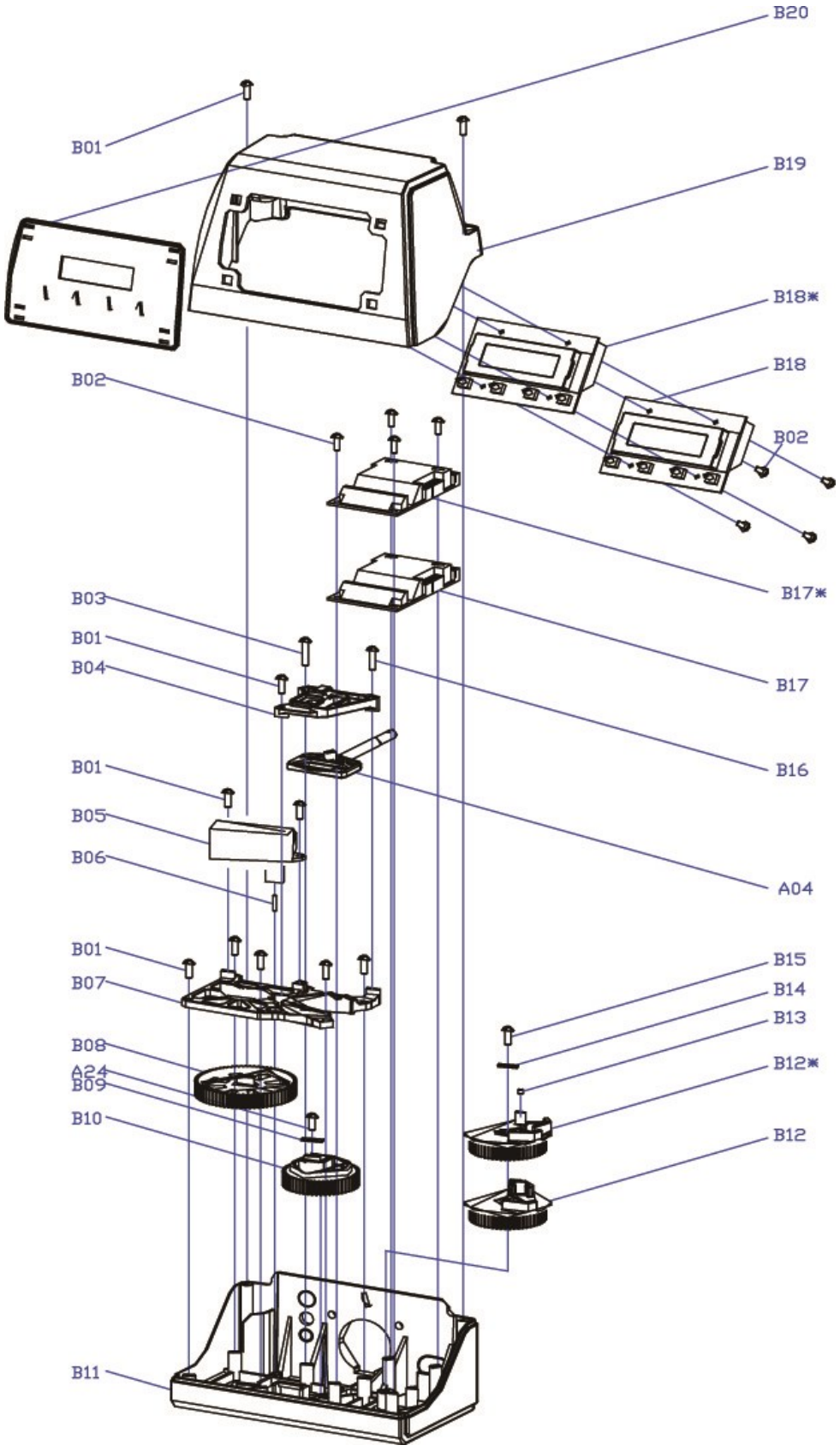


VALVE REPAIR PARTS LIST			
Replacement Part Number	Part Description	Replacement Part Number	Part Description
60010127	INJECTOR SET #0000 BLACK	60010129	85HE UPFLOW PISTON ASSEMBLY
60010126	INJECTTOR SET #000 GREY	60010171	85HE DOWNFLOW PISTON ASSEMBLY
60010035	INJECTOR SET #00 VIOLET	60010130	85HE SEAL & SPACER KIT
60010034	INJECTOR SET #0 RED	60010131	85HE DLFC #1 1.5 GPM
60010033	INJECTOR SET #1 WHITE	60010132	85HE DLFC #2 2.0 GPM
60010032	INJECTOR SET #2 BLUE	60010133	85HE DLFC #3 2.4 GPM
60010031	INJECTOR SET #3 YELLOW	60010135	85HE DLFC #5 3.5 GPM
60010128	BLFC 0.2 GPM	60010136	85HE DLFC #A 5.0 GPM
60010110	BLFC 0.3 GPM	60010137	85HE DLFC #B 7.0 GPM
60010082	BLFC 0.7 GPM	60010138	85HE DLFC #C 10.0 GPM

Control Valve Parts List

485HE CONTROL VALVE (DOWNFLOW)				
Replacement Part Number	MFG Part Number	Part Description	DWG #	Quantity
	5056087	Screw-M5x12(Hexagon)	A01	3
	5056088	Screw-M5x16(Hexagon With Washer)	A02	2
	5056047	End Plug Retainer	A03	1
	5031016	BNT85HE Piston Rod	A04	1
	5056097	Piston Pin	A05	1
	5031015	BNT85HE Quad Ring Plug Cover	A06	1
	5056070	Quad Ring	A07	2
	5031011	BNT85HE End Plug	A08	1
	5031014	BNT85HE Piston Retainer	A09	1
	5057001	BNT85HE Piston(Electrical Downflow)	A10	1
	5056073	Seal	A11	5
	5056021	Spacer	A12	4
	5010082	Drain Fitting-B	A13	1
	5031005	BNT85HE Spacer	A14	1
	5056186	DLFC-2#	A15	1
	5056172	Secure Clip-s	A16	2
	5031002	BNT85HE Valve Body	A17	1
	5056508	Screw-M5x12(Hexagon With Washer)	A18	5
	5030004	BNT85 End Cover	A19	1
	5030013	O-Ring-¢30×2.65	A20	1
	5056063	O-Ring-¢78.74×5.33	A21	1
	26010103	O-Ring-¢25×3.55	A22	1
	7060007	Valve Bottom Connector	A23	1
	13000426	Screw-ST2.9X13(Large Washer)	A24	2
	5031022	O-Ring-¢32×3	A25	1
	5031021	O-Ring-¢18×3	A26	1
	5031013	Injector Plug Body	A27	1
	30110007	Plastic Ball ¢6	A28	1
	30040089	Injector Throat	A29	2
	5031012	BNT85HE Injector Fixed Sleeve	A30	1
	30040090	Injector Nozzle	A31	2
	5056103	Injector Screen	A32	1
	5031003	BNT85HE Injector Cover Body	A33	1
	5031018	O-Ring-¢40×2.65	A34	1
	5031004	BNT85HE Injector Cover Cap	A35	1
	5031027	Screw-M5x25(Hexagon With Washer)	A36	4
	5056075	Seal Mat	A37	1
	5056134	O-Ring-¢12×2	A38	3
	5056054	Injector Stem	A39	1
	5056031	Injector Spacer	A40	1
	5056081	O-Ring-¢12.5×1.8	A41	1
	5056030	Injector Cap	A42	1
	5056093	Injector Screen	A43	1
	5010049	Special Washer	A44	1
	5056105	Retaining Ring	A45	1
	5031010	BNT85HE BLFC Fixed Sleeve	A46	2
	5056076	BLFC-2#	A47	1
	5005629	Injector Fitting(3/8".Elbow)	A48	1

Power Head Exploded View



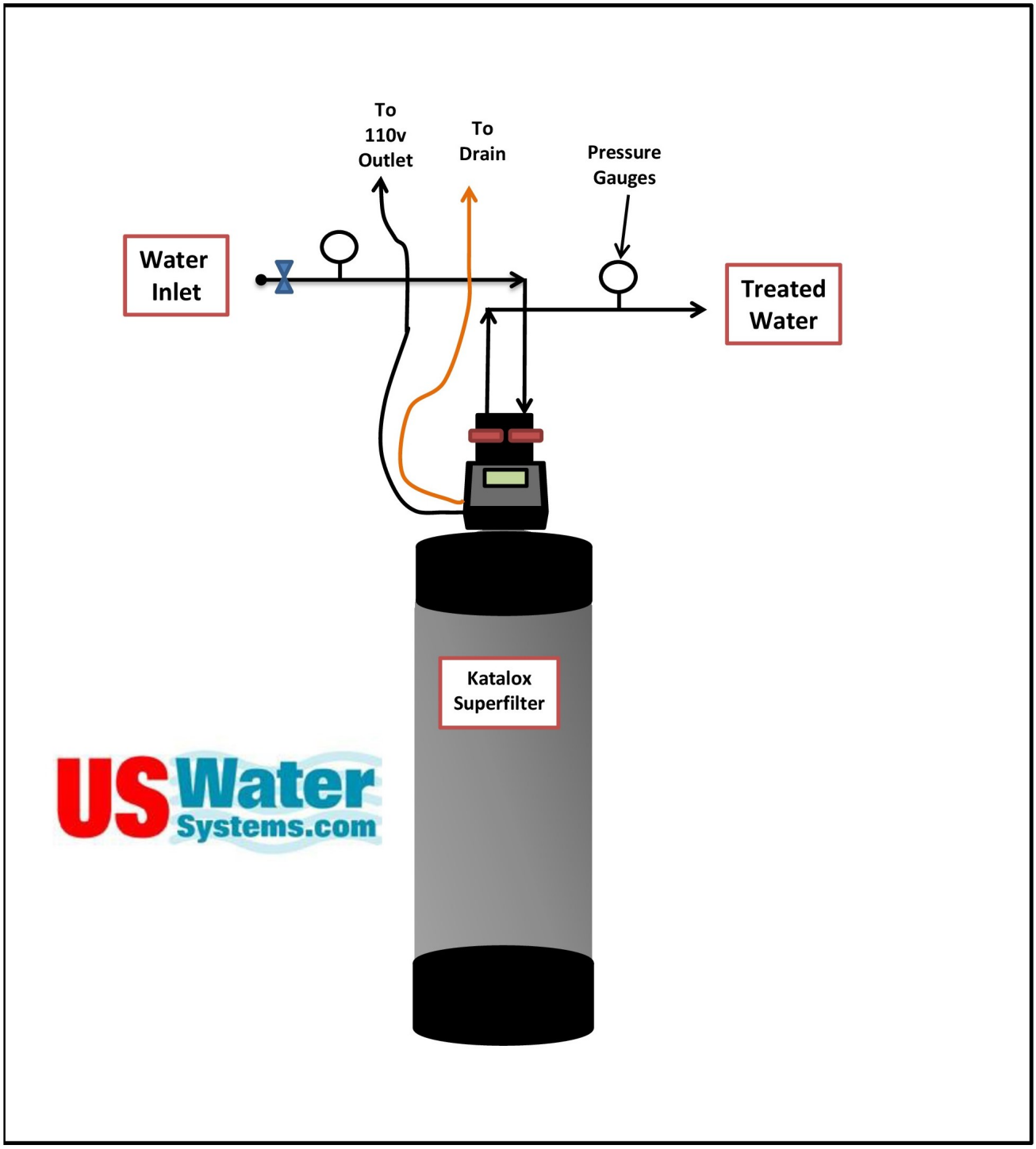
Power Head Parts List

485HE POWER HEAD (DOWNFLOW)				
Replacement Part Number	MFG Part Number	Part Description	DWG #	Quantity
	5056084	Screw-ST3.5X13	B01	10
	5010037	Screw-ST2.9X10	B02	9
	13000416	Screw-ST3.5X25	B03	1
	5031007	BNT85HE Piston Rod Guide Plate	B04	1
	5056510	Motor-12v/2rpm	B05	1
	5030014	Motor Power Cable		1
	11700005	Wire Connector		2
	5056098	Motor Pin	B06	1
	5031006	BNT85HE Mounting Plate	B07	1
	5030009	BNT85 Drive Gear	B08	1
	13000426	Screw-ST2.9X13(Large Washer)	A24	2
	5056139	Washer-3x13	B09	1
	5030007	BNT85 Main Gear	B10	1
	5030005	BNT185 Housing	B11	1
	5031017	BNT85HE Brine Gear(Downflow)	B12	1
	5010023	Magnet(3×2.7)	B13	1
	5056141	Washer-4x12	B14	1
	5056166	Screw-ST4.2X12(Large Washer)	B15	1
	5031016	BNT85HE Piston Rod	A04	1
	5010036	Screw-ST3.5X16	B16	1
	5031026	BNT85HE Main Pcb(Downflow)	B17	1
	5010031	Meter Assembly		1
	5010046	Meter Strain Rlief		1
	5010029	Power Cable		1
	5010035	Power Strain Rlief		1
	19010105	Wire Rope-3×100		2
	5031024	BNT85HE Display(Downflow)	B18	1
	5030021	BNT85 Wiring Harness		1
	5030003	BNT85 Cover	B19	1

Trouble Shooting

Issue	Possible Cause	Possible Solution
A. Unit fails to initiate a regeneration cycle.	1. No power supply.	Check electrical service, fuse, etc.
	2. Defective circuit board.	Replace faulty parts.
	3. Power failure.	Reset time of day.
B. FILTER BLEEDS TASTE AND ODOR OR SEDIMENT	1. By-pass valve open.	Close by-pass valve.
	2. Electrical service to unit has been interrupted	Assure permanent electrical service (check fuse, plug or switch)
	3. Defective or stripped media bed	Replace media
	4. Quality of water has worsened	Have water sample analyzed to determine any change
	5. Filter capacity too small	Replace with larger unit or add another filter
	6. Filter not backwashing enough	Be sure control is not clogged or drain line restricted. Be sure water pressure has not dropped and that pump has sufficient capacity.
	7. Leak between valve and central tube.	Check if central tube is cracked or o-ring is damaged. Replace faulty parts.
	8. Internal valve leak.	Replace valve seals, spacer, and piston assembly.
C. Low water pressure.	1. Iron or scale build up in line feeding unit.	Clean pipes.
	2. Iron build up inside valve or tank.	Clean control and add resin cleaner to clean bed. Increase regeneration frequency.
	3. Inlet of control plugged due to foreign material.	Remove piston and clean control valve.
D. Filter media in drain line.	1. Air in water system.	Check well system for proper air eliminator control.
	2. Incorrect drain line flow control (DLFC) button.	Check for proper flow rate.
E. Valve continuously cycles.	1. Defective position sensor PCB.	Replace faulty parts.
F. Flow to drain continuously.	1. Valve settings incorrect.	Check valve settings.
	2. Foreign material in control valve.	Clean control.
	3. Internal leak.	Replace seals, spacers, and piston assembly.

Pressure Differential Gauge Installation



FUSION
SUPERFILTER

Limited Lifetime Warranty

For the lifetime of the original purchaser, at the original residential place of installation of this *Fusion Katalox Light Superfilter* Water Conditioning System, *US WATER SYSTEMS, INC.* warrants the following:

LIFETIME COVERAGE

Media Tanks

Free of all costs to you except transportation and labor charges, we warrant that we will replace or repair the fiberglass media tank, if for any reason it is found to be defective, because of faulty materials or workmanship.

SEVEN YEAR COVERAGE

Valve Assembly & Electronics

We warrant that for seven (7) years from the date of purchase, we will replace the valve assemblies or electronic components at no charge to you except for transportation and standard labor charges. Electronics damaged due to environmental issues or improper installation are not covered.

US Water Systems.com

MADE IN USA

GENERAL PROVISIONS

This warranty does not apply to any commercial or industrial installations or to any part of the water conditioner which has been subjected to misuse, neglect, alteration or accident; or to any damage caused by fire, flood, freezing, Acts of God, or any other casualty, or if the original serial numbers have been removed.

These warranties are in lieu of all other warranties expressed. or implied, and we do not authorize any person to assume for us any other obligation on the sale of this water conditioner. No responsibility is assumed for delays or failure to meet these warranties caused by strike, government regulations or other circumstances beyond the control of *US WATER SYSTEMS, INC.*.

TO OBTAIN WARRANTY SERVICE, CALL OR WRITE: *US WATER SYSTEMS, INC. 1209 COUNTRY CLUB ROAD INDIANAPOLIS, IN 46234 (800) 608-USWA.*

ANY IMPLIED WARRANTIES OF FITNESS OR MERCHANTABILITY ARE LIMITED TO THE TERMS OF THIS EXPRESSED WARRANTY AND THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THOSE HEREIN. *US WATER* SHALL NOT BE LIABLE FOR ANY INCIDENTIAL OR CONSEQUENTIAL DAMAGES.

SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATIONS OF INCIDENTAL OR CONSEQUENTIAL DAMAGES SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE.

THIS WARRANTY MAY BE TRANSFRRED TO A SUBSEQUENT OWNER WITH WRITTEN APPROVAL OF *US WATER* AND PAYMENT OF STANDARD TRANSFER FEE.

CeraMetix®

10 Inch Ceramic Filter Candle

CeraMetix® filter elements utilize our class leading ceramic micro porous outer shell combined with our AquaMetix® core block technology.

AquaMetix® is made from the highest quality coconut shell based activated carbon and other superior adsorbent materials. Utilizing a unique compression molding manufacturing process, the base materials are melded into a solid block having a very uniform pore structure that ensures filtration consistency and high performance.

The ceramic shell and our AquaMetix® block combines mechanical filtration and physical adsorption processes to reduce a wide variety of drinking water contaminants of both aesthetic and health concerned. The dense pore structure and vast surface area of the compressed carbon and specialty adsorbents is ideally suited to improving taste and odor as well as reducing chlorine, chloramine, volatile organic compounds, MTBE, lead, mercury, asbestos, arsenic and fluoride. The cleanable ceramic shell is designed to remove suspended solids, pathogenic bacteria and cysts. The CeraMetix® elements have been tested in accordance with NSF protocols for cyst, turbidity, particulates, lead, chloramines and chlorine reduction (Class 1).

Contaminant Removals

Pathogenic bacteria—Cholera, Typhoid, Salmonella, E. Coli, Fecal Coliform—>99.9999% (ALcontrol Laboratories)

Cysts—Cryptosporidium Parvum, Giardia Lamblia—100% (ALcontrol Laboratories)

Sediment—100% absolute to 0.5 micron (IBR Laboratories)

Chloramines—>99% ANSI Standard 42—Capacity 600 gallons

Chlorine—>99% - Will remove chlorine for the life of the filter

Fluoride– 85% Reduction (SnowMass Water & Sanitation District Study)

Lead—>99% ANSI Standard 53—Capacity 500 gallons

VOC—Volatile Organic Compounds—>98%

Metals—Aluminum, Iron, Mercury, Nickel & Zinc—>98%

MTBE—>97%

Arsenic—>95&

Glyphosate—>99.9%

Pharmaceutical Compounds—Acetaminophen, Progesterone, Ibuprofen, Naproxen Sodium—>95%

Herbicides—>99%

Nitrates—>92%

(Independent laboratory tests — NSF/ANSI Std 42 & 53 Chemical Reduction Tests)

Capacity

600 Gallons based on Chloramines

Manufactured in England

AquaCera®

EV9328-06

High Flow CSR Triple-MC² System

Delivers premium quality water for combination applications

High Flow CSR Triple-MC² System: EV9328-06

MC² Replacement Cartridge: EV9612-56

EC210 Prefilter Cartridge: EV9534-26

SS-IMF Cartridge: EV9799-32

BENEFITS

One system provides premium quality water to high flow fountain dispensers, coffee makers and ice machines

New and improved Micro-Pure II media inhibits the growth of bacteria

Reduces chlorine taste and odor and other offensive contaminants that can adversely affect the taste of beverages

Precoat submicron technology reduces dirt and particles as small as 1/2 micron in size and reduces health contaminants such as cysts

Increases the overall efficiency of equipment

20" prefilter captures larger dirt particles

SR-X with SS-IMF cartridge inhibits scale buildup in ice machines and coffee brewers

Sanitary cartridge replacement is simple, quick and clean. Internal filter parts are never exposed to handling or contamination

NSF Certified under NSF/ANSI Standards 42 and 53

INSTALLATION TIPS

Choose a mounting location suitable to support the full weight of the system when operating

Use 3/4" water line

Fountain equipment connections are made to the outlet part of the system before the SR-X system

Coffee brewer and ice machine connections are made after the SR-X feeder; a tee is required

Install vertically with cartridges hanging down. Allow 2-1/2" clearance below the cartridge for easy cartridge replacement

Flush cartridges by running water through flushing valve for five minutes at full flow

OPERATION TIPS

Change cartridges on a regular 6 month preventative maintenance program

Change cartridges when capacity is reached or when pressure falls below 10 psi

Change SS-IMF cartridge before Hydroblend™ compound is completely used up

Change prefilter cartridge when excessively dirty

Always flush the filter cartridge at time of installation and cartridge change

APPLICATION/SIZING

For multiple equipment and combination applications

Combination of coffee brewers, espresso machines, hot chocolate dispensers, fountain and ice machines

Rated Capacity: 27,000 gallons

High Flow CSR Triple-MC² System

SPECIFICATIONS

Overall Dimensions:
25.59"H x 30"W x 6.74"D

Inlet connection: 3/4"

Outlet connection: 3/4"

Service Flow Rate:
Maximum 5.0 gpm (18.9 Lpm)

Rated Capacity: 27,000 gallons

Pressure Requirements:
10 - 125 psi (0.7 - 8.6 bar), non-shock

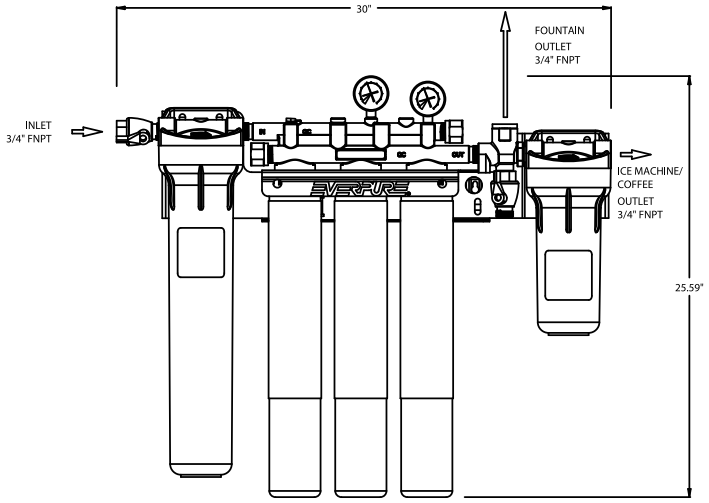
Temperature: 35 - 100°F (2 - 38°C)

No electrical connection required

Shipping Weight: 39 lbs.

Operating Weight: 49 lbs.

The contaminants or other substances removed or reduced by this drinking water system are not necessarily in your water. Do not use with water that is microbiologically unsafe or of unknown quality without adequate disinfection before or after the system. Systems certified for cyst reduction may be used with disinfected water that may contain filterable cysts.



WARRANTY

Everpure water treatment systems (excluding replaceable elements) are covered by a limited warranty against defects in material and workmanship for a period of five years after date of purchase. Everpure replaceable elements (filter cartridges and water treatment cartridges) are covered by a limited warranty against defects in material and workmanship for a period of one year after date of purchase. See printed warranty for details. Everpure will provide a copy of the warranty upon request.

System Tested and Certified by NSF International against NSF/ANSI Standard 42 and 53 for the reduction of:

Standard No. 42: Aesthetic Effects
- Chemical Unit
  - Taste and Odor Reduction
  - Chlorine Reduction
- Mechanical Filtration Unit
  - Particulate Reduction, Class I: 99.9+% reduction of particles one-half micron and larger in size

Standard No. 53: Health Effects
- Mechanical Filtration Unit
  - Turbidity Reduction
  - Cyst Reduction
  - Asbestos Reduction

Worldwide Headquarters:
EVERPURE, LLC
1040 Muirfield Drive
Hanover Park, Illinois 60133
Toll Free (800) 323-7873
Tel (630) 307-3000
Fax (630) 307-3030
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In Europe:
Pentair Water Belgium B.V./B.A.
Industriepark Wolfstee
Toekomstlaan 30
B-2200 Herentals
BELGIUM
TEL: +32.(0).14.283.500
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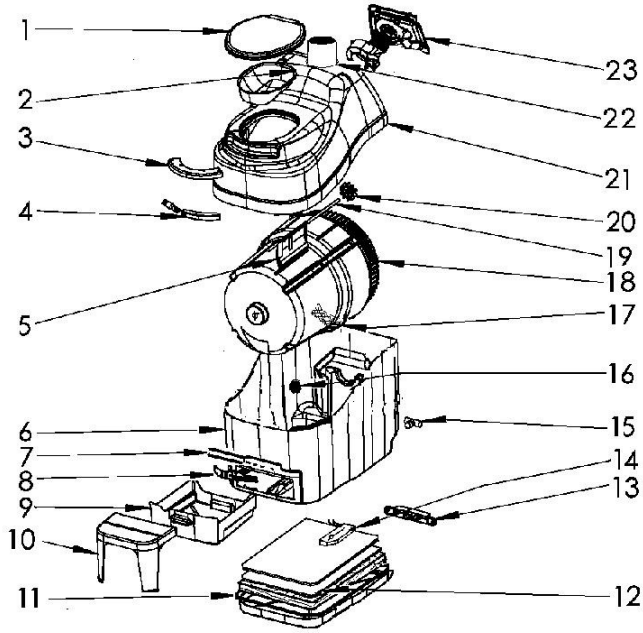
In Japan:
Hashimoto MN Bldg. 7F
3-25-1 Hashimoto Sagamihara-Shi
Kanagawa 229-1103
JAPAN
TEL: 81.(0)42.775.3011
FAX: 81.(0)42.775.3015

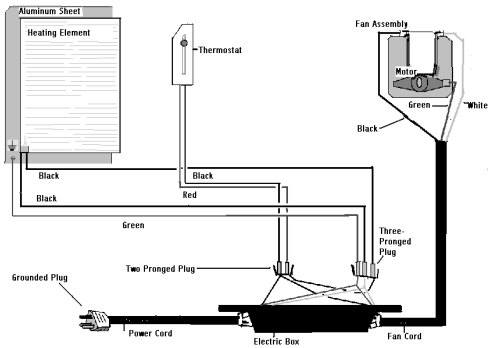
EXCEL SPECIFICATIONS

EXCEL EXPLOSION DIAGRAM & PART NUMBERS



1	Toilet Seat	9	Finishing Drawer	17	Drum Screen
2	Bowl Liner	10	Footrest	18	EXCEL Drum
3	Front Cover	11	EXCEL Heater Tray(Electric)	19	EXCEL SS Shaft Assembly
4	Handle Swivel	12	Heating Element(Electric)	20	Nylon Drive Gear
5	Plastic Drum Door	13	Electric Box (Electric)	21	EXCEL Top
6	EXCEL Tank	14	Thermostat Assembly(Electric)	22	Fan Assembly(Electric)
7	Footrest Channel	15	Emergency Drain	23	4" (100mm)Inlet Pipe (NE)
8	Drum Locker	16	Air Intake Vent		

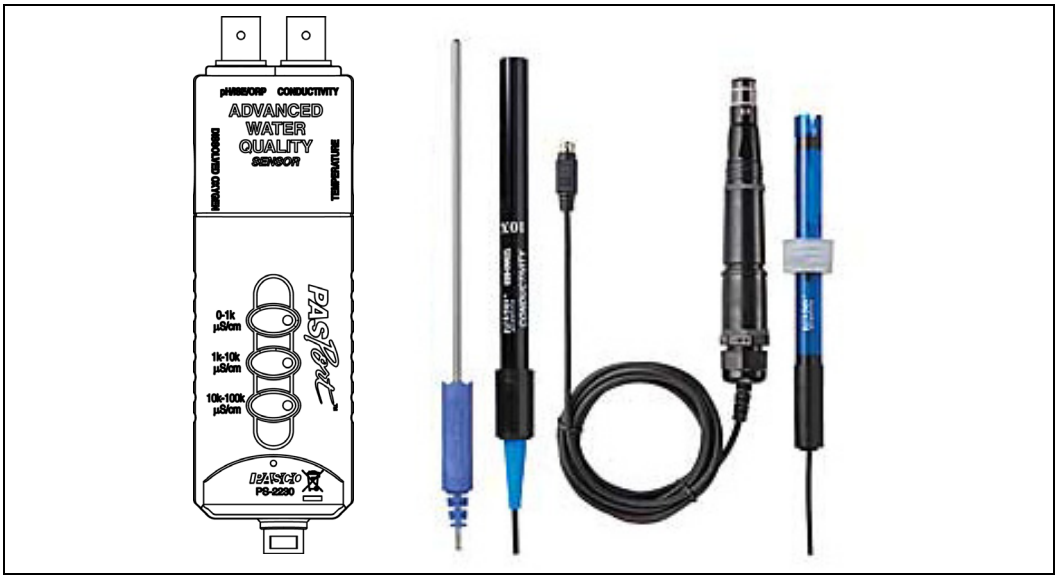
Wiring Diagram



Electrical Specifications	Excel 115V
Maximum Amps	2.4
Fan Watts (Required)	35 req.
Heater Watts (When on)	260
Average Power Use In Watts (Heater on 1/2 time)	150

Advanced Water Quality Sensor

PS-2230



Included Equipment	**Part Number**
Advanced Water Quality Sensor	PS-2230
Stainless Steel Temperature Probe	PS-2153
Conductivity Electrode (10x)	PS-2571
Optical Dissolved Oxygen Probe	003-14185
pH Electrode	PS-2573
Required Equipment	
PASPORT Interface and Software	See PASCO catalog or www.pasco.com
Optional Equipment	**Part Number**
Optical Dissolved Oxygen Probe Metal Guard	PS-2588
Skin/surface Temperature Probe	PS-2131
Conductivity Electrode (1x)	699-06620
Various Ion-selective Electrodes (ISE)	See PASCO catalog or www.pasco.com
Oxidation Reduction Potential (ORP) Electrode	CI-6716
Replacement Item	**Part Number**
Optical Dissolved Oxygen Probe Sensor Cap	PS-2587

Introduction

The PS-2230 Advanced Water Quality Sensor combines four sensors in a single unit:

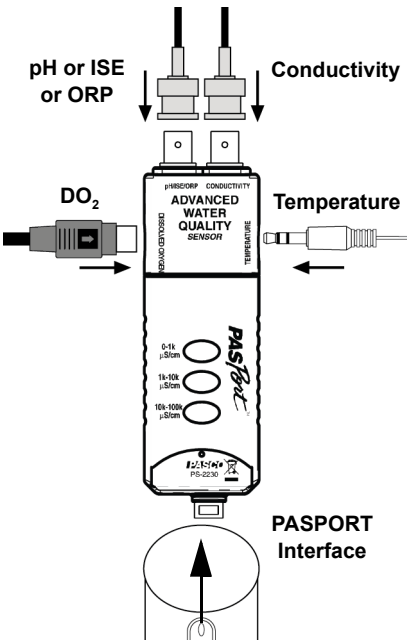
- Temperature
- Conductivity
- pH (or Ion-Selective Electrode, or Oxygen Reduction Potential, optional)
- Dissolved Oxygen (DO_2)

Note: The Optical Dissolved Oxygen Probe also measures barometric pressure and solution temperature.

When connected to a PASPORT interface, the multi-sensor collects data at up to 2 samples per second from each component sensor. One component sensor can be used at a time or any combination can be used simultaneously. If you have a PASPORT interface that supports multiple sensors, or if you have more than one interface connected to your computer, the Advanced Water Quality Sensor can be used in combination with other PASPORT sensors.

Note: No electrical interference will occur between two or more probes connected to a single Advanced Water Quality Sensor.

Sensor, Interface, and Software Setup



Connect the multi-sensor to your PASPORT interface as pictured (right). Connect any or all of the included probes to the multi-sensor. (You can leave any probe disconnected if you do not plan to use it.) If you will be using an ion-selective electrode or oxygen reduction potential electrode, connect it to the pH/ISE/ORP port.

Follow the instructions below to set up the sensor with PASCO Capstone, SPARKvue, SPARK SLS, or the Xplorer GLX (standalone).

For detailed information about each of the multi-sensor's component sensors, see the following pages.

Note: Only the tips and bodies of the probes should be immersed in liquid. Keep the connectors and body of the multi-sensor dry. The probe cables are immersible.

Capstone Setup

Connect the PASPORT interface using a Capstone supported interface. Build one or more displays for data. Click 'Record' to start data collection and 'Stop' to stop data collection.

Note that the sensor will collect data for probes that are not connected. These data are listed in the Data Summary and are displayed if selected on one or more displays. The default sampling rate and other parameters are defined with Hardware Setup in the Tool Palette. If needed, calibration is performed with the Calibration wizard in the Tool Palette. For more instructions on using Capstone, refer to the Capstone Online Help or User's Guide.

SPARKvue and SPARK SLS Setup

Connect the PASPORT interface directly to a SPARK SLS or to a computer using a SPARKvue supported interface. Build one or more displays for data. Press to start data collection and to stop data collection.

The default sampling rate is defined with Sampling Options. Calibration is performed with Experiment Tools > Calibrate Sensor. For more instructions on using the SPARKvue/SPARK SLS, refer to the SPARKvue/SPARK SLS Online Help or User's Guide.

Xplorer GLX Setup

If you are using an Xplorer GLX in standalone mode, press to start data collection.

Note that the sensor may collect data for probes that are not connected. Hide or ignore these measurements. To hide measurements that you do not need, open the Sensors screen (from the Home screen, press F4). In the Sensors screen you can also change the sampling rate and open the calibration dialog box. For more instructions on using the Xplorer GLX, refer to the GLX User's Guide.

Temperature

Use this component of the multi-sensor to measure the temperature of a fluid or object. The measurement can be displayed in units of °C, °F, or K. You can use the included stainless steel probe or a different probe, such as the Fast-response Probe (PS-2135) or Skin/Surface Probe (PS-2131). PASCO physics apparatus containing an embedded 10 kΩ thermistor can also be connected to the multi-sensor. The multi-sensor automatically detects the presence of a temperature probe, and it will only collect temperature data if a probe is connected.

Measuring Temperature

To measure temperature, connect the probe and start data collection. Immerse the tip of the probe in a fluid or place it in contact with an object. The included stainless steel probe can be used in both dry conditions and in liquids, such as water and other mild chemicals and solutions.

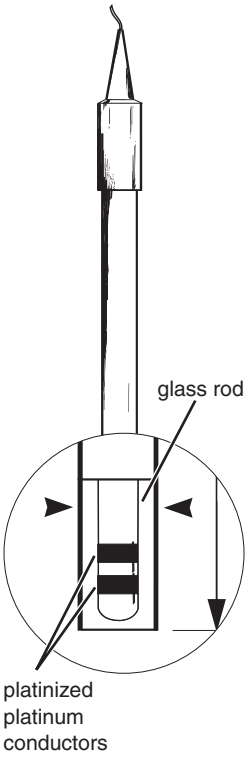
Tip: For better chemical resistance, use a Teflon® cover (CI-6549).

Temperature Calibration

The temperature measurement can be calibrated; however, for most applications calibration is not necessary. Use a two-point calibration with two standards of known temperature. Refer the SPARKvue/SPARK SLS, Capstone, or Xplorer GLX Online Help or User's Guide for calibration instructions.

Conductivity

The conductivity component sensor measures the electrolytic conductivity of aqueous solutions. It determines the conductivity by applying an alternating voltage to the electrode cell at the end of the probe and measuring the resulting current. You can use the included 10x electrode or an optional1x electrode (not included). In the software



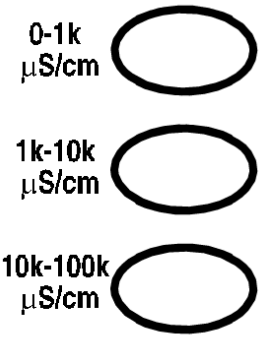
Conductivity Electrode

or on the interface select the **Conductivity (10x)** or **Conductivity (1x)** measurement, depending on which electrode you are using.

Note: The 10x probe can be used to measure conductivity up to 100000 μS/cm. The 1x probe has one tenth of the range (up to 10000 μS/cm) but ten times better resolution.

Measuring Conductivity

Before using the conductivity electrode, soak the end in distilled water for 5 to 10 minutes. Connect the electrode to the multi-sensor and start data collection. Immerse the end of the electrode in the solution to be measured and wait for the reading to stabilize. Rinse the electrode with deionized water before measuring a different solution.



The conductivity sensor has three ranges, which you select using the three buttons on the multi-sensor. To select a range, push one of the buttons: for 0 μS/cm to 1k (1000) μS/cm, for or 1k μS/cm to 10k μS/cm, or for 10k μS/cm to 100k μS/cm. Lights on the buttons indicate which range is selected. To determine which range is appropriate, look at the data (on a Graph display, for instance) while it is being collected; if the measurement appears to be "railed" at the top of the selected range (1k μS/cm or 10k μS/cm), select the next higher range. You can push a button to change the range without stopping data collection.

Note: The ranges specified above are for a 10x probe. Divide each range by 10 if you are using a 1x probe.

The conductivity electrode is sensitive to very low concentrations of dissolved solids, so you will probably never measure a sample with a conductivity of zero. A reading of 25 μS/cm for "pure" water is typical. True pure water is difficult to obtain and store. The table (right) lists typical conductivity values for common aqueous solutions at 25 °C.

Solution	Conductivity (μS/cm)
Ultra-pure Water	0.05 to 0.75
Drinking Water	50 to 1500
Ocean Water	~53000

As a rule of thumb, to estimate total dissolved solids (TDS) in parts per million (ppm), divide the conductivity in μS/cm by 2:

$$\text{TDS (ppm)} = \frac{\text{Conductivity (}\mu\text{S/cm)}}{2}$$

Conductivity Calibration

The conductivity measurement can be calibrated; however, for most applications calibration is not necessary. Use a one-point calibration with a standard solution of known conductivity. For instructions on preparing a standard solution, see Appendix A. Refer to the SPARKvue/SPARK SLS, Capstone, or Xplorer GLX User's Guide or Online Help for calibration instructions.

Conductivity Electrode Maintenance And Storage

To ensure accurate and reproducible results, the electrode must be clean. Substances on the electrode may contaminate the solution being tested and change the conductivity. To clean the electrode, dip the end into a detergent solution or dilute nitric acid (1%) and stir for three minutes, then rinse with deionized water.

For storage, dry the electrode and return it to its box. Before use, soak the electrode in distilled water for at least 5 minutes.

pH/ISE/ORP

The pH/ISE/ORP input of the multi-sensor is a specialized voltage sensor. Its BNC connector accepts the included pH electrode, as well as ISE and ORP electrodes (not included). The sensor measures the voltage produced by any of these electrodes. When used with a pH probe, the sensor also computes the pH based on the measured voltage.

Connect the pH electrode (or other electrode) to the pH/ISE/ORP port and start data collection. On your computer or interface, display the **ISE Voltage** measurement (this measurement is valid for pH and ORP electrodes as well as ISE) or the **pH** measurement for the calculated pH (assuming that the pH electrode is connected).

Measuring pH

The pH electrode produces a voltage proportional to the pH of the solution that it is immersed in. This voltage is measured by the multi-sensor, which computes pH.

Unscrew and remove the storage bottle from the electrode (be careful not to spill the storage solution). Push the O-ring and bottle cap up the electrode handle. Rinse the electrode tip with distilled water. If you see bubbles in the electrode bulb, gently shake the electrode downward (similar to shaking down a thermometer). Start data collection. Place the tip of the electrode in the solution to be measured and wait for the reading on your computer or interface to stabilize. Rinse the electrode with distilled water before measuring another solution.

pH Calibration

The pH measurement can be calibrated; however, for most applications calibration is not necessary. Perform a two-point calibration with two buffer solutions of known pH. Refer to the SPARKvue/SPARK SLS, Capstone, or Xplorer GLX User's Guide or Online Help for calibration instructions.

pH Electrode Maintenance and Storage

Cleaning

If the pH electrode becomes contaminated, use one of these methods to clean and restore it. After any of these procedures, soak the electrode in a pH 7 buffer solution for 30 minutes.

- **General Contamination:** Soak the electrode in 0.1 molar hydrochloric acid (HCl) for 15 minutes.
- **Protein Deposits:** Soak the electrode in a solution of 1% pepsin in 0.1 molar HCl.
- **Inorganic Deposits:** Rinse the electrode with 0.1 molar ethylene diamine tetra-acetic acid (EDTA) tetrasodium solution.
- **Oil and Grease Film:** Wash the electrode carefully in a mild detergent or a solvent known to be effective for the particular film.
- **Unknown Contamination:** Soak the electrode alternately in 12 molar sodium hydroxide (NaOH) and 1 molar HCl. Leave it in each solution for one minute. Rinse completely between soakings. End with HCl. (The NaOH etches the glass and the HCl reestablishes hydrogen ions on the surface.)

If these steps fail to improve the response of the electrode, replace it.

Storage

Store the pH electrode in the included electrode storage bottle with one of the following solutions. (Never store the electrode in distilled water.)

- **Short-term** (up to one week): pH 4 buffer solution or tap water.
- **Long-term** (over one week): 4 molar KCl solution (included with the electrode).

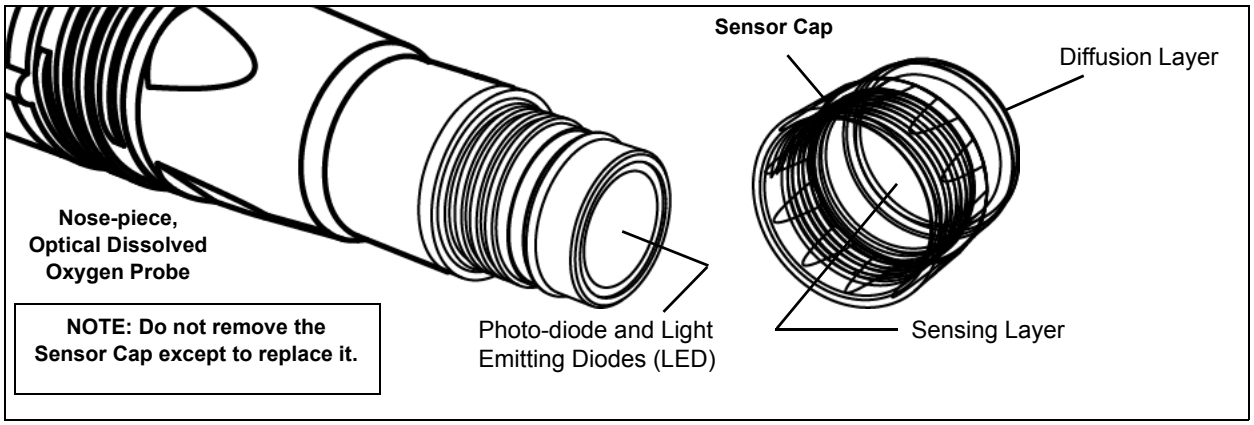
Dissolved Oxygen

The Optical Dissolved Oxygen Probe is designed to measure the concentration and the saturation percentage of dissolved oxygen molecules (O_2) in aqueous solutions.

The Optical Dissolved Oxygen Probe has several advantages when compared to a galvanic (electrochemical) dissolved oxygen sensor. The advantages include:

- no warm up time
- no calibration required
- no filling solution or electrode polishing
- no flow dependency

The sensing element of the Optical Dissolved Oxygen Probe is called the Sensor Cap. The sensing element has two layers, The outer layer is a paint that acts as an oxygen permeable diffusion layer which allows oxygen molecules to pass though while protecting the dye layer. The sensing layer is an immobilized polystyrene dye layer that luminesces when excited with light of the correct wavelength. The probe measures dissolved oxygen by emitting a blue light of the proper wavelength that causes the dye in the sensing layer to luminesce (glow) a red color. Oxygen dissolved in the sample being tested continually passes through the diffusion layer to the dye layer, affecting the luminescence lifetime and intensity of the dye. The sensor's photo-diode measures the lifetime of the luminescence as it is affected by the oxygen and compares the reading to a reference.



Factors that Affect Dissolved Oxygen Measurement

Factors that affect dissolved oxygen measurement include temperature, barometric pressure, and salinity.

Temperature: The rate of diffusion of oxygen through the Sensor Cap changes with temperature (approximately 1.5% per degree celsius). The Optical Dissolved Oxygen

Probe has a built-in thermistor, and the temperature changes are compensated for by proprietary algorithms that use readings from the thermistor.

Barometric Pressure: The partial pressure of oxygen in a sample of air or water is not affected by barometric pressure, but dissolved oxygen concentration in milligrams per liter is affected. The Optical Dissolved Oxygen Probe has a built-in barometer, and the reading from that device is used to determine the oxygen pressure during calibration.

Salinity: As the salinity of water increases, its ability to dissolve oxygen decreases. (Note: The user will be able to enter a value for the "salinity constant" in the data acquisition software.) For precise measurement of salinity, the PS-2195 Salinity Sensor is recommended (see the web site at www.pasco.com).

Water Type	Average Salinity
Fresh water	<0.5 ppt*
Brackish water	0.5 to 30 ppt
Sea water	33 to 47 ppt
Saline water	30 to 50 ppt
Brine	>50 ppt

*Salinity is a unit-less measurement determined from conductivity and temperature readings according to the Practical Salinity Scale. Historically, salinity values determined with the Practical Salinity Scale were given the designation "ppt" because these values were very close to those determine by the previously used method where the mass of dissolved salts in a given mass of water (parts per thousand) were reported.

Dissolved Oxygen Calibration

The Optical Dissolved Oxygen Probe is calibrated at the factory and does not need to be re-calibrated under most circumstances. However, if the Sensor Cap is replaced with a new Sensor Cap (PS-2587), then the Sensor Cap Calibration Code Coefficients (included with the new Sensor Cap) will need to be entered into the sensor using the PASCO data acquisition software. The sensor will then need to be re-calibrated. (See Appendix B.)

For a one-point calibration, you will need one "known standard" with 100% dissolved oxygen saturation.

For a two-point calibration, you will need two "known standards"; one with 100% dissolved oxygen saturation, and one with 0% dissolved oxygen saturation.

Refer to the SPARKvue/SPARK SLS, Capstone, or Xplorer GLX User's Guide or Online Help for calibration instructions, or go to the PASCO Web site at www.pasco.com and enter "Optical Dissolved Oxygen Sensor" or "PS-2196" in the Search window. Download the instruction manual PDF file under "User Resources".

Known Standards

One method for a known standard with 100% dissolved oxygen saturation is to use water-saturated air. Moisten the sponge inside the end of the Probe Cover (included with the probe) with water, and then put the probe into the Probe Cover for about fifteen minutes.

CAUTION: Do not push the Probe Cover on too tight or it might cause a pressure increase.

A second method for a known standard with 100% dissolved oxygen saturation is to use air-saturated water. Connect an air-stone to an air pump, and put the air-stone into water. Allow the air-stone and air pump to run for 10 minutes to make sure that the water is completely saturated.

For a known standard with 0% dissolved oxygen saturation, dissolve enough sodium sulfite in 150 milliliters of distilled water such that a small amount of sodium sulfite remains undissolved in the bottom of the beaker.

Probe Care and Maintenance

The sensing layer in the Optical Dissolved Oxygen Probe's Sensor Cap degrades over time due to bleaching caused by exposure to light, so the Sensor Cap must be replaced periodically. It should also be replaced if it is cracked, scratched, or damaged. The Sensor Cap is warranted for one year and may last much longer. The working life of a Sensor Cap may be extended by keeping it clean and properly stored between uses. The replacement for the Optical Dissolved Oxygen Probe Sensor Cap is model number PS-2587 (see www.pasco.com for more information).

NOTE: Do not remove the Sensor Cap except to replace it with a new cap.

To clean the Sensor Cap, rinse it with clean water and dry it with a lint free cloth. If necessary, use a mild detergent. ***Do not use alcohols or other organic solvents*** that may deteriorate the sensing layer. When changing the Sensor Cap, rinse the clear front surface of the nose-piece of the probe with clean water and then dry the surface with a lint free cloth or lens tissue.

Optical Dissolved Oxygen Probe Attacking Liquids

Alcohols will remove the paint layer of the Sensor Cap.

The following will remove the paint and dye layers of the Sensor Cap and will attack the probe housing as well:

Toluene	**Benzene**	**Carbon tetrachloride**	**Chloroform**
Methylene chloride	**Acetone**	**Methyl ethyl ketone**	**Organic solvents**

Storage

The Optical Dissolved Oxygen Probe should not be allowed to dry out. For storage, keep the Sensor Cap installed on the probe. Moisten the sponge that is in the end of the Probe Cover, and place the probe in the cover so that the Sensor Cap is next to the moist sponge.

Do *not* store the probe directly in water since that would encourage algae growth on the probe.

Appendix A: SpecificationsReference

General	
Included Sensors	Temperature, Conductivity, pH, Optical Dissolved Oxygen
Max. Sampling Rate	20 samples per second (for each component sensor)
Default Sampling Rate	2 samples per second
Temperature	
Range	−35 °C to +135 °C
Accuracy	±0.5 °C
Resolution	0.01 °C or better
Sensing Element	10 kΩ thermistor located in probe tip
Conductivity	
Range	three user-selectable ranges: 0 to 1000 μS/cm, 0 to 10000 μS/cm, 0 to 100000 μS/cm with included 10x probe 0 to 100 μS/cm, 0 to 1000 μS/cm, 0 to 10000 μS/cm with optional 1x probe
Accuracy	±10% of full scale without calibration
Resolution	better than 0.05% of full scale
pH/ISE/ORP probe voltage	
Electrode Connector	standard BNC
Input Resistance	1012 Ω
Voltage Range	−2000 mV to +2000 mV
Voltage Resolution	0.1 mV
pH Range	0 to 14
pH Resolution	0.001

Optical Dissolved Oxygen Probe	
Cable Length	3 meters
Response Time	90% in 35 seconds
Operating Temperature	0 to 50 °C
Operating Pressure	375 to 825 mm Hg
Range	0 to 20 mg per liter or 0 to 300% saturation
Resolution	0.01 °C or better
Accuracy	±0.6 mg per liter or ±3.0% right out of the box ±0.1 mg per liter or ±1.0%, whichever is greater, after calibration above 200% saturation, ±10%

Solutions for Conductivity Calibration

Reference Solution	Approximation Normality of Solution	Method of Preparation	Temperature (°C)	Electrical Conductivity[1] (µS/cm)
A	1	74.2480 g of KCl weighed in air per 1 L of solution at 20 °C	0	65176
			18	97838
			25	111342
B	0.1	7.4365 g of KCl weighed in air per 1 L of solution at 20 °C	0	7138
			18	11167
			25	12856
C	0.01	0.7440 g of KCl weighed in air per 1 L of solution at 20 °C	0	773.6
			18	1220.5
			25	1408.6
D	0.001	Dilute 100 mL of solution C to 1 L at 20 °C	0	77.69
			18	127.54
			25	148.93

[1]*Excluding the conductivity of the water used to prepare the solutions. These tabulated conductivity values are in international units. When using measuring instruments calibrated in absolute units, multiply the tabular values by 0.999505*

Appendix B: Optical Dissolved Oxygen Probe Replacement Cap Calibration

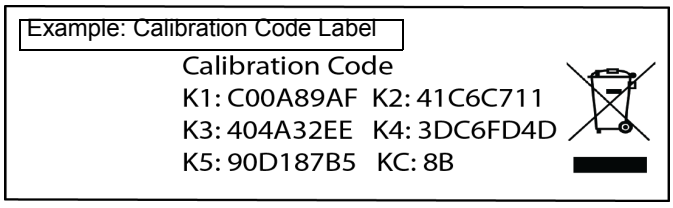
After a new replacement Sensor Cap (PS-2587) is placed on the Optical Dissolved Oxygen probe, there are two parts to the sensor calibration process.

1. With the probe connected to the sensor and the sensor connected to the PASCO Interface, use the data acquisition software to enter the Calibration Code coefficients (six groups of numbers labeled K1 to K5 and KC) for the replacement Sensor Cap into the sensor.

2. Perform a one-point calibration using a “known standard” such as air-saturated water. Alternatively, a two-point calibration could be performed using two calibration standard solutions.

3. Refer to the User’s Guide or Online Help for the PASCO software, or go to the PASCO web site at www.pasco.com and enter “Optical Dissolved Oxygen Sensor” or “PS-2196” in the Search window. Download the instruction manual PDF file under the User Resources tab.

Capstone: Calibration Code Coefficients



The replacement Sensor Cap comes with a Calibration Code Label (see the example).

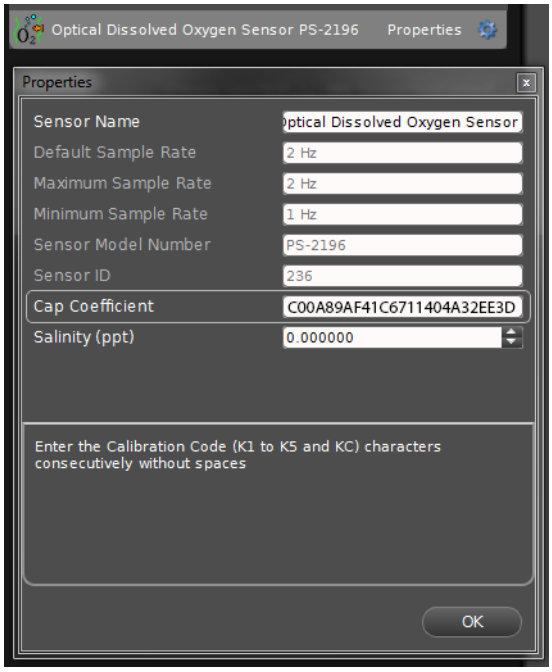
1. In Capstone, click the Hardware Setup icon ( ) in the Tools palette to open the Hardware Setup panel.

2. In the Hardware Setup panel, click the "Properties" icon ( ) in the lower right corner to open the Sensor Properties window.

3. Click "Cap Coefficient" and then enter the Calibration Code characters (K1 to K5 and KC) consecutively without spaces.

4. Click "OK" to close the Properties window.

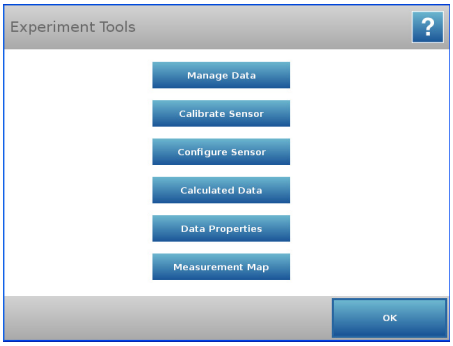
5. Perform a one-point or a two-point calibration. (Go to the PASCO web site at www.pasco.com and enter "Optical Dissolved Oxygen Sensor" or "PS-2196" in the Search window. Download the instruction manual PDF file under the User Resources tab.)



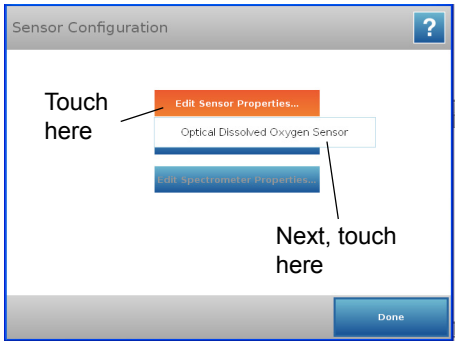
SPARK SLS: Calibration Code Coefficients

1. As in the calibration process, touch "Experiment Tools" in a display to open the "Experiment Tools" screen.

2. In the Experiment Tools screen, touch "Configure Sensor" to open the Sensor Configuration screen.

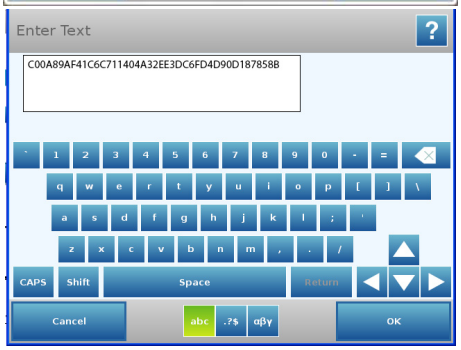


3. In the Sensor Configuration screen, touch “Edit Sensor Properties”. On the drop down menu, touch “Optical Dissolved Oxygen Sensor”.



4. The the “Edit Sensor Properties: Optical Dissolved Oxygen Sensor” screen opens. Touch “Set Cap Coefficients” to open the Enter Text screen.

5. Use the keyboard in the Enter Text screen to enter the Calibration Code Coefficients (K1 to K5 and KC). Enter the coefficients consecutively and without spaces. After the Calibration Code Coefficients have been entered, touch “OK”.



- NOTE: An error message screen will appear if the sensor is not connected to the interface, or the Calibration Code Coefficients were not entered properly. Press “OK”. Check the sensor connection or re-enter the Calibration Code Coefficients.

6. Perform a one point or two point calibration with “known standard” solutions. (Go to the PASCO web site at www.pasco.com and enter “Optical Dissolved Oxygen Sensor” or “PS-2196” in the Search window. Download the instruction manual PDF file under the User Resources tab.)

SPARKvue: Calibration Code Coefficients

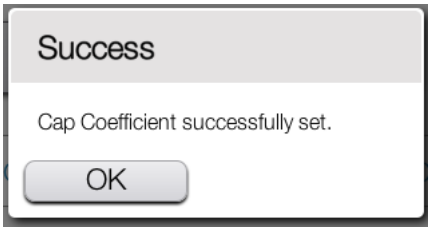
1. In SPARKvue, touch or click the "DO2 Saturation" measurement and then touch/click "Show" to open a Graph display screen.

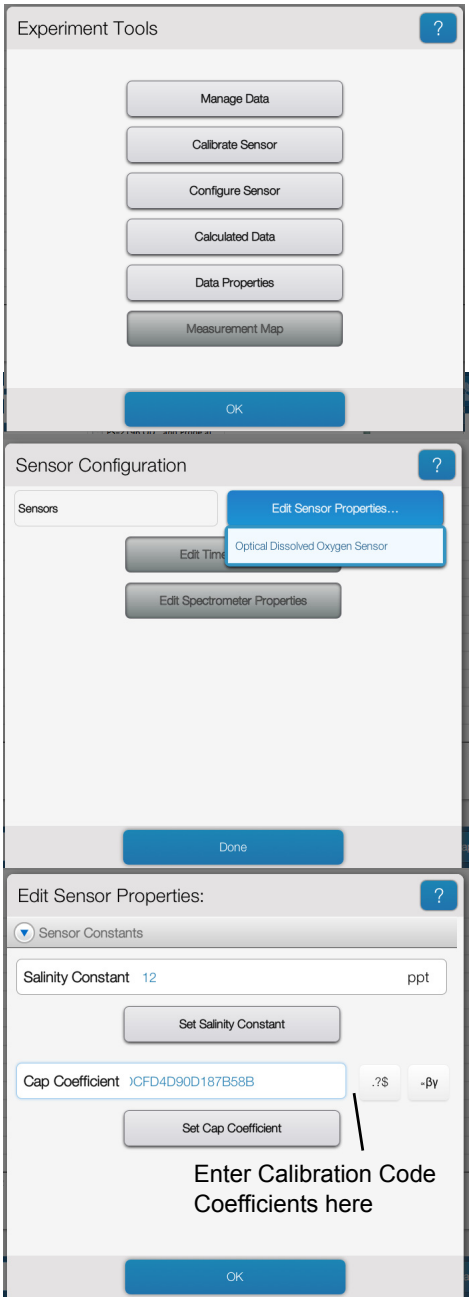
2. In the Graph display, touch/click the "Experiment Tools" icon ( ) to open the Experiment Tools menu.

3. In the Experiment Tools menu, touch/click "Configure Sensor" and then touch/click "OK" to open the Sensor Configuration screen.

4. The screen shows three selections: "Edit Sensor Properties", "Edit Timer Properties" and "Edit Spectrometer Properties". Touch or click Edit Sensor Properties to show the sensor menu, and then touch/click "Optical Dissolved Oxygen Sensor". The Edit Sensor Properties screen changes to show "Salinity Constant" and "Cap Coefficient".

5. In the text area for "Cap Coefficient", enter the Calibration Code Coefficients (K1 through K5 and KC) consecutively without spaces. Touch or click "Set Cap Coefficient" to save the coefficients. A small window opens to confirm that the procedure was successful.





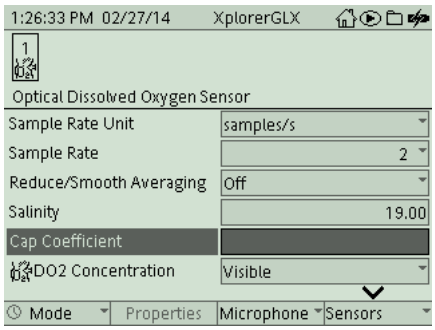
6. Touch or click "OK" to return to the Graph display screen.

Xplorer GLX: Calibration Code Coefficients

1. With the replacement sensor cap installed, the sensor connected to the interface, and the interface turned on, go to the Home Screen ( ).

2. In the Home Screen, press F4 ( ) to go to the Sensors screen.

3. In the Optical Dissolved Oxygen Sensor screen, use the down arrow ( ) to highlight the "Cap Coefficient" text area. Press "Check" ( ) to select the text area for the coefficients.



4. Use the keypad to enter the Calibration Code Coefficients (K1 to K5, and KC) consecutively without spaces. After the forty-two letters and numbers are entered, press "Check" to save the coefficients.

   - REMINDER: Press a numeric key twice to switch to the alphabetic characters that are on the key.
   - NOTE: An error message screen will appear if the sensor is not connected to the interface, or the Calibration Code Coefficients were not entered properly. Press "OK". Check the sensor connection or re-enter the Calibration Code Coefficients.

5. Perform a one point or two point calibration with "known standard" solutions. (Go to the PASCO web site at www.pasco.com and enter "Optical Dissolved Oxygen Sensor" or "PS-2196" in the Search window. Download the instruction manual PDF file under the User Resources tab.)

Software Requirements

As of November 2014, the minimum software requirements are as follows:

- PASCO Capstone: 1.2
- SPARKvue: 2.1.3
- SPARK SLS: v1.4.1
- Xplorer GLX: v1.54

For the latest and most complete information about minimum software requirements, go to www.pasco.com. Enter "PS-2230" in the "Search" window to go to the product page.

Technical Support

For assistance with any PASCO product, contact PASCO at:

Address: PASCO scientific
10101 Foothills Blvd.
Roseville, CA 95747-7100

Phone: 916-462-8384 (worldwide)
877-373-0300 (U.S.)

Web: www.pasco.com

Email: techsupp@pasco.com

Limited Warranty
For a description of the product warranty, see the PASCO catalog.

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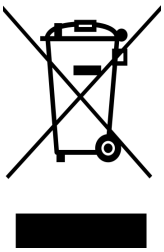
Product End of Life Disposal Instructions:

This electronic product is subject to disposal and recycling regulations that vary by country and region. It is your responsibility to recycle your electronic equipment per your local environmental laws and regulations to ensure that it will be recycled in a manner that protects human health and the environment. To find out where you can drop off your waste equipment for recycling, please contact your local waste recycle/disposal service, or the place where you purchased the product.

The European Union WEEE (Waste Electronic and Electrical Equipment) symbol (to the right) and on the product or its packaging indicates that this product must not be disposed of in a standard waste container.



11 - EQUIPMENT

113100 – RESIDENTIAL APPLIANCES

PART 1 – GENERAL

1.1 SCOPE

Kitchen and bathroom appliances will be determined by Construction Drawings.

1.2 PERFORMANCE REQUIREMENTS

A. When applicable, appliances must have Energy Star Rating or equivalent.
B. Appliances must have a written warranty with a warranty period of minimum 5 years.
C. All appliances to be installed per installation instructions included in cut sheets.

1.3 SUBMITTALS

A. Contractor shall provide Owner and Architect with brochures showing the full range of color, finish and sizes available for each proposed product.
B. Contractor shall provide Owner and Architect with sample finishes of each product proposed in up to two different colors, as selected by the Architect from the full range of options available.
C. Contractor shall provide Owner with a valid warranty certificate covering all materials used in the completion of the Work.

Part 2 - PRODUCTS

2.1 REFRIGERATOR

A. Acceptable Manufacturers and Products
    1. Model FF99DOW
        a. Website: (http://lpcorp.com/products/siding/lp-smartside-trim-siding/)
        b. Manufacturer: Avanti
        c. Width: 24 in
        d. Height: 59.8 in
        e. Depth: 28.0 in
        f. Color: as selected by the Architect for each unit, from the full range of colors available from the manufacturer. Up to five different colors may be selected for the project, and each unit in a Triplex or Duplex building may be assigned a different color.

    2. Alternative products may be proposed by the Contractor as options based on pricing. If an alternative product is proposed, Contractor shall provide performance, cost, installation and other product information as requested by the Architect. All material substitutions shall be subject to approval by the Owner and Architect.

2.2 COOKTOPS

A. Acceptable Manufacturers and Products
    1. Model GCI3061X
        a. Website: http://www.whirlpool.com/-[GCI3061XB]-1001318/GCI3061XB/

b. Manufacturer: Whirlpool
c. Width: 30.5 in
d. Height: 2.8 in
e. Depth: 21.4 in
f. Color: as selected by the Architect for each unit, from the full range of colors available from the manufacturer. Up to five different colors may be selected for the project, and each unit in a Triplex or Duplex building may be assigned a different color.

2. Alternative products may be proposed by the Contractor as options based on pricing. If an alternative product is proposed, Contractor shall provide performance, cost, installation and other product information as requested by the Architect. All material substitutions shall be subject to approval by the Owner and Architect.

2.3 CONVERTIBLE RANGE HOOD

A. Acceptable Manufacturers and Products

1. Model: 46000
   a. Website:
   b. Manufacturer: BROAN
   c. Size: 3-1/4”x10” damper/duct connector
   d. Duct plate size: 7” diameter
   e. Size:
   f. Volts:
   g. Amps:
   h. Color: Black
2. Alternative products may be proposed by the Contractor as options based on pricing. If an alternative product is proposed, Contractor shall provide performance, cost, installation and other product information as requested by the Architect. All material substitutions shall be subject to approval by the Owner and Architect.

2.4 OVENS

A. Acceptable Manufacturers and Products

1. Model H 6560 B AM
   a. https://www.mieleusa.com/domestic/convection-ovens-1451.htm?mat=09769400&name=H_6560_B_AM
   b. Manufacturer: Miele
   c. Width: 21.8 in
   d. Height: 22.8 in
   e. Depth: 21.6 in
   f. Color: as selected by the Architect for each unit, from the full range of colors available from the manufacturer. Up to five different colors may be selected for the project, and each unit in a Triplex or Duplex building may be assigned a different color.
2. Alternative products may be proposed by the Contractor as options based on pricing. If an alternative product is proposed, Contractor shall provide performance, cost, installation and other product information as requested by the Architect. All material substitutions shall be subject to approval by the Owner and Architect.

2.4 DISHWASHERS

A. Acceptable Manufacturers and Products
    1. Model iQ500 Dishwasher 60 cm
        a. Website: http://www.siemens-home.bsh-group.com/uk/productlist/dishwashing/full- size-dishwashers/iq500-dishwashers
        b. Manufacturer: Siemens
        c. Width: 17.7 in
        d. Height: 32.0 in
        e. Depth: 21.7 in
        f. Color: as selected by the Architect for each unit, from the full range of colors available from the manufacturer. Up to five different colors may be selected for the project, and each unit in a Triplex or Duplex building may be assigned a different color.
    2. Alternative products may be proposed by the Contractor as options for pricing. If an alternative product is proposed, Contractor shall provide performance, cost, installation and other product information as requested by the Architect. All material substitutions shall be subject to approval by the Owner and Architect.

2.5 CLOTHES WASHERS

B. Acceptable Manufacturers and Products
    1. Model iQ500 Front Loading Auto Washing Machine
        a. Website: http://www.siemens-home.bsh-group.com/au/productlist/WM14P380AU
        b. Manufacturer: Siemens
        c. Width: 23.5 in
        d. Height: 33.9 in
        e. Depth: 24.9 in
        f. Color: as selected by the Architect for each unit, from the full range of colors available from the manufacturer. Up to five different colors may be selected for the project, and each unit in a Triplex or Duplex building may be assigned a different color.
    2. Alternative products may be proposed by the Contractor as options for pricing. If an alternative product is proposed, Contractor shall provide performance, cost, installation and other product information as requested by the Architect. All material substitutions shall be subject to approval by the Owner and Architect.

2.6 CLOTHES DRYERS

A. Acceptable Manufacturers and Products
    1. Model TKG450 WP Fdos
        a. Website: https://www.miele.com.au/domestic/tumbl e-dryers-1575.htm?mat=09764530&name=TKG450_ WP_FDos%26SFinish_AU
        b. Manufacturer: Miele
        c. Width: 23.5 in
        d. Height: 33.5 in
        e. Depth: 25.0 in
        f. Color: as selected by the Architect for each unit, from the full range of colors available from the manufacturer. Up to five different colors may be selected for

the project, and each unit in a Triplex or Duplex building may be assigned a different color.

2. Alternative products may be proposed by the Contractor as options for pricing. If an alternative product is proposed, Contractor shall provide performance, cost, installation and other product information as requested by the Architect. All material substitutions shall be subject to approval by the Owner and Architect.

Part 3 - EXECUTION

A. Workers shall wear protective equipment as recommended by the materials manufacturer when installing equipment.
B. All wiring and plumbing hook ups to be per manufacturer instructions.
C. All exposed screw heads shall be countersunk, the hole filled as recommended by the material manufacturer and painted to match the adjacent surface.

END SECTION 113100

END SECTION 11

iQ500
WM12P420IN
iQ300
Front loading automatic washing machine

- ✓ Intelligent, durable and quiet iQdrive motor for highly effective and efficient laundry care.
- ✓ EcoPerfect: saves up to 50% energy
- ✓ Reload function: Allows you to add last minute laundry whenever the wash and water levels allow.
- ✓

Features

Technical Data

Built-in / Free-standing : Freestanding
Door hinge : left
Color / Material body : White
Length electrical supply cord (cm) : 120
Height for building under : 850.00
Height of the product (mm) : 850
Dimensions of the product (mm) : 850 x 600 x 590
Wheels : No
Net weight (kg) : 73.0
Drum volume (l) : 65
Capacity cotton (kg) : 9.0
Main colour of product : White
Door Frame : chrome, blackgray
Color Buttons : black
Color Dial : chrome
Connection Rating (W) : 2050
Current (A) : 10
Voltage (V) : 220
Frequency (Hz) : 50
Cord Included : Yes
Plug type : South Africa plug
Length of drain hose (in) : 47.24
Length of supply hose (in) : 47.24
Appliance Dimensions (h x w x d) (inches) : x x
Dimensions of the packed product (in) : 35.03 x 27.95 x 26.57
Net weight (lbs) : 160
Gross weight (lbs) : 170
Length of drain hose : 120.00
Length of supply hose : 120.00
Gross weight (kg) : 77.0
Connection Rating (W) : 2050
Current (A) : 10
Voltage (V) : 220
Frequency (Hz) : 50
Approval certificates : CCC, CE, VDE
Water protection system : Aquasecure
Number of Options : 7
Maximum spin speed (rpm) : 1200
Spin speed options : Variable
Internal water heater included : No
Digital countdown indicator : Yes
Drying progress indicator : LED-display

4 242003 700501

iQ500
WM12P420IN
iQ300
Front loading automatic washing machine

Features

- speedPerfect
- Reload function

Design

- Capacity: 9 kg
- Consumption: energy 0.98 kwh, water 55 l
- Maximum Spin Speed: 1200 rpm
- Noise level washing: NO_FEATURE dB; Noise level spinning: NO_FEATURE dB
- Noise level spinning:NO_FEATUREdB (A) re 1 pW:

Programmes

-

Performance

- ecoPerfect
- touchControl buttons: Start/Reload, Less Ironing, Spin speed selection/Rinse Hold

Key features

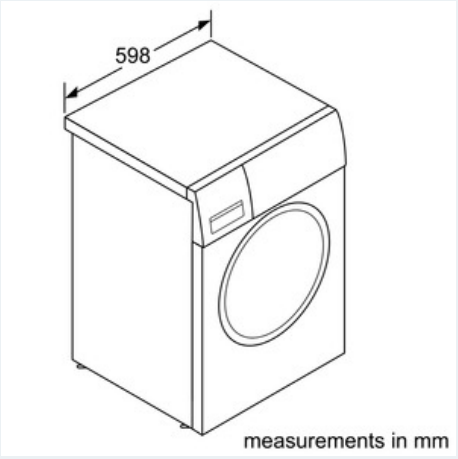
- waterPerfect
-
- 32 cm porthole, chrome, blackgrey door with 165° opening
- AllergyPlus + ECARF
- Reload Function
- iQdrive: energy-saving and quietest motor technology
- Sound insulation by bottom cover
- Circulatory sensor for optimal wateruse
- waterPerfect: resource gentle watermanagement
- aquaSecure
- Prewash
- ActiveWater
-
- VarioDrum
-
- voltMonitor
- Foam detection system
- speedPerfect
- WaterPlus

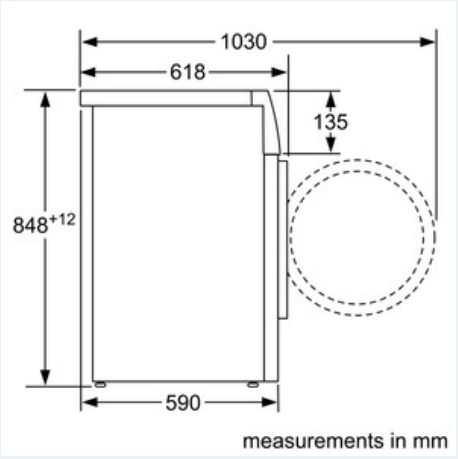
Additional features

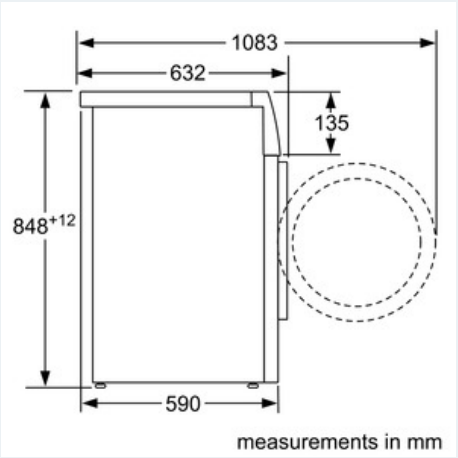
- Noise level washing: 54 dB; Noise level spinning: 74 dB
- Dimensions (H X W X D): 85 x 60 x 59 cm

iQ500
WM12P420IN
iQ300
Front loading automatic washing machine

Dimensioned drawings







30" (76.2 cm) ELECTRIC INDUCTION COOKTOP

PRODUCT MODEL NUMBERS

GCI3061X

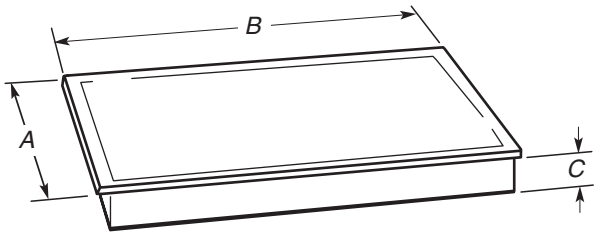
ELECTRICAL REQUIREMENTS:

To properly install your cooktop, you must determine the type of electrical connection you will be using and follow the instructions provided for it here.

- A 4-wire or 3-wire, single phase, 240 volt, 60 Hz., AC only electrical supply is required on a separate, 50-amp circuit (36" [91.4 cm] models) or 40-amp circuit (30" [76.2 cm] models), fused on both sides of the line.
- The cooktop should be connected directly to the junction box through flexible, armored or nonmetallic sheathed, copper cable. The flexible, armored cable extending from the fuse box or circuit breaker box should be connected directly to the junction box.
- Locate the junction box to allow as much slack as possible between the junction box and the cooktop so that the cooktop can be moved if servicing becomes necessary in the future.
- Do not cut the conduit. The length of conduit provided is for serviceability of the cooktop.
- A UL listed or CSA approved conduit connector must be provided at each end of the power supply cable (at the cooktop and at the junction box). A listed conduit connector is already provided at the cooktop.

PRODUCT DIMENSIONS

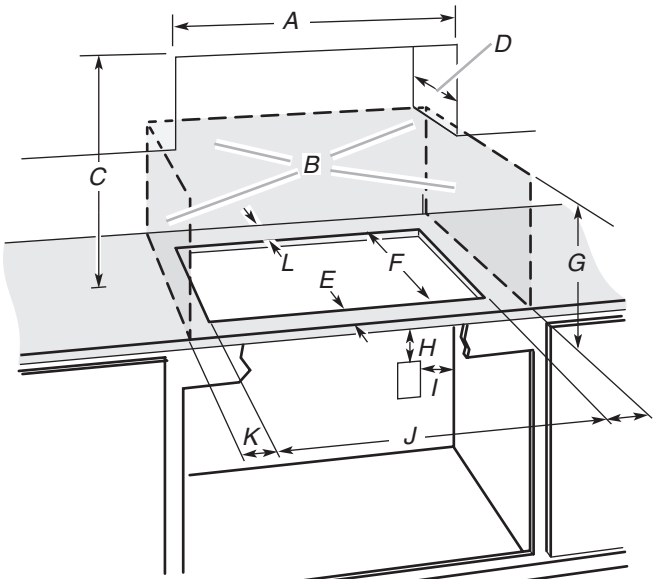
30" (76.2 cm) Cooktops



Models GCI3061
A. 21⁵⁄₁₆" (54.1 cm)
B. 30⁵⁄₁₆" (77.0 cm)
C. 2⅜" (6.0 cm)

CABINET DIMENSIONS

IMPORTANT: If installing a range hood or microwave hood combination above the range, follow the range hood or microwave hood combination installation instructions for dimensional clearances above the cooktop surface.



A. 29½" (75.0 cm)

B. Combustible area above countertop (shown by dashed box above)

C. 30" (76.2 cm) minimum clearance between top of cooktop platform and bottom of uncovered wood or metal cabinet (24" [61 cm] minimum clearance if bottom of wood or metal cabinet is covered by not less than ¼" [0.6 cm] flame retardant millboard covered with not less than No. 28 MSG sheet steel, 0.015" [0.04 cm] stainless steel, or 0.024" [0.06 cm] aluminum or 0.020" [0.05 cm] copper)

D. 13" (33.0 cm) recommended upper cabinet depth

E. 2" (5.1 cm)

F. 19⁵⁄₁₆" (49.0 cm)

G. 18" (45.7 cm) minimum clearance from upper cabinet to countertop within minimum horizontal clearances to cooktop

H. Junction box or outlet; 12" (30.5 cm) minimum from bottom of countertop

I. Junction box or outlet; 10" (25.4 cm) from right-hand side of cabinet

J. 29½" (75.0 cm)

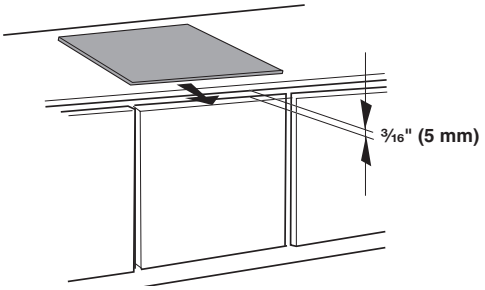
K. 1" (2.5 cm) minimum distance to nearest left and right side combustible surface above cooktop

L. 1" (2.5 cm) minimum clearance between back wall and countertop

NOTES: After you make the countertop cutout, some installations may require notching down the base cabinet side walls to clear the cooktop base. To avoid this modification, use a base cabinet with sidewalls wider than the cutout.

If cabinet has a drawer, a 5⅛" (13 cm) depth clearance from the countertop to the top of the drawer (or other obstruction) in base cabinet is required.

For proper ventilation, provide a vent of 3⁄16" (5 mm) under the countertop, in the front of the cabinet. The clearance should be the length of the cooktop cutout.



Because Whirlpool Corporation policy includes a continuous commitment to improve our products, we reserve the right to change materials and specifications without notice.

Dimensions are for planning purposes only. For complete details, see Installation Instructions packed with product. Specifications subject to change without notice.

Ref. 501910200567D
10/26/10

iQ500
SN66P050GB stainless steel Dishwasher 60cm

speedMatic dishwasher with varioSpeed Plus for washing in up to a third of the time and Zeolith® drying for sparkling-clean, efficient washing.

- ✓ Up to 66% faster dishwashing and drying to a gleaming shine with varioSpeed Plus.
- ✓ Brilliantly shiny drying dishes and extremely energy efficient thanks to innovative Zeolith technology.
- ✓ varioFlex Plus rack for maximum flexibility in the top and bottom racks, with a place for each item.
- ✓ timeLight shows the remaining time and cycle status alternately, with easy visibility on any floor.
- ✓ The hygienePlus option for antibacterial dishwashing at extra high temperatures for maximum hygiene.

Features

Technical Data

Water consumption (l) : 9.5
Construction type : Built-in
Height of removable worktop (mm) : 815
Required niche size for installation (HxWxD) : 815-875 x 600 x 550
Depth with open door 90 degree (mm) : 1150
Adjustable feet : Yes - front only
Maximum adjustability feet (mm) : 60
Adjustable plinth : both horizontal and vertical
Net weight (kg) : 45.0
Gross weight (kg) : 48.0
Connection rating (W) : 2400
Current (A) : 13
Voltage (V) : 220-240
Frequency (Hz) : 60; 50
Length of electrical supply cord (cm) : 175
Plug type : GB plug
Length inlet hose (cm) : 165
Length outlet hose (cm) : 190.0
EAN code : 4242003710302
Number of place settings : 13
Energy efficiency class - NEW (2010/30/EC) : A+++
Energy consumption annual (kWh/annum) - NEW (2010/30/EC) : 234
Energy consumption (kWh) : 0.82
Power consumption in left-on mode (W) - NEW (2010/30/EC) : 0.10
Power consumption in off-mode (W) - NEW (2010/30/EC) : 0.10
Water consumption annual (l/annum) - NEW (2010/30/EC) : 2660
Drying performance : A
Reference programme : Eco
Total cycle time of reference programme (min) : 195
Noise level (dB(A) re 1 pW) : 42
Installation type : Full-integrated

4 242003 710302

Optional accessories

SZ73005	Compensating + fixing kit, stainl. steel
SZ73001	Silver polishing cassette
SZ72010	inlet and outlet hose extention 2 m

iQ500
SN66P050GB stainless steel
Dishwasher 60cm

Features

Performance

- Energy Efficiency Class: A+++
- Zeolith energy efficient drying
- Capacity: 13 place settings
- Energy consumption in Eco 50 programme: 234 kwh per year, based on 280 standard cleaning cycles
- Water consumption in Eco 50 programme: 2660 litres per year, based on 280 standard cleaning cycles
- Programme time in Eco 50 programme: 195 minutes
- Noise level dB (A) re 1pW: 42 dB
- Energy consumption in Eco 50 programme: 0.82 kWh
- Water consumption in Eco 50 programme: 9.5 litres

Programmes/functions

- 6 programmes:
  Intensive 70 °C, Auto 45-65 °C, Eco 50 °C,
  Glass 40 °C, Quick Wash 45 °C, Pre Rinse
- 4 additional options: Shine & Dry, intensiveZone, VarioSpeed Plus, Hygiene Plus
- 5 temperatures

Flexible design elements

- varioFlex Plus basket system
- 3 stage rackMatic height-adjustable top basket
- Silver baskets with handle and stainless steel inlay
- 6 foldable plate racks in top basket
- 6 foldable plate racks in bottom basket
- 2 foldable cup shelves in top basket and 2 foldable cup racks in bottom basket
- Glass rack in bottom basket

Innovations and technology

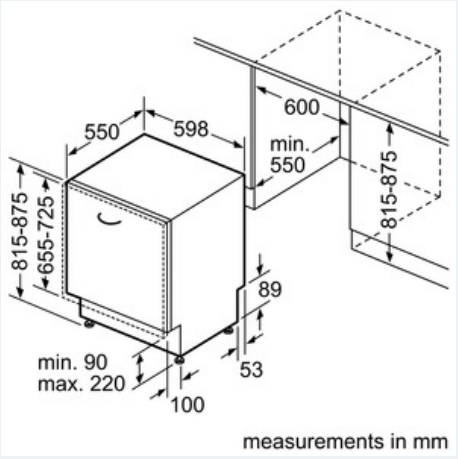
- hydroDry hygienic and efficient drying
- dosageAssist detergent dispenser
- Automatic detergent-aware system
- hydroSensor, loadSensor
- hydroMix glass care protection technology
- hydroSafe - ultimate 24hr anti leak system with guarantee

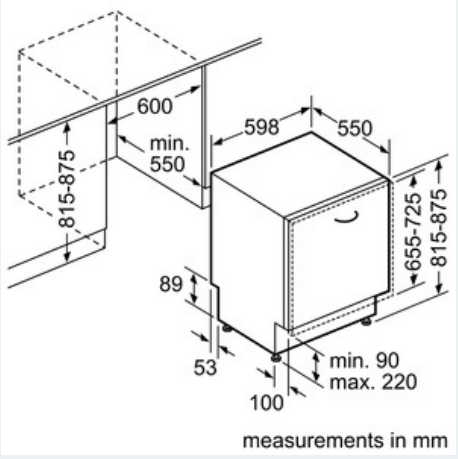
Design features

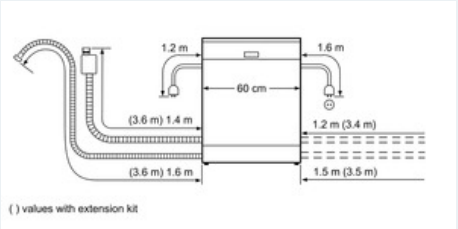
- Controls on top edge of door
- timeLight information projection
- Large item spray head, steam protection plate
- Colour of indicators: Red LED Indicators
- LED salt refill indicator, LED rinse aid refill indicator
- Self-cleaning filter system with 3 piece corrugated filter
- Dimensions (HxWxD): 81.5 x 59.8 x 55cm
- Stainless steel interior
- Time delay: 1-24 hours with acoustic end of cycle indicator, water inlet indicator
- Efficiency information relates to the Eco 50 programme. This programme is suitable for cleaning normally soiled tableware and is the most efficient programme in terms of combined energy and water consumption.

iQ500
SN66P050GB stainless steel
Dishwasher 60cm

Dimensioned drawings







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Before the first use

⚠ Before using the tumble dryer for the first time, ensure that it is correctly installed and connected..

If the tumble dryer has not been transported as described in the operating instructions, then it must be left to stand for at least 1 hour before it is connected to the electricity supply. Otherwise the heat pump can be damaged.

It is **essential** to read the operating instructions.

Operating the tumble dryer

1 **Display with sensors**
2 ***Start/Stop* button**
For starting the programme selected and cancelling a programme once it has started.
3 ***Drying level* button**
For all programmes with a selectable drying level.
4 ***Duration* button**
For selecting the duration for timed drying programmes.
5 ***Delay start* button**
For selecting Delay start.
6 **Extras buttons**
Various options can be added to the programmes.
7 **Programme selector**
For selecting the programme.
8 **Optical interface**
For service technicians.
9 **ⓘ button**
For switching the tumble dryer on and off. To save energy, the tumble dryer will switch off automatically 15 minutes after the end of the programme/Anti-crease phase or after being switched on if no other selection is made.
10 **∨ sensor**
Scrolls down the list to the next option or decreases a value.
11 **OK sensor**
Confirms the programme selected, a value set or opens a sub-menu.
12 **∧ sensor**
Scrolls up the list to the next option or increases a value.
13 **EcoFeedback sensor**
You can use the EcoFeedback sensor to call up information about the energy consumption of your dryer.
14 ***Perfect Dry* indicator**
With programmes with a selectable drying level, the Perfect Dry system calculates the residual moisture present in the laundry to ensure a precise drying result. The *Perfect Dry* indicator
– will flash after the programme has started and go out when the programme duration appears in the display.
– will light up again when the selected drying level is reached and remain on until the end of the programme.
– will remain dark with the following programmes: *Woollens handcare, Silks handcare, Cool air, Warm air, Basket programme*.

Energy saving tips

To avoid unnecessarily long drying times and high consumption of energy:

– Make sure your laundry is spun at the maximum spin speed before drying.
– Load according to the optimum amount of laundry recommended for the programme being used. Underloading is uneconomical. Overloading gives poorer quality of drying and may cause unnecessary creasing.
– After every cycle remove the fluff from the fluff filters in the door and in the door opening.
– Ensure sufficient room ventilation.
– Check the condenser unit once a year and clean it if necessary.

BEFORE THE FIRST USE/OPERATING THE TUMBLE DRYER

Drying

1. Notes on correct laundry care

⚠ Remove foreign objects like detergent dispensing devices from the laundry. They can melt and damage the dryer and the laundry.

- Sort the laundry according to the type of fibre and weave, size, garment care label symbol and the drying level required.
- Disentangle the laundry.
- Check seams and stitching to ensure that padding and linings are intact.
- Fasten duvet covers and pillow cases to prevent small items from being rolled up inside them.
- Fasten hooks and eyes.
- Tie together textile belts and apron ties.
- Sew in or remove underwiring from bras.

2. Loading the tumble dryer

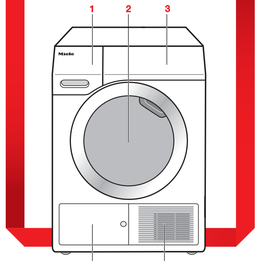
- Press the ⓘ button to switch the dryer on. The interior drum lighting will come on.
- Open the door.
- Unfold the laundry and load loosely into the drum.

Do not overload the drum. Overloading can cause unnecessary wear and tear to the laundry, give a disappointing drying result and cause more creasing.

⚠ If you are not using a fragrance flacon: the tab must be pushed down completely (see arrow).

⚠ When closing the door, make sure that laundry does not get trapped in the door opening.

- Shut the door with a gentle swing.



1 **Condensed water container**
– empty after every drying programme
2 **Door**
3 **Control panel**
4 **Access panel for the heat exchanger and plinth filter**
– do not open during drying
5 **Cool air intake grille**
– do not obstruct with a laundry basket or other objects

DRYING

3. Selecting a programme and starting it

Selecting a programme
- Turn the programme selector. The load for the programme selected will appear in the display.

Different programmes and setting options will light up in the display, depending on the position of the programme selector.

Further programmes
Touch the ∧ or ∨ sensor to scroll through the list until the programme you want appears in the display. Then confirm with *OK*.

Programmes with drying levels
Cottons, Minimum iron, Delicates, Denim, Shirts, Express, Gentle smoothing, Steam smoothing, Automatic plus, Sportswear, Outerwear
- Press the *Drying level* button. The currently selected drying level will appear marked with a tick √ in the display.
- Touch the ∨ or ∧ sensor to select the required drying level.
- Confirm by touching the *OK* sensor.

⚠ Important: When selecting the *Steam smoothing* programme, you must make sure that the condensed water container has been filled as described in the operating instructions (see "Cleaning and care").

Other programmes and the timed drying programmes
– *Cottons* ▭, *Woollens handcare, Silks handcare, Proofing*

The drying level is preset and cannot be altered.

– *Cool air, Warm air, Basket programme*

You can select the duration in ten-minute stages.

Cool air	0:20 - 2:00
Warm air	0:20 - 2:00
Basket programme	0:40 - 2:30

- Press the *Duration* button.
- Increase or decrease the duration by touching the ∨ or ∧ sensor.
- Confirm by touching the *OK* sensor.

Selecting Extras (if required)
- Press a button. The button will light up when the Extra is selected.

Gentle tumble
Delicate fabric (with the ⊡ symbol on the care label, e.g. acrylic garments) is dried at a lower temperature. The programme duration is longer.

Freshen up
You can use the Freshen up option to help remove or reduce odours in clean (dry or damp) clothing.

Auto load control
This Extra enables you to dry half the load stated in the "Programme chart", thus shortening the programme duration and optimising the drying process.

Anti-crease
Depending on the programme selected, the drum will continue to rotate in a special rhythm for up to 2 hours at the end of the programme, to reduce creasing, if you do not wish to remove the laundry immediately.

Buzzer
A buzzer (four beeps at intervals for a maximum of 1 hour) will sound to let you know that the programme has finished.

Selecting Delay start (if required)
- Press the *Delay start* button.

With Delay start you can delay the start of the programme by up to a maximum of 24 hours.

Starting the programme
- Press the flashing *Start/Stop* button. The *Start/Stop* button will now light up constantly.

4. Removing the laundry at the end of the programme

At the end of the programme: Anti-crease/Finish or Finish will light up. The Start/Stop button will no longer be lit up.
– To save energy, 10 minutes after the end of the programme the Start/Stop button will begin to flash slowly and the display will go out.
– The tumble dryer switches off automatically.

⚠ Do not open the door before the end of the programme.

- Open the door.
- Remove the laundry.

⚠ Check that all items have been removed from the drum. If items are left in the dryer, they could be damaged by overdrying when the dryer is next used.

If the dryer is switched on at the mains and the door is opened, the drum lighting will come on. It will go out a few minutes later to save energy.
- If the dryer is still switched on, switch it off with the ⓘ button.
- Clean the fluff filters.
- Shut the door with a gentle swing.
- Empty the condensed water container.

Changing the programme

Garment care label symbols

Drying
- ⊡ Normal/Higher temperature
- ⊡ Reduced temperature: Select *Gentle tumble (for delicate textiles)*
- ⊠ Do not tumble dry

Ironing
- Very hot
- Hot
- Warm
- Do not iron

Tips on drying

– Always observe the maximum recommended loads given in the "Programme chart".

⚠ Never overload the drum. Overloading can cause unnecessary wear and tear to the laundry, give a disappointing drying result and cause more creasing.

– Do not load the drum with items that are still soaking wet. Make sure your laundry is spun at the maximum spin speed before drying.
– Minimum iron fabric tends to crease more, the larger the load. This is particularly the case for garments made from very fine weave fabric, such as shirts or blouses.

You cannot change to another programme once a programme has started (this prevents unintentional alterations). If you move the programme selector, *Cannot be changed* will light up in the display until you move the programme selector back to the original programme.
You will need to cancel the current programme before you can select a new one.

Cancelling a programme while it is running and selecting a new programme
- Press the *Start/Stop* button. Cancel programme will light up in the display.
- Confirm by touching the *OK* sensor.

As soon as Finish lights up:
- Press the ⓘ button to switch the dryer off.
- Press the ⓘ button to switch the dryer on.
- Select and start a new programme straight away.

Adding or removing laundry after a programme has started
- Press the *Start/Stop* button. Cancel programme will light up in the display.
- Confirm by touching the *OK* sensor.

⚠ Danger of burning: Do not touch the back of the drum when adding or removing items. The drum and the items can get very hot.

As soon as Finish lights up:
- Add or remove items.
- Close the door.
- Press the *Start/Stop* button to continue the programme. If necessary, select a drying level beforehand.

Programme duration
Altering the programme sequence can cause the programme duration shown in the time display to be adjusted.

CHANGING THE PROGRAMME

Programme chart

Programme	Load (in kg)*	Items	Extras
Cottons	8.0	Cotton items such as those described under *Cottons Normal* with normal residual moisture.	A, B, C, D, E
Cottons ▭	8.0	Cotton and linen fabric such as bedding, jerseywear, T-shirts, underwear, workwear, covers, flannelette bed linen and baby clothes. Do not use *Extra dry* for jersey fabrics (e.g. T-shirts, underwear), as they have a tendency to shrink.	A, B, C, D, E
Minimum iron	4.0	Workwear, overalls, pullovers, dresses, trousers and table linen.	A, B, C, D, E
Woollens handcare	2.0	Woollen garments and fabric containing wool blends, e.g. pullovers, jackets, hooded sweatshirts, dresses, skirts, trousers, blouses and shirts.	E
Silks handcare	1.0	Silk and silk blends are suitable for drying in the tumble dryer, e.g. blouses and shirts.	B, E
Gentle smoothing	1.0	Minimum iron items (dry or damp) made of cotton, synthetic or mixed fibres, e.g. trousers, jackets, skirts.	A, D, E
Shirts	2.0	Shirts and blouses.	A, D, E
Express	4.0	Garments suitable for the Cottons programme.	B, E
Denim	3.0	Denim garments, e.g. jeans, jackets, skirts, shorts.	B, E
Steam smoothing	1.0	Minimum iron items made of cotton, synthetic or mixed fibres, e.g. trousers, jackets, skirts. Steam smoothing reduces creasing. **The condensed water container needs to be filled to run this programme.**	A, D, E
Warm air	8.0	Multi-layered fabric (jackets, pillows, sleeping bags) or for drying individual items (trainers, soft toys, sleeping bags).	A, D, E

X = Yes; A = Gentle plus; ✱ = Freshen up; E = Auto load control; ≋ = Anti-crease; K = Buzzer; * Weight of dry laundry
An explanation of the programmes at the further programme positions can be found in the "Programme chart" in the operating instructions.

TKG 405 WP

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Extras	Cottons	Minimum iron	Delicates	Shirts	Express	Denim	Steam smoothing	Warm air
Freshen up	–	–	–	–	–	–	–	–
Auto load control	–	–	–	–	–	–	–	–
Anti-crease	–	–	–	–	–	–	–	–
Extra dry	–	✓	✓	✓	✓	✓	✓	–
Normal+	✓	✓	✓	✓	✓	✓	✓	–
Normal	✓	✓	–	–	✓	✓	✓	–
Slightly dry	–	✓	–	–	✓	✓	–	–
Extra dry	–	✓	–	–	✓	✓	–	–
Freshen up	–	–	–	–	–	–	–	–
Anti-crease	–	–	–	–	–	–	–	–
Warm air	–	–	–	–	–	–	–	–

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Delay start

Selecting Delay start
- After selecting the programme, press the *Delay start* button.
- Touch the ∨ or ∧ sensor to set the hour.
- Confirm by touching the *OK* sensor.
- Then set the minutes in the same way.

Changing or deleting Delay start (if necessary)
- Press the *Delay start* button.
- Select *Change the time* or *Cancel the time*.

Starting Delay start
- Press the *Start/Stop* button.
- – The Delay start time counts down towards the start of the programme.
- – The drum will turn briefly every hour until the start of the programme to reduce creasing.

Changing Delay start after it has started counting down
- Press the *Delay start* button.
- Touch the ∨ or ∧ sensor to change the time.
- Confirm by touching the *OK* sensor.

Adding or removing laundry before a programme starts
You can open the door to add/remove laundry.
- – All programme settings will be saved.
- Press the *Start/Stop* button so that the Delay start time continues to count down.

