ABSTRACT

Title of Dissertation: A REFRIGERANT EXPANSION CONTROL DEVICE FABRICATED THROUGH NICKEL DEPOSITION WITHIN SU8 MICROMOLDS

David Anthony Yashar, Doctor of Philosophy, 2006

Dissertation directed by: Associate Professor Don DeVoe
Department of Mechanical Engineering

Control of refrigerant expansion offers improved system efficiency and reduced noise among other benefits. The cost of traditional active expansion devices, however, has limited their use to large HVAC&R systems. The design, fabrication and testing of a thermopneumatic microfabricated valve for controlling refrigerant mass flow rate during expansion is presented in this dissertation. This device was fabricated through nickel electroplating within very thick SU-8 molds, thereby realizing expansion devices useful for small HVAC&R applications through an inexpensive modified UV-LIGA process.

This work begins with process development to make meso-scale nickel electroplating within SU8 micromolds a feasible option. Then, two test apparatuses were constructed and used to benchmark the performance of a prototype; one to control the flow of compressed air, one to control refrigerant expansion. Next, three dimensional CFD simulations were performed on the flowfield within the device at various levels of

actuation to predict the device's ability to control compressed air flow. A numerical code was also developed to predict the device's temporal response and relationship between actuation level and power input.

The assembled prototype was demonstrated on the air flow test bench. The prototype was able to reduce the mass flow rate of the compressed air by 22 % at the conditions used in the CFD analysis. The performance was then demonstrated in a 1.5-2 kW R134a vapor compression system. Both steady state and transient response were characterized. Steady state data showed that the mass flow rate of refrigerant could be effectively controlled using the valve. The level of refrigerant subcooling defined the magnitude of the response. Steady state data taken at 750 kPa inlet pressure shows the mass flow rate was reduced by 4.2 % at 1 ºC subcooling and up to 10.8 % at 5 ºC subcooling for a given level of actuation. Transient system response was characterized using cyclic actuation of the device in the HVAC system. The change in capacity was approximately 5 %, at the conditions used during these tests. Data from the transient response tests showed the device's time constant to be within 11 % of the value predicted in the simulations.

A REFRIGERANT EXPANSION CONTROL DEVICE FABRICATED THROUGH

NICKEL DEPOSITION WITHIN SU8 MICROMOLDS

by

David Anthony Yashar

Dissertation submitted to the Faculty of the Graduate School of the
University of Maryland, College Park in partial fulfillment
Of the requirements for the degree of
Doctor of Philosophy
2006

Advisory Committee:

Associate Professor Don DeVoe, Chair
Professor Amr Baz
Professor Inderjit Chopra (Dean's Representative)
Associate Professor Kenneth Kiger
Professor Reinhard Radermacher

DEDICATION

To my wife, Shawnna Marie Yashar, for keeping me going all of these years

ACKNOWLEDGEMENTS

I cannot begin to express my deepest appreciation for my wife, Shawnna, for her love and support during this effort. Every time my experiments went awry, she was always there to get me back on my feet. Also, thank you so much for giving me a wonderful son, Zachary Robert, whose arrival was a strong incentive to complete this work.

I would also like to thank my dissertation advisor, Dr. Don DeVoe, for his direction and assistance during this project. Also, to the members of my advisory committee, Dr. Amr Baz, Dr. Inderjit Chopra, Dr. Kenneth Kiger, and Dr. Reinhard Radermacher for their guidance, assistance, and cooperation.

I would also like to thank Dr. Piotr Domanski, Dr. W. Vance Payne II, Dr. Mark Kedzierski, Dr. David Didion and Mr. John Wamsley of the National Institute of Standards and Technology (NIST) for their financial, technical, and laboratory support during this project.

I would also like to thank the Cornell Nanoscale Science and Technology Facility (CNF) for the use of their cleanroom during the fabrication of the DRIE prototype produced during this effort.