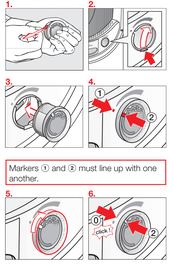
Cancelling Delay start
- Press the *Start/Stop* button.
- Confirm by touching the *OK* sensor.

Fragrance flacon

Tip: Using a fragrance flacon (optional accessory) will add a pleasant fragrance to your laundry.

Before using a fragrance flacon, please read "Warning and Safety instructions - Using a fragrance flacon (optional accessory)" and "Fragrance flacon" in the operating instructions.

Inserting a fragrance flacon



Markers ① and ② must line up with one another.

- Turn the outer ring clockwise a little.

Before drying

- Turn the outer ring clockwise a little.

The further you open the flacon, the more intense the fragrance.

After drying
To avoid the fragrance escaping needlessly:

- Turn the outer ring anti-clockwise until marker ② is in position 🔓.

If you want to dry laundry occasionally without adding fragrance: remove the fragrance flacon and store it in its original packaging until you want to use it again. See the following section.

Before cleaning the fluff filters

- Remove the fragrance flacon (reverse points 3 and 4) and store it in its packaging.

Never lay the fragrance flacon down on any surface as the fragrance will run out.

Cleaning and care

Emptying the condensed water container

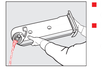
Empty the condensed water container after every drying programme.

Empty container will light up in the display if the maximum level of the condensed water container is reached.
To delete *Empty container*: open and close the door while the dryer is switched on.

⚠ Close the door fully. Otherwise the door and the front panel of the condensed water container could suffer damage when pulling the container out.

- Pull out the condensed water container.

- To prevent water running out, hold it at the front and towards the back and keep it in a horizontal position when carrying it.



- Empty the container.
- Replace the container in the dryer.

⚠ Do not drink the condensed water. It can cause health problems in people and animals.

Fluff filters

Removing visible fluff

Clean the fluff filters in the door opening after every drying cycle.

⚠ Remove the fragrance flacon (if fitted).

- Pull the upper fluff filter forwards to remove it.

- Use your fingers or a vacuum cleaner to remove the fluff from the surface of the filter.

- Push the upper fluff filter back into position until it clicks.
- Close the door.

Cleaning the fluff filters and air flow openings thoroughly

If the drying duration has become longer or the surface of the filters is visibly compacted with fluff, you should carry out the following cleaning procedure.

- Pull the upper fluff filter forwards to remove it.

- Turn the yellow dial on the lower fluff filter in the direction of the *arrow* (until you hear it click).

- Hold the dial and pull the fluff filter forwards to remove it.

- Use a vacuum cleaner with a long crevice nozzle attached to remove any visible fluff from the upper air flow openings.
- Flush the fluff filters through with warm running water.
- Shake the fluff filters thoroughly and then dry them carefully.

⚠ Ensure the filters are dry before replacing them. Wet filters could cause operational faults.

- Refit all of the fluff filters and close the door.

Plinth filter

Only clean the plinth filter when Clean out airways lights up.

To delete *Clean out airways*: Switch the dryer off and back on again or confirm with OK.

- Press the round, indented area on the heat exchanger access panel to open it. The panel will spring open.
- Pull the plinth filter out by the handle.

Removing the plinth filter will cause the right-hand guide pin in the dryer to come out. This pin ensures that the heat exchanger access panel can only be closed if the plinth filter is inserted the right way round.

- Pull the handle out of the plinth filter.
- Clean the filter thoroughly under running water.
- Squeeze the water out of the plinth filter thoroughly.

⚠ The plinth filter must not be replaced dripping wet as this can cause a fault.

- Use a damp cloth to remove any fluff from the access panel.

Checking the heat exchanger unit

⚠ Danger of injury! Do not touch the cooling fins. You could cut yourself.

- Carefully vacuum up any visible fluff or dirt.

Refitting the plinth filter

- Fit the filter back on the handle.

- Insert the handle with the plinth filter attached over the two guide pins.

The word Miele on the handle must be the correct way up.

- Push the plinth filter in completely and close the heat exchanger access panel.

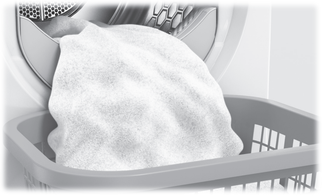
Problem solving guide

Some of the messages in the display are more than one line long. Touch the ∨ or ∧ sensor to read them in full.

Problem/Fault message	Possible cause and remedy
000 lights up after the tumble dryer is switched on and a programme cannot be selected	Access via a code has been activated. You must enter the correct code to use the tumble dryer. See "Settings menu - PIN Code" in the operating instructions.
The programme is cancelled and the following lights up: Adjust the load. See 🕮	This is not a fault. In some programmes, if the drum has been overloaded or underloaded, the programme will be cancelled. This can also happen if the items are already dry. ■ Open and close the door to resume drying. ■ Use the *Warm air* programme (timed drying) to dry individual items.
At the end of the programme, the following lights up: ℹ Clean out airways	There is a build-up of fluff in the airways. ■ Clean the fluff filters. ■ Clean the plinth filter (see "Cleaning and care"). To switch off the message: ■ Confirm with OK.
The programme is cancelled and the following lights up: Empty container. See 🕮	The condensed water container is full or there is a kink in the drain hose. ■ Empty the condensed water container. ■ Check the drain hose. To switch off the message: ■ Open and close the door while the dryer is switched on.
Fill condensate container	This is to remind you that water is taken from the condensed water container when the *Steam smoothing* programme is being used. The condensed water container must be filled with water to at least the –min– marker. ■ Confirm with OK.
ℹ Open & close door	This it to remind you to load the laundry when the *Steam smoothing* programme is selected. ■ Load the laundry in the drum.
Extra cooling	The programme has finished but the laundry has not yet cooled down. ■ Either remove the laundry and spread it out to cool down or leave it in the tumble dryer to cool down during the cooling phase.
The dryer is switched off at the end of the programme	The tumble dryer switches off automatically. This is not a fault, but a normal function. See "Settings menu - Appliance switch-off" in the operating instructions.
The display is dark and the *Start/Stop* button is flashing slowly	The tumble dryer is in standby mode. This is not a fault, but a normal function. See "Settings menu - Display switch-off status" in the operating instructions. The drum will turn at intervals in the Anti-crease phase.
The laundry is not sufficiently dry	The load consisted of different types of fabric. ■ Finish drying using the *Warm air* timed drying programme. ■ Select a more suitable programme next time. Tip: You can alter the residual moisture level for some programmes. See "Settings menu - Drying levels" in the operating instructions.
Items made of synthetic fibres are charged with static electricity after drying	Synthetic fibres tend to attract static charge. Static charge can be reduced by adding a fabric softener to the final rinse in the washing programme.
There is a build-up of fluff	Fluff is principally the result of friction when garments are being worn and to some extent when they are being washed. Machine drying hardly causes any fluff to form. Fluff is collected by the fluff filters and the plinth filter and can be removed easily. See "Cleaning and care".
There are humming noises	This is not a fault. The compressor is operating. These noises are quite normal and do not indicate a fault.

Miele

Quick Start Guide
Heat pump tumble dryer



These short instructions are not a substitute for the operating instructions supplied with the appliance.
Please read the operating instructions supplied with your tumble dryer before using it for the first time and take note of the Warning and Safety instructions, as well as the full descriptions on how to use your appliance.

en - AU, NZ

M.-Nr. 09 778 140

DELAY START/FRAGRANCE FLACON

CLEANING AND CARE

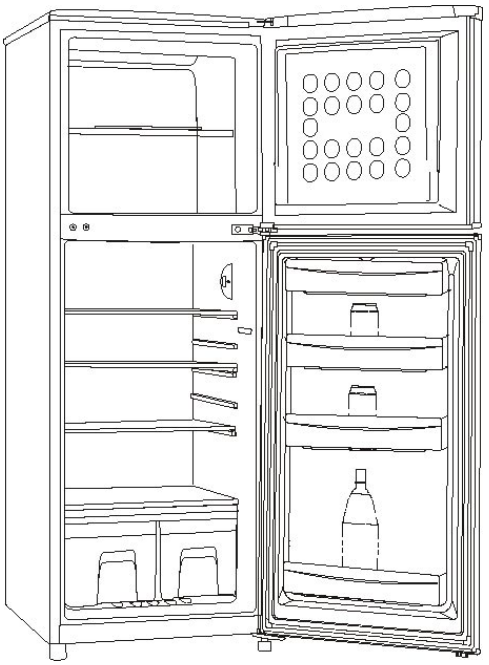
PROBLEM SOLVING GUIDE

INSTRUCTION MANUAL

Model Numbers / No. de Modelos:

RA7306WT – White Cabinet with White Doors.
RA7316PST – Black Cabinet with Platinum Finish Doors.

REFRIGERATOR
(REFRIGERADOR)



CAUTION:

BEFORE USE, PLEASE READ AND FOLLOW ALL SAFETY RULES AND OPERATING INSTRUCTIONS.

La sección en español empieza en la página 14

Avanti has a policy of continuous improvement on its products and reserves the right to change materials and specifications without notice.

Avanti Products, LLC.
P.O. Box 520604 - Miami, Florida 33152
www.avantiproducts.com

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REFRIGERATOR SAFETY

Your safety and the safety of others are very important.

We have provided many important safety messages in this manual for your appliance. Always read and obey all safety messages.

This is the Safety Alert Symbol. This symbol alerts you to potential hazards that can kill or injure you and others. All safety messages will follow the Safety Alert Symbol and either the words" DANGER", "WARNING" or "CAUTION".

⚠ DANGER ⚠

Danger means that failure to heed this safety statement may result in severe personal injury or death.

⚠ WARNING ⚠

Warning means that failure to heed this safety statement may result in extensive product damage, serious personal injury, or death.

CAUTION

Caution means that failure to heed this safety statement may result in minor or moderate personal injury, property or equipment damage.

All safety messages will alert you to know what potential hazard is, tell you how to reduce the chance of injury, and let you know what can happen if the instructions are not followed.

REFRIGERANT GAS WARNINGS

DANGER - Risk of fire or explosion. Flammable refrigerant used.
DO NOT use mechanical devices to defrost refrigerator. DO NOT puncture refrigerant tubing.
DANGER - Risque d'incendie ou d'explosion. Réfrigérant inflammable utilisé.
Ne pas utiliser de dispositifs mécaniques pour réfrigérateur à dégivrage.
Ne pas percer la tuyauterie du refrigerant.

DANGER - Risk of fire or explosion. Flammable refrigerant used.
To be repaired only by trained service personnel. DO NOT puncture refrigerant tubing.
DANGER - Risque d'incendie ou d'explsion. Réfrigérant inflammable utilisé.
Pour être réparé que par du peronnel qualifié.Ne pas percer la tuyauterie du réfrigérant.

CAUTION - Risk of fire or explosion. Flammable refrigerant used.
Consult repair manual / owner's guide before attempting to service
this product. All safety precautions must be followed.
AVERTISSEMENT - Risque d'incendie ou d'explosion. Réfrigérant inflammable
utilisé. Consultez réparation manuelle / propriétaire, guide avant d' essayer de réparer ce produit.
Toutes les précautions doivent être suivies.

CAUTION - Risk of fire or explosion. Dispose of property in accordance
with federal or local regulations. Flammable refrigerant used.
AVERTISSEMENT - Risque d'incendie ou d'explosion. Aliéner des biens conformément à la réglementation fedérale ou locale. Réfrigérant inflammable utilisé.

CAUTION - Risk of fire or explosion due to puncture of refrigerant tubing;
Follow handling instructions carefully. Flammable refrigerant used.
AVERTISSEMENT - Risque d'incendie ou d'explosion dus à la perforation des tuyaux de fluide réfrigérant, suivez attentivement les instructions remise. Réfrigérant inflammable utilisé

IMPORTANT SAFEGUIDES

Before the refrigerator is used, it must be properly positioned and installed as described in this manual so read the manual carefully. To reduce the risk of fire, electrical shock or injury when using the refrigerator, follow basic precaution, including the following:

⚠ DANGER ⚠

- Plug into a grounded 3-prong outlet, do not remove grounding prong, do not use an adapter, and do not use an extension cord.
- It is recommended that a separate circuit, serving only your refrigerator be provided. Use receptacles that cannot be turned off by a switch or pull chain.
- Never clean refrigerator parts with flammable fluids. These fumes can create a fire hazard or explosion. And do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance. The fumes can create a fire hazard or explosion.
- Before proceeding with cleaning and maintenance operations, make sure the power line of the unit is disconnected.
- Do not connect or disconnect the electric plug when your hands are wet.
- Unplug the refrigerator or disconnect power before cleaning or servicing. Failure to do so can result in electrical shock or death.
- Do not attempt to repair or replace any part of your refrigerator unless it is specifically recommended in this manual. All other servicing should be referred to a qualified technician.

⚠ WARNING ⚠

FOLLOW WARNING CALL OUTS BELOW ONLY WHEN APPLICABLE TO YOUR MODEL

- Use two or more people to move and install refrigerator. Failure to do so can result in back or other injury.
- To ensure proper ventilation for your refrigerator, the front of the unit must be completely unobstructed. Choose a well-ventilated area with temperatures above 60°F (16°C) and below 90°F (32°C). This unit must be installed in an area protected from the element, such as wind, rain, water spray or drips.
- The refrigerator should not be located next to ovens, grills or other sources of high heat.
- The refrigerator must be installed with all electrical, water and drain connections in accordance with state and local codes. A standard electrical supply (115 V AC only, 60 Hz), properly grounded in accordance with the National Electrical Code and local codes and ordinances is required.
- Do not kink or pinch the power supply cord of refrigerator.
- The fuse (or circuit breaker) size should be 15 amperes.
- It is important for the refrigerator to be leveled in order to work properly. You may need to make several adjustments to level it.
- All installation must be in accordance with local plumbing code requirements.
- Make certain that the pipes are not pinched or kinked or damaged during installations.
- Check for leaks after connection.
- Never allow children to operate, play with or crawl inside the refrigerator.
- Although the unit has been tested at the factory, due to long-term transit and storage, the first batch of cubes must be discarded.
- Do not use solvent-based cleaning agents of abrasives on the interior. These cleaners may damage or discolor the interior.
- Do not use this apparatus for other than its intended purpose.

HELP US HELP YOU...

Read this guide carefully.

It is intended to help you operate and maintain your new appliance properly.

Keep it handy to answer your questions.
If you don't understand something or your need more help, please call:

Avanti Customer Service
800-220-5570

Keep proof of original purchase date (such as your sales slip) with this guide to establish the warranty period.

CAUTION:

THIS APPLIANCE IS NOT DESIGNED FOR THE STORAGE OF MEDICINE OR OTHER MEDICAL PRODUCTS.

Write down the model and serial numbers.

You'll find them on a plate located on the inside left wall the appliance.

Please write these numbers here:

_____
Date of Purchase

_____
Model Number

_____
Serial Number

Use these numbers in any correspondence or service calls concerning your appliance.

If you received a damaged appliance, immediately contact the dealer (or builder) that sold you the appliance.

Save time and money. Before you call for service, check the Troubleshooting Guide. It lists causes of minor operating problems that you can correct yourself.

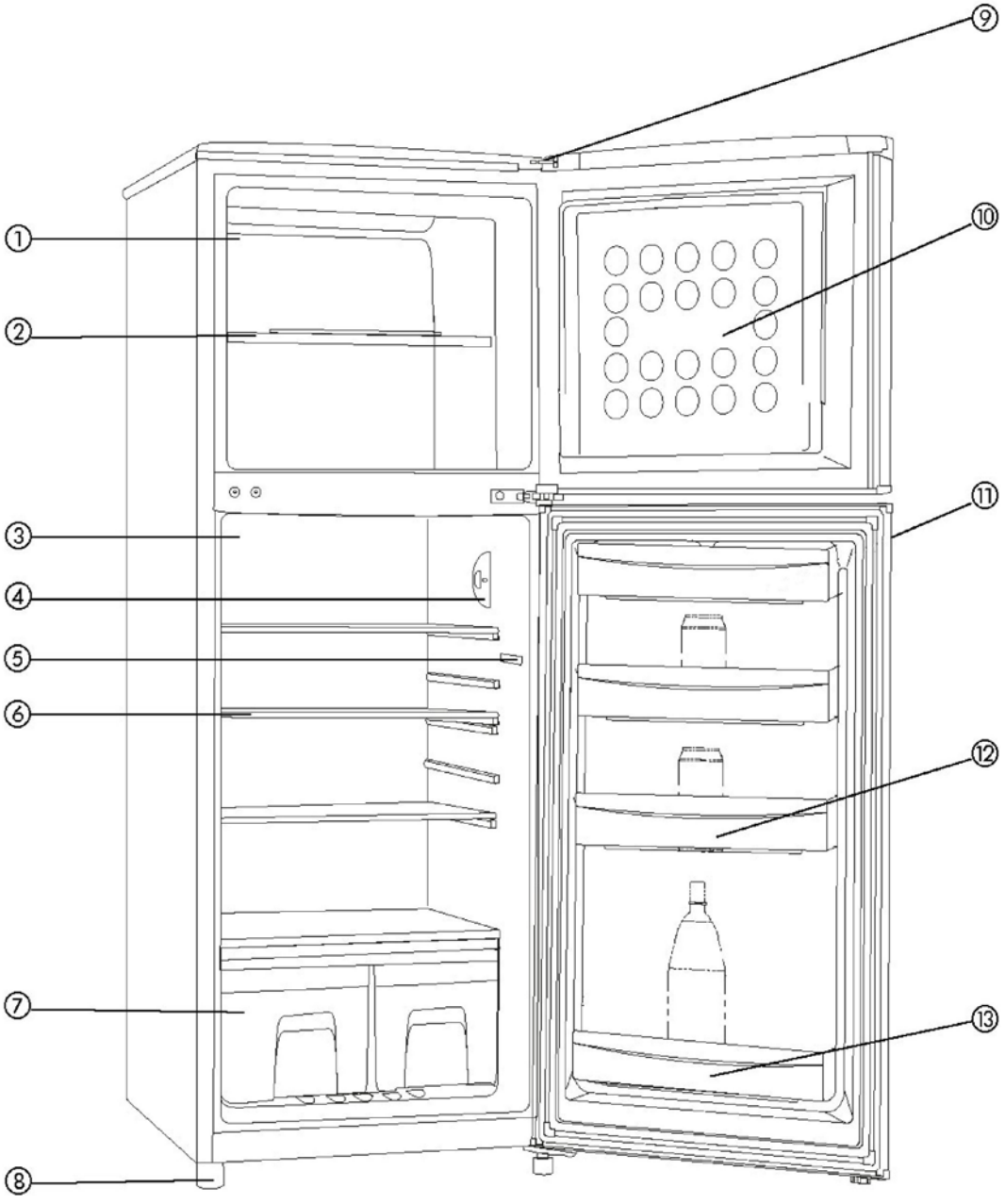
IF YOU NEED SERVICE

We're proud of our service and want you to be pleased. If for some reason you are not happy with the service you receive, here are some steps to follow for further help.
FIRST, contact the people who serviced your appliance. Explain why you are not pleased. In most cases, this will solve the problem.

NEXT, if you are still not pleased, write all the details, including your telephone number, and send to:

Customer Service
Avanti Products LLC
10880 NW 30 Street
Miami, FL 33172

PARTS AND FEATURES



1	Freezer Compartment	8	Leveling Leg
2	Freezer Shelf (Total 1)	9	Top Hinge
3	Fresh Food Compartment	10	Freezer Door
4	Temperature Control	11	Refrigerator Door
5	Light Switch	12	Door Bins (Total 3)
6	Refrigerator Shelf (Total 3)	13	2 – Little Bottle Door Bin
7	Crispers with Glass Cover		

Important Safety Instructions

WARNING	To reduce the risk of fire, electrical shock, or injury when using your appliance, follow these basic precautions:

- Read all instructions before using the appliance.
- **DANGER or WARNING**: Risk of child entrapment.
- Child entrapment and suffocation are not problems of the past. Junked or abandoned appliances are still dangerous. . . even if they will "just sit in the garage a few days."
- **Before you throw away your old refrigerator or freezer:** Take off the doors. Leave the shelves in place so that children may not easily climb inside.
- Never allow children to operate, play with, or crawl inside the appliance.
- Never clean appliance parts with flammable fluids. The fumes can create a fire hazard or explosion.
- Do not store or use gasoline or any other flammable vapors and liquids in the vicinity of this or any other appliance. The fumes can create a fire hazard or explosion.

-Save these instructions-

INSTALLATION INSTRUCTIONS

Before Using Your Appliance

- Remove the exterior and interior packing.
- Check to be sure you have all of the following parts:
  - 3 Door Bins
  - 1 Bottle Bin
  - 3 Refrigerator shelves
  - 1 Freezer shelf
  - 2 Crispers
  - 1 Glass Crisper Cover
  - 1 Ice Cube Tray
  - Instruction Manual
- Before connecting the appliance to the power source, let it stand upright for approximately 2 hours. This will reduce the possibility of a malfunction in the cooling system from handling during transportation.
- Clean the interior surface with lukewarm water using a soft cloth.
- In case the interior accessories are not correctly placed, rearrange them as described in chapter "Parts and Features"

Installation of Your Appliance

- Place your appliance on a floor that is strong enough to support the appliance when it is fully loaded. To level your appliance, adjust the legs at the front of the appliance.
- Allow 5 inches of space between the back and sides of the appliance, which allows the proper air circulation to cool the compressor.
- Locate the appliance away from direct sunlight and sources of heat (stove, heater, radiator, etc.). Direct sunlight may affect the acrylic coating and heat sources may increase electrical consumption. Extreme cold ambient temperatures may also cause the appliance not to perform properly.
- Avoid locating the appliance in moist areas. Too much moisture in the air will cause frost to form quickly on the evaporator requiring more frequent defrosting of the appliance.

ELECTRICAL CONNECTION

Warning

Improper use of the grounded plug can result in the risk of electrical shock. If the power cord is damaged, have it replaced by an authorized Avanti Products service center.

This appliance should be properly grounded for your safety. The power cord of this appliance is equipped with a three-prong plug which mates with standard three prong wall outlets to minimize the possibility of electrical shock.

Do not under any circumstances cut or remove the third ground prong from the power cord supplied. For personal safety, this appliance must be properly grounded.

This appliance requires a standard 115/120 Volt AC ~/60Hz electrical ground outlet with three-prong. Have the wall outlet and circuit checked by a qualified electrician to make sure the outlet is properly grounded. When a standard 2-prong wall outlet is encountered, it is your responsibility and obligation to have it replaced with a properly grounded 3-prong wall outlet.

The cord should be secured behind the appliance and not left exposed or dangling to prevent accidental injury.

The appliance should always be plugged into its own individual electrical outlet which has a voltage rating that matches the rating label on the appliance. This provides the best performance and also prevent overloading house wiring circuits that could cause a fire hazard from overheated. Never unplug the appliance by pulling the power cord. Always grip the plug firmly and pull straight out from the receptacle. Repair or replace immediately all power cords that have become frayed or otherwise damaged. Do not use a cord that shows cracks or abrasion damage along its length or at either end. When moving the appliance, be careful not to damage the power cord.

➢ EXTENSION CORD

Because of potential safety hazards under certain conditions, it is strongly recommended that you do not use an extension cord with this appliance. However, if you must use an extension cord it is absolutely necessary that it be a UL/CUL-Listed, 3-wire grounding type appliance extension cord having a grounding type plug and outlet and that the electrical rating of the cord be 115 volts and at least 10 amperes.

➢ SURGE PROTECTOR

Most electrical appliances use a series of electric control boards to operate. These boards are very susceptible to power surges and could be damaged or destroyed.
If the appliance is going to be used in an area or if your city / country is prone to power surges / outages; it is suggested that you use a power surge protector for all electrical devices / appliances you use. The surge protector that you select must have a surge block high enough to protect the appliance it is connected to. If you have any questions regarding the type and size of surge protector needed contact a licensed electrician in your area.

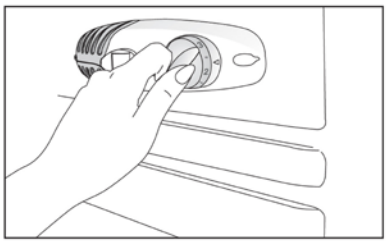
Damages due to power surges are not considered a manufacturer covered defect and will void your product warranty.

REVERSING THE DOOR SWING OF YOUR APPLIANCE

This refrigerator-freezer has the capability of the doors opening from either the left or right side. The unit is delivered to you with the doors opening from the left side. Should you desire to reverse the opening direction, please call service for reversal instructions.

OPERATING YOUR APPLIANCE

➢ Temperature Control



- Your appliance has only one control for regulating the temperature in the fresh food and the freezer compartment. The temperature control is located on the upper right hand side of the fresh food section.
- The range of the temperature control is from position"1" the warmest to "7" the coldest.
- The first time you turn the unit on set the temperature control to “7” or the max-position.
- After 24 to 48 hours, adjust the temperature control to the setting that best suites your needs. The setting of “4 - 5” should be correct for home or office appliance use.
- Changes of the ambient temperature affect temperature in the interior of the appliance (choose correct setting of the thermostat knob).
- To turn the thermostat off, turn the temperature control to "0".

NOTE:

- Turning the temperature control to "0" position stops the cooling cycle but does not shut off the power to the appliance.
- If the unit is unplugged, power lost, or turned off; you must wait 3 to 5 minutes before restarting the unit. If you attempt to restart before this time delay, the appliance will not start.

➢ Interior Light

When you open the door the light will be ON automatically. When you close the door the light will turn OFF automatically.

➢ Defrosting Your Appliance

- When? For the most efficient operation and minimum energy consumption, defrost the appliance compartment when the frost on the appliance walls is excessive or ¼ inch thick. There is no need to defrost the refrigerator, because ice depositing on the inner back wall is defrosted automatically. Ice is depositing on the inner back wall during the compressor operation; later on, when the compressor is not operating ice is defrosting and water drops collect and drain through the outlet in the inner back wall into the drain pan situated above the compressor, from where it evaporates.
- How?

CAUTION

Do not use boiling water because it may damage the plastic parts. In addition, never use a sharp or metallic instrument to remove frost as it may damage the cooling coils and will void the warranty. We recommend using the plastic scraper.

- Reset the thermostat to “0” position and disconnect the power supply.
- Remove the frozen food from the appliance and place it in a cooler to protect the food.
- Leave the door open for a while so that you can easy scrape off the frost.
- Use a plastic scraper but be careful not to damage the inner surfaces of the freezer.
- Wipe up the scraped frost and ice before it is completely defrosted.

.

➢ Freezer Compartment

- Proper use of the appliance, adequately packed food, correct temperature and taking into account hygienic precautions will substantially influence the quality of freezing the food or string of the frozen foods.

- Carefully select food you intend to freeze; it should be of adequate quality and suitable for freezing.
- Use correct packaging and wrap it right.
- The packaging should be airtight and shouldn't leak since this could cause substantial vitamin loss and dehydration of foods.
- Foils and bags should be soft enough to tightly wrap around the foods.
- When preparing foods to be frozen, consider sanitary precautions.
- Mark packages with following data: kind and amount of foods and the date of loading.
- It is most Important that the food is frozen as quickly as possible.
- If the loading amount is too large, the quality of freezing is reduced which affects the quality of frozen foods.

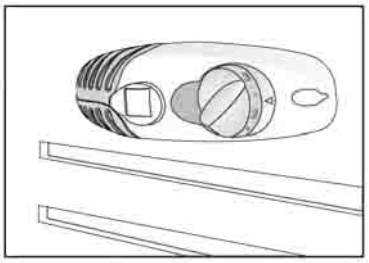
CARE AND MAINTENANCE

➢ Cleaning Your Appliance

- Turn the temperature control to "0", unplug the appliance, and remove the food, shelves, and trays.
- Wash the inside with warm water and baking soda solution. The solution should be about 2 tablespoons of baking soda to a quart of water.
- Wash the shelves and trays with a mild detergent solution. Plastic parts cannot be washed in a dishwasher.
- The outside of the appliance should be cleaned with mild detergent and warm water.
- The condenser coils should be vacuumed when they are dusty or dirty.
- Clean the drain pan on the refrigerator compressor. Do not remove the drain pan.
- After cleaning, connect the appliance to power supply and reload the packages.

➢ Maintenance of Your Appliance

➢ Changing the Light Bulb



- Unplug the AC power cord from the wall.
- Remove the screw that holds the light bulb cover.
- Remove the light bulb cover.
- Unscrew the bulb.
- Replace with a 10 watts bulb that is the same shape and size.
- Replace the light bulb cover.

➢ Power Failure

Most power failures are corrected within a few hours and should not affect the temperature of your appliance if you minimize the number of times the door is opened. If the power is going to be off for a longer period of time, you need to take the proper steps to protect your food.

➢ Vacation Time

During long absences, remove all the food; unplug your appliance, clean your appliance, and leave the door slightly open to avoid possible formation of condensation, mold, or odors.

➢ Moving Your Appliance

- Remove all the food.
- Securely tape down all loose items inside your appliance.
- Turn the leveling screws up to the base to avoid damage.
- Tape the doors shut.
- Be sure the appliance stays in the upright position during transportation.

➢ Energy Saving Tips

- The appliance should be located in the coolest area of the room, away from heat producing appliances or heating ducts, and out of the direct sunlight.
- Let hot foods cool to room temperature before placing in the appliance. Overloading the appliance forces the compressor to run longer. Foods that freeze too slowly may lose quality, or spoil.
- Be sure to wrap foods properly, and wipe containers dry before placing them in the appliance. This cuts down on frost build-up inside the appliance.
- Appliance storage bin should not be lined with aluminum foil, wax paper, or paper toweling. Liners interfere with cold air circulation, making the appliance less efficient.
- Organize and label food to reduce door openings and extended searches. Remove as many items as needed at one time, and close the door as soon as possible.
- Try not to open the door too often, especially when the weather is wet and hot.
- Every so often check if the appliance is sufficiently ventilated.
- Ice and frost layer increase energy consumption, so clean the appliance as soon as the layer is ¼" thick.

PROBLEMS WITH YOUR APPLIANCE?

You can solve many common appliance problems easily, saving you the cost of a possible service call. Try the suggestions below to see if you can solve the problem before calling the servicer.

TROUBLESHOOTING GUIDE

PROBLEM	POSSIBLE CAUSE
Appliance does not operate.	Not plugged in. The circuit breaker tripped or blown fuse.
Appliance does not cool.	The appliance temperature control is set at "0"
Compressor turns on and off frequently.	Condenser coil at the back of the unit is dirty. The room temperature is hotter than normal. A large amount of food has been added to the appliance. The door is open too often. The door is not closed completely. The temperature control is not set correctly. The door gasket does not seal properly. The appliance does not have the correct clearances. (5" to both sides and back of unit)
The light does not work.	The home circuit breaker or fuse has tripped. The appliance is unplugged. The bulb has burned out (see the maintenance section for the replacement procedure).
Vibrations.	Check to assure that the appliance is level.
The appliance seems to make too much noise.	The rattling noise may come from the flow of the refrigerant, which is normal. As each cycle ends, you may hear gurgling sounds caused by the flow of refrigerant in your appliance. Contraction and expansion of the inside walls may cause popping and crackling noises. The appliance is not level.
The door will not close properly.	The appliance is not level. The doors were reversed and not properly installed. The gasket is dirty. The shelves, bins, or baskets are out of position.

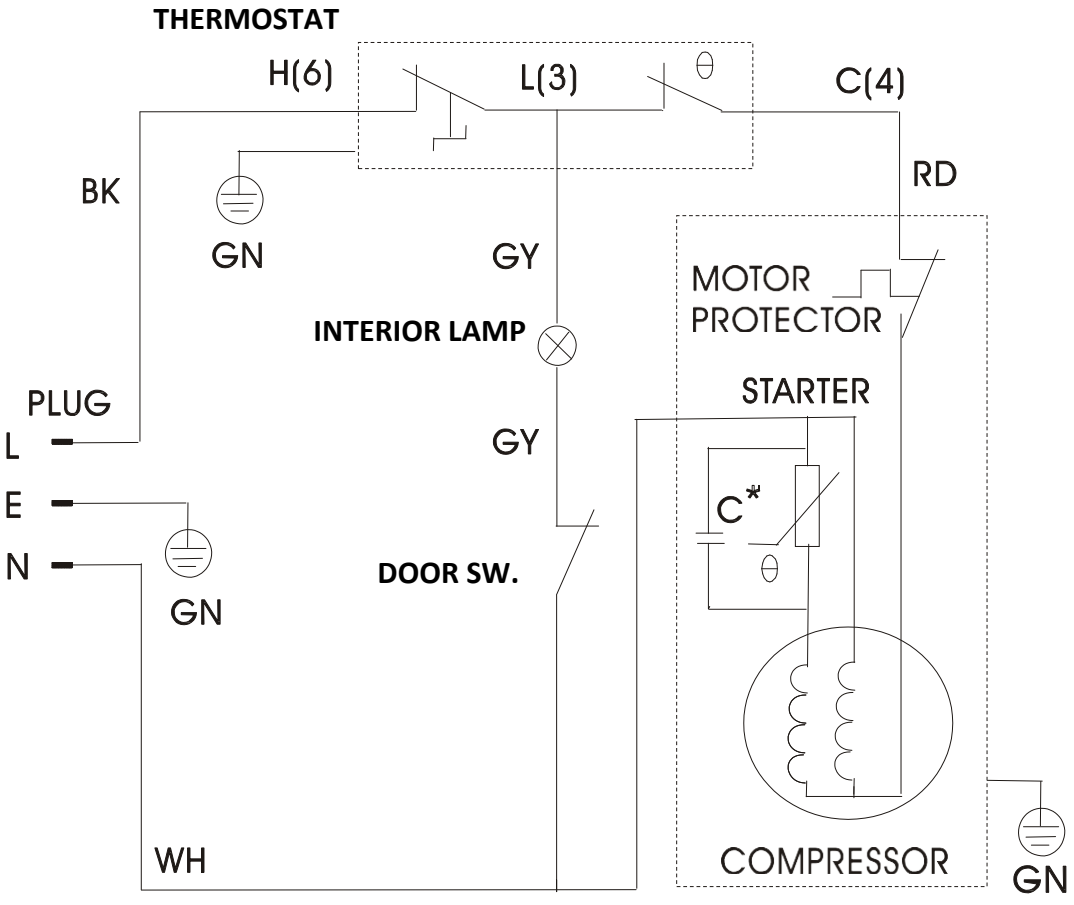
SERVICE FOR YOUR APPLIANCE

We are proud of our customer service organization and the network of professional service technicians that provide service on your Avanti appliances. With the purchase of your Avanti appliance, you can have the confidence that if you ever need additional information or assistance, the Avanti Products Customer Service team will be here for you. Just call us toll-free.

AVANTI PRODUCTS CUSTOMER SERVICES

Product Information 800-323-5029	Whatever your questions are about our products, help is available.
Part Orders 800-220-5570	You may order parts and accessories that will be delivered directly to your home. You may order these items by personal check, money order, Master Card, or Visa.
In-Home Repair Service 800-220-5570	An Avanti Products authorized service center will provide expert repair service, scheduled at a time that is convenient for you. Our trained servicers know your appliance inside and out.

Wiring Diagram



YOUR AVANTI PRODUCTS WARRANTY	Staple your sales receipt here. Proof of original purchase date is needed to obtain service under warranty.

WHAT IS COVERED – LIMITED ONE-YEAR WARRANTY

Avanti Products warrants that the product is free from defects in materials and/or workmanship for a period of twelve (12) months from the date of purchase by the original owner. The foregoing timeline begins to run upon the date of purchase, and shall not be stalled, tolled, extended, or suspended for any reason whatsoever unless described in detail in the warranty document. For one year from the date of purchase by the original owner, Avanti products will, at its option, repair or replace any part of the product which proves to be defective in material or workmanship under normal use. Avanti Products will provide you with a reasonably similar product that is either new or factory refurbished. During this period Avanti Products will provide all parts and labor necessary to correct such defects free of charge, so long as the product has been installed and operated in accordance with the written instructions in this manual. In rental or commercial use, the warranty period is 90 days. All Avanti appliances of 4.2 cubic feet capacity or less must be brought/sent to the appliance service center for repair.

LIMITED SECOND THROUGH FIFTH YEAR WARRANTY

For the second through the fifth year from the date of original purchase, Avanti Products will provide a replacement compressor free of charge due to a failure. You are responsible for the service labor and freight charges. In rental or commercial use, the limited compressor warranty is one year and nine months. Costs involved to move the product to the service center and back to the user's home, as maybe required, are the user's responsibility.

WARRANTY EXCLUSIONS / WHAT IS NOT COVERED:

The warranty coverage described herein excludes all defects or damage that are not the direct fault of Avanti Products, including without limitation, one or more of the following:

- A failure to comply with any applicable state, local, city, or county electrical, plumbing and/or building codes, regulations, or laws, including failure to install the product in strict conformity with local fire and building codes and regulations.
- Any external, elemental and/or environmental forces and factors, including without limitation, rain, wind, sand, floods, fires, mud slides, freezing temperatures, excessive moisture or extended exposure to humidity, lightning, power surges, structural failures surrounding the appliance, and acts of God.

- Content losses of food or other content due to spoilage.
- Incidental or consequential damages
- Parts and labor costs for the following will not be considered as warranty:
  - Inner door panels, door shelves, door rails, and/or door supports.
  - Vegetable crispers.
  - Light bulbs and/or plastic housing.
  - Plastic cabinet liners.
  - Punctured evaporator that voids the warranty on the complete sealed system.

- Shipping and handling costs associated with the replacement of the unit.
- Repairs performed by unauthorized servicers.
- Service calls that are related to external problems, such as abuse, misuse, inadequate electrical power, accidents, fire, floods, or any other acts of God.
- Failure of the product if it is used for other than it intended purpose.
- The warranty does not apply outside the Continental USA.
- Surcharges including but not limited to, any after hour, weekend, or holiday service calls, tolls, ferry trip charges, or mileage expense for service calls to remote areas.

In no event shall Avanti Products have any liability or responsibility whatsoever for damage to surrounding property, including cabinetry, floors, ceilings, and other structures and/or objects around the product. Also excluded from this warranty are scratches, nicks, minor dents, and other cosmetic damages on external surfaces and exposed parts; Products on which the serial numbers have been altered, defaced or removed; service visits for customer education, or visits where there is nothing wrong with the product; correction of installation problems (you are solely responsible for any structure and setting for the product, including all electrical, plumbing and/or other connecting facilities, for proper foundation/flooring, and for any alterations including without limitation cabinetry, walls, floors, shelving etc., as well as the resetting of breakers or fuses.

OUT OF WARRANTY PRODUCT

Avanti Products is under no obligation, at law or otherwise, to provide you with any concessions, including repairs, pro-rates, or product replacement, once this warranty has expired.

INSTRUCCIONES DE SEGURIDAD

- El model contiene R600A (el refrigerante isobutano), un gas natural respetuoso con el medio ambiente pero también inflamable. Al transportar o instalar la unidad se debe tener cuidado de no dañar ninguno de los componentes del sistema de refrigeración. En caso de daño se debe evitar la exposición al fuego o fuentes de ignición y se debe ventilar la habitación en la que se encuentra la unidad durante unos minutos.
- No utilizar aparatos mecánicos o sistemas artificiales para acelerar el proceso de descongelamiento.
- No utilizar aparatos eléctricos en la parte de almacenaje de comida.
- Si se utiliza este aparato para sustituir a otro que cuenta con cierre se debe romper o quitar dicho cierre como dedida de seguridad antes de guardarlo, para así evitar que los niños se queden encerrados dentro del lugar.
- Las neveras y los congeladores viejos contienen gases aislantes y de refrigeración que se deben eliminar adecuadamente. La eliminación de una unidad debe ser realizada por un servicio especializado, y cualquier duda debe ser consultada a las autoridades locales o al proveedor. Es preciso asegurarse de que los conductos de su aparato de refrigeración no resultan dañados antes de que los recoja el equipo encargado.

  AVISO IMPORTANTE:
- Por favor, lea atentamente este manual antes de proceder a la instalación y al encendido de este aparato. El fabricante no se hará responsable de las instalaciones defectuosas o del uso incorrecto del aparato, tal como se describe en este manual.

➢ RECOMENDACIONES

- No utilise adaptadores que puedan provocar el sobrecalentamiento del aparato o inclusive un incendio.
- No utilise cables de suministro de energía viejos o deformados.
- No retuerza o doble los cables.
- No permita que los niños jueguen con el aparato. Los niños nunca deben sentarse en los estantes ni colgarse de la puerta.
- No utilise objetos metálicos afilados para extraer el hielo del congelador: podrían perforar el circuito del refrigerador y, provocar un daño irreparable al aparato. Utilise la espátula de plástico suministrada.
- No enchufe el tomacorriente con las manos húmedas.
- No coloque recipientes (botellas de cristal o latas) con líquidos en el congelador, sobre todo líquidos con gas, ya que podrían provovar que el recipiente explote durante le congelación.
- Las botellas que contengan un alto porcentaje de alcohol, deberán estar debidamente cerradas y deben ser colocadas verticalmente en el refrigerador.
- No toque las superficies congeladas, especialmente si tiene las manos mojadas ya que podría producir quemaduras o heridas.

➢ LA INSTALACION Y ENCENDIDO DEL APARATO

- Este refrigerador se conecta a 115v y 60 ciclos.
- Podrá disponer de la ayuda necesaria para instalar y poner en marcha su refrigerador sin ningún costo adicional.
- Antes de realizar la conexión al suministro de corriente eléctrica, asegúrese de que el voltaje que aparece en la etiqueta corresponda al voltaje del sistema eléctrico de su hogar.
- Si la clavija no sirve para las base de enchufe de que dispone, cambie la clavija del enchufe del refrigerador a una correcta (al menos 10A).
- Inserte la clavija en la base de enchufe con una toma a tierra apropiada. Si la base de enchufe no tiene una toma a tierra, sugerimos que llame a un electricista para que la ayude.
- El fabricante no se hace responsable por los posibles fallos al completar la toma a tierra, tal como se describe en este manual.
- No coloque el aparato en un lugar en el que esté expuesto a la luz directa del sol.
- No lo use en lugares al aire libre y no permita que se exponga a la lluvia.
- Coloque el refrigerador lejos de toda fuente de calor y en un lugar ventilado. El refrigerador debe

estar colocado a una distancia de por lo menos 50 cm de radiadores, estufas de gas o de carbón, y a una distancia de 5 cm de las estufas eléctricas.

- No ponga nada encima del refrigerador, y si lo hace que sea a una distancia no menor de a 15 cm.
- Si se instala el aparato cerca de otro refrigerador o congelador, deberá comprobar que se mantiene a una distancia entre ambos de por lo menos 5 cm con el fin de evitar procesos de condensación.
- No introduzca en el refrigerador grandes cantidades de productos o que sean muy pesados.
- El refrigerador deberá estar colocado de manera que mantenga una posición firme y nivelada con respecto al suelo. Utilise las dos patas niveladoras frontales para compensar suelo irregular.
- Deberá limpiar tanto la parte externa del aparato como los accesorios que encontrará en el interior del mismo con una solución compuesta de agua y jabón líquido; para limpiar la parte interna del aparato utilise bicarbonato de sodio disuelto en agua tibia. Después de secarlos vuelva a colocar los accesorios en su lugar de origen.

➢ ANTES DEL ENCENDIDO

- Deberá esperar unas 3 horas antes de enchufar el aparato a la red eléctrica con el fin de asegurar el correcto funcionamiento del mismo.
- Es posible que se produzca un cierto olor al encender el aparato por primera vez. Este olor desaparece cuando el aparato haya comenzado a enfriarse.

LAS DISTINTAS FUNCIONES Y POSIBILIDADES

➢ AJUSTE DEL TERMOSTATO

- El termostato automáticamente regula la temperature interna en el compartimiento del refrigerador y del congelador. Para obtener temperaturas más frías debe girar el dial del termostato desde la posición 1 a la posición 7.
- Para la conservación de alimentos en el compartimiento del congelador durante un corto período de tiempo, puede colocar el dial del termostato entre la posición 4 y 5.
- Para la conservación de alimentos en el compartimiento del congelador durante un período largo de tiempo, puede colocar el dial del termostato en la posición 4-5.
- Tenga en cuenta; que la temperatura ambiente, la temperatura de la comida almacenada y la frecuencia con que se abra la puerta del aparato, afectan a la temperatura en el compartimiento del refrigerador. Si fuera necesario, modifique la temperatura seleccionada según sea el caso.

DISPOSICION DE LOS ALIMENTOS
COMPARTIMIENTO DEL REFRIGERADOR

- Para reducir el grado de humedad y el consecuente aumento de la formación de escarcha, no coloque nunca líquidos en recipientes sin cerrar dentro del refrigerador. La escarcha tiende a concentrarse en las partes más frías de congelador y con el tiempo necesitará realizar el proceso de descongelamiento cada vez con mayor frecuencia.
- No introduzca nunca comida caliente en el refrigerador. La comida caliente debería dejarse enfriar a temperatura ambiente y colocarse dentro del refrigerador de forma que garantice la circulación de aire adecuada dentro del compartimiento.
- Deberá evitar que cualquier producto esté en contacto con la pared trasera del aparato, ya que produciría escarcha y los empaques podrían quedarse pegados a la pared. No abra la puerta del refrigerador con demasiada frecuencia.
- Coloque la carne y el pescado limpio (envuelto en paquetes o en papel plastificado) que usará en los próximos 1-2 días, en la parte inferior del compartimiento refrigerado (encima del compartimiento para verduras), ya que ese es el lugar más fresco y garantizará las mejores condiciones de conservación.
- Puede colocar las frutas y verduras en el cajón correspondiente, sin necesidad de envolverlas.

Compartimiento del Congelador

- La función del compartimiento del congelador consiste en almacenar alimentos congelados durante largos períodos de tiempo, además de hacer cubitos de hielo.
- **Para congelar alimentos frescos**, asegúrese que la mayor superficie posible del alimento a congelar esté en contacto con la superficie del congelador.
- No introduzca alimentos frescos junto a los alimentos ya congelados, pegados unos a otros, pues los alimentos congelados podrían ablandarse o derretirse.
- Cuando congele alimentos frescos (como carne o pescado), divídalos en paquetes que contengan la cantidad que vaya a consumir cada vez.
- Una vez que la unidad ha sido descongelada coloque los alimentos de nuevo en el congelador y recuerde que debe consumirlos a la mayor brevedad posible.
- No introduzca nunca comida caliente en el compartimiento del congelador, ya que padría estropear los alimentos congelados.
- **Para almacenar los alimentos congelados:** se recomienda siempre seguir atentamente las instrucciones que aparecen en el empaquetamiento de alimentos congelados y en caso de no tener información concreta al respecto, no almacene nunca los alimentos durante más de 3 meses a partir de la fecha de compra.
- **Cuando compre alimentos congelados** asegúrese que hayan sido congelados a la temperatura adecuada y de que el empaque está intacto.
- Se recomienda transportar los alimentos congelados en recipientes adecuados para mantener la calidad de los alimentos, además de colocarlos en el congelador a la mayor brevedad posible.
- Si un paquete que contiene alimentos congelados muestra signos de humedad y presenta un aspecto anormalmente hinchado, es probable que previamente haya sido almacenado a una temperatura inapropiada y que el contenido del paquete se haya deteriorado.
- **El período de conservación de los alimentos congelados** depende de la temperatura ambiental, posición del dial del termostato, de la regularidad con que se abra la puerta del refrigerador, tipo de alimentos y tiempo necesario para transportar el producto desde la tienda hasta su hogar. Siga siempre las instrucciones impresas en el empaque del producto y no exceda nunca el período máximo de conservación indicado.
- Si quiere volver a abrir la puerta del refrigerador inmediatamente después de haberla cerrado, se producirá un vacío (debido al cambio de temperaturas) y la puerta no se abrirá con facilidad. Es normal. Después de alcanzar la temperatura adecuada en su interior, la puerta se podrá abrir facilmente.

LIMPIEZA Y MANTENIMIENTO

- **Desenchufe el aparato de la toma de corriente antes de empezar a limpiarlo**.
- No limpie el refrigerador echándole agua a chorro encima.
- Se recomienda limpiar el compartimiento del refrigerador periodicamente con una solución de bicarbonato de sodio.
- Limpie los accesorios por separado con agua y jabón. No meta los accesorios en el lavavajillas.
- No utilise productos, detergentes o jabones abrasivos. Cuando haya terminado de limpiar el aparato, pásele un trapo humedo y séquelo cuidadosamente. Cuando haya terminado el proceso de limpieza vuelva a conectar el enchufe del refrigerador, con las manos bien secas.
- Se recomienda realizar la limpieza del condensador con un cepillo al menos dos veces al año con el fin de ahorrar energía y de incrementar la productividad.

ELIMINACION DE LA ESCARCHA COMPARTIMIENTO DEL REFRIGERADOR

- Mientras el refrigerador está en funcionamiento el proceso de eliminación de la escarcha se produce automáticamente; el agua resultante de la descongelación se recoge en la cubeta y se evapora automáticamente.
- Se recomienda limpiar periodicamente la cubeta de drenaje así como el agujero que funciona como vertedero del agua descongelada con el instrumento destinado a tal efecto, para prevenir así que el agua se almacene en la parte inferior del refrigerador en lugar de ser expulsada.
- Puede además verter medio vaso de agua en el vertedero para limpiar su interior.

COMO REEMPLAZAR EL BOMBILLO

Para reemplazar el bombillo del compartimiento del refrigerador

1. Desenchufe el aparato del tomacorriente.
2. Presione los ganchos que encontrará a ambos lados de la parte superior y inferior de la cubierta, para así quitar dicha cubierta o tapa.
3. Reemplace el bombillo usado por otro cuya capacidad no sea superior a 10 W.

TRANSPORTE Y CAMBIO DE POSICION

COMO CAMBIAR LA DIRECCION DE APERTURA DE LA PUERTA

En caso de que necesite cambiar el lado de apertura de la puerta, por favor consulte al servicio pos-venta de su localidad.

Transporte y Cambio De Posición

- El empaque original y la espuma de poliestireno pueden cubrirse si así se desea.
- Durante el transporte el aparato deberá mantenerse siempre atado con una cinta ancha o con una cuerda resistente. Durante el transporte, deberá seguir las normas que aparecen en la caja de cartón.
- Antes de transportar el aparato o de cambiar su posición, todos los objetos movibles (como bandejas, cajones para las verduras...) deberían extraerse del aparato o fijarse con cinta adhesiva para evitar su movimiento.

ANTES DE LLAMAR AL SERVICIO TECNICO

Si su refrigerador no funciona correctamente, puede deberse a un problema de poca importancia, por lo tanto compruebe lo que viene a continuación antes de llamar a un electricista; así podrá ahorrar tiempo y dinero.

Que hacer si su refrigerador no funciona;
Compruebe:

- No se ha producido una falla en el suministro de corriente.
- El interruptor general de su hogar no está desconectado.
- El dial del termostato no está en la posición “0”.
- El tomacorriente se encuentra en perfectas condiciones. Para comprobarlo, conecte otro aparato que sepa que funciona bien en ese tomacorriente.

Que hacer si el refrigerador funciona mal:
Compruebe;

- No ha sobrecargado el aparato.
- Las puertas están perfectamente cerradas.
- No hay polvo acumulado en el condensador.
- Hay espacio suficiente en la parte trasera.

Si se produce ruido:
El gas refrigerante que circula por el circuito del refrigerador puede producir un ligero ruido (un sonido burbujeante) incluso cuando el compresor no está funcionando. No debe preocuparse por eso, ya que es perfectamente normal. Si los ruidos fuesen diferentes, compruebe que:

- El refrigerador está bien nivelado.
- No hay ningún producto en contacto con la parte trasera.
- Los elementos y accesorios del aparato no están vibrando.

Si encuentra agua en la parte inferior del refrigerador;
Compruebe que;
El vertedero por el que se extrae el agua descongelada no está obstruído. (Utilise el instrumento destinado para limpiar el agujero).

RECOMENDACIONES

- **Con el fin de aumentar el espacio disponible** y mejorar su aspecto, la “sección de enfriado” de este aparato se encuentra situada dentro de la pared posterior del compartimiento del refrigerador. Mientras el aparato esté funcionando, esta pared estará cubierta con escarcha o gotas de agua, dependiendo de si el compresor está funcionando o no. No debe preocuparse por eso. Es perfectamente normal. Deberá descongelar el aparato solamente si se forma una capa espesa en la pared trasera.
- **Si no va a usar el refrigerador durante un período de tiempo prolongado** (por ejemplo, durante las vacaciones de verano), ponga el dial del termostato del compartimiento que va a desconectar (normalmente el compartimiento del refrigerador) en la posición”0”. Descongele y limpie el refrigerador, y deje la puerta abierta para evitar la formacion de moho y la producción de malos olores.
- Para apagar totalmente el aparato, desconéctelo del tomacorriente (para realizar la limpieza y cuando se dejen las puertas abiertas).

Registration Information

Thank you for purchasing this fine Avanti product. Please fill out this form and return it to the following address within 100 days from the date of purchase and receive these important benefits:

Avanti Products, LLC.
P.O.Box 520604 – Miami, Florida 33152

- **Protect your product:**
  We will keep the model number and date of purchase of your new Avanti product on file to help you refer to this information in the event of an insurance claim such as fire or theft.

- **Promote better products:**
  We value your input. Your responses will help us develop products designed to best meet your future needs.

----------(detach here)----------

Avanti Registration Card

Name

Address

City State Zip

Area Code Phone Number

Did You Purchase An Additional Warranty

☐ Extended
☐ None

Reason for Choosing This Avanti Product:
Please indicate the most important factors That influenced your decision to purchase this product:

☐ Price
☐ Product Features
☐ Avanti Reputation
☐ Product Quality
☐ Salesperson Recommendation
☐ Other: _____
☐ Friend / Relative Recommendation
☐ Warranty
☐ Other: _____

Comments:

Model # Serial #

Date Purchased Store / Dealer Name

E-mail Address

Occupation

As your Primary Residence, Do You:

☐ Own ☐ Rent

Your Age:

☐ under 18 ☐ 18-25 ☐ 26-30
☐ 31-35 ☐ 36-50 ☐ over 50

Marital Status:

☐ Married ☐ Single

Is This Product Used In The:

☐ Home ☐ Business

How Did You Learn About This Product:

☐ Advertising
☐ In-Store Demo
☐ Personal Demo

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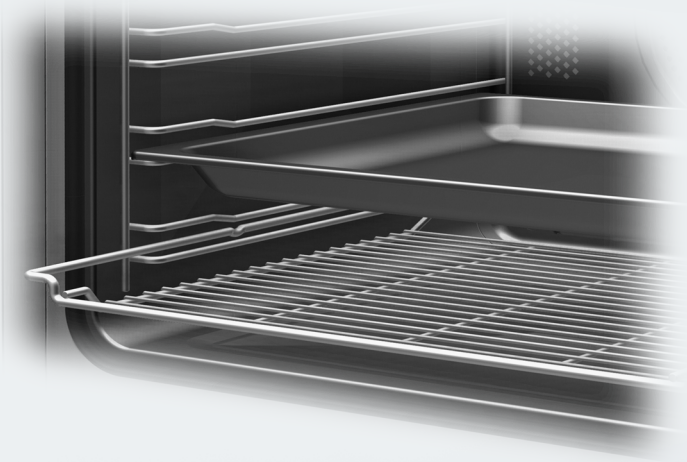
Operating and Installation Instructions
Oven



To prevent accidents and machine damage, read these instructions **before** installation or use.

en – US, CA

M.-Nr. 09 786 780

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IMPORTANT SAFETY INSTRUCTIONS

When using the appliance, follow basic safety precautions, including the following:

Read all instructions before installation and use of the oven to prevent accidents and machine damage.

This appliance complies with current safety requirements. Improper use of the appliance can lead to personal injury and material damage.

Read all instructions before installing or using the oven for the first time. Only use the appliance for its intended purpose.

Keep these operating instructions in a safe place and pass them on to any future user.

Use

▶ This appliance is intended for residential use only. Use only as described in these operating instructions.

▶ This appliance is not intended for outdoor use.

▶ Only use this oven for residential cooking, and the purposes described in this manual.
Other uses are not permitted and can be dangerous.

▶ Risk of Fire! Do not use this oven to store or dry flammable materials.

▶ Persons who lack physical, sensory or mental abilities, or experience with the appliance should not use it without supervision or instruction by a responsible person.

Children

▶ Children should not be left alone or unattended in an area where an oven is in use. Never allow children to operate, sit or stand on any part of the oven. **Caution:** Do not store items of interest to children in cabinets above an oven. Children climbing on the oven to reach these items could be injured.

▶ Burn Hazard - Do not allow children to use the oven. Failure to do so can result in severe burns or serious injury.

▶ Danger of suffocation! Ensure that any plastic wrappings, bags, etc. are disposed of safely and kept out of the reach of children.

▶ Danger of burns. The oven gets hot at the oven door glass, the vapor vent, the handle and the operating controls. Do not allow children to touch or play in, on or near the oven.

Technical safety

▶ This appliance must be installed and connected in compliance with the installation instructions.

▶ Installation, repair and maintenance work should be performed by a Miele authorized service technician in accordance with national and local safety regulations and the provided installation instructions. Contact Miele's Technical Service Department for examination, repair or adjustment. Repairs and other work by unauthorized persons could be dangerous and may void the warranty.

▶ Maintenance by the user: Never repair or replace any part of the appliance unless the instructions specifically recommend doing so. Service work may only be performed by a qualified technician.

▶ Before installing the oven, check for externally visible damage. Do not operate a damaged appliance.

▶ Reliable and safe operation of the oven can only be guaranteed if it is connected to the power supply.

IMPORTANT SAFETY INSTRUCTIONS

▶ To guarantee the electrical safety of this appliance, continuity must exist between the appliance and an effective grounding system. This appliance must be grounded. Connect only to properly grounded outlet. See "Electrical connection - GROUNDING INSTRUCTIONS". It is imperative that this basic safety requirement be met. If there is any doubt, have the electrical system of the house checked by a qualified electrician.

▶ Proper installation: Make sure that your appliance has been installed correctly and that it has been grounded by a qualified technician.

▶ Before installation, make sure that the voltage and frequency listed on the data plate correspond with the household electrical supply. This data must correspond to prevent injury and machine damage. Consult a qualified electrician if in doubt.

▶ Before installation or service, disconnect the power supply to the work area by

– removing the fuse,

– "tripping" the circuit breaker, or

– unplugging the unit. Pull the plug not the cord.

▶ Extension cords do not guarantee the required safety of the appliance (e.g. danger of overheating). Do not use an extension cord to connect this appliance to electricity.

▶ The oven is not to be operated until it has been properly installed within cabinetry.

▶ Danger of electric shock!
Under no circumstances open the outer casing of the appliance.

▶ This appliance must not be used in a non-stationary location (e.g. on a ship).

▶ Do not repair or replace any part of the appliance unless specifically recommended in the operating instructions. All other servicing should be referred to a qualified technician.

▶ Defective components should be replaced by Miele original parts only. Only with these parts can the manufacturer guarantee the safety of the appliance.

▶ In order for the oven to function correctly, it requires an adequate supply of cool air. Ensure that the air flow is not impaired (e.g. insulation in the cabinetry). Also be sure that the cool air supply is not heated by other sources nearby.

▶ If the oven is installed behind a cabinet door, do not close the door while the oven is in operation. Heat and moisture can build up behind the closed door and cause damage to the oven, cabinetry and flooring. Do not close the door until the oven has completely cooled down.

Proper use

⚠ The oven becomes very hot while in use. Use caution to ensure that you are not burned on the heating elements or interior surfaces of the oven. Use pot holders when placing food in the oven, adjusting the racks, etc. in a hot oven.

▶ Caution: Heating elements may be hot even though they are not glowing. Interior surfaces of an oven become hot enough to cause burns. External parts of the oven such as the door glass, vents, and the control panel can become hot. During and after use, do not touch, or let clothing or other flammable materials come into contact with heating elements or interior surfaces of the oven until they have had sufficient time to cool.

▶ Do not let food sit in the oven for more than one hour before or after cooking. Doing so can result in food poisoning or sickness.

IMPORTANT SAFETY INSTRUCTIONS

▶ It is important that the heat is evenly distributed throughout the food being cooked. This can be achieved by stirring and/or turning the food.

▶ Use only dry, heat-resistant potholders. Moist or damp potholders used on hot surfaces may result in steam burns. Do not let potholders come in contact with oil or grease. Do not substitute dish towels or other bulky items for potholders. Do not let potholders touch hot heating elements.

▶ Loose fitting or hanging garments present a fire hazard. Wear proper apparel while operating the appliance.

▶ Do not heat unopened containers of food in the oven, pressure may cause the containers to burst and result in injury.

▶ Never pour cold water onto hot surfaces in a hot oven.
The steam created could cause serious burns or scalding and the sudden change in temperature can damage the enamel in the oven.

▶ To prevent burns, always place oven racks at their desired height while the oven is cool. If the rack must be moved while the oven is hot, do not let pot holders touch hot heating elements.

▶ Open the door carefully to allow hot air or steam to escape before placing or removing food.

▶ To prevent burns, allow the heating elements to cool before cleaning by hand.

▶ Do not leave the oven door open unnecessarily as someone may trip over it or be injured by it.

▶ Never leave the appliance unattended when cooking with oil or fat. They can ignite if overheated. Do not use water on grease fires.Turn off the oven immediately and suffocate the flames by keeping the oven door closed.

▶ Smother the fire or flames, or use a dry chemical extinguishing agent or foam fire extinguisher.

▶ Never store flammable liquids and materials in, above or under an oven, or near cooking surfaces.

▶ Do not use the oven to heat the room. The high temperatures radiated could cause objects near the oven to catch fire.

⚠ WARNING
NEVER use this appliance as a space heater to heat or warm the room. Doing so may result in carbon monoxide poisoning and overheating of the oven.

⚠ WARNING
NEVER use this appliance as storage space. Doing so may result in carbon monoxide poisoning and overheating of the oven.

⚠ WARNING
NEVER cover any slots, holes or passages in the oven bottom or cover an entire rack with materials such as aluminum foil. Doing so blocks air flow through the oven and may cause carbon monoxide poisoning. Aluminum foil linings may also trap heat, causing a fire hazard.

▶ Broiling food for an excessively long time can cause it to dry out and may result in the food catching fire.
Do not exceed recommended broiling times.

▶ Some foods dry out very quickly and can be ignited by high broiling temperatures. Do not use broiling modes for crisping rolls or bread, or to dry flowers or herbs. Instead use the Convection Bake or Surround modes.

▶ Use caution when using alcohol in your recipes. Alcohol evaporates at high temperatures but may, in rare circumstances, combust on the hot heating elements.

IMPORTANT SAFETY INSTRUCTIONS

▶ Plastic containers, which are not heat-resistant, melt and may ignite at high temperatures and can damage the oven. Use only plastic containers that are indicated by the manufacturer as being suitable for use in ovens.

▶ When residual heat is used to keep food warm, the high level of humidity and condensation can cause damage in the oven. The control panel, countertop or cabinetry may also be damaged. Do not switch the oven off completely while food is inside it, but select the lowest possible temperature for the oven mode you are using. This will ensure the fan will automatically continue to run.

▶ It is recommended to cover all cooked food that is left in the oven to be kept warm. This will prevent moisture from condensing on the interior of the oven.

▶ To avoid damage, do not place aluminum foil, pots, pans or baking sheets directly on the oven floor. This can cause a build up of heat that will damage the oven floor.

▶ Do not slide pots or pans on the oven floor. This could scratch and damage the surface.

▶ The door can support a maximum weight of 33 lbs (15 kg). Do not sit on or lean against an open door, and do not place heavy objects on it. Also make sure that nothing can get trapped between the door and the oven cavity. The oven could get damaged.

▶ This oven must only be used for cooking food. Fumes, vapors or heat given off by glues, plastics or flammable liquids and materials could be hazardous. Do not use it as a dryer, kiln, dehumidifier, etc.

▶ Do not obstruct the flow of combustion and ventilation air.

▶ Do not let metal objects (aluminum foil, pans) come in contact with the heating element.

▶ Make certain that the power cords of small appliances do not come in contact with or get caught in the oven door.

▶ When baking frozen pizzas or pies, place them on the wire rack lined with parchment paper. Do not use the baking tray or the roasting pan for frozen foods with a large surface area. The tray or pan could become warped and difficult to remove from the oven when hot. Frozen foods like french fries, chicken nuggets, etc. can be baked on the baking tray.

Cleaning and care

▶ Do not use a steam cleaner to clean this oven.
Steam could penetrate electrical components and cause a short circuit.

▶ Only clean parts listed in these Operating and Installation Instructions.

▶ Scratches on the door glass can cause the glass to break.
Do not use abrasive cleaners, hard sponges, brushes or sharp metal tools to clean the door glass.

▶ The shelf runners can be removed for cleaning purposes (see "Cleaning and care"). Ensure they are correctly fitted after cleaning and never operate the oven without the shelf runners inserted.

▶ The back panel can be removed for cleaning purposes (see "Cleaning and care"). Ensure it is correctly fitted after cleaning and never operate the oven without the back panel fitted.

▶ There is a seal around the oven interior which seals the inside of the door. Take care not to rub, damage or move the gasket.

▶ Do not use oven cleaners. Commercial oven cleaners or oven liners of any kind should not be used in or around any part of the oven.

IMPORTANT SAFETY INSTRUCTIONS

Accessories

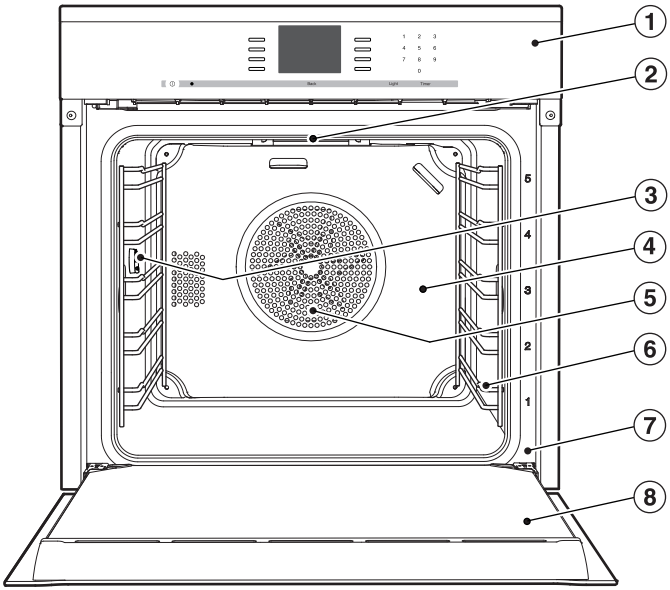
▶ Use only genuine original Miele parts. If parts or accessories from other manufacturers are used, the warranty will become void.

▶ If you have a Miele Gourmet Casserole Dish HUB 5000-M/HUB 5001-M/ HUB 5000-XL do not place it on shelf level 1. This can damage the oven floor. The small gap between the bottom of the dish and the oven floor would cause a build-up of heat and could cause the enamel to crack or chip.
Do not place Miele Casserole Dishes on the top rail of shelf level 1, they will not be secure in this position by the anti-tip safety notches on the sides of the dish.
Use self level 2 for these dishes.

▶ Only use the Miele roast probe supplied with this oven. If it is faulty, it must only be replaced with a Miele genuine roast probe.

▶ The plastic on the roast probe can melt at very high temperatures. Do not use the roast probe when using the broil functions (exception: Convection Broil). Do not store the roast probe in the oven if it is not in use.

SAVE THESE INSTRUCTIONS AND REVIEW THEM PERIODICALLY



① Oven controls

② Browning / Broiling element

③ Connection socket for the roast probe

④ Catalytic enameled back panel

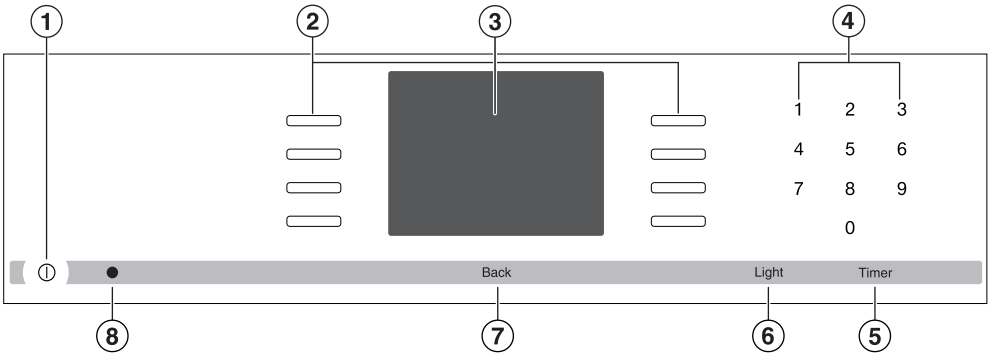
⑤ Convection fan with heating element

⑥ Runners with 5 shelf levels

⑦ Front frame with data plate

⑧ CleanGlass Door

Control panel



① On / Off button ⏻
Turns the oven on and off

② Sensor buttons ⬭
To select operating modes, settings and menu items

③ Display
Displays the time of day and information on operation

④ Sensor buttons 0-9
Numeric keypad to enter values

⑤ "Timer" sensor button
To set the timer

⑥ "Light" sensor button
To turn the oven interior lighting on and off

⑦ "Back" sensor button
To go back one step at a time

⑧ Optical interface
(for service technician use only)

Sensor buttons

The sensors react to touch. Each touch is confirmed with an audible tone. This tone can be turned off (see "Settings – Keypad tone").

Sensor button	Function	Notes
⬭	For selecting options and scrolling through the list of options.	A menu items can be selected by touching the illuminated sensor button ⬭ next to it.
0–9	Numerical keypad for setting values	The numerical keypad is used to set values, e.g. temperatures and durations.
Timer	To set the timer	If a list of options is showing in the display or if a cooking process is running, a timer duration (e.g., when boiling eggs) can be set at any point. If the time of day display is turned off, the "Timer" button will not react until the oven is turned on.
Light	For turning the oven interior lighting on and off	If a list of options is showing in the display or if a cooking process is running, touching "Light" will turn the oven interior lighting on or off. If the time of day display is turned off, the "Light" sensor button will not react until the oven is turned on. The oven interior lighting turns off after 15 seconds during cooking or remains constantly turned on, depending on the setting selected.
Back	To go back a step	

Display

The display is used for showing the time of day or information about modes, temperatures, cooking durations, MasterChef programs and settings. Information or a list of options is shown on the display depending on the function selected.

After turning the oven on with the On/Off sensor button ⏻, the main menu will appear:

If a cooking process is running, selecting Change will call up a list of options which can be set or changed for the cooking process in progress.

– Temperature
– Core Temperature (only when using the roast probe)
– Duration
– Ready at
– Start at (only if Duration / Ready at has been set)
– PreHeating (only available in some operating modes)
– Operating Modes

- A menu item can be selected by touching the illuminated sensor ⬭ next to the menu item.
- Options can then be accessed by touching the illuminated sensor ⬭ next to OK.

Symbols

The following symbols may appear in the display:

Symbol	Description
	Timer
-	Allocates an illuminated Sensor button ⬭ to an option and indicates that the option can be selected.
	If more than four options are available a bar will appear on the right-hand side of the display. Use the allocated sensors to scroll through the list.
▪▪▪▪▪▪▪▪▪▪	The end of a list is indicated by a dotted line. By scrolling down further, you will reach the beginning of the list again.
	Some settings, e.g. display brightness and buzzer volume, are selected using a bar chart.
✓	A check indicates the currently active setting. - will not be displayed and the corresponding sensor will not be illuminated.
i	This symbol indicates that there is additional information and advice about using the oven. Select OK to access the information.
	The system lock or sensor lock is active (see "Settings - System Lock "). The oven cannot be operated.
	Program finished
	Core temperature when using the roast probe

Model numbers

A list of the ovens described in these operating instructions can be found on the back page.

Data plate

The data plate located on the front frame of the oven is visible when the door is open.

Printed on the data plate are the model number, serial number and the connection data (voltage/frequency/ maximum rated load) of the oven.

Have this information available when contacting Miele Technical Service.

Items included

The following items are included with this appliance:

– the Operating and Installation Instructions,

– screws for securing your appliance into the cabinetry, and

– various accessories.

Standard and optional accessories

Accessories vary depending on model. **All ovens are supplied with shelf runners, a universal tray and a wire oven rack.** Depending on the model, your oven may also come with the additional accessories listed.

All accessories and cleaning and care products in these instructions are designed to be used with Miele ovens.

They can be ordered from the Mieleusa.com website or Miele.

When ordering, please have ready the model number of your oven and of the desired accessories.

Shelf runners

Side runners are located on the right and left-hand sides of the oven with 5 1 levels for inserting accessories.

The shelf level numbers are indicated on the front of the oven frame.

Each side runner consists of two rails:

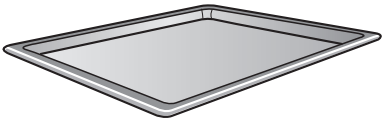
– The accessories (e.g. wire oven rack) slide in between the rails.

– The FlexiClip telescopic runners (depending on model) are inserted on the bottom rail.

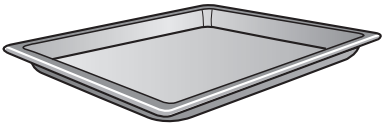
The runners can be removed for cleanings purposes. See "Cleaning and Care".

Baking tray, Roasting pan and Wire oven rack

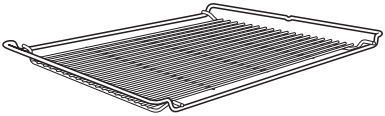
Baking tray HBB 71



Roasting pan HUBB 71



Wire oven rack HBBR 71



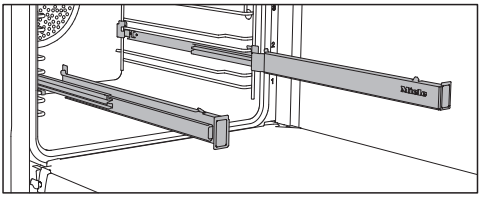
These accessories are inserted into the oven between the two rails of a side runner.

Always position the wire rack as illustrated above.

Non-tip safety notches are located on the shorter sides of these accessories. These prevent the trays being pulled completely out of the side runners when you only wish to pull them out partially.

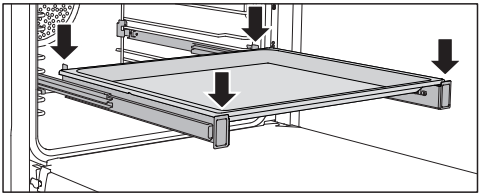
If you are using the roasting pan with the wire rack, insert the roasting pan between the rails of the side runners and the rack will slide in above it.

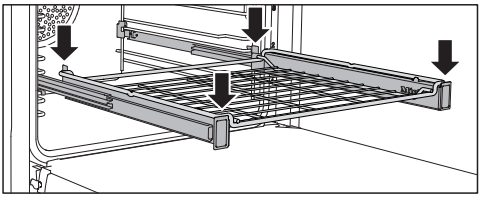
FlexiClip telescopic runners HFC 71



The FlexiClip telescopic runners can be attached to any shelf level.

Push the FlexiClip telescopic runners all the way into the oven before placing accessories on them.
The accessories will then automatically sit securely in between the stoppers at either end of each runner and be prevented from sliding off.





The FlexiClip runners can support a maximum load of 33 lbs (15 kg).

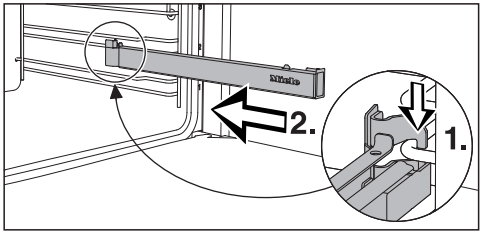
Installing and removing the FlexiClip telescopic runners

⚠ Danger of burns! Make sure the heating elements are turned off and that the oven cavity is cool.

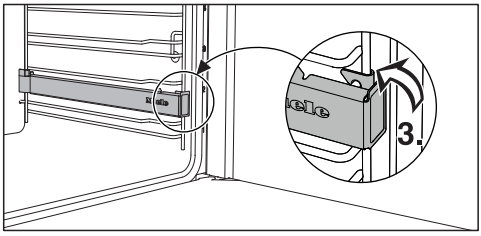
The FlexiClip telescopic runners are inserted in between the two rails that make up a shelf level.

The telescopic runner with the Miele logo must be inserted on the right.

When inserting or removing the telescopic runners, do **not** extend them.



- Hook the FlexiClip runner onto the front of the lower rail of a side runner (1.) and then push it along the rail into the oven compartment (2.).

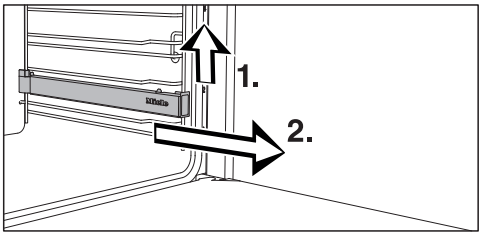


■ Then secure the FlexiClip runner to the bottom of the two rails as illustrated (3).

If the telescopic runners are difficult to pull out after inserting, you may need to pull firmly to release them.

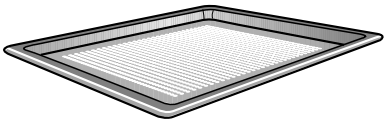
To remove a FlexiClip telescopic runner:

■ Push the FlexiClip runner in all the way.



■ Remove the FlexiClip telescopic runner by raising it at the front (1) then pulling it forwards along the rail and out (2).

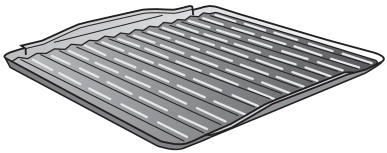
Perforated baking tray HBBL 71



The perforated baking tray has been specially developed for the preparation of baked goods.
The tiny perforations assist in browning the underside of baked goods.
The tray can also be used for dehydrating or drying food.

The surface has been treated with PerfectClean enamel for easy cleaning.

Grilling and Roasting insert HGBB 71



The grilling and roasting insert is placed in the universal tray.
The drippings from the meat or poultry are collected under the insert reducing spattering in the oven. The drippings can then be used for gravy and sauces.

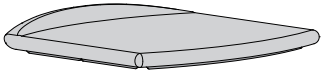
The surface has been treated with PerfectClean enamel.

Round baking form HBF 27-1

This circular form is suitable for cooking fresh or frozen pizzas, flat cakes, tarts and baked goods.

The surface has been treated with PerfectClean enamel.

Gourmet Baking Stone HBS 60



The baking stone is ideal for baking dishes with a crisp bottom such as pizza and bread.
The baking stone is made from a heat retaining stone and is glazed. Place the stone directly on the wire rack.
A wooden peel is supplied with it for placing food on and off the stone.

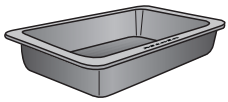
Gourmet Casserole Dishes HUB and Lids HBD

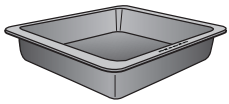
The Miele casserole dishes, unlike other oven dishes, slide into the oven on the side runners. They have non-tip safety notches to prevent them being pulled out too far.
They also have a non-stick coating.

The oven dishes have depths of 8 1/2" (22 cm) or 13 3/4" (35 cm). They have the same width and height.

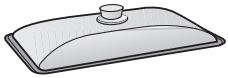
Matching lids are also available separately.

Depth: 8 1/2" (22 cm)	**Depth: 13 3/4" (35 cm)**
HUB 5000-M HUB 5001-M*	HUB 5000-XL

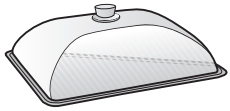




HBD 60-22

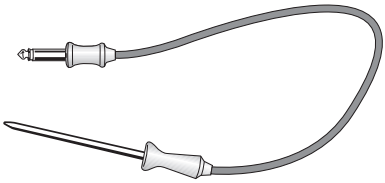


HBD 60-35



* Suitable for induction cooktops

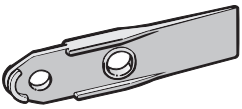
Roast Probe



The roast probe reliably monitors the roasting process. The tip of the probe continuously measure the core temperature of the meat or poultry.

The FlexiClip runners cannot be fitted to Shelf level 4 when using the roast probe, as they would cover the connection socket for the roast probe.

Opener



The opener allows you to open the cover of the oven light.

Catalytic enameled liners

– Side walls
  These are installed behind the shelf runners and protect the interior walls against soiling.

– Ceiling panel
  This is installed above the Browning / Broiling element to protect the ceiling against soiling.

– Back wall
  The back wall should be replaced if the catalytic enamel has become ineffective due to incorrect use or heavy soiling.

When ordering, please quote the model number of your oven.

Miele Oven Cleaner

Miele oven cleaner is suitable for removing stubborn soiling. It is not necessary to preheat the oven before use.

Oven controls

The oven controls allow you to use the various cooking modes to bake, roast and broil.

It also allows you to access:

– the time of day display,

– a timer,

– a timer to automatically turn cooking programs on and off,

– the MasterChef programs,

– the creating of a Favorite program,

– settings that can be customized.

Oven safety features

System lock

The system lock prevents the oven from being used unintentionally (see "Settings - System lock").

The system lock will remain activated even after a power failure.

Safety shut-off

The oven automatically turns itself off if it is used for an exceedingly long period. The length of time depends on the oven mode being used.

Cooling fan

The cooling fan comes on automatically when a cooking program is started. The cooling fan mixes hot air from the oven cavity with cool room air before venting it out into the kitchen through vents located between the appliance door and the control panel.

The cooling fan will continue to run for a while after a program is complete to prevent moisture from building up in the oven, on the control panel or surrounding cabinetry.

When the temperature in the oven has fallen sufficiently, the cooling fan will turn off automatically.

Vented oven door

The oven door is made of glass panes that have a heat-reflective coating on part of their surface.

During operation, air is also circulated through the door to keep the outer panel cool.

The door can be removed and disassembled for cleaning purposes (see "Cleaning and care").

PerfectClean surfaces

The revolutionary PerfectClean finish is a smooth, non-stick surface that is exceptionally easy to clean.

Food and grime from baking or roasting are easily removed.

Do not use ceramic knives, as these will scratch the PerfectClean surface.

Follow the instructions in the "Cleaning and Care" section of this manual so the anti-stick and easy cleaning properties are retained.

The following have all been treated with PerfectClean:

– Oven interior
– Shelf runners
– FlexiClip telescopic runners
– Universal tray
– Baking tray
– Wire oven rack
– Grilling and Roasting insert
– Perforated baking tray
– Round baking form

Catalytic enameled surfaces

The back panel is coated with catalytic enamel. Soiling from oil and fat is burnt off this type of surface when very high temperatures are used in the oven.

See "Cleaning and care" for more information.

General settings

⚠ The oven must not be operated until it has been properly installed within cabinetry.

The oven will turn on automatically when it is connected to the power supply.

Welcome screen

A welcome greeting is displayed. You will then be asked to select some basic settings which are needed before the appliance can be used.

- Follow the instructions on the display.

Set the language

- Scroll through the list until the desired language appears.
- Touch the illuminated sensor ⬭ next to the language you want to select.
- Confirm with OK.

Select the country

- Scroll through the list until the desired country appears.
- Touch the illuminated sensor ⬭ next to the country you want to select.
- Confirm with OK.

Setting the voltage (electrical version)

⚠ The voltage set must match that of the house as to not damage the oven.
Confirm the voltage before setting. If in doubt contact a qualified technician.

- Select the voltage.
- Confirm with OK.

Set the date

- Use + or − to set the year, month and day.
- Confirm with OK.

Set the time of day

- Use the numerical keypad to set the time of day in hours and minutes (e.g. 1-2-1-5 for 12:15).
- Confirm with OK.
- Select the lit sensor button ⬭ next to am or pm.
- Confirm with OK.

The time of day can be displayed in 24-hour format (see "Settings - Time of Day - Clock Format").

Time of day display

You will then be asked when you want the time of day to show in the display when the oven is turned off (see "Settings - Time of day - Display"):

– On

The time is always visible in the display.

– Off

The display appears dark to save energy. Some modes are limited.

– Night Dimming

The time only shows in the display between 5:00 am and 11:00 pm. It turns off at night to save energy.

■ Select the desired option.

■ Confirm with OK.

Information regarding energy consumption will appear in the display.

■ Confirm with OK.

Set up Successfully Completed is displayed.

■ Confirm with OK.

The oven is now ready to use.

If you accidently select the wrong language, follow the instructions described in "Settings - Language ⚑".

Heating the oven

New ovens may have a slight odor during their first use. Heating up the oven for at least one hour with nothing in it will eliminate the odor.

Ensure that the kitchen is well ventilated while the appliance is being heated up for the first time. Close doors to other rooms to prevent the smell spreading throughout the house.

- Remove any protective wrapping and sticky labels from the oven.
- Take all accessories out of the oven and clean them (see "Cleaning and care").
- Before heating the oven up, wipe the interior with a damp cloth to remove any dust or bits of packaging that may have accumulated in the oven cavity during storage and unpacking.
- Turn on the oven.

The main menu will appear.

- Select Operating Modes.
- Select Convection Bake

The default temperature is displayed 350°F (160°C).

The oven heating, lighting and cooling fan will turn on.

- Set the maximum temperature.
- Confirm with OK.

Heat up the oven for at least one hour.

After at least an hour:

- Turn the oven off.

After heating up for the first time

⚠ Danger of burns! Allow the oven to cool before cleaning.

- Turn on the oven.
- Select Light to turn on the oven light.
- Take all accessories out of the oven and clean them by hand (see "Cleaning and care").
- Clean the oven interior with warm water and liquid dish soap, applied with a soft sponge or cloth.
- Dry all surfaces with a soft cloth.
- Turn the lighting and the oven off.

Leave the oven door open until the oven interior is completely dry.

Accessing the "Settings" menu

■ Select Settings.

A list of settings will appear in the display.

They can be checked and changed, if needed.

A check ✓ next to an option shows which setting is active.

Settings cannot be altered while a cooking program is in progress.

Changing and saving settings

■ Select Settings.

■ Scroll through the list until the desired setting appears.

■ Touch the sensor button next to the setting. The desired setting may appear in a submenu.

■ Change the setting.

■ Confirm with OK.

■ Touch "Back" until the main menu appears or select another setting.

Settings

Settings overview

Option	Available settings
Language ⚑	... / deutsch / english / ... Country
Time	Show On / Off * / Night Dimming Clock Format 24 h / 12 h * Set
Date	
Lighting	On / On for 15 Seconds *
Display Brightness	▬▬▬▪═══
Audible tone information	Melody ▬▬▬▪═══ Solo Tone ▬▬▬▪═══
Keypad Tone	▬▬▬▪═══
Units of Measurement	Weight g / lb / lb:oz * Temperature °C / °F *

* Factory default

Option	Available settings
Cooling Fan	Temp. Controlled * Time Controlled
Default Temperature	
Safety	System Lock On / Off * Sensor Lock On / Off *
Calibrate Temperature	▬▬▬◆═══
Voltage	208V / 60Hz 220V / 60Hz 240V / 60Hz
Showroom Program	Demo Mode On / Off *
Factory Default	Settings Favorites Default Temperature

* Factory default

Language

The desired country and language can be set.

After selecting and confirming your choice, the language selected will appear in the display.

Tip: If you accidently select a language you do not understand, select the symbol to return to the submenu.

Time of day

Display

Select how you would like the time of day to appear in the display when the oven is turned off:

– On

The time of day will always appears in the display. To turn the lighting "Light" on and off or use the "Timer" touch the relevant sensor.

– Off

The display is turned off to save energy. The oven has be to be turned on before you can use it. This also applies when using the timer and the oven light.

– Night Dimming

To save energy, the time is only visible in the display between 5:00 am and 11:00 pm. The rest of the time it is not visible.

Clock format

You can select the clock format for the time of day:

– 24 h

The time of day is shown in a 24 hour clock format.

– 12 h

The time of day is shown in a 12 hour clock format.

Setting the time

Set the hours and the minutes.

If there is a power failure, the ucrrent time of day will reappear once the power has been restored. The time is stored in memory for about 200 hours.

Date

Set the date.

Lighting

– On

The interior lighting is turned on during the entire cooking period.

– On for 15 Seconds

The oven lighting turns off 15 seconds after a program starts. Touching "Light" turns it on for another 15 seconds.

Display brightness

The display brightness is represented by a bar with seven segments.

■ Select Darker or Brighter to change the brightness of the display.

Audible tone information

Melody

At the end of a process, a melody will sound several times in intervals.

The volume of the melody is represented by a bar with seven segments.

Maximum volume is selected when all segments are filled. If none of the segments are filled, the volume is turned off.

■ Select Quieter or Louder, to adjust the volume.

■ Select On or Off, to turn the melody on or off.

Solo tone

At the end of a process, a continuous tone will sound for period of time.

The pitch of this tone is represented by a segment bar.

■ Select Lower or Higher, to change the pitch.

■ Select On or Off, to turn the tone on or off.

Keypad tone

An audible tone is heard with each touch of a sensor.

The volume of the keypad tone is represented by a bar with seven segments.

Maximum volume is selected when all segments are filled. If none of the segments are filled, the volume is turned off.

- Select Quieter or Louder, to adjust the volume.
- Select On or Off, to turn the keypad tone on or off.

Units of measurement

Weight

– g

The weight of food in MasterChef programs is shown in grams.

– lb

The weight of food in MasterChef programs is shown in pounds.

– lb:oz

The weight of food in MasterChef programs is shown in pounds and ounces.

Temperature

– °C

The temperature is displayed in Celsius.

– °F

The temperature is displayed in Fahrenheit.

Cooling fan

The cooling fan will continue to run for some time after the oven has been turned off to prevent humidity from building up in the oven, on the control panel or in the surrounding cabinetry.

– Temp. Controlled

  The cooling fan will turn off when the oven compartment temperature drops below 160°F (70°C).

– Time Controlled

  The cooling fan will turn off after approx. 25 minutes.

Condensation can cause the cabinetry and the countertop to be damaged. This could lead to corrosion of the appliance.
When keeping food warm in the oven, increases to the Time Controlled setting can lead to condensation of the control panel, moisture on the countertop and on the cabinetry.
Do not adjust the Time Controlled setting and try not to leave food in the warm oven.

Default temperatures

If you often cook with temperatures that differ from the default, it makes sense to change the default temperatures.

After selecting this option, a list of oven modes will appear in the display.

■ Select the desired mode.

The default temperature is displayed along with the available temperature range.

■ Change the default temperature.

■ Confirm with OK.

Safety

System lock

The system lock prevents the oven being turned on inadvertently.

The system lock will remain activated even after a power failure.

Select On to activate the system lock.

The timer can still be used when the system lock is active.

– On

The system lock is now active. If you want to use the oven press and hold the sensor next to OK for at least 6 seconds.

– Off

The system lock is not active. The oven can be used as normal.

Sensor lock

The sensor button lock prevents you from accidently turning the oven off or changing a cooking program.

– On

The sensor lock is active. Press and hold OK for at least 6 seconds to use the sensors again. The sensor lock is then deactivated for a short period of time.

– Off

The sensor lock is not active. All sensors react to touch as normal.

Calibrate temperature

Using temperature calibration the temperature can be modified, in all modes and MasterChef programs, so that it is slightly higher or lower than shown.

The temperature calibration is represented by a bar with seven segments.

▬▬▬╪═══

If all of the segments are filled the oven temperature is much higher than indicated in the display. If no segment is filled the oven temperature is much lower than indicated.

- Select + or -, to adjust the temperature calibration.
- Confirm with OK.

Voltage

Setting the voltage (electrical version)

- Select the desired voltage and corresponding frequency.
- Confirm with OK.

Showroom program

This function enables the oven to be demonstrated in showrooms without heating up. It should not be set for domestic use.

Demo Mode

If you have demo mode activated Demo mode active. The appliance will not heat up will appear when you turn on the oven.

– On

Press and hold OK for at least 4 seconds to activate demo mode.

– Off

Press and hold OK for at least 4 seconds to deactivate demo mode. The oven can then be used as normal.

Factory default

– Settings

  Any settings that have been altered will be reset to the factory default setting.

– Favorites

  All Favorites will be deleted.

– Default Temperature

  Any default temperatures that have been changed will reset to the factory default settings.

The timer can be used to time any activity in the kitchen, e.g. boiling eggs.

The timer can also be used at the same time as a cooking program if a start and finish time have been set, e.g. a reminder to stir the dish or add seasoning.

A maximum timer duration of 9 hours, 59 minutes and 59 seconds can be set.

Setting the timer

When the setting Time - Show - Off is set the oven must be turned on to set the timer. The timer can then be seen counting down in the display when the oven is turned off.

Example: Boiling eggs and setting the timer for 6 minutes and 20 seconds.

- Select "Timer".

"0 : 00 : 00" (h : min : sec) will appear.

- Use the numerical keypad to enter a different duration (6-2-0).
- Confirm with OK.

The timer duration is now saved.

The duration counts down in the display when the oven is turned off.

If a cooking program is running at the same time, the timer duration will appear at the bottom of the display.

At the end of the timer

– 🔔 flashes,

– the time starts counting upwards,

– a buzzer will sound if turned on (see "Settings - Acoustic information").

■ Select the "Timer" button.

The buzzer will turn off and the symbols in the display will go out.

Resetting the timer

■ Select "Timer" or the illuminated sensor next to the timer duration that is counting down.

The time previously set appears

■ Set the new timer duration using the numeric keypad.

■ Confirm with OK.

The changed time is saved and will count down in seconds.

Canceling the timer

■ Select "Timer" or the illuminated sensor next to the timer duration that is counting down.

The time previously set appears

■ Select Reset.

The timer has been canceled.

The oven has a wide range of modes for preparing a variety of foods.

Due to country-specific preferences for preparation of food, default temperatures and temperature ranges in °F and °C do not correspond. The temperature values have been defined as given in the chart.

Mode	Default temperature	Temperature range
Convection Bake Use this mode for baking and roasting on several levels at the same time. You can cook at lower temperatures than with the Surround mode because the fan distributes the heat evenly throughout the cavity for a consistent baking temperature.	350 °F (160 °C)	75–475 °F (30–250 °C)
Surround This premium baking mode uses heat from the upper and lower elements to create perfect results on all baking recipes.	350 °F (180 °C)	75–525 °F (30–280 °C)
Intensive This mode gently circulates heated air from the lower heating element using the fan to create a brick oven environment. Ideal for baking pizza, focaccia, pies and tarts that require a crisp base and moist toppings.	400 °F (170 °C)	125–475 °F (50–250 °C)
Auto Roast For a premium result, the meat is seared at a high temperature keeping meat tender and juicy.	375 °F (160 °C)	200–450 °F (100–230 °C)
Convection Roast This mode uses the convection fan to circulate heated air throughout the oven. Ideal for cooking delicate cuts of meat, fish and crispy poultry.	375 °F (160 °C)	75–475 °F (30–250 °C)

Guide to the modes

Mode	Default temperature	Temperature range
Bake This mode uses traditional baking techniques to perfect pies and biscuits.	375 °F (190 °C)	200–525 °F (100–280 °C)
Browning For a perfectly browned topping, for example when making a gratin or browning the top of a casserole.	350 °F (190 °C)	200–475 °F (100–250 °C)
Maxi Broil For broiling meats e.g. steak, chops, kebabs, etc. The entire Browning / Broiling element will glow red to produce the required heat.	500 °F (240 °C)	400–575 °F (200–300 °C)
Broil For grilling smaller quantities of steak, chops, kebabs, etc.	500 °F (240 °C)	400–575 °F (200–300 °C)
Convection Broil This mode distributes hot air from the Browning/ Broiling element over the food using the fan. This allows for a lower temperature to be used then when using Broil. Ideal for broiling thicker cuts of meat (e.g. chicken, roulades).	400 °F (200 °C)	200–500 °F (100–260 °C)
Gentle Bake A combination of different heating elements ensures excellent baked good, gratins and lasagna.	350 °F (190 °C)	200–475 °F (100–250 °C)
Surround Roast For roasting traditional recipes, e.g. pot roast, and braising or cooking at low temperatures.	400 °F (180 °C)	75–525 °F (30–280 °C)

Energy saving tips

– Remove any accessories from the oven that you do not require for cooking.

– Try not to open the door when cooking.

– If a temperature range is given, it is best to select the lower temperature and check the food after the shortest cooking time given.

– The default setting for the Time of Day display Time - Show - Off will consume the least amount of energy.

– With the factory default setting Lighting - On for 15 Seconds the oven interior lighting turns off automatically after 15 seconds. It can be turned on again at any time by touching "Light".

– When cooking with automatic shut-off or the roast probe, the oven heating will turn off automatically shortly before the end of cooking. The reqidual heat is sufficient to finish the cooking process. Energy Save Phase will appear in the display. The cooling fan or hot air fan (depending on mode used) will remain on.

– The oven turns off automatically if a button is not pressed to save power. The amount of time before the oven turns off depends on the selected settings, e.g. mode, temperature, cooking duration, etc.

Quick Guide

■ Turn the oven on.

The main menu will appear.

■ Place the food in the oven.

■ Select Operating Modes.

■ Select the desired mode.

The oven mode and default temperature will appear.

The oven heating, lighting and cooling fan will turn on.

■ Adjust the default temperature if necessary.

The default temperature will be automatically accepted within a few seconds. If necessary, select Change to go back to the temperature setting (see "Additional functions - Changing the temperature").

■ Confirm with OK.

The required and the actual temperatures will appear.

You will see the temperature rising in the display. A buzzer will sound when the oven temperature is reached if this option is selected (see "Settings - Audible tone information").

After the cooking process:

■ Remove the food from the oven.

■ Turn the oven off.

Cooling fan

After the cooking process the cooling fan will continue to run for a while after a program is complete to prevent moisture from building up in the oven, on the control panel or surrounding cabinetry.

When the temperature in the oven has fallen sufficiently the cooling fan will turn off automatically.

The default setting can be changed if desired (see "Settings - Cooling Fan").

You have placed the food in the oven, selected an operating mode and set the temperature.

■ Select Change.

Additional options will appear in the display for you to select for change if desired.

– Temperature

– Core Temp. (This will only appear if you are using the roast probe. You cannot set a cooking duration when using the roast probe.)

– Duration

– Ready at

– Start at (This only appears if a Duration or Ready at time has been set.)

– PreHeating (This only appears in the Convection Bake / Convection Roast, Auto Roast, and Surround / Surround Roast modes if you set a temperature above 212°F/100°C.)

– Operating Modes (You can change the mode while a cooking program is in process.)

Changing the oven mode

You can change the oven mode during operation.

■ Select Change.

■ Scroll through the list until Operating Modes appears.

■ Select Operating Modes.

■ Confirm with OK.

The new mode will appear in the display together with its default temperature.

■ Change the temperature, if necessary.