Lastly, I would like to thank Dr. Ty Newell and the rest of the faculty of the Air Conditioning & Refrigeration Center (ACRC) at the University of Illinois for giving me the foundation necessary to take on this project.

Table of Contents

List of Tables

List of Figures

Nomenclature

Parameter		Units
A_{cs}	Cross Sectional Area	m^2
C	Speed of Sound	m/s
C_p	Specific Heat Capacity	J/kgK
D_h	Hydraulic Diameter	m^2
E	Young's Modulus	N/m^2
f	Friction Factor	dimensionless
Gr	Grashof Number	dimensionless
h	Enthalpy	kJ/kg
h_p	Height of Piston	m
k	Thermal conductivity	W/mK
L_c	Critical Length	m
M	Mach Number	dimensionless
m	Nodal variable	dimensionless
$\dot{m}$	Mass Flow Rate	kg/s
n	Nodal variable	dimensionless
P	Pressure	N/m^2
P_o	Stagnation Pressure	N/m^2
P*	Choking Pressure for Fanno Flow	N/m^2
R	Universal Gas Constant	m^2/s^2K
Re	Reynolds Number	dimensionless
r	Radius of Diaphragm	m

r_p	Radius of Piston	m
s	Entropy	J/kg.K
t	Diaphragm Thickness	m
T	Temperature	K
T_{ss}	Steady State Temperature	K
T_o	Stagnation Temperature	K
U_x	x-Component of Velocity	m/s
U_y	y-Component of Velocity	m/s
U_z	z-Component of Velocity	m/s
V	Shear Force	N/m^2
w	Pressure Differential Across Diaphragm	N/m^2

Nomenclature: Greek and other Symbols

Parameter		Units
α	Thermal Diffusivity	m^2/s
β	Coefficient of Thermal Expansion	1/K
γ	Ratio of Specific heats	dimensionless
δ	Piston Deflection	m
ε	Time lag	s
ϕ	Parameter used for Deflection Analysis Integration	m
ν	Poisson's ratio	none
ρ	Density	kg/m^3
σ	Stress	N/m^2
σ_y	Yield Stress	N/m^2
τ	Time Constant	s
τ_s	Shear Stress	N/m^2
Θ	Steady State Temperature	K
$\forall$	Volume	m^3

CHAPTER I

Introduction

The vapor compression cycle is used to move energy from a low temperature reservoir to a high temperature reservoir. There are four major mechanical components of the vapor compression cycle which are necessary to direct a working fluid through this cycle. The four basic cycle components and the process which the refrigerant undergoes are shown below in Figure 1.1.

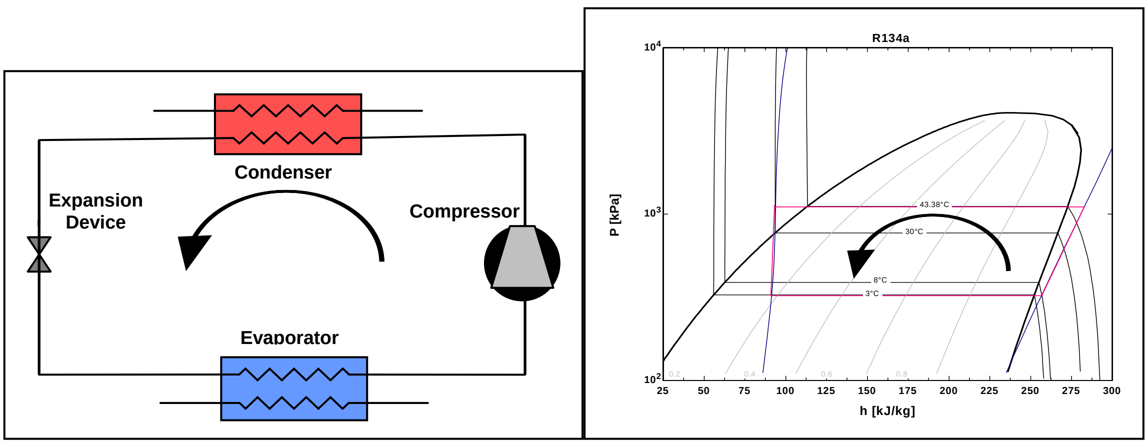


Figure 1.1 Vapor Compression Cycle

The compressor takes low pressure vapor and compresses it into a hot, high pressure vapor.