■ Confirm with OK.

The oven mode has been changed.

The times entered will be kept.

Changing the temperature

As soon as a cooking mode is selected, a default temperature will appear in the display together with its possible range (see the "Guide to the modes").

- If the default temperature is suitable for your recipe, confirm it with OK.
- If it is not suitable for your recipe, you can change it for this particular cooking program.

You can also permanently reset the recommended temperature to suit your personal cooking habits (See "Settings - Default temperatures").

Example: You have selected Convection Bake and 350°F (170°C) and can see the temperature rising in the display.

You would like to reduce the target temperature to 310°F (155°C).

- Select Change.
- Select Temperature.

The desired temperature is highlighted.

- Changing the temperature
- Confirm with OK.

The adjusted temperature is saved.

- Confirm with OK, if you would like to see the actual temperature increasing in the display.

The altered set temperature appears.

Rapid PreHeat

Rapid PreHeat can be used to speed up the preheating phase.

The Rapid PreHeat function will turn on automatically if a temperature of more than 212°F (100°C) is set for Convection Bake, Auto Roast and Surround.

Do not use Rapid PreHeat to preheat the oven when baking pizzas or delicates mixtures (e.g. small baked goods, sponge). These will brown too quickly.

You can turn off Rapid PreHeat for a relevant cooking process via the PreHeating option.

Preheating

– Rapid (Factory default)

The Browning / Broiling and ring heating elements turn on together with the fan to enable the oven to reach the required temperature as quickly as possible.

– Normal

Only the heating elements associated with the cooking program are turned on.

To turn the Rapid PreHeat function off:

- Select Change.
- Select PreHeating.
- Select Normal.
- Confirm with OK.
- Confirm with OK, if you would like to see the actual temperature increasing in the display.

Instead of Rapid PreHeat, Preheating will appear in the display.

- Select the required oven mode and temperature.
- Wait for the preheating phase to complete.

A buzzer will sound when the set temperature is reached, if the buzzer is set (see "Settings").

- Place the food in the oven.

Setting additional durations

You have placed the food in the oven, selected a mode and set the temperature.

By entering Duration, Ready at or Start at you can automatically turn the cooking program on or off.

– Duration

Enter the cooking duration desired. Once the duration set has elapsed, the heating will turn off automatically. The maximum duration which can be set is 12 hours.

A cooking duration cannot be entered if you are using the roast probe. When using the roast probe, the cooking duration is determined by when the set core temperature is reached.

– Ready at

You can specify when you would like the cooking program to complete. The oven will turn off automatically at the time set.

A Ready at time cannot be entered if you are using the roast probe. When using the roast probe the end time is determined by when the set core temperature is reached.

– Start at

Set the time you would like cooking to start at. The oven will turn on automatically at the time set.

Start at can only be used together with Duration or Ready at, except when using the roast probe.

Turning off automatically

It is now 11:45. The food takes 30 minutes to cook and should be ready at 12:15.

Select Duration and set 0:30 h or select Ready at and set the time for 12:15.

The oven will switch off automatically after this duration has elapsed or the time set has been reached.

Setting the duration

- Select Change.
- Select Duration.
- Use the numerical keypad to set the duration (3-0).
- Confirm with OK.

Setting the "Ready at" time

- Select Change.
- Select Ready at.
- Use the numeric keypad to set the time when food should be ready (1-2-1-5).
- Confirm with OK.

Turning on and off automatically

It It is recommended to use the automatic On/Off feature when roasting. Do not delay the start of the program for too long when baking. Cake mixtures and doughs will dry out, and the leavening agents will lose their effectiveness.

To turn a cooking program on and off automatically, you have a choice of how to enter the time parameters:

– Duration and Ready at
– Duration and Start at
– Ready at and Start at

It is now 11:45. The food takes 5 minutes to cook and should be ready at 12:30.

- Select Change.
- Select Duration and set a duration of 0:30 h.
- Select Ready at and set the time to 12:30 h.

The Start at time will be automatically calculated. Start at 12:00 will appear in the display.

The oven will turn on automatically when this time is reached.

Sequence of a cooking program that turns on and off automatically

Up until the start time the mode, the selected temperature, Start at and the start time will appear in the display.

After the program has started you can follow the preheating phase in the display until the required temperature has been reached.

Once this temperature is reached, a buzzer will sound if turned on (see "Settings - Audible tone information").

After the preheating phase the remaining time will appear in the display.

The time will count down in the display. The last minute counts down in seconds.

At the end of the cooking process a buzzer will sound if turned on (see "Settings - Audible tone information").

The oven heating and lighting are turned on. Program Finished appears in the display.

You have the option to save the program as a favorite (see "Favorites") or to increase the cooking duration using Change.

During the cooling down phase the cooling fan will continue to run.

Changing the set time

- Select Change.

All options that can be changed will appear.

- Select the desired time.
- Change the set time
- Confirm with OK.

These settings will be deleted in the event of a power failure.

Canceling cooking

- Select "Back".
- When Cancel Cooking? appears, select Yes.

The oven heating and lighting will turn off, and any durations set will be deleted.

Your oven has a wide range of MasterChef programs that enable you to achieve excellent cooking results with ease. Simply select the appropriate program for the type of food you are cooking and follow the instructions in the display.

List of food types

The programs can be found under MasterChef.

– Poultry
– Meat
– Fish
– Pizza
– Baked Goods
– Potatoes

Using the MasterChef programs

■ Select MasterChef.

A list of food types will appear on the display.

■ Select the desired food type.

The MasterChef programs will then appear.

■ Select the desired MasterChef program.

Each step you need to take before starting the MasterChef program will appear on the display.

Depending on the program, the following information will appear on the display:

– type of cookware,
– shelf level,
– using the roast probe,
– duration.

■ Follow the instructions in the display.

Notes on using these programs

– After cooking, allow the oven interior to cool down to room temperature again before starting a MasterChef program.

– Some programs require a preheating phase before food can be placed in the oven. A prompt will appear indicating when to add the food.

– The duration quoted for MasterChef programs is an estimate. It may increase or decrease depending on the program. When using the roast probe, the duration will be determined by when the core temperature is reached. The duration, in particular with meat, will vary depending on the initial temperature of the food.

You can create and save up to 20 of your own programs.

– Each one can have up to 10 cooking stages. This enables you to save your most frequently used recipes very accurately. In each stage you can select settings such as mode, temperature and duration or core temperature.
– You can specify the shelf level(s) for the food.
– You can enter a program name for your recipe.

When you next select the program, it will start automatically.

There are different ways of creating a Favorite:

– At the end of running a MasterChef Program, save it as a separate program.
– After running a program with a set duration, select Save.

Then name the program.

Creating a Favorite

■ Select Favorites.

When first creating a program Create Program will appear in the display.

■ Confirm with OK.

If the Favorite already exists, the program name will appear with Edit Program underneath.

■ Select Edit Program.

■ Select Create Program.

You can now specify the settings for cooking stage 1. Follow the instructions in the display:

■ Select and confirm the settings.

The settings for the first cooking stage have now been set.

You can now adjust the settings for PreHeating and the Crisp function, depending on the selected mode and the set temperature.

■ Select Additional Parameters.

■ Select the desired settings.

More cooking stages can be added, for example, if you would like to add another cooking mode to follow the first.

- If additional cooking stages are required, select Add Cooking Stage and proceed as you did for the 1st cooking stage.
- When you have completed setting the cooking stages. select Complete Program.

Set the shelf level(s) to be used:

- Select and confirm the required level(s).

A summary of your settings will appear in the display.

If you would like to change your program select Change. You can change individual cooking stages or add additional cooking stages.

- Confirm the settings and then select Accept.

You can now save or change your Favorite. You can also start it immediately or program it to turn on or off automatically at a specific time.

- Select Save.

You can now give the program a name. The following symbols appear next to he alphabet:

Symbol	Description
␣	Space
ABC	Alphabet in upper case
abc	Alphabet in lower case
123	Numbers 0 to 9 and hyphen -

- Touch the sensors next to the symbols to highlight the desired character.
- Select Select.

The letter or number you have selected will appear in the top line of the display.

You can delete the characters one at a time with "Back".

A maximum of 10 characters can be used.

- Finish creating the program name.
- Once you have entered the program name select Save.

A message will appear in the display confirming that the name has been saved.

- Confirm with OK.

Starting a Favorite

- Place the food in the oven.
- Select Favorites.

The display shows the program names and Edit Program at the bottom.

- Select the desired program.

A list will appear in the display:

– Start Now

The program will start right away and the oven heating will turn on.

– Start Later

This option will only appear if you are using the roast probe. You can specify when you would like the program to start. The oven heating will turn on automatically at the time set.

– Start at

You can specify when you want the program to start. The oven heating will turn on automatically at the time you set.

– Ready at

You can specify when you would like the cooking program to complete. The oven will turn off automatically at the time set.

– Change Cooking Stages

More information on this menu item can be found in "Change cooking stages".

- Select the desired menu item.
- Confirm the message regarding which shelf level to use with OK.

The selected program will begin automatically right away or at the time set.

Changing Favorites

Changing cooking stages

Cooking stages in a MasterChef program that have been saved under a different name cannot be changed.

- Select Favorites.

The display shows the program names and Edit Program at the bottom.

- Select the desired program.
- Select Change Cooking Stages.

The setting specified for a cooking stage can be changed or more cooking stages can be added to the program.

- Select the desired cooking stage or Add Cooking Stage.
- Alter the program as desired (see "Creating a Favorite").
- Confirm the settings and then select Accept.
- Select Save.

The changes made to the program will be saved.

- If necessary, change the name (see "Creating a Favorite) and select Save.

A message will appear in the display confirming that the name has been saved.

- Confirm with OK.

Changing the name

- Select Favorites.

The display shows the program names and Edit Program at the bottom.

- Select Edit Program.
- Select Change Program.
- Select the desired program.
- Select Change Name.
- Change the name (see "Creating a Favorite) and select Save.

A message will appear in the display confirming that the name has been saved.

- Confirm with OK.

The new program name will be saved.

Deleting a Favorite

- Select Favorites.

The display shows the program names and Edit Program at the bottom.

- Select Edit Program.
- Select Delete Program.
- Select the desired program.
- Confirm if the program should be deleted with Yes.

The program is deleted.

You can delete all of your Favorites at the same time (see "Settings - Factory Default - Favorites").

Eating food which has been cooked correctly is important for good health.
Only bake cakes, pizza, french fries, etc. until they are golden brown. Do not overcook them.

Oven modes

Depending on how you would like the food prepared, you can use Convection Bake, Intensive, or Surround.

Bakeware

The bakeware used depends on the oven mode chosen and how the food is prepared.

– Convection Bake, Intensive:
Baking tray, Roasting pan, any heat-resistant baking dishes.

– Surround:
Dark metal, enamel or aluminum baking tins with a matte finish, as well as heat-resistant glass, ceramic and coated dishes can be used.
Avoid bright, shiny metal tins as they result in uneven or poor browning, and in some cases cakes might not cook properly.

– Always place baking pans on the wire rack.
Position rectangular pans with the longer side across the width of the rack. This will allow for optimum heat distribution and even baking results.

– When baking cakes with fruit toppings or deep cakes, place the tin in the universal tray to catch any spills.

Parchment paper / Greasing the pan

All Miele accessories (baking tray, universal tray, perforated baking tray and round baking dish) are treated with PerfectClean finish.

Surfaces treated with PerfectClean finish generally do **not** need to be greased or covered with parchment paper.

Parchment paper is only needed with:

– anything with a high salt content (e.g. pretzels, bread sticks), because sodium can damage the PerfectClean surface;

– meringues or dishes with a high egg-white content, because they are more likely to stick,

– frozen food cooked on the wire oven rack.

Temperature

Select the suggested temperature if possible.

Choosing a baking temperature higher than those recommended may reduce the cooking time, but will lead to uneven browning, and unsatisfactory cooking results.

Baking duration

Check if the food is cooked at the end of the shortest duration quoted. To check if a cake is ready insert a wooden skewer or toothpick into the center, it should come out clean.

Shelf level

The shelf level that you place the food on for baking depends on the oven mode and the number of trays being used.

– **Convection Bake**
  1 Tray: Level 2
  2 Trays: Levels 1+3 / 2+4
  3 Trays: Levels 1+3+5

– **Intensive**
  1 Tray: Level 1 or 2

– **Surround**
  1 Tray: Level 1 or 2

When cooking with the universal tray and baking tray(s) at the same time, place the universal tray below the baking tray(s).

Bake moist cakes and muffins on a maximum of two levels at the same time.

Roast

Always observe the USDA guidelines for food safety.

Oven modes

Depending on how you would like the food cooked, you can use Convection Bake / Convection Roast, Auto Roast, Surround / Surround Roast or a MasterChef program.

Cookware

Any heat-resistant cookware can be used:

Wire oven rack, grilling and roasting insert (if available) on the universal tray, roasting pans, heat-resistant glass/ earthen/cast iron dishes, roasting bags

Temperature

As a general rule, select the suggested temperature.
If higher temperatures are used, the meat will brown on the outside, but will not be properly cooked through.

When cooking with Convection Bake / Convection Roast or Auto Roast select a temperature approx. 25°F (20°C) lower than with Surround / Surround Roast.

Shelf levels

As a general rule use shelf level 2.

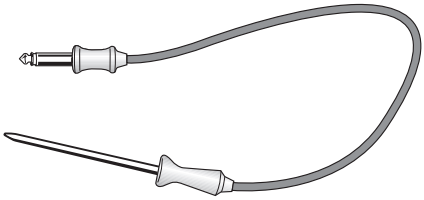
Tips

– Resting time: At the end of the program, take the roast out of the oven, cover with aluminum foil and let stand for about 10 minutes. This helps retain the juices when the meat is sliced.

– The larger the cut of meat, the lower the temperature setting should be.

– Use a roast probe for accurate cooking temperatures and best results.

Roast Probe



The roast probe enables the roasting process to be monitored simply and reliably.

How the roast probe works

The metal tip of the roast probe is inserted into the food. There is a temperature sensor in the metal tip which measures the core temperature of the food during cooking. The rise in the core temperature reflects the extent to which the food is cooked. You can program the core temperature to be lower or higher, depending on how you would like the meat cooked, rare, medium or well-done.

A core temperature of up to 210°F (99°C) can be set. Please refer to the roasting chart and "Slow cooking" for the core temperatures applicable for different types of meat.

The cooking time will be similar when cooking with or without the roast probe.

When to use the roast probe

Some MasterChef programs and Special modes will prompt you to use the roast probe.

You can also use it with your own Favorite programs and with the following functions:

– Auto Roast
– Convection Bake / Convection Roast
– Intensive
– Surround / Surround Roast
– Convection Broil

Important notes regarding the roast probe

– The meat can be placed in a pot or on the rack in the universal tray.

– The metal tip of the roast probe must be fully inserted into the center of the food.

– When cooking poultry, insert the metal tip into the thickest part of the breast. You can find the thickest part of the breast by pressing the area with your thumb and index finger.

– Do not let the metal tip touch any bones or insert it into a fatty area of the meat. If fat or bone come into contact with the probe, this can lead to the oven being turned off too early.

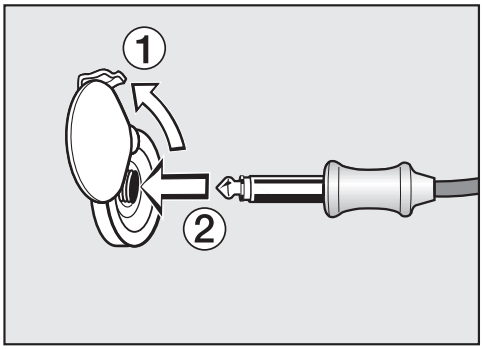
– If the meat is very heavily marbled with fat, select the highest core temperature given in the roasting chart.

– When using roasting bags or aluminum foil, insert the probe through the bag or foil into the center of the meat. You can also place the meat, with the roast probe inserted, inside the foil. Follow the roasting bag / aluminum foil manufacturer's instructions.

Using the roast probe

■ Insert the metal tip of the roast probe fully into the food.

■ Place the food in the oven.



■ Insert the plug of the roast probe into the socket until you feel it engage.

■ Close the door.

■ Select an oven mode or MasterChef program.

■ If necessary, use the numeric keypad to set the temperature.

■ If necessary use the numeric keypad to set the core temperature.

The core temperatures cannot be changed for the MasterChef programs.

You can also delay the start of the cooking program to a later time. To do this, select Start at.

You can estimate approximately when the food will be ready as the duration of the cooking program is about the same as if you were cooking food without using the roast probe.

Duration and Ready at cannot be set because the total time depends on how long it takes for the core temperature to be reached.

Time left display

If you have set a cooking temperature above 275°F (140°C), the estimated duration of the cooking process remaining (time left) will appear on the display.

The time left is calculated from the cooking temperature selected, the set core temperature, and the pattern of the increasing core temperature.

The time left first shown is an estimate. As the cooking process continues, the time is revised continuously, and a more accurate figure is shown.

The time left will be deleted if the cooking or core temperature is changed or if a different mode is selected. If the door is opened for a longer time, the time left will be recalculated.

Alternating between the time left and core temperature displays

As soon as the time left is shown, you can alternate between the time left and core temperature displays

- Select Change.
- Select Status.
- Select whether you would like the time left or core temperature to appear in the display.
- Confirm with OK.

Using residual heat

Shortly before the end of the cooking program the oven heating will turn off. The residual heat in the oven is sufficient to complete the cooking process.

Using the residual heat in the oven saves energy.

Energy Save Phase will appear in the display to show that the oven is in energy save mode. The measured core temperature is no longer visible.

The cooling fan and hot air fan (if turned on) will continue to run.

When the selected core temperature has been reched,

– Program Finished appears in the display,

– a buzzer will sound if turned on (see "Settings - Audible tone information").

Tip: If the food is not sufficiently cooked, insert the roast probe into another place and repeat the program.

This cooking method is ideal for cooking beef, pork, veal or lamb when a tender result is desired.

First, using a cooktop sear the meat on all sides to seal in the juices.

Then place the meat in a preheated oven. It will be cooked at a low temperature for an extended time allowing the meat to become very tender.

The meat will rest and the juices start to circulate evenly throughout.
This gives the meat a very tender and juicy result.

Tips

– Use fresh, lean meat that has been trimmed. Remove the bones before cooking.

– When searing, use a suitable cooking oil or fat that can withstand high temperatures (e.g. clarified butter, vegetable oil).

– Do not cover the meat during cooking.

Cooking will take approx. 2-4 hours, depending on the size and weight of the meat, as well as the desired degree of doneness and browning.

Cooking time / Core temperatures

Always observe USDA food safety guidelines.

Meat	[min]	°F / °C
Beef Tenderloin	80–100	138/59
Sirloin		
– rare	50–70	118/48
– medium	100–130	135/57
– well done	160–190	156/69
Pork tenderloin	80–100	145/63
Smoked pork chop *	140–170	154/68
Filet of veal	80–100	140/60
Veal loin *	100–130	145/63
Saddle of lamb *	50–80	140/60

* boneless

After cooking:

Because the cooking temperatures are very low:

– The meat can be carved immediately. No resting time is required.

– The cooking result will not be affected if the meat is left in the oven after the program is complete. It can be kept warm until you serve it.

– The meat is at an ideal temperature to be eaten right away. Serve on pre-warmed plates with a hot sauce or gravy to keep warm.

Using the Slow Roasting function

- Select Special Modes.
- Select Slow Roasting.
- Set the required temperature.
- Set the core temperature.
- Follow the instructions on the display. Let the wire oven rack and universal tray preheat in the oven.
- While the oven is preheating, sear the meat on all sides on the cooktop.

⚠ Burn hazard!
When the oven is hot use pot holders to insert, remove or turn the food, or when adjusting the oven shelves, etc.

- Once Use the roast probe appears in the display, place the seared meat on the rack and insert the roast probe, so that the metal tip is fully in the center of the meat.

For more information, see "Roast - Roast probe."

⚠ Use Caution!
The browning / broiling element will be hot. Burn hazard!

- Insert the plug of the roast probe into the socket until you feel it engage.
- Close the door.

When the program is complete, Program Finished will appear in the display and a buzzer will sound if it has been turned on (see "Settings - Audible tone information").

If the meat is not cooked to your satisfaction, you can extend the cooking time.

Adjusting the Slow Roasting temperature

Use the wire oven rack on top of the universal tray.
Do not use the Rapid PreHeat function to preheat the oven.

- Place the rack with the universal tray on shelf level 2.
- Select Surround or Surround Roast and a temperature of 265°F (130°C).
- Change the preheating function by selecting Change - PreHeating - Normal.
- Preheat the oven with the universal tray and wire oven rack for approx. 15 minutes.
- While the oven is preheating, sear the meat on all sides on the cooktop.

⚠ Burn hazard!
When the oven is hot use pot holders to insert, remove or turn the food, or when adjusting the oven shelves, etc.

- Place the seared meat on the wire oven rack.
- Select Change.
- Select Temperature and set 210°F (100°C).
- Continue cooking until the end of the cooking time.

You can set the cooking program to switch off automatically (see "Additional functions - Setting the cooking time").

Broil

⚠ Danger of burns!
Broil with the oven door closed. If you broil with the door open the hot air will escape from the oven before it has been cooled by the cooling fan.
The controls will get hot.

Oven modes

Maxi Broil

This mode delivers excellent browning and broiling results when cooking larger amounts of food. Use to broil chops, ribs and large quantities of meat and for browning large dishes.

The entire Browning/Broiling element will become red hot to produce the necessary heat.

Broil

This mode delivers excellent browning and broiling results when cooking smaller amounts of food. Use to broil chops, ribs and small quantities of meat and for browning small dishes.

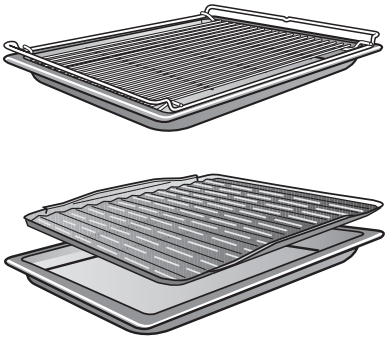
Only the center of the Browning/Broiling element will become red hot to produce the necessary heat.

Convection Broil

For broiling thicker items, e.g. poultry or London broil.

The Browning/Broiling element and the fan switch on in alternating phases.

Cooking accessories



Use the universal tray with the wire oven rack or grill and roasting insert (if available) on top.The insert protects the oven from splatter and collects the juices underneath. The juices can then be used for gravy and sauces.

Do not use the baking tray.

Temperature

As a general rule, select the default temperature.
If higher temperatures are used, the meat will brown on the outside, but will not be properly cooked through.

Preheating

Always preheat the oven for about 5 minutes with the door closed before Broiling.

Shelf levels

Select the shelf level according to the thickness of the food.

– Thin cuts: Shelf level 3 or 4

– Thick cuts: Shelf level 1 or 2

Broiling time

Flat pieces of fish and meat usually take 6–8 minutes per side.
When broiling thicker pieces, each side will take a bit longer. Make sure that the pieces have roughly the same thickness so that their broiling times do not vary too greatly.

Testing doneness

Always observe USDA food safety guidelines.

Preparing food for broiling

Rinse the meat under cold water and pat dry. Do not season the meat with salt before broiling, this will draw out the juices.

Brush the meat with oil, if necessary. Do not use other types of fat as they can easily burn and cause smoke.

Clean fish as usual. To enhance the flavor, salt or lemon can be added.

Broil

- Place the wire oven rack or the grilling and roasting insert (if available) in the universal tray.
- Place the food on top.
- Select the required oven mode and temperature.
- Preheat the Browning / Broiling element for approx. 5 minutes with the door closed.

⚠ Danger of burns!
When the oven is hot use pot holders to insert, remove or turn the food, or when adjusting the oven shelves, etc.

- Place the food on the appropriate shelf level (see the Broiling chart).
- Close the door.
- Turn the food halfway through cooking.

In addition to the MasterChef programs your oven has a variety of Special Modes.

– Defrost
– Dehydrate
– Reheat
(to reheat plated meals)
– Warm Cookware
– Proof
– Slow Roasting
See "Slow Roasting" for more information.
– Pizza
– Sabbath Program

This section also gives information on the following applications:

– Gentle Bake
– Canning
– Frozen food

Defrost

Use the Defrost function to gently defrost frozen food.

The temperature can be set between 75-150°F (25-50°C).

- Select Special Modes.
- Select Defrost.
- If necessary, adjust the default temperature and set the duration.
- Follow the instructions on the display.

Air is circulated throughout the oven cavity to gently defrost the food.

⚠ Risk of salmonella poisoning!
Be sure to strictly observe proper hygiene rules when defrosting poultry.
Do not use the liquid from the defrosted poultry.

Tips

– Remove the packaging and place the frozen food on the universal tray or in a suitable bowl or dish.

– When defrosting poultry, place it on the wire oven rack and position the rack on the universal tray so that the poultry does not sit in the defrosting liquid.

Dehydrate

This program is designed for traditional drying of food to preserve it.

The temperature can be set between 175-250°F (80-100°C).

It is important that fruit and vegetables are ripe and not bruised before they are dehydrated.

■ Prepare the food for dehydrating.

– Peel and core apples, and cut into slices 1/4" (.5 cm) thick.

– Core plums if necessary.

– Peel, core and cut pears into wedges.

– Peel and slice bananas.

– Clean mushrooms, then either halve or slice them.

– Remove parsley and dill from the stem.

■ Distribute the food evenly over the roasting pan.

You could also use the rack or perforated baking tray, if available.

■ Select Special Modes.

■ Select Dehydrate.

■ If necessary, adjust the default temperature and set the duration.

■ Follow the instructions on the display.

Food	Approx. dehydrating time
Fruit	2–8 hours
Vegetables	3–8 hours
Herbs*	50–60 minutes

* Because this program uses the fan, it is recommended that you use Surround with a temperature of 175-250°F (80-100°C) for drying herbs.

■ Reduce the temperature if condensation begins to form in the oven.

⚠ Danger of burns!
Use pot holders when removing the dehydrated food from the oven.

■ Allow the fruit or vegetables to cool down after dehydrating.

Dried fruit must be completely dry, but also soft and elastic. Juice should not escape when cut.

■ Store in sealed glass jars or tins.

Reheat

This mode is designed to reheat cooked food.

Available options are:

– Pizza

– Large Oven Dish

– Bakes

Use heat-resistant cookware.

- Place the food that is to be reheated in a dish, and place the dish on the wire rack. Do not cover.
- Select Special Modes.
- Select Reheat and change the default temperature if necessary.
- Follow the instructions in the display.

⚠ Burn hazard!
Use pot holders when removing dishes from the oven. Condensation may accumulate on the bottom of the dish.

Warm-up Cookware

This program is designed to warm your cookware.

The temperature can be set between 75-175°F (50-80°C).

Use heat-resistant cookware.

- Place the rack on shelf level 2 and place the cookware to be heated on it.
- Select Special Modes.
- Select Warm Cookware.
- If necessary, adjust the default temperature and set the duration.
- Follow the instructions on the display.

⚠ Danger of burns!
Use pot holders when removing dishes from the oven. Condensation may accumulate on the bottom of the dish.

Proof

This mode is designed specifically for proofing dough.

You can set a temperature between 75 and 125°F (30 and 50°C).

- Select Special Modes.
- Select Proof.
- If necessary, adjust the default temperature and set the duration.
- Follow the instructions in the display.

If you would like to proof dough with the addition of moisture, select the appropriate MasterChef program.

Pizza

This program is designed specifically for baking pizza.

The temperature can be set between 300-475°F (160-250°C).

- Select Special Modes.
- Select Pizza.
- If necessary, adjust the default temperature and set the duration.
- Follow the instructions on the display.

Sabbath Program

This program is designed for religious observance.

Select the Sabbath Program and then select the oven mode and temperature.

The program will only start once the door is opened and closed:

– The cooking process will start after about 5 minutes using Surround or Bake .

– The oven will heat up to the temperature you have set and will maintain this temperature for a maximum of 72 hours.

– The interior lighting does not come on, even when the door is opened.

If Settings - Lighting - On has been selected, the lighting will remain turned on throughout the program.

– Sabbath Program will appear in the display throughout the entire program.

– The time of day is turned off.

Once the Sabbath Program has started is cannot be changed or saved as a Favorites.

Using the Sabbath Program

The program can only be canceled by turnng the oven off.

■ Select Special Modes.

■ Select Sabbath Program.

■ Select the desired mode.

The Sabbath Program cannot be started if the timer is being used.

■ Set the required temperature.

■ Confirm with OK.

The oven is now ready for use.

■ Open the door to start the program.

■ Place the food in the oven.

■ Close the door.

The oven heating will turn on after 5 minutes.

To end the program early:

■ Turn the oven off.

Gentle Bake

The Gentle Bake mode is ideal for casseroles and gratins.

You can select a temperature setting from 200-475°F (100-250°C).

- Select Operating Modes.
- Select Gentle Bake and change the default temperature if necessary.
- Follow the instructions on the display.

Canning

Always observe USDA food safety guidelines.

Canning containers

⚠ Danger of injury!
Do not use the appliance to heat up or can food in sealed jars or containers. Pressure will build up inside them and they can explode causing damage to the appliance, as well as the risk of injury and scalding.

Only use jars designed for canning:

– Canning jars,

– Jars with twist-off lids.

Canning fruit and vegetables

We recommend using the Convection Bake mode.

The instructions below are for 6 one-liter glass jars.

- Slide the universal tray onto shelf level 2. Place the jars on the tray.
- Select the Convection Bake mode and a temperature of 300-340°F (150–170 °C).
- Wait until bubbles rise evenly in the jars.

Then reduce the temperature to avoid a boil-over.

Fruit / Cucumbers

- As soon as bubbles begin to rise evenly in the jars, reduce the temperature to the lowest setting. Then, leave the jars in the warm oven for an additional 25-30 minutes.

Vegetables

- Reduce the temperature to 210°F (100°C) as soon as bubbles begin to rise evenly in the jars.
- After the canning time has finished, reduce the temperature to the lowest setting and leave the jars in the oven for an additional 25-30 minutes.

After canning

⚠ Danger of burns!
Use pot holders when removing the jars from the oven.

- Take the jars out of the oven.
- Cover the jars with a towel and leave to set for approx. 24 hours.
- Make sure all jars are closed properly when storing them.

Frozen food

Tips for pizza, French fries, croquettes and other similar items

Cakes, pies, pizza, baguettes

– Bake frozen pizza on parchment paper placed on the wire oven rack.

– Cook smaller frozen food items on parchment paper placed on a baking tray or the universal tray.

– For smaller frozen food items, use the lowest temperature recommended on the packaging.

– Turn small frozen food items several times during cooking.

Preparation

Handling food carefully will help protect your health.

- Select the oven mode and temperatures recommended on the food's packaging.
- Preheat the oven.
- Place the food in the preheated oven on the shelf level recommended on the packaging.
- Check the food at the end of the shortest time recommended on the packaging.

⚠ Danger of burns!
Make sure the heating elements are turned off and allowed to cool completely.

⚠ Danger of injury! The steam from a steam cleaner could reach electrical components and cause a short circuit.
Do not use a steam cleaner to clean this appliance.

All surfaces can discolor or be damaged if unsuitable cleaning agents are used. The front of the oven, in particular, will be damaged by oven cleaners and descalers.
All surfaces are susceptible to scratches. Scratches on glass surfaces could cause a breakage.
Remove any cleaning agent residues immediately.

Unsuitable cleaning agents

To avoid damaging surfaces when cleaning, do not use:

- Cleaners containing soda, ammonia, acids or chlorides
- Lime removers on the front of the ovens
- Abrasive cleaning agents, such as scouring powder, scouring cream, pumice stones
- Solvent-based cleaners
- Stainless steel cleaners
- Dishwasher cleaners
- Glass cleaners
- Ceramic cooktop cleaners
- Hard, abrasive sponges and brushes, such as pot scrubbers or used sponges that still contain traces of abrasive cleaner
- Eraser sponges
- Sharp metal scrapers
- Steel wool
- Spot cleaners
- Oven cleaners*
- Stainless steel scouring pads*

* Can be used to remove very heavy soiling from PerfectClean surfaces.

If stains and food residues are allowed to remain on surfaces for a longer period of time, it may no longer be possible to remove them. Continued use without cleaning will make the oven much harder to clean.

Remove any soiling immediately.

The accessories are not dishwasher-safe.

Tips

– Soiling caused by spilt juices and cake mixtures is best removed while the oven is still warm. Use caution and make sure the oven is not too hot - Danger of burns.

– For easier cleaning, the oven door can be disassembled. Remove the side runners, the catalytic back panel and fold down the Browning / Broiling element.

Normal soiling

See "Cleaning the catalytic enameled back panel" for cleaning instructions.

- Remove normal soiling immediately using a clean sponge with warm water and liquid dish soap applied with a clean, damp microfiber cloth.
- After cleaning, ensure that any detergent residue is removed with clean water.
  This is particularly important when cleaning surfaces treated with PerfectClean enamel as detergent residue can impair the non-stick properties.
- After cleaning, dry the surfaces with a soft cloth.

Cleaning the seal

There is a seal around the oven cavity which ensures that the interior of the oven and the inside of the door are sealed.

Grease deposits on the seal can cause it to become brittle and cracked.

- Wipe the seal clean after each use.

Roast Probe

Do not put the roast probe into water or clean it in the dishwasher, this will damage it.
Clean the roast probe with a damp towel.

Stubborn soiling (excluding the FlexiClip runners)

Spilt fruit and roasting juices may permanently discolor surfaces of the oven. This discoloration is permanent but will not affect the performance of the oven. Do not use force to remove these stains. Clean using the instructions in this manual.

- Baked on deposits can be removed with a glass scraper or a non-abrasive stainless steel spiral pad.

Remove the catalytic panels before using oven cleaners. They will damage the catalytic enamel.

- Stubborn soiling on PerfectClean surfaces can be cleaned using Miele Oven Cleaner. It must only be applied to cold surfaces in accordance with the instructions on the packaging.

Non-Miele oven spray must only be used in a cold oven and for no longer than 10 minutes.

- If necessary, the rough side of a dish sponge can be used to remove the soiling.
- After cleaning, remove all oven cleaning agent residues thoroughly with clean water, and dry with a soft cloth.

Stubborn soiling on the FlexiClip runners

Do not wash the FlexiClip telescopic runners in the dishwasher. This will remove the special lubricant which is essential for their smooth functioning.

For stubborn surface soiling or if the bearings become sticky proceed as follows:

- Soak the FlexiClip runners for approx. 10 minutes in warm water and liquid dish soap.
  If necessary, use the rough side of a dish sponge. The bearing can be cleaned using a soft brush.

After cleaning discolorations or lighter areas may remain on the runners. This will not affect the performance in any way.

Cleaning the catalytic enameled back panel

Soiling from oil and fat is burnt off catalytic enamel when very high temperatures are used in the oven.

The higher the temperature, the more effective the process.

Exposure to scouring agents, abrasive brushes or sponges and oven sprays can cause the catalytic enamel to lose its self-cleaning properties.
Catalytic enameled panels should be removed before using oven spray.

Removing soiling caused by spices, sugar and similar deposits.

- Remove the back panel (see "Cleaning and care - Removing the back panel").
- Wash the back panel by hand with warm water and liquid dish soap applied with a soft sponge.
- Rinse thoroughly and let dry before placing it back in the oven.

Removing oil and grease

- Remove any accessories from the oven, including the shelf runners.
- Wipe any soiling form the oven interior and the inside of the door before starting the cleaning process. This will avoid them baking on.
- Select Convection Bake and 475°F (250 °C).
- Heat the empty oven for at least 1 hour, or more depending on the degree of soiling.

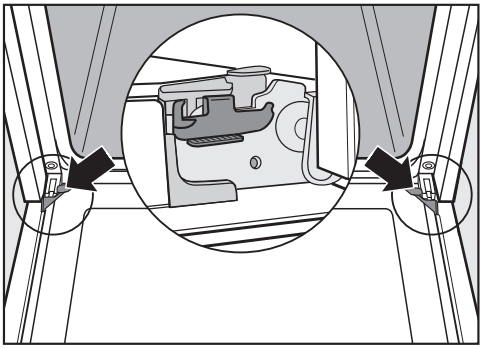
If the catalytic coating is very heavily soiled with oil and grease, a film can form on the surfaces of the oven interior during the cleaning process.

⚠ To prevent burns, allow the heating elements to cool before cleaning by hand.

- Clean the inside of the door and the oven interior with warm water and liquid dish soap, applied with a clean, damp microfiber cloth.

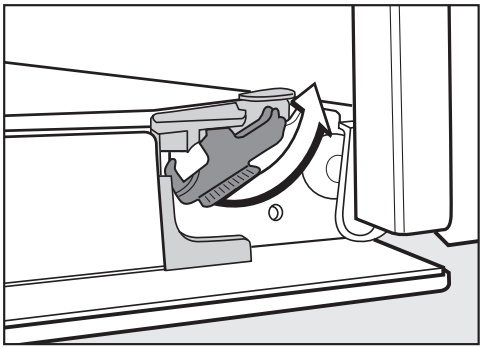
Any remaining soiling will gradually disappear with each subsequent use of the oven at a high temperature.

Removing the door



The door is connected with brackets on each door hinge.
Before the door can be removed the hinges must first be unlocked.

- Open the door fully.



- Release the locking clamps by turning them as far as they will go.

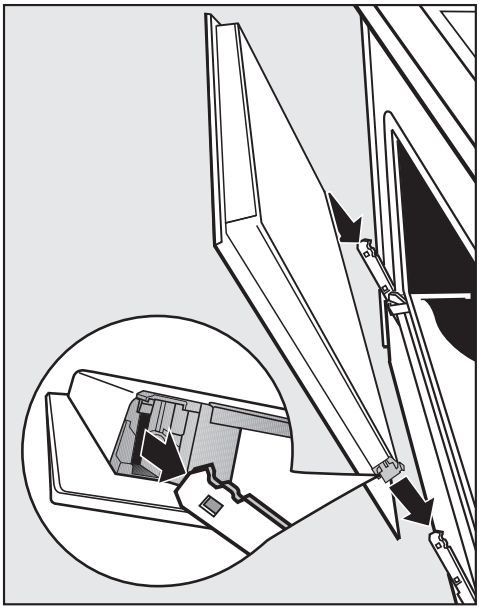
Do not attempt to take the door off the brackets when it is in the horizontal position, the brackets will spring back against the oven.

Do not use the handle to pull the door off the brackets, the handle could break.

- Close the door until it rests partially open.

- Holding the door securely at both sides, lift it straight upwards.

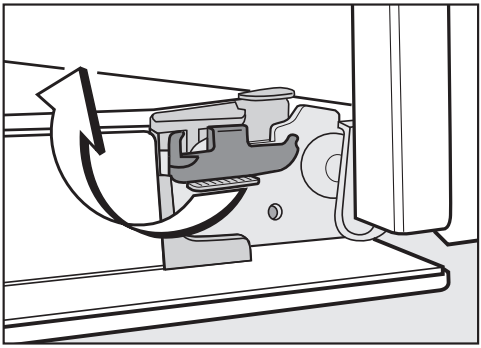
Reinstalling the door



■ Hold both sides of the door securely and carefully fit it onto the brackets of the hinges.
Make sure that the door goes on straight.

■ Open the door fully.

If the locking clamps are not locked, the door can easily become detached from the brackets and be damaged.
You must make sure that the locking clamps are locked again.



■ To relock the locking clamps, turn them back up to the horizontal position as far as they will go.

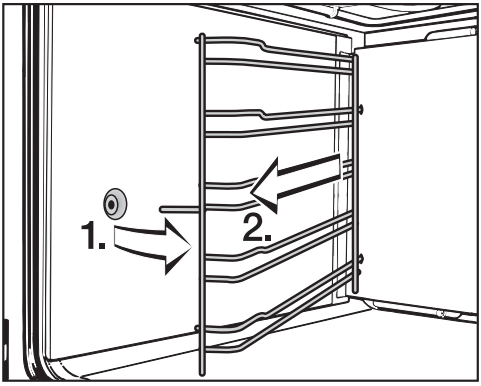
Removing the shelf runners with FlexiClip telescopic runners

⚠ Danger of injury!
Do not use the oven without the shelf runners correctly inserted.

The shelf runners can be removed together with the FlexiClip telescopic runners (if inserted).

If you wish to remove the FlexiClip telescopic runners separately, follow the instructions in "Features – Inserting and removing the FlexiClip telescopic runners".

⚠ Danger of burns! Make sure the heating elements are turned off and that the oven cavity is cool.



- Pull the runners out of the holder (1.) at the front of the oven, and then pull them out of the oven (2.).

The runners can be **reinstalled** in the reverse order.

- Be sure that all parts are installed correctly.

Removing the back panel

⚠ Danger of injury!
Do not use the oven without the back panel in place.

The back panel can be removed for cleaning purposes.

⚠ Danger of burns! Make sure the heating elements are turned off and that the oven cavity is cool.

- Disconnect the appliance from the power supply.
- Remove the shelf runners.
- Loosen the four Torx screws (T20) at the corners of the back panel and remove it.
- Clean the back panel (see "Cleaning the catalytic enameled back panel").

The back panel can be **reinstalled** in the reverse order.

- Be sure that the back panel is installed correctly.

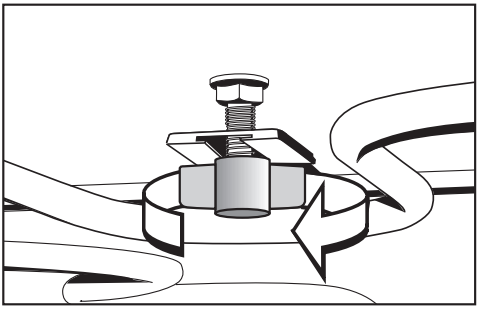
See "Guide to the oven" for arrangement of the openings.

- Reconnect the oven to the electrical supply.

Lowering the Browning/ Broiling element

⚠ Danger of burns!
Make sure the heating elements are turned off and allowed to cool completely.

- Remove the shelf runners.



- Unscrew the wing nut.

Use caution not to damage the Browning/Broiling element.
Do not use force to lower the Browning/Broiling element.

- Carefully lower the Browning/Broiling element.

The ceiling can now be cleaned.

- Raise the Browning/Broiling element and tighten the wing nut securely.
- Reinsert the shelf runners.

The following faults can be corrected without contacting the Miele Service Department. If in doubt, please contact Miele.

⚠ Danger of injury! Repairs should only be carried out by a qualified and trained professional in accordance with local and national safety regulations. Unauthorized repairs could cause personal injury or machine damage.

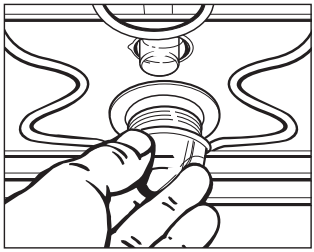
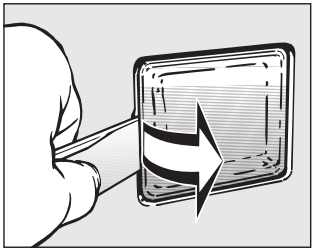
Problem	Possible cause and solution
This display is dark.	The time of day display is deactivated. When the appliance is turned off, the time of day display is turned off. ■ As soon as the oven is turned on, the time of day will appear. If you want it to be displayed continuously, the setting to turn the time of day display back on must be changed (see "Settings – Time of day - Display").
	There is no power to the appliance. ■ Check if the circuit breaker has tripped.
System Lock 🔒 **in the display when the oven is turned on.**	The system lock is On. ■ Press and hold the icon for at least 6 seconds to unlock the oven for 1 cooking program. ■ To permanently deactivate the lock, see "Setting - System Lock".

Frequently asked questions

Problem	Possible cause and solution
The oven does not heat up.	Demo mode is activated. The oven can be operated but will not heat up. ■ Deactivate Demo mode (see "Settings – Showroom Program").
Power Failure - Program Canceled **appears in the display.**	There has been a power failure which has caused the current cooking process to stop. ■ Turn the oven off and then back on again. ■ Restart the cooking process.
12:00 **appears in the display.**	The power supply was interrupted for longer than 200 hours. ■ Reset the date and time.
Maximum Operating Hours Reached **appears in the display.**	The oven was operated for an unusually long period of time. The Safety cut-out feature has been activated. ■ Confirm with OK. Clear the message Program Finished by selecting "Back". The oven is now ready to use.
⚠ Fault XX **appears in the display.**	A fault has occurred that you cannot resolve. ■ Contact Miele.
The core temperature cannot be set.	The roast probe is not recognized by the oven. ■ Check whether the roast probe is correctly plugged into the socket. If the oven still does not recognize the roast probe, it must be faulty. A replacement roast probe can be ordered from Miele.
A noise is heard after the cooking process is complete.	The fan remains turned on after a cooking program (see "Settings - Cooling fan").
The oven has turned itself off.	The oven turns off automatically if a button is not pressed after a certain amount of time or after a cooking program has ended to save power. ■ Turn the oven back on.

Problem	Possible cause and solution
Spots appear on the catalytic surfaces.	The catalytic cleaning process does not remove spices, sugar or similar deposits. ■ Remove the catalytic panels and clean this type of soiling with warm water and liquid dish soap applied with a soft brush (see "Cleaning and care - Cleaning the catalytic enameled back panel").
Baked goods are not cooked properly after following the times given in the chart.	A different temperature than that given in the recipe was used. ■ Select the temperature required for the recipe.
	The ingredient quantities are different from those given in the recipe. ■ Double check the recipe. The addition of more liquid or more eggs will make a wetter mixture which will take longer to cook.
The browning is uneven.	The wrong temperature or shelf level was selected. ■ There will always be a slight unevenness. If the unevenness is great, check whether the correct temperature and shelf level were selected.
	The material or color of the bakeware is not suitable for the oven mode selected. ■ When using Surround use matte, dark colored pans. Light colored, shiny pans will not produce as desirable results.
The FlexiClip telescopic runners do not push in or pull out smoothly.	The bearings in the FlexiClip telescopic runners are not sufficiently lubricated. ■ Lubricate the bearings with the special Miele lubricant. Only use this special lubricant as it is designed to withstand high temperatures in the oven. Other lubricants can harden and stick to the telescopic runners when they are heated.The Miele lubricant is available to order from Miele.
The oven lighting turns off after a short time.	The oven is factory set to turn off automatically after 15 seconds. This setting can be changed (see "Settings - Lighting").

Frequently asked questions

Problem	Possible cause and solution
The top oven lighting does not turn on. 	The halogen bulb needs to be replaced. ⚠ Danger of burns! Make sure the heating elements are turned off and allowed to cool completely. ■ Disconnect the appliance from the power supply. ■ Turn the lamp cover a quarter turn counter-clockwise to release it and then pull it together with its seal downwards to take it out. ■ Replace it with a new halogen bulb (Sylvania 66740, 120 V, 40 W, G9, FS1). ■ Refit the lamp cover together with its seal and turn it clockwise to secure. ■ Reconnect the oven to the electrical supply.
The side oven lighting does not turn on. 	The halogen bulb needs to be replaced. ⚠ Danger of burns! Make sure the heating elements are turned off and allowed to cool completely. ■ Disconnect the appliance from the power supply. ■ Remove the side runners. ■ Loosen the bulb cover with the tool supplied from the frame. ■ Replace it with a new halogen bulb (Sylvania 66740, 120 V, 40 W, G9, FS1). ■ Press the lamp cover back into its frame and refit the side runners. ■ Reconnect the oven to the electrical supply.

After sales service

In the event of a fault which you cannot easily correct yourself, please contact:

– your Miele dealer, or

– the Miele Technical Service Department.

See back cover for contact details.

Please quote the model and serial number of your appliance when contacting Miele.

This information is given on the data plate, visible on the front frame of the oven, with the door fully open.

Warranty

For further information, please refer to your warranty booklet.

Disposal of the packing material

The cardboard box and packing materials protect the appliance during shipping. They have been designed to be biodegradable and recyclable.

Ensure that any plastic wrappings, bags, etc. are disposed of safely and kept out of the reach of children. Danger of suffocation!

Disposal of your old appliance

Old electrical and electronic appliances often still contain valuable materials. However, they also contain harmful substances that were essential for the proper functioning and safe use of the equipment. Handling these materials improperly or disposing of them in your household waste can be harmful to your health and the environment. Therefore, please do not dispose of your old appliance with regular household waste.

Old appliances may contain materials that can be recycled. Please contact your local recycling authority about the possibility of recycling these materials.

Please be sure that your old appliance does not pose a danger to children while being stored for disposal.

⚠ CAUTION:
Before servicing, disconnect the power supply by either removing the fuse, shutting off the power main or manually "tripping" the circuit breaker.

Installation, repair and maintenance work must be performed by a Miele authorized service technician. Work by unqualified persons could be dangerous and may void the warranty.

Before connecting the appliance to the power supply, make sure that the voltage and frequency listed on the data plate correspond with the household electrical supply. This data must correspond to prevent machine damage. Consult an electrician if in doubt.

Only operate the appliance after it has been installed into cabinetry.

The plug must be inserted into a suitable outlet that has been installed and grounded in compliance with all applicable local regulations.

WARNING: THIS APPLIANCE MUST BE GROUNDED

Installer: Please pass these instructions on to the customer.

Electrical connection

The oven is equipped with a power cord approx. 5' 6" (1.7 m) in length with a NEMA 14-30 P plug ready for connection to the power supply:

– 120/208 V, 20 A, 60 Hz

or

– 120/240 V, 20 A, 60 Hz

The voltage can be adjusted (see "Settings - Electrical Version").

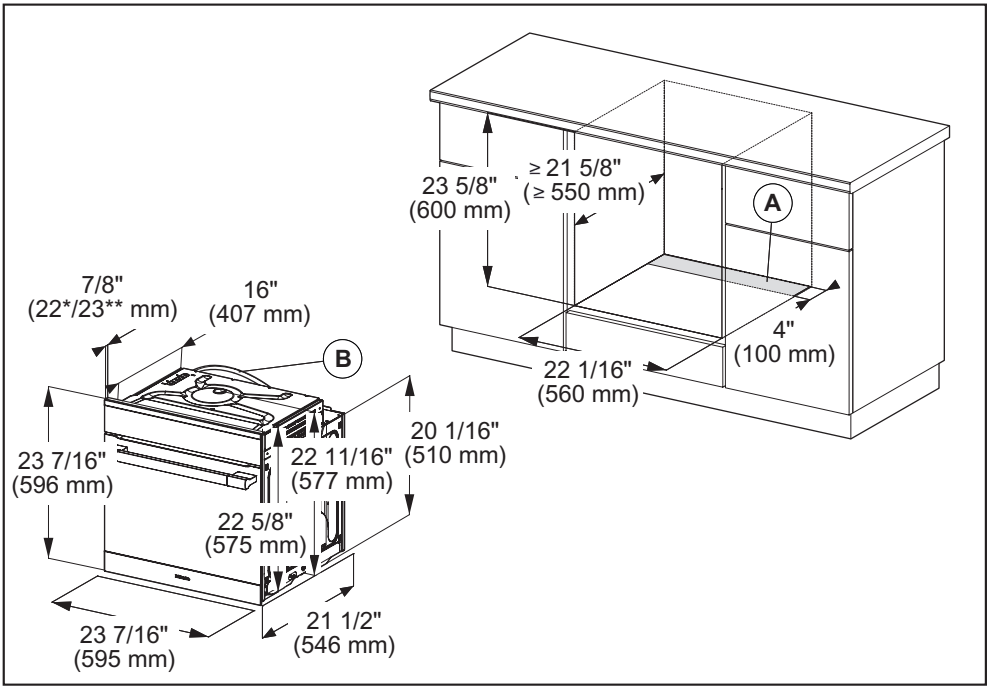
SAVE THESE INSTRUCTIONS FOR THE ELECTRICAL INSPECTOR'S USE.

Installation diagrams

Appliance and cut-out dimensions

Miele ovens can be installed flush or proud. Discuss your installation requirements with your architect, designer and installer.

Undercounter installation



Ⓐ Cut-out (4" x 22" / 100 mm x 560 mm) in the bottom of the cabinet for power cord and ventilation

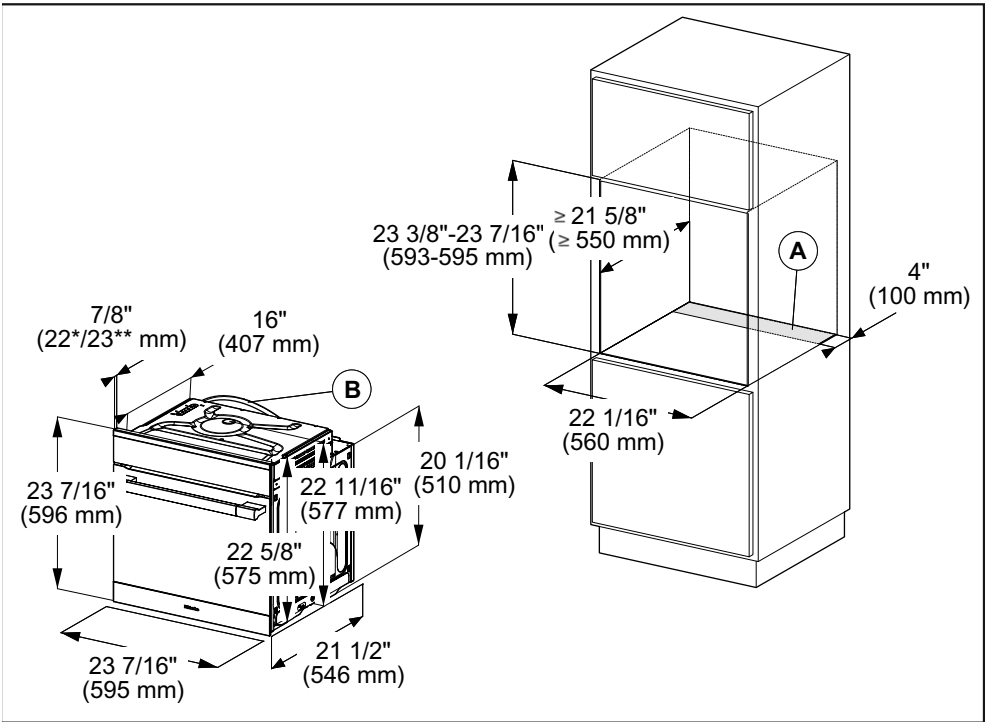
Ⓑ Power cord with plug

* Oven with glass front

** Oven with metal front

Depending on the model, the oven front may differ from the one shown the drawing. Current specifications can be found on the Miele website.

Installation into a tall cabinet



Ⓐ Cut-out (4" x 22" / 100 mm x 560 mm) in the bottom of the cabinet for power cord and ventilation

Ⓑ Power cord with plug

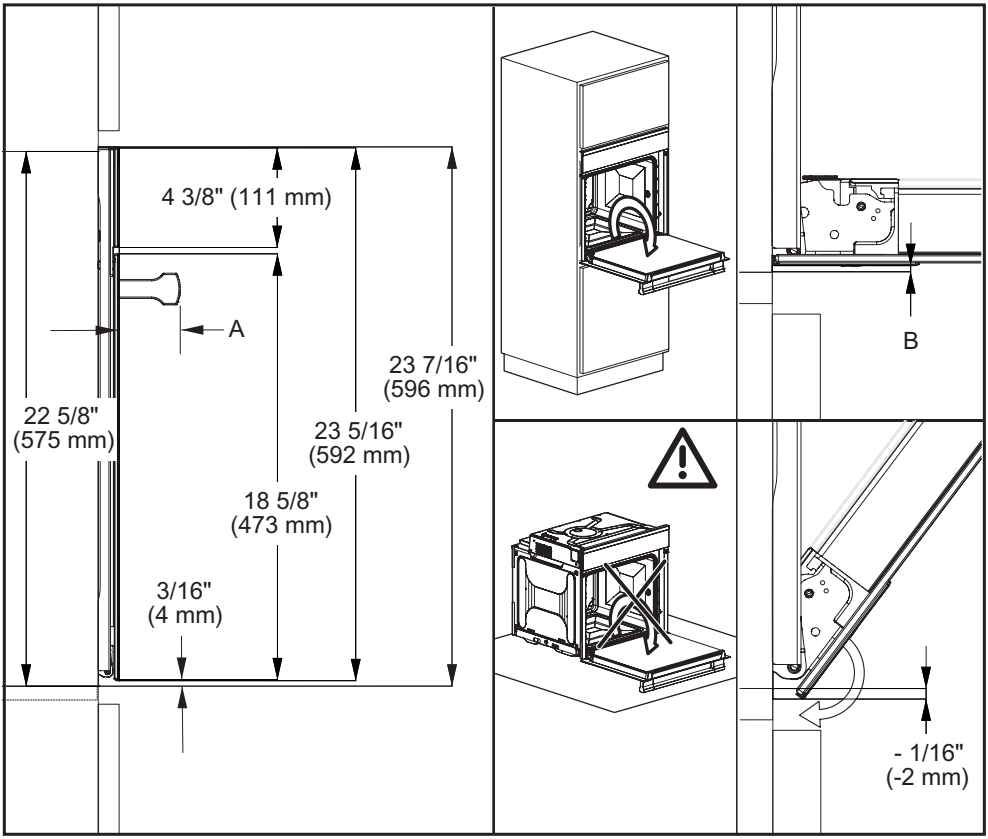
* Oven with glass front

** Oven with metal front

Depending on the model, the oven front may differ from the one shown the drawing. Current specifications can be found on the Miele website.

Installation diagrams

Front dimensions



A H65xx: 2 11/16" (69 mm)

H66xx: 1 5/8" (42 mm)

B Oven with glass front: 1/16" (2.2 mm)

Oven with metal front: 1/16" (1.2 mm)

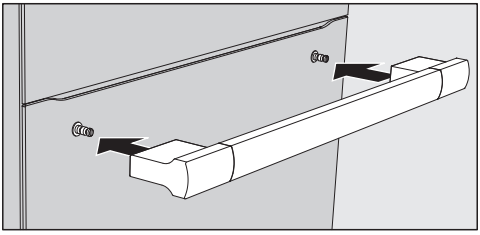
⚠ The oven must not be operated until it has been properly installed within cabinetry.

In order for the oven to function correctly, it required an adequate supply of cool air. Ensure that the air flow is not impaired (e.g. insulation in the cabinetry). Also be sure that the cool air supply is not heated by other sources nearby.

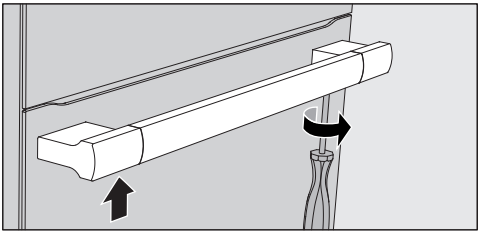
Before installation

- Before connecting the oven to the power supply, first disconnect the power supply from the oven isolator switch.

Mounting the door handle (depending on model)



- Mount the handle onto the retaining bolts.



- Use the supplied Allen wrench to tighten all four bolts.

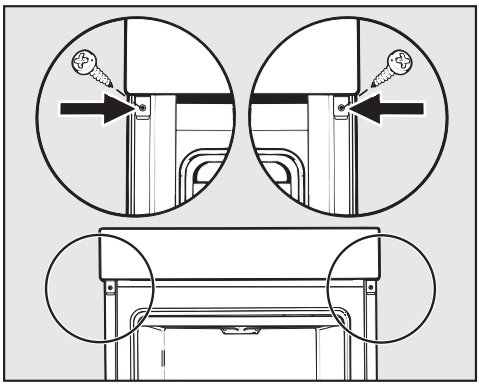
Installing the oven

- Connect the power cord to the electrical supply.

Do not carry the oven by the door handle. The door can be damaged. Use the handles on each side of the oven to carry it.

It is recommended that you remove the door before installing the appliance (see "Cleaning and Care - Removing the door") and all oven accessories from the cavity. This will make for easier installation into the niche and will not tempt you to use the handle to carry it.

- If there are side handles, please remove them.
- Push the oven into the cabinetry and align it.
- Open the door (if it was not removed previously).



- Use the supplied screws to secure the oven to the side walls of the cabinetry through the holes in the trim.

- Reinstall the door, if necessary (see "Cleaning and care - Installing the door").

Please have the model and serial number of your appliance available before contacting Technical Service.

U.S.A.

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33332 Gütersloh

Miele

H6560B

CE

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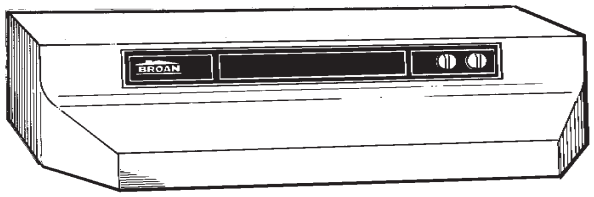
M.-Nr. 09 786 780 / 02

BROAN

SPECIFICATION SHEET

MODEL 46000 4-WAY CONVERTIBLE RANGE HOOD



Deluxe features in our smaller shell - offers the most hood for the money.

FEATURES

- Infinite speed fan control
- Polymeric blade and light lens (accepts up to 75W bulb)
- Washable aluminum filter
- Converts to non-ducted by removing cover plate from control panel and installing the non-ducted filter (purchase separately)
- Mitered sides and hemmed bottom for safety and good looks
- 3¼" x 10" damper/duct connector included
- 7" round duct adapter plate included. 7" round damper purchase separately.
- Contemporary styling in White, Almond, Biscuit and Stainless Steel
- Available in 24", 30", 36" and 42" widths
- **Special Order Color -** Black (24", 30" and 36" only)

SPECIFICATIONS

VOLTS	AMPS	CFM	SONES	DUCT
120	2.5	190	7.5	3¼" X 10" (H)
120	2.5	190	7.5	3¼" X 10" (V)
120	2.5	220	7.5	7" Round (V)
120	2.5	-	-	Non-Ducted

HVI-2100 CERTIFIED RATINGS comply with new testing technologies and procedures prescribed by the Home Ventilating Institute, for off-the-shelf products, as they are available to consumers. Product performance is rated at 0.1 in. static pressure, based on tests conducted in a state-of-the-art test laboratory. Sones are a measure of humanly-perceived loudness, based on laboratory measurements.

TYPICAL SPECIFICATION

Range hood shall be Broan Model 46000.

Unit shall be convertible between ducted (using a washable aluminum filter) and non-ducted (using a non-ducted filter).

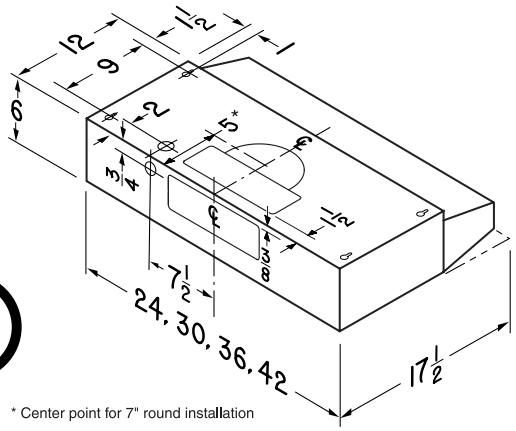
Motor to be permanently lubricated. RPM not to exceed 3150.

Unit shall have infinite speed fan control with separate light/night light switch.

Sides shall be mitered and bottom edge hemmed - with no sharp edges.

Air delivery shall be no less than 190 CFM (3¼ x 10 discharge) and 220 CFM (7" round discharge) and sound levels no greater than 7.5 Sones. All air and sound ratings shall be certified by HVI.

Unit shall be U.L. listed.



* Center point for 7" round installation

Broan-NuTone LLC, 926 West State Street, Hartford, WI 53027 (1-800-637-1453)

REFERENCE	QTY.	REMARKS	Project
			Location
			Architect
			Engineer
			Contractor
			Submitted by Date

12- FURNISHINGS

Part 1: Scope

The cabinets will be used in the kitchen and bathroom as storage devices for kitchenware.

Part 2: Product

2.1 Base Cabinets
A. Sektion Base Cabinet with shelves
B. Website: http://www.ikea.com/us/en/catalog/products/S39034607/
C. Dimensions: Width: 15 "
System, depth: 15 "
Depth: 15 3/8 "
Frame, height: 30 "

2.2 Cabinet Panel
A. Voxtrop Cover Panel, White
B. http://www.ikea.com/us/en/catalog/products/40314169/
C. Width: 24 5/8 "
Height: 30 "
Thickness: 1/2 "

2.3 Wall Cabinet

A. SEKTION
Wall cabinet
B. http://www.ikea.com/us/en/catalog/products/S89034657/
C. Width: 30 "
System, depth: 15 "
Depth: 15 1/2 "
Frame, height: 30 "

Part 3: Execution
3.01 Installation
A. The systems will be installed in compliance with codes and construction manuals, and will not compromise the stability of the supporting structure.

END SECTION 329300

END SECTION 12

21 – FIRE SUPPRESSION

210000 – WET PIPE SPRINKLER SYSTEM

PART 1 – GENERAL

1.1 SCOPE

To be installed in the house ceiling area and requires water used from the water filtration system potable water supply.

1.2 SECTION REQUIREMENTS

A. Submittals: Product Data for valves, sprinklers, specialties, and alarms.
    1. Submit sprinkler system drawings identified as "working plans" and calculations according to NFPA 13. Submit required number of sets to authorities having jurisdiction for review, comment, and approval. Include system hydraulic calculations.
    2. Submit test reports and certificates as described in NFPA 13.
B. Design and Installation Approval: Acceptable to authorities having jurisdiction.
C. Hydraulically design sprinkler systems according to NFPA 13.
D. Comply with NFPA 13D and NFPA 70, and IRC 2009 Section P2904.
E. UL-listed and -labeled and FM-approved pipe and fittings.
F. Verify dimensions in field measurements before fabrication & indicate on shop drawings.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. CPVC Plastic Pipe: ASTM F 442/F 442M, UL 1821, 175-psig rating, made in NPS for sprinkler service. Include "Listed" and "CPVC Sprinkler Pipe" marks on pipe.
B. CPVC Plastic Pipe Fittings: ASTM F 438 for NPS 3/4 to NPS 1-1/2 and ASTM F 439 for NPS 2, UL listed, 175-psig rating, for sprinkler service. Include "Listed" and "CPVC
C. Sprinkler Fitting" marks on fittings.
D. Black steel piping shall be provided in all exposed areas.
E. Provide hangers, supports, and seismic restraints with UL listing and FM approval for fire-protection systems.

2.2 VALVES

A. Fire-Protection Service Valves: UL listed and FM approved, with 175-psig nonshock minimum working-pressure rating. Indicating valves shall be butterfly or ball type, bronze body, and integral indicating device with 115-V ac, electric, single-circuit supervisory switch indicator.

2.3 SPRINKLERS

A. Automatic Sprinklers: With heat-responsive element complying with the following:
    a. UL 1626, for residential applications.
B. Sprinkler Types and Categories: Nominal 1/2-inch orifice for "Ordinary" temperature classification rating unless otherwise indicated or required by application.
C. Sprinkler types include the following:
    a. Pendent Sprinkler: Tyco Rapid Response LFII Flush Residential Sprinkler Head
    b. Pendent Sprinkler: Viking VK457 Concealed Sprinkler Head
    c. Pendant Sprinkler: Viking VK468 Semi-Recessed Sprinkler Head
D. Sprinkler Escutcheons: steel, one piece, with finish to match sprinklers.

E. Sprinklers shall be low flow residential hidden pendent sprinklers engineered to provide a minimum design density of 0.05 gpm/ft2 over the listed coverage area.
F. Sprinkler frame and deflector shall be of bronze frame construction having a ½" NPT thread.
G. Water seal assembly shall consist of a Teflon-coated Belleville spring washer with top-loaded extruded or cold head cup with 3 mm glass bulb containing no plastic parts, and having a temperature rating of 155°F, 165°F or 175°F.
H. Sprinklers shall have a nominal K-factor of as designed in the hydraulic sprinkler design.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fasten securely in place, with provisions for thermal and structural movement. Install with concealed fasteners, unless otherwise indicated.
B. Correct deficiencies in or remove and reinstall sprinkler that does not comply with requirements.
C. Repair, refinish, or replace sprinklers damaged during installation, as directed by Architect.
D. Adjust operating parts and hardware for smooth, quiet operation and weather tight closure. Lubricate hardware and moving parts.

3.2 PIPE AND FITTING APPLICATION

A. Use steel pipe with threaded, press-seal, roll-grooved, or cut-grooved joints; copper tube with wrought-copper fittings and brazed joints; or CPVC plastic pipe and fittings and metal-to-plastic transition fittings with solvent-cemented joints.

3.3 PIPING INSTALLATION

A. Install "Inspector's Test Connections" in sprinkler piping, complete with shutoff valve.

3.4 TESTING

A. Flush, test, and inspect sprinkler-piping systems according to NFPA 13.

END SECTION 210000

END SECTION 21

22 – PLUMBING

221000 – PLUMBING PIPING

PART 1 - GENERAL

1.1 SCOPE

Included in this section are the piping for the house. There is a difference between feed piping and drain piping, and that will be specified in this section. Depending on the systems and appliances in the house, there will be different sizing to the pipes.

1.2 REQUIREMENTS

a. Solar Decathlon Building Code
b. International Residential Code 2015
    i. Table P2605.1 Piping Support
c. NSF 14
    i. Plastic piping, fittings and components from third party vendors
d. NSF 61

1.3 SUBMITTALS

e. Product
    i. Specifications
    ii. Warranty
    iii. Installation Requirements

PART 2 - PRODUCTS

2.1 PEX TUBING (COLD WATER)

1. 1” PEX TUBING
    i. Color: Blue
    ii. Location: Wet Wall
    iii. Website: http://www.homedepot.com/p/SharkBite-1-in-x-500-ft-Blue-PEX-Pipe-U880B500/202688018
    iv. Manufacturer: SharkBite
    v. Certifications: IAMPO Certified
    vi. Pipe Size: 1”
    vii. Dimensions (L x W x H x Depth): 500’ x 34.24” x 13” x 34.25”
    viii. Max. Working Temperature: 200 F
    ix. Min. Working Temperature: 32 F
    x. Max. Working Pressure: 160 PSI
2. 3/4” PEX TUBING
    i. Color: Blue
    ii. Location: Wet Wall and Mechanical Room
    iii. Website: http://www.homedepot.com/p/SharkBite-3-4-in-x-300-ft-Blue-PEX-Pipe-U870B300/202687981
    iv. Manufacturer: SharkBite
    v. Certifications: IAMPO Certified

vi. Pipe Size: ¾”
vii. Dimensions (L x W x H x Depth): 300’ x 30” x 12” x 30”
viii. Max. Working Temperature: 200 F
ix. Min. Working Temperature: 32 F
x. Max. Working Pressure: 160 PSI

2.2 PEX PIPING (HOT WATER)

3. 1” PEX TUBING
   i. Color: Red
   ii. Location: Wet wall
   iii. Website: http://www.homedepot.com/p/SharkBite-1-in-x-100-ft-Red-PEX-Pipe-U880R100/202033016
   iv. Manufacturer: SharkBite
   v. Certifications: ANSI Certified, CSA Listed, IAMPO Certified
   vi. Pipe Size: 1”
   vii. Dimensions (L x W x H x Depth): 100’ x 12” x 29” x 29”
   viii. Max. Working Temperature: 200 F
   ix. Min. Working Temperature: 32 F
   x. Max. Working Pressure: 160 PSI
4. ¾” PEX TUBING
   i. Color: Red
   ii. Location: Wet Wall and Mechanical Room
   iii. Website: http://www.homedepot.com/p/SharkBite-3-4-in-x-500-ft-Red-PEX-Pipe-U870R500/202033040
   iv. Manufacturer: SharkBite
   v. Certifications: ANSI Certified, CSA Listed, IAMPO Certified
   vi. Pipe Size: ¾”
   vii. Dimensions (L x W x H x Depth): 500’ x 12” x 29” x 29”
   viii. Max. Working Temperature: 200 F
   ix. Min. Working Temperature: 32 F
   x. Max. Working Pressure: 160 PSI

2.3 ABS (ACRYLONITRILE BUTADIENE STYRENE) PIPING

A. Website: http://www.homedepot.com/p/2-in-ABS-DWV-90-Degree-Hub-x-Hub-Long-Turn-Elbow-C5807LTHD2/100346300
B. Manufacturer: Nibco Inc.
C. Fitting size: 2”
D. Dimensions (L x W x H x Depth): 5.38” x 2.73” x 5.38” x 5.38”
E. Maximum Working Pressure: 5 PSI

PART 3. EXECUTION

1. INSTALLATION
   a. PEX TUBING
      i. Website: https://www.huduser.gov/portal/publications/pex_design_guide.pdf
      ii. Requirements:
         1. Minimum bending radius for 1” tubing = 7” and ¾” tubing = 9”

2. Do not pull the tubing too much

b. ABS PIPING
    i. Website: https://www.ppfahome.org/abs/absgeneral.aspx#install

END SECTION 221000

221100 – PEX PIPING MANIFOLD

PART 1. GENERAL

1. SCOPE

Included in this section is the Pex Manifold System that will be the control system where the hot and cold water will be distributed to individual fixtures. This will help with water and energy consumption throughout the house.

2. REQUIREMENTS
    a. IAMPO
    b. NSF International Performance and Health Effects
    c. Intertek Testing Services

3. SUBMITTALS
    a. Specifications
    b. Warranty
    c. Installation Requirements

PART 2. PRODUCTS

1. PEX PIPING MANIFOLD
    a. Website: https://www.cpesupply.com/2319552/Product/50243?gclid=CjwKEAiApLDBBRC8oICb9NvKsg0SJAD9yOHsMiISQpNWf7PLW2rulMvDjZIA2JLwZ-TjupWSIwnhCxoC9GXw_wcB
    b. Manufacturer: Viega
    c. Material: Brass
    d. Nominal Size: 1” (need another ¾” one for those pipes)
    e. Dimensions (L x W x D): 24-3/8” x 8” x 3”
    f. Number of Outlets: 24 (9 hot, 15 cold)
    g. Includes: 1/4 Turn Valves and T-Handle Valve Key, Port Crimp Connections, Drill Templates, Instruction Guide, Faceplate and Port Labels

PART 3. EXECUTION

1. INSTALLATION
    a. Must be protected from UV exposure and petroleum
    b. Reference to Viega cutsheet

222100 - Potable Water Tanks

PART 1. GENERAL

1. SCOPE

Included in this section is the tank where the potable, drinking water will be stored. For the competition, this tank will only be filled once. However, after the competition, the grey water

filtration system will contribute to the supply in the potable water tank to feed into the water appliances and for drinking.

2. REQURIEMENTS
    a. Solar Decathlon Rules
        i. Rule 9. Liquids
    b. NSF
    c. ANSI61

3. SUBMITTALS
    a. Product
        i. Specifications
        ii. Warranty
        iii. Installation Requirements

PART 2. PRODUCTS

1. POTABLE WATER STORAGE TANK
    a. Type: Pillow Tank
    b. Website: http://www.aireindustrial.net/products/750-gallon-potable-water-pillow-tank.asp
    c. Manufacturer: AIRE
    d. Dimensions (L x W x Loft): 120” x 100” x 16”
    e. Capacity: 750 gallons
    f. Warranty: 1 year limited warranty

PART 3. EXECUTION

1. INSTALLATION
    a. Website: http://www.aireindustrial.net/images/Bladder_Instructions_web.pdf
    b. Precautions upon installation
        i. Make sure the area is free of sharp objects
        ii. Make sure that the tank is leveled
        iii. Do not drag bladder
        iv. Use Teflon tape for tight connection

END SECTION 221100

222200 – WATER STORAGE TANKS

PART 1. GENERAL

1. SCOPE

Included in this section are the tanks that will be used to store the grey water that is coming from the light grey water appliances (i.e. washing machine, bathroom sink, and shower) and the tank that will store the water after the biosand filtration and rainwater. In total, it should be two tanks.

2. REQURIEMENTS
    a. Solar Decathlon Rules
    b. Solar Decathlon Building Code
    c. NSF
    d. ANSI61

3. SUBMITTALS
    a. Product
        i. Specifications
        ii. Warranty
        iii. Installation Requirements

PART 2. PRODUCTS

1. GRAY 1, WASTE WATER, TANK
    a. Type: Pillow Tank
    b. Website: http://www.aireindustrial.net/products/150-gallon-waste-water-pillow-tank.asp
    c. Manufacturer: AIRE
    d. Dimensions (L x W x Loft): 66” x 48” x 12”
    e. Capacity: 150 Gallons
    f. Warranty: 1 year limited

2. TREATED COMBINED LIGHT GRAY AND RAIN TANK
    a. Type: Pillow Tank
    b. Website: http://www.aireindustrial.net/products/750-gallon-waste-water-pillow-tank.asp
    c. Manufacturer: AIRE
    d. Dimensions (L x W x Loft): 120” x 100” x 16”
    e. Capacity: 750 Gallons
    f. Warranty: 1 year limited

END SECTION 222200

222400 – WATER PUMPS

PART 1 - GENERAL

1.1 SCOPE

Included in this section is the pressure boosting pump for our water filtration system. This pump will be in between the first grey water storage tank and the biosand filter. There is going to be a significant vertical head that the water will need to travel in order to reach the biosand filter, and this pump will accomplish that.

1.2 SUBMITTALS

A. Specifications
B. Installation Requirements

PART 2 - PRODUCTS

2.1 SCALA PUMP

C. Purpose: Pump water from GREY 1 tank to biosand filter which cannot be gravity fed.
D. Website: http://us.grundfos.com/products/find-product/SCALA2.html#brochures
E. Manufacturer: Groundfos
F. Dimensions (L x W x H): 15.9” x 7.6” x 11.9”
G. Power Requirement: Max. 600 W
H. Flow Rate: Max. 16 GPM

2.2 BMQE PUMP

A. Purpose: Provides constant pressure and works with low pressure feed. Able to set the desirable pressure.
B. Website: http://us.grundfos.com/products/find-product/grundfos-bmqe-system/_jcr_content/tabbedpanel/brochures/download_list/downloads/download_0/file/file.res/L-DWS-PG-01.pdf
C. Manufacturer: Groundfos
D. Dimensions (L x W x H): 22.44” x 8.58” x 12.74”
E. Power Requirement: 200 W
F. Flow Rate: 22 GPM

PART 3 - EXECUTION

3.1 INSTALLATION

PUMP #1

A. Website :http://us.grundfos.com/content/dam/GPU/Literature/SCALA2/SCALA2-IO.pdf
B. Location
    a. Must not be exposed to frost
    b. Near drain or in a drip tray connected to a drain
    c. Space Requirement: 17” x 8.5” x 12.8”

END SECTION 222400

223000 – HOT WATER HEATER

PART 1 - GENERAL

1.1 SCOPE
Will be used for the hot water in the house and both components will be located in the mechanical closet.

1.2 SPECIFICATION REQUIREMENTS
1. Energy efficiency
2. Corrosion resistant tank
3. 149 degree F hot water temperature
4. Support four person family
5. CO2 refrigerant
6. Heat pump warranty 10 years
7. Heat storage tank warranty 15 years

1.3 SUBMITTALS
1. Product specifications
2. Drawing with installation location

PART 2 - PRODUCTS
2.1 HEAT PUMP WATER HEATER
1. Volume: 43 gallons
2. Energy factor: 3.5
3. Water temperature: 149
4. Pipe size: ½”

2.2 STAINLESS STEEL STORAGE TANK

224000 – RESIDENTAIL PLUMBING FIXTURES

PART 1 – GENERAL

1.1 SCOPE

Fixtures that are used in the kitchen and bathroom plumbing fixtures.

1.2 STANDARDS

A. ASME A112.18.1/CSA B125.1 NSF 61 NSF 372 All applicable US Federal and State material regulations DOE - Energy Policy Act 1992 ADA ICC/ANSI A117.1 CSA B651 OBC

PART 2 – PRODUCTS

2.1 BATHROOM SINK

A. Acceptable Product

1. Product: Purist Wading Pool Bathroom Sink
2. Model: K-2314-1
3. Manufacturer: Kohler
4. Website:
5. Size: 24" (610 mm) x 23-1/2" (597 mm)
6. Overflow: None
7. Faucet hole: 1-3/8”
8. Warranty: 1 year limited
9. Colors: White, Biscuit, and Almond

2.2 BATHROOM SINK FIXTURE

A. Acceptable Product

1. Product: Elliston single-handle bathroom sink faucet
2. Model: K-R72782-AD
3. Manufacturer: Kohler
4. Website:
5. Spout reach: 5”
6. Max flow rate: 1.5 gal/min
7. Pressure: 60 psi
8. Warranty: 1 year limited
9. Color: Polish chrome, or vibrant brushed nickel

2.3 KITCHEN SINK

A. Acceptable Product

1. Product: Gilford Apron-front Kitchen Sink
2. Manufacturer: Kohler
3. Single bowl
4. Length: 22”
5. Width: 18”
6. Depth: 8-5/8”
7. Deck holes: 2
8. Faucet holes: 1-3/8”; two on 8” centers
9. Drain hole: 3-5/8”
10. Size: 24" (610 mm) x 22" (559 mm) x 8-5/8" (219 mm)
11. Wall mounted

12. Warranty: 1 year limited
13. Colors: White (0), Biscuit (96), Almond (47), and Black Black (7)

2.4 KITCHEN SINK FIXTURE

A. Acceptable Product

1. Product: Coralasis Kitchen Sink Faucet
2. Model: K-15175-P
3. Manufacturer: Kohler
4. Spout reach: 8-1/2”
5. Flow rate: 1.8 gal/min
6. Pressure: 60 psi
7. Color: Polished chrome

2.4 SHOWER FIXTURE

A. Acceptable Product

1. Product: Contemporary Round Rain Showerhead
2. Model: K-45201
3. Manufacturer: Kohler
4. Flow rate: 2.0 gpm (gallons per minute)
5. Connection: 1/2-inch NPT

END SECTION 224000

END SECTION 22

KOHLER. Faucets

Elliston®

Single-handle Bathroom Sink Faucet

K-R72782-4D

Features

- One-piece, self-contained ceramic disc valve allows both volume and temperature control.
- Temperature memory allows faucet to be turned on and off at any temperature setting.
- Pop-up drain with lift rod and tailpiece.
- Stationary spout.
- Single-hole mounting.
- 5" (127 mm) spout reach.
- Includes a 6" (152 mm) escutcheon plate for three-hole bathroom sinks.
- 1.5 gal/min (5.7 l/min) maximum flow rate [max at 60 psi (4.14 bar)].

Material

- Metal construction.

ADA

Codes/Standards

ASME A112.18.1/CSA B125.1
NSF 61/9
EPA WaterSense®
ADA
ICC/ANSI A117.1

KOHLER® Faucet Lifetime Limited Warranty

See website for detailed warranty information.

Available Color/Finishes

Color tiles intended for reference only.

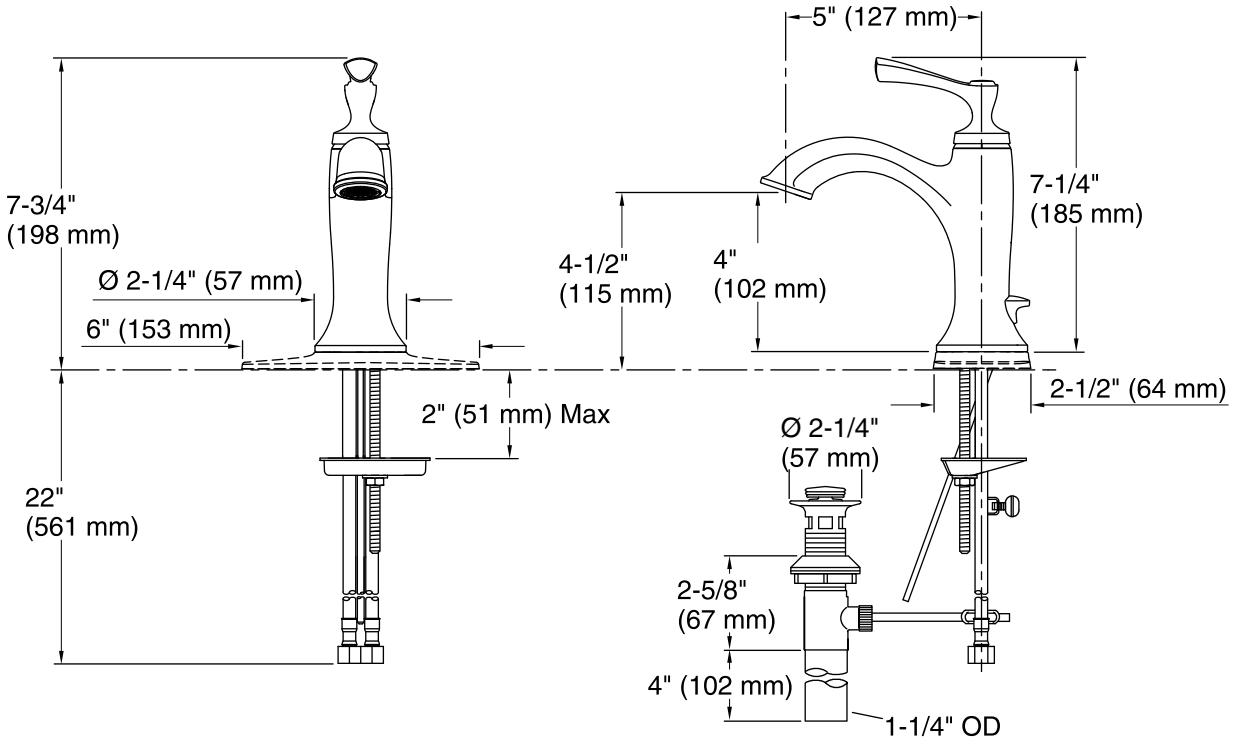
Color	Code	Description
	CP	Polished Chrome
	BN	Vibrant® Brushed Nickel

KOHLER. Faucets

Elliston®

Single-handle Bathroom Sink Faucet

K-R72782-4D



Pop-Up Drain

Technical Information

All product dimensions are nominal.

Drain included:	YES
Drain tailpiece included:	YES

Spout:

Spout reach:	5" (127 mm)

Faucet:

Flow rate:	1.5 gal/min (5.7 l/min)
Pressure:	60 psi (4.1 bar)

Notes

Install this product according to the installation guide.

ADA compliant when installed to the specific requirements of these regulations.

Purist®
Wading Pool® Bathroom Sink
K-2314-1

Features
- Fireclay
- Without overflow.
- Countertop or wall-mount installation.
- Single faucet hole.
- Complements the Purist Suite.
- 24" (610 mm) x 23-1/2" (597 mm)

Recommended Accessories
K-7129 Drain
K-7605-P Angle Supply with Stop (pair)
K-9018 P-Trap
K-9583 Bathroom Sink Bracket Kit

ADA | **CSA B651** | **OBC**

Codes/Standards
ASME A112.19.2/CSA B45.1
ADA
ICC/ANSI A117.1
CSA B651
OBC

See website for detailed warranty information.

Available Color/Finishes
Color tiles intended for reference only.

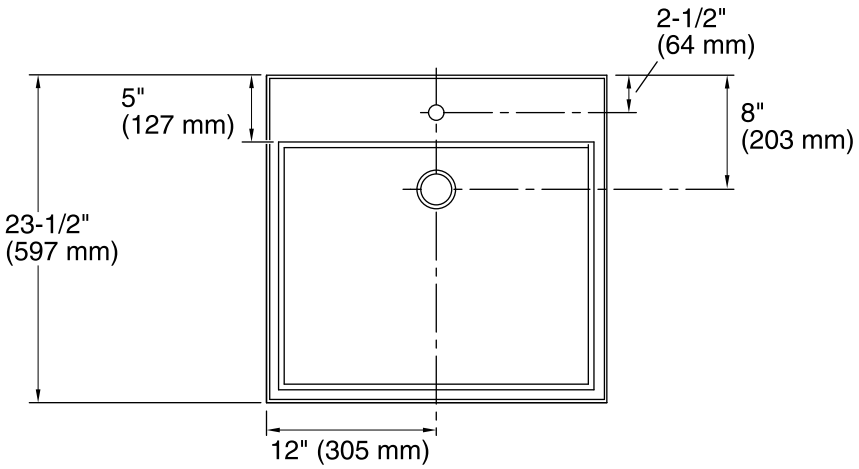
Color	Code	Description
	0	White
	96	Biscuit
	47	Almond

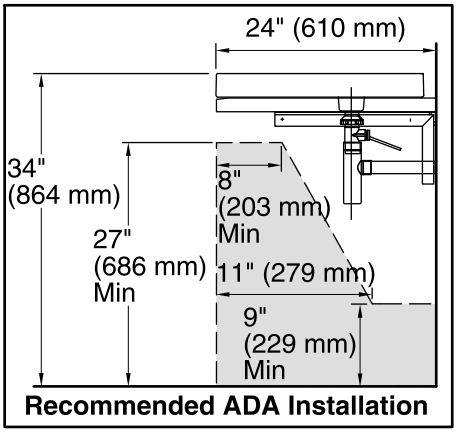
KOHLER®

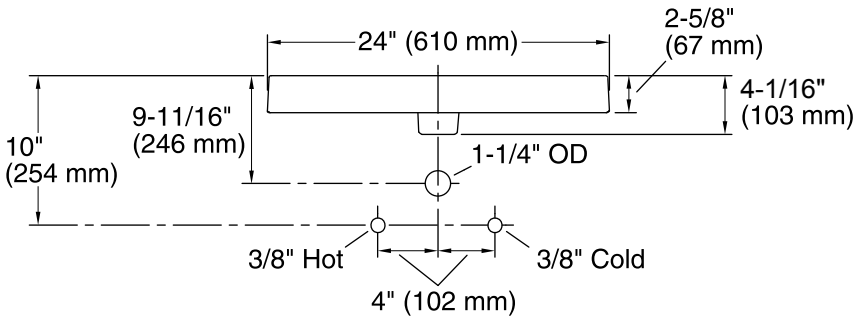
Purist®

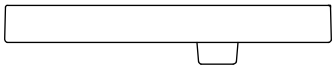
Wading Pool® Bathroom Sink

K-2314-1









Technical Information

All product dimensions are nominal.

Installation:	Above-counter, Wall-mount
Bowl area (Only)	Length: 22" (559 mm) Width: 17-1/2" (445 mm) Water depth: 1-3/4" (44 mm)
Number of deck holes:	1
Faucet hole(s):	1-3/8" (35 mm)
Template:	1014137-7, required, included

Notes

Install this product according to the installation instructions.

Product does not have an overflow.

NOTICE: Countertop manufacturer or cutter must use the cut-out template provided with the product, or a current one provided by Kohler Co. (call 1-800-4-KOHLER). Kohler Co. is not responsible for cutout errors when the incorrect cut-out template is used.

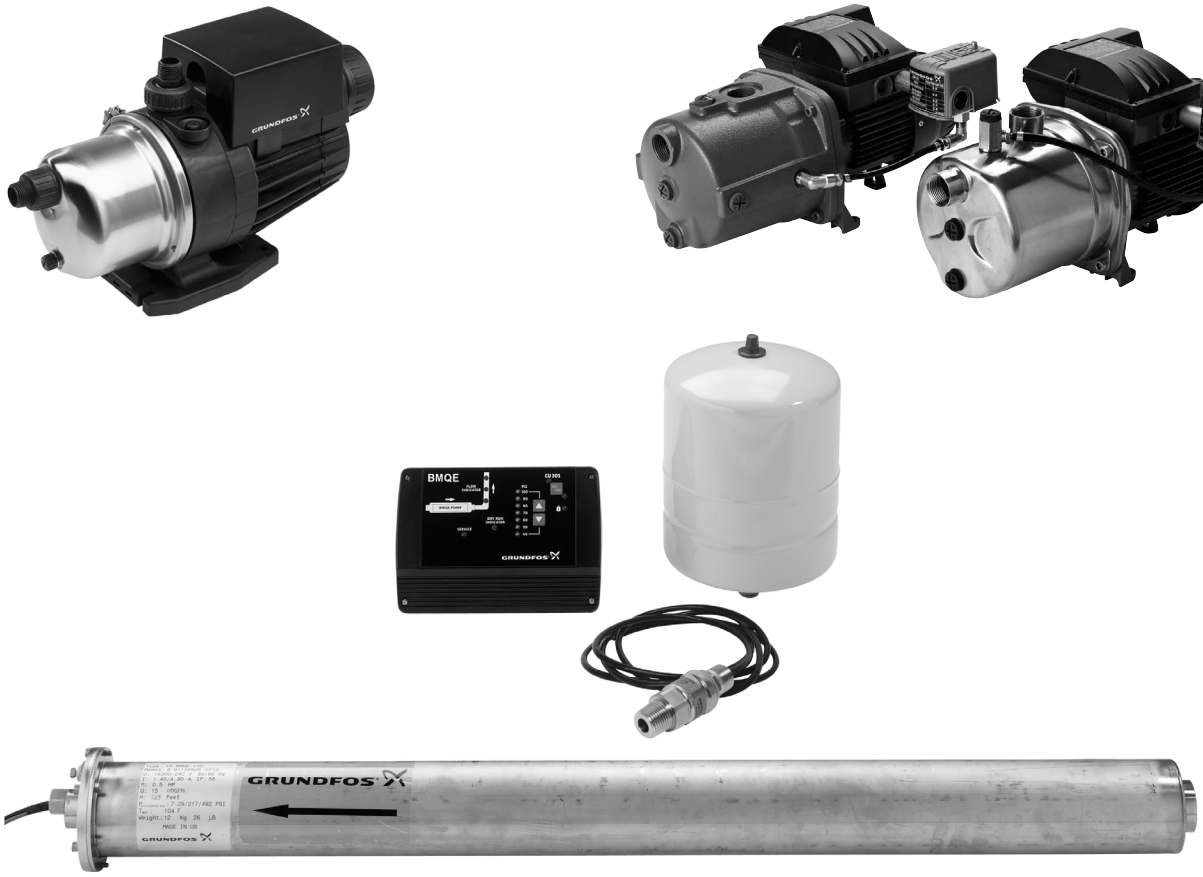
ADA, OBC, CSA B651 compliant when installed to the specific requirements of these regulations.

GRUNDFOS **PRODUCT GUIDE**

Domestic water supply

BMQE, MQ, Jets

60 Hz



BE > THINK > INNOVATE >

GRUNDFOS

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1. Grundfos DWS family

The Grundfos Domestic Water Supply (DWS) family of pumps includes:

- BMQE Constant Pressure System
- MQ Flow Based Pressure System
- Jet pumps.

This product guide offers information about each of these product lines.

DWS applications

The Grundfos DWS family includes pumps to fit most applications including:

- Constant pressure systems (BMQE)
- flow-based pressure boosting (MQ)
- rain water harvesting (MQ)
- pressure-switch-based boosting (Jet)
- suction lift (Jet).

Application	Product		
	BMQE	MQ	Jet
Constant pressure system	●	-	-
Flow-based pressure boosting	-	●	-
Rain water harvesting	-	●	-
Suction lift	-	●	●
Pressure-switch-based boosting	-	-	●

Constant pressure systems

In constant water pressure systems, only the required discharge pressure needs setting (fig. 1).

Cut-in and cut-out pressures do not play a role in this system.

Discharge pressure can be set from 40 to 100 psi, according to individual needs and piping system limitations.

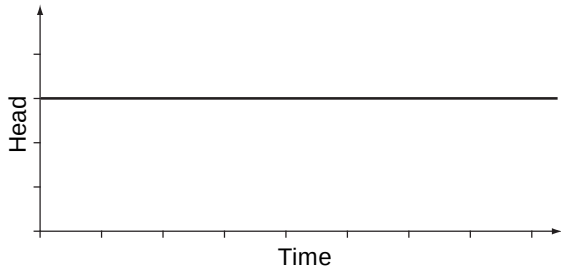


Fig. 1 In a constant pressure system, pressure does not vary in relationship to consumption

Flow-based pressure boosting

With flow-based pressure boosting, the pump starts automatically when water is consumed and stops automatically when the consumption ceases. This is accomplished via a flow switch connected to a printed circuit board (PCB).

The pump will produce pressure in relation to the flow rate with any incoming pressure cumulative to the total discharge pressure (fig. 2).

Fig. 2 Flow-based pressure boosting

Rain water harvesting

Rain water harvesting is a way to store rain water for future use — for example, watering a garden. Rain water is collected from the roof of a home and collected into a storage container. Pull a suction lift using a non-collapsible suction line from the storage container or connect the inlet of the pump to a spigot at the bottom of the collection barrel for flooded suction.

Suction lift

High pressure water from the drive pipe passes through the venturi and pulls water from the well into the ejector, then pushes it up to the pump. This makes it possible to push water up to the pump from depths greater than 25 feet or to boost the output from a shallow well pump to higher pressures.

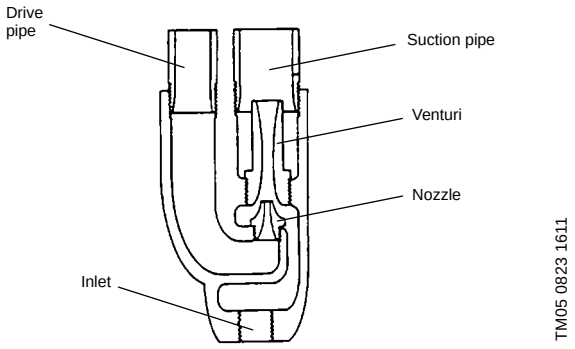


Fig. 3 Suction lift pressure boosting

Pressure-switch-based boosting

Pressure switches are used to control pump operation. These switches have a cut-in pressure and a cut-out pressure to turn the pump on and off respectively.

DWS product selection

Matching consumption and pump capacity

Selecting the right pump is a matter of matching water consumption with pump capacity. For best performance, avoid installing an undersized or oversized pump. Consumption may vary greatly depending on housing standards and lifestyle. For example, lawn sprinkler systems in the summer can increase consumption.

Pump selection

Pump selection is based on the water demand and required system head.

The water demand depends on the number of consumers connected to the system.

Head can either be expressed in feet or psi. Head refers to static head, pressure head, and friction head.

For assistance with pump selection, refer to the WebCAPS product selection program; a link to CAPS may be found on the Grundfos website.

Piping

In any water supply system, the sizing and choice of materials of the pipework has an impact on the choice of pumps and on the cost. Piping takes into account the system head as referred to in Pump Selection. Static head is the distance from the ground water level to the uppermost tap. Pressure head is the system pressure the user wants to achieve.

In most residential application this pressure is approximately 60 psi. Friction head depends on the pipe size, type and length.

When calculating friction loss remember to allow for deterioration in the piping schematic, since all water pipes will eventually become coated with rust, lime deposits, etc.

Flow velocity in the piping must be kept low as noise can occur due to turbulence in elbows and valves or from water hammer.

Fitting a pressure relief valve in the discharge piping is recommended to protect the piping from over-pressure due to system malfunction.

Pressure tanks

A pressure tank should be installed in order to minimize the number of pump starts and stops in the water supply system, and to reduce problems with water hammer in the pipework.

Tanks are included with the BMQE Constant Pressure System and the MQ. The BMQE system has an external tank. The MQ has an internal tank.

Jet pumps, however, may require the addition of a tank depending upon the application.

Pressure switches

Pressure switches are used to control pump operation. These switches have a cut-in pressure and a cut-out pressure to turn the pump on and off.

The BMQE Constant Pressure System includes a pressure transducer for constant pressure. The MQ has a built-in pressure switch. Jet pumps have an attached pressure switch.

Valves

Check valves

A check valve is a mechanical device which normally allows fluid to flow through in only one direction.

The BMQE Constant Pressure System and the MQ have built-in check valves. For suction lift applications with the MQ, a check valve (provided) is required at the inlet.

Foot Valves

A foot valve is required when pulling a suction lift (shallow or deep well) with a Jet pump. This valve is installed at the end of the suction pipe to prevent back flow. The MQ will also benefit from the use of a foot valve with suction lift applications.

Shut off valves

Shut off valves in the piping system make it possible to drain only the part of the system that needs attention or repair.

Flow control valves

Flow control valves are used in applications where a set flow (gpm) is required; for example, a shower head or an irrigation system.

Pressure reducing valves

Pressure reducing valves are used in applications where the incoming water pressure exceeds the maximum inlet pressure of the pump as is the case with the MQ and city water pressure. The pressure reducing valve (PRV) is used inline after the city water tap and before the pump to ensure a set pressure.

Pressure relief valves

This valve is a spring controlled device that can be adjusted to meet the needs of the pumping system. Pressure relief valves are used in applications where high pressure can result in damage to accessories; for example, tanks with maximum pressure ratings.

2. BMQE

Product introduction

The BMQE Constant Pressure System maintains constant water pressure under varying demand, even with multiple taps running. The BMQE is a complete pressure boosting system that includes:

- pump
- controller
- tank
- mounting brackets
- pressure sensor.

TM04 9387 4010

Fig. 4 Grundfos BMQE Constant Pressure System

High-quality construction and rugged design ensure low maintenance and trouble-free operation. The system is based on the time-tested technology of the Grundfos SQE constant pressure system (for submersible applications).

The pump's MSE 3 motor incorporates solid state electronics and permanent magnet motors which account for high motor efficiencies.

Variable speed is offered though frequency control via the CU 301 remote status box. The system can be set to operate at any duty point in the range between minimum and maximum performance of the pump.

The BMQE has built in safeties in the solid state electronics. The small footprint of the pump allows the system to be positioned either vertically or horizontally depending upon the application. Refer to the BMQE (previously EZ Boost) pages on our web site at www.grundfos.us.

Applications

The BMQE Constant Pressure System is suitable for:

- condos
- restaurants
- homes
- irrigation
- offices
- grocery applications
- many other boosting applications.

Pumped liquids

The BMQE Constant Pressure System is suitable for pumping water or other clean, thin, non-aggressive liquids not containing solid particles or fibers.

Features and benefits

With the Grundfos BMQE Constant Pressure System, constant pressure is as simple as a touch of a button on the accompanying CU 301 control unit.

Features

- Quick and easy installation
- ready-to-use system requires minimal space
- high user convenience (constant pressure regardless of consumption)
- easily adjustable pressure level with push button control
- continuous control and monitoring of pump operation
- integrated dry-running protection
- integrated overload protection
- integrated protection against over-voltage and under-voltage
- soft start feature.

Benefits

The BMQE Constant Pressure System automatically balances water surges and equalizes flow and pressure according to consumption.

In other words, the system maintains a constant water pressure despite varying consumption.

The pressure is registered by means of a pressure sensor and transmitted to the controller. The controller adjusts the BMQE pump performance accordingly.

How the system functions

When a tap is opened, the pressure in the tank will start to drop. The system maintains a constant pressure within the maximum pump performance despite varying water consumption.

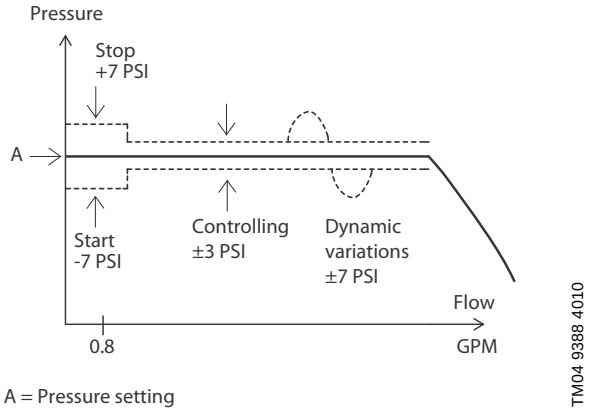
The pressure is registered by means of the pressure sensor, which transmits a signal to the controller. The controller adjusts the pump performance accordingly to maintain constant pressure by changing the pump speed.

At low flow the pressure will drop slowly. When the pressure in the tank is 7 psi below the setpoint, the pump will start. When the pressure is 7 psi above the setpoint, the pump will stop.

Even though the BMQE controller is controlling the pressure within + / - 3 psi, larger pressure variations may occur in the system.

If the consumption is suddenly changed — for example, if a tap is opened — the water must start flowing before the pressure can be made constant again. Such dynamic variations depend on the pipe work, but typically they will lie between 7 and 14 psi.

If the desired consumption is higher than the quantity the pump is able to deliver at the desired pressure, the pressure follows the pump curve as illustrated in the far right of fig. 5.



A = Pressure setting

Fig. 5 System function

At large flow rates, the pressure will drop quickly and the pump will start immediately and maintain constant pressure. When the system is running, the controller makes small adjustments to the pressure to detect whether there is consumption. If there is none, the pump will simply refill the tank and stop after a few seconds.

BMQE pump

The pumps used for BMQE system are modified SQE submersible pumps. The BMQE pump is an SQE pump with an MSE 3 motor. The pump and motor are centered in the 4 inch stainless steel sleeve.

BMQE pumps are suitable for both continuous and intermittent operation for a variety of pressure boosting applications.

BMQE controller

The BMQE controller is a control and communication unit specifically developed for the BMQE booster pumps in constant pressure applications.

The controller provides:

- Full control of the BMQE pumps
- Two-way communication with the BMQE pumps
- Possibility of adjusting the pressure
- Alarm indication (LED) when service is needed
- The possibility of starting, stopping and resetting the pump simply by means of a push-button.

The controller communicates with the pump via power line communication, meaning that no extra cables are required between the controller and the BMQE pump.

The controller incorporates external signal input for pressure sensor and a pump status relay for use with devices dependant on pump status.

BMQE motor

The MSE 3 motors are based on state-of-the-art technology within permanent magnets (PM motor), which accounts for the high motor efficiencies. In addition, the motors have a built-in electronic unit with a frequency converter for variable frequency and soft starting.

The MSE 3 motors features high efficiency within a wide load range. The high and flat efficiency curve of the PM motor enables the same motor to cover a wide power range as opposed to conventional AC motors. For BMQE pumps, this means fewer motor variants.

Diaphragm tank

The pre-charge pressure of the diaphragm tank must be set to 70 % of the pressure setting in order to use the tank to the limit of its capacity.

Use the values in the following table. Pre-charge pressure is measured with 0 psi in the pipeline.

Setting (psi)	Pre-charge pressure (psi)
40	28
50	35
60	42
70	49
80	56
90	63
100	70

Only a 2-gallon tank (Grundfos part number 91121984) is recommended in the BMQE system. Use of a different size tank will result in pressure fluctations.

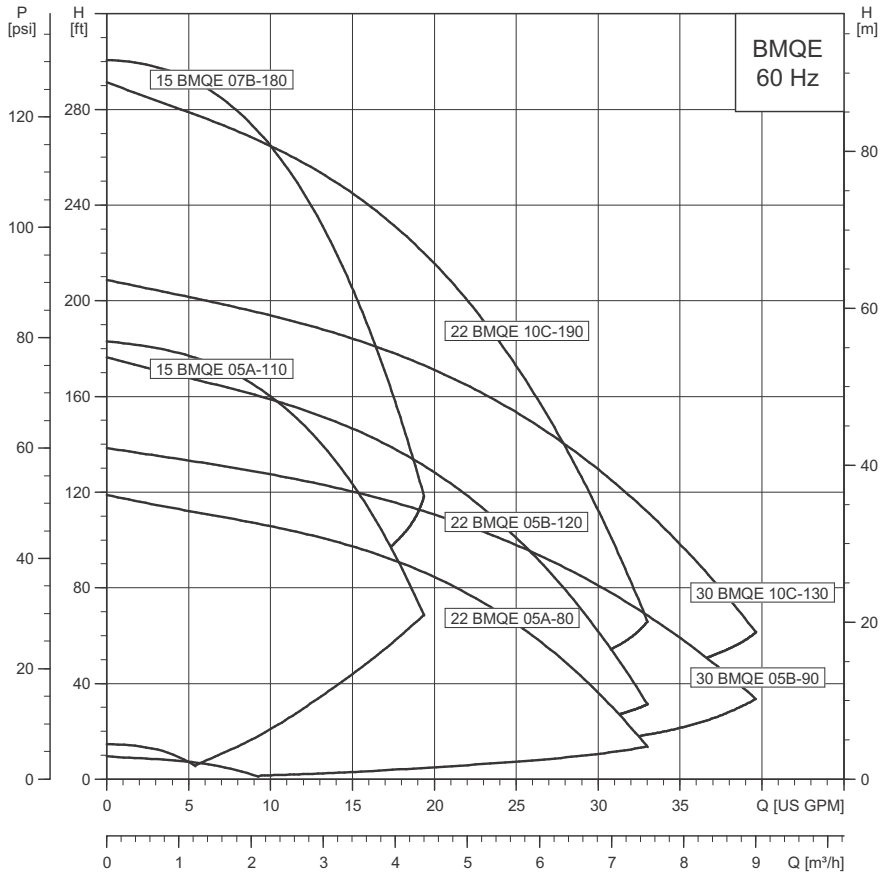
Identification

Type key

Example	22	BMQ	E	05B	120
Rated flow [US gpm]					
BMQE pump					
Electronically controlled pump via BMQE controller					
Motor [Hp]					
Head at rated flow [ft]					

Product overview

Performance range, BMQE 60 Hz

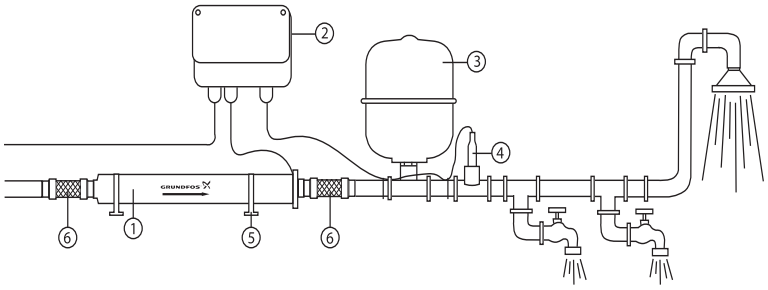


TM05 0676 1411

Product range, BMQE

Range	BMQE 15	BMQE 22	BMQE 30
Nominal flow rate [US gpm (m^3h)]	15 (3.4)	22 (5.0)	30 (6.8)
Liquid temperature range [°F (°C)]	+32 to +95°F (0 to +35°C)		
Maximum inlet pressure [psi (bar)]	217 (15)		
Minimum inlet pressure [psi (bar)]	8 (0.5)		
Maximum working pressure [psi (bar)]	347 (23)		
Maximum efficiency [%]	57	62	60
Flow range [US gpm (m^3h)]	0 to 19 (4.3)	0 to 33 (7.5)	0 to 39 (8.8)
Maximum pump pressure [ft (m)/psi)]	300 (91.4)/130	290(88.4)/125	208(63.4)/90
Pipe connection	1.25" NPT inlet / 1" NPT discharge		

System diagram



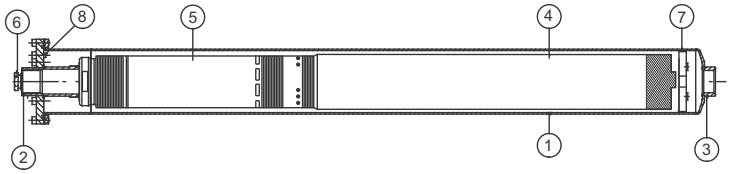
TM04 9415 4110

Pos.	Description
1	BMQE pump
2	BMQE controller
3	Diaphragm tank*
4	Pressure sensor
5	Mounting brackets
6	Flex connector**

* Recommended size:
2 U.S. gal (8 liter) / 130 psi
** Not sold by Grundfos

Construction

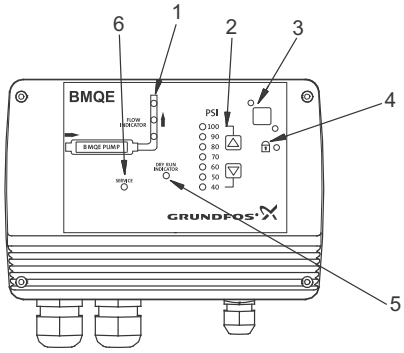
Components, BMQE



TM05 0678 1411

Pos.	Description
1	Sleeve
2	Discharge connection
3	Suction connection
4	MSE 3 motor
5	SQE pump
6	Cable entry
7	Centering device
8	Air vent screw

Components, BMQE controller



TM05 0719 1511

Pos.	Description
1	Flow indicator
2	System pressure setting
3	System ON/OFF
4	Button lock indicator
5	Dry-running indicator
6	Service needed in case of:
	• No contact to pump
	• Over voltage
	• Under voltage
	• Speed reduction
	• Over temperature
	• Overload
	• Sensor defective

Material specification

Sleeve			
Pos.	**Description**	**Material**	**AISI**
90	Sleeve	Stainless steel	316
91	Flange	Stainless steel	304
92	Cable entry	Stainless steel/FKM	304
93	Air vent screw	Stainless steel	304
94	O-ring	FKM	

Pump			
Pos.	**Description**	**Material**	**AISI**
1	Valve casing	Polyamide	304
1a	Discharge chamber	Stainless steel	
1d	O-ring	NBR rubber	
2	Valve cup	Polyamide	
3	Valve seat	NBR rubber	
4a	Empty chamber	Polyamide	
6	Top bearing	NBR rubber	
7	Neck ring	TPU / PBT	
7a	Lock ring	Stainless spring steel	310
7b	Neck ring retainer	Polyamide	
9b	Chamber top	Polyamide	
9c	Chamber bottom	Polyamide	
13	Impeller with tungsten carbide bearing	Polyamide	
14	Suction interconnector	Polyamide	
14a	Ring	Stainless steel	304
16	Shaft with coupling	Stainless steel	304
		Sintered steel	
18	Cable guard	Stainless steel	304
18a 18b	Screws for cable guard	Stainless steel	316
30	Cone for pressure equalization	Polyamide	
32	Guide vanes	Polyamide	
39	Spring	Stainless spring steel	316LN
55	Pump sleeve	Stainless steel	304
64	Priming screw	Polyamide	
70	Valve guide	Polyamide	
86	Lip seal ring	NBR rubber	
87	Cone for pressure equalization complete	Polyamide / NBR rubber	

Motor			
Pos.	**Description**	**Material**	**AISI**
201	Stator	Stainless steel	304
202	Rotor	Stainless steel	304
202a	Stop ring	PP	
202b	Filter	Polyester	
203	Thrust bearing	Carbon	
205	Radial bearing	Ceramic	
220	Motor cable with plug	EPR	
222a	Filling plug	MS 3: NBR	
		MSE 3: FKM	
224	O-ring	FKM	
225	Top cover	PPS	
232	Shaft seal	MS 3: NBR	
		MSE 3: FKM	
	Motor liquid	SML-2	

Key

NBR = Nitrile Butadiene Rubber

TPU = Thermoplastic Polyurethanes

PBT = Polybutylene Terephthalate

PP = Polypropylene

EPR = Ethylene Propylene Rubber

FKM = Viton

PPS = Polyphenylene Sulphide

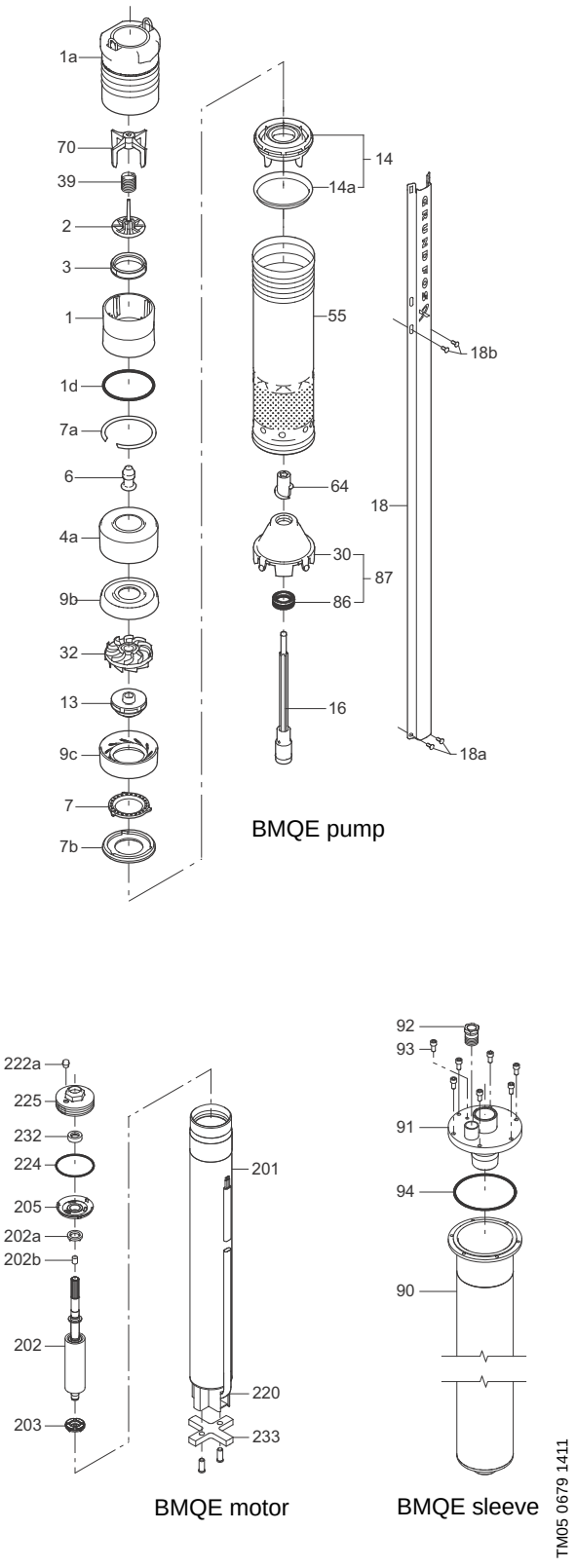


Fig. 6 BMQE exploded view

Operating conditions

Flow:	Max. 39 US gpm (8.9 m3/h)
Head:	Max. 300 ft (91.4 m)
Liquid temperature:	Max. 95°F (35°C)
Operating pressure:	Max. 347 psi (23 bar)
Inlet pressure:	Min. 8 psi (0.55 bar)
Sound-pressure level:	The sound pressure level of the BMQE is lower than 74 db[A] at a distance of 3 ft (1 m).

Installation

Location of installation

The sound pressure level of the BMQE is <74 db[A] at a distance of 3 ft (1 m). It is recommended by Grundfos that the pump be installed with sound and vibration dampening equipment (flexible piping adapters and anti-vibration mounting — not sold by Grundfos).

Like most mechanical equipment, this system can create noises and vibrations. Grundfos recommends that the BMQE pump should not be mounted in or adjacent to living quarters.

Positioning the pump

The GRUNDFOS BMQE pump is supplied with a built-in non-return valve. An arrow on the BMQE sleeve shows the direction of liquid flow through the pump (fig. 7).

The BMQE is suitable for both vertical and horizontal installation; however, the discharge port should never fall below the horizontal plane. See fig. 8.

The BMQE must be installed with the air relief vent in the 12 o'clock position when installed horizontally and when installed in the vertical position, the air vent must be at the top of the unit.

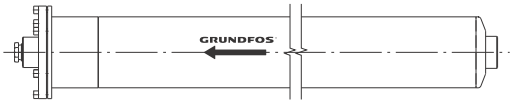


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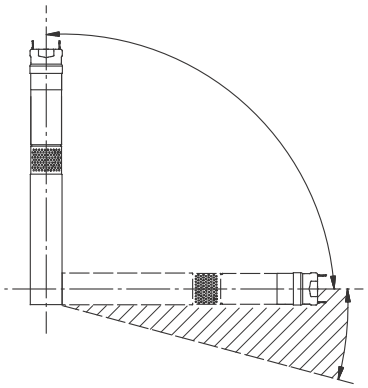
Fig. 7 Arrow showing direction of liquid flow through pump



TM04 1375

Fig. 8 Installation positions

Controller installation

All BMQE pumps can be connected to BMQE controllers. Each BMQE pump must be connected to its own BMQE controller.

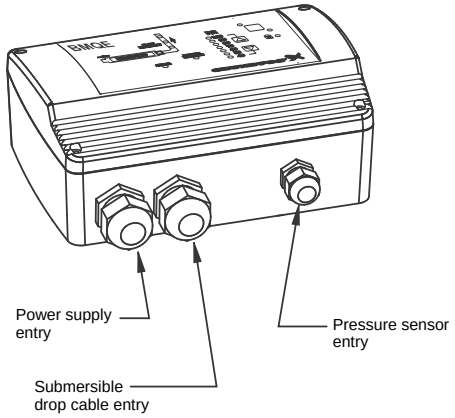


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Fig. 9 BMQE controller entry ports

Connection of motor

The BMQE incorporates a starter device and can therefore be connected directly to the main power supply. The BMQE incorporates thermal overload protection and requires no additional motor protection.

Cable installation

In situations where multiple BMQE power cables are run parallel in wiring trays or conduit and less than 12 inches apart, the possibility for undesired communication between units exists. When this occurs, intermittent or continuous NO CONTACT is typically seen. Other unexpected errors may also be seen.

The chart shows single-phase 60 Hz maximum cable length motor service to entrance. The maximum cable length with one BMQE controller is 650 ft (198.1 m); the maximum wire size is 10 AWG.

Maximum cable length (one controller)				
Motor rating		Copper wire size (AWG)		
Volts	Hp	14	12	10
		Maximum cable length [ft (m)]		
115	0.50	100 (30.5)	160 (48.8)	250 (76.2)
230	0.50	400 (121.9)	650 (198.1)	650 (198.1)
	0.75	300 (91.4)	480 (146.3)	650 (198.1)
	1.0	250 (76.2)	400 (121.9)	630 (192)

BMQE pumps connected in parallel

When connecting BMQE pumps in parallel (fig. 10) a separate BMQE controller must be used on each BMQE pump.

Set the pressure on one BMQE 10 psi lower than the other.

For BMQE pumps connected in parallel, mount one above the other; it is recommended to connect the pipes as shown in fig. 10. This layout ensures that the BMQE pumps are filled with water before starting.

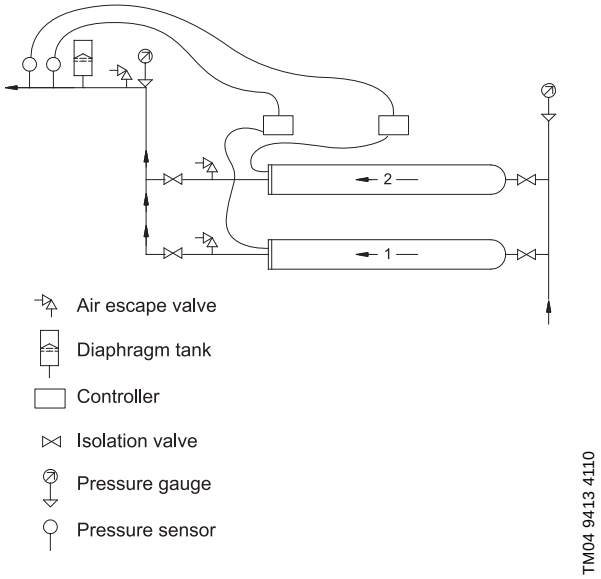


Fig. 10 Booster unit with two BMQE pumps connected in parallel, mounted one above the other

Additional considerations when connecting in parallel:

- All BMQE modules are supplied with a non-return valve.
- BMQE modules connected in parallel may also be installed vertically.
- As venting problems may arise in such installations, it is advisable to install suitable air vent devices.
- The BMQE should be positioned with the discharge and air vent at the top when installed vertically.
- When the maximum flow for BMQE pumps in parallel will exceed 35 gpm, a 4-gallon or two 2-gallon diaphragm tank(s) should be used.

Pressure sensor installation

The BMQE controller keeps the pressure constant in the place where the pressure sensor is positioned.

The maximum shielded cable length for the sensor must not exceed 1600 ft (487.7 m).

Generator operation

Power may be supplied to BMQE pumps by an adequately sized generator. The generator must be sized 50 % above the pumps P1 (input power) values.

Motor Hp	Minimum generator size [watts]	Recommended generator output [watts]
0.33 to 0.50 A	1100	1500
0.50 to 0.75 B	1700	2300
1.0 to 1.5 B	2000	3500

Quick selection guide

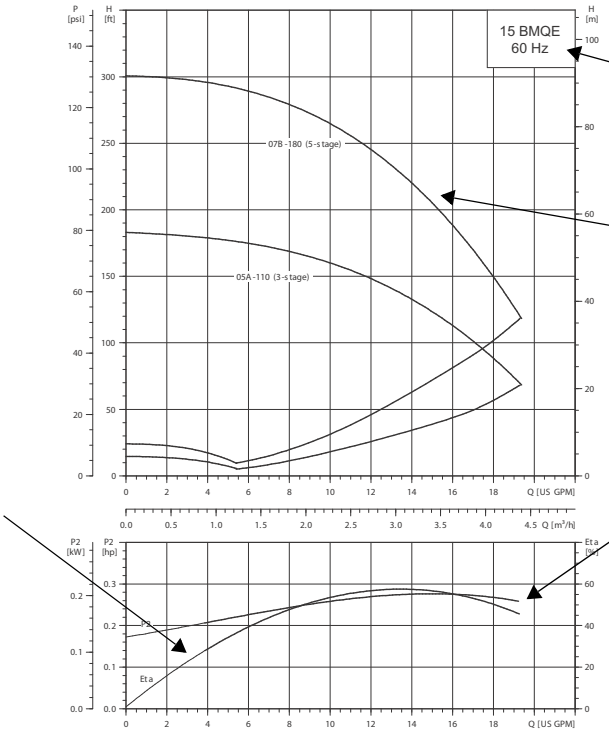
Example:

- The maximum demand is 15 gpm (3.4 m^3/h).
- The pressure required is 70 psi (4.8 bar) system pressure at the taps in the building.
- The normal minimum inlet pressure (e.g. city pressure) is 20 psi (1.4 bar)
- The additional boost required is 50 psi (3.5 bar) at 15 gpm (3.4 m^3/h).
- Select a 15 BMQE 05A-110.

Additional (boost) pressure required [psi]	Flow required [gpm]							
	5	10	15	20	25	30	35	39
90								
80		15 BMQE 07B-180						
70					22 BMQE 10C-190			
60								
50								
40		15 BMQE 05A-110		22 BMQE 05B-120			30 BMQE 10C-130	
30								
20				22 BMQE 05A-80		30 BMQE 05B-90		
10								

Curve charts and technical data

How to read the curve charts



Pump type and frequency.

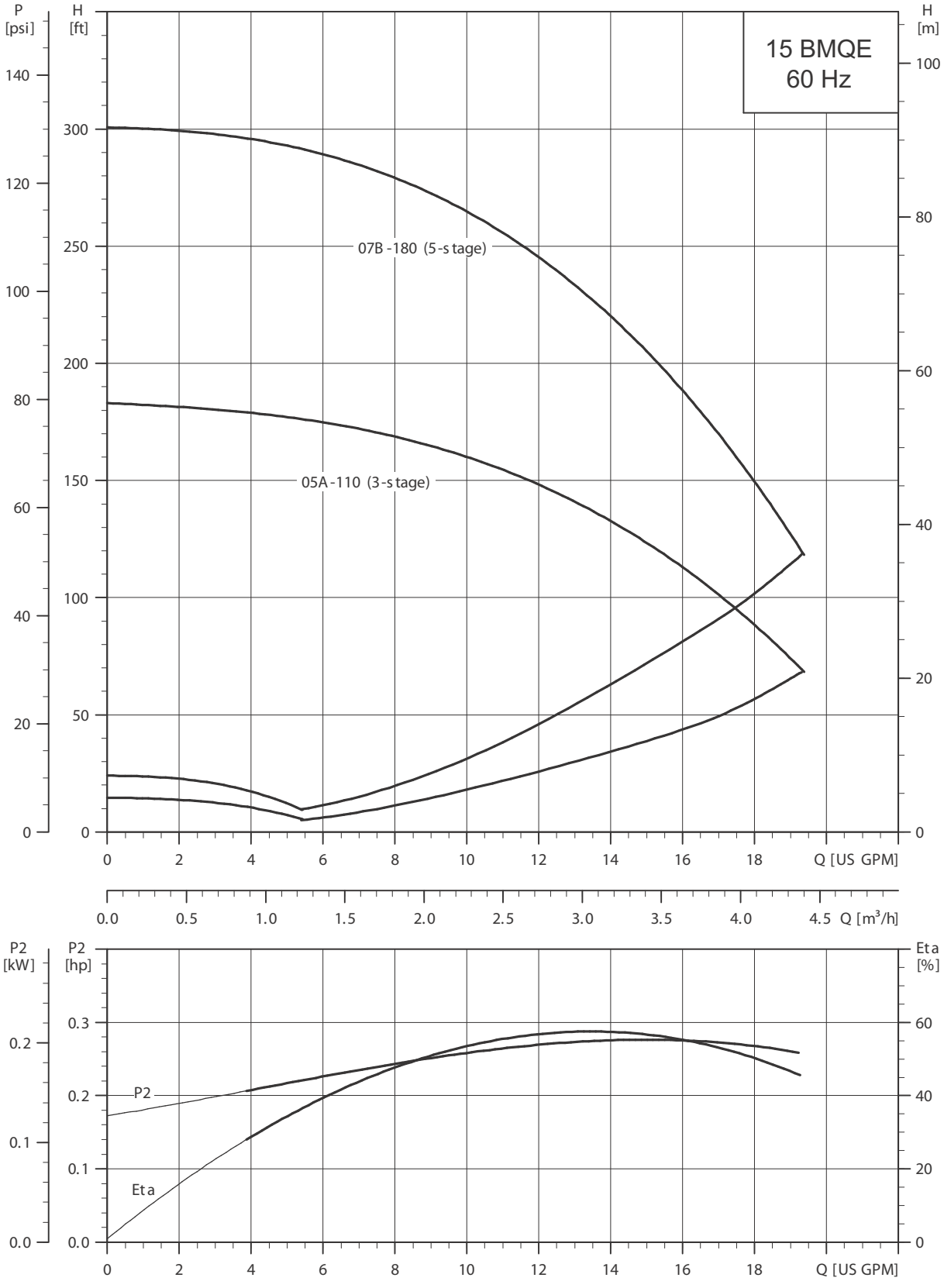
QH curve for the individual pump.

The power curves indicate pump input power **per stage**.

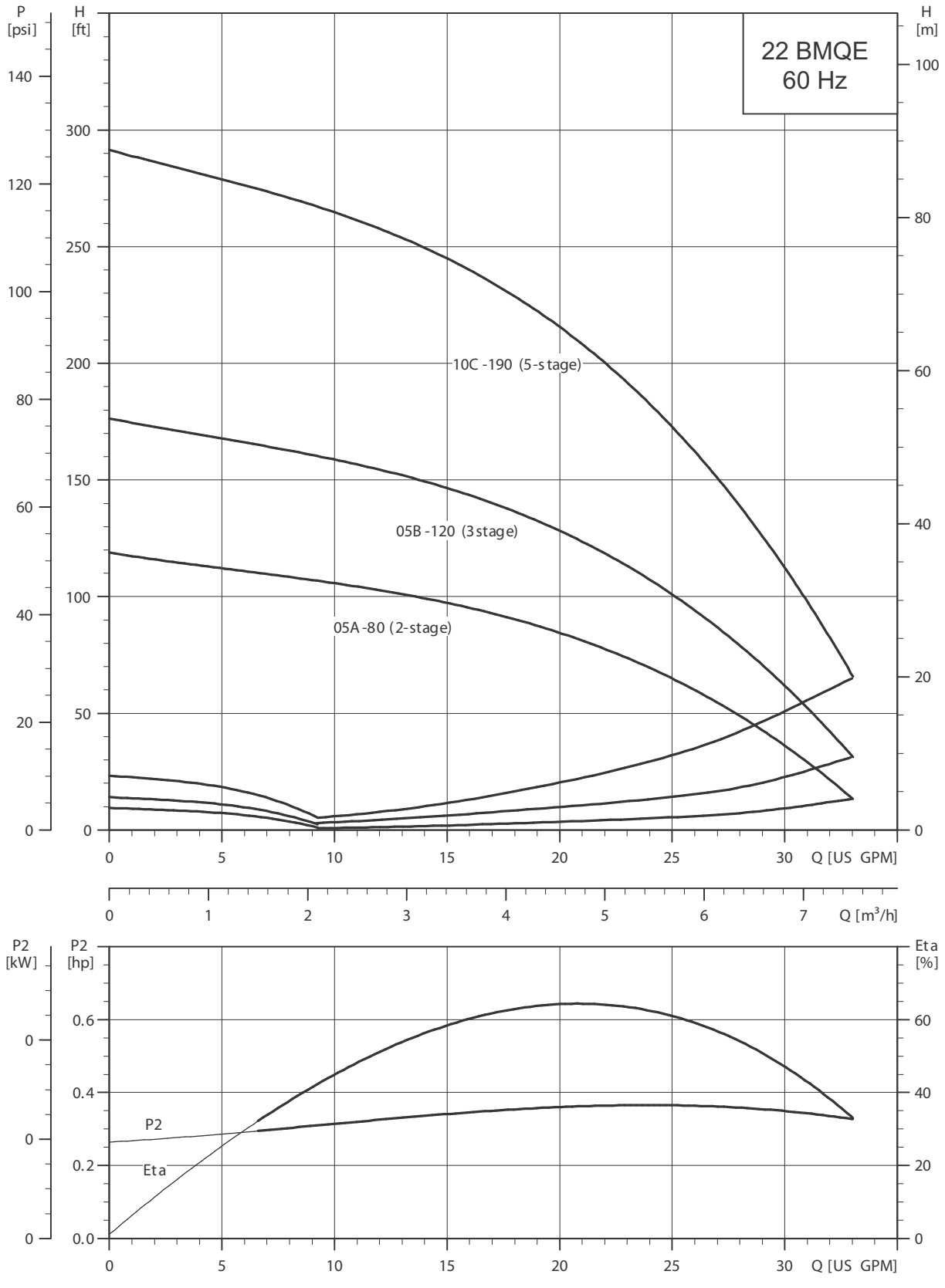
The efficiency curve shows the efficiency of the pump. The efficiency curve is an average curve of all the pump types shown in the chart.

TM04 4551 1609

15 BMQE 60 Hz

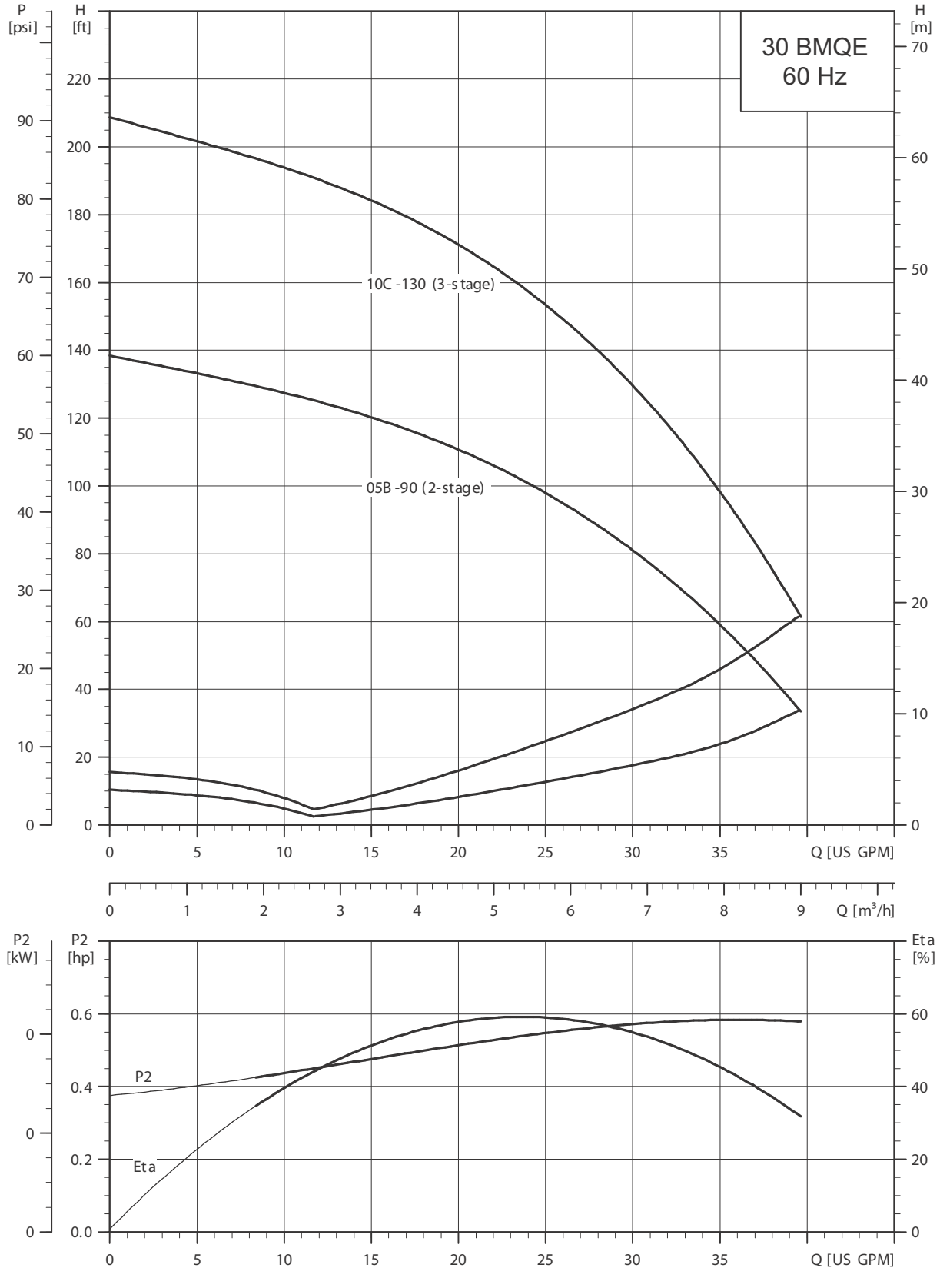

15 BMQE
60 Hz
P [psi]
H [ft]
H [m]
07B-180 (5-stage)
05A-110 (3-stage)
Q [US GPM]
Q [m³/h]
P2 [kW]
P2 [hp]
Eta [%]
P2
Eta
Q [US GPM]
TM05 0772 1511

22 BMQE 60 Hz



TM05 0773 1511

30 BMQE 60 Hz

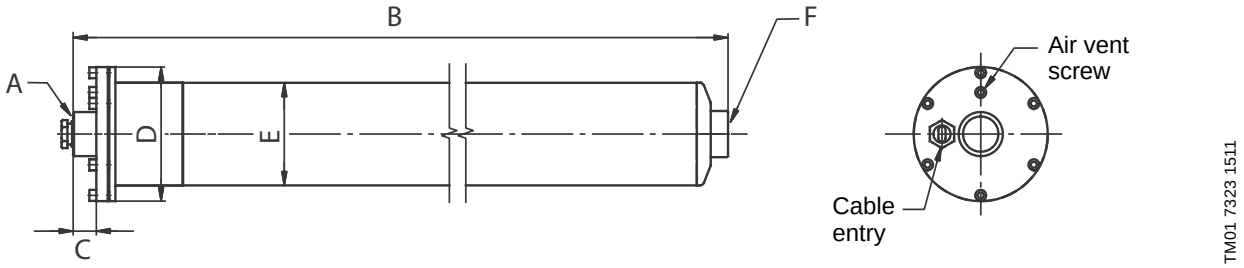


TM05 0774 1511

Weights and electrical data

Model	Product number	Max. motor output [hp]	Rated voltage [V]	Rated current [A]	Locked rotor current [A]	Shipping weight [lb (kg)]	Shipping volume [ft^3 (m^3)]
15 BMQE 05A-110	91128524	0.845	110-115	9.2	11.1	26 (11.8)	
22 BMQE 05A-80	91128527	0.845	110-115	7.8	11.1	26 (11.8)	
15 BMQE 05A-110	91128525	0.845	200-240	4.6	5.0	26 (11.8)	
15 BMQE 07B-180	91128526	1.408	200-240	7.1	8.0	29 (13.2)	
22 BMQE 05A-80	91128528	0.845	200-240	3.9	5.0	26 (11.8)	0.9 (0.025)
22 BMQE 05B-120	91128529	1.408	200-240	5.6	8.0	29 (13.2)	
22 BMQE 10C-190	91128530	2.320	200-240	9.9	11.1	31 (14.1)	
30 BMQE 05B-90	91128531	1.408	200-240	6.0	8.0	31 (14.1)	
30 BMQE 10C-130	91128533	2.320	200-240	9.5	11.1	31 (14.1)	

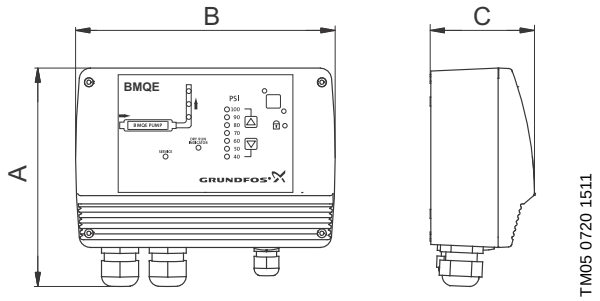
Dimensional sketch, BMQE pump



TM01 7323 1511

Dimensions					
A	B [in (mm)]	C [in (mm)]	D [in (mm)]	E [in (mm)]	F
1.0" NPT	43.3 (1100)	0.8 (20.5)	Ø 4.6 (116)	Ø 3.5 (88.9)	1.25" NPT

Dimensional sketch, BMQE controller



TM05 0720 1511

Dimensions [in (mm)]		
A	B	C
7.68 (195)	9.13 (232)	4.49 (114)

Technical data, BMQE pump

Main power supply to pump	1 x 200-240 V –10 % / +6 %, 60 Hz 1 x 110-115 V –10 % / +6 %, 60 Hz
Starting	Soft starting. The motor starting current is equal to the highest value stated on the BMQE nameplate.
Stopping	Soft stopping when stopped by the BMQE controller
Run-up time	Maximum: 2 seconds. No limitation to the number of starts/stops per hour.
Motor protection	Built into the pump. Protection against: • Dry running • Over voltage and under voltage 230 V cuts out at < 150 V and > 280 V 115 V cuts out at < 75 V and > 150 V • Overload • Over temperature
Sound pressure level	The sound pressure level is < 74 db[A] at a distance of 3 feet (1 meter). It is recommended by Grundfos that the pump be installed with sound and vibration dampening equipment such as flexible piping adapters and anti-vibration mounting.* The pump should not be mounted in or adjacent to living quarters. The pump can also be wrapped with sound proofing insulation to reduce noise.*
Reset function	BMQE pumps can be reset via BMQE controller
Power factor	PF = 1.
Operation via generator	It is recommended that the generator output is equal to the motor input power P1 [kW] plus 50 %; min. P1 +10 %, however.
Pipe connection	1.25” NPT inlet / 1” NPT discharge
Strainer	Holes of the strainer: ø0.09” (2.3 mm)
Approvals	UL Listed, CE (SQE Pump with MSE 3 motor only)
Weight	31 lbs. (14.1 kg)
Voltage	1 x 100-240 V –10 % / +6 %, 60 Hz

* Not sold by Grundfos.

Technical data, BMQE controller

Voltage	1 x 100-240 V -10 % / +6 %, 60 Hz
Power consumption	5 W
Current consumption	Maximum 130 mA
Motor cable	• 2-wire w/ground, 12 AWG Teflon • B: Black (Line, Neutral) • G: Green (Ground)
Enclosure class	NEMA 3R (IP 55)
Ambient temperature	In operation: -22 to +122 °F (-30 to +50 °C). During storage: -22 to +140 °F (-30 to +60 °C)
Relative air humidity	95 %
Pump cable	Maximum length between BMQE controller and pump: 650 ft (198 m)
Back-up fuse	Maximum: 16 A
Load	Max. 100 mA
Approvals	UL Listed, CE

Accessories, BMQE

BMQE constant pressure kit

Description	Rating	Product number
BMQE controller and pressure sensor	Setting range 40 to 100 psi (2.8 to 6.9 bar)	91128636

BMQE controller

Description	Rating	Product number
BMQE controller	Setting range 40 to 100 psi (2.8 to 6.9 bar)	91121987

Sensor

Description	Rating	Product number
Pressure sensor for BMQE controller	0 to 120 psi (0 to 8.3 bar), 1/2" NPT	96437852

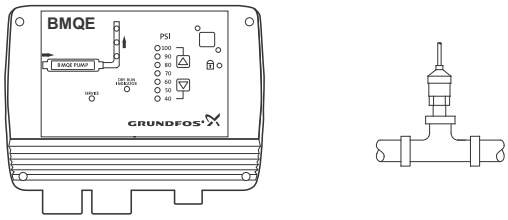
Diaphragm tank

Description	Weight [lbs (kg)]	Product number
Diaphragm tank, 2 gal.	5 (2.3)	91121984

Dimensions		
G connection	D [in (mm)]	H [in (mm)]
3/4" NPT	8 (203)	12.63 (321)

Specifications
Duty range
Pre-charge pressure: 40 psi (2.8 bar)
Max. operating pressure: 150 psi (10.3 bar)
Max. liquid temperature: 200 °F (93 °C)

Materials
Liner: Polypropylene
Connection: Lead-free brass
Tank: Stainless steel, AISI 304



TM05 0732 / TM05 0733

Fig. 11 BMQE constant pressure kit

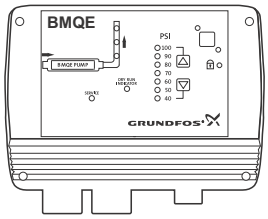


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Fig. 12 BMQE controller

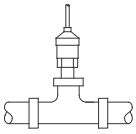

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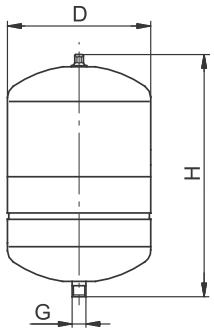
Fig. 13 Pressure sensor for BMQE controller



TM05 0734 1511

Fig. 14 Diaphragm tank

3. MQ

Product introduction

The Grundfos MQ is a compact pump and pressure boosting unit, purpose-designed for domestic water supply and other applications where a compact and reliable, easy-to-install pump is advantageous. The MQ is a self-priming multistage centrifugal pump; it self-primes from a well depth of down to 26 ft (8 m) within 5 minutes.

The MQ is a complete, all-in-one unit, incorporating pump, motor, diaphragm tank, pressure and flow sensor, controller and check valve.

TM01 9873

Fig. 15 Grundfos MQ

Applications

MQ is suitable for pressure boosting of potable water and rain water for:

- water pressure boosting
  (max. inlet pressure 40 psi (2.8 bar)
- water supply from wells
  (max. suction lift: 26 ft (8 m).

Examples of ideal applications for MQ are:

- private homes
- farms
- market gardens and other large gardens.

Pumped liquids

The MQ is suitable for pumping potable water, rain water, or other clean, thin, non-aggressive liquids not containing solid particles or fibers.

Features and benefits

Complete system

The MQ is a compact, "plug and pump" or all-in-one solution; there is no need for a separate pressure tank, pressure switch, electrical connections, fittings, or any other separate items. No maintenance of the pump is required. Two versions are available to choose from.

Installation

Installation of the MQ is simple and can be done in a matter of minutes, which means greatly reduced installation costs.

Outlet connnection can be angled up to 5° to fit existing pipework.

Simple operation

The MQ features a user-friendly control panel with ON/OFF button and indicator lights for indication of the operational state of the pump.

Compact design

Compact, horizontal design fits even where space is limited (outdoor applications require the use of the Protection Cover, sold separately); no space around the pump is required.

Self-priming

As it is self-priming, the MQ is able to pump water from a level below the pump. Provided it is filled with water, the pump is able to lift water from a depth of 26 ft (8 m) in less than 5 minutes. This facilitates installation and start-up of the pump and provides more reliable water supply in installations where there is a risk of dry running and leakages in suction hose or pipes.

Built-in protective functions

Built-in protective functions; if exposed to dry running, excessive temperature, or any overload condition the pump will stop automatically, thus preventing a motor burnout.

Automatic reset

In case of dry running or a similar alarm, the pump will stop. Restarting will be attempted every 30 minutes for a period of 24 hours. The reset function can be deactivated.

Low noise level

Superior hydraulics and internal cooling combined result in very quiet operation, which makes it suitable for many applications.

Pressure tank

The built-in pressure tank reduces the number of starts and stops in case of leakages in the pipe system, causing less wear on the pump.

How the MQ functions

The MQ pump has a small built-in pressure tank, sufficient to ensure that water is readily available from the tap. When water is required, the pump automatically starts. A non-return valve prevents backflow.

The controller ensures that the pump starts automatically when water is consumed and stops automatically when the consumption ceases. In addition, the controller protects the pump in case of faults.

Identification

Type key, MQ

Example	MQ	3	- 35	A	- B	- A	- BVBP

Pump range

Rated flow [m^3/h]

Max. head [m]

Code for pump version
A: standard

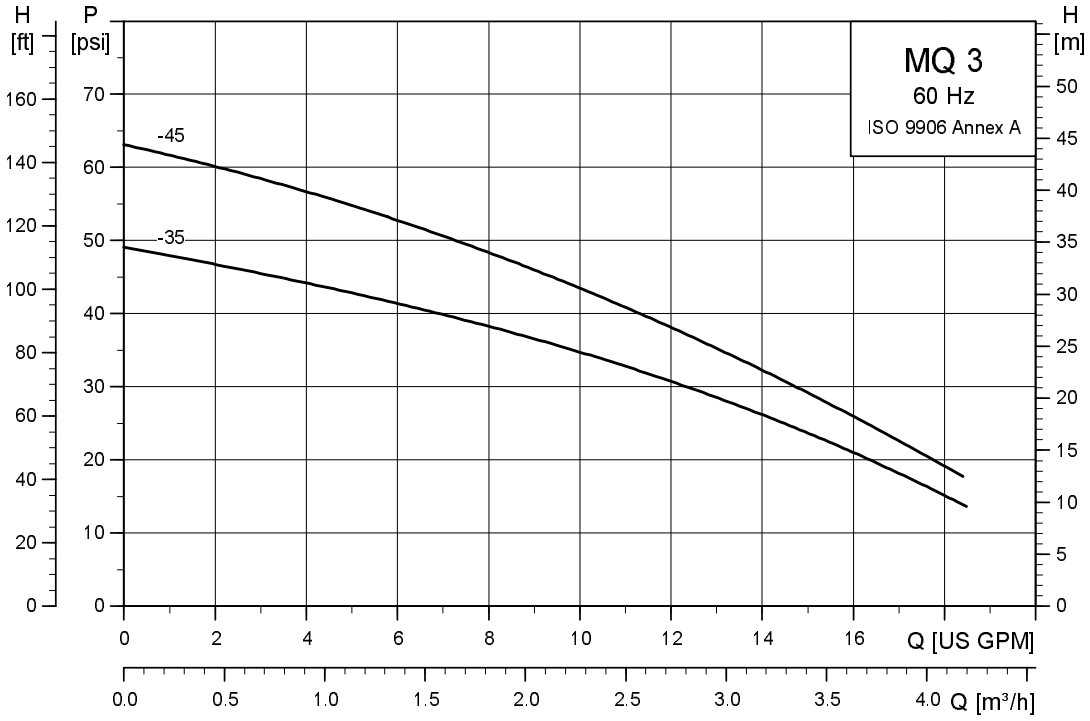
Code for pipework connection
B: External thread

Code for materials
A: Standard

Code for shaft seal
B: Bellow seal, rubber
V: Ceramic
B: Carbon, resin-impregnated
P: NBR (nitrile rubber)

Product overview

Performance range, MQ 60 Hz



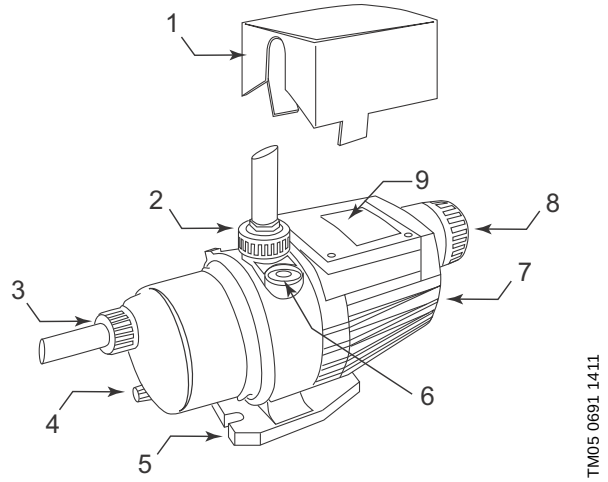
TM04 4141 0909

Product range, MQ

Range	MQ 3-35	MQ 3-45
Maximum flow rate [gpm (m^3h)]	19 (4.3)	
Maximum pressure [psi (bar)]	49 (3.4)	63 (4.3)
Maximum system pressure [psi (bar)]	109 (7.5)	
Maximum inlet pressure [psi (bar)]	40 (2.7)	
Maximum suction lift [ft (m)]	26 (8)	
Minimum ambient temperature [°F (°C)]	32 (0)	
Maximum ambient temperature [°F (°C)]	113 (45)	
Minimum liquid temperature [°F (°C)]	32 (0)	
Maximum liquid temperature [°F (°C)]	95 (35)	
Net weight [lbs (kg)]	29 (13.2)	
Sound pressure level [dB(A)]	< 60	
Tank volume [oz (ml)]	13.5 (399)	
Air pressure in tank [psi (bar)]	22 to 25 (1.5 to 1.7)	
Connections	1" NPT	
Priming and drain plugs	3/8" GAS	

Construction

Components, MQ

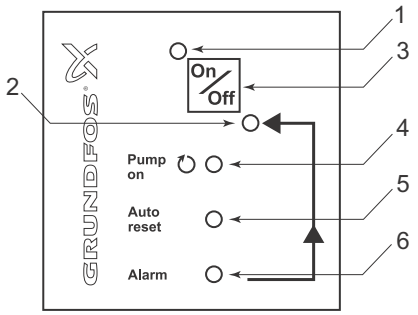


TM05 0691 1411

Fig. 16 MQ pump components

Pos.	Description
1	Protective cover (accessory)
2	Discharge port
3	Suction port
4	Drain plug
5	Baseplate
6	Priming plug
7	Shaft access port plug
8	Pressure tank
9	Control panel

MQ control panel



TM05 0769 1511

Fig. 17 MQ control panel

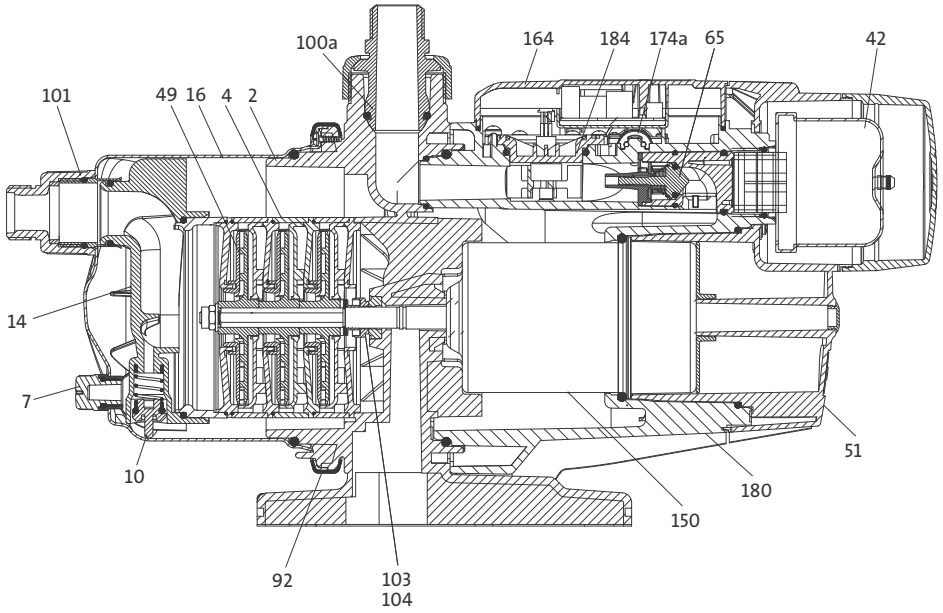
Pos.	Description	
1	Power indicator light	Indicates the pump is ready for operation (green).
2		Indicates the pump is on standby (red).
3	On/Off button	Pump is started and stopped by pressing On/Off button.
4	Pump ON (green)	Indicates pump is running.
5	Auto reset	Indicates auto reset function is active. After an alarm, restarting will be attempted every 30 minutes, for a period of 24 hours.
6	Alarm (red)	Indicates pump is in alarm state. Manual resetting is possible by pressing On/Off button.

Material specification, MQ

Pos.	Components	Material
2	Support flange	PP + 30 % glass fiber
4	Chamber	PPO + 20 % glass fiber
7	Drain and priming plug	PPO + 20 % glass fiber
10	Self-priming valve	PP + 30 % glass fiber
14	Self-priming part	PPO + 20 % glass fiber
16	Pump sleeve	Stainless steel, DIN W.-Nr. 1.4301, AISI 304
42	Tank cover	PP + 30 % glass fiber HB (f1)
49	Impeller	PPO + 20 % glass fiber-PTFE
51	Motor cover	PP + 30 % glass fiber HB (f1)
65	Non-return valve	POM + 25 % glass fiber
92	Clamp	Stainless steel, DIN W.-Nr 1.4301, AISI 304
100a	Discharge port	PPO + 20 % glass fiber

Pos.	Components	Material
101	Suction port	PPO + 20 % glass fiber
103 104	Shaft seal: Stationary and rotating part	Carbon/ceramics/NBR rubber
149	Insulation disc	PA 5VA (Polyammide)
150	Shaft	Stainless steel, DIN W.-Nr 1.4005, AISI 416
	Motor sleeve	Stainless steel, DIN W.-Nr 1.4301, AISI 304
164	Terminal box cover	PP + 30 % glass fiber 5VA (f1)
174a	Pressure switch	POM + 25 % glass fiber / SIL Rubber (Silicone Rubber)
	Pressure switch membrane	SIL Rubber - Silicone Rubber.
180	Motor body	PP + 30 % glass fiber 5VA (f1)
184	Flow sensor	POM + 25 % glass fiber
	O-rings	NBR-rubber

POM: Polyoximetylen
NR-rubber: Natural Rubber
PPO: Polyphenylene Oxides
PP: Polypropylene
NBR-rubber: Nitrile-Butadiene Rubber



TM01 9733 1411

Fig. 18 MQ exploded view

Operating conditions

System pressure:	Max. 109 psi (7.5 bar)
Inlet pressure:	Max. 40 psi (2.8 bar)
Suction lift:	Max. 26 ft (8 m)
Liquid temperature:	32°F to +95°F (0°C to +35°C)
Ambient temperature:	32°F to +113°F (0°C to +45°C)

Installation

Location

The pump is suitable for indoor and outdoor installation. It is resistant to sunlight. For outdoor installation, the pump must be fitted with a protective cover (accessory). Should the unlikely event of an internal leakage occur, pumped liquid will be drained out from the base and/or end cover instead of damaging the pump. Install the pump in such a way that no undesirable collateral damage can arise.

Positioning the pump

Mount the pump on the base plate with horizontal suction port and vertical discharge port.

The pump must be installed horizontally.

The maximum permissible inclination angle is +/- 18 °.

To prevent movement and vibrations, the pump and base plate can be secured to a solid foundation by means of the bolt holes in the base plate.

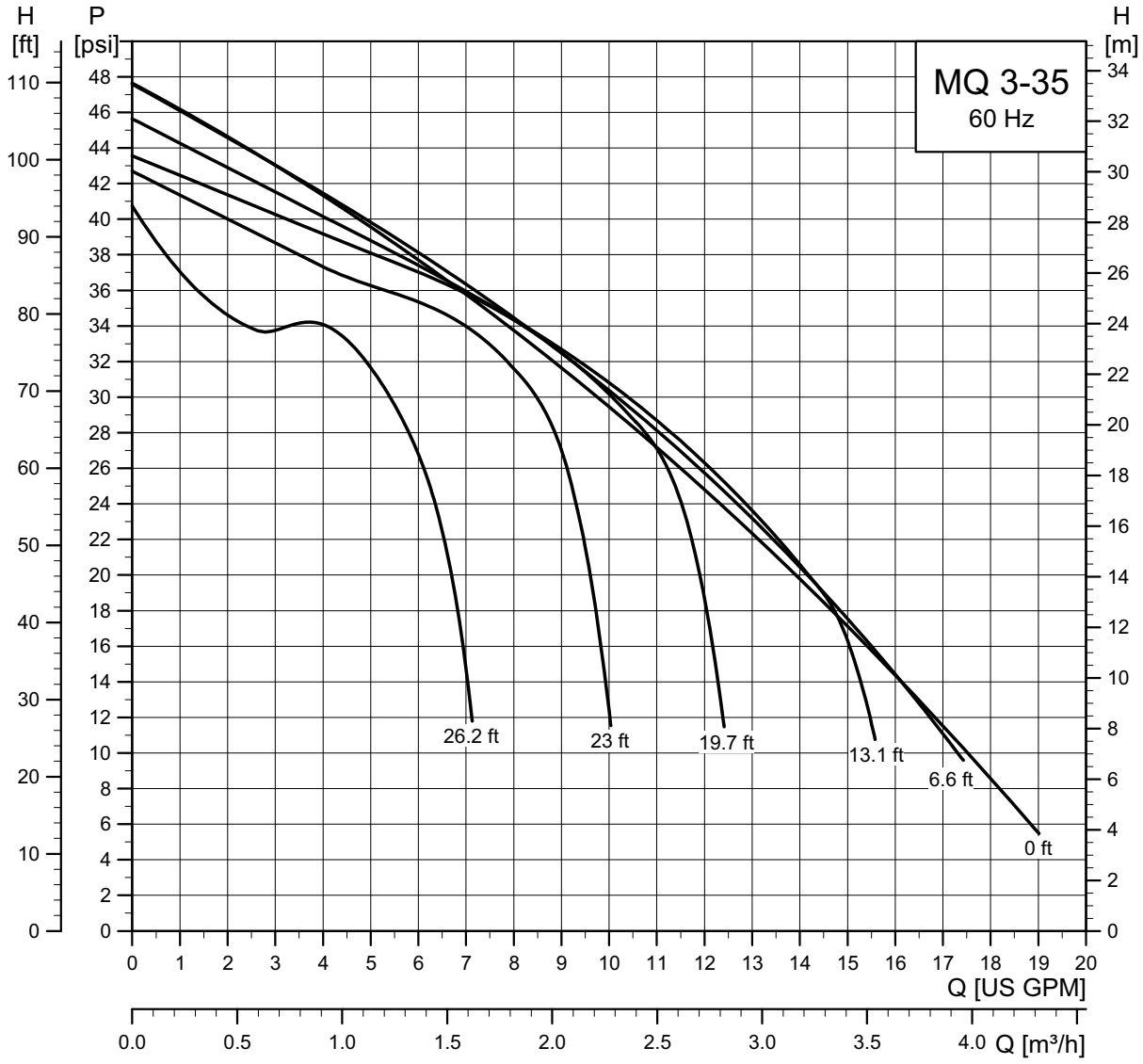
Selection of product

MQ is available in two sizes and two voltages.

Model	**Voltage [V]**	**Product number**
MQ 3-35	115	96860172
	230	96860201
MQ 3-45	115	96860195
	230	96860207

Curve charts and technical data

MQ 3-35 60 Hz, suction lift performance curve

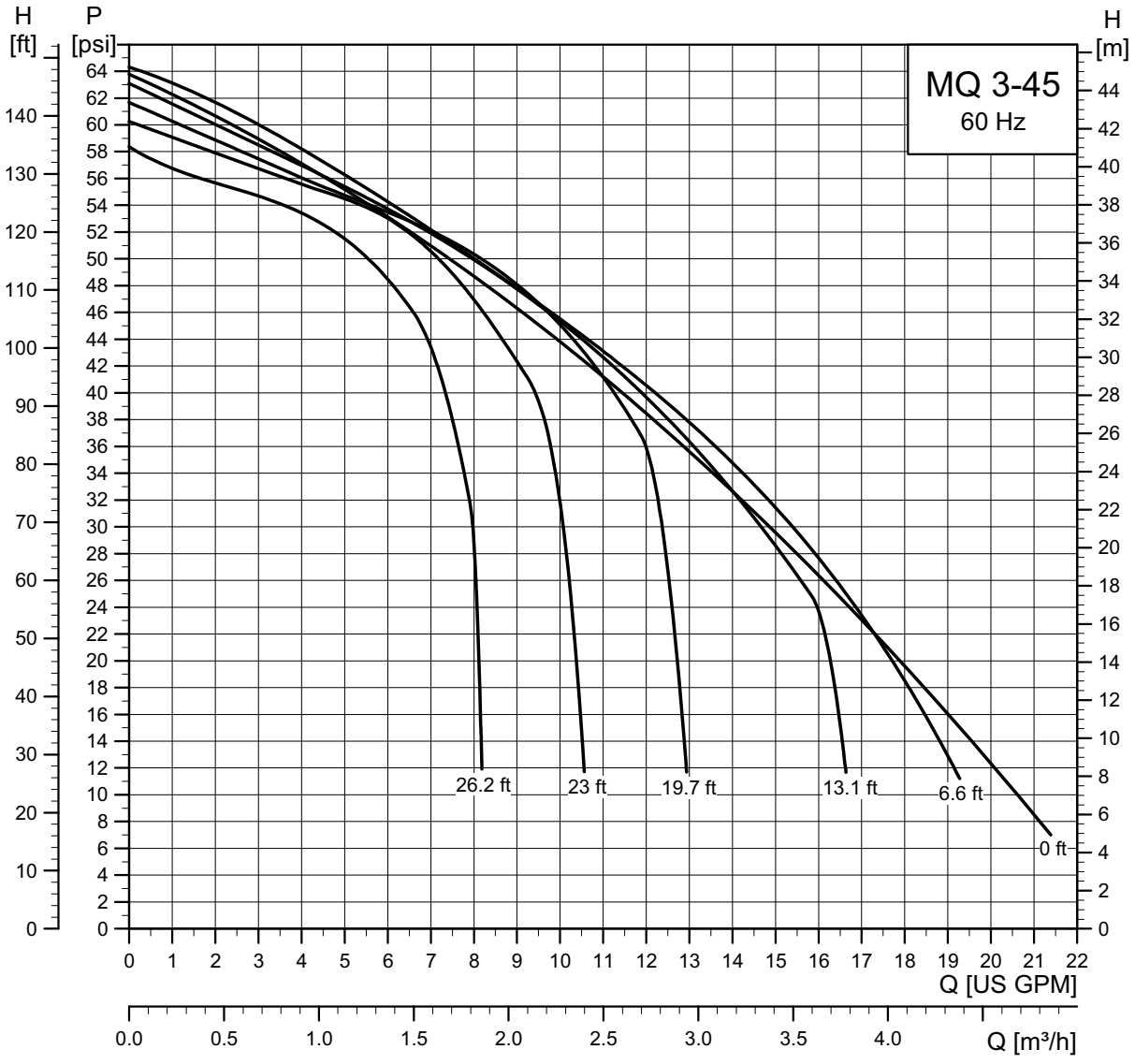


TM05 2056 4311

Provided it is filled with water, the pump is able to lift water from a depth of 26 ft (8 m) in less than 5 minutes.

Note: Use with a foot valve in suction lift applications.

MQ 3-45 60 Hz, suction lift performance curve

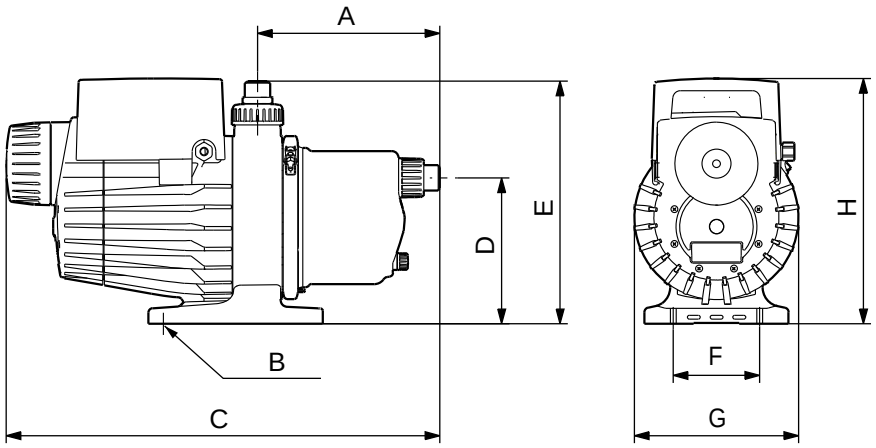


TM05 2057 4311

Provided it is filled with water, the pump is able to lift water from a depth of 26 ft (8 m) in less than 5 minutes.

Note: Use with a foot valve in suction lift applications.

Dimensional sketch - MQ



TM01 9799

Dimensions [in (mm)]							
A	B	C	D	E	F	G	H
9.45 (240)	2 x 3/8 (2 x 9.6)	22.44 (570)	7.56 (192)	12.60 (320)	4.49 (114)	8.58 (218)	12.74 (324)

Weights and electrical data

-10/+6 % voltage tolerance
7.5 ft. power cord with plug

Model	Part Number	Phase, Volts	Amps		P2		Net wt. [lb (kg)]
			Run	Start	W	Hp	
MQ 3-35	96860172	1X110-120V	8	29	585	0.75	30.1 (13.7)
MQ 3-45	96860195	1X110-120V	10	29	725	1	30.2 (13.7)
MQ 3-35	96860201	1X220-240V	4	15	565	0.75	30.1 (13.7)
MQ 3-45	96860207	1X220-240V	4.8	15	716	1	30.2 (13.7)

Approvals

C US
Liquid Pump

Drinking Water
NSF / ANSI 61

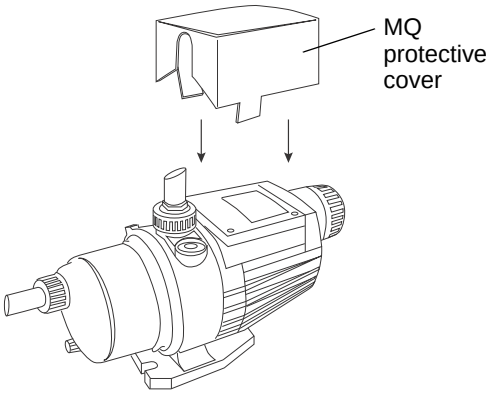
NSF / ANSI 372
Low Lead Content

Accessories, MQ

MQ protective cover

Protects keypad and electronics in outdoor applications. Required for outdoor applications where MQ is exposed to the elements. Two Velcro tabs are included to help adhere back end of cover to pump.

Description	Material	Product number
MQ protective cover	Polypropylene with Velcro tabs	96693071



TM05 0787 1511

4. JP Jet Pumps

Product introduction

The Grundfos JP line of self-priming centrifugal jet pumps is designed for shallow well, deep well, and convertible shallow well pump applications.

JP pumps provide excellent suction capacity.

TM05 1948 4011

Fig. 19 Grundfos JP line (from left to right: JP shallow well; JP deep well; and JP convertible shallow well)

Applications

Grundfos JP pumps are particularly suitable for:

- domestic water supply systems
- light agricultural
- industrial water transfer
- home and market gardens.

Features and benefits

Shallow well - cast iron
JP05S-CI, JP07S-CI, JP10S-CI, JP30S-CI

Single-stage, shallow well self-priming centrifugal pumps. Features:

- Rugged cast iron construction
- end suction, top discharge arrangement
- technopolymer impeller
- built-in ejector complete with clean-out port to clear blockages from nozzle
- convenient priming plug for ease of priming and air elimination
- ceramic-carbon bellows mechanical seal ensures trouble-free operation
- high quality pressure switch.

Shallow well convertible - cast iron
JP15S-CI, JP20S-CI

Single stage, convertible, self-priming centrifugal pumps. Features:

- Rugged cast iron construction
- end suction, top discharge arrangement
- detachable ejector assembly for deep well applications
- technopolymer impeller
- convenient priming plug for ease of priming and air elimination
- ceramic-carbon bellows mechanical seal ensures trouble-free operation
- high quality pressure switch.

Deep well - cast iron
JP05D-CI, JP07D-CI, JP15D-CI, JP20D-CI

Single-stage, deep well, self-priming centrifugal pumps. Features:

- Rugged cast iron construction
- end suction, top discharge arrangement
- technopolymer impeller
- separate deep well port for connection to Deep Well Ejector Kit
- convenient priming plug for ease of priming and air elimination
- ceramic-carbon bellows mechanical seal ensures trouble-free operation
- high quality pressure switch.

Shallow well - stainless steel
JP05S-SS, JP07S-SS, JP10S-SS

Single-stage, shallow well self-priming centrifugal pumps constructed of stainless steel. Features:

- Corrosion-resistant stainless steel
- end suction, top discharge arrangement
- technopolymer impeller
- built-in ejector complete with clean-out port to clear blockages from nozzle
- ceramic-carbon bellows mechanical seal ensures trouble-free operation
- high quality pressure switch.

Motors

All Grundfos JP motors are Totally Enclosed and Fan-Cooled (TEFC) for quiet operation and superior protection in harsh environments. Features:

- Stainless steel motor shaft offers excellent corrosion resistance
- Double, oversized grease ball bearings are maintenance-free; sealed for life
- Built-in thermal overload protection
- Capacitor-run, with no switches to fail
- Drive end motor bearing protected by durable lip seal
- Insulation class F
- Motor protection IP44
- Terminal box protection IP55.

Identification

Type key

Example	JP	05	S	CI

Jet pump

Horsepower

03: 1/3 Hp
05: 1/2 Hp
07: 3/4 Hp
10: 1 Hp
15: 1-1/2 Hp
20 2 Hp
30: 3 Hp

Well type

S: Shallow Well
D: Deep Well

Material

CI: Cast Iron
SS: Stainless Steel
EC: Engineered Composite

Product overview

Conversion chart

Old JPF Shallow Well Cast Iron Jet Pumps					
Type	**Hp**	**Ph**	**Volts**	**Pressure switch setting [psi]**	**Material number**
JPF3	1/2	1	115	30-50	96430412
JPF3	1/2	1	230	30-50	96430413
JPF4	3/4	1	115	30-50	96430414
JPF4	3/4	1	230	30-50	96430415
JPF5	1-1/2	1	230	50-70	96430416
JPF7	2	1	230	50-80	96457277

New Shallow Well Cast Iron Jet Pumps					
Type	**Hp**	**Ph**	**Volts**	**Pressure switch setting [psi]**	**Material number**
JP05S-CI (JP4-47ASA)	1/2	1	115/230	30-50	97855073
JP07S-CI (JP4-54ASA)	3/4	1	115/230	30-50	97855081
JP10S-CI (JP4-61ASA)	1	1	115/230	30-50	97855085
JP15S-CI (JP5-61ASA)	1-1/2	1	230	40-60	97855091
JP20S-CI (JP8-62ASA)	2	1	230	40-60	97855094
JP30S-CI (JP12-51ASA)	3	1	230	40-60	97855095

Old JPF Shallow Well Stainless Steel Jet Pumps					
Type	**Hp**	**Ph**	**Volts**	**Pressure switch setting [psi]**	**Material number**
JPS2	1/2	1	115	30-50	96430421
JPS2	1/2	1	230	30-50	96430422
JPS4	1	1	115	30-50	96430423
JPS4	1	1	230	30-50	96430424

New Shallow Well Stainless Steel Jet Pumps					
Type	**Hp**	**Ph**	**Volts**	**Pressure switch setting [psi]**	**Material number**
JP05S-SS (JP4-47ASI)	1/2	1	115/230	30-50	97855075
JP07S-SS (JP4-54ASI)	3/4	1	115/230	30-50	97855083
JP10S-SS (JP4-61ASI)	1	1	115/230	30-50	97855088

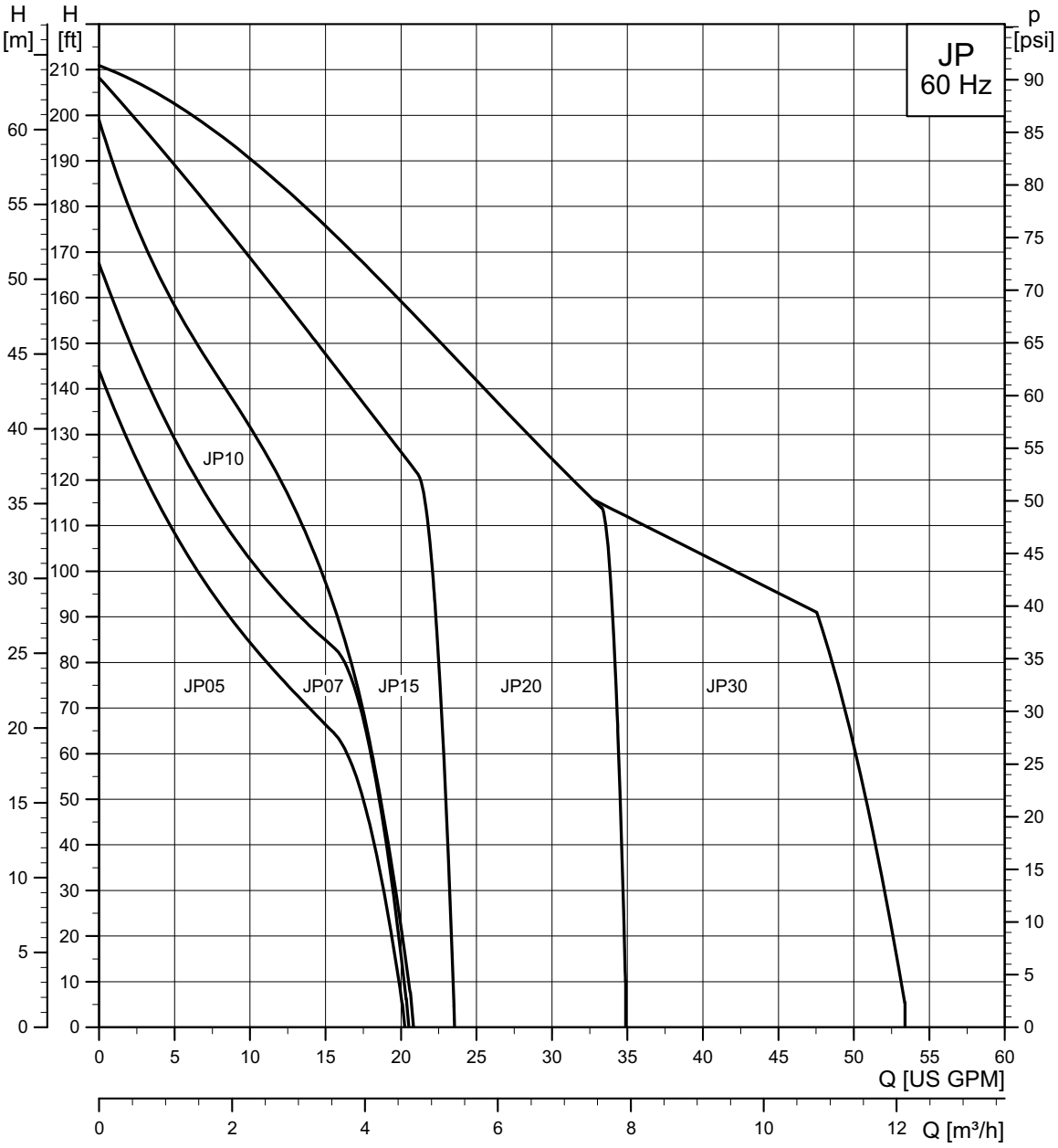
Old JPF Deep Well Cast Iron Jet Pumps*					
Type	**Hp**	**Ph**	**Volts**	**Pressure switch setting [psi]**	**Material number**
JDF2	1/2	1	115	30-50	96430417
JDF2	1/2	1	230	30-50	96430418
JDF4	3/4	1	115	30-50	96430419
JDF4	3/4	1	230	30-50	96430420

*Ejector not included

New Deep Well Cast Iron Jet Pumps*					
Type	**Hp**	**Ph**	**Volts**	**Pressure switch setting [psi]**	**Material number**
JP05D-CI (JP4-47DSA)	1/2	1	115/230	30-50	97855072
JP07D-CI (JP4-54DSA)	3/4	1	115/230	30-50	97855080
JP15D-CI (JP5-61DSA)	1-1/2	1	230	40-60	97855090
JP20D-CI (JP8-62DSA)	2	1	230	40-60	97855093

*Ejector not included

Performance range



Product range

Shallow well

Model	Shallow well cast iron						Shallow well stainless steel		
	JP05S-CI	JP07S-CI	JP10S-CI	JP15S-CI	JP20S-CI	JP30S-CI	JP05S-SS	JP07S-SS	JP10S-SS
Max. flow [gpm (m^3h)]	21 (4.7)	20 (4.5)	20 (4.5)	23 (5.2)	34 (7.7)	52 (11.8)	21 (4.7)	20 (4.5)	20 (4.5)
Max. pump head [ft (m)]	145 (44.2)	170 (51.2)	200 (61.0)	210 (64.0)	210 (64.0)	170 (51.2)	145 (44.2)	170 (51.2)	200 (61.0)
Max. working pressure [psi (bars)]	116 (8)						116 (8)		
Motor power [hp]	1/2	3/4	1	1 1/2	2	3	1/2	3/4	1
Fluid temp range [°F (°C)]	+32 to +95 (0 to +35)						+32 to +95 (0 to +35)		
Max. lift [ft suction lift at sea level]	25						25		
Max. ambient temp [°F (°C)]	+104 (+40)						+104 (+40)		
Factory pressure switch setting [psi (bars)]	30/50 (2.1/3.5)	30/50 (2.1/3.5)	30/50 (2.1/3.5)	40/60 (2.8/4.1)	40/60 (2.8/4.1)	40/60 (2.8/4.1)	30/50 (2.1/3.5)	30/50 (2.1/3.5)	30/50 (2.1/3.5)
Storage temp range [°F (°C)]	+14 to +104 (-10 to +40)						+14 to +104 (-10 to +40)		
Relative humidity	95%						95%		
Max. starts per hour	20						20		

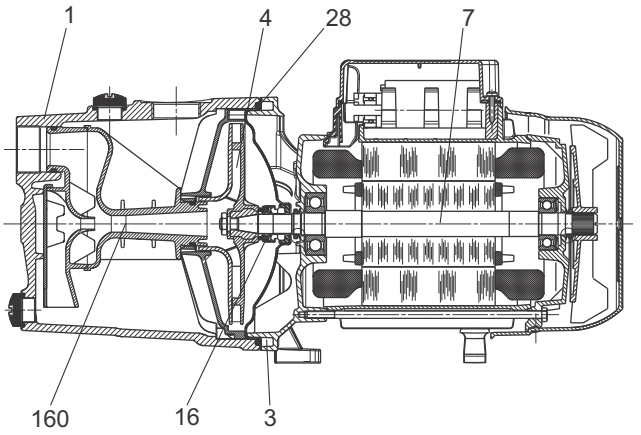
Deep well

Model	Deep well cast iron			
	JP05D-CI	JP07D-CI	JP15D-CI	JP20D-CI
Max. flow [gpm (m^3h)]	18 (4.0)	18 (4.0)	21 (4.7)	32 (7.2)
Max. pump head [ft (m)]	145 (44.2)	170 (51.2)	195 (59.4)	200 (61.0)
Max. working pressure [psi (bars)]	116 (8)			
Motor power [hp]	1/2	3/4	1 1/2	2
Fluid temp range [°F (°C)]	+32 to +95 (0 to +35)			
Max. lift [ft suction lift at sea level]	50	70	90	90
Max. ambient temp [°F (°C)]	+104 (+40)			
Factory pressure switch setting [psi (bars)]	30/50 (2.1/3.5)	30/50 (2.1/3.5)	40/60 (2.8/4.1)	40/60 (2.8/4.1)
Storage temp range [°F (°C)]	+14 to +104 (-10 to +40)			
Relative humidity	95%			
Max. starts per hour	20			

Construction

Materials of construction

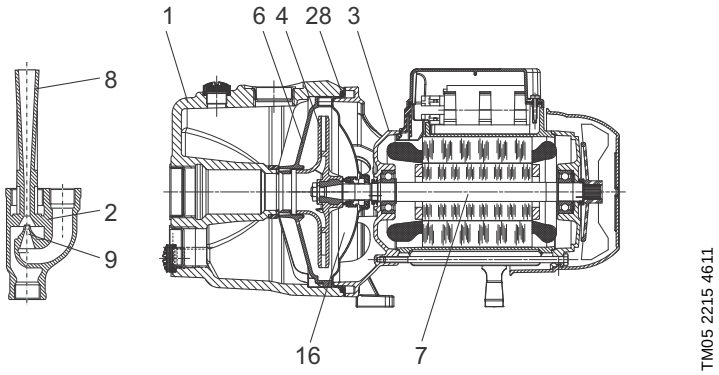
Shallow well - cast iron, stainless steel



TM05 2216 4611

Pos.	Descriptions: in contact with liquid	Materials	Cast iron models	Stainless steel models
1	Pump Body	Cast Iron 200 UNI ISO 185	All	-
		Stainless Steel AISI 304	-	All
3	Support	Cast Iron 200 Uni ISO 185	JP15, JP20, JP30	-
3	Support	Aluminum + AISI304	JP05, JP07, JP10	All
4	Impeller	Technopolymera	All	All
7	Shaft with Rotor	Stainless Steel AISI 416	All	-
		Stainless Steel AISI 303	-	All
16	Mechanical Seal	Carbon / ceramic	All	All
28	OR Gasket	NBR Rubber	All	All
160	Nozzle-Venruri Diffuser Assembly	Technopolymera	All	All

Deep well - cast iron



TM05 2215 4611

Pos.	Descriptions: in contact with liquid	Materials	Cast iron models
1	Pump Body	Cast Iron 200 UNI ISO 185	All
3	Support	Cast Iron 200 UNI ISO 185	All
4	Impeller	Technopolymer	All
6	Diffuser	Technopolymer	All
7	Shaft with Rotor	Stainless Steel ANSI 416	JP05 & JP07
		Stainless Steel ANSI 303	JP15 & JP20
16	Mechanical Seal	Carbon/Ceramic	All
28	OR Gasket	NBR Rubber	All
2	Ejector Body	Cast Iron 200 UNI ISO 185	E20, E25, E30
8	Venturi Tube	Technopolymer	E20, E25, E30
9	Nozzle	Brass	E20, E25, E30

Operating conditions

Max. operating pressure:	116 psi (8 bar)
Liquid temp range:	+32 °F to +95 °F (0 °C to +35 °C)
Max. relative humidity of air	95%
Storage temp range:	+14 °F to +104 °F (-10 °C to 40 °C)

Selection

Pumped liquids

JP pumps are suitable for pumping clean, non-viscous, non-aggressive, non-explosive liquids, free of solid particles or fibers.

Selection of pumps

Shallow well - cast iron

Pump type	Hp	Ph	Volts [V]	Pressure switch setting [psi]	Product number
JP05S-CI	1/2	1	115/230	30-50	97855073
JP07S-CI	3/4	1	115/230	30-50	97855081
JP10S-CI	1	1	115/230	30-50	97855085
JP15S-CI	1-1/2	1	230	40-60	97855091
JP20S-CI	2	1	230	40-60	97855094
JP30S-CI	3	1	230	40-60	97855095

Shallow well - stainless steel

Pump type	Hp	Ph	Volts [V]	Pressure switch setting [psi]	Product number
JP05S-SS	1/2	1	115/230	30-50	97855075
JP07S-SS	3/4	1	115/230	30-50	97855083
JP10S-SS	1	1	115/230	30-50	97855088

Deep well - cast iron*

Pump type	Hp	Ph	Volts [V]	Pressure switch setting [psi]	Product number
JP05D-CI	1/2	1	115/230	30-50	97855072
JP07D-CI	3/4	1	115/230	30-50	97855080
JP015D-CI	1-1/2	1	230V	40-60	97855090
JP020D-CI	2	1	230V	40-60	97855093

* Ejector not included

Deep well ejectors

Type	Product number
E20 NPT	96654382
E25 NPT	96654383
E30 NPT	96654384

Installation

Pump location

The pump must be located in a well-ventilated place, protected from unfavorable weather conditions and with an environmental temperature not exceeding 104 °F (40 °C).

It is always good practice to place the pump as close as possible to the liquid to be pumped.

Pump position

Allowable positions

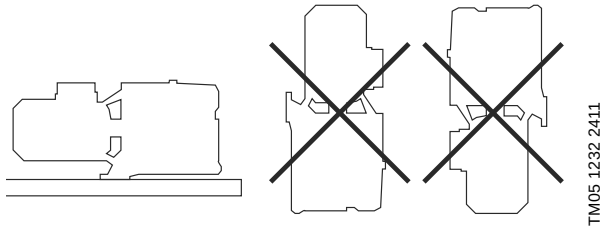


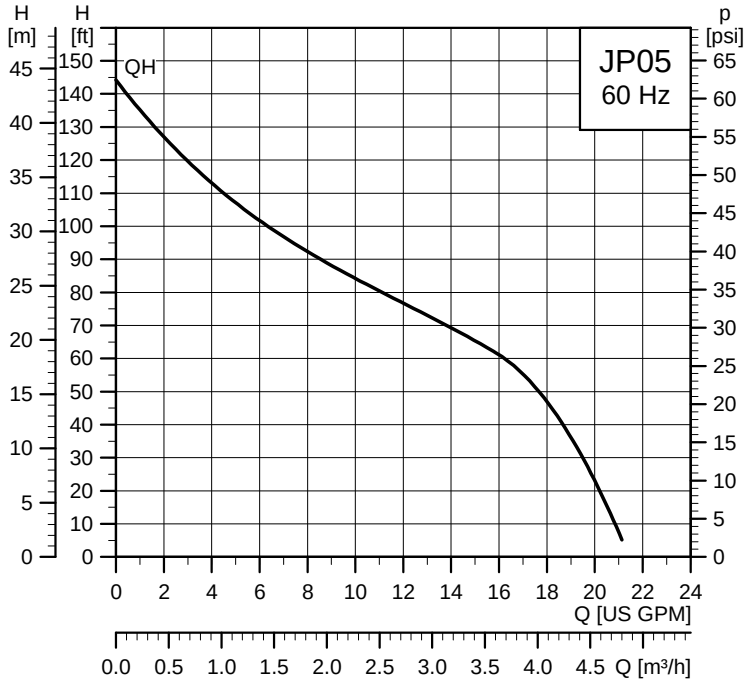
Fig. 20 Pump must be installed in horizontal position only

The pump must be installed only in horizontal position. To prevent movement and vibrations, anchor the pump firmly to a horizontal surface.

Curve charts and technical data

Performance curves

Models JP05S-CI, JP05S-SS



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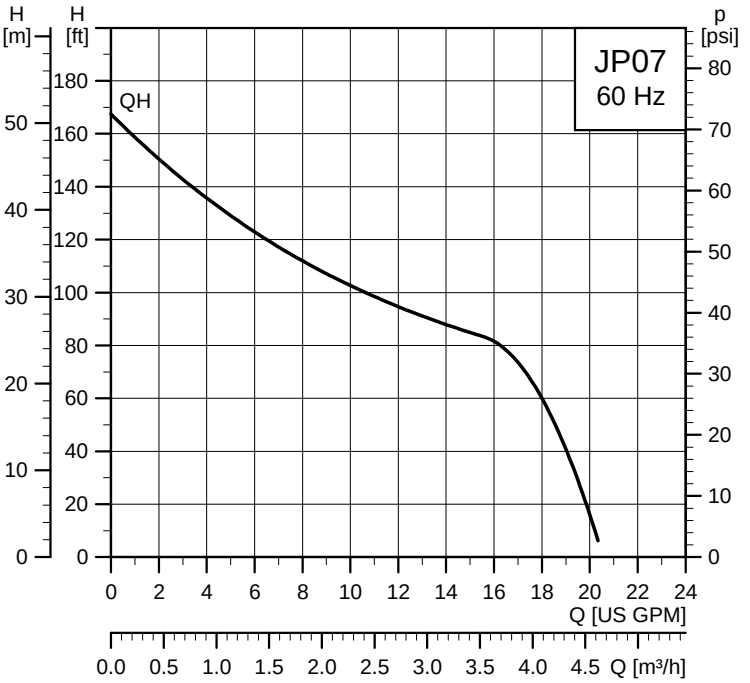
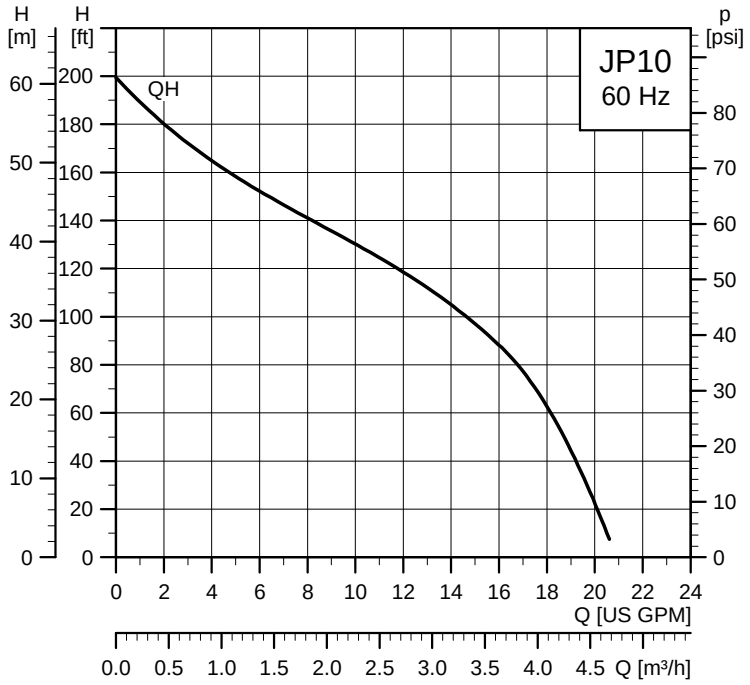
Models JP07S-CI, JP07S-SS



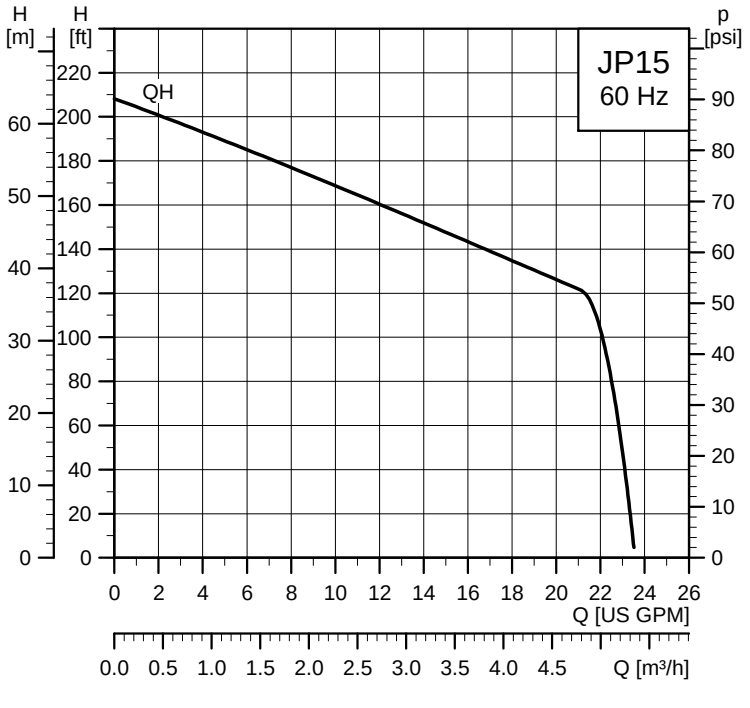
TM05 1139 5111

Models JP10S-CI, JP10S-SS



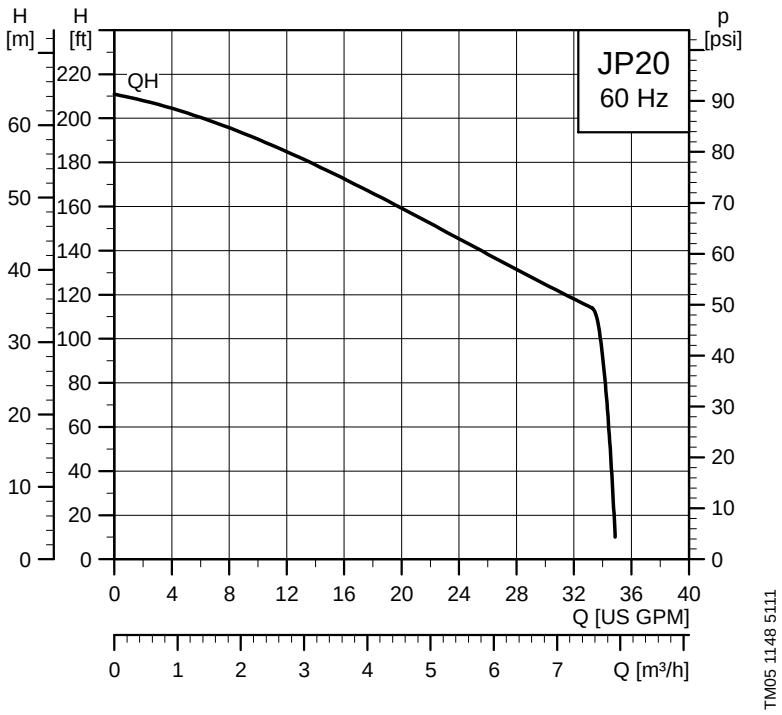
TM05 1141 5111

Model JP15S-CI

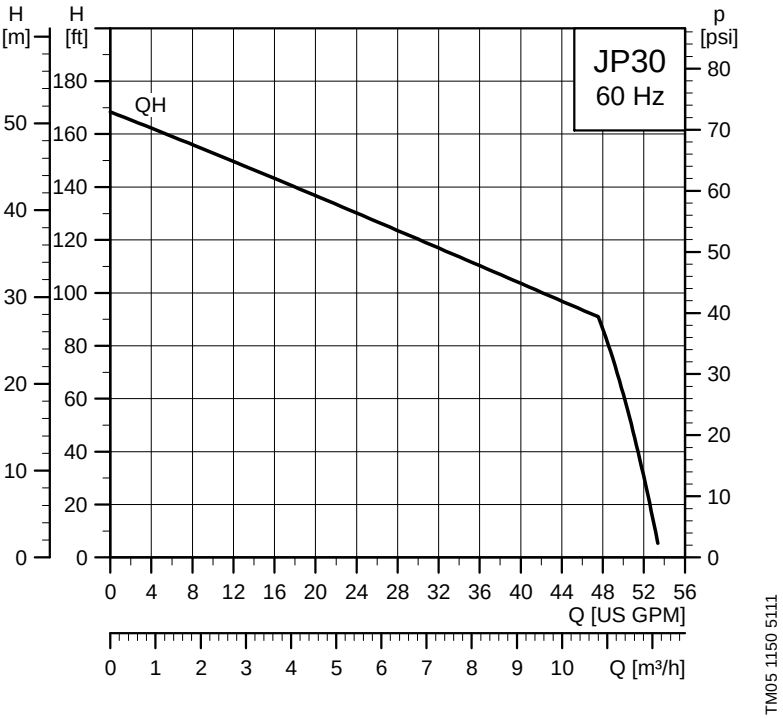


TM05 1147 5111

Model JP20S-CI



Model JP30S-CI



Shallow well performance data

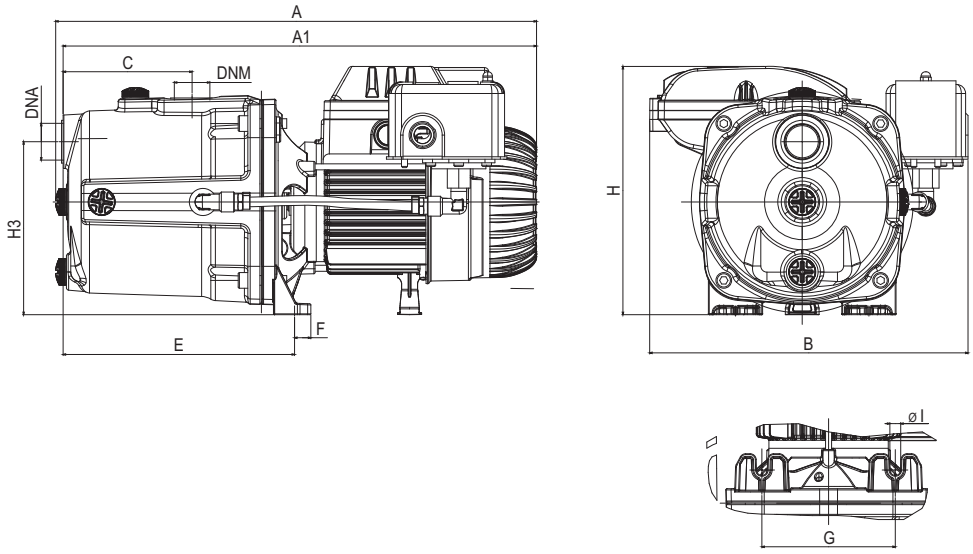
Pump type	Part number cast iron	Part number stainless steel	Pressure switch setting on/off	Suction depth [ft]	Delivery pressure [psi]											Max. pressure [psi]	Shut off pressure [psi]
					15	20	25	30	35	40	45	50	55	60	65		
					Flow table [gpm]												
JP05S	97855073	97855075	30/50	5	14.8	14.8	14.7	13.6	-	-	-	-	-	-	-	62	59
				10	13.2	13.2	13.1	12.8	-	-	-	-	-	-	-		57
				15	-	10.8	10.8	10.7	10.1	-	-	-	-	-	-		55
				20	-	-	8.9	8.9	8.8	7.6	-	-	-	-	-		53
				25	-	-	7.0	7.0	7.0	6.9	5.5	-	-	-	-		51
JP07S	97855081	97855083	30/50	5	-	-	14.3	14.3	14.2	12.6	-	-	-	-	-	75	73
				10	-	-	13.1	13.1	13.0	12.3	-	-	-	-	-		70
				15	-	-	-	11.0	11.0	11.0	10.0	-	-	-	-		68
				20	-	-	-	9.2	9.1	9.1	9.0	-	-	-	-		66
				25	-	-	-	-	7.0	7.0	7.0	6.9	-	-	-		64
JP10S	97855085	97855088	30/50	5	-	-	-	14.5	14.4	14.3	14.2	-	-	-	-	86	84
				10	-	-	-	-	13.1	12.8	12.7	12.4	-	-	-		82
				15	-	-	-	-	-	11.8	11.6	11.4	10.9	-	-		80
				20	-	-	-	-	-	9.9	9.8	9.7	9.4	-	-		77
				25	-	-	-	-	-	-	-	7.9	7.8	7.7	7.3		75
JP15S	97855091	-	40/60	5	-	21.0	20.9	20.7	20.6	20.3	20.2	19.9	-	-	-	87	85
				10	-	19.0	18.8	18.5	18.2	17.9	17.8	17.5	17.3	-	-		82
				15	-	-	15.7	15.5	15.4	15.2	15.1	15.0	14.8	14.5	-		80
				20	-	-	-	13.3	13.1	12.9	12.7	12.5	12.4	12.1	11.9		78
				25	-	-	-	-	9.7	9.5	9.3	9.1	8.9	8.6	8.5		76
JP20S	97855094	-	40/60	5	-	31.8	31.6	31.2	30.8	30.5	30.1	29.1	-	-	-	85	83
				10	-	28.0	27.7	27.6	27.2	26.9	26.7	26.0	25.1	-	-		81
				15	-	23.6	23.3	23.2	23.1	22.8	22.5	22.3	22.1	20.9	-		79
				20	-	-	20.2	19.9	19.8	19.7	19.4	19.3	19.0	18.5	17.3		76
				25	-	-	-	-	14.3	14.2	14.1	13.8	13.7	13.4	13.2		74
JP30S	97855095	-	40/60	5	-	49.5	49.3	48.9	47.9	46.8	-	-	-	-	-	73	71
				10	-	46.0	45.4	45.0	44.5	43.6	42.0	-	-	-	-		69
				15	-	37.1	36.8	36.5	36.1	35.5	34.7	33.5	-	-	-		67
				20	-	32.1	31.8	31.6	31.2	30.6	30.4	29.3	25.9	-	-		64
				25	-	20.9	20.7	20.6	20.4	20.0	19.5	18.8	18.0	16.5	13.8		62

Deep well performance data

Pump type	Pump part number	Ejector type NPT	Ejector part number	Pressure switch on/off	Suction depth [ft]	Delivery pressure [psi]							
						20	30	40	50	60	70	80	90
						Flow table [gpm]							
JP05D	97855072	E 25	96654383	30/50	30	8	5	-	-	-	-	-	-
					40	6	3	-	-	-	-	-	-
					50	4	1.5	-	-	-	-	-	-
		E 30	96654384	30/50	30	7.7	5.8	2.5	1.3	-	-	-	-
					40	5.9	4.3	1.6	-	-	-	-	-
					50	5	3.4	1	-	-	-	-	-
JP07D	97855080	E 25	96654383	30/50	30	10.5	7.9	2.5	-	-	-	-	-
					40	8.5	5.4	-	-	-	-	-	-
					50	6.4	3.5	-	-	-	-	-	-
		E 30	96654384	30/50	40	-	5.6	2.8	1.7	-	-	-	-
					50	-	4.6	2.2	1.3	-	-	-	-
					60	-	3.5	1.5	-	-	-	-	-
					70	-	2.9	-	-	-	-	-	-
JP15D	97855090	E 20	96654382	40/60	30	-	-	15	12.2	9.2	2.6	-	-
					40	-	-	13.5	10.6	7.6	-	-	-
					50	-	-	11.6	8.8	5.5	-	-	-
					60	-	-	10	7	3.6	-	-	-
		E 25	96654383	40/60	50	-	-	12	9.8	7.7	3.5	-	-
					60	-	-	10.8	8.6	6.5	2.5	-	-
					70	-	-	9.7	7.5	5.3	1.7	-	-
		E 30	96654384	40/60	70	-	-	7.9	7.1	6	3.8	2	-
					80	-	-	7.2	6.5	5.3	3.2	1.6	-
					90	-	-	6.7	5.8	4.7	2.8	1.2	-
JP20D	97855093	E 20	96654382	40/60	30	-	-	-	15	9	2	-	-
					40	-	-	-	13.4	6.8	-	-	-
					50	-	-	-	11.7	5	-	-	-
					60	-	-	-	9.9	2.9	-	-	-
		E 25	96654383	40/60	50	-	-	-	12.5	7.9	3.7	2	-
					60	-	-	-	11.1	6.7	2.8	1.2	-
					70	-	-	-	9.9	5.5	1.8	-	-
					80	-	-	-	8.6	4.3	1	-	-
		E 30	96654384	40/60	70	-	-	-	7.9	6.2	4	3	2.3
					80	-	-	-	7.3	5.6	3.4	2.7	1.9
					90	-	-	-	6.7	5	3	2.3	1.5

Dimensions and weights

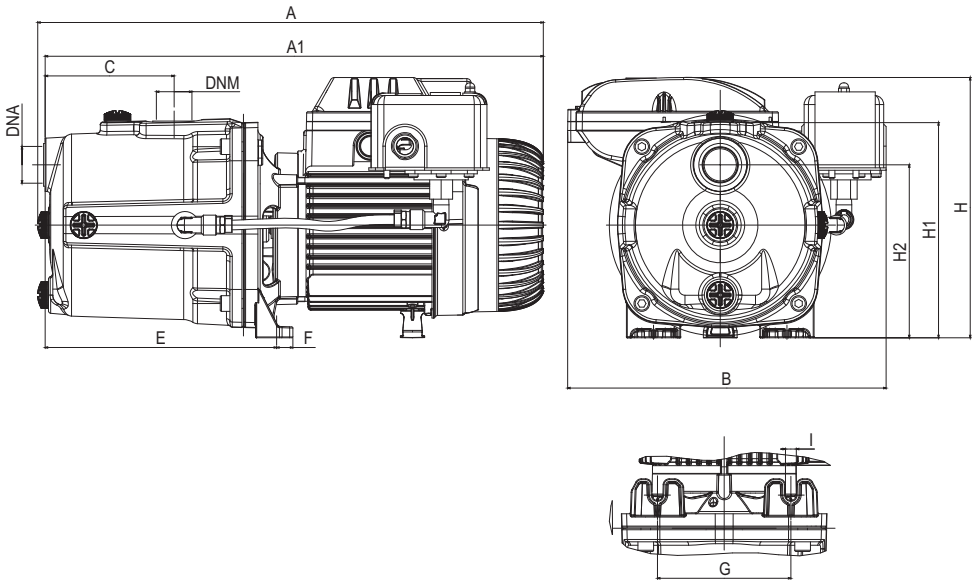
Cast iron shallow well, model JP05S-CI



TM05 2221 4611

Model	Part number	Dimensions [in]												Weight [lbs]
		A	A1	B	C	E	F	G	H	H3	I	DNA	DNM	
JP05S-CI	97855073	15.7	15.5	10.4	4.2	7.6	0.5	4.4	8.1	5.6	0.4	1	1	24

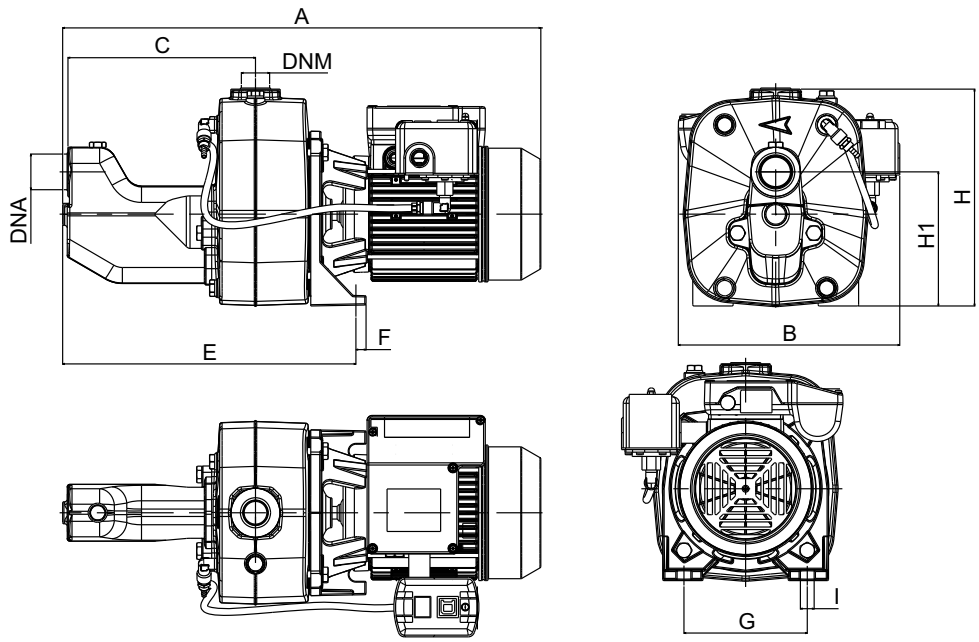
Cast iron shallow well, models JP07S-CI, JP10S-CI



TM05 2222 4611

Model	Part number	Dimensions [in]													Weight [lbs]
		A	A1	B	C	E	F	G	H	H1	H2	I	DNA	DNM	
JP07S-CI	97855081	16.5	16.3	10.4	4.2	7.6	0.5	4.4	8.5	7	5.6	0.4	1	1	28
JP10S-CI	97855085	16.5	16.3	10.4	4.2	7.6	0.5	4.4	8.5	7	5.6	0.4	1	1	30

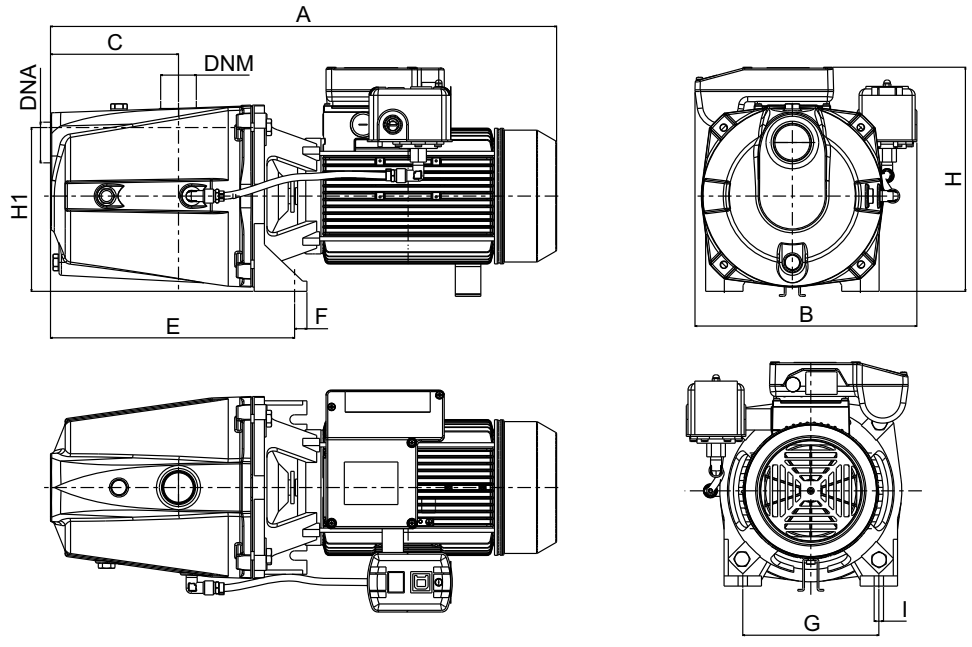
Cast iron shallow well, models JP15S-CI, JP20S-CI



TM05 2365 5011

Model	Part number	Dimensions [in]											Weight [lbs]
		A	B	C	E	F	G	H	H1	I	DNA	DNM	
JP15S-CI	97855091	21.8	10.2	8.7	13.5	0.5	5.7	10	6.2	0.6	1.25	1	68
JP20S-CI	97855094	21.9	10.2	8.7	13.5	0.5	5.7	10	6.2	0.6	1.25	1	77

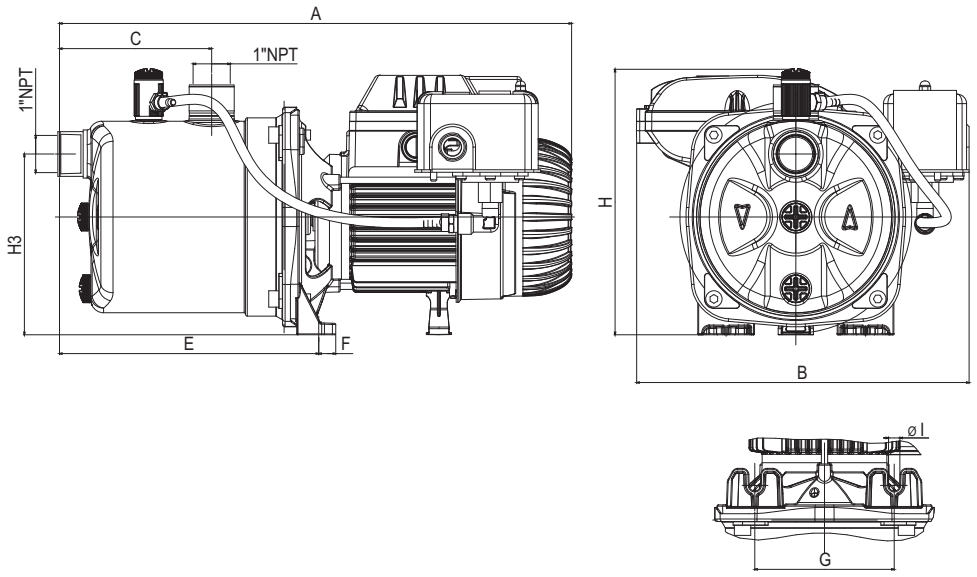
Cast iron shallow well, models JP30S-CI



TM05 2366 5011

Model	Part number	Dimensions [in]											Weight [lbs]
		A	B	C	E	F	G	H	H1	I	DNA	DNM	
JP30S-CI	97855095	23.4	10.3	5.9	11.3	0.6	6.3	10.4	7.6	0.4	1.5	1.25	71

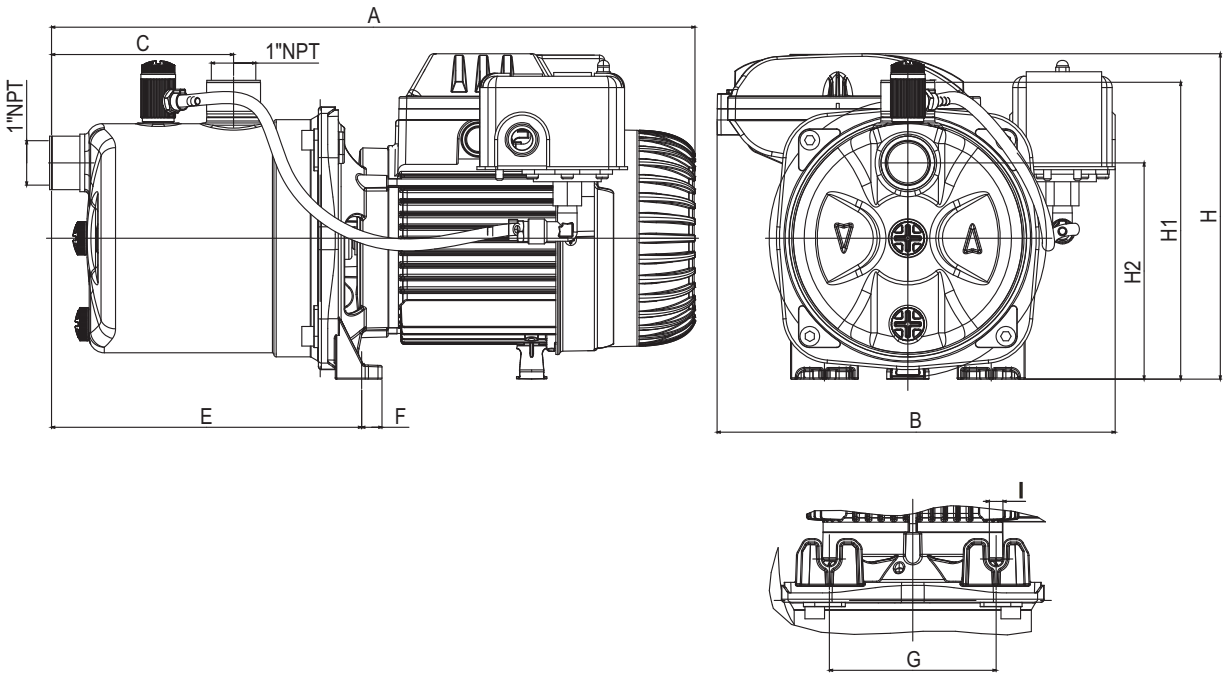
Shallow well stainless steel, model JP05S-SS



TM05 2219 4611

Model	Part number	Dimensions [in]									Weight [lbs]
		A	B	C	E	F	G	H	H3	I	
JP05S-SS	97855075	16	10.4	4.7	8.1	0.6	4.4	8.3	5.6	0.4	18

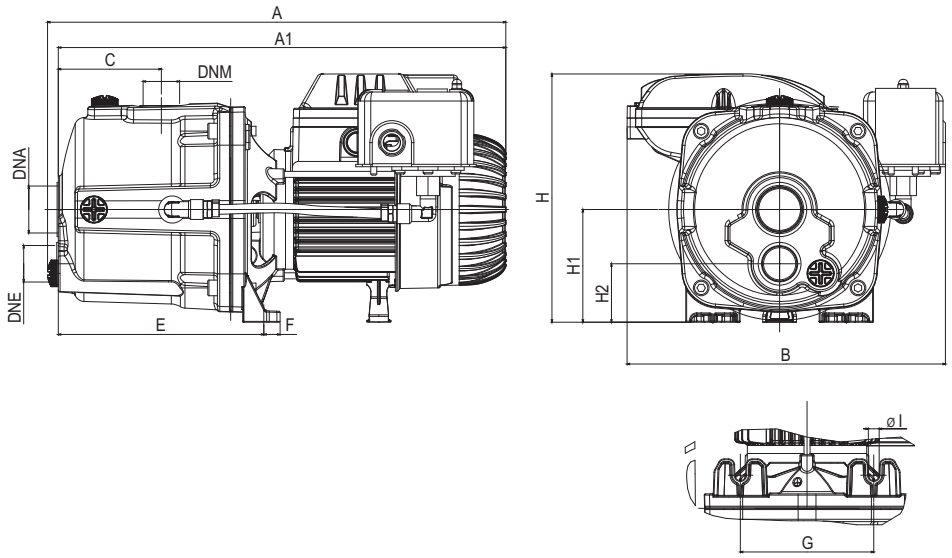
Shallow well stainless steel, models JP07S-SS, JP10S-SS



TM05 2220 4611

Model	Part number	Dimensions [in]										Weight [lbs]
		A	B	C	E	F	G	H	H1	H2	I	
JP07S-SS	97855083	16.8	10.4	4.7	8.1	0.6	4.4	8.5	7.7	5.7	0.4	22
JP10S-SS	97855088	16.8	10.4	4.7	8.1	0.6	4.4	8.5	7.7	5.7	0.4	24

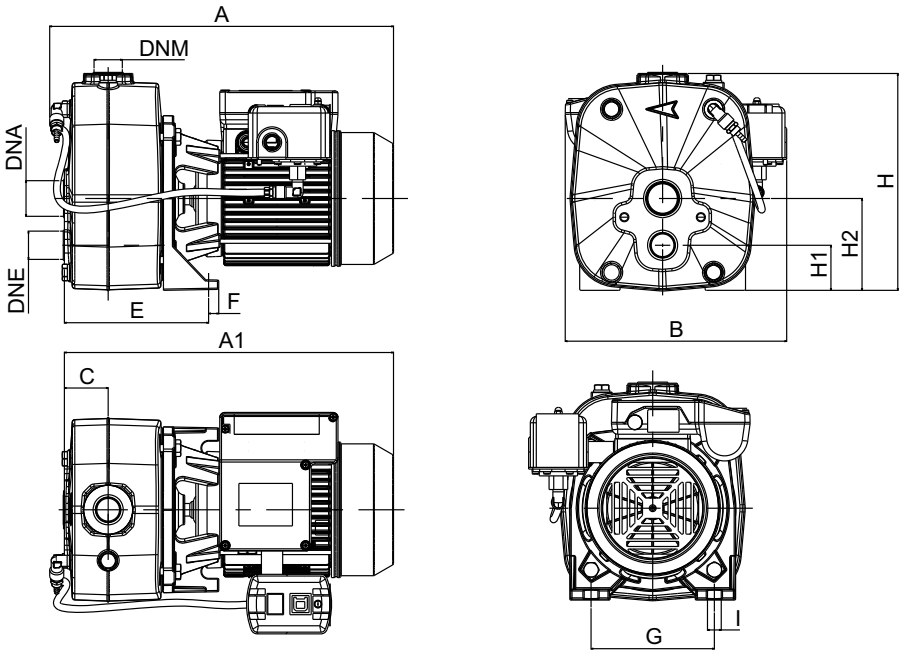
Cast iron deep well, models JP05D-CI, JP07D-CI



TM05 2218 4611

Model	Part number	Dimensions [in]													Weight [lbs]
		A	A1	B	C	E	F	G	H	H1	H2	I	DNA	DNE	DNM	
JP05D-CI	97855072	15	14.6	10.4	3.4	6.7	0.5	4.4	8.1	3.7	1.9	0.4	1.25	1	1	25
JP07D-CI	97855080	15.8	15.4	10.4	3.4	6.7	0.5	4.4	8.5	3.7	1.9	0.4	1.25	1	1	25

Cast iron deep well, models JP15D-CI, JP20D-CI



TM05 2367 5011

Model	Part number	Dimensions [in]													Weight [lbs]
		A	A1	B	C	E	F	G	H	H1	H2	I	DNA	DNE	DNM	
JP15D-CI	97855090	15.9	15.2	10.2	2	6.7	0.5	5.7	10	2.1	4.2	0.6	1.25	1	1	63
JP20D-CI	97855093	18.9	18.2	10.2	2	6.7	0.5	5.7	10	2.1	4.2	0.6	1.25	1	1	72

Electrical data

Supply voltage:
1 X 115/230V 60Hz
1 X 230V 60Hz
Voltage tolerance + / - 6 %

Electrical data 60 Hz								
Pump Model	Part Number	P2 Power Out [Hp]	Service factor [Hp]	Phase & voltage	I [amps]	Phase & voltage	I [amps]	Capacitor [uF]
JP05D-CI	97855072	1/2	1.60	1x115	7.09	1x230	3.61	50
JP05S-CI	97855073	1/2	1.60	1x115	8.21	1x230	4.22	50
JP05S-SS	97855075	1/2	1.60	1x115	8.21	1x230	4.22	50
JP07D-CI	97855080	3/4	1.5	1x115	9.2	1x230	4.67	50
JP07S-CI	97855081	3/4	1.5	1x115	10.3	1x230	5.25	50
JP07S-SS	97855083	3/4	1.5	1x115	10.3	1x230	5.25	50
JP10S-CI	97855085	1	1.40	1x115	13.8	1x230	7.1	80
JP10S-SS	97855088	1	1.40	1x115	13.8	1x230	7.1	80
JP15D-CI	97855090	1-1/2	1.3	-	-	1x230	7.6	31.5
JP15S-CI	97855091	1-1/2	1.3	-	-	1x230	8	31.5
JP20D-CI	97855093	2	1.25	-	-	1x230	8.5	40
JP20S-CI	97855094	2	1.25	-	-	1x230	11	40
JP30S-CI	97855095	3	1.15	-	-	1x230	12	40

Note: Refer to pump nameplate.

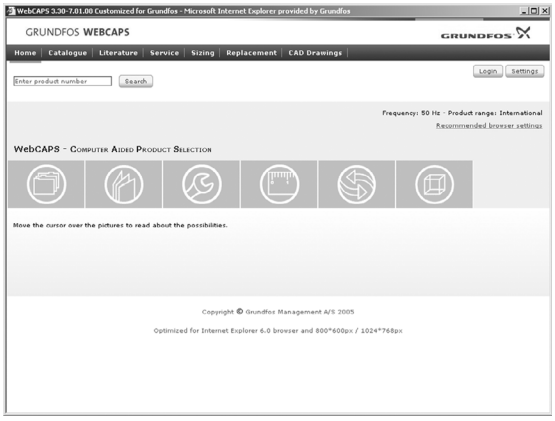
Approvals

C US
Liquid Pump

Subject to alterations.

5. Further documentation

WebCAPS

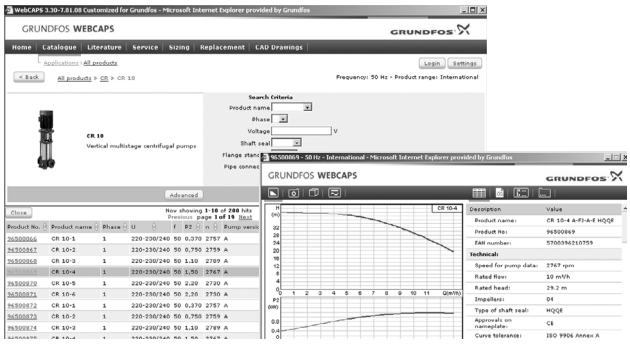


WebCAPS is a **Web**-based **C**omputer **A**ided **P**roduct **S**election program available on www.grundfos.com.

WebCAPS contains detailed information on more than 185,000 Grundfos products in more than 20 languages.

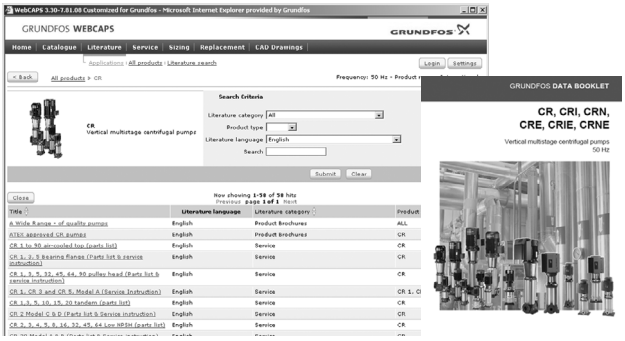
In WebCAPS, all information is divided into 6 sections:

- Catalog
- Literature
- Service
- Sizing
- Replacement
- CAD drawings.



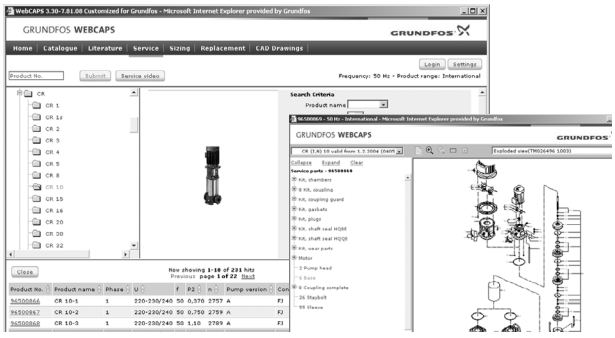
Catalog

This section is based on fields of application and pump types, and contains
- technical data
- curves (QH, Eta, P1, P2, etc) which can be adapted to the density and viscosity of the pumped liquid and show the number of pumps in operation
- product photos
- dimensional drawings
- wiring diagrams
- quotation texts, etc.



Literature

In this section you can access all the latest documents of a given pump, such as
- product guides
- installation and operating instructions
- service documentation, such as Service kit catalog and Service kit instructions
- quick guides
- product brochures, etc.



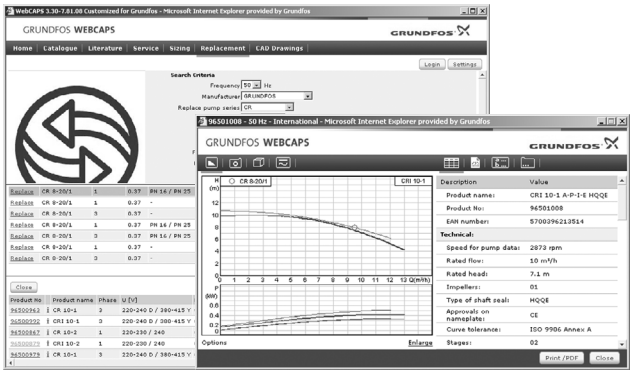
Service

This section contains an easy-to-use interactive service catalog. Here you can find and identify service parts of both existing and discontinued Grundfos pumps.
Furthermore, this section contains service videos showing you how to replace service parts.

Sizing

This section is based on different fields of application and installation examples, and gives easy step-by-step instructions in how to

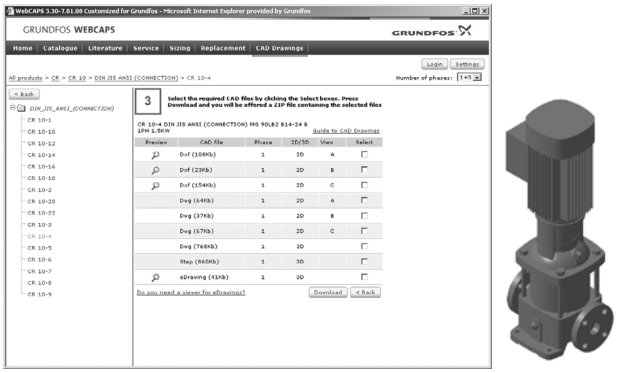
- select the most suitable and efficient pump for your installation
- carry out advanced calculations based on energy consumption, payback periods, load profiles, life cycle costs, etc.
- analyze your selected pump via the built-in life cycle cost tool
- determine the flow velocity in wastewater applications, etc.



Replacement

In this section you find a guide to selecting and comparing replacement data of an installed pump in order to replace the pump with a more efficient Grundfos pump.
The section contains replacement data of a wide range of pumps produced by other manufacturers than Grundfos.

Based on an easy step-by-step guide, you can compare Grundfos pumps with the one you have installed on your site. When you have specified the installed pump, the guide will suggest a number of Grundfos pumps which can improve both comfort and efficiency.



CAD drawings

In this section it is possible to download 2-dimensional (2D) and 3-dimensional (3D) CAD drawings of most Grundfos pumps.

These formats are available in WebCAPS:

2-dimensional drawings:

- .dxf, wireframe drawings
- .dwg, wireframe drawings.

3-dimensional drawings:

- .dwg, wireframe drawings (without surfaces)
- .stp, solid drawings (with surfaces)
- .eprt, E-drawings.

WinCAPS

Fig. 21 WinCAPS CD-ROM

WinCAPS is a **Win**dows-based **C**omputer **A**ided **P**roduct **S**election program containing detailed information on more than 185,000 Grundfos products in more than 20 languages.

The program contains the same features and functions as WebCAPS, but is an ideal solution if no Internet connection is available.

WinCAPS is available on CD-ROM and updated once a year.

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ECM: -

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SAN CO_2

Hot water, *naturally.*

The Sanden SANCO$_2$ Heat Pump Water Heater is a highly energy efficient alternative to traditional electric or gas water heaters. It absorbs heat from the air to heat water – saving energy, saving money and reducing greenhouse gas emissions.

Superior Features

BuildingGreen APPROVED
TOP 10 PRODUCT FOR 2016

ENERGY EFFICIENT

- 4x more efficient than traditional electric water heaters
- Allows use of off-peak power

HIGH PERFORMANCE

- Greater first hour rating than all heat pump water heaters
- Faster recovery after hot water draw

SUPERIOR QUALITY

- Corrosion-resistant stainless steel tank
- 3-year labor, 10-year parts heat pump warranty; 15-year tank warranty

EXTENDED OPERATING RANGE

- Hot water production down to -15°F
- 149°F delivered hot water temperature
- No need for a back up electric element in the storage tank

LOW-PROFILE DESIGN

- Whisper-quiet noise level (38dB)
- Slimline heat pump design for a reduced footprint

TANK SIZE OPTIONS

- Two sizes to best fit your hot water needs

43 Gallon Tank
66-Gallon first hour delivery

2 to 4 People

83 Gallon Tank
97-Gallon first hour delivery

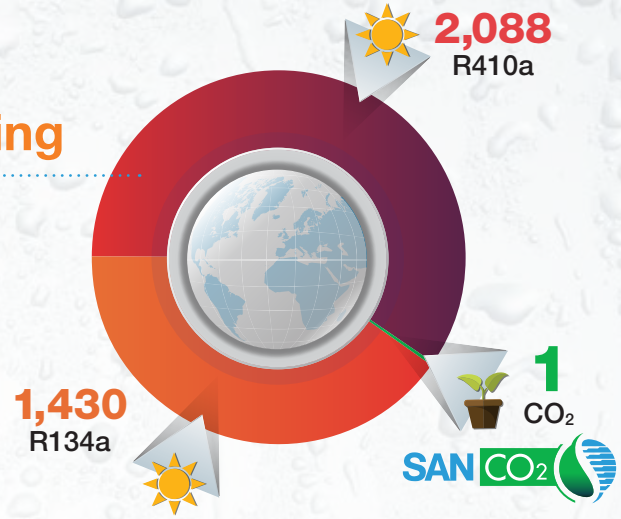
5+ People

Minimal Impact on Global Warming

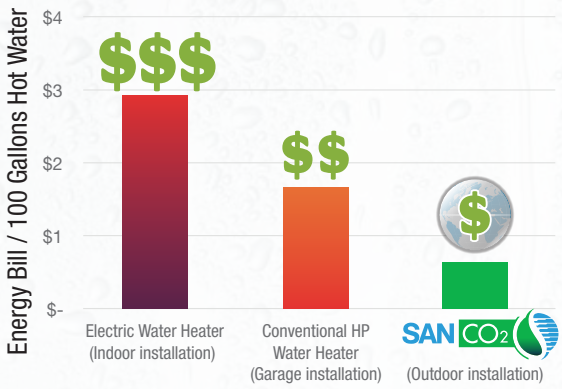
UNIQUE OZONE-FRIENDLY CO_2 REFRIGERANT

Heat pump water heaters commonly use synthetic refrigerants, such as R410A or R134A. Although these refrigerants do not deplete the ozone layer, they can have a significant impact on global warming. The CO_2 refrigerant uniquely used in the SANCO$_2$ system has an extremely low Global Warming Potential*, and CO_2, a natural refrigerant, does not deplete the ozone layer.

*Global Warming Potential (GWP) is a measure of how much a given mass of greenhouse gas is estimated to contribute to global warming. It is a relative scale which compares the gas in question to that of the same mass of carbon dioxide (whose GWP is equal to 1).



Global Warming Potential*
by refrigerant type per 100 years



Energy Bill Comparison
with traditional water heaters

Ultra High Efficiency Reduces Energy Bills

USES OVER 70% LESS ELECTRICITY

The SANCO$_2$ system uses an inverter-type compressor, DC fan motor and pump. Our design minimizes energy consumption, maximizes water-heating capacity, and allows for faster recovery, resulting in significantly lower operating costs than electric-resistance storage water heaters or conventional heat pump water heaters.

- Field testing data in cold climate (Northwest)
- Reference: Washington State University presentation by Ken Eklund available at www.sandenwaterheater.com
- Electricity price: 12.73 cents per kwh (EIA Residential October 2015)

Easy Installation

FLEXIBLE 2-PIECE SYSTEM

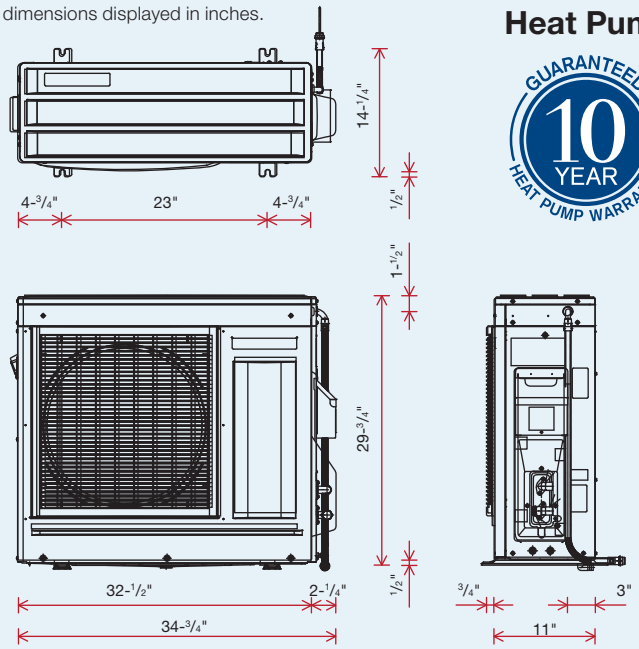
The tank is installed indoors and the heat pump outdoors (up to 25 feet away) with only water piping connections required between the two. This flexible SANCO$_2$ design offers several advantages including maintaining comfortable indoor air temperatures (unlike conventional heat pump water heaters that 'scavenge' heat from the indoor air), along with reducing in-home noise.

SANDEN
Delivering Excellence

SANCO2 Specifications

All dimensions displayed in inches.

Heat Pump

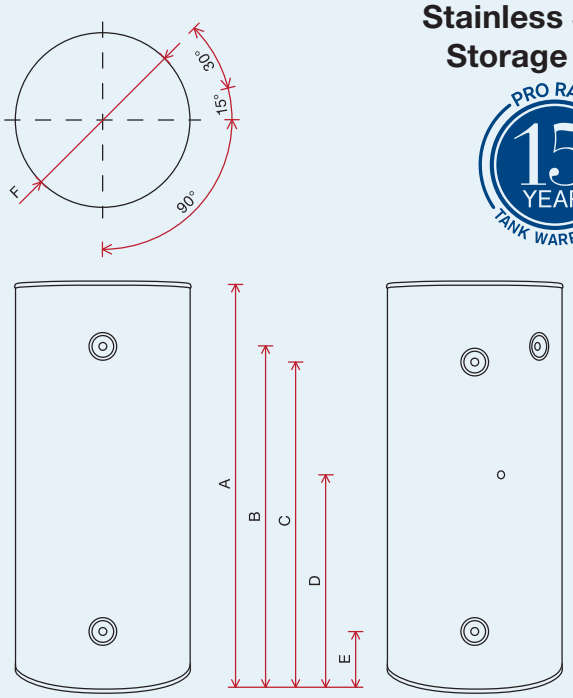


GUARANTEED 10 YEAR HEAT PUMP WARRANTY

Outdoor Unit (Heat Pump) Model No. GUS-A45HPA

Performance	With 43-gal.	With 83-gal.
Energy Factor	3.5	3.4
First Hour Rating	66 gallons	97 gallons
Specifications		
Water Temperature Setting	149°F	
Ambient Air Operating Temperature	-15°F to +110°F	
Heat Pump Capacity	15,400 Btu/h	
Heat Pump Capacity	4.5 kW	
Heat Pump COP	4.5	
Refrigerant Type	R744 (CO_2)	
Compressor Type	Inverter	
Power Voltage	208/230v –1Ph – 60Hz	
Breaker Size	15 Amps	
MCA	7.7 Amps	
Outdoor Operating Noise Level	38 dB	
Weight	123 lbs	
Pipe Size (Tank to Heat Pump)	1/2" (Cold & Hot)	
Max Length Inc Vertical	25 ft	
Max Vertical Separation	10 ft	
Max Water Pressure	95 Psig	

Stainless Steel Storage Tank



PRO RATA 15 YEAR TANK WARRANTY

Tank Model No:		GAUS-160QTA	GAUS-315EQTD
A	Height	47-1/4"	58-5/8"
B	Hot Water Outlet & PR Valve	37-3/8"	49-5/8"
C	Heat Pump Return	37-3/8"	49-5/8"
D	Sensor Port	17-1/8"	37"
E	Cold Water Inlet / Cold Water to HP	8-1/4"	7-7/8"
F	Diameter	22-1/2"	26-3/4"
	Weight (lbs)	88 lbs	154 lbs
	Tank Capacity (gallons)	43 gallons	83 gallons
Connection Sizes			
Cold Water Inlet		3/4" NPT	3/4" NPT
Hot Water Outlet		3/4" NPT	3/4" NPT
Cold Water to Heat Pump		1/2" NPT	1/2" NPT
Hot Water Return from Heat Pump		1/2" NPT	1/2" NPT
Pressure Relief Valve Setting (Psig)		125 Psig	125 Psig

Note: Materials and specifications are subject to change without notice.

REV 0616

INTERTEK ETL LISTED c US

For more information, please call **1-844-SANDCO2** or email **info@sandenwaterheater.com**.

SANDEN
Delivering Excellence

Sanden International (U.S.A.) Inc.
47772 Halyard Drive, Plymouth, MI 48170

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Email: info@sandenwaterheater.com
Website: www.sandenwaterheater.com

Sanden Dealer

KOHLER. Faucets

Coralais®

Kitchen Sink Faucet

K-15175-P

Features

- Metal construction.
- One-piece, self-contained ceramic disc valve allows both volume and temperature control.
- Temperature memory allows faucet to be turned on and off at any temperature setting.
- High-temperature limit setting for added safety.
- Single-control lever handle.
- Ground joint connections.
- 8-1/2" (216 mm) swing spout reach.
- Lower flow aerator options are available (refer to the Kohler Price Book).
- 1.8 gal/min (6.8 l/min) maximum flow rate [max at 60 psi (4.14 bar)].

ADA	CSA B651	OBC

Codes/Standards

ASME A112.18.1/CSA B125.1
NSF 61
NSF 372
All applicable US Federal and State material regulations
DOE - Energy Policy Act 1992
ADA
ICC/ANSI A117.1
CSA B651
OBC

KOHLER® Faucet Lifetime Limited Warranty

See website for detailed warranty information.

Available Color/Finishes

Color tiles intended for reference only.

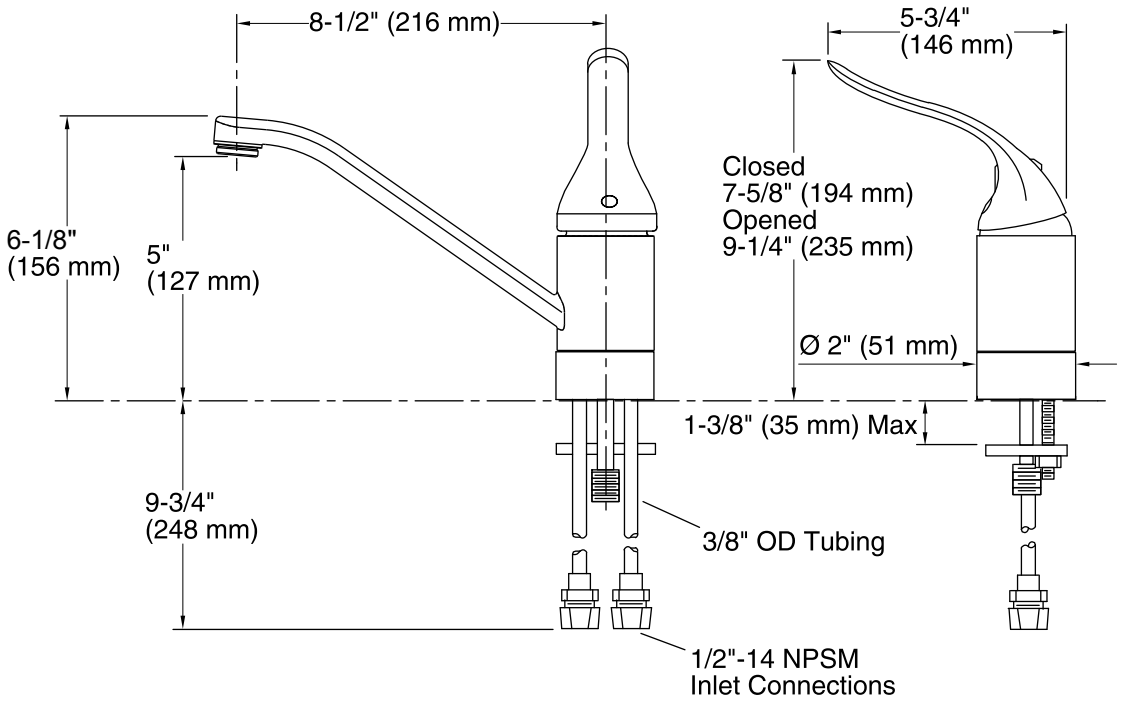
Color	Code	Description
	CP	Polished Chrome

KOHLER. Faucets

Coralais®

Kitchen Sink Faucet

K-15175-P



Technical Information

All product dimensions are nominal.

Spout:

Spout reach:	8-1/2" (216 mm)

Faucet:

Flow rate:	1.8 gal/min (6.8 l/min)
Pressure:	60 psi (4.1 bar)

Notes

Install this product according to the installation guide.

ADA, OBC, CSA B651 compliant when installed to the specific requirements of these regulations.

KOHLER®

Gilford™
Apron-front Kitchen Sink
K-12701

Features
- 24-inch apron sink minimum base cabinet width.
- Vitreous china.
- Wall-mount or top-mount installation.
- Single bowl.
- Two faucet holes on 8" (203 mm) centers.
- Integral apron and backsplash.
- 24" (610 mm) x 22" (559 mm) x 8-5/8" (219 mm)

Recommended Accessories
K-1814-P Wall Mount Sink Brackets
K-9000 P-Trap
63001 Bracket Tie Bar

Optional Accessories
K-6013 Sink Rack
K-8801 Sink Strainer

Codes/Standards
ASME A112.19.2/CSA B45.1

KOHLER® One-Year Limited Warranty
See website for detailed warranty information.

Available Color/Finishes
Color tiles intended for reference only.

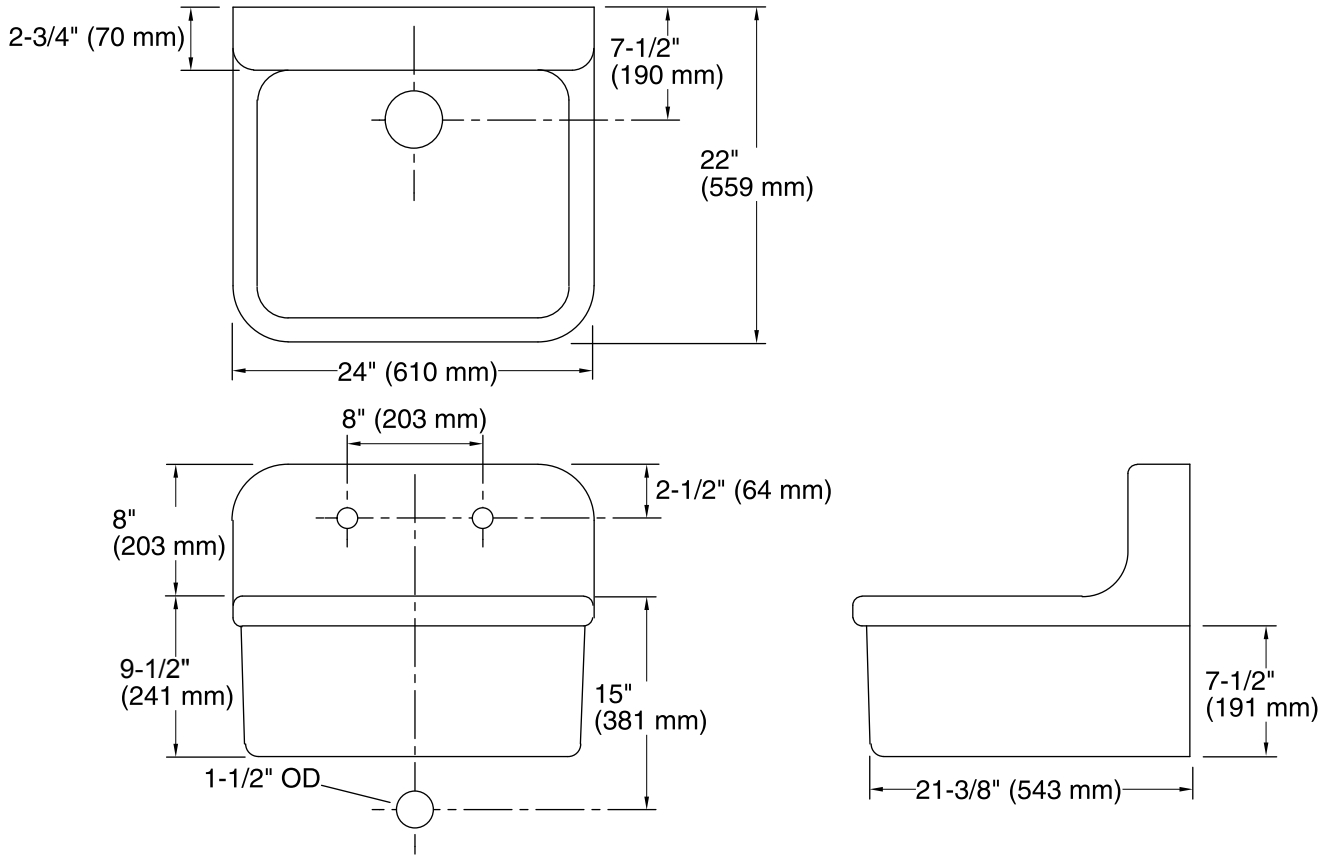
Color	Code	Description
	0	White
	96	Biscuit
	47	Almond
	7	Black Black™

KOHLER®

Gilford™

Apron-front Kitchen Sink

K-12701



Technical Information

All product dimensions are nominal.

Bowl configuration:	Single
Installation:	Wall-mount, Top-mount
Bowl area	Length: 22" (559 mm) Width: 18" (457 mm) Bowl depth: 8-5/8" (219 mm)
Number of deck holes:	2
Faucet hole(s):	1-3/8" (35 mm)
Drain hole:	3-5/8" (92 mm)

Notes

Install this product according to the installation instructions.

PLUMBING

TechData
PRODUCT SPECIFICATION SHEET

viega

PureFlow® MANABLOC® Manifold Control Unit For ViegaPEX™, ViegaPEX™ Ultra and FostaPEX® SDR-9 Cross-linked Polyethylene (PEX)

Scope
This specification designates requirements for the PureFlow MANABLOC Manifold Plumbing Control Unit. The MANABLOC parallel water distribution system supplies water to individual plumbing fixtures through dedicated ports and distribution lines. Each port (outlet) is equipped with a built-in shut-off valve to provide control for each fixture from a central location. The MANABLOC has separate hot and cold water inlets and ports to manage the entire plumbing system. A variety of fitting options are available for the MANABLOC distribution ports, including PEX Compression, Bronze PEX Press, Brass PEX Crimp and PolyAlloy PEX Crimp fittings. These distribution connections come complete with the MANABLOC when ordered. However, supply connections and fixture transition fittings are not included with the unit but are available separately.

Materials
The modular MANABLOC sections are molded from polysulfone (PLS) plastic. This material is used extensively in the medical industry and is highly resistant to hot water, chlorine and other chemicals typically found in potable water systems. The other components making up the MANABLOC consist of corrosion-resistant metals and engineered plastics that have been chosen specifically for each purpose. The stiffener used in the compression port fitting assembly is manufactured from 304 stainless steel.

Marking and Certification
MANABLOC units are marked with the product name, unit part number, material designation, production date and marks of third-party certifications by NSF International (NSF-pw) to ASTM F877 and ANSI/NSF standards 14 and 61, CSA B137.5 Warnock Hersey, and are listed with IAPMO as meeting the requirements of the Uniform Plumbing Code.

Recommended Uses
The MANABLOC is recommended for use in hot and cold potable water distribution systems in single and multifamily dwellings, as well as multiple-unit structures (apartments, condos, hotels, motels, etc.). Maximum pressure/temperature rating is 100 psi @ 180°F. The MANABLOC is not to be used directly in line with hot water domestic recirculation loops. PureFlow MANABLOC system components are not interchangeable with components and tubing from other suppliers. For information on other hot and cold applications not listed here, consult with your Viega representative.

Handling and Installation
The MANABLOC must be protected from UV exposure and petroleum products that can damage them. Use of these materials in hot and cold water distribution systems must be in accordance with good plumbing practices, applicable code requirements, and current installation practices available from Viega. Contact a Viega representative or the applicable code enforcement bureau for information about approvals for specific applications.

Capacities and K-Factor

Specifications	English Units	SI
Main Waterway (each side)	1-1/4"	31.8mm
Main Inlet/Outlet Connection	1" Male NPSM	–
Fixture Ports	3/8" CTS and 1/2" CTS	9.5mm and 12.7mm
Fixture Port Rating (each)	3/8" - 2.5 GPM	3/8" - 9.5 LPM
(@ 8 FPS tubing velocity)	1/2" - 4 GPM	1/2" - 15.1 LPM
Fixture Port K-Factor	3/8" - .35	3/8" - 1.66 x 10^{-3}
	1/2" - .21	1/2" - 9.997 x 10^{-4}
	(PSI=KxGPM^2)	(BAR=KxLPM^2)
Main Bore Flow Capacity (each side) (2006 IPC Table 604.10.1)	31 GPM	117.3 LPM
Main Bore Through Feed K Factor	0.012	56.98x10^{-6}
(36 Ports with "Y" Block)	(PSI=KxGPM^2)	(BAR=KxLPM^2)
WSFU Capacity (each side) (2006 IPC, table E103.3)	60	–

VIEGA
301 N. Main, 9th Floor
Wichita, KS 67202
Phone: 1-800-976-9819
Fax: 1-800-976-9817

service@viega.com
www.viega.com

TechData
PRODUCT SPECIFICATION SHEET

PLUMBING

viega

Quality Assurance
When the product is marked with the ASTM F877 designation, it affirms that all MANABLOC manifold control units are factory-assembled and pretested prior to delivery to the field. Viega utilizes protective packaging to reduce risk of damage during shipping and storage. MANABLOC manifolds are not intended to be fabricated or disassembled in the field. MANABLOC manifolds are intended for potable water use only.

Certification
NSF-pw - NSF International Performance and Health Effects (Standards 14 & 61)

- **IAPMO Certified**

- **Intertek Testing Services** (Warnock Hersey) - certification to CSA B137.5

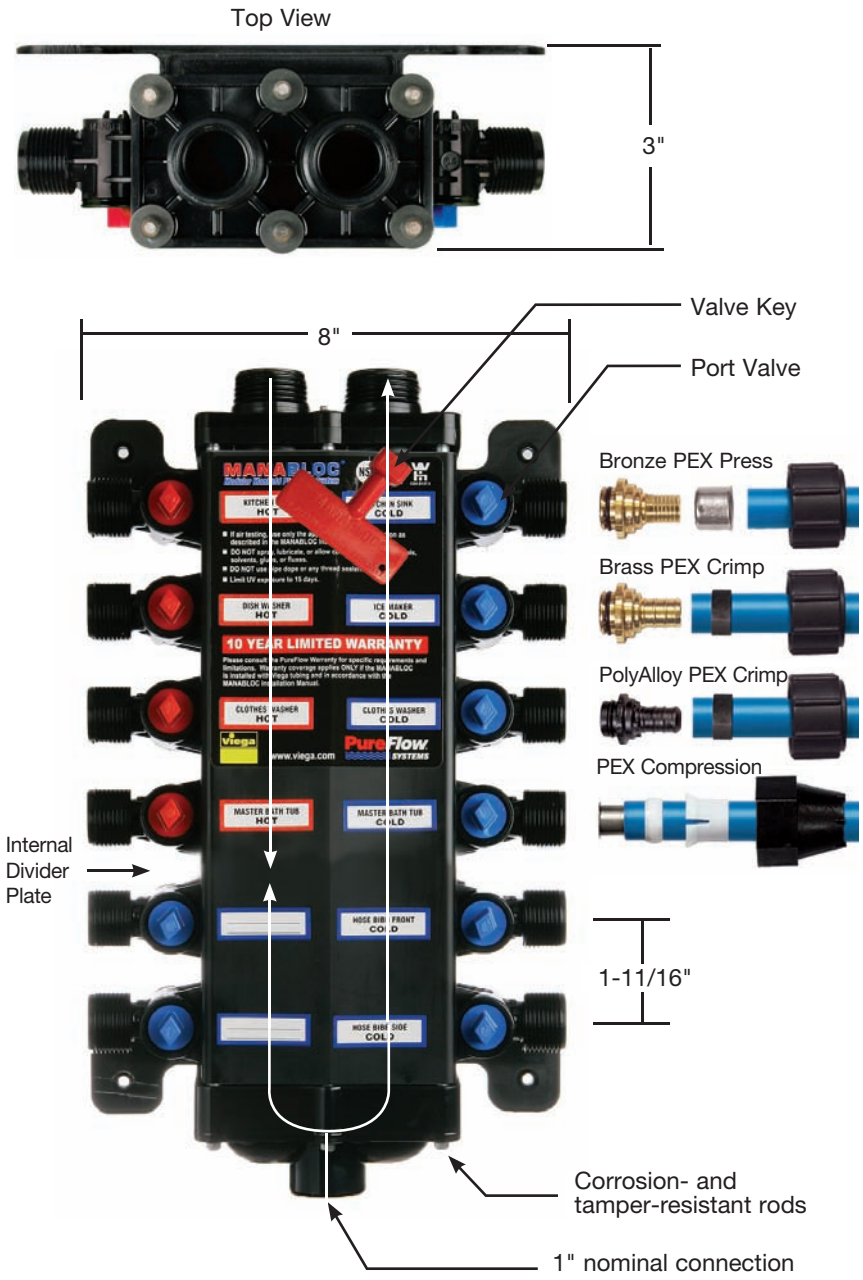
MANABLOC Dimensions

Total Ports	Length
14	15 - 15/16"
18	19 - 3/8"
24	24 - 3/8"
30	29 - 1/2"
36	34 - 3/8"

Dimensions reflect stock MANABLOC sizes.

MANABLOC Pressure Drop Table
Expressed as PSI Drop Through Port

Port Size	Rated Flow	PSI Drop
3/8"	2.5 gpm	2 psi
1/2"	4 gpm	3.4 psi



VIEGA
301 N. Main, 9th Floor
Wichita, KS 67202
Phone: 1-800-976-9819
Fax: 1-800-976-9817

service@viega.com
www.viega.com

SCALA2

TM06 4538 2515

General description

Grundfos SCALA2 is a fully integrated, self-priming, compact all-in-one water pump for pressure boosting in domestic applications.

SCALA2 incorporates integrated speed control enabling perfect water pressure at the taps, meaning that the pump performance will increase with increasing demand.

SCALA2 can be installed in three easy steps:

1. Connect the pipes.
2. Prime the pump.
3. Plug the pump into the power outlet and the pump will start.

Grundfos SCALA2 has all the components necessary to ensure a comfortable pressure:

- intelligent controller
- integrated speed-controlled drive
- integrated tank
- integrated sensors
- integrated non-return valve.

Features

- Adjustable constant pressure
- Low noise, < 47 dB(A) (in typical use)
- Compact
- Robust and reliable
- Easy installation and self-priming
- Dry-running protection

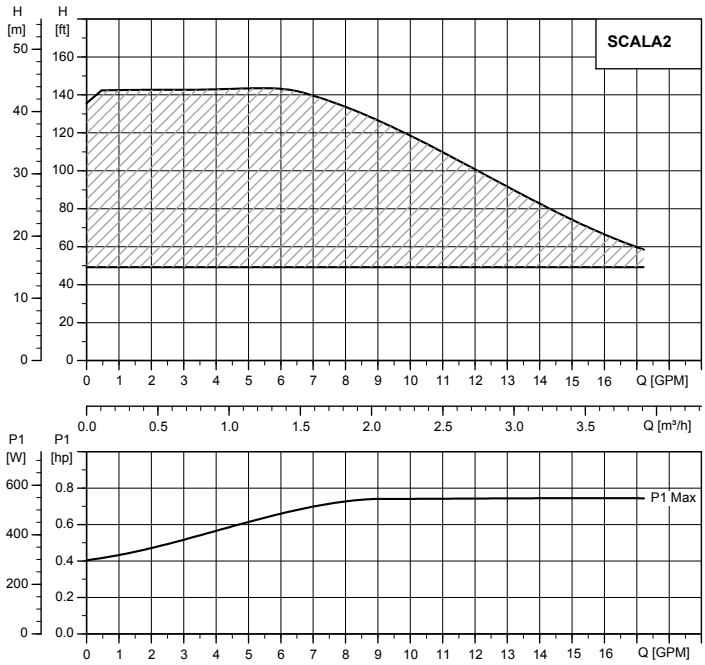
Applications

Grundfos SCALA2 is designed for pressure boosting in one-family houses and apartments.
We recommend SCALA2 for the following applications:

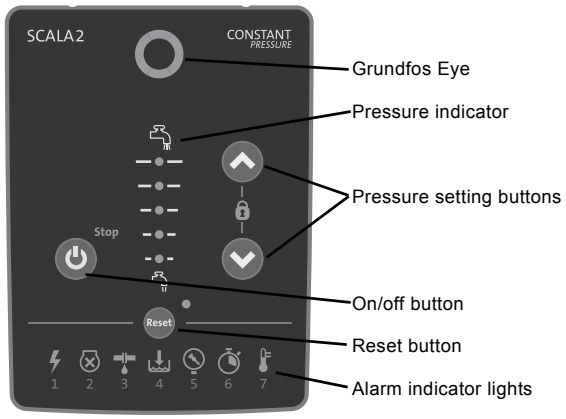
- pressure boosting of city mains water
- pressure boosting of water from roof tank
- pressure boosting of water from break tank
- pressure boosting of water from ground tank
- water supply from shallow wells (< 26 1/4 ft / 8 m).

Performance

SCALA2 is suitable for houses with up to three floors and eight tapping points.
Accurate sizing of the pump can be based on the pump curve below and local norms and standards.

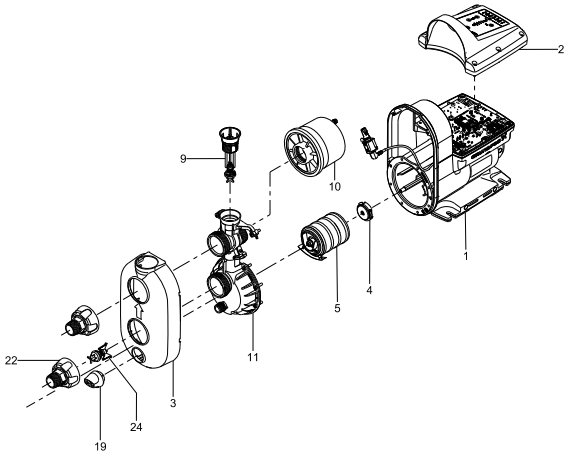


Control panel



TM06 3301 5114

Exploded view

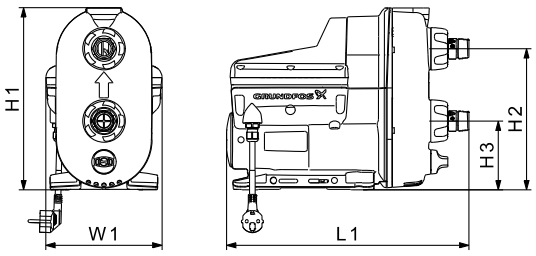


TM06 3306 5114

Materials

Pos.	Component name	Material
1	Combined pump and stator housing	Aluminium, Composite and EN 1.4301 / AISI 304
2	Control box cover	Composite
3	Pump cover	Composite
4	Shaft seal	Carbon/Ceramic
5	Chamber stack (four stages)	Composite
9	Non-return valve, outlet	Composite
10	Tank complete	Composite, Butyl and EN 1.4301/AISI 304
11	Connection part	Composite
19	Drain plug	Composite
22	Thread R 1" / NPT 1"	Composite
24	Non-return valve, inlet	Composite

Dimensional sketch



TM06 3305 5114

Type	H1 [mm] [inch]	H2 [mm] [inch]	H3 [mm] [inch]	W1 [mm] [inch]	L1 [mm] [inch]	Weight [kg] [lbs]
SCALA2	302 11.9	234 9.2	114 4.5	193 7.6	403 15.9	10 22

Thermal protection

SCALA2 incorporates current- and temperature-dependent motor protection.

Technical data

Type	Voltage [V] and Frequency [Hz]	$I_{max.}$ [A] and P1 [W]	Thread	Plug	Product number
SCALA2	1 x 208-230 60	2.3 - 2.8 550	NPT 1"	NEMA 6-15P	98562817
SCALA2	1 x 115 60	5 - 5.7 560		IEC type B, NEMA 5-15P	98562818

Operating conditions

Max. ambient temperature:	113°F (45°C) 131°F (55°C) for 1 x 200-240 V, 50 Hz models.
Max. liquid temperature:	113°F (45°C)
Max. system pressure:	145 PSI (10 bar)
Max. inlet pressure:	87 PSI (6 bar)
Max. head:	148 ft (45 m)
Enclosure rating:	NEMA 3
Pumped liquid:	Clean, fresh water and chlorinated water < 300 ppm.

Markings and approvals

Safety approvals

Drinking water approvals

CLASSIFIED UL WATER QUALITY

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Subject to alterations.

GRUNDFOS North America
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Downers Grove, IL 60515
www.grundfos.us
www.grundfos.ca
www.grundfos.mx

KOHLER. Faucets

Contemporary Round
Rain Showerhead
K-45201

Features
- Superior spray performance with Katalyst air-induction spray technology delivers a luxurious and drenching “rain” experience.
- Optimized sprayface creates a denser uniform spray pattern for consistent coverage and feeling of warmth.
- MasterClean™ sprayface with translucent nozzles is easy to clean.
- 2.0 gpm (gallons per minute) flow rate.
- 1/2-inch NPT connection.
- Requires K-7392, K-7394, or K-7396 showerarm (sold separately).

Material
- Solid-brass construction.
- KOHLER finishes resist corrosion and tarnishing.

Installation
- Ceiling-mount

Optional Accessories
7392
7394
K-7396
10124

Codes/Standards
ASME A112.18.1/CSA B125.1
DOE - Energy Policy Act 1992

Kohler Faucet Lifetime Limited Warranty
See website for detailed warranty information.

Available Color/Finishes
Color tiles intended for reference only.

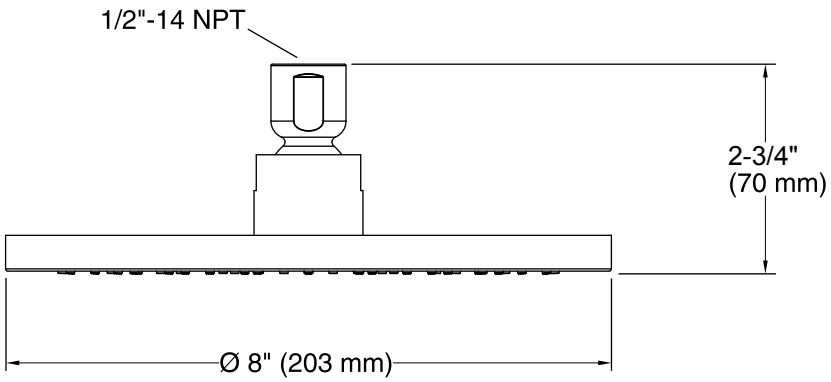
Color	Code	Description
	CP	Polished Chrome
	BN	Vibrant® Brushed Nickel
	TT	Titanium

KOHLER. Faucets

Contemporary Round

Rain Showerhead

K-45201



Technical Information

All product dimensions are nominal.

Showerhead:

Rated maximum flow: 2 gal/min (7.6 l/min)

Notes

Install this product according to the installation guide.

NOTICE: To ensure your valve will provide safety at the lowest flow rates, choose an automatic compensating valve with the appropriate minimum flow rating. For a showerhead rated at 2.0 gal/min (7.6 l/min) maximum, use with an automatic compensating valve rated at 1.6 gal/min (6.1 l/min) or less.

SECTION 23 – HEATING VENTILATION & AIR CONDITIONING

231000 – INSTRUMENTS

Part 1 – GENERAL

1.1 SCOPE

Used to measure various physical parameters for recording by digital systems and feedback for control systems.

1.2 REQUIREMENTS

A. Requirements for measurement range and sensitivity vary from sensor to sensor and from location to location.
B. Provide hardwired data and power connections to all instrumentation that requires it. Connections shall be shown on the appropriate (telecommunications) sheets of the Drawings.

Part 2 – PRODUCTS

2.1 THERMOSTAT

A. Acceptable thermostat products
    1. NEST
    2. Website: https://store.nest.com/product/thermostat?selectedVariantId=T3007ES
    3. Assembled mass: 8.6 oz (243.7 g)
    4. Assembled diameter: 3.3 in (8.4 cm)
    5. Assembled height: 1.21 in (3.08 cm)
    6. Wireless: Wi-Fi 802.11b/g/n @ 2.4GHz, 5GHz
    7. Battery: Built-in rechargeable lithium-ion battery
        i. Power consumption: Less than 1 kWh/month
    8. Connectivity: Nest app on phone or tablet with iOS 8 or later, or Android 4.1 or later
    9. Warranty: 2-year limited

2.2 TEMPERATURE SENSORS

2.3 HUMIDITY SENSORS

2.4 MOTION DETECTORS – NEAR FIELD

2.5 MOTION DETECTORS – FAR-FIELD

2.6 AMBIENT LIGHT

2.7 ELECTRICAL CURRENT SENSORS

2.8 POWER CONSUMPTION SENSORS

2.9 RESIDENTIAL WEATHER STATION

A. Provide accurate real-time data for the specific location of the house. Wireless all-in-one integrated sensor array measures wind speed, wind direction, temperature, humidity, wind speed, wind direction, rainfall, UV and solar radiation.
B. Any portion of the weather station which violates the prescribed solar envelope of the house shall have a form factor which does not interfere with the operation or performance of neighboring houses. Installation of the weather station is subject to approval by the Solar Decathlon Competition Organizers.
C. Acceptable manufacturer and products:

1. Ambient Weather WS-1400-IP
    a. Manufacturer: Ambient Weather
    b. Website: http://www.ambientweather.com/amws1400ip.html
    c. Wireless: transmits at 915MHz to ObserverIP
    d. Outdoor Temperature Sensor Range: -40 to 149 °F
    e. Outdoor Humidity Accuracy: ± 5%
    f. Solar Radiation Accuracy: ± 15%
    g. UV Accuracy: ± 1
    h. Wind Direction Accuracy: ± 1º
    i. Wind Speed Accuracy: ± 2.2 mph or 10% (whichever is greater)
    j. Barometric Pressure Accuracy: ± 0.08 inHg (within range of 27.13 to 32.50 inHg)
    k. Dimensions (LxWxH): 14” x 6” x 12”
    l. Weight: 4 lbs
    m. Location: Wide open area either on the roof or ground (Outside)
    n. Warranty: 1 years
2. Davis Instruments 6250 Vantage Vue Wireless Weather Station
    a. Manufacturer: Davis Instruments
    b. Website: http://www.davisnet.com/solution/vantage-vue/
    c. Wireless: transmits to LCD console via RF (902 to 928 MHz), max range 1000 ft
    d. Outdoor Temperature Sensor Range: -40 to 150 °F
    e. Outdoor Humidity Range: 0-100%
    f. Wind Speed: 2-180 mph
    g. Rainfall accuracy: ± .01"
    h. Barometer: Arrow indicating increase/decrease
    i. Dimensions (in): 14 x 9 x 6
    j. Weight: 7 lbs
    k. Location: Wide open area either on the roof or ground (Outside)
    l. Warranty: 1 year

END SECTION 231000

SECTION 232000 - DAMPERS

Part 1 – GENERAL

1.1 SCOPE

Back-Draft Dampers are used with the intake or exhaust duct systems to prevent infiltration of outside air when the ventilation system is not active.

Control Dampers are used to activate or deactivate specific duct paths in the system.

Part 2 – PRODUCTS

2.1 Back-Draft Prevent Dampers

A. Acceptable damper products

1. Product: Galvanized Back Draft Prevention Damper
    a. Manufacturer: Speedi-Products
    b. Website: http://www.homedepot.com/p/Speedi-Products-4-in-Galvanized-Back-Draft-Prevention-Damper-AC-BD-04/202907123
    c. Size: 4 inch diameter; 30 gauge
    d. Material: Steel
    e. Warranty: 1 year

Part 3 – EXECUTION

1. Seal joints with approved duct mastic sealants
2. Insulate ductwork for improved energy efficiency and comfort
3. Consult local building codes for approved installation practices

END SECTION 232000

SECTION 233000 – ENERGY RECOVERY VENTILATOR

Part 1 - GENERAL

1.1 SCOPE

Energy Recovery Ventilator is uses to provide a continuous flow of fresh outdoor air to the house interior in a pressure balanced system (neither pressurizing nor depressurizing the house). This is required by ASHRAE 62.2 because most high-efficiency modern homes are tightly sealed against air infiltration. ERVs provide transfer of sensible and latent heat (humidity) between incoming fresh and outgoing stale air streams, enhancing the energy efficiency of the system overall.

1.2 REQUIREMENTS

A. Applicable Standards
    1. ASHRAE 62.2
    2. ASHRAE 90.1
    3. Interior CO_2 levels shall not exceed 1000 PPM.

B. Provide minimum of 0.5 ACH fresh outside air (based on 4 occupants and 1000 square foot home size for).

C. Provide booster mode (additional capacity) to handle maximum anticipated CO_2 load (based on 12 people).

Part 2 – PRODUCTS

1. Acceptable products for Energy Recovery Ventilator (ERV)
    1. Product: ComfoAir 350
        a. Manufacturer: Zehnder
        b. Filters: class G4 for general and F7 for pollen
        c. DC Motors
        d. Dimensions: (H x W x D) 31.5" x 24.6" x 22.5"
        e. Thermal output: up to 95%

Part 3 – EXECUTION

A. Maintenance
    1. Regular replacement and cleaning of the filter in front of the unit
    2. The heat exchanger should be cleaned every 3-4 years depending on how dirty the outside air is
    3. Please see the unit manual for additional servicing tasks.

END SECTION 233000

SECTION 234000 – COMPRESSOR / CONDENSER UNIT

Part 1 – GENERAL

1.1 SCOPE

The compressor / condenser unit is located outside the thermal envelope of the house. Its function is to reject heat from the interior (cooling mode) or absorb heat from the exterior (heating mode).

1.2 REQUIREMENTS

A. Applicable Standards
    1. ASHRAE 90.1
B. Installed unit shall be UL Listed. Any modifications to the unit for increased efficiency shall be thoroughly tested and the results provided to the Solar Decathlon Competition Organizers prior to acceptance of the design.
C. Capacity of the unit shall be determined according to the total system heat and cooling loads as determined by energy modeling.

Part 2 – PRODUCTS

2.1 VRF CONDENSER

A. Acceptable Products
    1. VRF Mini-Split Condenser
        a. Manufacturer: LG
        b. Model: LMU30CHV
        c. Website: http://www.totalhomesupply.com/30000-btu-22-seer-quad-zone-multi-f-mini-split-air-conditioner/p/LG-LMU30CHV
        d. Dimensions (HxWxD): 32.8” x 37.4” x 15.7”

Part 3 - EXECUTION

A. If the outdoor unit is installed on a roof structure be sure to level the unit. Ensure the roof structure and anchoring method are adequate for the unit location.
B. Consult local codes regarding rooftop mounting.
C. Unit shall be kept free of snow.
D. Unit shall not be installed in areas where corrosive gases, such as acid or alkaline gas, are produced.
E. Unit shall not be installed where it could be exposed directly to sea winds.

END SECTION 234000

SECTION 236000 – INTERIOR HEAT PUMP UNITS

Part 1 – GENERAL

1.1 SCOPE

Interior heat pump units provide heated or cooled air (heating and cooling modes respectively). In cooling mode, these units also dehumidify the air. Air is drawn from the space in which the unit is located, heated or cooled / dehumidified and recirculated into the space.

Interior units are generally installed high on the wall or in the ceiling (different products for each application). A separate unit is generally installed in each living space (living room, bedroom, etc.) and are controlled separately by proprietary remote control systems.

1.2 REQUIREMENTS

A. Applicable Standards
    1. ASHRAE 90.1
B. Capacity of each unit is selected from range of products commercially available, and based on enegy analysis of the house and space served
C. Minimum Seasonal Energy Efficiency Rating (SEER) : 22
D. Minimum Coefficient of Performance (COP) : 4.0

Part 2 – PRODUCTS

2.1 WALL-MOUNTED UNIT

A. Acceptable Products:
    1. Mini-split Wall-mounted Unit
        a. Manufacturer: LG
        b. Model:
        c. Web Link http://www.totalhomesupply.com/7000-btu-standard-indoor-wall-unit-heat-pump/p/LG
        d. Height 8.2" Width 35.6" Depth 11.4"

2.2 CEILING MOUNTED UNIT

A. Acceptable Products
    1. Mini-Split Ceiling Mounted Unit
        a. Manufacturer LG
        b. Model LMN096HVT
        c. Web Link http://www.totalhomesupply.com/7000-btu-standard-indoor-wall-unit-heat-pump/p/LG-
        d. Dimensions L
            i. Height 8.2"
            ii. Width 35.6"
            iii. Depth 11.4"

Part 3 - EXECUTION

A. Indoor units with product-specific mounting kits. Route the indoor refrigerant lines to the required piping hole position and connect to exterior condensing unit. Route the condensate drain line to a convenient exterior location and discharge to ground. No air ducts are required for this unit.

END SECTION 236000

SECTION 235000 – HUMIDIFIER

PART 1 – General

1.1 SCOPE

Humidifiers are designed to regulate the relative humidity of an indoor area by evaporating water particles into the air. This project includes a central humidifier located in the mechanical space.

1.2 PERFORMANCE REQUIREMENTS

A. Shall be capable of maintaining relative humidity level of the house within healthy range (40-60%)
B. Shall not pose a hazard to occupants of the house (i.e. scalding)

1.3 SUBMITTALS

A. The Contractor shall provide the Architect with technical product performance details and installation instructions sufficient to verify the performance requirements cited above.
B. The Contractor shall provide the Owner with a warranty certificate covering materials AND installation of the Insulation.

Part 2 - PRODUCTS

2.1 BY-PASS DRUM HUMIDIFIER

A. Acceptable Manufacturers and Products
    1. HE120 By-pass Drum Humidifier
        a. Manufacturer: Honeywell
        b. Width: 12-3/8“
        c. Height: 10-15/16”
        d. Depth: 11-11/16”
B. Alternative products may be proposed by the Contractor as options for pricing. If an alternative product is proposed, Contractor shall provide performance, cost, installation and other product information as requested by the Architect. All material substitutions shall be subject to approval by the Project Architect & Project Engineer.

2.2 ACCESSORIES

A. Included Installation kit
B. Replacement evaporation pads

3. EXECUTION

3.1 INSTALLATION

A. All cuts should be done using the provided template and in a place along ventilation duct as recommended by the manufacturer.
B. Workers shall wear protective equipment as recommended by the materials manufacturer when cutting or finishing the materials.

3.2 FINISHING

A. The end users shall refer to the manual provided by the manufacturer for the recommended humidity setting based on outdoor temperature, unless a more accurate humidistat is being used.
B. The end users shall perform annual maintenance as described by manufacturer in product manual.

END SECTION 235000

SECTION 237000 – ELECTRIC RADIANT HEATING

Part 1 – GENERAL

1.1 SCOPE

Electric radiant heat is commonly installed in floors and / or walls of kitchen and / or bathroom spaces. Electric resistance wires with a suitable protective coating (UL listed commercially available product) are commonly embedded in the layer of thin-set mortar used to adhere tile to the surface.

In this application, electric radiant heating is reserved for the bathroom floor only. Refer to Drawings.

1,2 REQUIREMENTS

A. Products and materials must be UL LIsted
B. Products and materials shall be rated for use under floor tiles, including in wet-service areas such as showers.

Part 2 PRODUCTS

A. Acceptable Products
    1. Schluter Ditra Heat
        a. Website: http://www.schluter.com/schluter-us/en_US/Floor-Warming/Schluter®-DITRA-HEAT-E-KIT/p/DITRA_HEAT-E-KIT.

Part 3 - EXECUTION

A. Install over wood, concrete or composite substrate, in thin-set mortar under ceramic tiles.
B. Install in conjunction with suitable waterproof membranes and crack prevention membranes.
C. Requires electrical hook up (hardwired)
D. Requires a thermostat (programmable – included in the kit)

END SECTION 237000

END SECTION 23

Ventilation unit

Zehnder ComfoAir 350

Use

The ComfoAir (CA) 350 ventilation unit was specially developed for use in residential and commercial buildings with high ventilation demand. It combines maximum comfort, simple operation and high efficiency with flexible integration into building services. The CA 350 ventilation unit moves 218 cfm of air at an external pressure of 0.80" wc.

ComfoAir 350

Efficiency

The integrated cross-counterflow heat exchanger achieves efficiencies of more than 90%. For user comfort this means no unpleasant draft effects, because the supply air is heated almost to room temperature even when external temperatures are around freezing.

Fans

The two supply and extract fans are driven by efficient DC motors. Differential pressures in the supply and extract air distribution systems can be compensated thanks to direct control. The especially quiet fans can be adjusted to the required volumetric flow in 1% increments. The air volumes of the selectable stages can be set to between 29 cfm and 218 cfm on the Zehnder CA 350.

Filters

The CA 350 ventilation unit is equipped with a class G4 filter (MERV 7/8).
An optional F7 pollen filter (MERV 13) is available for outside air.

Installation

The Zehnder CA 350 ventilation unit is characterised by its extra compact design. All air connections are located on the top. The air connections provide all the possible flexible connection options. The insulating, sound-absorbing pipe connections can be rotated to suit your needs, thus simplify installation of the ventilation tubes to the unit and simultaneously offer acoustic decoupling from the air distribution system.

Operation

The ventilation unit is controlled using a control unit commonly employed in living areas. The ComfoAir 350 is controlled by the CC-Ease control unit as standard.

CC-Ease remote control

Servicing

Servicing of the Zehnder ComfoAir CA 350 ventilation unit is limited to regular replacement and cleaning of the filter integrated in the front of the unit. The heat exchanger should be cleaned every 3-4 years depending on how dirty the outside air is. Please see the unit manual for additional servicing tasks.

Remote-controlled unit

Frost protection

If the ventilation unit is operated without a geothermal heat exchanger, the condensate in the extract air may freeze. The frost protection setting prevents this by variably reducing the supply air volume. Conventional units must reduce the supply air volume by an entire step from 26.6 °F or switch off the supply air completely. Optional electric preheater prevents the heat exchanger freezing even at the lowest temperatures.

Bypass

During summer nights and in the transition periods with strong sunshine, the house often becomes too warm, while the outside air remains pleasantly cool. In such cases heat removal by what is known as *free cooling* helps: The cooler outside air is fed to the rooms in the living area, bypassing the heat recovery system. The Zehnder CA 350 ventilation unit is equipped with an automatic bypass for just this purpose. The bypass is a standard component and takes 100% of the extract air past the heat exchanger.

Options

- **Moisture recovery with the Zehnder enthalpy exchanger**
  The Zehnder enthalpy plate exchanger provides a hygienic ideal solution for excessively dry air in winter. Not only heat, but also up to 65% of the moisture contained in the extract air is transferred from the extracted air to the supply air. Supply and extract air flows are kept completely separate so there is no transfer of odors or bacteria.

- **Pollen filter**
  A large pollen filter installed in the supply air line keeps the inside of the house pollen-free and reduces the particulate, spore and germ load: breathe freely in times of increasing allergies.

- **Zehnder ComfoFond-L brine geothermal heat exchanger**
  The Zehnder ComfoFond-L utilises the ground as passive storage via a brine loop. In summer, it transfers heat to the ground and in winter it withdraws heat again and uses it to preheat the supply air. A control unit is available as both an external and an internal controller.

- **Electric air heater and hot water postheater**
  An external electric air heater or hot water postheater guarantees a defined supply air temperature, even in extreme climatic conditions and on systems without a geothermal heat exchanger. A control unit is available as both an external and an internal controller.

- **Wireless remote control**
  More installation freedom. With the Zehnder wireless remote control the ventilation unit can be wirelessly controlled from several switches distributed throughout the house or flat.

Benefits

- Comfort ventilation up to 218 cfm
- Heat recovery with an efficiency of more than 90%
- Moisture recovery with the Zehnder enthalpy exchanger (optional)
- Low power consumption thanks to DC motors
- Automatic 100% summer bypass
- Frost protection function: Efficient even at low temperatures
- Quick, safe installation and servicing
- Simple operation
- Integrated preheater and humidity control (optional)
- Wireless remote control and filter replacement indicator
- Geothermal heat exchanger control
- Electrical and hot water postheater integration possible
- Small minimum air volume, specially designed for single family houses
- Digital Ease control unit
- CO_2 control (optional)

Article numbers

L = supply air left, R = supply air right, V = preheater
Luxe = advanced controls

Product	Article number	Reference number
ComfoAir 350 L Luxe	471 239 520	9244
ComfoAir 350 R Luxe	471 239 525	9245
ComfoAir 350 VL Luxe	471 239 540	9304
ComfoAir 350 VR Luxe	471 239 545	9452
ComfoAir 350 L Luxe Enthalpy	471 239 530	9246
ComfoAir 350 R Luxe Enthalpy	471 239 535	9247
ComfoAir 350 VL Luxe Enthalpy	471 238 540	9428
ComfoAir 350 VR Luxe Enthalpy	471 238 545	9429

Accessories		
ComfoControl CC-Ease control unit	655 010 100	9257
Housing for surface mounting for CC-Ease control unit	659 000 250	9259
Wireless remote control	655 000 755	9238
ComfoAir 550 assembly base	642 300 140	9287

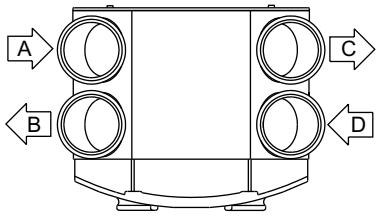
Filters		
Filter for ComfoAir 350 G4 (MERV 7/8)	006 040 201	9240
Filter for ComfoAir 350 F7 (MERV 13)	006 040 211	9241

Description

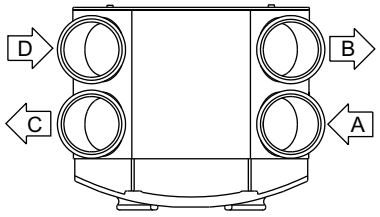
Comfort ventilation unit Zehnder ComfoAir 350
with plastic cross-counterflow heat exchanger, thermal efficiency of more than 90%, direct control in 1% increments variable supply and extract fans with EC direct current motors, automatically controlled, integrated 100% bypass, housing with rotating insulated pipe connections, maximum air volume 218 cfm at 0.4 in. w.c., H x W x D: 31.5" x 24.6" x 22.5", version left/right unit with preheater, CO_2 control, humidity, timer, postheater and geothermal heat exchanger possible.

Air directions

The figures on the right show the air directions (top view).
A = extract air
B = supply air
C = exhaust air
D = outside air



Version supply air left (L)



Version supply air right (R)

Ventilation unit

Zehnder ComfoAir 350

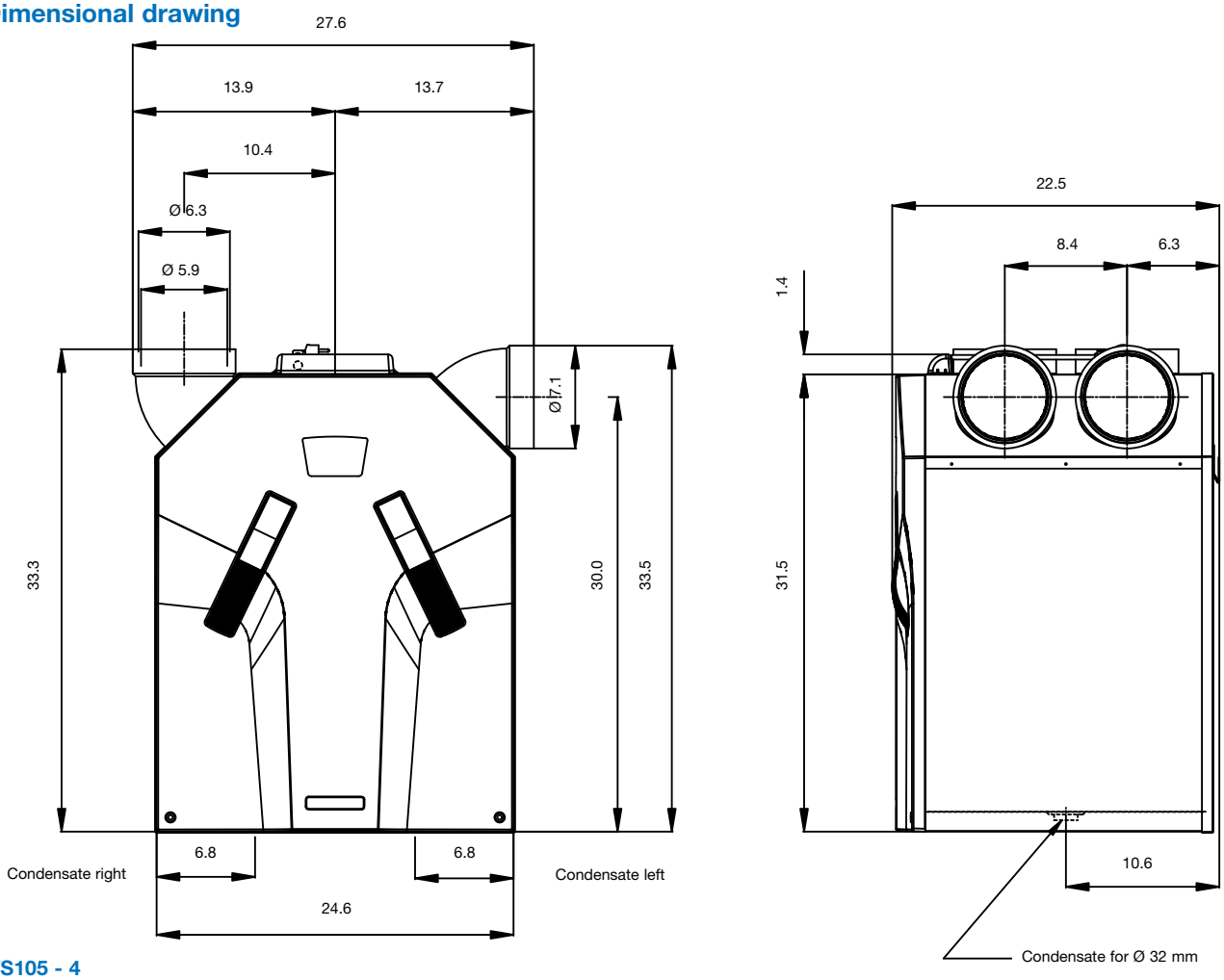
Technical specifications

Dimensions	
Height (")	31.5
Overall height (")	33.9
Width (")	24.6
Overall width (")	27.6
Depth (")	22.5
Electrical connection	230 V, 50-60 Hz

Specification

HR exchanger material	Polystyrene
Interior lining material	(E) PP / PA / PA
Thermal output	Up to 95 %
Weight	77.2 lb

Dimensional drawing



Certificates

- General Building Regulations [Germany] approval applied for
- HVI listed
- Passive House Certified

Equipment

Equipment	CA 350 Luxe	CA 350 V Luxe
Bypass	x	x
Preheater		x
Digital clock with weekly programme	x	x
Right-handed version	x	x
Pipe connections DN 150/160	x	x
Rotating pipe connections	x	x
Geothermal heat exchanger controller, NE, filter	x	x
Ready to plug in design	x	x
CC-Ease control unit	x	x
Wireless remote control unit (optional)	x	x

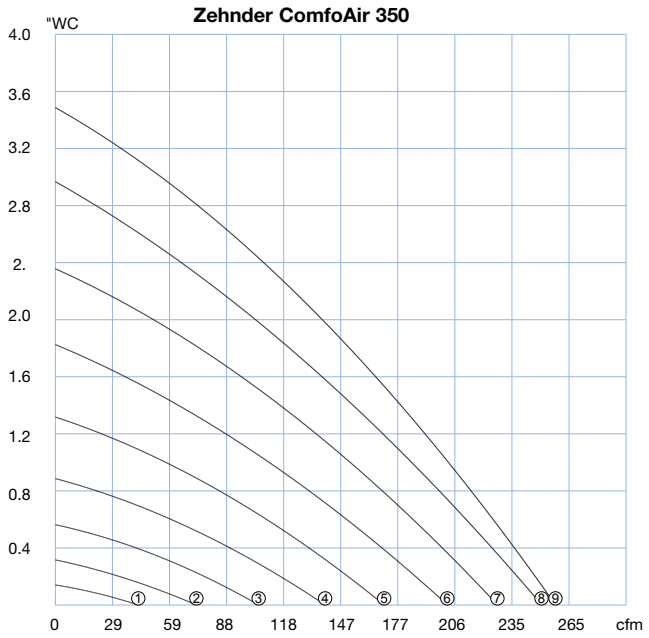
Function

Frost protection function/automatic defrost
Supply and extract air separate and infinitely variably programmable
Switch on and off delay for bathroom switch
Adjustable comfort temperature
Controller for geothermal heat exchanger
Controller for electrical air heater
Controller for hot water postheater
Fault indicator interface
Filter replacement indicator
Supply air + extract air can be switched off
Fast heat-up (using postheater)
Fireplace circuit

Ventilation unit

Zehnder ComfoAir 350

Switch setting Factory setting (speed)	Speed %	Air volume Qv cfm	Pressure Δ P st "WC	Power consumption W	Current consumption A	COS ϕ (-)	Acoustic performance Extract air dB(A)	 Supply air dB(A)	Weight lb
ComfoAir 350									
(1)	15	24	0.016	10	0.08	0.50	34	32	77.2
(2)	30	59	0.080	17	0.13	0.57	37	45	
(3)	40	82	0.161	27	0.21	0.56	43	53	
(4)	50	106	0.261	44	0.35	0.55	47	59	
(5)	60	132	0.402	70	0.55	0.55	52	64	
(6)	70	153	0.562	105	0.81	0.56	54	68	
(7)	80	177	0.703	145	1	0.58	57	71	
(8)	90	191	0.863	198	1.42	0.60	59	74	



Technical specifications

Sound, supply air

Acoustic performance at the supply air connection at a distance of 0 ft

Ventilation unit								
Type	Speed	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
ComfoAir350	1	46	35	23	11	4	5	13
ComfoAir350	2	55	49	40	33	22	12	12
ComfoAir350	3	60	59	49	43	35	25	12
ComfoAir350	4	66	64	56	50	43	34	22
ComfoAir350	5	71	68	62	56	49	42	29
ComfoAir350	6	74	70	66	60	53	47	35
ComfoAir350	7	76	73	69	64	57	51	39
ComfoAir350	8	78	76	72	68	61	55	43
ComfoAir350	9	79	76	74	69	62	57	45

Sound, extract air

Acoustic performance at the extract air connection at a distance of 0 ft

Ventilation unit								
Type	Speed	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
ComfoAir350	1	50	34	3	23	10	7	12
ComfoAir350	2	51	41	30	30	12	7	12
ComfoAir350	3	53	49	39	39	22	10	11
ComfoAir350	4	55	54	45	45	29	19	7
ComfoAir350	5	57	56	51	51	34	25	13
ComfoAir350	6	60	60	54	54	38	29	19
ComfoAir350	7	63	61	57	57	42	33	23
ComfoAir350	8	65	64	59	59	44	36	27
ComfoAir350	9	65	65	61	61	46	38	29

Sound, unit emission

Ventilation unit							
Type	Speed	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	dB (A)
ComfoAir350	1	27	17	17	14	4	19
ComfoAir350	2	32	29	24	19	16	26
ComfoAir350	3	36	36	32	29	27	35
ComfoAir350	4	41	40	39	36	35	41
ComfoAir350	5	46	44	44	42	41	47
ComfoAir350	6	50	47	50	46	45	52
ComfoAir350	7	52	49	52	50	49	55
ComfoAir350	8	53	52	55	54	52	58
ComfoAir350	9	53	53	56	55	54	59

ZA-CSY-FLYERTS105, V1211, en_us, subject to changes

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LG
Life's Good

Home Comfort Solutions

Innovation for a better life

The ultimate in comfort... heat or cool any room to your favorite temperature

Home Comfort Solutions by LG allow you to cool or heat your entire home or just a single room without the need for invasive ductwork. There's no tearing down of walls or altering your home's appearance. LG Duct-Free Split systems are simple to have installed. In most cases, a professional contractor gets the job done in less than a day.

How LG Duct-Free Split systems work

LG Duct-Free Split air-conditioning and heating systems consist of three basic components: an inverter-driven outdoor unit, a stylish and quiet indoor unit that delivers conditioned air to the room, and compact conduit for refrigerant lines and wiring that connects the units. This design allows for energy conservation by targeting only those areas that need cooling or heating, a cost-effective feature when only certain portions of a building are being used.

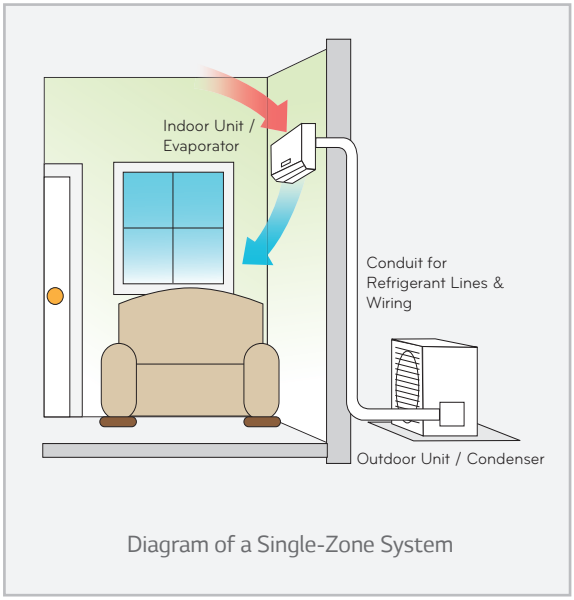

Diagram of a Single-Zone System

LG Duct-Free Split systems can be used virtually anywhere

LG delivers advanced climate control and operating efficiency to a wide range of residential and light commercial projects, from a stuffy bedroom to a home addition where cooler temperatures are required.

Applications may include:

- Older homes
- Sunrooms
- New home constructions
- Room additions
- Bedrooms
- Home offices
- Basements
- Kitchens
- Attics

The advantages of inverter technology

Inverter variable-speed outdoor units are measurably quieter and use less energy than conventional air conditioners. Unlike conventional air conditioners that cycle on and off, an inverter compressor ramps up or down to match the capacity needed and maintain comfort levels.

LG Duct-Free Split systems bring comforting innovation

Benefits of LG Duct-Free Split systems

- Reduced energy costs—LG's evolved technology can make a difference in cooling and heating bills
- Incredibly quiet—With advanced motor and fan designs, LG units operate at low sound levels
- Custom temperature control—Precise temperature settings in each zone
- Beautiful design—Variety of elegant looks to complement any decor
- Enhanced air circulation—Electronically controlled louvers and fan speeds designed to keep room temperatures consistent
- High-speed cooling—Powerful Jet Cool setting quickly lowers the temperature of warm rooms
- Dependable heating—An excellent source of primary or supplemental heating in the cooler months
- Built to last—LG's commitment to quality means years of dependable comfort
- Convenient controls—All indoor units include a handheld or a wall-mounted controller
- Many units are ENERGY STAR® Rated

SEER: Your guide to cool savings

An acronym for Seasonal Energy Efficiency Ratio, SEER is the industry-wide rating measurement that conveys energy consumption information to consumers. The higher the number, the more efficiently a product will produce cool air...and operating efficiency is a big step in conserving our natural resources. Your contractor will be happy to explain SEER numbers in greater detail, and help you determine which LG Duct-Free Split system is best for your unique requirements.

HSPF: For cost-saving coziness

Heating Seasonal Performance Factor, or HSPF, represents the total heating output when compared to the electricity used. Like SEER, the higher the HSPF rating, the more efficiently a product will produce warm air. If you live in a climate that requires heating in the winter months as well as cooling in the summer, ask your contractor to determine the ideal Duct-Free Split system for you.

LEARN MORE AT energystar.gov

ENERGY STAR® is a joint program of the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy (DOE) created to promote energy-efficient products and practices. The ENERGY STAR® logo helps homeowners identify which products meet energy efficiency performance levels set by U.S. EPA and U.S. DOE.

Control at your fingertips...
LG Smart AC

Control on the go

Just left the house and forgot to change the settings on your air conditioner? Returning from vacation and want the house to be cool by the time your arrive? Worried about high energy costs? Now there is no need to worry – with LG Smart AC, control your LG Duct-Free Split air conditioner from just about anywhere, using your smart phone.

How it works

Hardware WLAN module and smart phone app together provide monitoring and remote control capabilities with select* LG Duct-Free Split air conditioners such as:

- Control - Use to make instant changes to temperature and fan speeds
- Favorite Settings - Create or save an existing setting as a favorite
- Advanced Functions - Control additional features such as purification, air flow, sleep timer, filter renewal date
- Additional Settings - Register a/c units, set temperature unit display (°F or °C), help, etc.

AIR CONDITIONER LG

TO DOWNLOAD *FREE* APP

Available on the App Store

Google play

Style and performance... single-zone **indoor units**

Many styles, many choices

There's no need to compromise when it comes to comfort. LG single-zone systems offer many styles of indoor units to enhance any decor, plus performance that lets you enjoy every room to the fullest. And they're available in a full range of capacities to perfectly match any size space, large or small. Whether you need cooling or heating, LG offers the perfect Duct-Free Split performance package.

Uniquely LG. It looks like a work of art—and it is!

up to 16.0 SEER

The ingenious **Art Cool™ Gallery Inverter Indoor Unit** cools and warms with world-class efficiency...and flair. Frame any artwork or photo (20 x 20 inches or smaller) that you wish to display. And changing images couldn't be easier.

ENERGY STAR

up to 27.5 SEER

Art Cool™ Premier

ENERGY STAR

up to 21.5 SEER

Standard Wall Mounted

ENERGY STAR

up to 21.5 SEER

Art Cool™ Mirror

ENERGY STAR

up to 20.0 SEER

Ceiling Cassette

ENERGY STAR

up to 19.0 SEER

Mega Standard

ENERGY STAR

up to 21.5 SEER

Extended Pipe Wall-Mounted

ENERGY STAR

up to 17.6 SEER

Ceiling Concealed Duct (High Static)

ENERGY STAR

ENERGY STAR Note: Energy Star® certification may not apply to all models within product series, visit www.lg-dfs.com for specific model information.

The more rooms the better with Multi F systems

One LG inverter-driven multi-zone outdoor unit can support two, three, four, or up to eight indoor units, providing personalized cooling and heating for an entire home. Compact refrigerant pipes work in tandem with wiring to link the outdoor unit with all indoor units, either directly or through a branch distribution (BD) unit (Multi F MAX systems).

Multiple rooms add up to multiple benefits

- Long refrigerant piping lengths allow for extra design flexibility in indoor unit installation
- Each indoor unit includes its own controller
- Indoor units are available in a full range of capacities for all room sizes
- Easy installation: little to no ductwork required; most indoor units can mount on any wall
- Indoor unit and outdoor unit dimensions ensure space-saving convenience
- All-season use—heat pump models have both cooling and heating capabilities

up to 22.0 SEER

Dual-Zone Multi F Outdoor Units

ENERGY STAR

up to 21.7 SEER

Tri-Zone Multi F Outdoor Units

ENERGY STAR

up to 22.0 SEER

Quad-Zone Multi F Outdoor Units

ENERGY STAR

up to 19.5 SEER

Eight-Zone Multi F MAX Outdoor Units

A solution for every room...
Multi-F Indoor Units

Multi F systems have multiple indoor units

Select from a variety of sleek, elegant indoor units to complement any decor. And the choice is not limited to one type of indoor unit per system—mix and match according to function and style!

Art Cool™ Mirror
Wall-Mounted Indoor Units

Standard Wall-Mounted
Indoor Units

Art Cool™ Gallery
Inverter Indoor Units

Ceiling Concealed Duct
(High Static) Indoor Units

Ceiling Concealed
Ducted Indoor Units

Ceiling Cassette
Indoor Units

Vertical-
Horizontal Air
Handling Unit

Make yourself at home...diagram of a Multi F multi-zone system

1. One outdoor condensing unit (Multi F MAX system) can support up to eight indoor units.
2. An Art Cool™ Mirror indoor unit shines in the dining room.
3. A ceiling cassette indoor unit in the living room—the look preferred by many homeowners.
4. Standard wall-mounted indoor units in the master and second bedrooms. Precise comfort in your personal retreat.

Convenient remote controls simplify all setting functions. Many remote controls can also be wall mounted.

Visit LGHomeComfort.com.
Our site is an excellent resource for information, and it's where you'll find the LG Trained Contractors in your area.

LG Electronics U.S.A., Inc. HVAC Division
4300 Northpoint Parkway, Alpharetta, GA 30022

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Job Name/Location: **Tag #:**

Date:

PO No.:

For: ☐ File ☐ Resubmit ☐ Approval ☐ Other _____

Architect: GC:

Engr: Mech:

Rep:
(Company) (Project Manager)

LMU30CHV
Multi F Inverter Heat Pump Outdoor Unit

LG Life's Good

Performance:

Nominal Cooling Capacity (Btu/h)	30,000
Nominal Heating Capacity (Btu/h)	32,000
Cooling Power Input (kW)	2.31
Heating Power Input (kW)	2.49

Cooling Nominal Test Conditions:
Indoor: 80°F DB/67°F WB
Outdoor: 95°F DB/75°F WB

Heating Nominal Test Conditions:
Indoor: 70°F DB/60°F WB
Outdoor: 47°F DB/43°F WB

Electrical:

Power Supply (V[1]/Hz/Ø)	208-230/60/1
MOP (A)	25
MCA (A)	16.6
Cooling Rated Amps (A)	13.93
Heating Rated Amps (A)	13.93
Compressor (A)	10.8
Fan Motor (A)	0.73

MOP - Maximum Overcurrent Protection MCA - Minimum Circuit Ampacity

Piping:

Refrigerant Charge (lbs)	6.18
Liquid Line (in, OD)	1/4 x 4
Vapor Line (in, OD)	3/8 x 4
Max Total Piping[2] (ft)	246.1
Max ODU to IDU Piping (ft)	82
Piping Length (no add'l refrigerant, ft)	98.4
Max Elevation between ODU and IDU (ft)	49.2
Max Elevation between IDU and IDU (ft)	24.6

ODU - Outdoor Unit IDU - Indoor Unit

Controls Features:

- Auto operation
- Auto restart operation
- Defrost/Deicing
- Inverter (variable speed compressor)
- Built-in low ambient standard down to 14F
- Restart delay (3-minutes)
- Self diagnosis
- Soft start

Optional Accessories:

- ☐ PI-485 Integration Board - PMNFP14A1
- ☐ AC Smart IV - PACS4B000
- ☐ AC Ez - PQCSZ250S0
- ☐ Power Distribution Indicator - PQNUD1S00
- ☐ ACP IV - PACP4B000
- ☐ LONWORKS Gateway - PLNWKB100
- ☐ ACP IV BACnet - PQNFB17C1

Operating Range:

Cooling (°F DB)	14-118
Heating (°F WB)	-4-64

Unit Data:

Refrigerant Type	R410A
Refrigerant Control	EEV
Sound Pressure[3] (Cool/Heat) ±3 dB(A)	52/55
Net Unit Weight (lbs)	137
Shipping Weight (lbs)	148
Heat Exchanger Coating	GoldFin™
Min Number of Indoor Units	2
Max Number of Indoor Units	4

Compressor:

Quantity	1
Type	Twin Rotary
Oil/Type	FVC68D

Fan:

Type	Propeller
Quantity	1
Fan Motor/Drive	Brushless Digitally Controlled/Direct
Airflow Rate (CFM)	2119

Notes:

1.Acceptable operating voltage: 187V-253V.
2.Piping lengths are equivalent.
3.Sound Pressure levels are tested in an anechoic chamber under ISO Standard 1996.
4.All power/communication cable to be minimum 18 AWG, 4-conductor, stranded, shielded and must comply with applicable local and national code.
5.Power wiring cable size must comply with the applicable local and national code.
6.See Engineering Manual for sensible and latent capacities.
7.Power wiring cable size must comply with the applicable local and national code.
8.This data is rated 0 ft above sea level, with 24.6 ft of refrigerant line and a 0 ft level difference between outdoor and indoor units. All capacities are net with a combination ratio between 95 – 105%.
9.Refer to the Engineerin Manual for combination capacity tables.
10.Must follow installation instructions in the applicable LG installation manual.
11. See Engineering Manual Capacity Tables for ODU capacity at design condition.

Intertek Inverter

AHRI CERTIFIED™ www.ahridirectory.org
Unitary Small AC
AHRI Standard 210/240
Certification applies only when the complete system is listed with AHRI.

For a complete list of available accessories, contact your LG representative.

For continual product development, LG reserves the right to change specifications without notice.

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Job Name/Location:

LMU30CHV

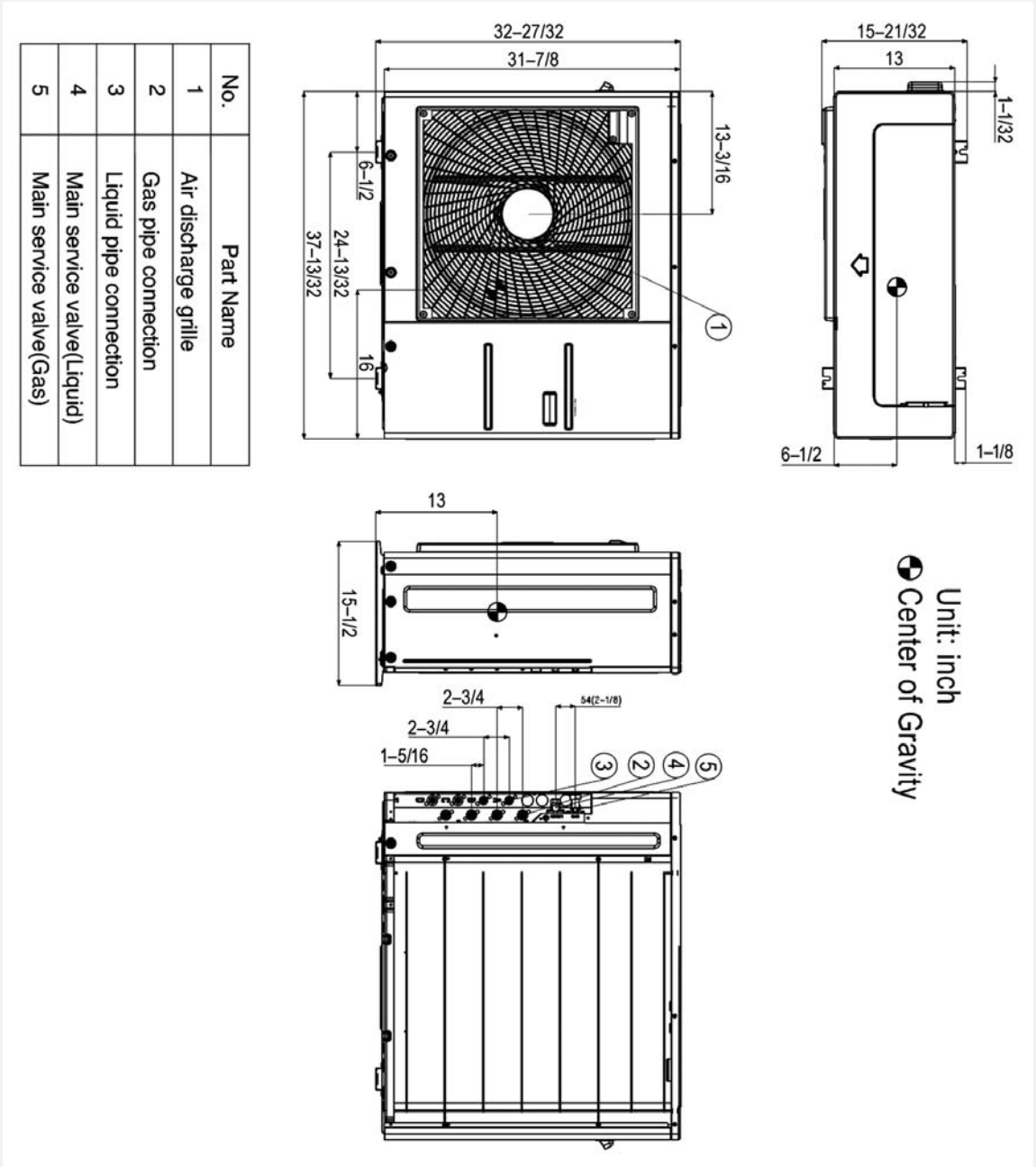
Multi F Inverter Heat Pump Outdoor Unit

Tag #:

Date:

PO No.:

No.	Part Name
1	Air discharge grille
2	Gas pipe connection
3	Liquid pipe connection
4	Main service valve(Liquid)
5	Main service valve(Gas)



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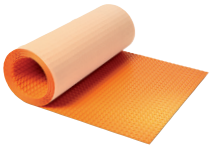
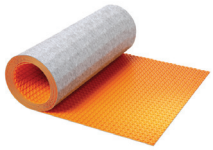
Product Item Numbers



6.4 Schluter®-DITRA-HEAT — Uncoupling and waterproofing membrane

Item No.	Item	Dimensions
DH5 12M	Roll	3' 3" x 41' 1" = 134.5 ft² *(1 m x 12.5 m = 12.5 m²)*
DH5 MA	Sheet	3' 3" x 2' 7" = 8.6 ft² *(1 m x 0.8 m = 0.8 m²)*

U.S. Pat. No. 8,950,141, and U.S. DES. PAT. No. D706459
Canada Ⓓ Schluter Systems L.P. and other patents pending.



6.4 Schluter®-DITRA-HEAT-TB — Uncoupling and waterproofing membrane with thermal break

Item No.	Item	Dimensions
DHTB810M	Roll	3' 3" x 33' = 108 ft² *(1 m x 10 m = 10 m²)*
DHTB8MA	Sheet	3' 3" x 2' 7" = 8.6 ft² *(1 m x 0.8 m = 0.8 m²)*

Patent pending

6.4 Schluter®-DITRA-HEAT-E-HK — Heating cable

Item No.	Length	Area	Total Power	Average Power (Watts/ft² – Watts/m²)	Current (Amps)
120 V					
DHE HK 120 11	35.3 ft *(10.8 m)*	10.7 ft² *(1.0 m²)*	135 W	12.6 - *135.8*	1.1
DHE HK 120 16	52.9 ft *(16.1 m)*	16.0 ft² *(1.5 m²)*	203 W	12.7 - *136.3*	1.7
DHE HK 120 21	70.5 ft *(21.5 m)*	21.3 ft² *(2.0 m²)*	270 W	12.7 - *136.3*	2.3
DHE HK 120 27	88.2 ft *(26.9 m)*	26.7 ft² *(2.5 m²)*	338 W	12.7 - *136.3*	2.8
DHE HK 120 32	105.8 ft *(32.2 m)*	32.0 ft² *(3.0 m²)*	405 W	12.7 - *136.3*	3.4
DHE HK 120 38	124.1 ft *(37.8 m)*	37.5 ft² *(3.5 m²)*	475 W	12.7 - *136.3*	4.0
DHE HK 120 43	141.1 ft *(43.0 m)*	42.7 ft² *(4.0 m²)*	540 W	12.7 - *136.3*	4.5
DHE HK 120 51	169.8 ft *(51.8 m)*	51.4 ft² *(4.8 m²)*	650 W	12.7 - *136.3*	5.4
DHE HK 120 64	212.9 ft *(64.9 m)*	64.4 ft² *(6.0 m²)*	815 W	12.7 - *136.3*	6.8
DHE HK 120 73	240.2 ft *(73.2 m)*	72.7 ft² *(6.8 m²)*	920 W	12.7 - *136.3*	7.7
DHE HK 120 83	275.5 ft *(84.0 m)*	83.3 ft² *(7.7 m²)*	1055 W	12.7 - *136.3*	8.8
DHE HK 120 92	303.0 ft *(92.4 m)*	91.7 ft² *(8.5 m²)*	1160 W	12.7 - *136.3*	9.7
DHE HK 120 102	336.9 ft *(102.7 m)*	101.9 ft² *(9.5 m²)*	1290 W	12.7 - *136.3*	10.7
DHE HK 120 113	372.2 ft *(113.4 m)*	112.6 ft² *(10.5 m²)*	1425 W	12.7 - *136.3*	11.9
DHE HK 120 134	444.0 ft *(135.3 m)*	134.3 ft² *(12.5 m²)*	1700 W	12.7 - *136.3*	14.2
240 V					
DHE HK 240 11	35.3 ft *(10.8 m)*	10.7 ft² *(1.0 m²)*	135 W	12.6 - *135.8*	0.6
DHE HK 240 16	53.1 ft *(16.2 m)*	16.1 ft² *(1.5 m²)*	203 W	12.6 - *135.8*	0.8
DHE HK 240 21	70.6 ft *(21.5 m)*	21.4 ft² *(2.0 m²)*	270 W	12.7 - *136.3*	1.1
DHE HK 240 27	88.2 ft *(26.9 m)*	26.7 ft² *(2.5 m²)*	338 W	12.7 - *136.3*	1.4
DHE HK 240 32	105.8 ft *(32.2 m)*	32.0 ft² *(3.0 m²)*	405 W	12.7 - *136.3*	1.7
DHE HK 240 38	124.1 ft *(37.8 m)*	37.5 ft² *(3.5 m²)*	475 W	12.7 - *136.3*	2.0
DHE HK 240 43	141.0 ft *(43.0 m)*	42.6 ft² *(4.0 m²)*	540 W	12.7 - *136.3*	2.3
DHE HK 240 53	176.3 ft *(53.7 m)*	53.3 ft² *(5.0 m²)*	675 W	12.7 - *136.3*	2.8
DHE HK 240 64	211.6 ft *(64.5 m)*	64.0 ft² *(5.9 m²)*	810 W	12.7 - *136.3*	3.4
DHE HK 240 75	248.2 ft *(75.7 m)*	75.1 ft² *(7.0 m²)*	950 W	12.7 - *136.3*	4.0
DHE HK 240 85	282.1 ft *(86.0 m)*	85.3 ft² *(7.9 m²)*	1080 W	12.7 - *136.3*	4.5
DHE HK 240 103	339.4 ft *(103.4 m)*	102.7 ft² *(9.5 m²)*	1300 W	12.7 - *136.3*	5.4
DHE HK 240 129	425.8 ft *(129.8 m)*	128.8 ft² *(12.0 m²)*	1630 W	12.7 - *136.3*	6.8
DHE HK 240 145	480.5 ft *(146.5 m)*	145.3 ft² *(13.5 m²)*	1840 W	12.7 - *136.3*	7.7
DHE HK 240 167	551.0 ft *(167.9 m)*	166.7 ft² *(15.5 m²)*	2110 W	12.7 - *136.3*	8.8
DHE HK 240 183	605.9 ft *(184.7 m)*	183.3 ft² *(17.0 m²)*	2320 W	12.7 - *136.3*	9.7
DHE HK 240 204	673.8 ft *(205.4 m)*	203.8 ft² *(18.9 m²)*	2580 W	12.7 - *136.3*	10.7
DHE HK 240 225	744.4 ft *(226.9 m)*	225.2 ft² *(20.9 m²)*	2850 W	12.7 - *136.3*	11.9
DHE HK 240 269	888.0 ft *(270.7 m)*	268.6 ft² *(25.0 m²)*	3400 W	12.7 - *136.3*	14.2

6.4 Schluter®-DITRA-HEAT-E-RT — Digital thermostat

Item No.	Description
DHE RT 102/BW	Touchscreen programmable thermostat with floor temperature sensor in bright white

c UL us according to the following standards: UL 60730, CSA E60730-1, UL E-file: E157297, GFCI: UL 943, CSA C22.2 No.144.1-06

6.4 Schluter®-DITRA-HEAT-E-RSD — Digital thermostat

Item No.	Description
DHE RSD/BW	Programmable thermostat with floor temperature sensor in bright white

Listed by C ETL us

6.4 Schluter®-DITRA-HEAT-E-R — Digital thermostat

Item No.	Description
DHE RT 103/BW	Non-programmable thermostat with floor temperature sensor in bright white

c UL us according to the following standards: UL 60730, CSA E60730-1, UL E-file: E157297, GFCI: UL 943, CSA C22.2 No.144.1-06

6.4 Schluter®-DITRA-HEAT-E-RR — Power module

Item No.	Description
DHE RR 1/BW	Power module

c UL us according to the following standards: CSA E60730-1, GFCI: UL 943, CSA C22.2 No.144.1-06

6.4 Schluter®-DITRA-HEAT-E-KIT — Programmable thermostat

Item No.	DHE K 120 40	DHE K 120 56
Matting	5 sheets – 43.1 ft² *(4.0 m²)*	7 sheets – 60.3 ft² *(5.6 m²)*
Heating cable	88' 3" – 26.7 ft² *(26.9 m – 2.5 m²)*	124' 0" - 37.5 ft² *(37.8 m - 3.5 m²)*
Thermostat	1 – white, programmable	1 – white, programmable

6.4 Schluter®-DITRA-HEAT-E-KIT — Touchscreen programmable thermostat

Item No.	DHE K RT 120 40	DHE K RT 120 56
Matting	5 sheets – 43.1 ft² *(4.0 m²)*	7 sheets – 60.3 ft² *(5.6 m²)*
Heating cable	88' 3" – 26.7 ft² *(26.9 m – 2.5 m²)*	124' 0" - 37.5 ft² *(37.8 m - 3.5 m²)*
Thermostat	1 – white, programmable touchscreen	1 – white, programmable touchscreen

26 - ELECTRICAL

261100 - Lighting Controls

PART 1 – GENERAL

1.1 SCOPE

The lighting control system will allow for automatic control of the lighting. This will allow for advanced energy saving capabilities and the ability of the occupants to control the lighting in each portion of the house by smartphone or tablet “apps”.

1.2 PERFORMANCE REQUIREMENTS

Main Controller

a. cULus Listed
b. FCC approved
c. Operates on standard 120V, 50/60 Hz
d. Operational between 32 and 104 degrees F
e. Operates between 0% and 90% humidity
f. Controls on frequency signals between 431 and 437 MHz
g. Remains unharmed when exposed to static discharge-conforms to IEC 61000-4-2
h. Remains unharmed when exposed to surge voltages-conforms to IEEE C62.41-1991
i. Retains memory after power failure
j. Able to connect to the internet
k. Can relay signals between occupant and room controllers
l. Programmable
m. Can control the settings of lighting in each room based on different “set modes” produced by the user
n. Can schedule lighting turning on and off based on schedules provided by the user
o. Connects to Lutron Cloud, enabling remote control

Room Controller

a. Controllable by frequency signals between 431 and 437 MHz
b. Can control LED lamps and fixtures
c. Retains set mode of lighting level prior to power failure
d. cULus Listed
e. FCC approved
f. Operates on standard 120V, 50/60 Hz
g. Remains unharmed when exposed to static discharge-conforms to IEC 61000-4-2
h. Remains unharmed when exposed to surge voltages-conforms to IEEE C62.41-1991
i. Can be mounted in standard 1-gang electrical receptacles
j. Operational between 32 and 104 degrees F
k. Operates between 0% and 90% humidity
l. Can connect to 10 devices
m. Can connect to devices visible within 60 feet.

n. Can connect to devices through walls within 30 feet

1.3 SUBMITTALS

A. Main Controller
   a. Specs
   b. Warranty
   c. Who will install and maintain
   d. Installation instructions

B. Room Controller
   a. Specs
   b. Warranty
   c. Who will install and maintain
   d. Installation instructions

2. PRODUCTS

2.1 Main Controller

2.1.1 Lutron

A. Connect Bridge
   a. Size: W: 2.75”, L: 2.75”, H: 2.75”
   a. Power Supply: 5V, 300 mA
   b. Typical Power Usage: 1.3W
   c. Used in conjunction with Lutron Main Repeater to connect to devices
   d. 1 year warranty
   e. Price: $209

B. Main Repeater
   a. Operates on frequency of 434 MHz
   b. Antenna length of 6.25 in
   c. Signal operates up to 30 ft
   d. Electrical input: 9V @ 300 milliAmps
   e. Consumes 3.1W
   f. Connects with devices operating on frequencies between 431 and 437 MHz
   g. Can connect to internet
   h. Remains unharmed when exposed to static discharge-conforms to IEC 61000-4-2
   i. Remains unharmed when exposed to surge voltages-conforms to IEEE C62.41-1991
   j. Retains memory after power failure
   k. Size: W: 4.25”, L: 5.25” (disregarding antenna attachment), H: 1 1/16”
   l. Size: W: 2.75”, L: 2.75”, H: 2.75”
   f. Power Supply: 5V, 300 mA
   g. Typical Power Usage: 1.3W
   h. Must be used with Lutron Main Repeater to connect to devices
   i. 1 year warranty
   j. Price: $341.01

C. Smart Bridge
   a. Size: W: 2.75”, L: 2.75”, H: 2.75”
   b. Power Supply: 5V, 300 mA

c. Typical Power Usage: 1.3W
d. 1 year warranty
e. Price: $110.00

2.1.2 Developed System

A. See performance requirements above that need to be met for a developed system to be considered.

2.2 Room Controller

2.2.2 Lutron

A. Caseta Wireless In-Wall Dimmer
a. Size: W:2 15/16", L: 4 11/16", D: 1 7/16"
b. Needs to be wired to ground
c. Price: $72.00

2.2.3 Developed System

A. See performance requirements above that need to be met for a developed system to be considered.

2.3 Accessories

2.5.1 Wire

A. See Power specification

2.5.2 Junction Boxes

A. See Power specification

2.5.3 Switch Covers

A. Lutron
a. Size: W: 2.75", L: 4.75", D: 0.25"
b. Style of Switch: Rocker
c. Number of Gangs: 1-6
d. Shape: Rectangular
e. Color: Multiple options
f. Material: Plastic
g. Price: $4.90

B. Generic Model
a. Size: W: 2.75", L: 4.75", D: 0.25"
b. Style of Switch: Rocker
c. Number of Gangs: 1-6
d. Shape: Rectangular
e. Color: Multiple options
f. Material: Plastic
g. Price: $0.79 and up

PART 3- EXECUTION

Installation of the system shall be incompliance with local, and national codes. The trained technicians installing the system shall follow the instructions provided by the manufacturer in the "Installation Instructions". Controller will be integrated with the relevant lighting sensors provided in integrated automation.

3.1 Installer

A. Electrical Contractor
a. Shall have applicable licensure

b. Shall have qualified technicians installing product
c. Shall troubleshoot issues at the site for best installation
d. Shall follow applicable building codes
e. Shall follow installation instructions
f. Shall ensure all components are operating correctly at the site

END SECTION 261100

261200 – LIGHTING FIXTURES

PART 1 – GENERAL

1.1 SCOPE

This section addresses the lighting needs through asking for spaces with ambient lighting, tasked lighting and accent lighting highlighting the structure at the same time.

1.2 REQUIREMENTS

Good quality day lighting

Use of LED lights which integrates with the integrated automation system

1.3 SUBMITTALS

Product data sheets

PART 2 – PRODUCTS

1. Products have been selected for all rooms within the house according to the lighting schedule
2. Product data sheets are included
3. Any alternatives need to be approved by Owner

PART 3 - EXECUTION

Installation of the system shall be incompliance with local, and national codes. The trained technicians installing the system shall follow the instructions provided by the manufacturer in the "Installation Instructions". Controller will be integrated with the relevant lighting sensors provided in integrated automation.

Installer

Electrical Contractor

- Shall have applicable licensure
- Shall have qualified technicians installing product
- Shall troubleshoot issues at the site for best installation
- Shall follow applicable building codes
- Shall follow installation instructions
- Shall ensure all components are operating correctly at the site

END SECTION 261200

262100 - Photovoltaic Collectors

Part 1 - GENERAL

1.1 SCOPE

Included in this section is the designed photovoltaic system for the house, battery storage, inverters, and general wiring of the house. The power usage throughout the entire system was considered in this development and selection.

1.2 PERFORMANCE REQUIREMENTS

A. Have enough solar panels such that the house will produce enough power to ensure net zero energy regardless of weather.

B. Have a high enough capacity of storage for the batteries such that there will be enough power supply for when the house has a heavy load or for days where the solar panels are not producing enough power.

C. The wiring of the house will be done such that all wires are easily accessible for replacement/maintenance. Ties back to the idea of disentanglement.

D. Have safe equipment compliant with standards that will not pose any fire hazards.

E. Have a controller that will effectively produce “useable” voltage ranges for the battery and inverter. The controller shall also control whether the power produced by the solar panels go to the battery or inverter.

F. Power will go straight to the inverter if battery storage is full or if there is a high load requirement at a given time.

1.3 SUBMITTALS

A. Products: solar panels, battery storage, micro inverter, and controller
    1. Specifications
    2. Warranty
    3. Who will install and maintain them
    4. Installation instructions and limitation to technology

B. Wiring
    1. Specs on the wires (diameter, length, type)
    2. Warranty
    3. Who will be wiring the house and how?
    4. What safety precautions need to be considered?

Part 2 - PRODUCTS

2.1 SOLAR PANELS

A. Acceptable manufacturers and products
    1. Sunpower SPR-X21-335-BLK

a. Website: https://us.sunpower.com/sites/sunpower/files/media-library/data-sheets/ds-x21-series-335-345-residential-solar-panels-datasheet.pdf
b. Manufacturer: Sunpower
c. Dimensions (in): 61.24x41.18 x1.81
d. Area (ft2): 17.54
e. Max Power (W): 335
f. Warranty: 25 years

2. Alternative products may be proposed by the Contractor to the Owner to provide options based on pricing. If an alternative product is proposed, Contractor shall provide performance, cost, installation and other product information as requested by the Architect. All material substitutions shall be subject to approval by the Owner and Architect.

2.2 BATTERY

A. Trojan IND29-4V
1. Website: http://www.trojanbattery.com/pdf/datasheets/IND29-4V_Trojan_Data_Sheets.pdf
2. Manufacturer: Trojan Batteries
3. Dimensions (in): 27.10x10.35x23.81
4. Capacity (kWh): 6.47
5. Cost: $1,475
6. Price per capacity ($/kWh): 227.98
7. Location: outdoor
8. Warranty: TBD
9. Operating temperature (^{o}F): -4-122
10. Power (kW): TBD
11. Installation: Floor
1. Color: Maroon

Alternative products may be proposed by the Contractor to the Owner to provide options based on pricing. If an alternative product is proposed, Contractor shall provide performance, cost, installation and other product information as requested by the Architect. All material substitutions shall be subject to approval by the Owner and Architect.

2.3 CAR CHARGER

A. Acceptable Products
1. Evr. Green 400
2. Manufactuer: Leviton
3. 40 AMP
4. 200 VOLT
5. Surface Mount

2.4 MICRO-INVERTERS

B. Acceptable manufacturers and products
1. Enphase M250 Micro inverter
a. Website: https://enphase.com/sites/default/files/downloads/support/M250-DS-EN-US.pdf
b. Manufacturer: Enphase Energy

c. Dimensions: 171 mm x 173 mm x 30 mm (without mounting bracket)
d. Output Power (W): 250 (peak)
e. Output Voltage (V): 208 V / 183-229 V @ 208 VAC, 240 V / 211-264 V @ 240 VAC
f. Output Current (A): 1.15 A @ 208 VAC, 1.0 A @ 240 VAC
g. Output Frequency (Hz): 60
h. Input Voltage (V): 16-60
i. Operating Temperature (oF): -40 - 165
j. Warranty: 25 years

2. Alternative products may be proposed by the Contractor to the Owner to provide options based on pricing. If an alternative product is proposed, Contractor shall provide performance, cost, installation and other product information as requested by the Architect. All material substitutions shall be subject to approval by the Owner and Architect.

2.5 MPPT CHARGE CONTROLLERS

A. Acceptable manufacturers and products

1. Midnite Solar Classic 250
   b. Website: http://www.midnitesolar.com/pdfs/spec_sheet_classic.pdf
   c. Manufacturer: Midnite Solar Inc.
   d. Dimensions: 378 mm x 152 mm x 102 mm
   e. Output Power (W): 6600 watts (peak)
   f. Output Voltage (V): 12 to 72 VDC
   g. Output Current (A): 55 ADC for 48V battery string.
   h. Output Frequency (Hz): DC
   i. Input Voltage (V): 250VDC + battery voltage.
   j. Operating Temperature (oF): -40° C to 50° C. Controller will auto derate as temperature rises above 25°C.
   k. Warranty: 5 year standard
2. Alternative products may be proposed by the Contractor to the Owner to provide options based on pricing. If an alternative product is proposed, Contractor shall provide performance, cost, installation and other product information as requested by the Architect. All material substitutions shall be subject to approval by the Owner and Architect.

2.6 WIRING

A. Acceptable manufacturers and products

1. Romex 14/3 NM-B Copper Wire
   a. Website: https://hdsupplysolutions.com/shop/p/14-3-romex-nm-b-copper-wire-50-length-p301398?gclid=CjwKEAiA6YDBBRDwtpTQnYzx5lASJAC57ObMT2woaN3w8dcOmLCrc59SM7MrzqMJEs0muc5CbtzG5xoC6qjw_wcB
   b. Manufacturer: Southwire
   c. Dimensions (in): 8.9x9.1x2.1
   d. Length of pack (ft): 50
   e. Amps (A): 15
   f. Price: $36.00

2. Alternative products may be proposed by the Contractor to the Owner to provide options based on pricing. If an alternative product is proposed, Contractor shall provide performance, cost, installation and other product information as requested by the Architect. All material substitutions shall be subject to approval by the Owner and Architect.

Part 3- Execution

3.1 INSTALLATION

A. Solar Panels
    1. Solar panels add 5-6 lbs per square foot of roof loading.
    2. Most companies want to install the panels themselves.
    3. There must be adequate insulation between the solar panel and roof to ensure that the solar panels do not heat up. Need some space for convective heat transfer to cool down solar.

B. Batteries
    1. Need to be cautious of where these batteries need to be installed. Tesla powerwall can go inside or out but lead acid batteries such as the Trojan ones need an outdoor ventilated space.

C. Wiring
    1. Need to run all electrical wires through a central location (preferably near a fuse box)
    2. May want to use a larger diameter conduit for central vein of wiring and then branch off with smaller sizes for individual rooms.
    3. Need to set up at least one electrical outlet and one phone jack in each room.
    4. Should color code the conduit and wiring to keep track of what's been installed.
    5. Red and black wires denote live wires, white wires serve as the ground, and blue yellow or other colors are used for switches.
    6. Avoid laying conduit around sharp corners because it makes wire installation difficult and restricts data flow.
    7. When installing a high-wattage device like major appliances, at least one new circuit with its own circuit breaker needs to be installed in the breaker panel.
    8. Permanently installed appliances (washing machine, HVAC, etc.) require their own dedicated circuit.
    9. Any long lengths of wires over 100 ft can experience amperage loss.

END SECTION 262100

END SECTION 26

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Radio Powr Savr™ Wireless Daylight Sensor

The Lutron® wireless daylight sensor is a battery-powered sensor that automatically controls lights via RF communication to compatible dimming or switching devices. This sensor mounts to the ceiling and measures light in the space. The sensor then transmits the light level to the associated dimming or switching devices that automatically control the lights to balance light level in the space. The sensor combines both convenience and exceptional energy savings potential along with ease of installation.

Features

- Wireless daylight sensor has simple calibration.
- Daylight compensation through Lutron® reliable open loop control.
- Designed to give a linear response to changes in viewed light level.
- Light range 0 to 1600 lx (0 to 150 fc).
- Uses Clear Connect® technology.
- Works with Radio Powr Savr™ occupancy/vacancy sensors and Pico® wireless controls.
- Intuitive test mode provides instant system verification.
- Multiple ceiling-mount methods available for different ceiling materials.
- Front accessible test buttons make setup easy.
- 10-year battery life.
- RoHS compliant.

Model Number

LRFX-DCRB-WH

- Color Code
- Frequency/Channel Code

Frequency/Channel Codes

2 = 431.0 – 437.0 MHz (U.S.A., Canada, Mexico, Brazil)
3 = 868.125 – 869.850 MHz (Europe, U.A.E.)
4 = 868.125 – 868.475 MHz (China, Singapore)
5 = 865.5 – 866.5 MHz (India)
6 = 312.3 – 314.8 MHz (Japan)
7 = 433.05 – 434.79 MHz (Hong Kong, Macau)

Color Code

WH = White

Compatible RF Devices

- For use with Lutron® products only.
- Communicates to various wireless Lutron® systems*.

* *Contact Lutron® Customer Service at www.lutron.com for frequency/channel code compatibility with your particular geographic region, and for integrating with other Lutron® lighting and shading products.*

Job Name:	Model Numbers:	
Job Number:		

Specifications

Regulatory

Lutron® Quality Systems Registered to ISO 9001:2008

Standards

LRF2-

- FCC certified
- IC certified
- COFETEL
- ANATEL
- ASEP
- CRC
- SUBTEL
- SUPERTEL
- SUTEL
- Meets CA (U.S.A.) Energy Commission Title 24 requirements
- cULus Listed

LRF3-

- CE Marked (European Union)
- TRA Type Approved (United Arab Emirates)
- CITC (Kingdom of Saudi Arabia)

LRF4-

- SRRC Type Approved (Mainland China)
- iDA Registered (Singapore)

LRF5-

- WPC Type Approved (India)

LRF6-

- 007YUUL0688

LRF7-

- FCC certified

Power/Performance

- Operating voltage: 3 V⎓
- Operating current: 7 µA
- Requires one CR 2450 lithium battery
- 10-year battery life
- Non-volatile memory (settings are stored during power loss)

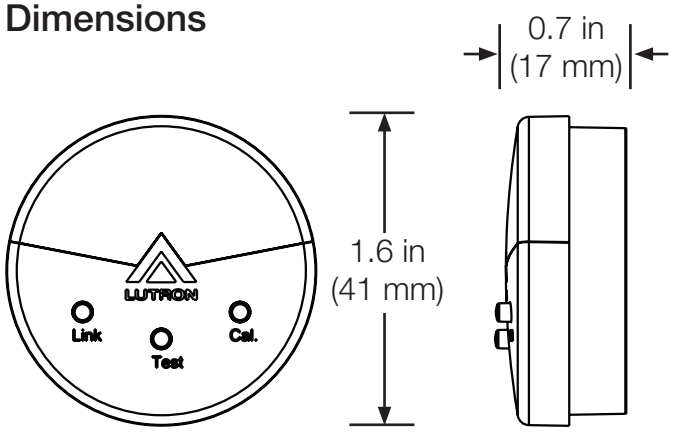
Enviroment

- Temperature: 32 °F to 104 °F (0 °C to 40 °C)
- For indoor use only
- Relative humidity: < 90% non-condensing

Range

- **LRF2-, LRF3-, LRF4-, LRF5-, LRF7-**
  Local load controls must be located within 60 ft (18 m) line of sight, or 30 ft (9 m) through walls, of a sensor.
- **LRF6-**
  Local load controls must be located within 23 ft (7 m) through walls of a sensor.

Dimensions

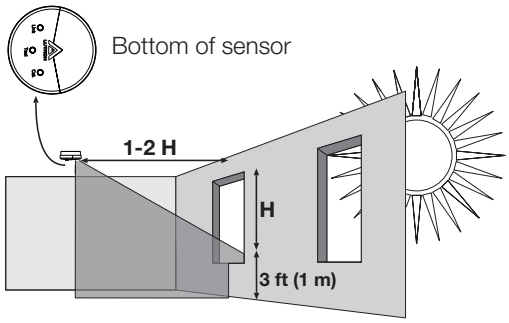


Job Name:	Model Numbers:	
Job Number:		

Mounting

Location for average size areas

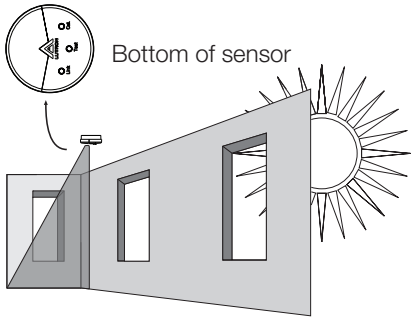
Arrow points towards the area viewed by the sensor (towards windows).



H = Effective Window Height

Location for narrow areas (corridors, private offices)

Arrow points towards the area viewed by the sensor (away from window)



Installation Overview

Determine the Daylight Sensor mounting location using the diagrams at left:

- The arrow on the daylight sensor points toward the area viewed by the sensor.
- Place the daylight sensor so the arrow is pointed at the nearest window at a distance from the window of one to two times the effective window height (H).
- The effective window height (H) starts at the window sill or 3 ft (1 m) up from the floor, whichever is higher, and ends at the top of the window.
- Ensure that the view of the daylight sensor is not obstructed (e.g. ceiling fans or pendant fixtures).
- Do not position the daylight sensor above an electric light that shines up at the ceiling or at the sensor.
- Do not position the daylight sensor in the well of a skylight or above indirect lighting fixtures.
- For narrow areas where the daylight sensor cannot be placed 1-2 (H) from windows, place sensor near windows facing into the space.
- Mount sensor(s) away from large metal surfaces (e.g. light fixtures or metal-backed ceiling tiles). Metal objects will affect the RF performance of the sensor.
- For detailed and application specific mounting information, please see "Daylight Sensor Design and Application Guide" (P/N 3683587) at www.lutron.com/TechnicalDocumentLibrary/3683587_Daylight_Sensor_Design_and_App_Guide_sg.pdf

Job Name:	Model Numbers:	
Job Number:		

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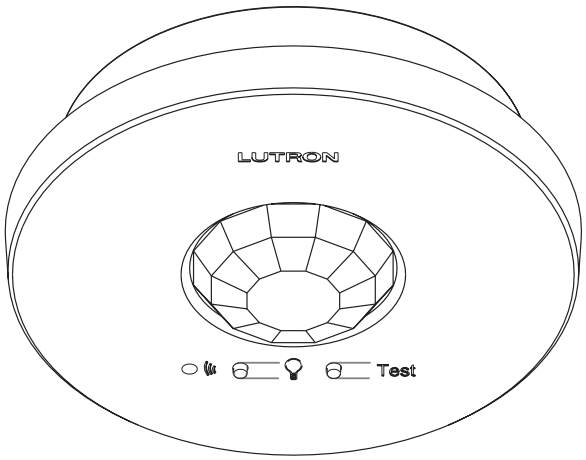
Radio Powr Savr™ Wireless Occupancy/Vacancy Ceiling Sensor

Lutron® Radio Powr Savr™ occupancy/vacancy sensors are wireless, battery-powered, passive infrared (PIR) sensors that automatically control lights via RF communication to compatible dimming and switching devices. These sensors detect the heat (IR radiation of 9.5 µm) from people moving within an area to determine when the space is occupied. The sensors then wirelessly transmit the appropriate commands to the associated dimming and switching devices to turn the lights on or off automatically. They combine both convenience and exceptional energy savings potential along with ease of installation.

Features

- Wireless occupancy sensor has 3 settings available: Auto-On/Auto-Off, Auto-On Low-Light/Auto-Off, and Manual-On/Auto-Off
- Auto-On Low-Light feature will turn lights on automatically only if there is less than approximately 10 Lux (1 fc) of ambient light
- Vacancy-only model available to meet California (U.S.A.) Title 24 requirements
- Uses Clear Connect® technology
- Passive infrared motion detection with exclusive Lutron® XCT™ Technology for fine motion detection
- 360˚ coverage ranges from 324 ft^2 (30.2 m^2) to 676 ft^2 (62.4 m^2), depending on mounting height
- Simple and intuitive adjustments available for Timeout, Auto-On, and Activity settings
- Supports advanced occupancy features, such as dependent occupancy groups and customizable occupied/unoccupied presets in some systems
- Multiple sensors can be added for extended coverage. Refer to product specification submittal of receiving device to determine system limits
- Lens illuminates during test mode to verify ideal locations
- Multiple ceiling-mount methods available for different ceiling materials
- Front accessible test buttons make programming easy
- 10-year battery life design
- RoHS compliant



Models Available

- LRF__-OCR2B-P-WH
  - Color Code
  - Occupancy and Vacancy
  - Frequency/Channel Code
- LRF2-VCR2B-P-WH
  - Vacancy Only
  - Available for Channel Code 2 Only

Frequency/Channel Codes

Available

2 = 431.0–437.0 MHz (U.S.A., Canada, Mexico, Brazil)
3 = 868.125–869.850 MHz (Europe, U.A.E.)
4 = 868.125–868.4755 MHz (China, Singapore)
5 = 865.5–866.5 MHz (India)
6 = 312.3–314.8 MHz (Japan)
7 = 433.05–434.79 MHz (Hong Kong, Macau)

Color Code

WH = White

Compatible RF Devices

- For use with Lutron® products only
- Communicates to various wireless Lutron® systems*

* Contact Lutron® Customer Service at www.lutron.com for frequency/channel code compatibility with your particular geographic region, and for integrating with other Lutron® lighting and shading products.

Job Name:	Model Numbers:	
Job Number:		

Specifications

Regulatory

- Lutron® Quality Systems Registered to ISO 9001:2008

Standards Approved

LRF2- (USA and Canada)

- cULus Listed
- FCC certified
- IC certified
- Meets CA (U.S.A.) Energy Commission Title 24 requirements
- COFETEL
- ANATEL
- SUTEL

LRF3-

- CE marked (European Union)
- TRA type approval (United Arab Emirates)
- CITC type approval (Saudi Arabia)

LRF4-

- SRRC type approval (Mainland China)
- iDA registered (Singapore)

LRF5-

- WPC Type (India)

LRF6-

- ㊣ 007YUUL0689

LRF7-

- FCC

Power/Performance

- Operating voltage: 3 V⎓
- Operating current: 14 µA nominal
- Requires one CR 123 lithium battery
- 10-year battery life
- Non-volatile memory (saved changes are stored during power loss)

Environment

- Temperature: 32 ˚F to 104 ˚F (0 ˚C to 40 ˚C)
- For indoor use only

Warranty

- 5-Year Limited Warranty. For additional Warranty information, please visit www.lutron.com/TechnicalDocumentLibrary/Sensor_Warranty.pdf

Range

LRF2-, LRF3-, LRF4-, LRF5-, LRF7-

Local load controls must be located within 60 ft (18 m) line-of-sight, or 30 ft (9 m) through walls, of a sensor.

LRF6-

Local load controls must be located within 40 ft (12.2 m) line-of-sight, or 23 ft (7 m) through walls, of a sensor.

Sensor Coverage Test

- Front accessible test button
- Lens illuminates orange in response to motion during test mode and is visible from 60 ft (18 m)

Wireless Communication Test

- Front accessible test button
- Turn associated loads on and off

Timeout Options

- 1 minute*
- 5 minutes
- 15 minutes (default setting)
- 30 minutes

Auto-On Options (Occupancy Versions Only)

- *Enabled*: Sensor turns lights ON and OFF automatically (default setting).
- *Low Light*: Sensor turns lights ON automatically only in low ambient light conditions; sensor turns lights OFF automatically.
- *Disabled***: Lights must be turned ON manually from dimming or switching device; sensor turns lights OFF automatically.

Activity Options

- *Low Activity*: (default setting)
- *Medium Activity*:
- *High Activity*:

* Intended for use in high-activity, briefly occupied areas only.

** During the 15-second grace period that begins when the lights are automatically turned off, the lights will automatically turn back on in response to motion. This grace period is provided as a safety and convenience feature in the event the lights turn off while the room is still occupied, so that the user does not need to manually turn the lights back on. After 15 seconds, the grace period expires and the lights must be manually turned on.

Job Name:	Model Numbers:	
Job Number:		

Installation Overview

Sensor Setup

- Sensor setup is available as a service by Lutron. For more information see the Sensor Layout and Tuning service document (Lutron® P/N 3601235).

Sensor Placement

- To detect motion, the sensor requires line-of-sight of room occupants. The sensor must have an unobstructed view of the room. DO NOT mount behind or near tall cabinets, shelves, hanging fixtures, ceiling fans, etc. The sensor cannot see through glass objects such as patio- or shower doors.
- Hot objects and moving air currents can affect the performance of the sensor. To ensure proper operation, the sensor should be mounted at least 4 ft (1.2 m) away from HVAC vents and light bulbs that are below the ceiling line.
- The performance of the sensor depends on a temperature differential between the ambient room temperature and that of room occupants. Warmer rooms may reduce the ability of the sensor to detect occupants.
- Devices emitting Radio Frequency (RF) energy can affect the performance of sensors. To ensure proper operation, sensors should be mounted at least 4 ft (1.2 m) away from devices that emit radio waves (e.g., microwave ovens, wireless routers or other wireless devices).
- For additional information on placing sensors, please see the Occupancy/Vacancy Sensor Design and Application Guide (P/N 368-3197) located at www.lutron.com.

Mounting

Temporary mounting is optional to test sensor coverage and wireless communication before permanently installing the sensor.

Drop Ceiling (Compressed Fiber Ceiling Tile)

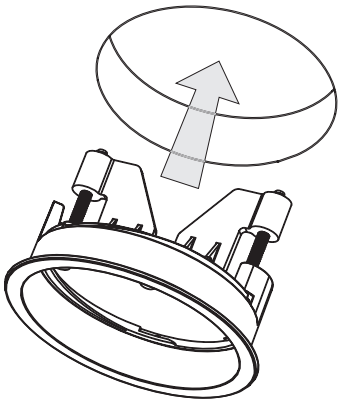
The mounting wire is provided for both temporary and permanent mounting of the sensor to ceiling tiles. It is designed to allow temporary mounting, testing, and repositioning (if necessary) of the sensor without damaging a ceiling tile. Once the final position of the sensor has been chosen, the mounting wire should be twisted together to permanently secure the sensor in place.

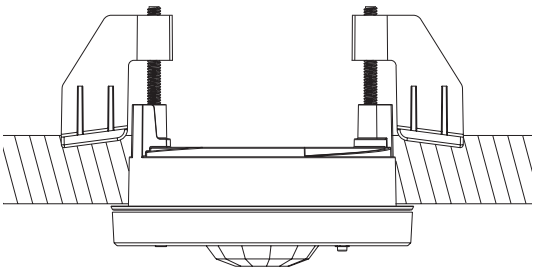
Solid Ceiling (Drywall, Plaster, Concrete, or Wood)

- Temporary mounting: Ten (10) temporary mounting strips can be purchased in the kit, L-CMDPIRKIT, for temporarily mounting and testing the sensor.
- Permanent mounting: Screws and anchors (for drywall or plaster) provided to mount the sensor.

Recess-Mount

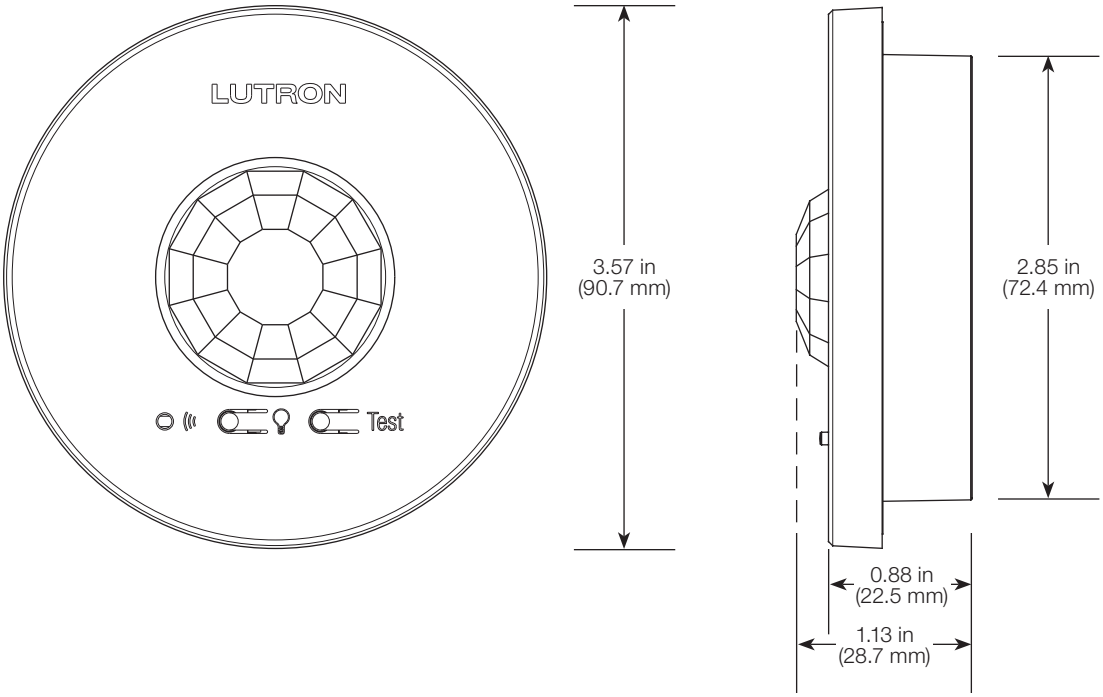
- Do not recess-mount sensor in a metal surface.
- Recess-mounting ring requires an opening of 3 in (76 mm) in diameter.
- Recess-mounting ring secures internally to ceiling. Sensor twists into the recess mounting ring and sits flush with ceiling (see image below).
- Recess-mounting ring purchased as a separate kit: L-CRMK-WH.





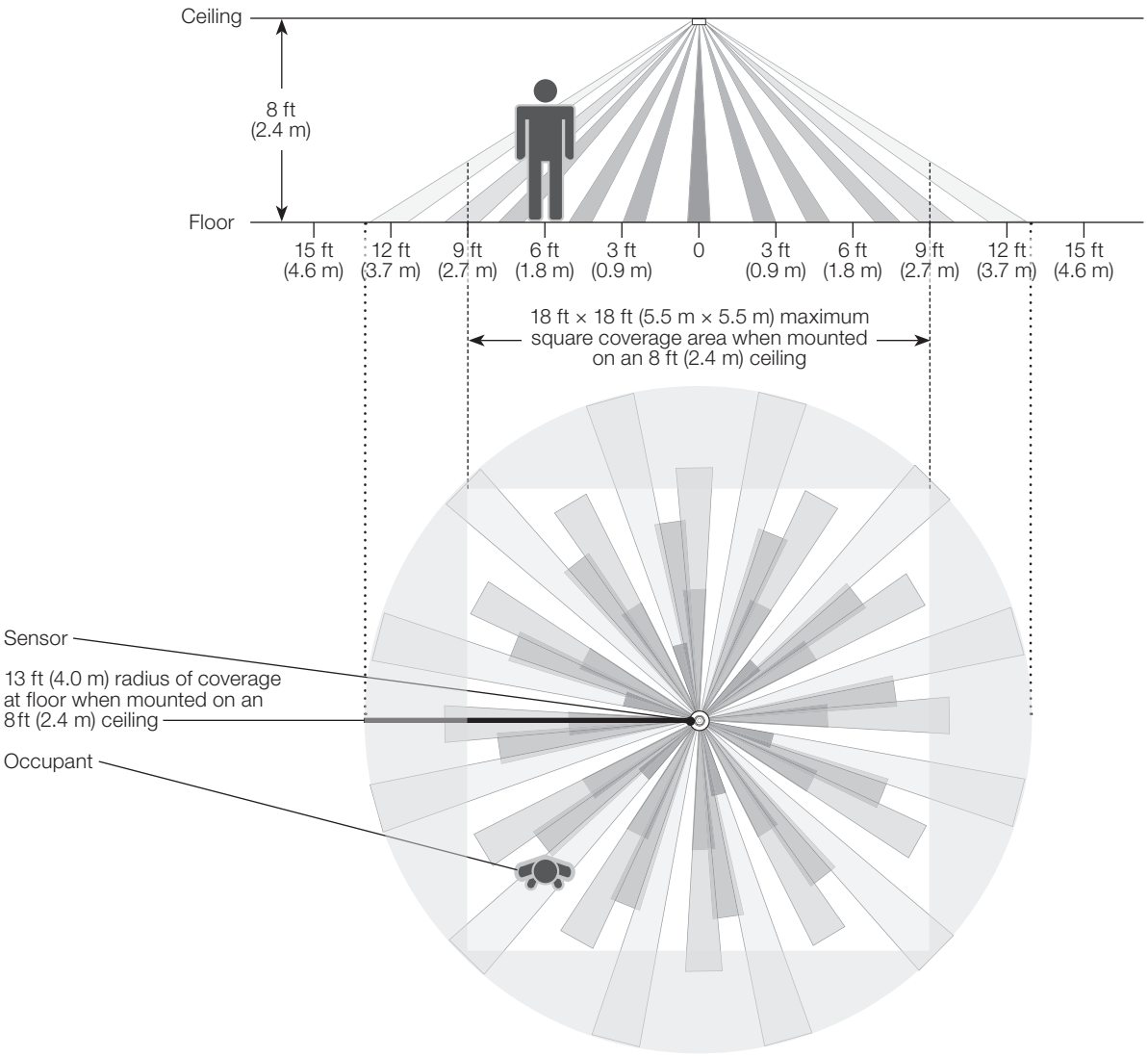
Job Name:	Model Numbers:	
Job Number:		

Dimensions



Job Name:	Model Numbers:	
Job Number:		

Range Diagrams



Sensor Coverage Chart (for sensor mounted in center of room)

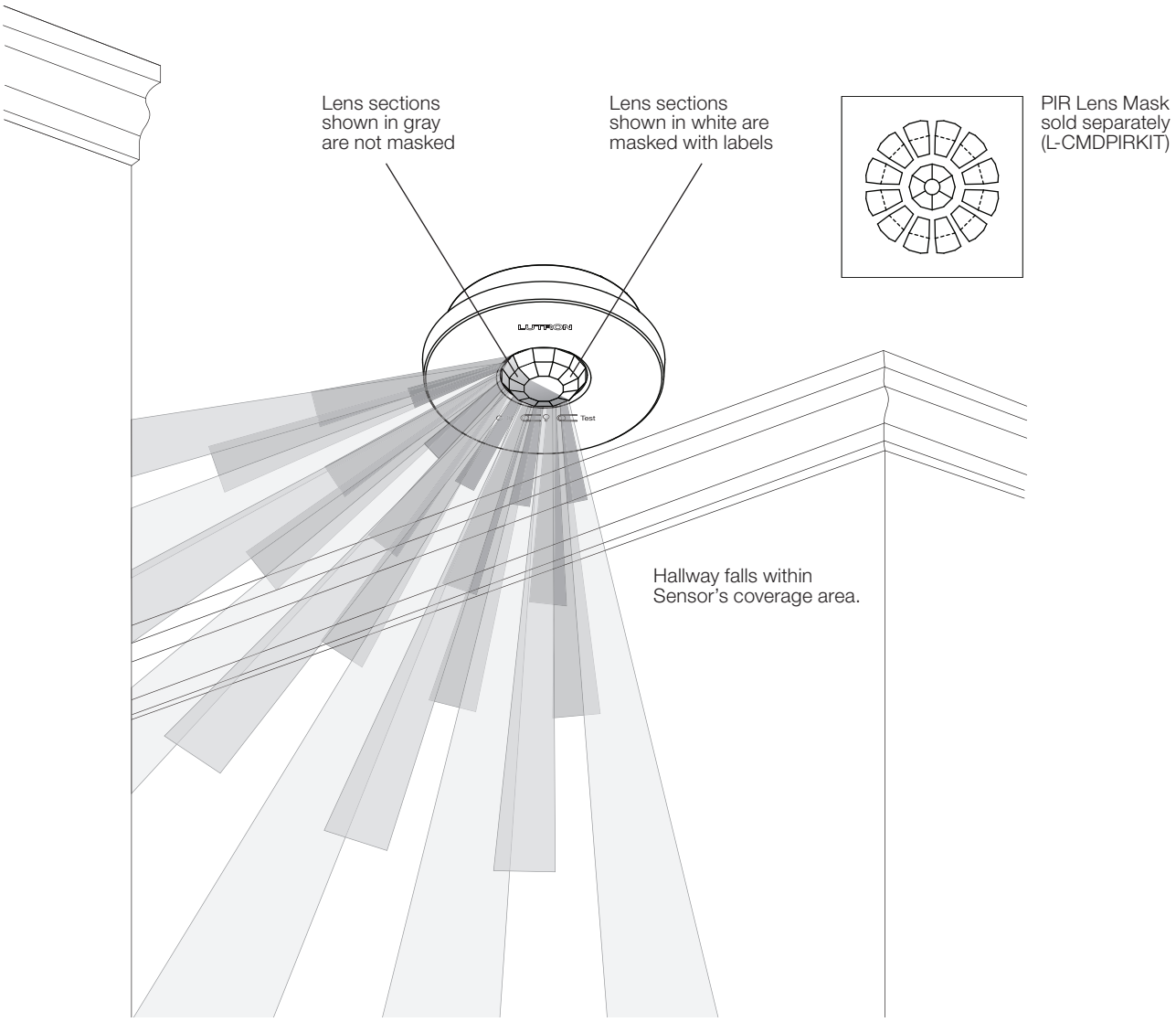
Ceiling Height	Maximum Square Coverage Area*	
8 ft (2.4 m)	18 ft × 18 ft (5.5 m × 5.5 m)	324 ft^2 (30.2 m^2)
9 ft (2.7 m)	20 ft × 20 ft (6.1 m × 6.1 m)	400 ft^2 (37.2 m^2)
10 ft (3.0 m)	22 ft × 22 ft (6.7 m × 6.7 m)	484 ft^2 (44.9 m^2)
12 ft (3.7 m)	26 ft × 26 ft (7.9 m × 7.9 m)	676 ft^2 (62.4 m^2)

* 12 ft (3.7 m) is the recommended maximum mounting height

Job Name:	Model Numbers:	
Job Number:		

Lens Masking

Whenever possible, the sensor should be installed in a location where it cannot view areas outside the intended space, such as hallways or adjacent rooms. If this situation cannot be avoided, portions of the lens may be masked to block the view of the sensor into undesired areas. Ten (10) PIR Lens Masks may be purchased in the kit, L-CMDPIRKIT.



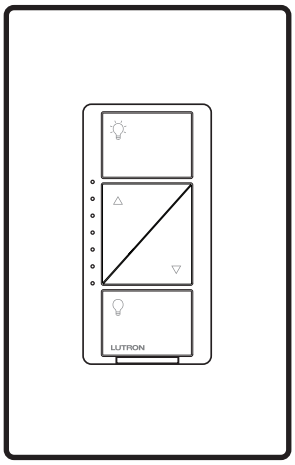
Job Name:	Model Numbers:	
Job Number:		

Caséta™ Wireless In-Wall Dimmer

The Caséta™ Wireless in-wall dimmer controls lighting loads automatically through wireless sensors and wireless remote controls, providing a system that delivers energy savings, convenience, and ease of installation.

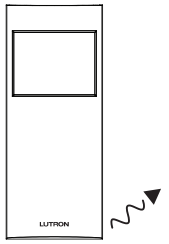
The Caséta™ Wireless in-wall dimmer uses Lutron® patented Clear Connect® RF Technology, which enables wireless communication with Radio Powr Savr™ sensors and Pico® remote controls for total load control.

Receiving Device
Caséta™ Wireless
In-Wall Dimmer

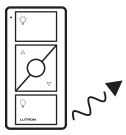


Transmitting Devices
Radio Powr Savr™ Sensors

Ceiling-mounted occupancy/vacancy sensor



Wall-mounted occupancy/vacancy sensor



Pico® remote control

Features

- The Caséta™ Wireless in-wall dimmer provides dimming of multiple load types and allows remote control and occupancy/vacancy sensing when paired with wireless transmitting devices.
- Lutron® patented Clear Connect® RF Technology works through walls and floors.
- Includes Front Accessible Service Switch (FASS™) for safe lamp replacement.
- Two-wire dimmer ideal for retrofit applications. No neutral required.
- Power failure memory: If power is interrupted, the control will return to its previously set level prior to interruption.
- Works with dimmable LEDs and CFLs as well as incandescent and halogen light bulbs.

Load Types and Capacity*

LED
up to 150 W

CFL
up to 150 W

Halogen
up to 600 W

Incandescent
up to 600 W

* See **Ganging and Derating** section.

Job Name:	Model Numbers:	
Job Number:		

Specifications

Regulatory Approvals

- cULus Listed
- NOM certified
- FCC Approved. Complies with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules
- Industry Canada certified
- COFETEL certified

Power

Operating voltage:
120 V~ 50/60 Hz

Key Design Features*

- Tested to withstand electrostatic discharge without damage or memory loss, in accordance with IEC 61000-4-2.
- Tested to withstand surge voltages without damage or loss of operation, in accordance with IEEE C62.41-1991 Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
- Dimmers always operate locally and do not require system control.
- Power failure memory: should power be interrupted, the control will return to its previously set level prior to the interruption when power is restored.
- Uses Lutron® Claro® wallplates or designer-style wallplates from other manufacturers. Wallplates are sold separately.
- Lutron® Claro® wallplates snap on with no visible means of attachment.
- Requires a 1-gang U.S. wallbox. 3½ in (89 mm) deep recommended, 2¼ in (57 mm) deep minimum.
- Green LEDs indicate load status.

System Communications and Capacity

- The Caséta™ Wireless in-wall dimmer communicates with the Pico® remote controls and Radio Powr Savr™ sensors through radio frequency (RF).
- The Caséta™ Wireless in-wall dimmer must be located within 60 ft (18 m) line-of-sight or 30 ft (9 m) through walls, of Pico® remote controls and Radio Powr Savr™ sensors.
- Up to ten transmitting devices may be associated to each in-wall dimmer.

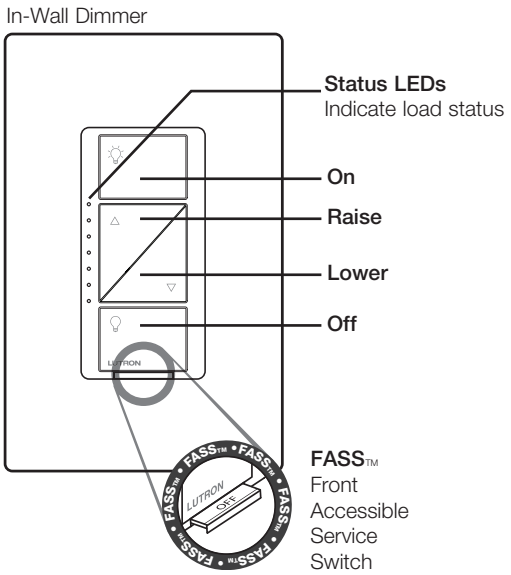
Environment

- Ambient operating temperature: 32 °F to 104 °F (0 °C to 40 °C), 0%-90% humidity, non-condensing. Indoor use only.

* For advanced features, tips on how to use Caséta™ Wireless dimmers with CFLs and LEDs, the complete Caséta™ Wireless product line, and more, please visit **www.casetawireless.com/features**

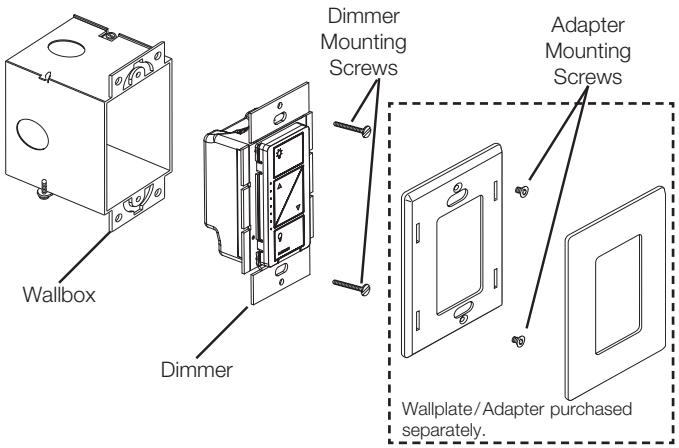
Job Name:	Model Numbers:	
Job Number:		

Operation



IMPORTANT NOTICE:
FASS™ - Front Accessible Service Switch - to service load, remove power by pulling the FASS™ switch out completely on Switch. After servicing load, push the FASS™ switch back in fully to restore power to the control.

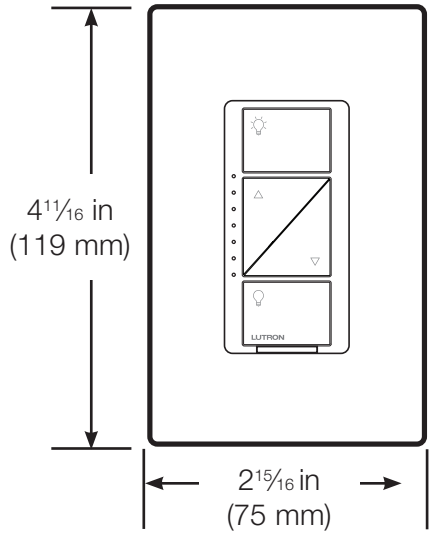
Mounting



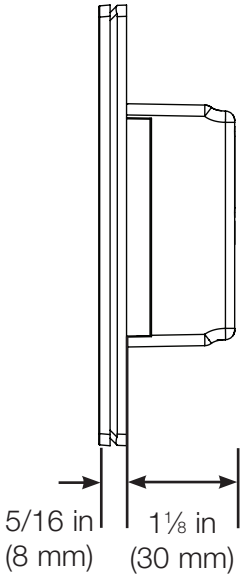
Job Name:	Model Numbers:	
Job Number:		

Dimensions

Front View

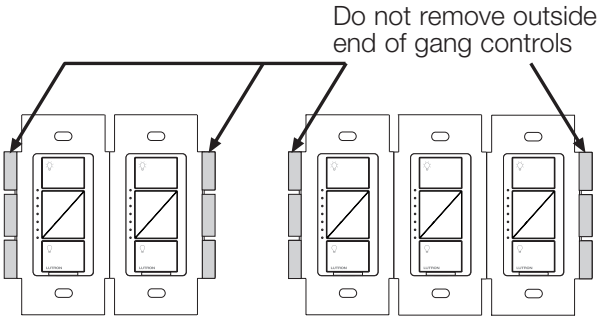


Side View



Ganging and Derating

When ganging with other controls in the same wallbox, derating is required. See Load Type and Capacity chart.



Load Type and Capacity*

CFL/LED Total Wattage		Incandescent/Halogen Total Wattage Ⓐ	Ⓑ	Ⓒ
0 W	+	600 W	500 W	400 W
1 W – 25 W	+	500 W	400 W	300 W
26 W – 50 W	+	400 W	300 W	200 W
51 W – 75 W	+	300 W	200 W	100 W
76 W – 100 W	+	200 W	100 W	50 W
101 W – 125 W	+	100 W	50 W	0 W
126 W – 150 W	+	0 W	0 W	0 W

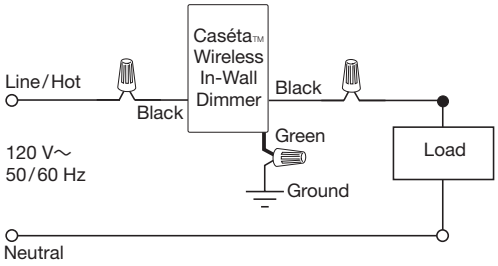
- Mixing bulb types (using a combination of CFL/LED and incandescent/halogen bulbs) reduces maximum wattage as shown in the chart above.
- In-wall dimmer has a minimum load requirement of 25 W or one bulb from the compatible bulb list.

* See **www.casetawireless.com/bulblist** for the latest list of compatible bulbs.

Job Name:	Model Numbers:	
Job Number:		

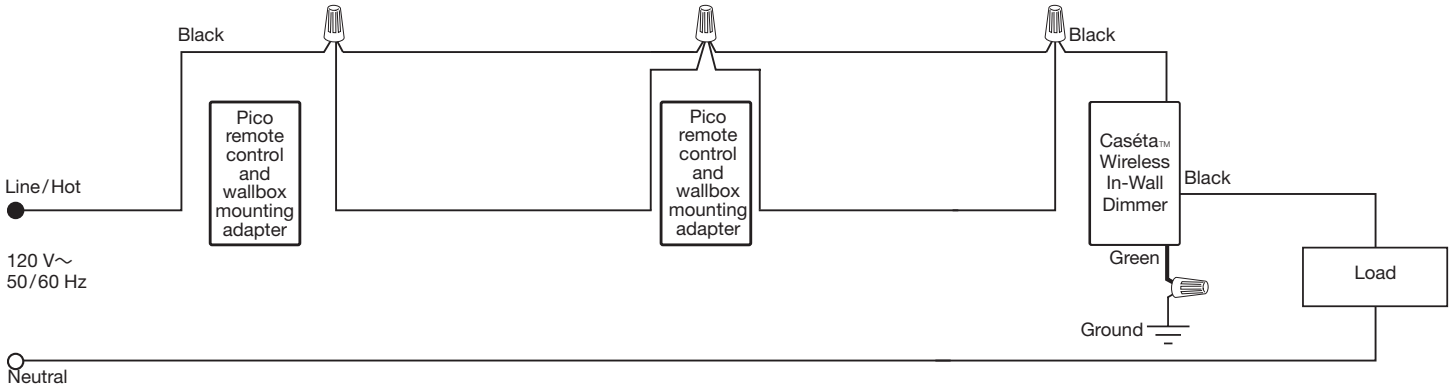
Wiring Diagrams

Single Location Installation



Multi-Location Installation

With Pico® remote controls (PJ2-XX-XX) and wallbox mounting adapters (PICO-WBX-ADAPT)



Colors and Finishes

Gloss Finishes

White
WH

Black
BL

Ivory
IV

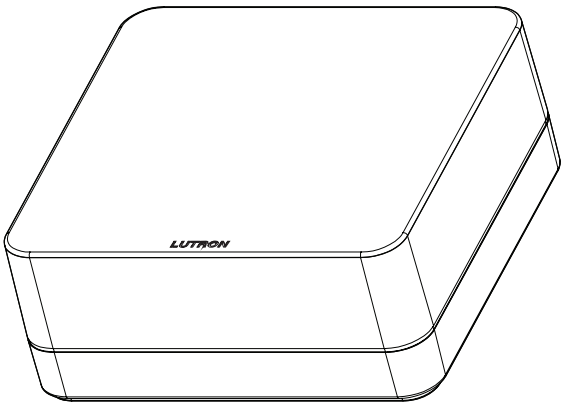
Light Almond
LA

Due to printing limitations, colors and finishes shown cannot be guaranteed to perfectly match actual product colors.

Job Name:	Model Numbers:	
Job Number:		

Lutron® Smart Bridge and Lutron® Smart Bridge PRO

The Smart Bridge and Smart Bridge PRO allow for setup, control, and monitoring of Caséta® Wireless devices and Lutron® wireless shades from a smartphone or tablet using the Lutron® App[1].



Lutron® Smart Bridge and Smart Bridge PRO

Models Available

L-BDG2-WH	5 V⎓ 300 mA (Lutron® Smart Bridge)
L-BDGPRO2-WH	5 V⎓ 300 mA (Lutron® Smart Bridge PRO)

[1] The Lutron® App is required for setup and use with the Smart Bridge/Smart Bridge PRO. The Lutron® App is compatible with iOS® devices version 8.0 or later and Android™ devices 4.1 or later.

iOS is a registered trademark of Cisco in the U.S. and other countries and is used under license. Android is a trademark of Google Inc.
Apple, Apple TV, iPad, iPod touch, iPhone, and Siri are registered trademarks and Apple Watch and HomeKit are trademarks of Apple Inc., registered in the U.S. and other countries.

Job Name:	Model Numbers:	
Job Number:		

Features	Smart Bridge	Smart Bridge PRO
Supports up to 50 wireless devices (Caséta® Wireless dimmers, plug-in dimmers, and switches, Pico® remote controls, wireless shades). Smart Bridge/Smart Bridge PRO counts as one device.	√	√
Programmed via the Lutron® App (available for iOS® and Android™).	√	√
Scene control via the Lutron® App.	√	√
Timeclock scheduling of daily events via the Lutron® App.	√	√
Connects to Wi-Fi router via Ethernet.	√	√
Local device operation will continue to function if internet connection is lost or Smart Bridge/Smart Bridge PRO is powered down or not communicating.	√	√
System access from anywhere in the world using the Lutron® App.	√	√
Supports Caséta® Wireless devices, Serena® shades, and Pico® remote controls.	√	√
Control outside the app via widgets (iOS® and Android™).	√	√
Supports Geofencing from the Lutron® App.	√	√
Control from *Apple Watch*.	√	√
Supports *Siri* and *Apple HomeKit* technology.[1]	√	√
Supports Sivoia® QS Triathlon® and select Sivoia® QS Wireless shades (venetian and horizontal sheer blinds are not supported).		√
Integration with select A/V and security systems (see www.casetawireless.com/integration for details).		√

[1] HomeKit requires an iPhone, iPad, or iPod touch with iOS 8.1 or later. Controlling HomeKit-enabled accessories from home also requires an Apple TV (3rd generation or later) with Apple TV software 7.0 or later. Smart Bridge enables plug-in lamp dimmers to work with HomeKit technology. See CasetaWireless.com/Support for more details.

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Apple, Apple TV, iPad, iPod touch, iPhone, and Siri are registered trademarks and Apple Watch and HomeKit are trademarks of Apple Inc., registered in the U.S. and other countries.

Job Name:	Model Numbers:	
Job Number:		

Specifications (Smart Bridge/Smart Bridge PRO)

Regulatory Approvals

- cULus Listed
- NOM certified
- FCC approved. Complies with the limits of a Class B digital device, pursuant to Part 15 of the FCC rules
- IC certified
- COFETEL certified

Power

- 5 V⎓ 300 mA
- Power Supply (included): 5 V⎓ 550 mA, cable length 6 ft (1.83 m)

Typical Power Consumption

- Lutron® Smart Bridge: 1.3 W
- Lutron® Smart Bridge PRO: 1.3 W
- Test Conditions: LED on, Ethernet cable plugged in, powered by the 5 V⎓ adapter

Environment

- Ambient operating temperature: 32 °F to 104 °F (0 °C to 40 °C)
- 0% to 90% humidity, non-condensing
- Indoor use only

Communications

- All devices must be located within 30 ft (9 m) of Smart Bridge/Smart Bridge PRO
- System devices operate on frequencies between 431.0 MHz to 437 MHz
- Internet connection required for initial setup and to maintain system date/time and receive periodic firmware updates

Protection

- Tested to withstand electrostatic discharge without damage or memory loss in accordance with IEC 61000-4-2
- Tested to withstand surge voltages without damage or loss of operation, in accordance with IEEE C62.41-1991

Power Failure Memory

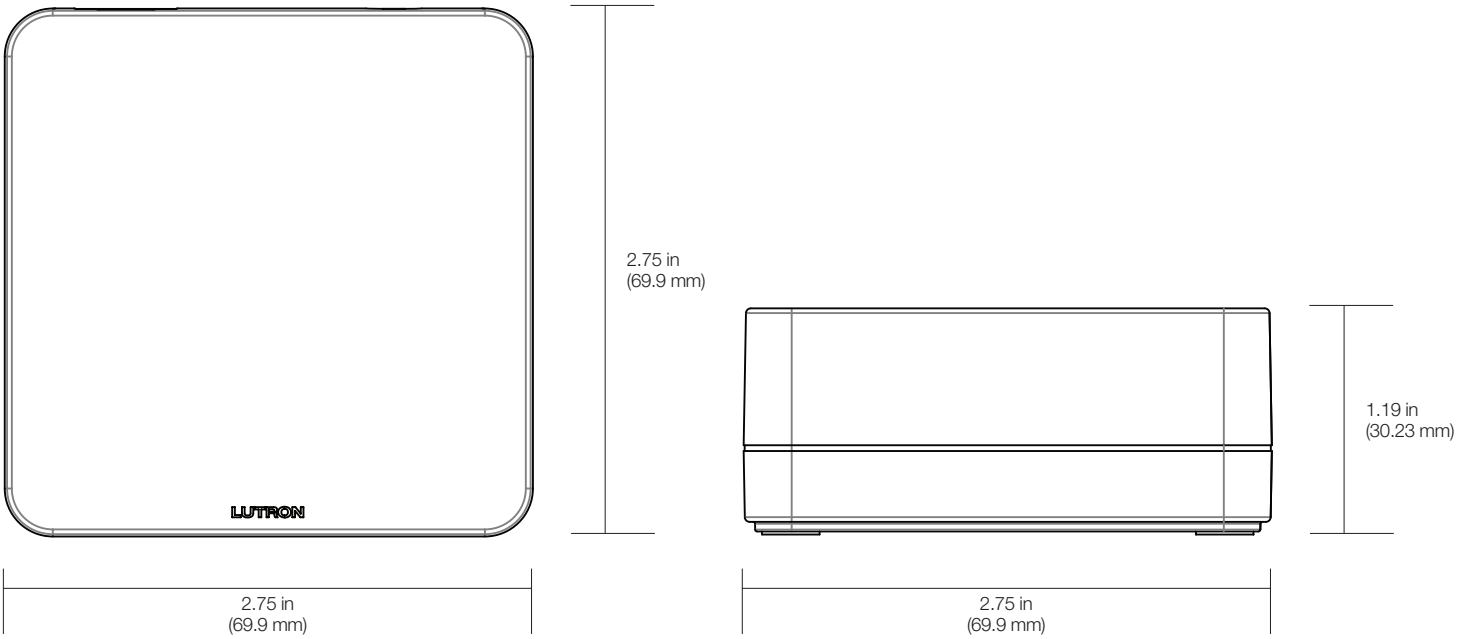
- Should power be interrupted, the Smart Bridge/Smart Bridge PRO will return to its previous state when power is restored

Connections

- Ethernet: 3 ft (0.92 m) cable included (for internet and Lutron® App connection)
- USB (power only)

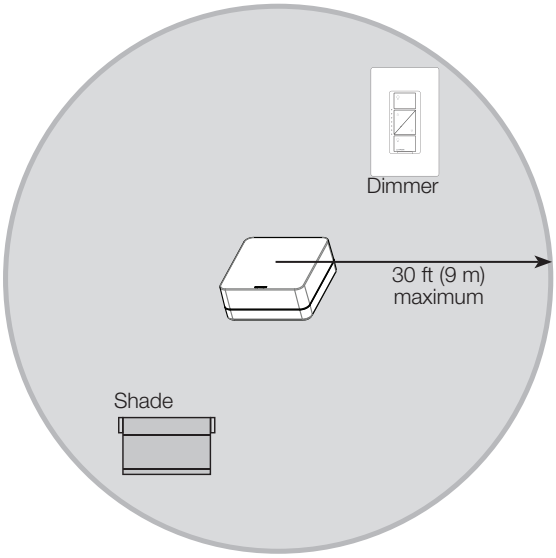
Job Name:	Model Numbers:	
Job Number:		

Dimensions (Smart Bridge/Smart Bridge PRO)



Job Name:	Model Numbers:	
Job Number:		

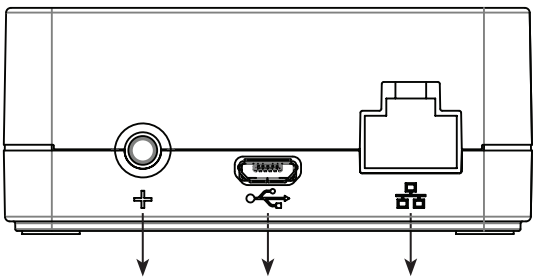
RF Range (Smart Bridge/Smart Bridge PRO)



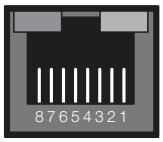
All devices must be located within 30 ft (9 m) of Smart Bridge/Smart Bridge PRO

Connections (Smart Bridge and Smart Bridge PRO)

Back View



Ethernet Pin Numbering

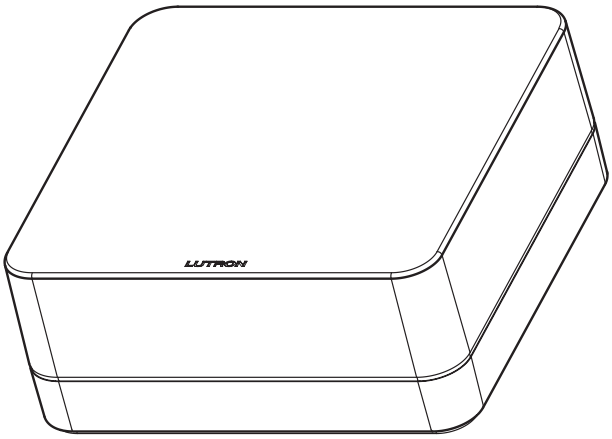


Ethernet	Pin #
T+Ve	1
T–Ve	2
R+Ve	3
R–Ve	6

Job Name:	Model Numbers:	
Job Number:		

Lutron Connect™ Bridge

The Lutron Connect™ Bridge creates a link between a RadioRA® 2 or HomeWorks® QS system and the Lutron® cloud, enabling remote access to your system.



Lutron Connect™ Bridge

Features

- Works with the Lutron Connect™ app (Android and iOS)
- Provides remote access for control and monitoring of system via Lutron Connect™ app*
- Timeclock syncing to always ensure accurate system time

Models Available

- **CONNECT-BDG-1**: 5 V⎓ 300 mA (North America with Power Supply T-5DC-USB-WH)
- **CONNECT-BDG-2**: 5 V⎓ 300 mA (International without Power Supply)

* The Lutron Connect™ Bridge is required when using the Lutron Connect™ app.

iOS is a registered trademark of Cisco in the U.S. and other countries and is used under license.
Android is a trademark of Google Inc.

Customer Assistance:
1.844.LUTRON1 (U.S.A./Canada)
+44.(0)20.7680.4481 (Europe)

Lutron Connect™ Bridge

Specifications

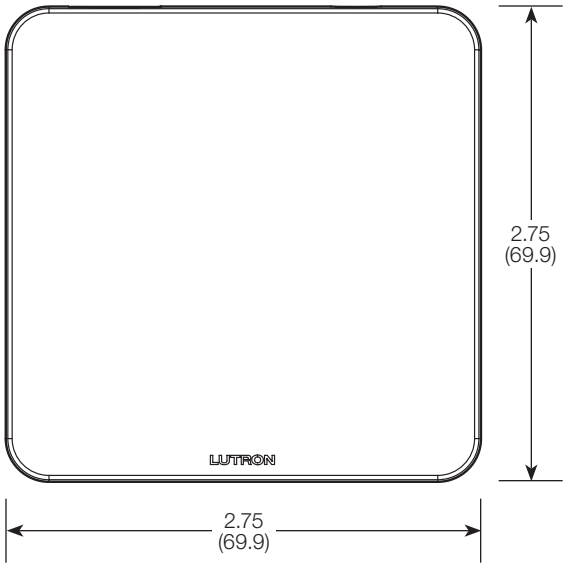
Model Numbers	CONNECT-BDG-1, CONNECT-BDG-2
Power	5 V⎓ 300 mA *Power Supply* (CONNECT-BDG-1 only): 5 V⎓ 550 mA; cable length 6 ft (1.83 m)
Typical Power Consumption	1.3 W *Test conditions*: LED on, Ethernet cable plugged in, powered by the 5 V⎓ power supply
Regulatory Approvals	cULus listed; certified for IEC/EN compliance; CE marked. *Power Supply (T-5DC-USB-WH)*: cULus listed; NOM certified.
Environment	*Ambient operating temperature*: 32 °F to 104 °F (0 °C to 40 °C), 0% to 90% non-condensing humidity. Indoor use only.
Communications	Internet connection is required for initial setup, to maintain system date/time, for remote access from the Lutron Connect™ app, and to receive periodic firmware updates. Network connection to RadioRA® 2 main repeater or HomeWorks® QS processor is required.
Protection	Tested to withstand electrostatic discharge without damage or memory loss in accordance with IEC 61000-4-2. Tested to withstand surge voltages without damage or loss of operation in accordance with IEEE C62.41-1991.
Power Failure	*Power failure memory*: should power be interrupted, the Lutron Connect™ Bridge will return to its previous state and reconnect to the Lutron® system and cloud services when power is restored.
Connections	*Ethernet*: 3 ft (0.92 m) cable included for internet and Lutron Connect™ Bridge connection via RadioRA® 2 main repeater or HomeWorks® QS processor. Micro USB cable (power only).
Warranty	www.lutron.com/TechnicalDocumentLibrary/warranty.pdf www.lutron.com/TechnicalDocumentLibrary/Intl_warranty.pdf

Lutron Connect™ Bridge

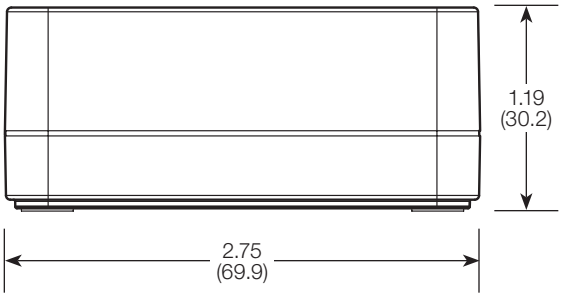
Dimensions

Measurements shown as: in (mm)

Top View



Front View



Customer Assistance:
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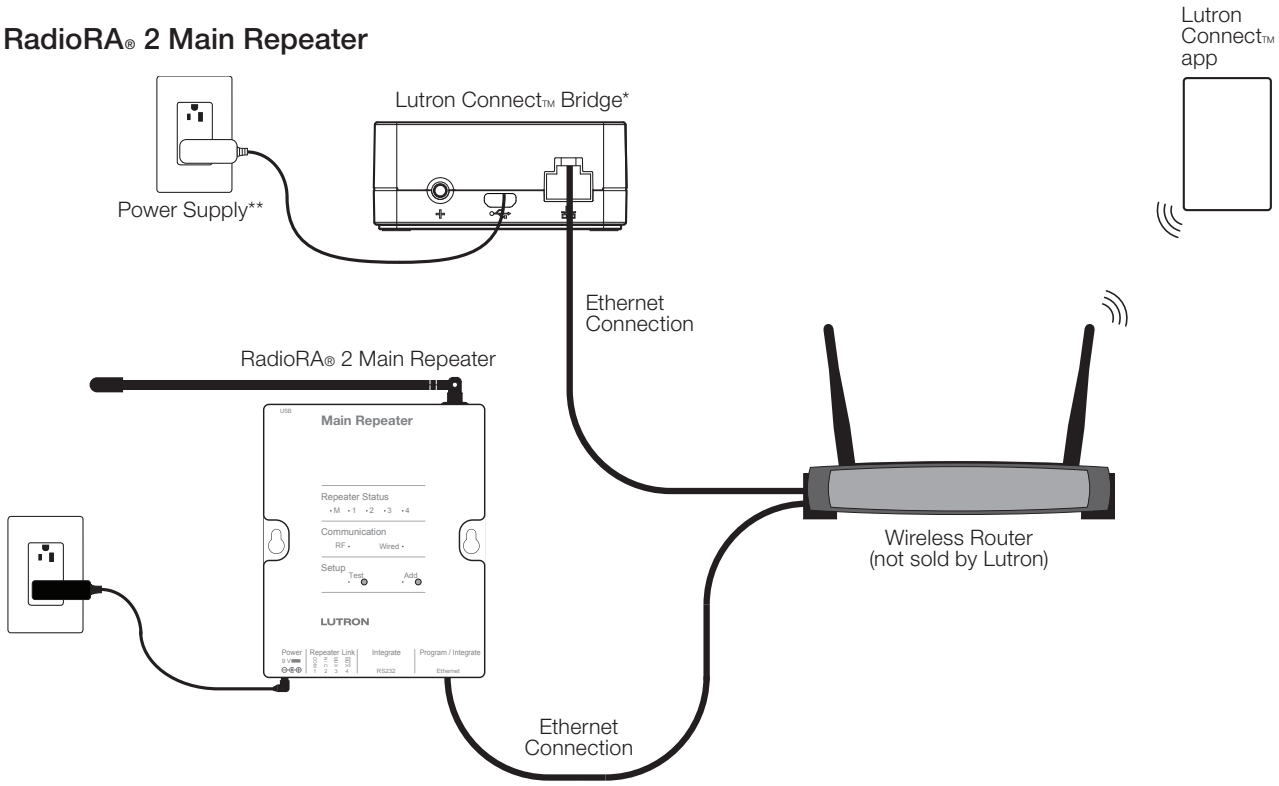
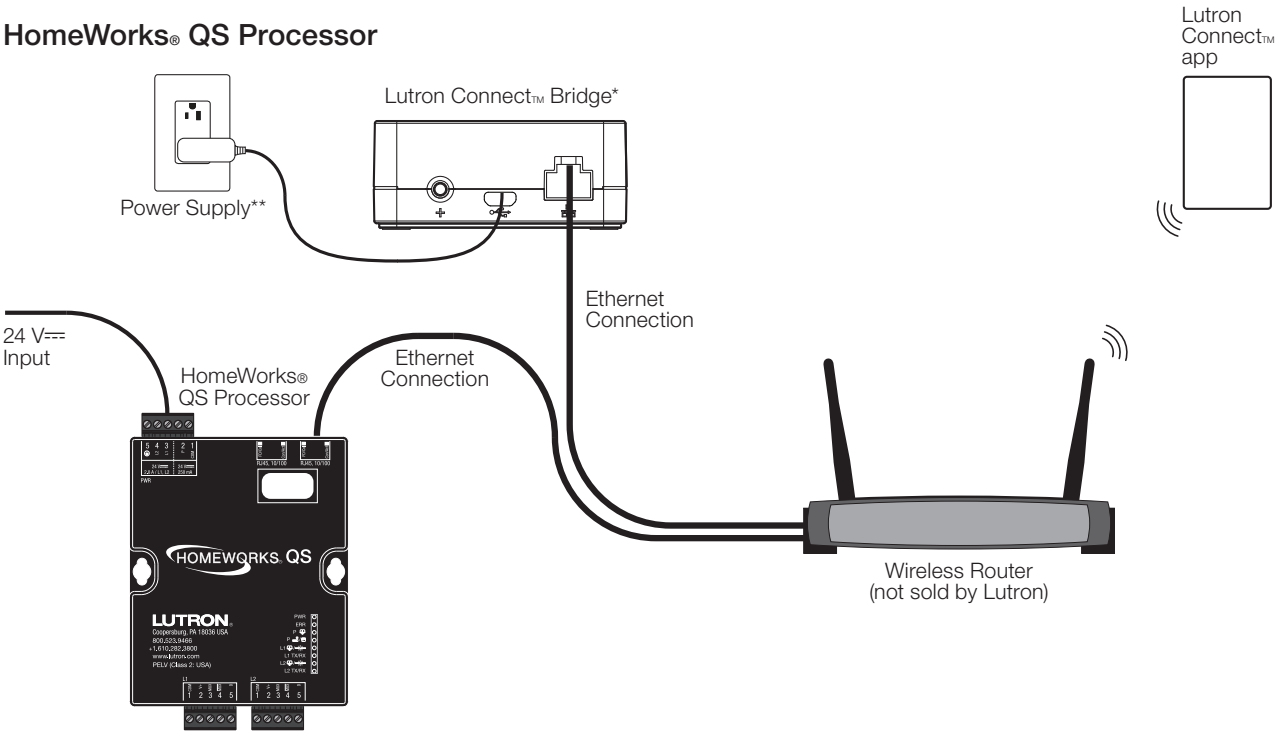
Lutron Connect™ Bridge

Connections

RadioRA® 2 Main Repeater



HomeWorks® QS Processor



* The Lutron Connect™ Bridge must be on the same subnet as the RadioRA® 2 Main Repeater or the HomeWorks® QS Processor.

** Power supply included only with CONNECT-BDG-1.

Customer Assistance:
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+44.(0)20.7680.4481 (Europe)

Accent Head Cable Kit

By **Tech Lighting**

$156.80

Compare: $196.00
You Save: 20%

IN STOCK Ships within 3 business days.

4.7 out of 5

15 of **15** (100%) people recommend this product

Best designs. Best value.
Chat or call. **877.445.4486.**

FREE SHIPPING on orders over $50.

FREE GIFT ONLY AT LUMENS: Use code **TECH** at checkout to receive a FREE Lil Big Wonder Accent Lamp or a FREE 360 Round Flushmount with $300+ Tech Lighting purchase during the LED Event. Limited time only.

Details

With its unique dual cable configuration, the Tech Accent Head Cable Kit is a perfect alternative to standard single rail systems. It comes with five adjustable Accent heads in a sleek Matte Nickel finish hovering in-between two matching cables. The Accent Head Cable Kit comes with everything needed for easy installation.

Tech Lighting, headquartered in Skokie, IL, is known for their innovative lighting systems and exquisite lighting designs. Their passion for art, sophistication and imagination is balanced by rigorous testing and quality control in the creation of their line-voltage and low-voltage lighting, including the Tech Lighting FreeJack and monorail systems and track heads.

The Accent Head Cable Kit is available with the following:

Details:

- 5 Accent heads and lamps
- Heads each rotate 120-degrees
- Matte Nickel finish
- Dimmable with standard incandescent dimmer
- One 12 Volt 100 Watt electronic surface transformer
- Two 20' sections of cable
- Pair of anchors
- Pair of turnbuckles
- ETL Listed

Lighting:

- Five 20 Watt 12 Volt Low-voltage Type MR16 Incandescent lamps (included).

Compare Brightness:

VIEW CHART

Dimensions:

- **Suspension**: Length 2"

- **Head**: Height 2.1", Diameter 2.8"
- **Cable**: Length 20'

Ratings: Based on 15 reviews, this product is rated 4.7 out of 5.

Manufacturer IDs: view

Need help with some of our terminology? Check out **Lumens' Lighting & Design Glossary**.

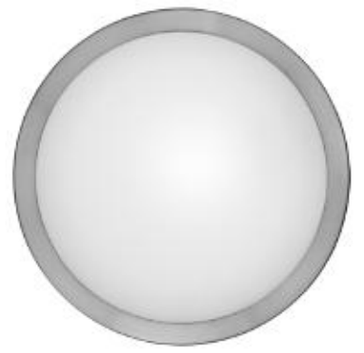
YOU MAY ALSO LIKE

Focus Head Monorail Kit
By Tech Lighting

From: $227.20

360 Round Flushmount
By Tech Lighting

From: $70.40



Arezzo Ceiling/Wall Light
By Eglo

From: $38.00

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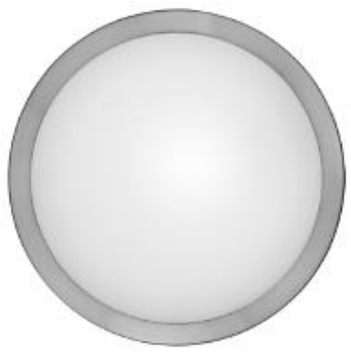
By Tech Lighting

From: $227.20

360 Round Flushmount
By Tech Lighting

From: $70.40



Arezzo Ceiling/Wall Light
By Eglo

From: $38.00

YOU MAY ALSO LIKE

Focus Head Monorail Kit
By Tech Lighting

From: $227.20

360 Round Flushmount
By Tech Lighting

From: $70.40

Arezzo Ceiling/Wall Light
By Eglo

From: $38.00

GUARANTEE

SERVICE

Access 52034-BS/OPL

Comet 3 Light 120v Brushed Steel Semi-Flush Mount Rail Ceiling Light in Incandescent

0

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shown in alternate finish, color, or with options that are sold seperately

Zoom Image

Product Information | General Information | Manufacturer's Catalog(s) | Questions

General Information

Access 52034-BS/OPL
Comet 3 Light 120v Brushed Steel Semi-Flush Mount Rail Ceiling Light in Incandescent

Ceiling - Fixture

Brand Information

- Brand: Access
- Collection: Comet
- SKU: 52034-BS/OPL
- UPC: 641594169959

Dimensions and Weight

- Length: 35.00 in.
- Width: 35.00 in.
- Height: 10.00 in.
- Backplate/Canopy Width: 7.50 in.
- Backplate/Canopy Length: 7.50 in.
- Backplate/Canopy Thickness: 1.10 in.
- Install Position: Ceiling

Design Information

- Category: Rail Lighting
- Finish: Brushed Steel
- Glass: Opal
- Material: Metal

Bulb Information

- Bulbs Included: No
- Bulb Category: Halogen
- Primary Bulb(s): 3 x 35 watts Halogen 120v MR16 (GU-10 Base)
- Color Temperature: 2900k

Product Rating

- Voltage: 120v

Customers Who Bought This Also Bought...

Access 52029-BS/OPL
Comet 3 Light Spotlight in Brushed Steel

$75.00

Access 52030-BS/OPL
Comet 3 Light 120v Brushed Steel Semi-Flush Mount Rail Ceiling Light in Incandescent

$114.00

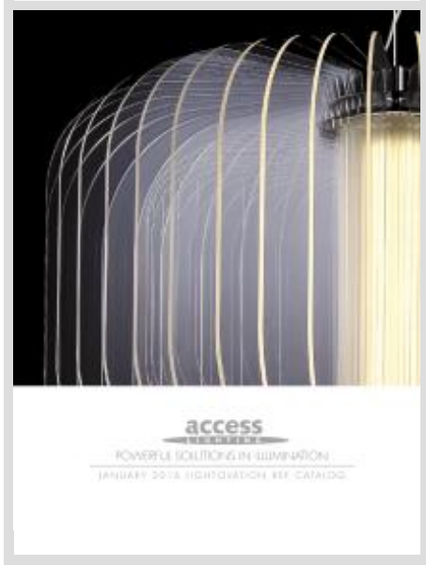
See the entire Comet Collection

Other Specifications

- Ships Via: UPS (FREE SHIPPING)
- Warranty: 1 Year Warranty
- Safety Rating: CETL Dry

Access's Catalogs

Click on the catalog to view the PDF in your browser or right-click and hit "Save As" to save the PDF to your computer.



Customer Reviews

There are no reviews for this product. Currently review requests are being sent to Lighting New York customers that have already purchased and received the product.

Product Questions

Questions about Access 52034-BS/OPL

Ask us a question...

1 question(s) from the community have been answered.

Q	52034-BS/OPL- does this come in brushed nickel and with LED instead of halogen
A	The Access Lighting Comet 3 Light Semi-Flush 52034-BS/OPL does not come in any other finish and is not available in an LED fixture.

Was this answer helpful? Yes | No

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Now available! Call 866.344.3875 for more information.

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Sat & Sun 9am to Midnight EST

Customer Service - 866.344.3875
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Ordering Info
Guarantee
Privacy Policy
Return Policy
Security
Pricing Disclaimer
Low Price Guarantee

My Account
Log In (Sign Up)
My Orders & Quotes
My Lists
My Addresses
My Product Reviews
Log Out

Payment Accepted

Feel Secure Shopping at Access Lighting Lights

GoDaddy

BBB Rating: A+ as of 11/16/2016 Click for Review

YOUR VIP CODE: **ENV5BL8Q13**

A member of the Lighting New York family. © 2009 - 2016. All rights reserved. | Brushed Steel Rail Lighting | Access Lighting's Official Site | Mobile Site

Model # 441-EVB40-PST Internet #205743378

Leviton

Evr-Green 400 40-Amp 240-Volt 9.6-kW Surface Mount Electric Vehicle Charging Station

★★★★½ (5) Write a Review Questions & Answers (7)

- Easy and safe electric vehicle charging
- Compact design takes up minimum amount of wall space
- 25-ft charging cable provides flexibility for mounting location

$699.00 /each

Pick Up In Store

This product isn't currently sold in stores

We'll Ship It to You

Out of stock online

Receive an email if this item is back in stock.

Email Notify Me

Product Overview

The Leviton Evr-Green 400 Charging Station is the first UL listed charging station that can provide up to 40-Amp continuous at 240-Volt AC (9.6 kW output) to deliver a fast charging experience for any SAE J1772 compatible plug-in electric vehicle. The modern design, enhanced convenience features, integrated connector dock, and 25 ft. charging cable make the Evr-Green 400 ideal for residential or light commercial applications. The Evr-Green 400 EVB40-PST is used for surface mount receptacle installations - where the electrical box is mounted to the surface of the wall.

- Compatible with all electric vehicle supply equipment (EVSE) standards and recommended practices, including SAE J1772 NEC 625, UL 2231 and UL 2594
- Tool-less, "non-permanent" installation also makes it easier to remove and replace or take with you in the event you move
- Industry exclusive 40-Amp charging station will optimize the charge time for vehicles with onboard chargers larger than 6.6 kW
- Enclosure is rated NEMA type 4 watertight - this rating applies to hard-wired applications only
- Industry leading 3-year limited warranty
- Input plug on the bottom for surface mount applications

Info & Guides

Instructions / Assembly

Product Brochure

SDS

Use and Care Manual

You will need Adobe® Acrobat® Reader to view PDF documents.
Download a free copy from the Adobe Web site.

- Preferred EVSE supplier for the Toyota RAV4 EV
- Leviton cord connected EVSEs meet the NEC Article 625.44 compliance of being fastened in place through the use of a bracket
- Leviton EVSEs that are rated 32Amps or greater meet NEC Article 625 with 8 AWG electrical vehicle cable requirements
- Preferred electric vehicle charging station for Toyota, Honda, Kia

- Click here for more information on Electronic Recycling Programs

Specifications

Dimensions

Cable Length (ft.)	25	Product Height (in.)	24
Product Depth (in.)	9	Product Width (in.)	16.2

Details

Amperage (amps)	40	Power Input	Hard-Wired
Charging Level	Level 2	Product Weight (lb.)	34.4 lb
Commercial / Residential	Residential	Returnable	90-Day
Features	Charges 1 Car,Outdoor	Voltage (volts)	208
Mounting Type	Wall Mounted		

Warranty / Certifications

Certifications and Listings	1-UL Listed	Manufacturer Warranty	3-Year Limited Warranty

How can we improve our product information? Provide feedback.

P5675 - Outdoor Fixture by Progress Lighting

Specs

Back Plate Length:	4.50"
Back Plate Width:	4.50"
Depth/Extension:	7.88"
Height:	14.00"
Height from Center:	7.00"
Width/Diameter (in):	5.00"
Wire Length:	6.00"
# of Bulbs:	2
Standard Wattage:	75W
Bulb Type:	PAR-30/BR-30
Voltage Rating:	120V
Material:	Porcelain/Cast Aluminum
Optional Finishes:	Yes
Weight:	2.80 lbs.

Style and Option 1

Style:	Antique Bronze Finish with Metal Shade
Item #:	P5675-20
Price:	Listed Price: $114.39 On Special: $91.51

Style and Option 2

Style:	White Finish with Metal Shade

Item #:	P5675-30
Price:	Listed Price: $114.39 On Special: $91.51

Style and Option 3

Style:	Black Finish with Metal Shade
Item #:	P5675-31
Price:	Listed Price: $114.39 On Special: $91.51

Style and Option 4

Style:	Metallic Gray Finish with Metal Shade
Item #:	P5675-82
Price:	Listed Price: $114.39 On Special: $91.51

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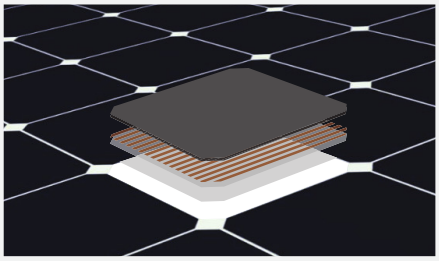
  Ideal for roofs where space is at a premium or where future expansion might be needed.
- **Maximum performance**
  Designed to deliver the most energy in demanding real world conditions, in partial shade and hot rooftop temperatures.[1, 2, 3]
- **Premium aesthetics**
  SunPower® Signature™ Black X-Series panels blend harmoniously into your roof. The most elegant choice for your home.



Maxeon® Solar Cells: Fundamentally better.
Engineered for performance, designed for durability.

Engineered for peace of mind

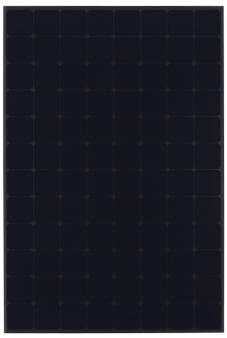
Designed to deliver consistent, trouble-free energy over a very long lifetime.[4,5]

Designed for durability

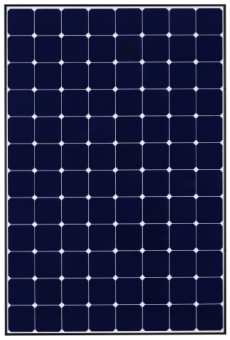
The SunPower Maxeon Solar Cell is the only cell built on a solid copper foundation. Virtually impervious to the corrosion and cracking that degrade Conventional Panels.[4,5]

Same excellent durability as E-Series panels.
#1 Ranked in Fraunhofer durability test.[10]
100% power maintained in Atlas 25+ comprehensive PVDI Durability test.[11]

UNMATCHED PERFORMANCE, RELIABILITY & AESTHETICS



SIGNATURE™ BLACK
X21 - 335 PANEL



X21 - 345 PANEL

X21 SERIES

HIGHEST EFFICIENCY[6]

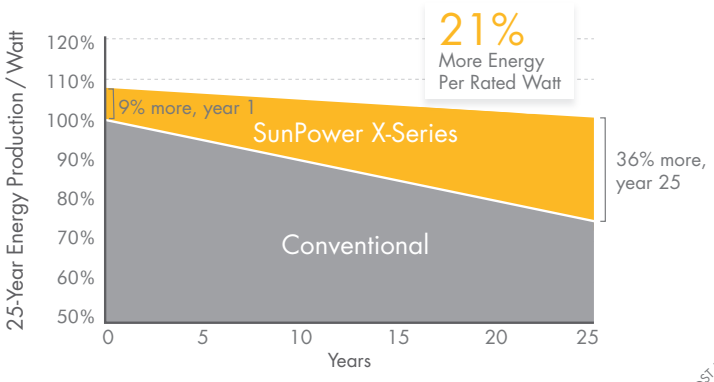
Generate more energy per square foot

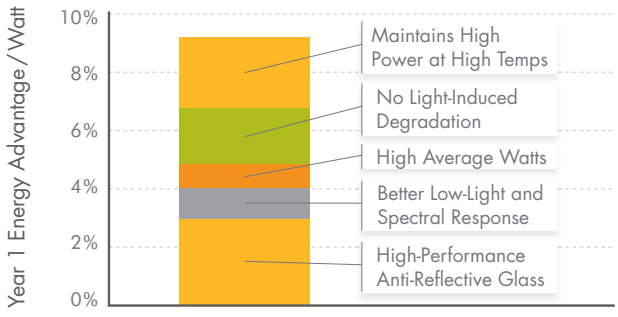
X-Series residential panels convert more sunlight to electricity producing 44% more power per panel,[1] and 75% more energy per square foot over 25 years.[3,4]

HIGHEST ENERGY PRODUCTION[7]

Produce more energy per rated watt

High year one performance delivers 8-10% more energy per rated watt.[3] This advantage increases over time, producing 21% more energy over the first 25 years to meet your needs.[4]





MOST ENERGY PER WATT
PHOTON
2012 FIELD TEST

Awarded to SunPower E-Series. X-Series delivers even more energy.[7]

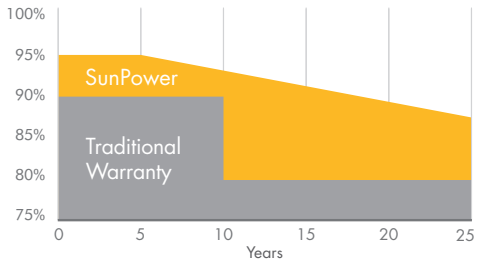
SUNPOWER®

MORE ENERGY. FOR LIFE.™

X-SERIES SOLAR PANELS

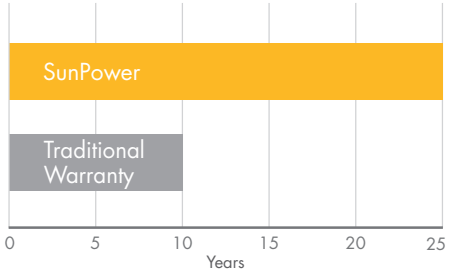
SUNPOWER OFFERS THE BEST COMBINED POWER AND PRODUCT WARRANTY

POWER WARRANTY



More guaranteed power: 95% for first 5 years, -0.4%/yr. to year 25. [8]

PRODUCT WARRANTY

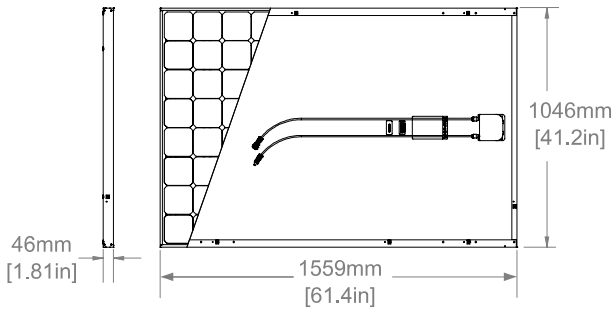


Combined Power and Product Defect 25 year coverage that includes panel replacement costs. [9]

ELECTRICAL DATA		
	X21-335-BLK	**X21-345**
Nominal Power[12] (Pnom)	335 W	345 W
Power Tolerance	+5/–0%	+5/–0%
Avg. Panel Efficiency[13]	21.1%	21.5%
Rated Voltage (Vmpp)	57.3 V	57.3 V
Rated Current (Impp)	5.85 A	6.02 A
Open-Circuit Voltage (Voc)	67.9 V	68.2 V
Short-Circuit Current (Isc)	6.23 A	6.39 A
Maximum System Voltage	600 V UL ; 1000 V IEC	
Maximum Series Fuse	20 A	
Power Temp Coef. (Pmpp)	–0.30% / °C	
Voltage Temp Coef. (Voc)	–167.4 mV / °C	
Current Temp Coef. (Isc)	3.5 mA / °C	

OPERATING CONDITION AND MECHANICAL DATA	
Temperature	– 40°F to +185°F (– 40°C to +85°C)
Max load	Wind: 50 psf, 2400 Pa, 245 kg/m² front & back Snow: 112 psf, 5400 Pa, 550kg/m² front
Impact resistance	1 inch (25 mm) diameter hail at 52 mph (23 m/s)
Appearance	Class A+
Solar Cells	96 Monocrystalline Maxeon Gen III Cells
Tempered Glass	High Transmission Tempered Anti-Reflective
Junction Box	IP-65 Rated
Connectors	MC4 Compatible
Frame	Class 1 black anodized, highest AAMA Rating
Weight	41 lbs (18.6 kg)

TESTS AND CERTIFICATIONS	
Standard tests	UL 1703, IEC 61215, IEC 61730
Quality tests	ISO 9001:2008, ISO 14001:2004
EHS Compliance	RoHS, OHSAS 18001:2007, lead-free
Ammonia test	IEC 62716
Salt Spray test	IEC 61701 (passed maximum severity)
PID test	Potential-Induced Degradation free: 1000V [10]
Available listings	CEC, UL, TUV, MCS



REFERENCES:

1 All comparisons are SPR-X21-345 vs. a representative conventional panel: 240W, approx. 1.6 m², 15% efficiency.
2 PVEvolution Labs "SunPower Shading Study," Feb 2013.
3 Typically 8-10% more energy per watt, BEW/DNV Engineering "SunPower Yield Report," Jan 2013, with CFV Solar Test Lab Report #12063, Jan 2013 temp. coef. calculation.
4 SunPower 0.25%/yr degradation vs. 1.0%/yr conv. panel. Campeau, Z. et al. "SunPower Module Degradation Rate," SunPower white paper, Feb 2013; Jordan, Dirk "SunPower Test Report," NREL, Oct 2012.
5 "SunPower Module 40-Year Useful Life" SunPower white paper, Feb 2013. Useful life is 99 out of 100 panels operating at more than 70% of rated power.
6 Higher than E Series which is highest of all 2600 panels listed in Photon Int'l, Feb 2012.
7 1% more energy than E-Series panels, 8% more energy than the average of the top 10 panel companies tested in 2012 (151 panels, 102 companies), Photon Int'l, Mar 2013.
8 Compared with the top 15 manufacturers. SunPower Warranty Review, Feb 2013.
9 Some exclusions apply. See warranty for details.
10 X-Series same as E-Series, 5 of top 8 panel manufacturers were tested by Fraunhofer ISE, "PV Module Durability Initiative Public Report," Feb 2013.
11 Compared with the non-stress-tested control panel. X-Series same as E-Series, tested in Atlas 25+ Durability test report, Feb 2013.
12 Standard Test Conditions (1000 W/m² irradiance, AM 1.5, 25° C).
13 Based on average of measured power values during production.

See http://www.sunpowercorp.com/facts for more reference information.
For further details, see extended datasheet: www.sunpowercorp.com/datasheets Read safety and installation instructions before using this product.

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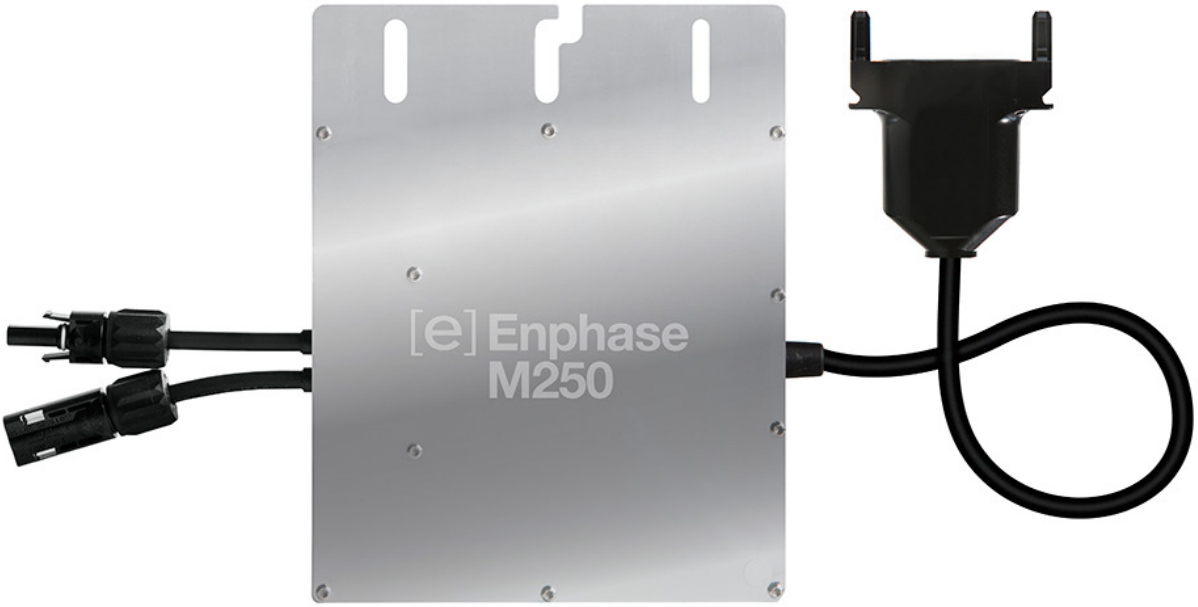
sunpowercorp.com

Document # 504828 Rev A /LTR_EN

Enphase® **Microinverters**

Enphase® **M250**



The **Enphase® M250 Microinverter** delivers increased energy harvest and reduces design and installation complexity with its all-AC approach. With the M250, the DC circuit is isolated and insulated from ground, so **no Ground Electrode Conductor (GEC) is required for the microinverter.** This further simplifies installation, enhances safety, and saves on labor and materials costs.

The Enphase M250 integrates seamlessly with the Engage® Cable, the Envoy® Communications Gateway™, and Enlighten®, Enphase's monitoring and analysis software.

PRODUCTIVE

- Optimized for higher-power modules
- Maximizes energy production
- Minimizes impact of shading, dust, and debris

SIMPLE

- No GEC needed for microinverter
- No DC design or string calculation required
- Easy installation with Engage Cable

RELIABLE

- 4th-generation product
- More than 1 million hours of testing and millions of units shipped
- Industry-leading warranty, up to 25 years

enphase® ENERGY

C US

INPUT DATA (DC)	**M250-60-2LL-S22, M250-60-2LL-S25**	
Recommended input power (STC)	210 - 310 W	
Maximum input DC voltage	48 V	
Peak power tracking voltage	27 V - 39 V	
Operating range	16 V - 48 V	
Min/Max start voltage	22 V / 48 V	
Max DC short circuit current	15 A	
OUTPUT DATA (AC)	**@208 VAC**	**@240 VAC**
Peak output power	250 W	250 W
Rated (continuous) output power	240 W	240 W
Nominal output current	1.15 A (A rms at nominal duration)	1.0 A (A rms at nominal duration)
Nominal voltage/range	208 V / 183-229 V	240 V / 211-264 V
Nominal frequency/range	60.0 / 57-61 Hz	60.0 / 57-61 Hz
Extended frequency range*	57-62.5 Hz	57-62.5 Hz
Power factor	>0.95	>0.95
Maximum units per 20 A branch circuit	24 (three phase)	16 (single phase)
Maximum output fault current	850 mA rms for 6 cycles	850 mA rms for 6 cycles
EFFICIENCY		
CEC weighted efficiency	96.5%	
Peak inverter efficiency	96.5%	
Static MPPT efficiency (weighted, reference EN50530)	99.4 %	
Night time power consumption	65 mW max	
MECHANICAL DATA		
Ambient temperature range	-40°C to +65°C	
Dimensions (WxHxD)	171 mm x 173 mm x 30 mm (without mounting bracket)	
Weight	1.6 kg (3.4 lbs)	
Cooling	Natural convection - No fans	
Enclosure environmental rating	Outdoor - NEMA 6	
Connector type	M250-60-2LL-S22: MC4 M250-60-2LL-S25: Amphenol H4	
FEATURES		
Compatibility	Compatible with 60-cell PV modules	
Communication	Power line	
Integrated ground	The DC circuit meets the requirements for ungrounded PV arrays in NEC 690.35. Equipment ground is provided in the Engage Cable. No additional GEC or ground is required. Ground fault protection (GFP) is integrated into the microinverter.	
Monitoring	Enlighten Manager and MyEnlighten monitoring options	
Compliance	UL1741/IEEE1547, FCC Part 15 Class B, CAN/CSA-C22.2 NO. 0-M91, 0.4-04, and 107.1-01	

* Frequency ranges can be extended beyond nominal if required by the utility

To learn more about Enphase Microinverter technology, visit **enphase.com**

enphase® ENERGY

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Trojan BATTERY COMPANY

DATA SHEET

IND29-4V
INDUSTRIAL LINE

MODEL **IND29-4V**
NOMINAL CAPACITY **1618AH @ C_{20}**
MATERIAL **Polypropylene** (internal cell container) **Polyethylene** (outer container)
DIMENSIONS **Inches (mm)**
BATTERY **Deep-Cycle Flooded/Advanced Lead Acid Battery**
COLOR **Maroon**
WATERING **Single-Point Watering Kit (Optional)**
PRODUCT HIGHLIGHTS **Smart Carbon™ for Improved Performance**
17 Years Battery Life Based on IEC 61427

4V

PRODUCT + PHYSICAL SPECIFICATIONS

BCI Group Size	Type	Voltage	Cell(s)	Terminal Type [G]	Dimensions [C] Inches (mm)			Weight Lbs. (kg)
					Length	Width	Height [F]	
N/A	IND29-4V	4	2	14	27.10 (688)	10.35 (263)	23.81 (605)	465 (211)

ELECTRICAL SPECIFICATIONS

Cranking Performance		Capacity [A] Minutes		Capacity [B] Amp-Hours (AH)							Energy (kWh)	Internal Resistance (mΩ)	Short Circuit Current (amps)
C.C.A.[D] @ 0°F (-18°C)	C.A.[E] @ 32°F (0°C)	@ 25 Amps	@ 75 Amps	2-Hr	5-Hr	10-Hr	20-Hr	48-Hr	72-Hr	100-Hr	100-Hr		
—	—	—	—	—	1274	1448	1618	1899	2022	2105	8.42	—	—

CHARGING INSTRUCTIONS

Charger Voltage Settings (at 77°F/25°C)						
System Voltage	4V	8V	12V	24V	36V	48V
Bulk Charge	4.94	9.88	14.82	29.64	44.46	59.28
Float Charge	4.50	9.00	13.50	27.00	40.50	54.00
Equalize Charge	5.40	10.80	16.20	32.40	48.60	64.80

Do not install or charge batteries in a sealed or non-ventilated compartment. Constant under or overcharging will damage the battery and shorten its life as with any battery.

CHARGING TEMPERATURE COMPENSATION

Add	Subtract
0.005 volt per cell for every 1°C below 25°C 0.0028 volt per cell for every 1°F below 77°F	0.005 volt per cell for every 1°C above 25°C 0.0028 volt per cell for every 1°F above 77°F

OPERATIONAL DATA

Operating Temperature	Self Discharge
-4°F to 122°F (-20°C to +50°C). At temperatures below 32°F (0°C) maintain a state of charge greater than 60%.	5 – 15% per month depending on storage temperature conditions.

STATE OF CHARGE MEASURE OF OPEN-CIRCUIT VOLTAGE

Percentage Charge	Specific Gravity	Cell	4 Volt
100	1.260	2.11	4.22
90	1.246	2.09	4.18
80	1.227	2.07	4.14
70	1.207	2.05	4.10
60	1.187	2.03	4.06
50	1.165	2.01	4.02
40	1.142	1.99	3.98
30	1.119	1.96	3.92
20	1.096	1.94	3.88
10	1.072	1.92	3.84

MADE IN USA · TRUE DEEP CYCLE · SMART CARBON · T2 Technology™

Designed in compliance with applicable BCI, DIN, BS and IEC standards.
Tested in compliance to BCI and IEC standards.

IEC · Battery Council International · TROJAN BATTERY COMPANY WITH QUALITY SYSTEM CERTIFIED BY DNV = ISO 9001:2008 =

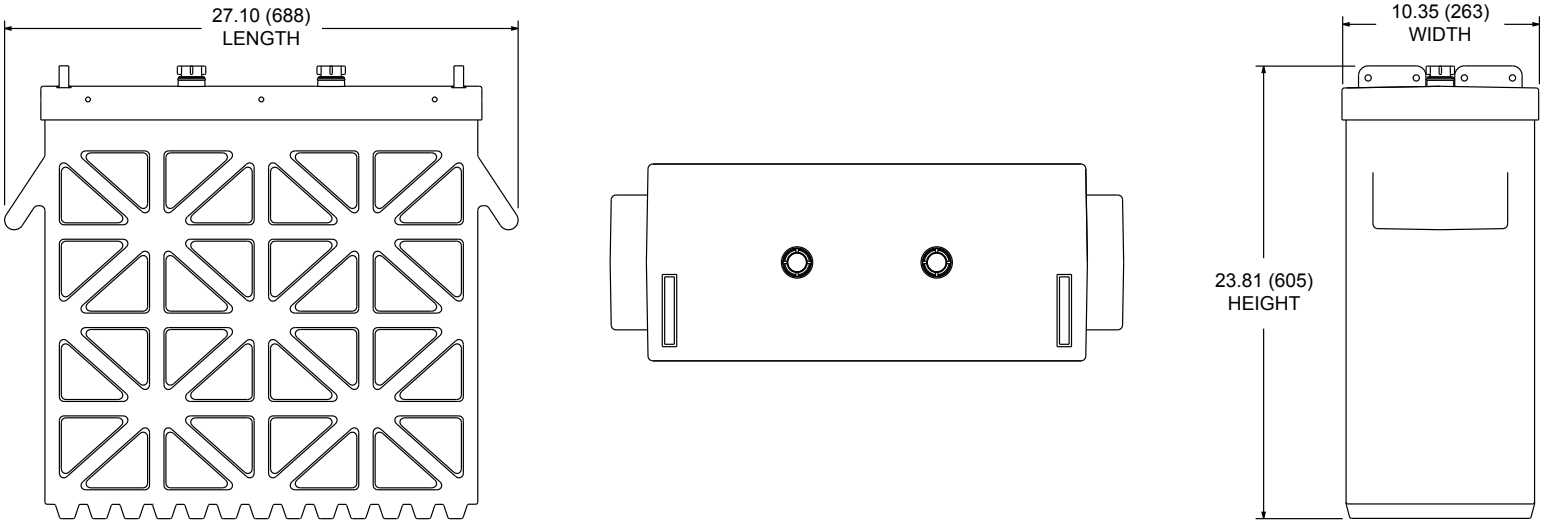
TERMINAL CONFIGURATIONS [6]

14 IND	IND Terminal
	Terminal Height Inches (mm) 1.75 (44) **Torque Values in-lb (Nm)** 95 – 105 (11 – 12) **Bolt** 5/16″

VENT CAP OPTIONS

Flip Top	Bayonet

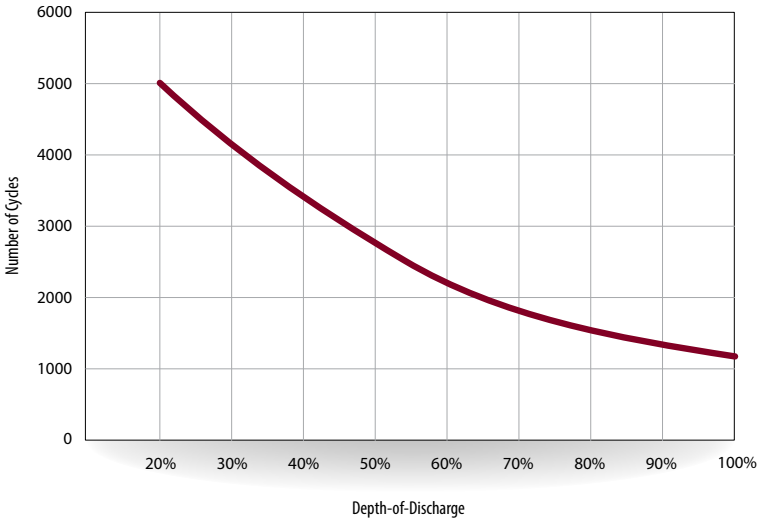
BATTERY DIMENSIONS (shown with IND)



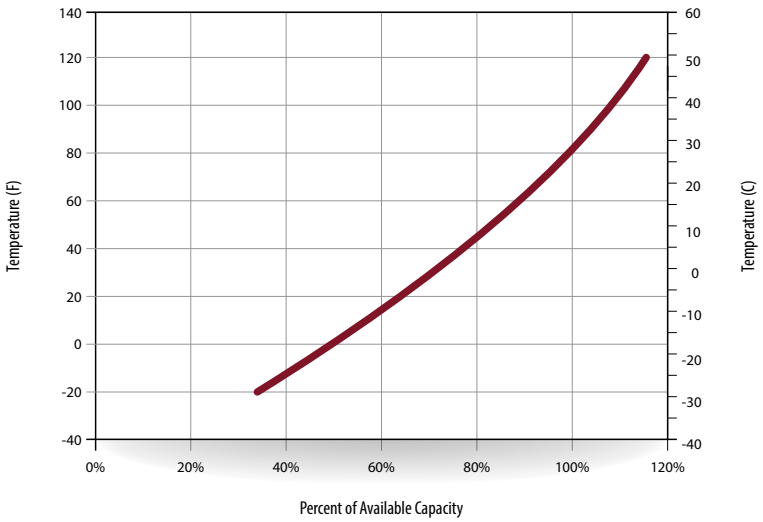
CAPACITY AMP-HOURS (AH)

Cutoff Voltage	5-Hr	10-Hr	20-Hr	48-Hr	72-Hr	100-Hr	240-Hr
1.75 vpc	**1274**	**1448**	**1618**	**1899**	**2022**	**2105**	**2111**
1.80 vpc	**1148**	**1361**	**1553**	**1849**	**1973**	**2050**	**2055**
1.85 vpc	**1041**	**1232**	**1426**	**1652**	**1800**	**1932**	**1936**
1.90 vpc	**764**	**995**	**1195**	**1382**	**1529**	**1716**	**1719**

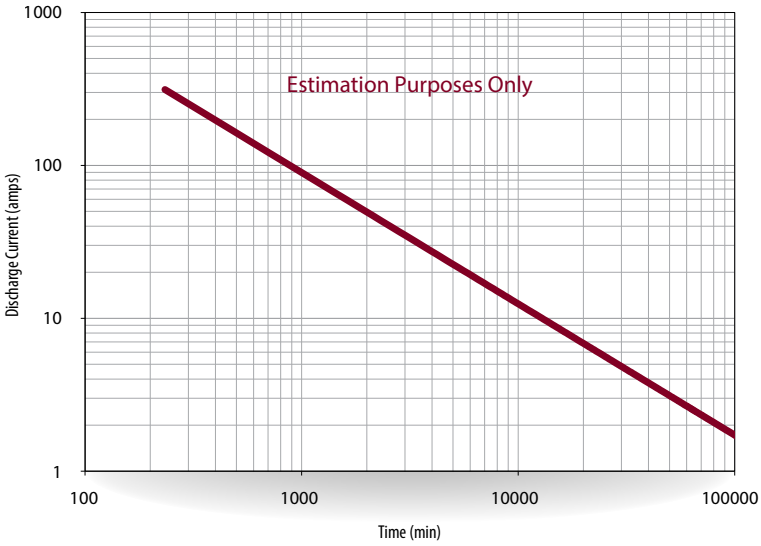
TYPICAL CYCLE LIFE IN A STATIONARY APPLICATION



PERCENT CAPACITY VS. TEMPERATURE



TROJAN IND29-4V PERFORMANCE



EXPECTED LIFE VS. TEMPERATURE

Chemical reactions internal to the battery are driven by voltage and temperature. The higher the battery temperature, the faster chemical reactions will occur. While higher temperatures can provide improved discharge performance the increased rate of chemical reactions will result in a corresponding loss of battery life. As a rule of thumb, for every 10°C increase in temperature the reaction rate doubles. Thus, a month of operation at 35°C is equivalent in battery life to two months at 25°C. Heat is an enemy of all lead acid batteries, FLA, AGM and gel alike and even small increases in temperature will have a major influence on battery life.

SMART CARBON™

Deep-cycle batteries used in off-grid and unstable grid applications are heavily cycled at partial state of charge (PSOC). Operating at PSOC on a regular basis can quickly diminish the overall life of a battery, which results in frequent and costly battery replacements.
To address the impact of PSOC on deep-cycle batteries in renewable energy (RE), inverter backup and telecom applications, Trojan Battery has now included Smart Carbon™ as a standard feature in its Industrial and Premium flooded battery lines.

A. The number of minutes a battery can deliver when discharged at a constant rate at 80°F (27°C) and maintain a voltage above 1.75 V/cell. Capacities are based on peak performance.
B. The amount of amp-hours (AH) a battery can deliver when discharged at a constant rate at 80°F (27°C) and maintain a voltage above 1.75 V/cell. Capacities are based on peak performance.
C. Dimensions may vary depending on type of handle or terminal. Batteries should be mounted with 0.5 inches (12.7 mm) spacing minimum.
D. C.C.A. (Cold Cranking Amps) - the discharge load in amperes which a new, fully charged battery can maintain for 30 seconds at 0°F (-18°C) at a voltage above 1.2 V/cell.
E. C.A. (Cranking Amps) - the discharge load in amperes which a new, fully charged battery can maintain for 30 seconds at 32°F (0°C) at a voltage above 1.2 V/cell. This is sometimes referred to as marine cranking amps @ 32°F or M.C.A. @ 32°F.
F. Height taken from bottom of the battery to the highest point on the battery. Heights may vary depending on type of terminal.
G. Terminal images are representative only.

Trojan BATTERY COMPANY

800.423.6569 / +1.562.236.3000 / trojanbattery.com

IND29-4V_DS 2016_1011

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Kichler 15735BBR30 Bronzed Brass 7" LED Hardscape Light - 3000K

Item #: bci1795968

View the entire Hardscape Collection

$77.00 - $87.40

Originally $115.50 - $131.10, You Save 33%

★★★★★ 5/5 Read 1 Reviews | Write a Review

Ships to Canada | 4 4 | Compare

Shipping: **Free Shipping!** See Details

Finish: Bronzed Brass - In Stock - $87.40

Tech Specs

524 In Stock

Leaves the Warehouse Tomorrow, November 17th

1 Qty

Add To Cart ▶

Return Policy

Live Chat
Ask A Question

Earn **77 - 87** points with the purchase of this product Learn More

KICHLER

Click to view larger image

Product Details for the Kichler 15735BBR30 in Bronzed Brass

This product has additional required/recommended options. To configure, add to your cart.

Low Voltage Cable Recommended

Mounting Accessories Recommended

Transformers Recommended

Kichler LED hardscape lights are the perfect solution for outdoor applications such as lighting stairs, concrete walls, and benches. This fixture can be installed directly to a surface with the included hardware and wired to a magnetic landscape transformer. For new-construction, purchase the 15745 instead, which includes a mounting plate that slides in-between brick or masonry as you're building for a clean look.

Features:

- Cast aluminum, cast brass, or copper plated brass construction
- 3 integrated high output Nichia® LEDs
- Includes stainless steel mounting screws
- For complicated installations, purchase the 15717 mounting bracket
- Compatible with magnetic transformers only
- Operates between 9V and 15V with no loss in output due to constant current technology
- Note: Brass and copper will develop a natural patina over time
- ETL listed for wet locations

People Who Viewed Kichler 15735 Also Viewed

Dimensions:

- Length: 7"
- Width: .66"
- Depth: .6"
- Lead Wire Length: 70"

Electrical Specifications:

- Bulb Type: LED
- Wattage: .75
- Color Temperature: 3000K (Pure White)
- Lumen Output: 45
- CRI (Color Rendering Index): 80
- Average LED Life: 40,000 hours
- Beam Spread: 55°
- Voltage: 12 (Low Voltage)
- Amp Draw: 1.3 VA
- See the attached spec sheets and catalog pages for full photometric details

Additional Information

Catalog Page
Strip Light Guide
Landscape Design Guide

Additional Kichler Links

- View Manufacturer Warranty
- Shop All Kichler Hardscape Collection Products

Our SKU: Kichler 15735

This product is listed under the following manufacturer number(s):

Kichler 15735BBR30
Bronzed Brass

Kichler 15735CO30
Copper

Kichler 15735GRY30
Gray

Kichler 15735SD30
Sand

Kichler 15735AZT30
Textured Architectural Bronze

Kichler 15735WHT30
Textured White

Kichler 15735WHT30
White

*Denotes a finish or option that has been discontinued

Kichler 15735 Reviews

Reviews

Rating Snapshot	Average Customer Ratings	
Select a row below to filter reviews.	Overall	5.0
5★		1
4★		0
3★		0
2★		0
1★		0

1 Ratings-Only Review

4 Questions from the Community

Kichler 15745
Starting At $89.40
★★★★★ 1

Kichler 15736
Starting At $106.00
☆☆☆☆☆ 0

Kichler 15745-27
Starting At $89.40
☆☆☆☆☆ 0

Kichler 15755
Starting At $134.20
☆☆☆☆☆ 0

People Who Viewed Kichler 15735 Also Viewed

Kichler 15745
Starting At $89.40
★★★★★ 1

Kichler 15736
Starting At $106.00
☆☆☆☆☆ 0

Kichler 15745-27
Starting At $89.40
☆☆☆☆☆ 0

Kichler 15755
Starting At $134.20
☆☆☆☆☆ 0

Kichler 15735 Technical Specs

Amperage	1.3
Average Hours	40000
Beam Spread	55
Bulb Base	Integrated LED
Bulb Included	Yes
Bulb Type	LED
Collection	Hardscape
Color Rendering Index (CRI)	80
Color Temperature	3000K
Country Of Origin	China
ETL Listed	Yes
Energy Efficient	Yes
Genre	Transitional

How may watts are the bulbs and what are their replacment numbers?

The Kichler 15735 LED is a chip that unfortunately is non replaceable. If the light were to go out the entire light would need to be replaced. Per Kichler all of their LED fixtures have a chip rather than a bulb. But the life expectancy is longer than a normal bulb.

What is the wattage for this fixture? Are the bulbs replaceable? Order Number?

The Kichler 15735 led is a chip that unfortunately is non replaceable. If the light were to go out the entire light would need to be replaced. Per Kichler all of their LED fixtures have a chip rather than a bulb. But the life expectancy is longer than a normal bulb.

Does this light require a bracket for installation?

The Kichler 15735 does not requre a bracket for installation.

Does this come in 120V?

No, the Kichler 15735 does not come in a 120V.

Hardscape Light Type	Strip Lights
Height	0.75
LED	Yes
Length	7
Light Direction	Ambient Lighting
Location Rating	Wet Location
Lumens	44.5
Material	Aluminum, Brass
Number of Bulbs	3
Product Weight	0.5
Suggested Room Fit	Outdoor
Voltage	12
Voltage Type	Low Voltage
Wattage	0.75
Width	0.75

Sponsored Links

Sponsored Links

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CLASSIC AND CLASSIC LITE SPECIFICATIONS

www.midnitesolar.com 360-403-7207 17722 - 67th Ave NE, Arlington, WA 98223

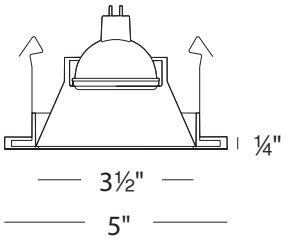
Classic and Classic Lite 150, 200 or 250	
Nominal Battery Voltage	12 Through 72 volts on Classic's. Lite requires PC or MNGP for advanced feature programming
Maximum Output Current	Classic 150 and 150 Lite = 96A on 12V, 94A on 24V and 86A on 48V battery Classic 200 and 200 Lite = 79A on 12V, 78A on 24+48V and 65A on 72V battery Classic 250 and 250 Lite = 61A on 12V, 62A on 24V, 55A on 48V and 43A on 72V battery
PV Open Circuit Voltage VOC *(NOTE: See HyperVOC at bottom)*	Classic150 = 150V + HyperVOC (battery voltage up to 48V) *Example 150V + 48V = 198VOC* Classic200 = 200V + HyperVOC (battery voltage up to 48V) Classic250 = 250V + HyperVOC (battery voltage up to 48V) *(NOTE: See HyperVOC at bottom)*
Power Conversion Efficiency	98% (Typical system)
Maximum Stand-By Self-Consumption (12V)	2.8W - 4W
Reverse Current At Night	Zero - Internal relay for reverse current
Low Battery Voltage	Low Battery voltage disconnect and re-connect of loads fully programmable with 2 Auxiliary outputs to control external load disconnect /re-connect switches
Hyper VOC *(NOTE: See HyperVOC at bottom)*	Standard all models - Extended VOC range for cold climates
Arc Fault Protection	Standard on Classic, 0.25 second detect and trip speed - Not available on the Lite
Ground Fault Protection	Standard all models - resettable, no fuse to blow
Charging Regulation	Bulk, Absorb, Float as well as Equalization
Battery Voltage Regulation Set Points	10-100VDC
Equalization Charging	Adjustable Voltage and Duration, Manual or Auto
PV Reverse Polarity	Protected to Max VOC
Battery Reverse Polarity	Fully protected
Battery Over Voltage	Fully protected
Battery Short Circuit	Fully protected
Battery Temp Compensation	Automatic when BTS is installed, Adjustable mV per degree C per 2V cell
Programmable Auxiliary Control Output	2 Auxiliary outputs, Aux1 can be 12V out or dry contact, Aux2 is 12V out or Logic IN
Graphic Display	Graphical display - MNGP (NOTE: MNGP is an option on the Classic Lites)
Networking Cabling	Standard 4 conductor phone cable, no hub needed
Communications	RS232, Ethernet and ModBus openly published protocol
Remote Display	Display (MNGP) can be relocated and a second display can be added
Remote Monitoring And Control	Local Application software included allows viewing and control from the network or over the Internet. MyMidNite.com - online status monitoring
Internet Ready	All models
Data Logging	380 days of daily history, 24 hours of data at 5 minute intervals
Wind And Hydro Applications	Standard on all models, requires a PC or MNGP on the Lite
Positive Ground Applications	Requires 2 pole input and output breakers
Operating Temperature	Minimum of -40C to 50C - Controller will auto derate as temperature rises above 25C
Environmental Rating	Indoor type 1
Conduit knock Outs	Single 1" conduit (35.05mm) on left and right sides. Two 1" conduit (35.05mm) on bottom. Two 3/4" conduit (27.76mm) on back.
Warranty	5 Year standard
Weight & Dimensions	12 Lbs. (5.45 kgs) - 14.9" x 6" x 4" (378mm x 152mm x 102mm)
Shipping Dimensions HxWxD	19" x 8.5" x 5.7" (482.6mm x 215.9mm x 144.78mm)
Options	MNGP graphical display, 3ft networking cable (NOTE: MNGP standard with Classic and optional with the Classic Lite)
Certifications	Listed by ETL for US & Canada, CE Certified, FCC Class B

HyerVOC: A non-operative VOC safety zone over and above the maximum input voltage for cold climates.

HR-D418-S

4" Low Voltage Downlight Trim

WAC LIGHTING
Responsible Lighting®



Fixture Type:

Catalog Number:

Project:

Location:

PRODUCT DESCRIPTION

Wet location listed drop glass lens trim. Typical applications include bathrooms, sauna's, workrooms and patios. For use with HR-8400 series low voltage housings.

FEATURES

- Shower light with drop glass lens recessed downlight
- The supplied clear glass lens can be replaced with one lens accessory
- Handles surfaces up to ¾" thick
- 5 year WAC Lighting product warranty

SPECIFICATIONS

Construction: Durable die-cast aluminum construction. Three heavy gauge retention clips firmly hold trim to housing.

Lamp: Utilizes LED or Halogen 12V MR16 lamps (order separately). 50W maximum, see individual housing for wattage rating.

Finish: Abrasion resistant powder coat painted or plated metal finish. Available in White (WT).

Standards: UL & CUL Listed, Suitable for wet locations

ORDER NUMBER

Model #	Finish
HR-D418-S	**WT** *White*

Model # Finish

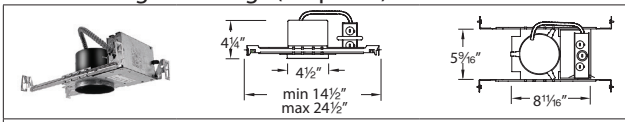
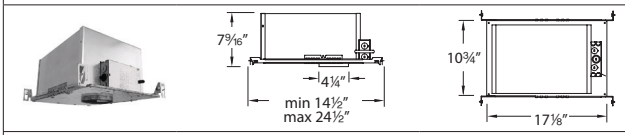
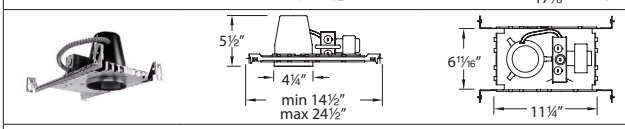
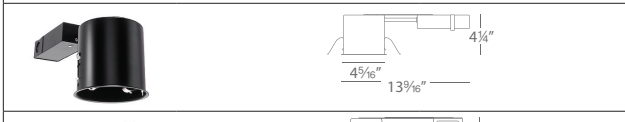
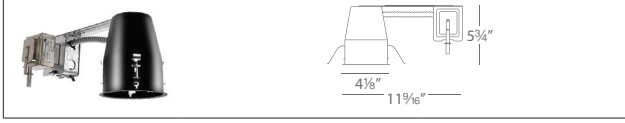
HR-D418-S – **WT**

Example: **HR-D418-S-WT**

ACCESSORIES

LENS-16-	Color Lens	**AMB**	*Amber*	**LENS-16-UVF**	UV Filter
		BLU	*Blue*	**LENS-16-FR**	Frosted Lens
		GRN	*Green*	**LENS-16-SPR**	Spread Lens
		RED	*Red*	**LENS-16-BEL**	Beam Elongating Lens
		YEL	*Yellow*	**LENS-16-HCL**	Honeycomb Louver

4" Low Voltage Housings (Required)

	Model	Voltage	Transformer	Output	Installation	Rating
	**HR-8402E**	*120V*	*Electronic*	*12V, 50W max*	*New Construction*	*Non-IC*
	**HR-8403**	**H** *120V* **HF** *277V*	*Magnetic*	*12V, 50W max*	*New Construction*	*IC Airtight*
	**HR-8402**	**H** *120V* **HF** *277V*	*Magnetic*	*12V, 50W max*	*New Construction*	*Non-IC*
	**HR-8401E**	*120V*	*Electronic*	*12V, 50W max*	*Remodel*	*Non-IC*
	**HR-8401**	**H** *120V* **HF** *277V*	*Magnetic*	*12V, 50W max*	*Remodel*	*Non-IC*

Non-IC housings require 3" of clearance from insulation on all sides.
Accommodates ceiling thickness of up to ¾" for remodel & ¾" for new construction.

WAC Lighting
www.waclighting.com
Phone (800) 526.2588 • Fax (800) 526.2585

Headquarters/Eastern Distribution Center
44 Harbor Park Drive • Port Washington, NY 11050
Phone (516) 515.5000 • Fax (516) 515.5050

Western Distribution Center
1750 Archibald Avenue • Ontario, CA 91760
Phone (800) 526.2588 • Fax (800) 526.2585

WAC Lighting retains the right to modify the design of our products at any time as part of the company's continuous improvement program. MAR 2016

2340-DIM Stiletto 24″ Dimmable LED Sconce/Bath Bar

Dimensions:

Height: 23 ¾″
Width: 5″

Description:

Shade: Frosted Acrylic
Wall Plate: 5″ SQ
w/adjustable position
Extension: 3 ¼″
Dimmable with Electronic Low Voltage
or Standard (TRIAC) Incandescent

Lamping Options:

LED

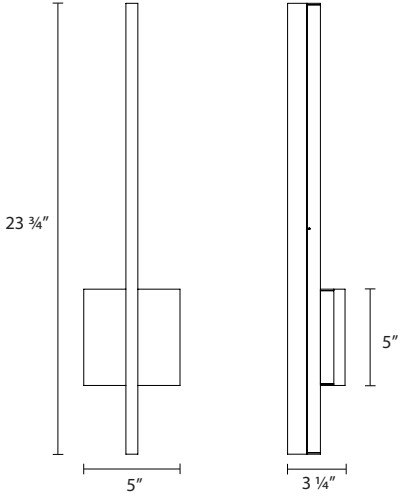
10W, 840 Lumens
Warm White (3000K), 80 CRI
120VAC Input w/LED Driver

Available Finishes:

Satin White
2340.03-DIM

Bright Satin Aluminum
2340.16-DIM

Satin Black
2340.25-DIM



ADA

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A WAY OF LIGHT

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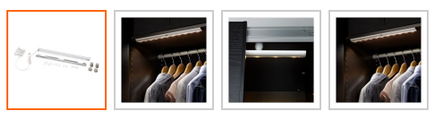

STRIBERG

LED light strip, aluminum color

$19.99

Article Number: 602.677.27

The light switches on and off automatically when you open or close the door so no energy is wasted. Read more

Size
17 "

1 Buy online Save to list

Buy online Save to list

Complete the product

To be used with ANSLUTA cord system, sold separately; possible to connect together into a system of up to 10 units.

View all coordinating products

Check stock at your local store

Choose Ok

Ok

Store selection may vary and prices may differ from those online. We apologize we do not offer in-store pick up. Items purchased online will be delivered directly to your home from one of our distribution centers.

WARNING - Serious or fatal crashing injuries can occur from furniture tip-over. To prevent this furniture must be permanently fixed to the wall. Secure it! Learn how to prevent furniture tip-over accidents.

View the tip-over restraint assembly instructions for chest of drawers

Assembly instructions
Downloads

Share Pin it G+1 0 Like 0 Share
Share

Coordinating Products | **Product information**

STRIBERG
LED light strip
$19.99

To be used with ANSLUTA cord system, sold separately; possible to connect together into a system of up to 10 units.

Product dimensions

Luminous flux: 150 Lumen
Length: 17 "
Cord length: 59 "
Power: 2 W

Luminous flux: 150 Lumen
Length: 42 cm
Cord length: 150 cm
Power: 2.4 W

This product requires assembly

Instructions & other documents

Downloads for this product:
Assembly instructions

Good to know

To be completed with ANSLUTA power supply cord, sold separately.
Designed for PAX wardrobes.
Built-in LED light source.
The lamp emits 150 lumen, which is approximately equal to the light emitted by a 15-watt incandescent bulb.
LED life approx. 25,000 hours.
Light color: warm white (2700 Kelvin).

Care instructions

Wipe clean with a damp cloth.
Wipe dry with a clean cloth.

Product description

Main parts: Aluminum
Mounting bracket: Steel, Galvanized
Diffuser/ Lid: Polycarbonate plastic

More Wardrobe lighting

Go to Wardrobe lighting

Key features

- The light switches on and off automatically when you open or close the door so no energy is wasted.

- Suitable for use in confined spaces, such as cabinets, bookshelves and closets, as the LED light source emits low heat.

- Uses LEDs, which consume up to 85% less energy and last 20 times longer than incandescent bulbs.

Designer:

Ulf Quensel

Package measurements and weight

Article Number: 602.677.27
Package: 1

Width: 3 " (8 cm)
Height: 1 ¼ " (3 cm)
Length: 20 " (51 cm)
Weight: 1 lb 2 oz (0.52 kg)

People & Planet

Special waste handling may be required. Please contact your local authorities for more information.

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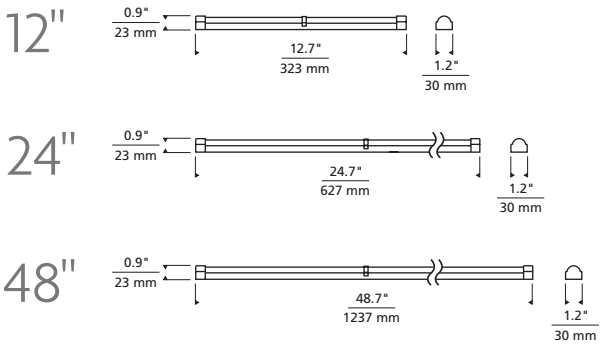
Unilume LED Micro Channel

ALUMINUM
(SHOWN OFF)

ALUMINUM
(SHOWN ON)



DESCRIPTION

Unilume LED Micro Channel was specifically developed for applications where custom length, end-to-end illumination is crucial. Combining on-site length customization with ultra slim housing design and superior light performance makes the Unilume Micro Channel one of the most unique LED products available. The special co-extruded remote phosphor mixing channel provides a sleek profile while providing impressive general illumination. As an added benefit, it also creates a clean, white look even when turned off. Available in 300 lumens per foot and 600 lumens per foot. Mounted using adhesive tape or screws and optional angled mounting brackets. Each fixture includes a removable powerfeed endcap and a termination endcap.

POWER & DIMMING

Each run is powered by a remote or plug-in 24v DC power supply available in varying wattages based on run length and number of fixtures per system. Units are dimmable using an ELV dimmer to 5-15% depending on dimmer selected. Power supplies and connectors are required and sold separately. Please see accessory page for accessory ordering details.

TECHNICAL SPECIFICATIONS

	12" Length	24" Length	48" Length
System Power:	3.0 watts/300 6.0 watts/600	6.0 watts/300 12.0 watts/600	12.0 watts/300 24.0 watts/600
System Efficacy:	95 lms/watt	95 lms/watt	95 lms/watt
Lumens Per Foot:	300, 600	300, 600	300, 600
Color Temperatures:	2400K, 3000K 3500K, 4000K	2400K, 3000K 3500K, 4000K	2400K, 3000K 3500K, 4000K
Color Rendering Index:	80+	80+	80+
Power Factor:	0.95	0.95	0.95
Input Power:	24V DC	24V DC	24V DC
Dimming:	To 5%-15% Depending on Dimmer	To 5%-15% Depending on Dimmer	To 5%-15% Depending on Dimmer
Warranty:	5 years	5 years	5 years

ORDERING INFORMATION

700UMCD	OUTPUT	LENGTH	CRI/COLOR TEMPERATURE	FINISH
	3 300 LMS/FT **6** 600 LMS/FT	**01** 1' **02** 2' **04** 4'	**824** 80 CRI / 2400K **835** 80 CRI / 3500K **840** 80 CRI / 4000K **930** 90 CRI / 3000K	**A** ALUMINUM

TECH LIGHTING®

7400 Linder Avenue
Skokie, Illinois 60077

T 847.410.4400
F 847.410.4500

www.techlighting.com

700UMCD _____ _____ _____ _____ _____

FIXTURE TYPE: _____

JOB NAME: _____

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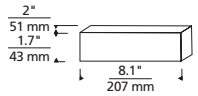
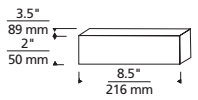
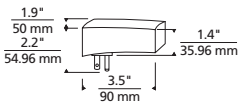
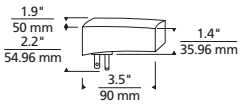
Unilume LED Micro Channel Accessories

TRANSFORMERS

Whether powered from a junction box or wall outlet, Unilume LED Micro Channel offers a broad selection of remote transformers to power the system. At least one transformer is required to provide power.

TRANSFORMER	INPUT VOLTAGE OUTPUT VOLTAGE WATTAGE TYPE	ITEM NUMBER	COMPATIBLE DIMMER TYPE	MOUNTING TYPE	NOTES
	1 X 120V 24V DC 1 X 60 WATTS NO LOAD ELECTRONIC DC	700AT0624EL	LOW-VOLTAGE ELECTRONIC 450 WATTS	REMOTE	
	1 X 120V 24V DC 1 X 150 WATTS NO LOAD ELECTRONIC DC	700AT1524EL	LOW-VOLTAGE ELECTRONIC 600 WATTS	REMOTE	
	1 X 120V 24V DC 1 X 30 WATTS NO LOAD ELECTRONIC DC PLUG-IN	BLACK: 700AT0324ELPB WHITE: 700AT0324ELPW	LOW-VOLTAGE ELECTRONIC 450 WATTS	WALL PLUG-IN	INTEGRATED 3 PRONG PLUG: INCLUDES THE TRANSFORMER 3' OF LEADS FOR CONNECTION TO POWERFEED
	1 X 120V 24V DC 1 X 60 WATTS NO LOAD ELECTRONIC DC PLUG-IN	BLACK: 700AT0624ELPB WHITE: 700AT0624ELPW	LOW-VOLTAGE ELECTRONIC 450 WATTS	WALL PLUG-IN	INTEGRATED 3 PRONG PLUG: INCLUDES THE TRANSFORMER 3' OF LEADS FOR CONNECTION TO POWERFEED

POWER FEED CABLE

Required to get power from the transformer to the Unilume LED Micro Channel system.

700UMCPF

LENGTH		FINISH	
06	6'	**A**	ALUMINUM
12	12'		

FEMALE TO FEMALE CONNECTOR

Joins two Jumper Connectors together to create extended runs or custom lengths.

700UMCFC

FINISH	
A	ALUMINUM

T-CONNECTOR

Used to join three fixtures together in a T configuration.

700UMCTC

FINISH	
A	ALUMINUM

JUMPER CONNECTORS

When systems need to be extended or change direction, Jumper Connectors allow Unilume LED Micro Channel units to be connected together over longer distances. 3"–24" jumpers include power feed endcap.

700UMCJC

LENGTH		FINISH	
01	1"	**A**	ALUMINUM
03	3"		
06	6"		
12	12"		
24	24"		

L-CONNECTOR

Used to join two fixtures together while forming a 90 degree angle.

700UMCLC

FINISH	
A	ALUMINUM

MOUNTING BRACKETS

Used to mount units at an angle to create the desired lighting effect. Come in a set of 4 to be used every 2 feet.

700UMCMB

ANGLE		FINISH	
30	30° ANGLED MOUNTING BRACKETS	**A**	ALUMINUM
45	40° ANGLED MOUNTING BRACKETS		
90	90° ANGLED MOUNTING BRACKETS		

TECH LIGHTING®

7400 Linder Avenue
Skokie, Illinois 60077

T 847.410.4400
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www.techlighting.com

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GEORGE KOVACS®

Job Name:	
Job Type:	
Quantity:	

Family:	George's Reading Room™
Product Category:	Wall Mount
Item#:	P4308-084
Finish:	Brushed Nickel
Certification:	3057374

Lamping

Number of Bulbs:	1
Light Type:	Z05, Led
Socket Type:	Y05 Led Module
Max Bulb Wattage:	8
Bulbs Included:	1
Dimmable:	Y
CRI:	84
Color Temp:	3000
Initial Lumens:	590.000
Delivered Lumens:	438.760
Rated Life Hours:	30000
Photo Cell Included:	N/A
Ballast:	N/A

Shipping

Carton Weight:	4.27
Carton Width:	4.5
Carton Height:	8
Carton Length:	22
Carton Cubic Feet:	0.46
Master Pack:	4
Master Pack Weight:	17.81
Master Pack Width:	9.5
Master Pack Height:	16.75
Master Pack Length:	22.5
Master Cubic Feet:	2.072
*Multi-Pack:	N/A
Small Package Shippable:	Y

Measurements

Width:	13.75
Height:	6.25
Length:	N/A
Min Overall Height:	N/A
Max Overall Height:	N/A
Height Adjustable:	N/A
Extension:	4.5
Net Weight:	2.71
Back Plate/Canopy Width:	5
Back Plate/Canopy Height:	6.25
Canopy Length:	N/A
Center to Top of Fixture:	3.13
Center to Bottom of Fixture:	3.13
Slope:	N/A
Chain Length:	N/A
Wire Length:	96

Shade

*Shade Description:	Brushed Nickel
*Shade Material:	Alum. Casting
*Shade Quantity:	1
*Shade Number:	N/A
*Shade Width:	3.5
*Shade Height:	0.88
*Shade Length:	N/A

Miscellaneous

Safety Cable Included:	N/A

**For additional information, please contact Customer Care: 1-800-221-7977.*

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Windfall Exterior Wall Sconce

Shown in: Black

Description:
Windfall Exterior Wall Sconce features a Black or Silver finish. May be mounted vertically or horizontally. One 20 watt, 120 volt LED module is included. ADA compliant. UL listed for damp locations. 6 inch width x 24 inch height x 4 inch depth.

List Price: $464.00
Our Price: $371.20

Shade Color: N/A
Body Finish: Black
Lamp: 1 x LED/20W/120V LED
Wattage: 20W
Dimmer: Low Voltage Electronic
Dimensions: 24"H x 6"W x 4"D

Product Number: **LBL187663**					
Company:		Fixture Type:		Date:	Nov 14, 2016
Project:		Approved By:			

#1220EW-Windfal-390L1-BK

Lightology
Address: 1718 W. Fullerton Ave. Chicago IL 60614
Phone: 866-954-4489 Fax: (773) 883-6131
www.Lightology.com

27 – TELECOMMUNICATIONS

271000 – ROUTER AND MODEM

1.1 SCOPE

In order to ensure connectivity of sensors, smart appliances, and wifi, the following products have been specified. Connectivity is tantamount to the communications between users, our "smartHouse" control system, and appliance accessibility.

1.2 PERFORMANCE SPECIFICATIONS

A. Wireless functionality throughout the house

B. These products will work with any appropriate internet provider for the area

1.3 SUBMITTALS

WIRELESS ROUTER

a. Acceptable manufacturers and products
    i. NETGEAR AC1750 Dual Band Router
        i. Website: https://www.amazon.com/NETGEAR-Router-AC1750-Gigabit-R6300v2/dp/B00EM5UFP4/ref=cm_cr_arp_d_pdt_img_sims?ie=UTF8
        ii. Manufacturer: Netgear
        iii. Wireless: 802.11 A/C, 5.8 GHz Radio Frequency, 802.11 a/b/g/n
        iv. Total WiFi speed: 1750Mbps
        v. Processor Speed: Dual Core 800Mhz
        vi. Dimensions (in): 10.12 x 12.01 x 2.83 in
        vii. LAN Ports: 4
        viii. Location: Core or Office space/Bedroom

B. Cable Modem

b. Acceptable manufacturers and products:
    i. ARRIS SURFboard SB6141 DOCSIS 3.0 Cable Modem
        i. Description: 3 products in 1: a DOCSIS 3.0 Cable Modem, Dual-Band Concurrent 802.11ac Wi-Fi Access Point and 2-Port Gigabit Ethernet Router.
        ii. Website: https://www.amazon.com/gp/product/B00AJHDZSI/ref=pd_cp_147_1?ie=UTF8&psc=1&refRID=QFD15A0SW6GNW4MZ5A8M
        iii. Manufacturer: ARRIS
        iv. Wireless: 802.11ac
        v. Download speed: 343 Mbps wireless, 1600 Mbps wired
        vi. Dimensions (in): 2 x 6.4 x 8.7 in
        vii. Weight: 1.3 lbs
        viii. Location: Core or Office space/Bedroom

END SECTION 271000

END SECTION 27

29 - INTEGRATED AUTOMATION

PART 1 - GENERAL

1.1 SCOPE

The “smartHouse” control system for the house is included in this section. The role that the control system takes is that of a supervisory mode. The effective range of control from the controller of a feature of the house will be limited to that which can be conducted manually by occupants. To define this role, the use of sensors as well as predictive data in terms of forecasts will influence the way in which the control system interacts with power, HVAC, and water. The goal of the “smartHouse” will be to autonomously enable the occupants to generate more effective cost-saving as well as resource-saving techniques and actions.

1.2 PERFORMANCE SPECIFICATIONS

A. Predictive simulation through a physically based model of the house design (virtual house)
B. Real-time data through a personal weather station & a wide range of sensors to assist and confirm the projected performance of the house.
   Note: many of the other system’s products do already come with integrated sensors and accessibility to data.
C. Intuitive user Interface and accessibility for occupants. Main control would be featured in the core in the form of a tablet while performing necessary calculations.
D. Minimal invasiveness to actual imbedded system controllers. This is to disentangle and prove the modularity of the control system to be able to be implemented in many cases.
E. Case designs made by the “smartHouse” will focus on event scheduling, such as the charging of the electric vehicle for maximizing profits.

1.3 SUBMITTALS

A. Products: Sensors, actuators, controllers, user Interface & accessibility
    1. Specs and performance
    2. Warranty
    3. Installation

Part 2- Products

2.1 SENSORS

A. Comfortability
    1. Acceptable manufacturers and products
        a. Comet America – H6520 Temperature, humidity, CO2 transmitter with two relay outputs
            i. Description: “All-in-one temperature, humidity, and CO2 wireless sensor”
            ii. Website: http://www.cometsystem.com/products/h6520-temperature-humidity-co2-transmitter-with-two-relay-and-ethernet-outputs/reg-H6520
            iii. Manufacturer: Comet America
            iv. Dimensions: 136 x 213 x 45 mm (W x H x D), stem length 75 mm

v. Accuracy of CO_2 concentration measurement: ±(50ppm +2% from reading) at 25°C and 1013hPa
vi. Accuracy of relative humidity measurement: ±2.5% relative humidity from 5 to 95% at 23°C
vii. Accuracy of temperature output: ±0.4°C
viii. Wireless: IEEE 802.11b/g/n
ix. Location: Plugged in key locations for sensor readings
x. Warranty: 3 yrs

b. Senmatic – InClimate: Temperature, Humidity & CO2 Sensor
i. Description: "Combined temperature-humidity-CO2 controller/transmitter for comfort control of indoor climate"
ii. Website: http://www.senmatic.com/sensors/inclimate
iii. Manufacturer: Senmatic
iv. Dimensions: 80 x 80 x 23 mm (W x H x D)
v. Accuracy of CO2 concentration measurement: ±75ppm at 20°C, max range 0-2000ppm (adjusted to 600-1200ppm)
vi. Accuracy of relative humidity measurement: ±5% relative humidity from 0 to 100% (adjusted to 20% to 95%)
vii. Accuracy of temperature output: ±1°C, Range 0oC to 50oC (adjusted to 5oC to 30 oC)
viii. Wired: Can be read by anything that can read 0-10V min. load 10kΩ
ix. Power Consumption: 1.0W
x. Rated Voltage: 24V AC/DC
xi. Weight: 85g

B. Energy Management

1. Acceptable manufacturer and products
a. EDIMAX SP-2101W Smart Plug Switch with Power Meter Intelligent Home Energy Management
i. Description: Monitor & manage power consumption of plugged appliances through remote switching with smartphone accessibility
ii. Website: http://www.newegg.com/Product/Product.aspx?Item=N82E16881117018
iii. Manufacturer: EDIMAX
iv. Dimensions (in): 2.36" x 2.52" x 4.13"
v. Weight: .33 lb
vi. Accuracy: ±3% (PF 1.0)
vii. Max load capacity: EU: 16A/230VAC; UK: 13A/240VAC AU: 10A/240VAC; US: 15A/120VAC
viii. Wireless: IEEE 802.11b/g/n
ix. Location: Plugged in between appliances & electronics
x. Warranty: 2 yrs

b. TP-LINK Smart Plug w/ Energy Monitoring (HS110)
i. Description: Monitor & manage power consumption of plugged appliances through remote switching with smartphone accessibility. Can create schedules and set timers. Works with amazon echo. Can

display electricity used in the last day, last week, last month and even last year.
ii. Website: https://www.amazon.com/TP-Link-Monitoring-Control-Anywhere-HS110/dp/B0178IC5ZY/ref=sr_1_7?ie=UTF8&qid=1478216755&sr=8-7&keywords=Smart+Plug+Switch
iii. Manufacturer: TP-LINK
iv. Dimensions (in): 2.75 x 2.75 x 4.25
v. Weight: 3.8 oz.
vi. Accuracy: not listed
vii. Max load capacity: 120~240 Volt Compatible
viii. Wireless: IEEE 802.11b/g/n.
ix. Location: Plugged in between appliances & electronics
x. Warranty: 2 yrs

c. Ankuoo NEO PRO Wi-Fi Smart Switch
i. Description: Monitor & manage power consumption of plugged appliances through remote switching with smartphone. Countdown, anti-theft and schedule timers.
ii. Website: https://www.amazon.com/Ankuoo-Switch-Automation-Android-Smartphones/dp/B00NAX31WI?tag=uid705600-20&th=1
iii. Manufacturer: Ankuoo
iv. Dimensions (in): 2.2 x 2.5 x 4.3
v. Weight: 0.3 ounces
vi. Accuracy: not listed
vii. Max load capacity: Electrical rating: 120V/15A/60Hz/1800W
viii. Wireless: 802.11 b/g/n
ix. Location: Plugged in between appliances & electronics
x. Warranty: 3 yrs

C. Light Management

1. Acceptable manufacturer and products
   a. Radio Powr Savr Wireless Occupancy Sensor
      i. Description: The sensor can sense whether a room is occupied or unoccupied
      ii. Manufacturer: Lutron
      iii. Battery life: 10 yr
      iv. Wireless: RF signals between 431 and 437 MHz
      v. Size: Diameter: 3.57”, Depth: 1.13”
      vi. Voltage/Ampage: 120V/6A
      vii. Coverage: 900 sqft (major motion)/400 sqft (minor motion)
      viii. Location: Ceiling mounted in each room
      ix. Notes: Complant with RoHS, cULus Listed, FCC approved
   b. Radio Powr Savr Wireless Daylight Sensor
      i. Description: The sensor detects light in the space and then wirelessly transmits the appropriate commands to the compatible dimming and switching devices
      ii. Manufactuer: Lutron

iii. Battery life: 10 yr
iv. Wireless: RF signals between 431 and 437 MHz
v. Size: Diameter: 1.6”, Depth: 0.7”
vi. Operating voltage: 3 V
vii. Operating current: 7 µA
viii. Light range: 0-1600 lux
ix. Location: Ceiling mounted in each room
x. Warranty: 1 yr
xi. Notes: Complant with RoHS, cULus Listed, FCC approved

WATER LEVEL MONITORING

a. WIRELESS LEVEL MONITOR

A. Website: http://www.rainharvest.com/aquatel-d110-wireless-tank-level-monitor.asp
B. Manufacturer: AQUATEL
C. Power Requirement for Display Unit: 6V DC

WATER FLOW RATE METER

A. Website: https://www.instrumart.com/assets/Dwyer-WMT2-Datasheet.pdf
B. Manufacturer: Dwyer
C. Power Requirement: N/A
D. Max. Flow Rate: 160 GPM
E. Temperature Limit: 104 F
F. Pressure Limit: 232 PSI

2.4 Controller

A. Raspberry Pi
1. Description: To act as hub for automation
2. Website: https://www.amazon.com/Raspberry-Pi-RASP-PI-3-Model-Motherboard/dp/B01CD5VC92
3. Manufacturer: Raspberry Pi
4. Processor: 1.2GHz 64-bit quad-core ARMv8 CPU, 1 GB RAM
5. Wireless: 802.11n Wireless LAN, 10/100Mbps Lan Speed
6. Auxillary: 4 USB ports, 40 GPIO pins, Full HDMI port, Combined 3.5mm audio jack and composite video
7. Dimensions: 4.8 x 2.99 x 1.34 inches
8. Location: Core
9. Operating Temperature : -55°C to +85°C

B. Power Supply
1. Description: Cord for Raspberry Pi
2. Website: https://www.amazon.com/gp/product/B00MARDJZ4/ref=pd_bxgy_147_2?ie=UTF8&psc=1&refRID=2495Q2WEDFQSN9QQ4Z17
3. Manufacturer: CanaKit
4. Output: 5V DC 2.5A Regulated Input 100V to 240V AC
5. Dimensions (in): 3.75 x 2.75 x 1.25 inches
6. Cord length: 5 ft
7. Location: Core, attached to outlet

C. Case

1. Description: Houses the raspberry pi
2. Website: https://www.amazon.com/gp/product/B01F1PSFY6/ref=pd_bxgy_147_img_3?ie=UTF8&psc=1&refRID=JB5PZWD6VF3C5T3CFQ5A
3. Manufacturer: Raspberry Pi
4. Dimensions (in): 1.2 x 4.2 x 3 inches
5. Mass: 0.3 ounces
6. Location: Core

2.5 Actuators

A. NEA 8040 Series Battery Cell Bypass Switches
    1. Website: http://www.neaelectronics.com/products/battery-cell-bypass-switches/
    2. Manufacturer: Magnum Energy
    3. Current: Rated up to 400 A, minimum 1.2A
    4. Switch Resistance: <150 μΩ @ 400 A
    5. Actuation time: <50 ms
    6. Dimensions (in): 8.75x6.5x1.1
    7. Mass: 250 g
    8. Location: Installed to battery
    9. Operating Temperature: -55°C to +85°C

2.6 User Interface & Accessibility:

A. Touchscreen Display (Tablet)
    1. Acceptable manufacturers and Products:
        a. Eleduino Raspberry Pi Touchscreen Display
            i. Website: https://www.amazon.com/Eleduino-Raspberry-1280x800-Capacitive-TouchScreen/dp/B01HZCUSHA/ref=sr_1_2?ie=UTF8&qid=1478057133&sr=8-2&keywords=Eleduino+TouchScreen+Display
            ii. Manufacturer: Eleduino
            iii. Dimensions (in): 12 x 7.8 x 1.8 inches
            iv. Weight: 3.1 pounds
            v. Location: Core

B. Human and technology interface
    a. Acceptable manufacturers and products:
        i. Amazon Echo
            i. Description: Voice control with smartphone accessibility
            ii. Website: https://www.amazon.com/Amazon-Echo-Bluetooth-Speaker-with-WiFi-Alexa/dp/B00X4WHP5E
            iii. Manufacturer: Amazon
            iv. Wireless: 802.11a/b/g/n Wi-Fi networks
            v. Dimensions: 9.3" x 3.3" x 3.3" (235 mm x 84 mm x 84 mm)
            vi. Warranty: 1 yr
            vii. Location: Living Space

Part 3- Installation

a. Sensors will be installed in appropriate locations (either plugged in or powered by battery)
b. Raspberry pi will be installed in core with appropriate accessories
c. Calibration of sensors and smartHouse software will be ran

END SECTION 29

AQUATEL™ WIRELESS FLUID LEVEL SOLUTIONS

Wireless Level Monitor

MULTI TANK CAPABLE - MODEL D110

A COMPLETE WIRELESS LEVEL MONITORING SYSTEM FOR YOUR TANKS/CISTERNS

wireless • no need for wires or trenching • automatically monitors fluid level • Used with T110's can monitor up to 6 tanks/cisterns • easy to set up and change settings at any time • works on tanks/cisterns of any construction up to 4m (13 feet) deep • simple DIY installation that can be completed in minutes

www.aquatel.co.nz

AQUATEL™ WIRELESS FLUID LEVEL SOLUTIONS

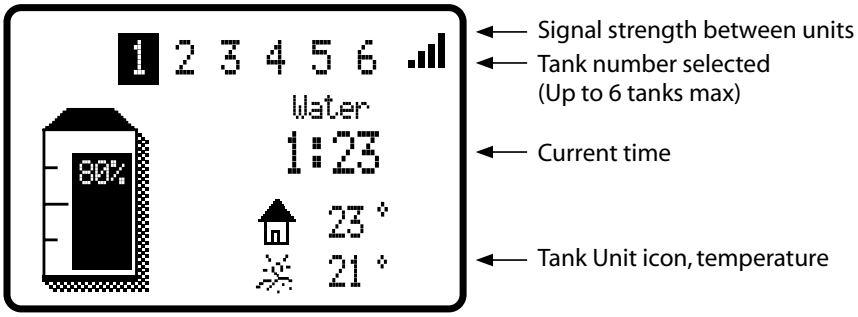
How it works

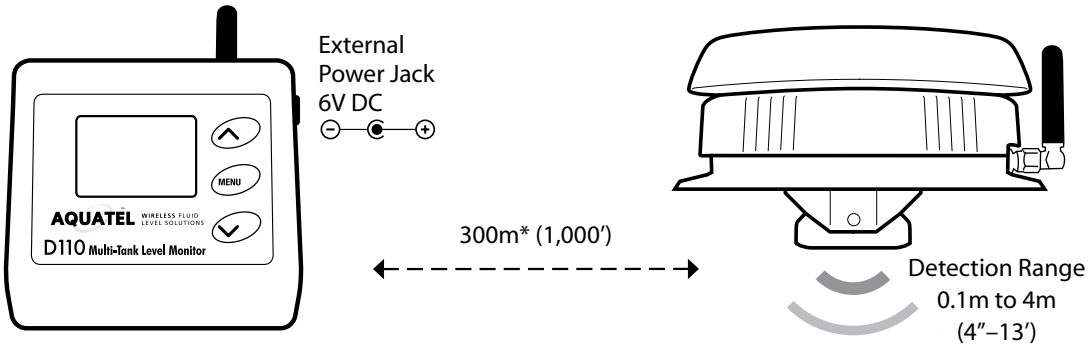
The Tank Unit is mounted on the top surface of the tank or mounted inside the underground tank/cistern on our AQSMB 316 stainless Bracket. It uses ultrasonic signals to detect the fluid level in the tank/cistern and then wirelessly transmits this to the Display Unit, which displays the fluid level and system status on an LCD screen. The Display System is also used for setting the system settings such as tank/cistern depth, high and low alarms. Should more than one tank/cistern need to be monitored, you can purchase additional Tank Units (T110) and run them off your existing D110 Display.

Features

- fully wireless – no cables
- blue backlit* display
- high and low level alarms
- monitor up to 6 tanks/cisterns*
- up to 1.6km (1 mile) range when use with Booster Antenna

Display Unit Status Screen





Display Unit

- 4 x AA Alkaline batteries required

Tank Unit

- Use on any non-flammable fluid (water, diesel, septic)
- 4 x AA Alkaline batteries required

- Temperature range : -10 to +60°C (14 to 140°F)
- Individually Security coded sets
- Approval : AS/NZS 4268:2003 1:2005 CE FC
- Housing : ABS Plastic

* Range shown is line of sight. Objects between units will reduce range. Long range antenna available (up to 1,600m/1 mile range)

* To monitor more than one Tank additional T110 units are required.

Aquatel NZ Ltd, PO Box 780, Wanaka 9343, New Zealand Email: sales@aquatel.co.nz

CO_2 concentration, temperature, humidity
and other calculated humidity variables regulator

with Ethernet interface

H5521
H5524
H6520
H6521

Instruction Manual

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General safety rules

The following summary is designed to prevent injury hazards or device damage. Operate the instrument in accordance with this manual to prevent electric trauma.

Service should be performed by a qualified person only.

Use a safety ac/dc adapter. Use only an adapter with the power voltage recommended by its manufacturer and which is approved by proper standards. Check that the adapter has undamaged cables and cover.

Connect and disconnect correctly. Do not connect and disconnect cables if the device is under electric voltage.

Do not use the instrument without the cover.

Do not use the instrument, if it does not work correctly. If the instrument seems not to work correctly, have it checked by a qualified service person.

Do not use the instrument in an explosive environment.

Read instruction manual before the first device connection, please.

.

Models marked Hxxxx**Z** are non-standard versions of the devices. Description is not included in this manual.

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COMET System, Ltd makes constant development and improvement of all its products. That is why it reserves the right to make any technical changes on the device/product without previous notice.

1. General description

The regulators are designed for online measurement of temperature (°C or °F), relative humidity and carbon dioxide concentration of air. Measured temperature and relative humidity are recomputed to following humidity expression: dew point temperature, absolute humidity, specific humidity, mixing ratio and specific enthalpy.

The regulators are designed to be operated in a chemically non-aggressive environment.

Type	Temperature	Humidity	CO_2	Computed value
H5521	-	-	✓	-
H5524	-	-	✓	-
H6520	✓	✓	✓	✓
H6521	✓	✓	✓	✓

The device is equipped with two relay outputs for alarming or controlling of external devices. It is possible to assign any input value to each relay, to set comparing limit, delay, hysteresis and acoustic alarm or change its status by far control with using of Modbus communication protocol. The device is communicating through Ethernet interface. The device is internally separated into two units. The first unit provides measurement and controlling of output relays – there is possible to change these parameters directly through device's keys or TSensor software. The second unit provides all Ethernet services, its configuration is possible through Telnet terminal or TSensor software (this setting is impossible to change through device's keys).

Measured and calculated values are available from Ethernet interface or are displayed on LCD. If there are two values displayed at one LCD line, they are periodically switched between both readings with period of 4 seconds. Display can be switched OFF totally. On the left LCD side there are placed three LEDs for CO_2 zone level indication.

The following formats are supported:

- WWW pages with user-design possibility
- Modbus protocol
- SNMPv1 protocol
- SOAP

The instrument may send a warning message to several defined points if the measured value gets out of adjusted limits. There are the following possible ways to deliver the warning report:

- to send an e-mail to maximum of three e-mail addresses
- to send a SNMP trap to maximum of three IP addresses
- to display an alarm state on the device WWW page
- to send a message to Syslog server

Alarm limits may be set via TSensor software, Modbus, Telnet or a SNMPv1 protocol. The alarm state may be read via the device WWW pages, Modbus or the SNMPv1 protocol.

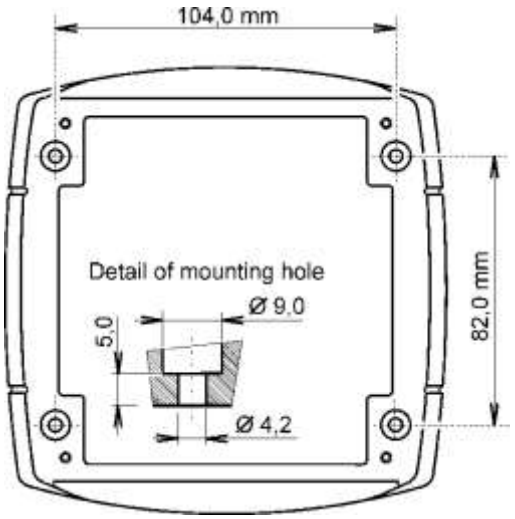
The value assign to each relay is possible through TSensor software or through device's keys.

If Power over Ethernet is needed, it is necessary to use some PoE Splitter. Tested is e.g. D-Link DWL-P50. Regulator itself does NOT support PoE internally!

Regulator supports Internet protocol version 4 (IPv6 is NOT supported).

2. Regulator mounting and connection

Regulators are designed for wall mounting. Device must be mounted on the plane surface to prevent its deformation. Mounting holes and connection terminals are accessible after demounting of four screws in the corners of the box and removing the lid. There is recommended to use screws with half round head with cross-recessed screw ST 3.9 (DIN 7981). External probe for measuring the concentration of CO2 unpack and connect to the device.



Lace the lead-in cable with outer diameter of 3 to 6.5 mm through the glands at the case wall and connect them according schematic below. Terminals are self-clamping and can be opened by a suitable screwdriver. For the opening, insert the screwdriver to smaller terminal hole and lever by him. Do not forget to tighten glands and case lid with inserted packing after cables connecting. Insert attached plug into unused cable glands too. Do not connect the regulator under voltage.

It is not recommended to use the device H6520 and external RH+T probe of H6521 regulator for long time under condensation conditions. It could be the cause of water steam condensation inside the sensor's cover into water phase. This liquid phase stays inside sensor's cover and can't escape from the cover easily. It can dramatically increase response time to relative humidity change. If water condensation occurs for longer time it can cause sensor damage. Similar effect can occur under water aerosol conditions.

The communication cable must be placed as far as possible from potential interference sources.

Electrical system (wiring) may be done only by a worker with required qualification by rules in operation.

3. Preparation to operation

To provide all Hx5xx regulator functions it is necessary to make its setting through PC to satisfy your requirements. Requested parts necessary for operation:

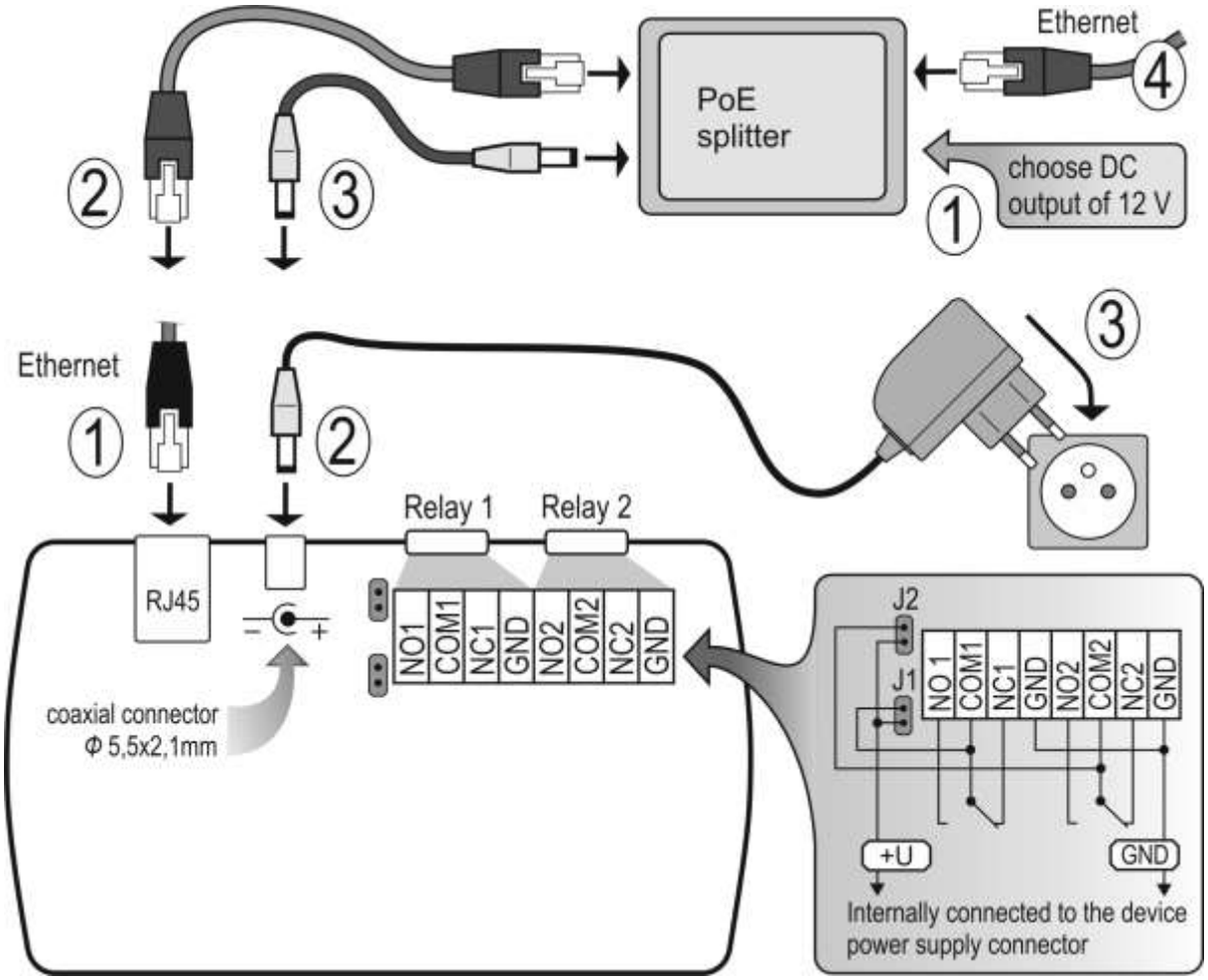
- ac/dc adapter 9-30V, 200mA or PoE splitter
- RJ-45 LAN connection
- free IP address in your network

Contact network administrator to get free IP address.

Warning! Reliability of warning messages reception (e-mail, trap) depends on current accessibility of required network services. It is recommended to protect device from unauthorized access to device settings and cables connection.

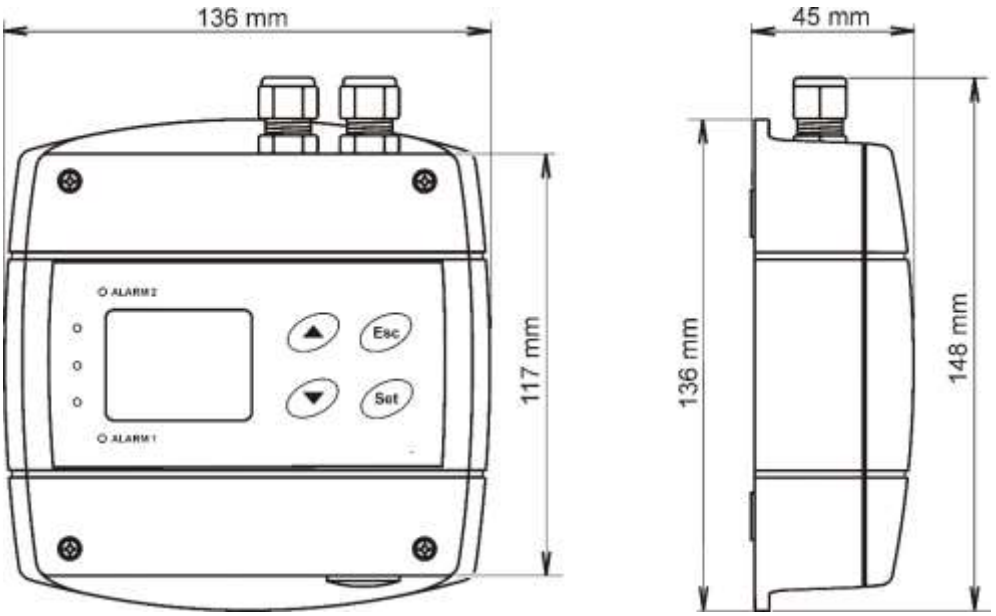
3.1. Procedure of device connection

The cables, power adapter or PoE splitter connect in order as shown in the pictures. After power supply connection, make regulator configuration.

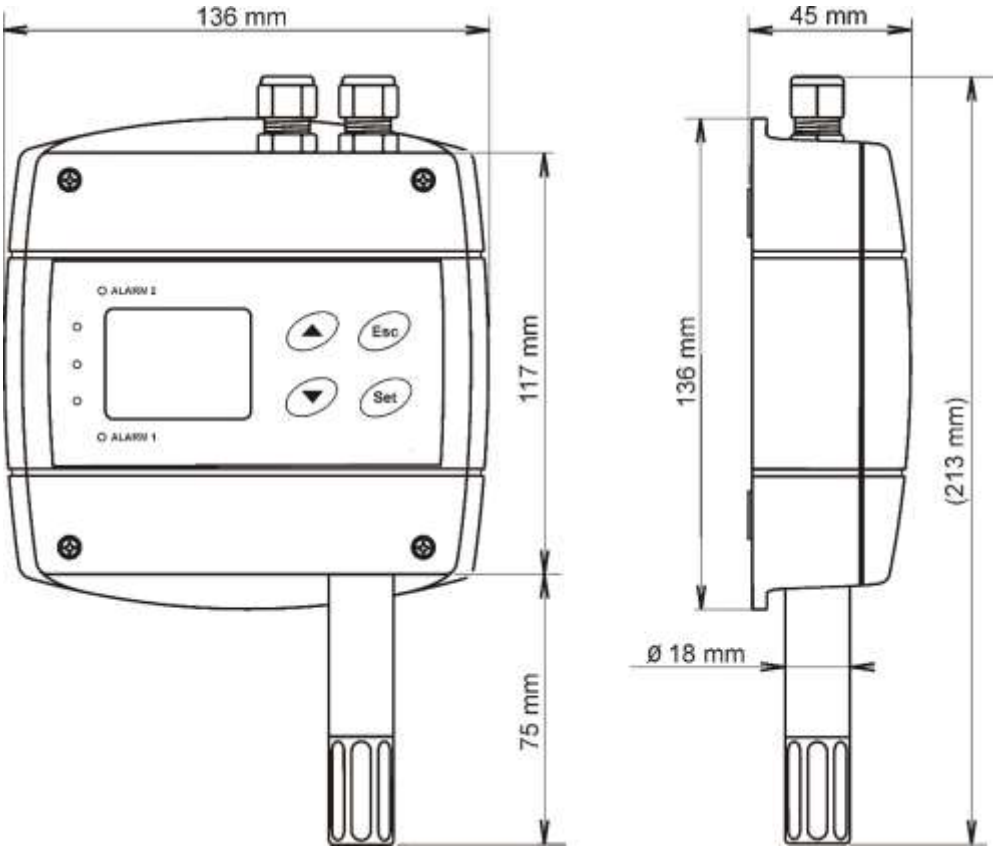


4. Dimensions

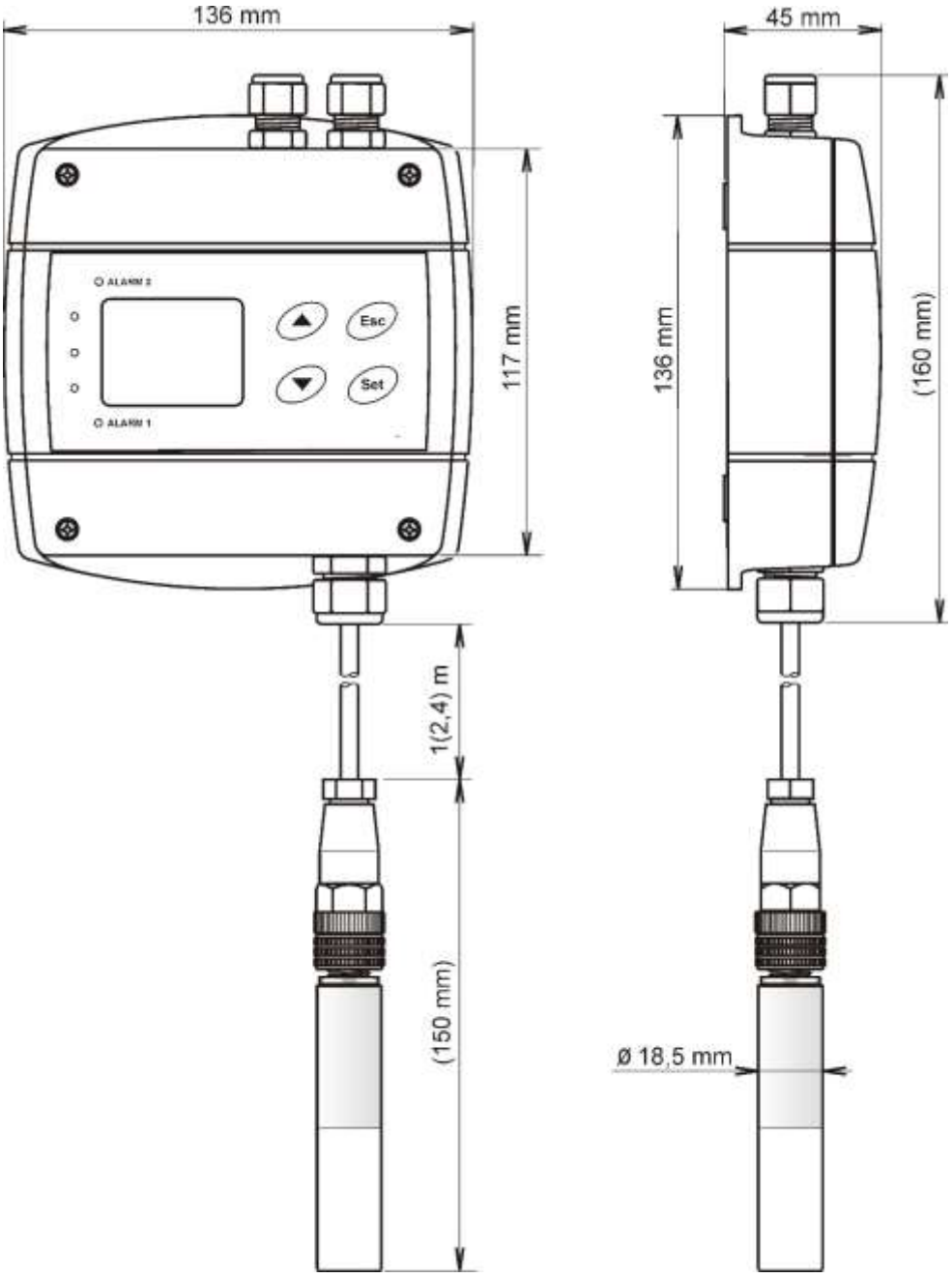
H5524



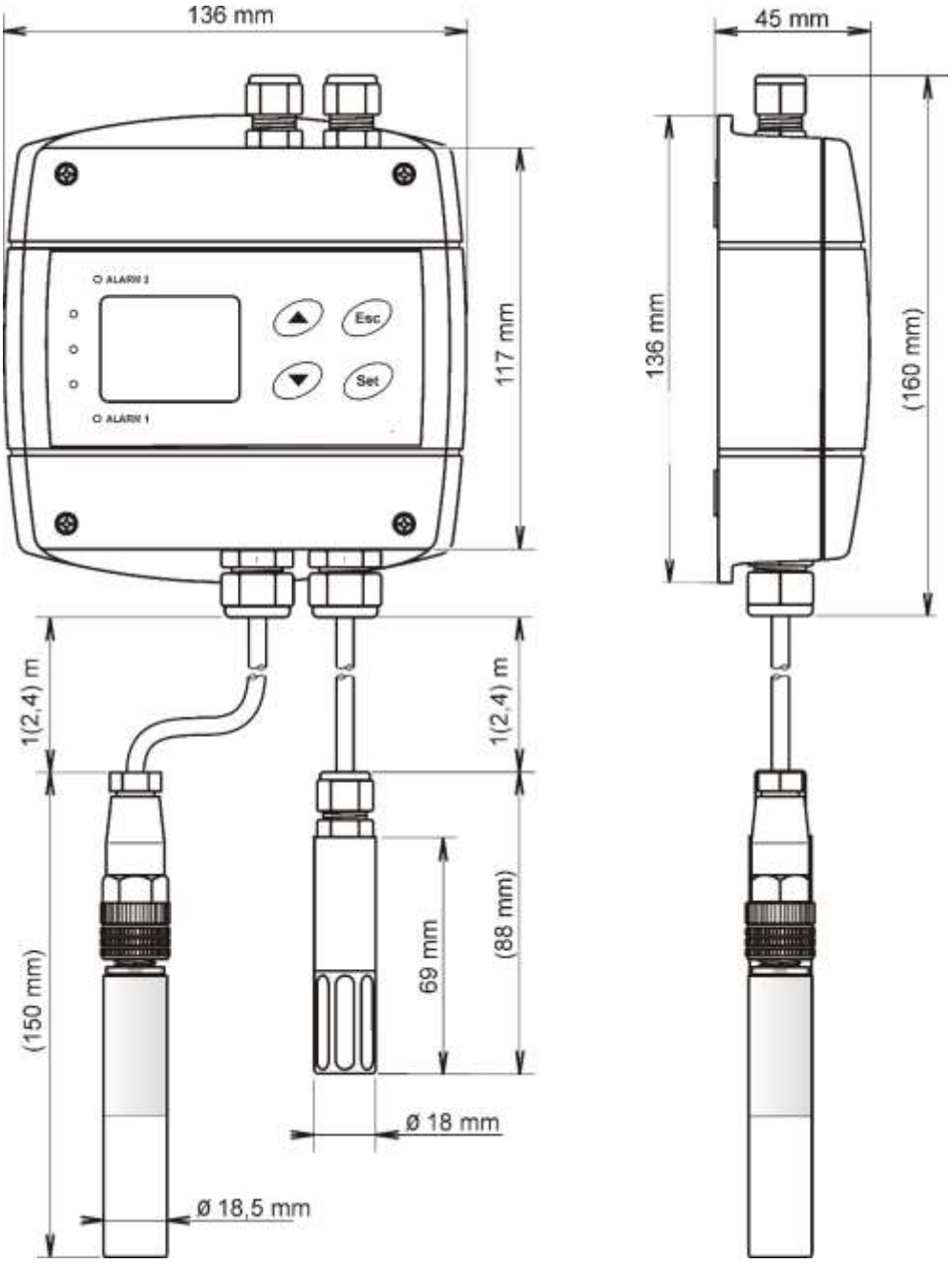
H6520



H5521


136 mm
45 mm
ALARM 2
Esc
Set
ALARM 1
117 mm
136 mm
(160 mm)
1(2,4) m
(150 mm)
ø 18,5 mm

H6521



5. Installation

It is necessary to assign a new suitable IP address to the device at the first connection to it in order to prevent collisions with already existing network IP addresses, and make the address conform to the local habits. If installing several new devices, connect them to the network one after another! If a suitable IP address is not known, contact your network administrator and ask him for the following:

IP address of regulator	_____._____._____._____
IP address of gateway	_____._____._____._____
Network mask	_____._____._____._____

The IP gate address and the network mask need not be specified if the device will be operated only in a local network. If you set the IP address to one which is already used in the network the device will NOT work correctly and collisions in the network will appear. It is possible to set the IP address by DHCP server.

Device setting from the manufacturer:

IP address:	**192.168.1.213**
Gateway:	**not set**
Value assigned to Relay1 and Relay2:	**none**
Password for setting through keys (PASS):	**0000**
Password for setting via TSensor:	**none**
Value shown at first LCD line:	**temperature / CO2 - by device type**
Value shown at second LCD line:	**relative humidity / dew point temp. - by device type**
Temperature unit:	**°C**
Computed value preset:	**dew point temperature**
Relay response for error:	**stay unchanged at previous condition**
Acoustic alarm:	**off**
LED indication of CO_2 concentration:	**up to 1000 ppm lights green LED, between 1000 and 1200 ppm lights yellow LED and over 1200 ppm lights red LED**
altitude:	**300 m above sea level at the installation site**

5.1. Installation procedure

- run TSensor software (default regulator IP address is `192.168.1.213`) or use command line at PC with command „`telnet 192.168.1.213 9999`“. Telnet provides to set all Ethernet services. For setting of measurement and controlling of output relays use keys – see chapter “*Regulator setting change – part of measurement unit”* at page 13.
- assign new regulator IP address
- make your own regulator setting by your requirements (alarm settings, used units, email and trap sending ...) and save settings

6. Operation checking

6.1. Visual check

When power source is on, there are actually measured values shown on LCD (if the LCD has not been switched off). When Ethernet cable is connected, there is one light on its connector lighting.

6.2. Communication check via a LAN

Open a browser of WWW pages and enter the devices IP address into appropriate field.

Example: `http://192.168.1.213`

Regulator shows its name, serial number, measured values, alarm status and alarm settings or shows message `Access denied` in case of web pages are disabled or setting through Telnet is in operation.

7. Description of device function and setting

Information from regulator is available directly through LCD or you can read them with one of next communication protocols. For communication through some communication protocol (SNMPv1, Modbus, SOAP) there is necessary to have installed appropriate software supporting appropriate communication protocol on PC. Such software is not included in the delivery! The device is internally separated into two units. The first unit provides measurement and controlling of output relays – these parameters are possible to change directly through device's keys or TSensor software. The second unit provides all Ethernet services, its configuration is possible through Telnet terminal or TSensor software (this setting is impossible to change through device's keys).

7.1. Relay outputs

Regulator is equipped with two relay outputs. It is possible to assign any input or computed value or "far control" to each relay, to set comparing alarm limit, if the relay may close if measured value is higher (Hi) or lower (Lo) than preset limit, delay for while must be preset condition true before relay close its contact and hysteresis for return to open status. Each relay status is indicated with LED diode and shown on LCD with corresponding symbols „ALARM 1" or „ALARM 2".

Terminal block for connecting the relays is equipped with terminals GND, which are connected to the power supply of the device (see chapter "*Procedure of device connection"*). When you need to use relays to switching the voltage identical with the supply voltage of the device, you can use jumpers J1 and J2 for interconnection the power supply of the device directly with the common contacts of the relays. **This modification is used in devices with serial number higher than 16981000** (the wiring diagram of the relay contacts for devices with serial number lower than 16981000 is given in the "*Appendix B*").

The devices are equipped with two relays that are not intended for direct switching power circuits or mains voltage. If necessary, use suitable type of external relay (an example of wiring is given in the "*Appendix A*").

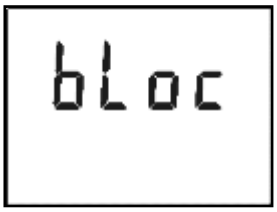
7.2. Carbon dioxide concentration measurement

A multiple point CO2 and temperature adjustment procedure leads to excellent CO2 measurement accuracy over the entire temperature working range; this is a must for process control and outdoor applications. The dual wavelength NDIR CO2 sensing procedure compensates automatically for ageing effects. The CO2 module is highly resistant to pollution and offers maintenance free operation and outstanding long term stability. Measured values can be read in „SLOW mode" (filtered, averaged) or in „FAST mode" (current values without averaging). SLOW mode has advantages in applications like climate control because of filtering short time peaks. As an example exhaled air from an employee passing the sensor could affect the climate control negatively with a short response time because the control would trigger a change of the ventilation based on this one-time measurement. On the contrary in „FAST mode" no software filter is used for calculating the output value. This fact adds a noise of typ. ±30ppm which has to be considered in terms of accuracy. Of principle measurement is the measured value of CO_2 concentration depends on the value of air pressure - altitude at the installation site. For this reason, it is suitable for accurate measurement to set the altitude of the installation site by TSensor software.

After power up there is internal check in progress and takes about 20 s. During this time LCD display shows (----) instead of CO_2 concentration value.

Parameter setting description is into chapter "*Regulator setting change – part of measurement unit*" at page 13.

7.3. Actual regulator preset – measurement part



It is NOT possible to make any changes of Ethernet services, for their setting see chapter "*Regulator configuration – Ethernet interface*" at page 19. If output relay alarm condition configuration is made using Modbus protocol, keyboard is blocked for this time. During this configuration is a word "bloc" shown in the display.

It is possible to display actual regulator preset on its LCD display by pressing of „▲" key. LCD shows information about Relay1 and then Relay2 setting step by step. Information about Relay1 are indicated with symbol „ALARM 1", for Relay2 with symbol „ALARM 2" (at right top corner of LCD). It is possible to edit parameters after pressing „SET" key and entering of correct password „PASS" - see chapter "*Change of "Password for setting through keys" (PASS)*" at page 16. Following examples are for Relay1 setting, similarly are displayed values for Relay2. Pressing of „ESC" key ends this mode and switch to actual value displaying, the same occur if more than 20 s is not pressed any key.

7.3.1. Value assigned to output relay

None, relay is still off

Temperature at °C

Relative humidity

Computed value – dew point temperature

CO_2 concentration

Far condition 0

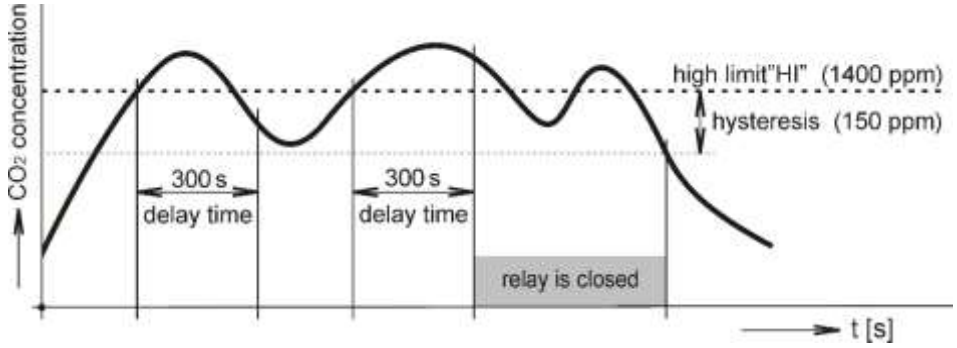
Far condition 1

FAR0 – „far condition 0": after device's power on the relay is open
FAR1 – „far condition 1": after device's power on the relay is close
If "far condition" is assigned to output relay, then there is possible to change the output relay status by Modbus communication protocol only. See chapter *"Modbus protocol"* at page 20.

7.3.2. When close output relay

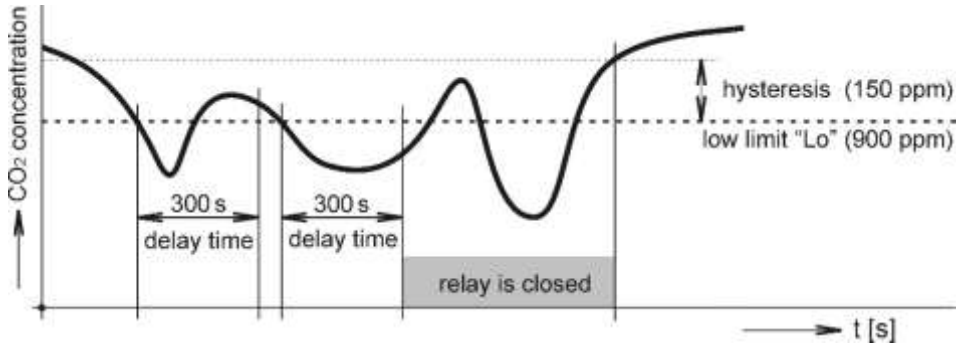
High limit „HI" – the relay close when measured value exceeds preset „high limit" for longer time than preset „delay time". Relay goes open when measured value decrease under „high limit" value minus the „hysteresis" value. See example.

High limit „HI“ *Delay [s]* *Hysteresis*



Low limit „Lo“ – the relay close when measured value falls below preset „low limit” for longer time than preset „delay time“. Relay goes open when measured value exceeds „low limit“ value plus the „hysteresis” value. See example.

Low limit „Lo“ *Delay [s]* *Hysteresis*



7.4. Regulator setting change – part of measurement unit

7.4.1. Setting with PC and TSensor software

User’s software **TSensor** is available free to download at web page www.cometsystem.com. It provides **setting of all regulator parameters**. Run the TSensor program and follow the program instructions. Regulator includes hardware write protection of internal setting (except of Ethernet setting which is protected by password), new setting is possible to write only while:

1. during write period press „SET“ key – do requested setting in TSensor software, press „SET“ key on regulator and keep it down, then click on the button „Save Changes“ into TSensor software and after end of write release „SET“ key, or
2. jumper placed nearby keys is closed (jumper is accessible after demounting of four screws in the corners of the box and removing the lid, don’t confuse with jumper nearby Ethernet connector!). This jumper is suitable e.g. until device adjustment is in process and regulator is placed into calibration box and keys are not accessible. Don’t forget to remove (open) jumper after procedure finish (restore write protection)

TSensor software supports to make the adjustment of the regulator too. This procedure is described at file „*Calibration manual.pdf*“ which is installed commonly with the software.

7.4.2. Setting with using regulator keys

If „Actual regulator preset” is displayed, it is possible to enter into edit mode and edit displayed value by pressing „SET“ key. Then you are asked for valid password „PASS“. You can edit selected value if right password is entered. During value editing there is range check executed and edited value is still compared with limits for corresponding value (range). If inserted value is higher or lower then edited number is automatically changed to its maximum / minimum value – for possible range see chapter „Technical parameters“ at page 26. Value can be changed with using „▲“ and „▼“ keys. Edited value is switched in “round” -9, -8, -7, …-2, -1, 0, 1, 2, …8, 9. To edit next number digit press „SET“ key, for moving back to previous digit press „ESC“ key. Edited value is stored by next „SET“ key pressing. It is possible to cancel editing by pressing „ESC“ key if necessary. If valid password is once inserted right, then there is possible to edit next items without asking for password insertion again, till “Actual regulator preset” is left (till actual measured values are shown). With new entering into edit mode it is necessary to enter Password again. Default password setting is preset from manufacturer to 0000, password change is possible into „Extended setting”. During edit mode regulator still works and changes are valid immediately after its storing – it is not necessary to restart regulator.

7.4.3. Extended setting mode

During regulator operation it is possible to change parameters available through “Actual regulator preset” only (see chapter “*Actual regulator preset – measurement part”* at page 12). Rest of regulator parameters are available through “Extended setting mode”. **In this mode regulator does NOT communicate, does NOT do any measurements and does NOT service output relays. To leave this mode press „ESC“ key and open jumper nearby keys. To enter into extended setting mode do following steps:**

1. disconnect power supply
2. demount four screws in the corners of the box and remove the lid
3. closed jumper placed nearby keys (don’t confuse with jumper nearby Ethernet connector
4. press „▲“ and „▼“ keys together and keep them down
5. connect power supply to regulator – you should see message „SEL“ on the top line of LCD and on the bottom line you should see number of Firmware version (e.g. 0401)
6. release „▲“ and „▼“ keys – you are into “Extended setting mode” now

Use „▲“ and „▼“ keys to inspect each items. If you want to change some shown item then press „SET“ key, item starts blink. Now you can edit setting with using „▲“ and „▼“ keys. To store preset value press „SET“ key. Press „ESC“ key to leave editing (changing) without save – last stored value is kept.

Acoustic alarm assign to Relay1 (Relay2)

acoustic indication of Relay1 is OFF

close of Relay1 contact starts acoustic indication

acoustic indication of Rela 2 is OFF

close of Relay2 contact starts acoustic indication

Acoustic alarm deactivation

activated acoustic alarm is possible to deactivate by pressing „ESC“ key

acoustic alarm is still activated for all time and it is impossible to deactivate it

Relay response for error

Regulator continuously checks its state during operation. In case error of assigned value measurement is found then output relay:

stays unchanged (in previous status)

Relay1 switch OFF

Relay1 switch On

stays unchanged (in previous status)

Relay2 switch OFF

Relay2 switch On

Change of "Password for setting through keys" (PASS)

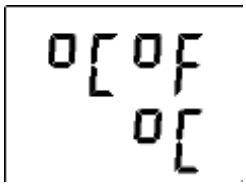
password setting

This item shows actual password setting. It is possible to change it after „SET" key pressing. It is number from range -19999 to +19999.

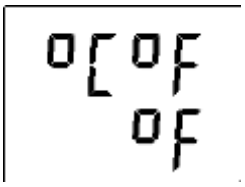
Temperature unit choice

It is possible to measure temperature at °C or °F. There is shown preset unit. It is possible to change it after „SET" key pressing.

preset to °C



preset to °F



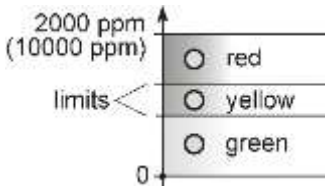
CO_2 measurement mode selection

This item provides to choice if measured value is displayed and read in "SLOW" or "FAST" mode. "FAST" mode provides last measured value without averaging; this means that no software filter is used for calculating the output value. "SLOW" mode provides value averaged from last 11 "FAST" measured values.

averaged value „SLOW" mode

current value without averaging „FAST" mode

CO_2 zone level indication setup



Whole measuring range can be divided into three areas. Each active area there is indicated by green, yellow or red LED depends on actual measured value. It is done by two boundary limits setting. „YELL" limit sets boundary between green and yellow indication. It means that if actual measured value is lower than „YELL" limit, there is green LED active. If actual measured value is higher than „YELL" limit, then there is yellow LED active. Yellow LED lights until actual measured value exceeds „RED" limit. If actual value is higher than „RED" limit, red LED is active. If you don't want to use this indication then set "YELL" limit to 0.

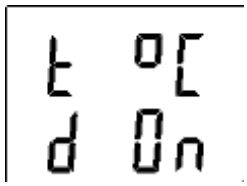
„YELLOW" limit setting

„RED" limit setting

Show temperature at LCD display

This item provides to choice if actual measured temperature may be displayed at LCD display or not. It is possible to change it after „SET“ key pressing.

show value on LCD

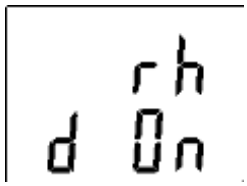


don’t show value on LCD

Show relative humidity at LCD display

This item provides to choice if actual measured relative humidity may be displayed at LCD display or not. It is possible to change it after „SET“ key pressing.

show value on LCD

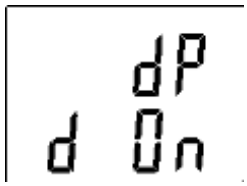


don’t show value on LCD

Show computed value at LCD display

This item provides to choice if actual computed value may be displayed at LCD display or not. There is shown the name of computed value on the top LCD line. It is possible to change it after „SET“ key pressing.

show value on LCD

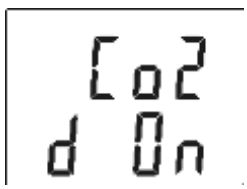


don’t show value on LCD

Show CO_2 concentration at LCD display

This item provides to choice if CO_2 value may be displayed at LCD display or not. It is possible to change it after „SET“ key pressing.

show value on LCD



don’t show value on LCD

Computed value selection

It shows the actually selected computed value name. It is possible to change it after „SET“ key pressing. There is possible choice one of the following computed values:

dew point temperature

absolute humidity

mixing ratio

specific humidity

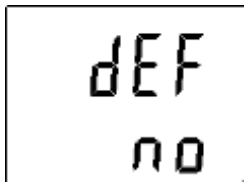
specific enthalpy

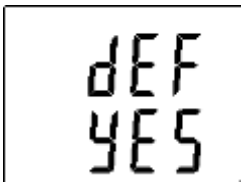
7.5. Restore to „Factory default“ – measurement part

This item provides regulator restoring to factory setting. Press „SET“ key, select „YES“ and confirm it by pressing of „SET“ key. It reset regulator parameters to following values:

Value assigned to Relay1 and Relay2:	**none**
Password for setting through keys (PASS):	**0000**
Display:	**on**
Temperature unit:	**°C**
Computed value preset:	**dew point temperature**
Relay response for error:	**stay unchanged at previous condition**
Acoustic alarm:	**off**

restore to factory default





7.6. Regulator configuration – Ethernet interface

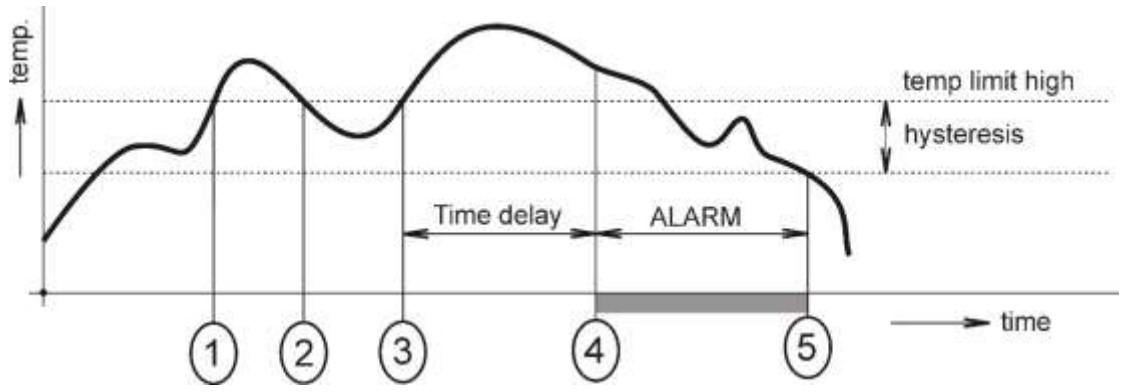
The Ethernet configuration is performed by `TSensor` software[1] or Telnet setup. Setting through the Telnet is described in separated document. Access to the Setup can be protected by a password. `TSensor` program you can find on manufacture web www.cometsystem.com or on the installation CD. This program is free for use and supports firmware update. The newest firmware is available at web pages too.

7.7. Alarms – Ethernet interface

7.7.1. Analogue values

It is possible to set an upper limit, lower limit, hysteresis and time delay to each measured value. Figure shows a temperature curve with some specified upper limit (`temp_limit_high`) and `hysteresis`. At point 1 temperature exceeds the limit. From that moment a time delay is counted (`time_delay`) after which an alarm is set. Because at point 2 the temperature dropped below the limit value (`temp_limit_high`) before the time delay expired, alarm was not set.

At point 3 the temperature again exceeded the limit, and because it did not drop below the limit value (`temp_limit_high`) before the time delay ended, the alarm was set at point 4. At this moment the alarm e-mails and traps are sent, if they are enabled, and the alarm flag is set (the flag is set when the alarm is active and reset when inactive). The state of the flag can be found on the WWW pages or via Modbus or the information console. The alarm lasted to point 5, where the temperature dropped below the limit value given by the adjusted hysteresis (`hysteresis`). For other measured values the principle of alarm activity is analogical.



An alarm report is always sent right after an alarm appears. The device memorizes sent alarm reports of current alarms while the power is connected. In case of power disconnection or a reset of the device (e.g. by modification of configuration) a new alarm evaluation is performed and new alarm reports are sent again, if any.

It is possible to set the alarm parameters via telnet, Modbus protocol or a SNMPv1 protocol, TSensor program. Detailed description of setting via these protocols can be found in chapters informing about particular services.

[1] In telnet some settings are not allowed (display settings, computed value selection), see chapter ***7.4***

7.8. Factory default – Ethernet interface

This procedure describe how set Ethernet interface of device to factory defaults (new IP address: `192.168.1.212`, mask: `255.255.255.0`).

1. power off device
2. remove device cover
3. close jumper near the Ethernet interface
4. power on the device
5. wait approximately 15s
6. open jumper (remove shorting link)
7. close device cover

8. Communication protocols

8.1. Modbus protocol

The device contains support for the Modbus TCP protocol to communicate with control systems. The port is set to 502. Port 502 enables full access, i.e. both read and write operations are supported. Access to port can be disabled in the Setup. Maximal number of client transaction is set to 1.

Supported Modbus commands:

Command	Code	Description
Read multiple register(s)	0x03	Reads 16 bit register(s)
Write multiple register(s)	0x10	Writes 16 bit register(s)

Modbus registers of regulator:

Variable	Unit	Format	Address [hex]	Address [dec]	Status
measured temperature	°C, °F	Int*10	0x0031	49	r
measured relative humidity (RH)	%	Int*10	0x0032	50	r
computed value (CV)	CV depend	Int*10	0x0033	51	r
CO_2 concentration displayed on LCD	ppm	Int	0x0034	52	r
device serial number Hi	-	BCD	0x1035	4149	r
device serial number Lo	-	BCD	0x1036	5150	r
Relay1 status [0/1]	-	Int	0x003B	59	r
Relay2 status [0/1]	-	Int	0x003C	60	r
far Relay1 control (see below) [0 – relay open, 1 – relay closed]	-	Int	0x0042	66	r/w
far Relay2 control (see below) [0 – relay open, 1 – relay closed]	-	Int	0x0043	67	r/w
CO_2 concentration „FAST“ mode value	ppm	Int	0x0054	84	r
CO_2 concentration „SLOW“ mode value	ppm	Int	0x0055	85	r
status word (described below)	-	Int	0x0007	7	r
firmware version Hi	-	BCD	0x3001	12289	r
firmware version Lo	-	BCD	0x3002	12290	r
lower limit for temperature	°C, °F	Int*10	0x5001	20481	r/w

Variable	Unit	Format	Address [hex]	Address [dec]	Status
upper limit for temperature	°C, °F	Int*10	0x5002	20482	r/w
lower limit for humidity	%	Int*10	0x5003	20483	r/w
upper limit for humidity	%	Int*10	0x5004	20484	r/w
lower limit for computed value	CV depend	Int*10	0x5005	20485	r/w
upper limit for computed value	CV depend	Int*10	0x5006	20486	r/w
temperature hysteresis	°C, °F	Int*10	0x5007	20487	r/w
temperature time delay	s	uInt	0x5008	20488	r/w
RH hysteresis	%	Int*10	0x5009	20489	r/w
RH time delay	s	uInt	0x500A	20490	r/w
computed value hysteresis	CV depend	Int*10	0x500B	20491	r/w
computed value time delay	s	uInt	0x500C	20492	r/w
temperature alarm status	-	ASCII[a)]	0x500D	20493	r
RH alarm status	-	ASCII[a)]	0x500E	20494	r
computed value alarm status	-	ASCII[a)]	0x500F	20495	r
lower CO_2 concentration limit	ppm	Int	0x5010	20496	r/w
upper CO_2 concentration limit	ppm	Int	0x5011	20497	r/w
CO_2 concentration hysteresis	ppm	Int	0x5012	20498	r/w
CO_2 concentration limit status	-	ASCII[a)]	0x5013	20499	r
CO_2 concentration time delay	s	uInt	0x5014	20500	r/w
Relay1 alarm status	-	ASCII[b)]	0x5015	20501	r
Relay2 alarm status	-	ASCII[b)]	0x5016	20502	r

Legend:

- r register is designed for read
- w register is designed for write
- Int*10 register is in format of integer*10
- Int*X register is in format of integer*10, int*100, int*1000 depend on type
- BCD register is in format of BCD
- uInt register is at range of 0-65535
- ASCII character, where:
  a) Temperature, RH, computed value, pressure alarm status
    - no no alarm
    - lo value is bigger than specified upper limit
    - hi value is lower than specified lower limit

  b) Relay alarm status:
    - op no alarm
    - cl relay is closed, alarm is signaled
- Status word: 16b value return, bite description:
  - Bit0 0/1 jumper open/closed
  - Bit3 0/1 Relay1 open/closed
  - Bit4 0/1 Relay2 open/closed
  - Bit5 0/1 internal acoustic alarm status
- Far relay control: open/close relay through Modbus protocol. Before using remote relay control option is necessary setup FAR0 or FAR1 to the relay.
  - FAR0 remote relay control, after device reboot relay is open
  - FAR1 remote relay control, after device reboot
- Output relay alarm condition configuration: For more information please download appendix for user guide from www.cometsystem.com.

8.2. SMTP

In case of exceeding adjusted limits of measured values the device can send e-mails to maximum of three addresses. It is necessary to set your SMTP server address (IP address, authentication, etc.) for correct function of e-mail sending.

If limits of several measured values are exceeded a special alarm e-mail is sent for each alarm state. Dummy address `sensor@[device IP address]` is displayed as a sender of the e-mail. It is not possible to reply to this address. In the Subject field of the message the sentence `Alarm [Description of the device]` is displayed or `Test message [Description of the device]` in the case of sending a test e-mail.

8.3. SNMPv1

By means of the SNMPv1 protocol it is possible to find currently measured values, read and set parameters concerning alarms. In case of alarm activation, warning message (a trap) can be sent to specified addresses. By means of the SNMPv1 protocol it is also possible to display history of last 100 measured values.

For read and write the device communicates via `UDP port 161`. Traps are sent via port `UDP port 162`. Sending of traps can be disabled in the Setup. **The following traps sent**

- `0/0` device restart
- `1/0` testing trap
- `1/1` SNTP time synchronization error
- `1/2` Ethernet firmware was uploaded
- `1/3 - 1/5` SOAP communication error
- `1/6 - 1/8` e-mail sending error
- `1/9` Configuration changed via SNMP or Modbus
- `6/3 - 6/55` report on a measured value being outside of the limits or a return of the measured value to the limits

For the correct function of the SNMPv1 server it is necessary to store the MIB table `Hx5xx.mib` and `RFC-1213.mib` to the MIB client. The path to the device is then:

`iso.org.dod.internet.private.enterprises.comet.products.hx5xx`

MIB tables are available at WWW pages www.cometsystem.com or on the installation CD in the MIB directory. Password for a read operation is set by the manufacturer to `public`, password for write is set to `private`. These passwords may be changed in the setup.

History

By means of the SNMPv1 protocol it is possible to display history of the last 100 measured values, stored in adjusted time interval. This interval is set by configuration program. If a value has not been measured yet or an error was detected the value is 9999, or -9999, if pressure is measured. The history is erased after each restart of the device. Restart occurred if device configuration is changed via keyboard or TSensor software.

8.4. WWW

The device supports display of measured values, adjusted limits and alarm states on its WWW pages. The address of the WWW pages is identical with its IP address. It is possible to upload self-made web pages to device. More info about user-defined web you can find on www.cometsystem.com section programs.

Example: The device has an IP address `192.168.1.204`. Enter `http://192.168.1.204` to the browser address field and confirm it with the Enter key.

WWW pages have adjustable automatic refresh interval. The manufacturer sets it to 60 seconds. The value can be modified in the setup in a range of 10–65535s. If the device has WWW pages display disabled screen with message `Access denied`.

8.5. SNTP

The device allows time synchronization with SNTP server. The time synchronization is set to every 8 hours. If the time synchronization failed in next three hours, SNTP trap, e-mail and Syslog message will be sent.

8.6. Syslog protocol

Device allows send messages to selected Syslog server (`UDP` protocol, `port 514`). Events are described below.

Event	Text
device restart	`Device restart`
test message	`Testing message`
alarm occurred	`Alarm …`
SNTP connection error	`NTP connection error`
write to device via Modbus, SNMP	`Settings changed`
firmware was changed	`Firmware uploaded`
alarm is down	`Clearing …`
SOAP server communication error	`SOAP …`
e-mail sending error	`EMAIL …`

8.7. SOAP

Device allows sending SOAP messages with measured values to user defined remote web server in preset time intervals 10-65535 s. If the device cannot establish connection with the web server in the whole delay interval, device sends trap `1/3 - 1/5`. The file with XML schema is on www.cometsystem.com/schemas/soapHx5xx.xsd.

How to configure sending SOAP messages example:

SOAP enable: `Yes`
Target web page: `my.hosting.cz/soap/server.php`
SOAP server IP address: `123.123.123.123`
Source port: `0` (never set to 80, causes it web server collision)
Destination port: `80` (http servers usually listens at this port)
Sending interval: `10`

9. What to do when…

I forgot the IP address of the device

Finding the device IP address

IP address is set to the value `192.168.1.213` by the manufacturer. If you changed it and forgot the new IP address, run the TSensor program and press the "`Find…`" button. In a new window all sensors will be show.

It is not possible to connect to the device from a LAN

In the "Find device" window is only IP and MAC address displayed
The next information is displayed as `N/A`. This problem will be occurred, when the device IP is set to another LAN.

In TSensor program choose `Find device/Change IP address`. Follow the program instruction.

The sensor IP address in Find device window is not displayed
In TSensor program select `Find device/Help my device Wasn't found!` Follow the program instruction.

Finding the MAC address
The MAC address is a unique address of a device which is necessary to be known e.g. in case when there are several devices connected to the network. MAC address is on device label.

It is not possible to find meter after manual MAC enter
In TSensor program select `Find device/Help my device Wasn't found`. In this select `Set IP to ARP only`. Into `device MAC address` enter the meters MAC address (e.g. 00-20-4A-84-F0-80) and press the `Set IP` button.

Open telnet to the IP address you assigned to the device MAC address by running a telnet command `telnet [IP_address_assigned_to_MAC_address] 9999` and confirm with the Enter key.

Choose `0 - Global Settings`, set the meters IP address, clear the gate IP, no. of net mask set to 0. Pres the Enter key, until you are not back into a menu. `Press - 9 Save and Exit`. The connection will be closed. Now you can connect to meter by the `TSensor` program.

LCD display is Off

- check if power supply is connected properly
- disconnect and connect the power supply - watch the display at the moment of connecting the power. If all LCD segments light for 1 second and go out again, the display is turned off by the software

10. Error States of the device

Device continuously checks its state during operation. In case error is found LCD displays corresponding error code:

Error 0 - first line of LCD displays „Err0“. Check sum error of stored setting inside device’s memory. This error appears if incorrect writing procedure to device’s memory occurred or if damage of calibration data appeared. At this state device does not measure and calculate values. It is a serious error, contact distributor of the device to fix.

Error 1 - measured or calculated value (except concentration of CO_2) is over upper limit of allowed full scale range. There is a reading „Err1“ on LCD display. Value read from the device is +999.9. This state appears in case of:

- Measured temperature is higher than approximately 600°C (i.e. high non-measurable resistance of temperature sensor, probably opened circuit).
- Relative humidity is higher than 100%, i.e. damaged humidity sensor, or humidity calculation of humidity is not possible (due to error during temperature measurement).
- Computed value – calculation of the value is not possible (error during measurement of temperature or relative humidity or value is over range).

The value of CO_2 concentration 9999 ppm is correct value!

Error 2 - there is a reading „Err2“ on LCD display. Measured or calculated value is below lower limit of allowed full scale range or CO_2 concentration measurement error occurred. Value read from the device is -999.9. This state appears in case of:

- Measured temperature is lower than approximately -210°C (i.e. low resistance of temperature sensor, probably short circuit).
- Relative humidity is lower than 0%, i.e. damaged sensor for measurement of relative humidity, or calculation of humidity is not possible (due to error during temperature measurement).
- Measured value of CO2 concentration is outside the range 0 to 2000 (10000) ppm
- Computed value – calculation of computed value is not possible (error during measurement of temperature or relative humidity).

Error 3 - there is a reading „Err3“ on LCD display upper line. Error of internal A/D converter appeared (converter does not respond, probably damage of A/D converter). At this state device does not measure temperature and relative humidity and computed values are not calculated. This error does not affect CO_2 concentration measurement. It is a serious error, contact distributor of the device.

Error 4 - there is a reading „Err4“ on LCD display. It is internal device error during CO_2 concentration sensor initialization. Under this condition device does not measure concentration of CO_2. Value read from device is -9999 (concentration of CO_2). CO_2 sensor is probably damaged. It is a serious error, contact distributor of the device**.**

Error 5, 6 - there is problem with assigned value to output relay, there is some wrong setting (mismatch). This error appears if incorrect writing procedure to device’s memory occurred.

Error 9 - inserted password is not valid, there is shown for short time message “Err9” on LCD display.

11. Readings on LCD display

°C, °F reading next to this symbol is measured temperature or error state of value

%RH reading next to this symbol is measured relative humidity or error state of value

CO2 ppm reading next to this symbol is measured concentration of CO_2 or error state of value.

°C / °F DP reading next to this symbol is calculated dew point temperature or error state of value

g/m^3 reading next to this symbol is calculated absolute humidity or error state of value

g/kg reading next to this symbol is calculated specific humidity or mixing ratio (depends on device setting) or error state of value

3 this symbol is on if jumper is closed

If specific enthalpy is selected, there is shown only value (number) without corresponding unit.

12. Preventive maintenance and calibration

Pay heed to recommended calibration interval. Do not subject the device to mechanical stress.
Recommended calibration intervals:

- H5521 5 years (CO_2)
- H5524 5 years (CO_2)
- H6520 5 years (CO_2), 1 year (relative humidity), 2 years (temperature)
- H6521 5 years (CO_2), 1 year (relative humidity), 2 years (temperature)

13. Technical specification

13.1. Technical parameters

13.1.1. Common parameters

Power voltage: 9 to 30 V DC

Power consumption: 1W during normal operation
4W for 50ms with 15 s period

Power connector: coaxial connector, diameter 5,5 x 2,1 mm, (+) internal contact

Measuring interval: temperature, relative humidity 2s
concentration of CO_2 . . . . . 15s

Display switching interval: 4 s (when more than two values are displayed)

Communication with computer: Ethernet connection (RJ-45 connector)

Relay outputs: Amount: 2
Maximal voltage: 50 V
Maximal current: 2A
Maximal power: 60 VA
Relays contact is not designed for direct control of line voltage!
(relay contact parameters: max 220Vdc, 125Vac, 2A, 60 W, 62.5 VA)

EMC: EN 61326-1, EN 55011, EN55022

13.1.2. H5521 - CO_2 regulator

Concentration of CO_2:

Accuracy:: ± (100 ppm + 5 % of measuring value) at 25°C (77°F) and 1013 hPa
Range: 0 to 10 000 ppm
Temperature dependence: typ. 2 ppm CO_2 / ºC in the range 0 to 50 ºC (32 to 122°F)
Long term stability: typ. 20 ppm / year
Resolution: 1 ppm

Response time: t90 < 195 s in „SLOW“ measurement mode
t90 < 75 s in „FAST“ measurement mode

13.1.3. H5524 - CO_2 regulator

Concentration of CO_2:

Accuracy:: ± (50 ppm + 2 % of measuring value) at 25°C (77°F) and 1013 hPa
Range: 0 to 2 000 ppm
Temperature dependence: typ. 2 ppm CO_2 / ºC in the range 0 to 50 ºC (32 to 122°F)
Long term stability: typ. 20 ppm / year
Resolution: 1 ppm

Response time: t90 < 195 s in „SLOW“ measurement mode
t90 < 75 s in „FAST“ measurement mode

13.1.4. H6520 – temperature, relative humidity and CO_2 regulator

Temperature:

Accuracy: ± 0,4 °C (±0,7 °F)
Range: -30 to +60 °C (-22 to 140 °F)
Resolution: 0,1 °C (0,2 °F)

Relative humidity:

Accuracy: ± 2,5 %RH from 5 to 95 %RH at 23 °C (73,4 °F)
Range: 0 to 100 %RH, temperature compensated
Resolution: 0,1 %RH

Concentration of CO_2:

Accuracy:: ± (50 ppm + 2 % of measuring value) at 25°C (77°F) and 1013 hPa
Range: 0 to 2000 ppm
Temperature dependence: typ. 2 ppm CO_2 / ºC in the range 0 to 50 ºC (32 to 122°F)
Long term stability: typ. 20 ppm / year
Resolution: 1 ppm

Measuring temperature and humidity range is limited in accordance with the graph below

Response time measurement of temperature and relative humidity with stainless steel mesh sensor cover (F5200B) and bronze sensor cover (F0000 - selectable option), air flow approximately 1 m/s:

temperature: t90 < 6 min (temperature step 20 °C (36 °F))
relative humidity: t90 < 30 s (humidity step 65 %RH, constant temperature)

Response time measurement of CO_2 concentration:

t90 < 195 s in „SLOW“ measurement mode
t90 < 75 s in „FAST“ measurement mode

13.1.5. H6521 – temperature, relative humidity and CO_2 regulator

Temperature:

Accuracy:	± 0,4 °C (±0,7 °F)
Range:	-30 to +105 °C (-22 to 221°F)
Resolution:	0,1 °C (0,2 °F)

Relative humidity:

Accuracy:	± 2,5 %RH from 5 to 95 %RH at 23 °C (73,4 °F)
Range:	0 to 100 %RH, temperature compensated
Resolution:	0,1 %RH

Concentration of CO_2:

Accuracy::	± (100 ppm + 5 % of measuring value) at 25°C (77°F) and 1013 hPa
Range:	0 to 10000 ppm
Temperature dependence:	typ. 2 ppm CO_2 / ºC in the range 0 to 50 ºC (32 to 122°F)
Long term stability:	typ. 20 ppm / year
Resolution:	1 ppm

Measuring temperature and humidity range is limited in accordance with the graph below

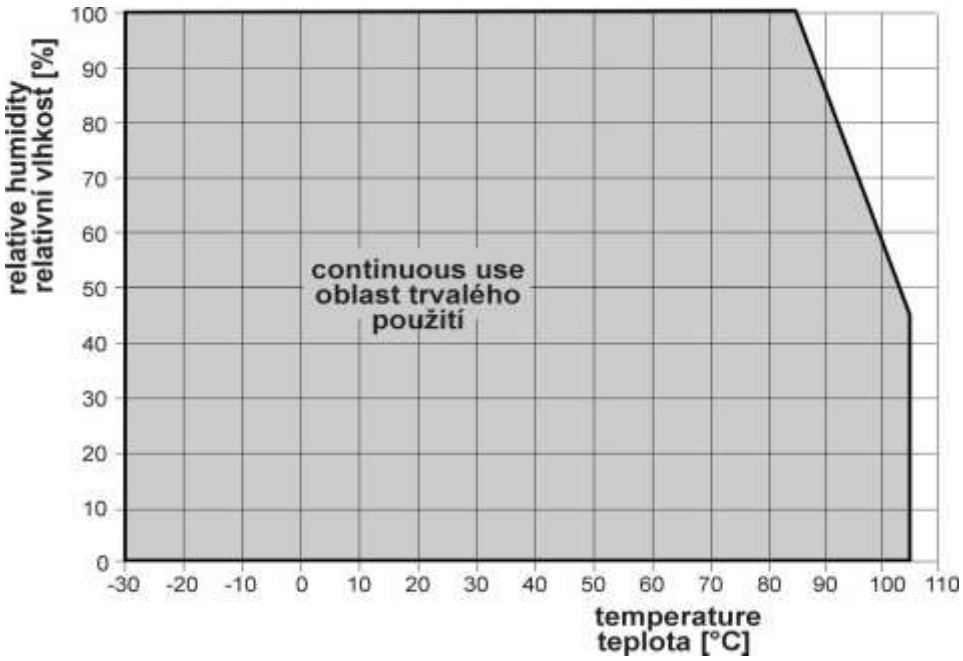
Response time measurement of temperature and relative humidity with stainless steel mesh sensor cover (F5200B) and bronze sensor cover (F0000 - selectable option), air flow approximately 1 m/s:

temperature:	t90 < 6 min (temperature step 20 °C (36 °F))
relative humidity:	t90 < 30 s (humidity step 65 %RH, constant temperature)

Response time measurement of CO_2 concentration:

t90 < 195 s in „SLOW“ measurement mode
t90 < 75 s in „FAST“ measurement mode

13.1.6. Relative humidity and temperature restriction

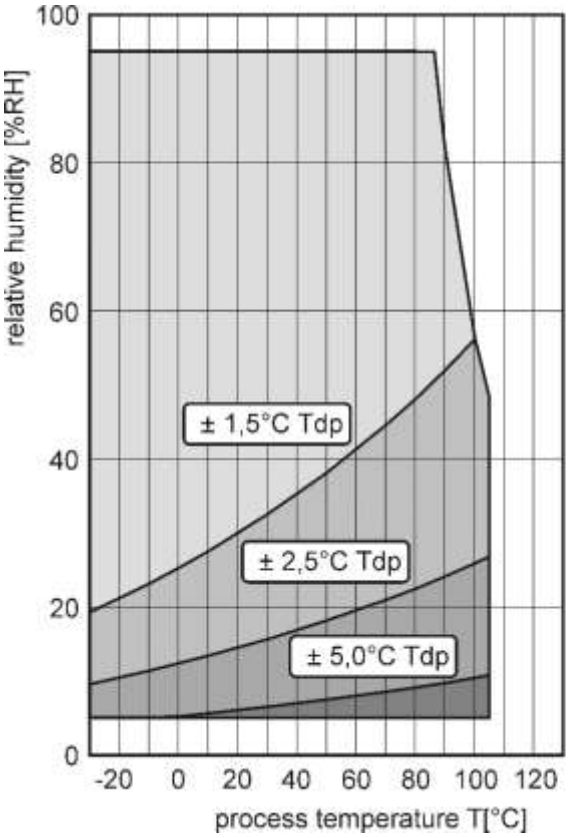


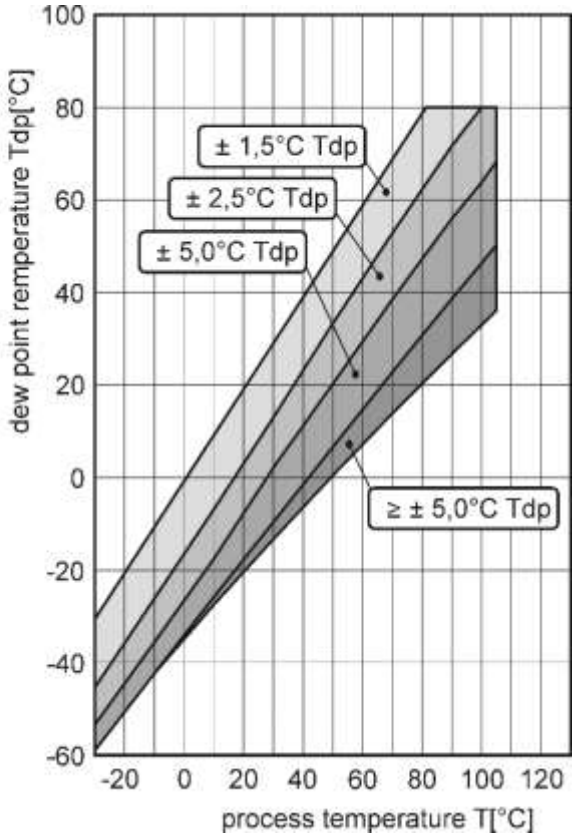
13.1.7. Value computed from measured relative humidity and temperatur

Dew point temperature

Range: -60 to +80 °C (-76 to 176 °F)

Accuracy: ±1,5°C (±2,7°F) at ambient temperature T<25°C (77°F) and relative humidity RH >30%, for more details see graphs below

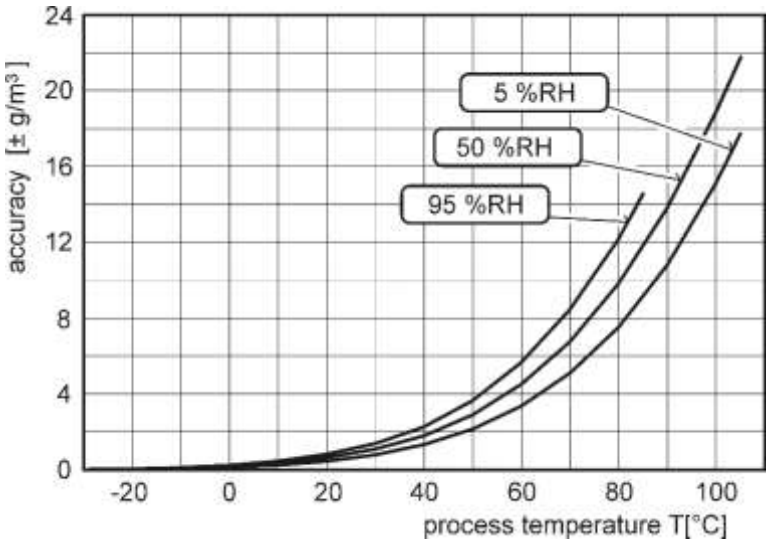




Absolute humidity

Range: 0 to 400 g/m^3

Accuracy: ±1,5 g/m^3 at ambient temperature T < 25°C (104 °F), for more details see graph below



Specific humidity[2]

Accuracy: ±2g/kg at ambient temperature T < 35°C (95 °F)
Range: 0 to 550 g/kg

Mixing ratio[2]

Accuracy: ±2g/kg at ambient temperature T < 35°C (95 °F)
Range: 0 to 995 g/kg

Specific enthalpy[2]

Accuracy: ± 3kJ/kg at ambient temperature T < 25°C (77 °F)
Range: 0 to 995 kJ/kg[3]

The values computed from ambient temperature and relative humidity including their accuracy you can exactly determine by the program **Conversions**. It is free to download at www.cometsystem.com .

13.2. Operating conditions

Operating temperature range:

electronics H5521, H6521:	-30 to +80 °C (-22 to 176 °F)
electronics H5524, H6520**:**	-30 to +60 °C (-22 to 140 °F)
measuring end of stem H6520:	-30 to +80 °C (-22 to +176 °F)
CO_2 probe H5521, H6521	-40 to +60 °C (-40 to +140 °F)
RH+T probe H6521:	-30 to +105 ºC (-22 to +221 ºF)

It is recommended to switch off the LCD display at ambient temperatures above 70°C around electronics.

Operating humidity range:

H5521, H6521:	0 to 100 % RH (no condensation)
H5524, H6520:	5 to 95 % RH (no condensation)

Operating barometric pressure range: 850 to 1100 hPa

Protection:

H5521	IP30 (electronics), IP65 (CO_2 probe)
H5524	IP30 (electronics)
H6520	IP30 (electronics), IP40 (measuring end of stem)
H6521	IP30 (electronics), IP65 (CO_2 probe), IP40 (RH+T probe)

Working position:

H5521, H6521:	negligible
H5524:	with cable glands upwards
H6520:	with sensor cover downwards

Not allowed manipulations: It is not allowed to operate the device under conditions other than specified in technical parameters. Devices are not designed for locations with chemically aggressive environment. Temperature and humidity sensors must not be exposed to direct contact with water or other liquids. It is not allowed to remove the sensor cover to avoid any mechanical damage of the sensors.

[2] This value depends on the atmospheric pressure. For computing is used constant value stored in device memory. Default value preset by manufacturer is 1013hPa and can be changed by user's software.
[3] This maximum is reached under conditions about 70°C/100%RH or 80°C/70%RH

Storage conditions:

temperature:	-40 to +60 °C (-40 to 140 °F)
relative humidity:	5 to 95 % RH (no condensation)
atmospheric pressure:	700 to 1100 hPa

Dimensions: see dimensional drawings

Weight: approximately

H5521/1m probe	420 g
H5521/2m probe	450 g
H5521/4m probe	510 g
H5524	330 g
H6520	350 g
H6521/1m probe	500 g
H6521/2m probe	570 g
H6521/4m probe	710 g

Material of the case: ABS

13.3. End of operation

Device itself (after its life) is necessary to liquidate ecologically!

13.4. Technical support and service

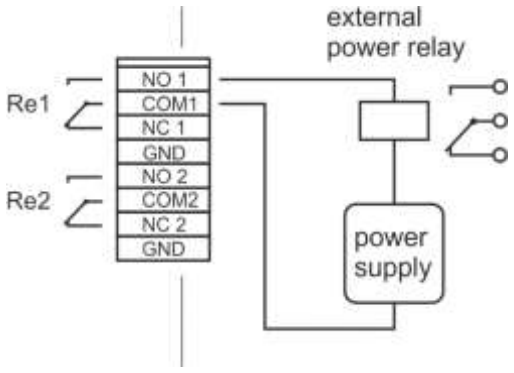
The adjustment procedure is described at file „*Calibration manual.pdf*“ which is installed commonly with the TSensor software.

Technical support and service is provided by distributor. For contact see warranty certificate. You can use discussion forum at web address: http://www.forum.cometsystem.cz/.

14. Appendix A

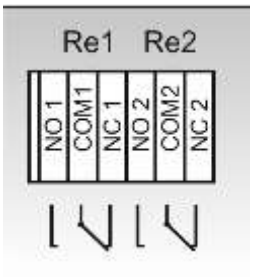
Connection of external power relay

Coil data chart of external power relay:
nominal voltage : max 50V
nominal power: max 60VA
current: max 2A



15. Appendix B

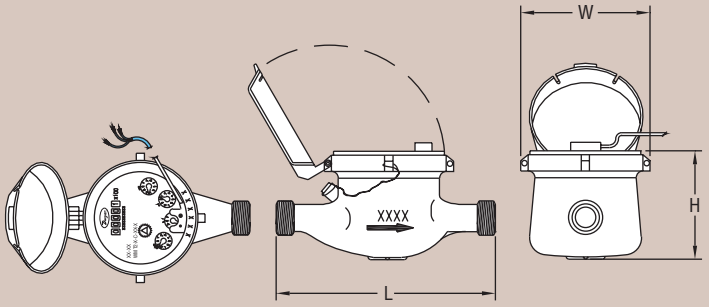
Wiring diagram of relay contacts for devices with serial number lower than **16981000**.



Series
WMT2

Multi-Jet Water Meter with Pulsed Output

Economical, Brass Body, Dry Dial



Size in (mm)	Spud NPSM (BSPP)	Length 'L' in (mm)	Width 'W' in (mm)	Height 'H' in (mm)	Weight lb (kg)
5/8 1/2 (15)	3/4″ (3/4″)	6-1/2 (165)	3-45/64 (94)	4-15/64 (107.5)	3.75 (1.7)
5/8 x 3/4	1″ (1″)	7-1/2 (190)	3-45/64 (94)	4-15/64 (107.5)	3.97 (1.8)
3/4 (20)	1″ (1″)	7-1/2 (190)	3-45/64 (94)	4-15/64 (107.5)	4.9 (2.2)
1 (25)	1-1/4″ (1-1/4″)	10-1/4 (260)	3-55/64 (98)	4-5/8 (117.5)	6.4 (2.9)
1-1/4 (32)	1-1/2″ (1-1/2″)	10-1/4 (260)	3-55/64 (98)	4-5/8 (117.5)	8.2 (3.7)
1-1/2 (40)	2″ (2″)	11-13/16 (300)	4-51/64 (122)	5-9/16 (141.5)	13.52 (6.17)
2 (50)	2-1/2″ (2-1/2″)	11-13/16 (300)	5-45/64 (145)	6-31/32 (177)	18.74 (8.5)

The Series WMT2 Multi-Jet Water Meter is ideal for commercial and industrial applications. The multi-jet design allows simplicity and accuracy with wide flow ranges even in low flow applications. The meter is designed for long service life and relatively maintenance-free operation, even under adverse conditions. The magnetically driven, hermetically sealed register will not leak or fog and is completely separated from the water. The reed switch is activated by a magnet on the dial, which is directly proportional to the flow rate. The output is perfect for remote monitoring of flow rate or flow totalization, and can interface with PLC's, counters, data loggers, and SCADA systems.

FEATURES

- Magnetic Drive – water is sealed from entering register
- Dry dial won't discolor or fade – hermetically sealed from the elements
- Integral strainer that protects meters from particulate damage
- Pointer-roller indicator
- Frost resistant body
- Pulsed output
- Includes two mounting adapters (couplings)

SPECIFICATION

Service: Water.
Wetted Materials:
Body: Brass, polyethylene;
Couplings: Brass;
Measuring Chamber: Polyethylene, ABS plastic, ferrite, acetal.
Flow Range: See model chart.
Accuracy: Transitional Flow: ±5%; Nominal Flow: ±2%.
Temperature Limit: 104°F (40°C).
Pressure Limit: 232 psi (16 bar).
Pressure Drop: See service manual.
Totalizing Display Maximum: See model chart.
Output Signal: Pulse output with frequency proportional to flow rate.
Pulse Options: 0.1 gal, 1 gal, 10 gal, 100 gal per pulse (1 L, 10 L, 100 L per pulse).
Electrical Rating: 0.01 A @ 24 VAC/DC.
Electrical Connections: Color-coded lead wires, 4.5´ (1.5 m) long.
Mounting Orientation: Horizontal.
Weight: See dimension chart.

Model	Coupling Size	Size	Max Flow	Nominal Flow Range	Transitional Flow	Display Max (Gallons)	Pulse Rate (Gal./Pulse)
			GPM (Gallons Per Minute)				
WMT2-A-C-01	1/2´ NPT	5/8 x 1/2´	20	1 to 10	0.25	9,999,999.99	0.1
WMT2-A-C-02	3/4´ NPT	5/8 x 3/4´	20	1 to 20	0.25	9,999,999.99	0.1
WMT2-A-C-03	3/4´ NPT	3/4´	30	2 to 30	0.25	9,999,999.99	0.1
WMT2-A-C-04	1´ NPT	1´	50	3 to 50	0.75	99,999,999.9	0.1
WMT2-A-C-01-1	1/2´ NPT	5/8 x 1/2´	20	1 to 10	0.25	9,999,999.99	1
WMT2-A-C-02-1	3/4´ NPT	5/8 x 3/4´	20	1 to 20	0.25	9,999,999.99	1
WMT2-A-C-03-1	3/4´ NPT	3/4´	30	2 to 30	0.25	9,999,999.99	1
WMT2-A-C-04-1	1´ NPT	1´	50	3 to 50	0.75	99,999,999.9	1
WMT2-A-C-06-10	1-1/2´ NPT	1-1/2´	100	5 to 100	1.5	99,999,999.9	10
WMT2-A-C-07-10	2´ NPT	2´	160	80 to 160	2	99,999,999.9	10
WMT2-A-C-04-100	1´ NPT	1´	50	3 to 50	0.75	99,999,999.9	100
WMT2-A-C-07-100	2´ NPT	2´	160	80 to 160	2	99,999,999.9	100

Model	Coupling Size	Size	Max Flow	Nominal Flow Range	Transitional Flow	Display Max (m^3)	Pulse Rate (L/Pulse)
			m^3/h				
WMT2-B-C-08-1	1/2´ BSPT	15 mm	3	0.12 to 1.5	0.03	99,999.9999	1
WMT2-B-C-10-1	3/4´ BSPT	20 mm	5	0.2 to 2.5	0.05	99,999.9999	1
WMT2-B-C-11-1	1´ BSPT	25 mm	7	0.25 to 3.5	0.07	99,999.9999	1
WMT2-B-C-12-1	1-1/4´ BSPT	32 mm	12	0.48 to 6	0.12	99,999.9999	1
WMT2-B-C-08-10	1/2´ BSPT	15 mm	3	0.12 to 1.5	0.03	99,999.9999	10
WMT2-B-C-12-10	1-1/4´ BSPT	32 mm	12	0.48 to 6	0.12	99,999.9999	10
WMT2-B-C-14-10	2´ BSPT	50 mm	30	1.2 to 15	0.3	999,999.9999	10
WMT2-B-C-12-100	1-1/4´ BSPT	32 mm	12	0.48 to 6	0.12	99,999.9999	100
WMT2-B-C-14-100	2´ BSPT	50 mm	30	1.2 to 15	0.3	999,999.9999	100

32 – EXTERIOR IMPROVEMENTS & LANDSCAPING

329300 - PLANTS

PART 1 – GENERAL

1.1 SCOPE

The green wall system will cover the south facing sides of the house, on the outside of the bedroom wall and the outside of the living room wall. There will be a different green wall system near the front door of the house.

1.2 REQUIREMENTS

A. Each wall will be irrigated and have a pump.

B. The plants will be chosen to suit the environment.

1.3 SUBMITTALS

A. Product owner manual and maintenance

B. Instructions on setup and installation

C. Information on irrigation and pumping system

PART 2 – PRODUCT

2.1 GREEN WALLS ON SOUTH FACING SIDE OF HOUSE

A. Model: Pro Wall

B. Website: https://www.gsky.com/pro-wall/

C. Manufacturer: GSky

D. Dimensions: Exterior wall of the bedroom

E. Square Footage: 125

F. Height: 10' - 10" (left), 9' - 3" (right)

G. Bottom length: 10' - 5"

H. Top length: 10' - 6"

I. Dimensions: Exterior wall of the living room

J. Square Footage: 107

K. Height: 9' - 3" (left), 10' - 10" (right)

L. Bottom length: 12' - 5"

M. Top length: 12' - 6"

2.2 GREEN WALL PERPINDICULAR TO ENRTANCE

A. Model: Florafelt 12-Pocket Vertical Garden Planter

B. Website: http://www.florafelt.com/products/florafelt-12-pocket-vertical-garden-planter

C. Manufacturer: Florafelt

D. Dimension of system (W x H x D): 32" x 24" x 1-1/2"

E. Weight: around 25 planted

F. Dimensions of wall space:

G. Square Footage: 107

H. Height: 9' - 3" (left), 10' - 10" (right)

I. Length: 4' - 4"

2.3 LANDSCAPING AND PLANTERS

A. The plants will stay in the containers they were received from the nursery, they do not need to be replanted.
B. Plants will be various small trees, shrubs, bushes, and herbaceous plants, mostly comprised of Colorado Native species.

PART 3 – EXECUTION

3.01 INSTALLATION

A. The systems will be installed in compliance with codes and will not compromise the stability of the supporting structure

END SECTION 329300

END SECTION 32

DRAWING TITLE:

GSKY GREEN WALL PANELS

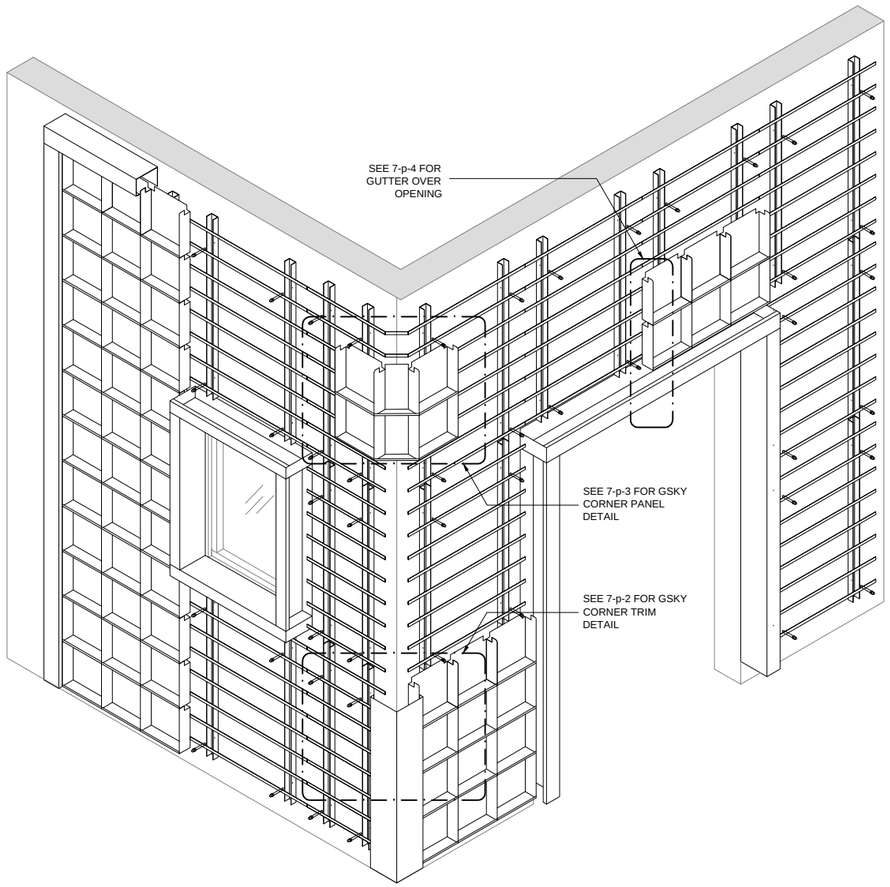
TYPICAL DETAILS / INTERIOR OR EXTERIOR

3D VIEW
CORNER TRIM
CORNER PANEL
GUTTER OVER OPENING

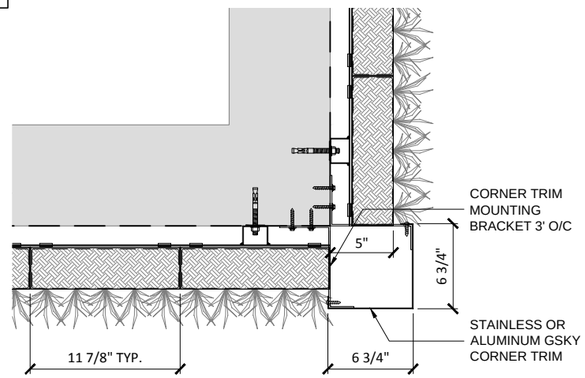
DRAWING # 7-p

DATE: AUG 18, 2010
REV DATE: N/A
SCALE: AS NOTED
PAPER SIZE: 11 x 17

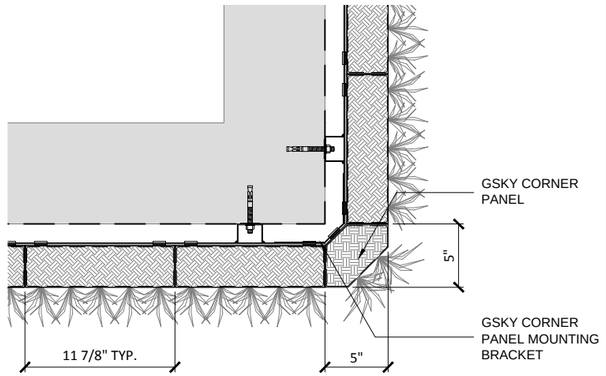
#704 - 318 HOMER ST
VANCOUVER, BC V6B 2V2
604-708-0611 ph 604-357-1315 fax
www.gsky.com



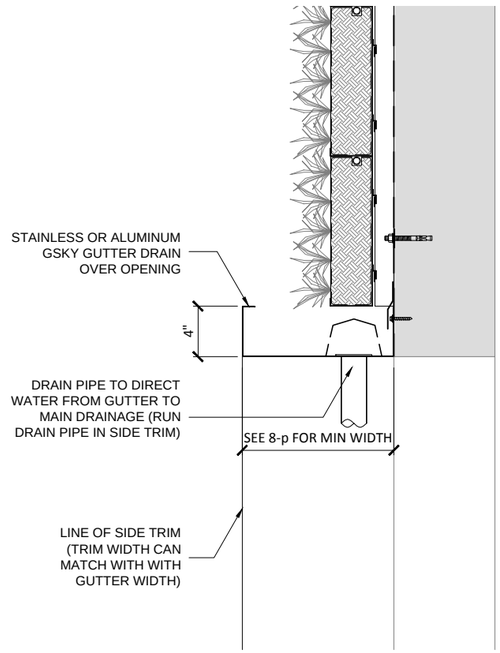
1 3D VIEW FOR TYPICAL DETAILS
SCALE NTS (FILE # 7-p-1)



2 PLAN DETAIL / CORNER TRIM
SCALE 1" - 1'-0" (FILE # 7-p-2)



3 PLAN DETAIL / CORNER PANEL
SCALE 1" - 1'-0" (FILE # 7-p-3)



4 SECTION DETAIL / GUTTER OVER OPENING
SCALE 1" - 1'-0" (FILE # 7-p-4)

DRAWING TITLE:

GSKY GREEN WALL PANELS

DRAIN DETAILS / INTERIOR OR EXTERIOR

GUTTER DRAIN
GRAVEL DRAIN
TRENCH DRAIN
CURB DRAIN

DRAWING # 8-p

DATE: AUG 18, 2010
REV DATE: N/A
SCALE: AS NOTED
PAPER SIZE: 11 x 17

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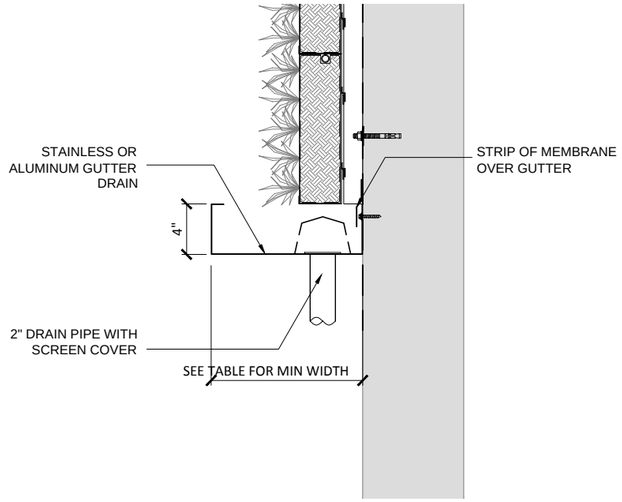
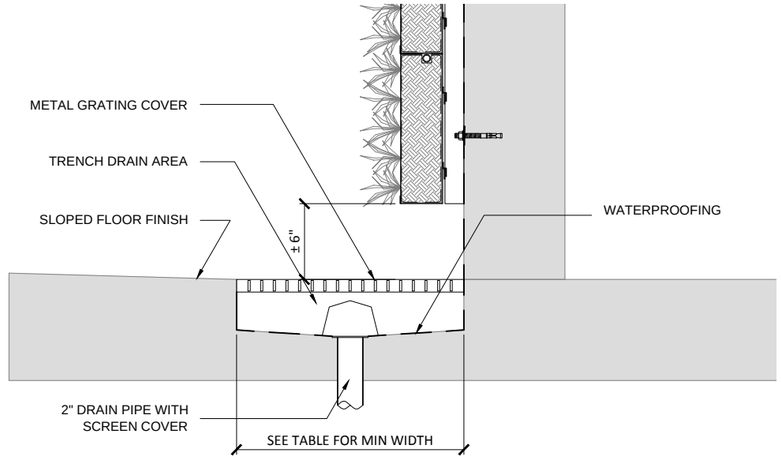
	HEIGHT: LESS THAN 16 PANELS	HEIGHT: BETWEEN 16 AND 24 PANELS	HEIGHT: MORE THAN 24 PANELS
GUTTER DRAIN	MIN 12"	NOT ADEQUATE	NOT ADEQUATE
TRENCH DRAIN	MIN 12"	MIN 24"	MIN 36" (ASK GSKY)
GROUND DRAIN	MIN 12"	MIN 24"	MIN 36" (ASK GSKY)
CURB DRAIN	MIN 12"	MIN 24"	MIN 36" (ASK GSKY)

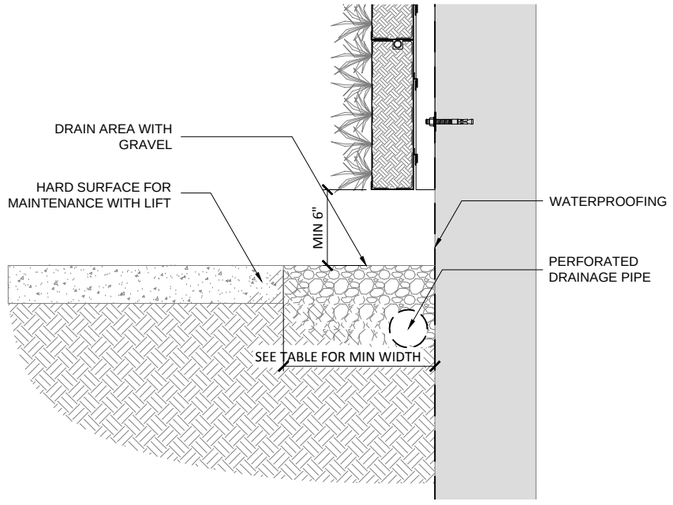
*DRAIN AREA SHOULD EXTEND MIN 1/2 DRAIN WIDTH FROM EACH SIDES OF GREEN WALL
*MIN WIDTH MAY CHANGE DEPENDING ON PLANT SELECTION
*WATERPROOFING IN TRENCH AND CURB DRAIN ARE REQUIRED
*GREEN WALL BELOW MUST TO BE CLEAR FOR MAINTENANCE LIFT ACCESS



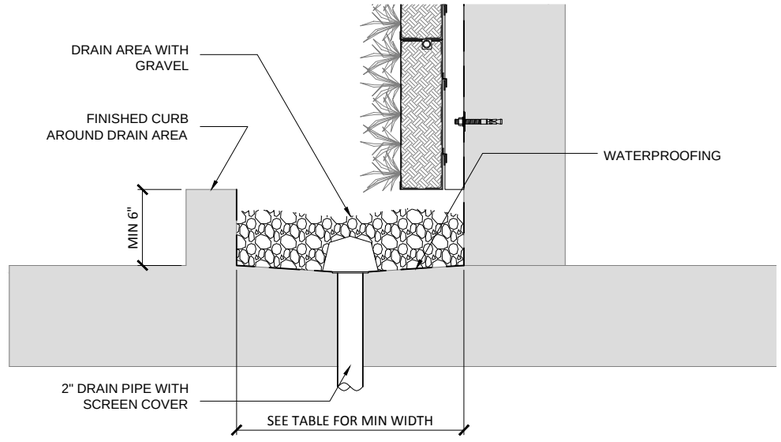
1 SECTION DETAIL / GUTTER DRAIN
SCALE 1" - 1'-0" (FILE # 8-p-1)



2 SECTION DETAIL / TRENCH DRAIN
SCALE 1" - 1'-0" (FILE # 8-p-2)



3 SECTION DETAIL / GRAVEL DRAIN
SCALE 1" - 1'-0" (FILE # 8-p-3)



4 SECTION DETAIL / CURB DRAIN
SCALE 1" - 1'-0" (FILE # 8-p-4)

DRAWING TITLE:

GSKY GREEN WALL PANELS

IRRIGATION CONTROL UNIT (ICU) DESIGNS

ICU-1000
ICU-600

PLUMBING REQUIREMENTS
ELECTRICAL REQUIREMENTS

DRAWING #
9-p

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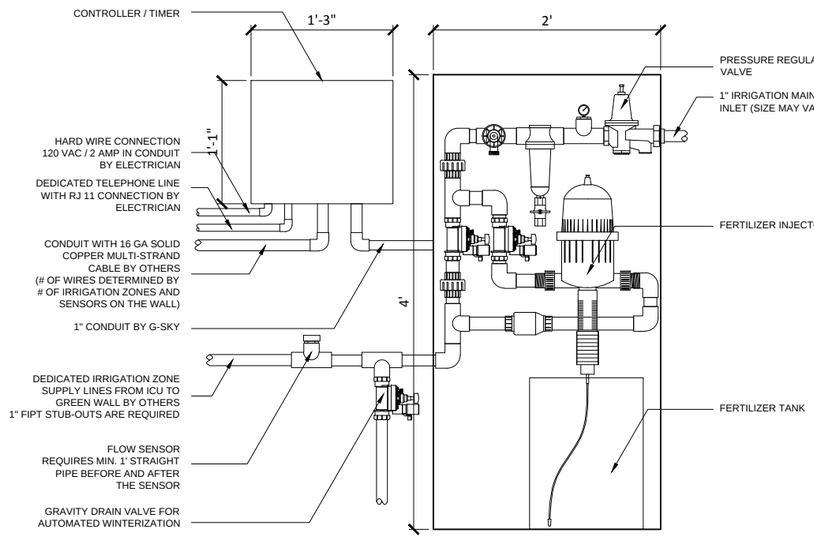
ICU-1000

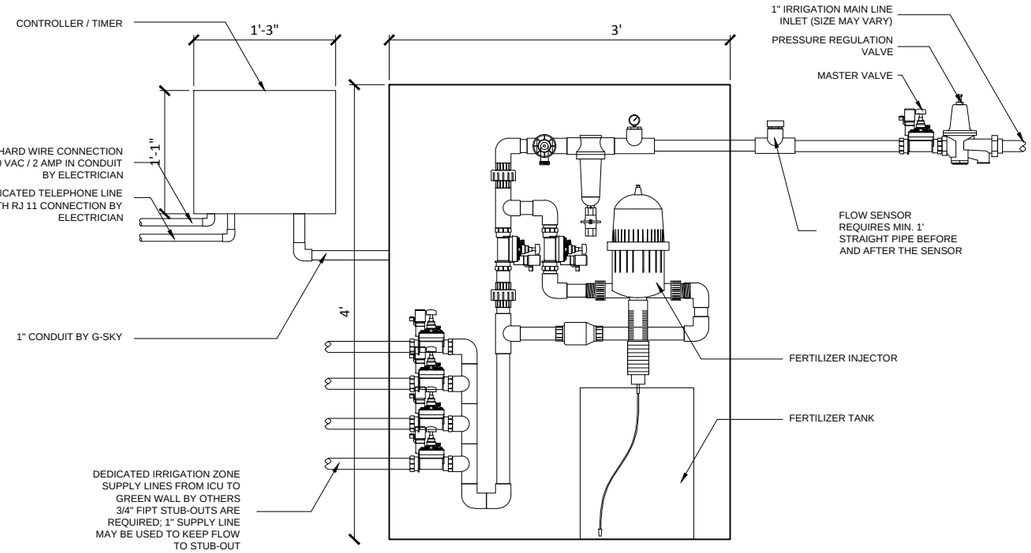
IRRIGATION CONTROL UNIT FOR:
*GREEN WALLS LARGER THAN 1080SQFT (INTERIOR OR EXTERIOR)
*EXTERIOR GREEN WALLS IN FREEZING CLIMATES USDA PLANT ZONE 8 OR BELOW (USDA PLANT ZONE 8 = MAX 20F OR -6.7C)



*REQUIREMENTS:
*ICU - 48"h x 24"w x 36"d (INCLUDING DOOR SWING)
*CONTROLLER - 13"h x 15"w x 20"d (INCLUDING DOOR SWING)
*EASY ACCESS FOR MAINTENANCE
*ADEQUATE PRESSURE TO GET MIN PSI AT BOTTOM OF GREEN WALL (TYP 65 PSI, UP TO 50 FT HEIGHT WALL)
INSTALL BOOSTER PUMP IF REQUIRED (BY PLUMBER)
*120V / 2 AMP POWER (HARD WIRE) (BY ELECTRICIAN)
*DEDICATED TELEPHONE LINE RJ 11 (FOR OTHERS)
*GROUNDING CONNECTION IF REQUIRED (BY ELECTRICIAN)
*1 1/4" CONDUIT BETWEEN ACC AND EACH TRIM SPACES FOR ZONE VALVE CONTROL WIRES AND FREEZING SENSOR (BY ELECTRICIAN)
*BACK-FLOW PREVENTOR AS REQUIRED (BY PLUMBER)
*GREEN WALL MUST BE DESIGNED TO HAVE SPACE FOR ZONE VALVES TO RUN ALONG THE SIDE OF THE GREEN WALL WITHIN THE SIDE TRIM (MIN 7" WIDE TRIM) OR ABOVE THE WALL IN THE TOP TRIM (MIN 8" HIGH TRIM)
*NON-FREEZING INDOOR SPACE WITH FLOOR DRAIN

1 ICU-1000 / ZONE VALVES AT GREEN WAL
SCALE 3/4" - 1'-0" (FILE # 9-p-1)

ICU-600
IRRIGATION CONTROL UNIT FOR:
*GREEN WALLS SMALLER THAN 1080 SQFT (INTERIOR OR EXTERIOR)
*EXTERIOR WALLS IN USDA PLANT ZONE 9 OR HIGHER (NON-FREEZING CLIMATES)



*REQUIREMENTS:
*ICU - 48"h x 36"w x 48"d (INCLUDING DOOR SWING)
*CONTROLLER - 13"h x 15"w x 20"d (INCLUDING DOOR SWING)
*EASY ACCESS FOR MAINTENANCE
*ADEQUATE PRESSURE TO GET MIN PSI AT BOTTOM OF GREEN WALL (TYP 65 PSI, UP TO 50 FT HEIGHT WALL)
INSTALL BOOSTER PUMP IF REQUIRED (BY PLUMBER)
*120V / 2 AMP POWER (HARD WIRE) (BY ELECTRICIAN)
*DEDICATED TELEPHONE LINE RJ 11 (BY OTHERS)
*GROUNDING CONNECTION IF REQUIRED (BY ELECTRICIAN)
*BACK-FLOW PREVENTOR AS REQUIRED (BY PLUMBER)
*CAN BE EXPANDED MAX 6 ZONES TO ACCOMMODATE IF THERE IS NO SPACE FOR VALVES AT THE GREEN WALL(S)
*NON-FREEZING INDOOR SPACE WITH FLOOR DRAIN
*CAN BE LOCATED OUTDOORS WITH ADDITIONAL ENCLOSURE
*CAN BE CUSTOM DESIGNED TO ACCOMMODATE FREEZING CLIMATES

2 ICU-600 / ZONE VALVES AT ICU
SCALE 3/4" - 1'-0" (FILE # 9-p-2)

DRAWING TITLE:

GSKY GREEN WALL PANELS

IRRIGATION LAYOUT 1

IRRIGATION LAYOUT FOR ICU-1000
IRRIGATION LAYOUT FOR ICU-600
STUB-OUT DETAIL
ZONE VALVE DETAIL

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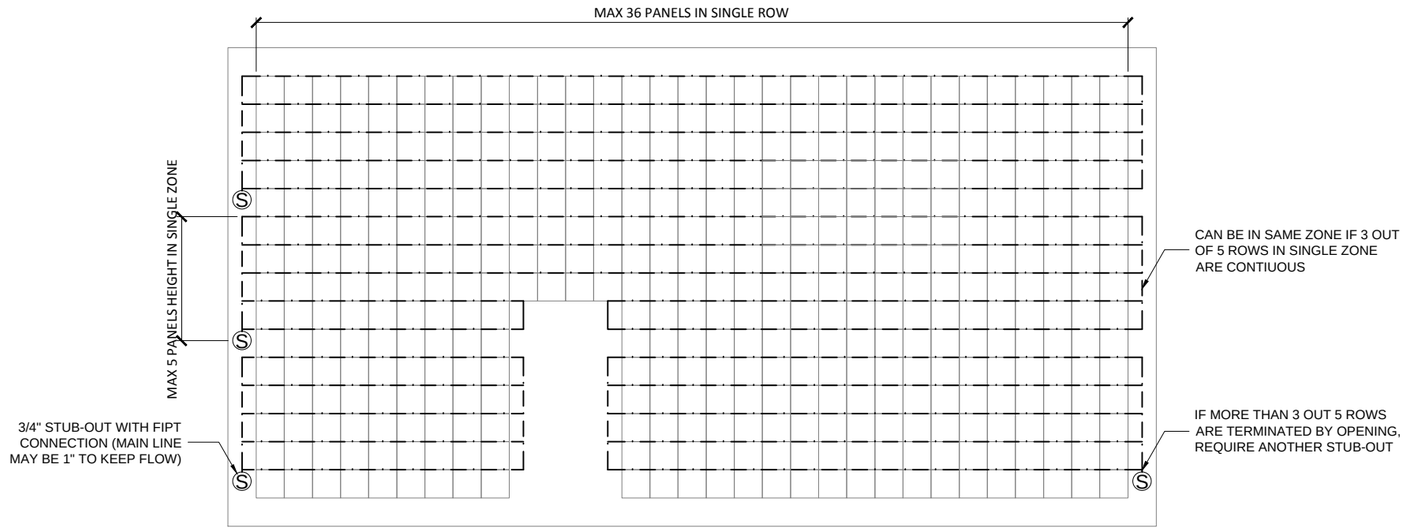
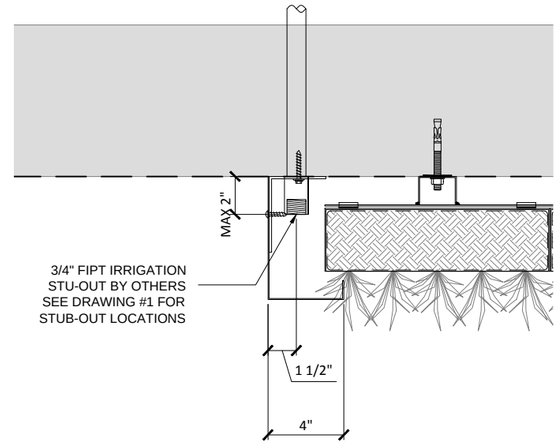
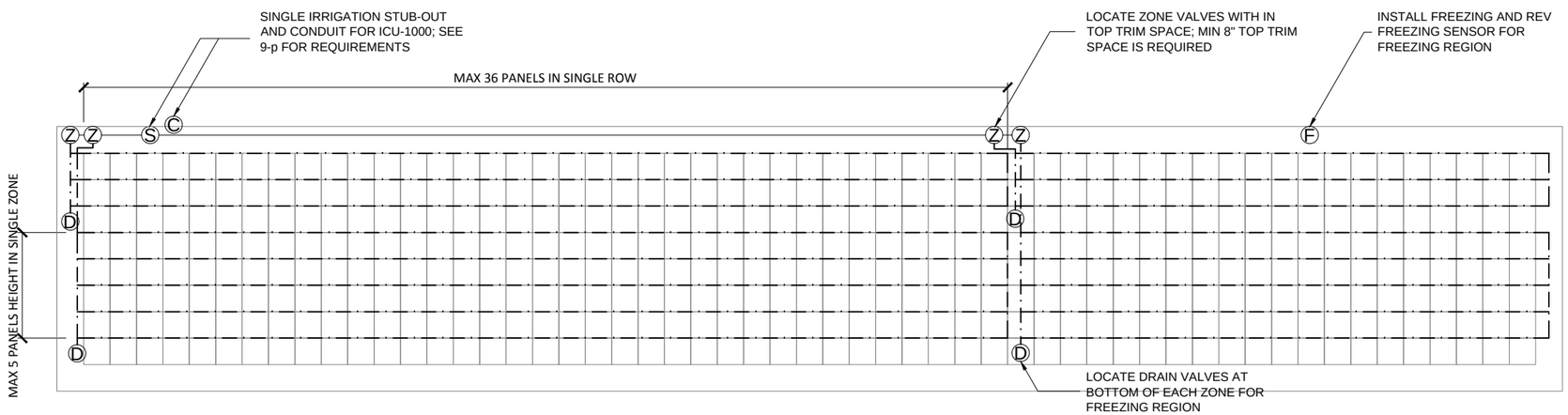
MAX. 36 PANELS IN EACH CONTINUOUS ROW
MAX. 5 PANELS HEIGHT IN ONE ZONE
MAIN IRRIGATION SUPPLY LINE CAN BE COPPER, PEX OR PVC TO MEET LOCAL CODE (BY PLUMBER)
STUB-OUT SHOULD BE INSTALLED WITH FEMALE PIPE THREAD FITTINGS



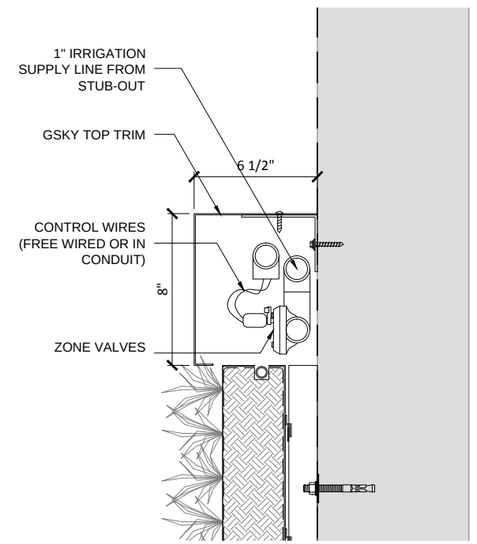
1 IRRIGATION LAYOUT FOR ICU-600 / ZONE VALVES AT ICU
SCALE NTS (FILE # 10-p-1)



2 IRRIGATION STUB-OUT DETAIL FOR ICU-600
SCALE 1-1/2" = 1'-0" (FILE # 10-p-2)



3 IRRIGATION LAYOUT FOR ICU-1000 / ZONE VALVES IN TOP TRIM
SCALE NTS (FILE # 10-p-3)



4 ZONE VALVE DETAIL FOR ICU-1000 IN TOP TRIM
SCALE 1-1/2" = 1'-0" (FILE # 10-p-4)

DRAWING TITLE:

GSKY GREEN WALL PANELS

IRRIGATION LAYOUT 2

IRRIGATION LAYOUT FOR ICU-1000 -

ZONE VALVE DETAIL -

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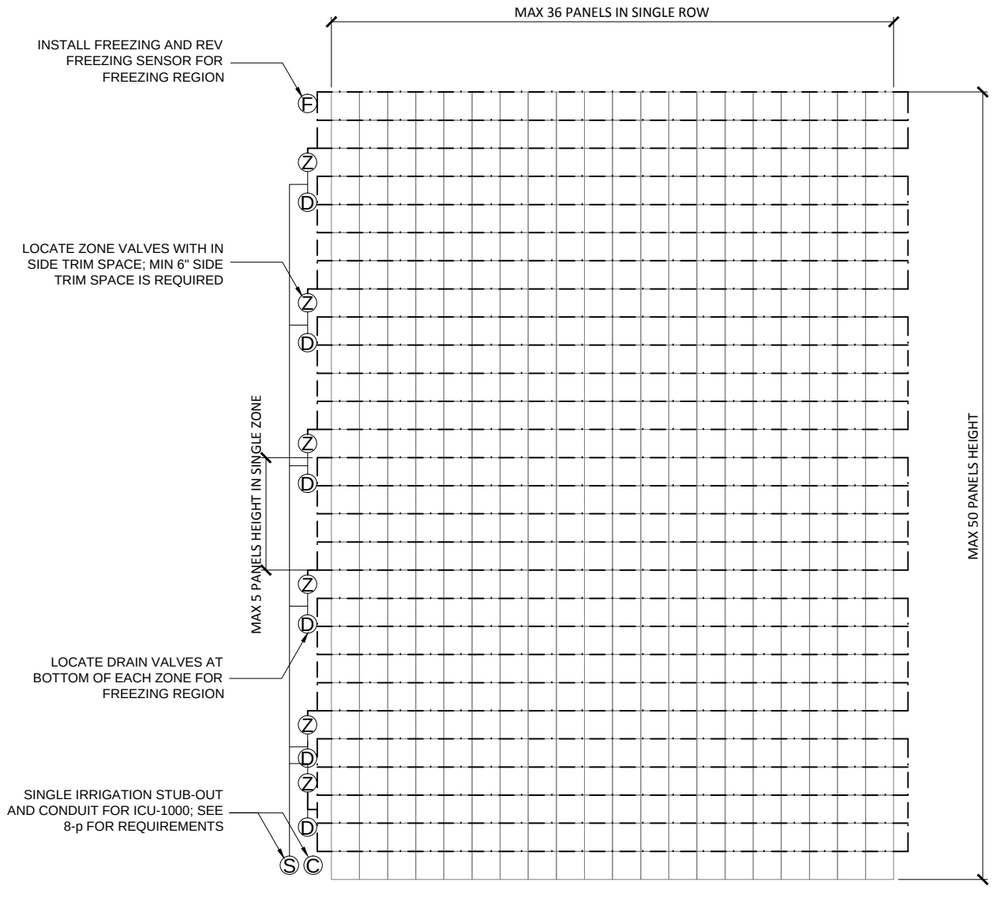
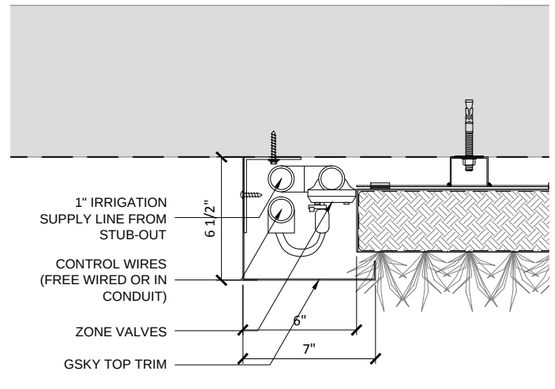
STUB-OUT SHOULD BE INSTALLED WITH FEMALE PIPE THREAD FITTINGS



1 IRRIGATION LAYOUT FOR ICU-1000 / ZONE VALVES IN SIDE TRIM

SCALE NTS (FILE # 11-p-1)



2 ZONE VALVE DETAIL FOR ICU-1000 IN TOP TRIM

SCALE 1-1/2" = 1'-0" (FILE # 11-p-2)