The condenser is a heat exchanger that takes the hot, high pressure vapor from the compressor and allows it to reject heat. While doing so, the fluid undergoes phase change and condenses into a liquid.

The expansion device is a flow constricting device; its purpose is to establish a pressure differential between the components on either side. Also, the expansion device is tasked with controlling the mass flow of the refrigerant through the cycle. As the refrigerant from the condenser passes through the expansion device, it undergoes substantial pressure drop. This pressure drop occurs without energy addition to the fluid; therefore, the temperature of the fluid is lowered through this process. Generally, the expansion device receives refrigerant that is near saturated liquid conditions and it lowers the refrigerant's pressure to the point where it undergoes a partial change of phase and becomes a liquid-vapor mixture.

The evaporator is a heat exchanger that takes the low temperature liquid-vapor and allows it to absorb heat from an outside source. This causes the remaining liquid refrigerant to boil at a low temperature, producing a cooling effect.

1.1 Expansion Devices

Most of the smaller vapor compression systems use a simple, fixed area flow restrictor as the expansion device. Their simple design and low cost make them well suited for many applications. The most common of these devices are the capillary tube and the short tube restrictor.

The capillary tube is the device of choice for the smallest systems, such as household refrigerating appliances [1]. The capillary tube is a small gage section of pipe which induces a drop in pressure through friction. Typical sizes for capillary tubes range between 1 m and 6 m in length, with a diameter between 0.5 mm and 2 mm. The exact diameter and length of a capillary tube must be selected based on the designed operating conditions and the specifications of the compressor.

Short tube restrictors are commonly used for many residential air conditioning and heat pump applications. They are also frequently used in automotive air conditioning systems. A short tube is a slug of metal, typically between 5-40 mm in length, with a small hole bored through its length. The short tube diameter typically ranges between 0.5-2 mm. A sketch of a short tube is shown below in Figure 1.2.

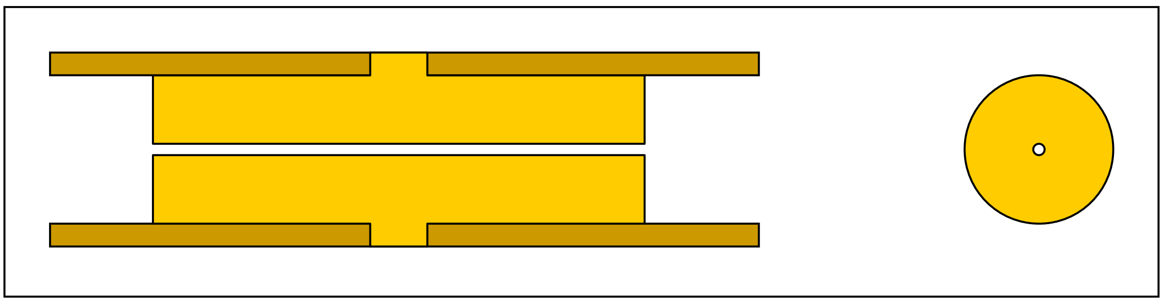


Figure 1.2 Short Tube Restrictor

Unlike the capillary tube, which induces pressure drop through friction, the short tube mainly induces pressure drop through abrupt changes in flow area. As the refrigerant enters one side of the short tube, the area contraction causes the refrigerant's pressure to drop, isenthalpically, until it begins to undergo phase change. At this point, the flow is termed "approximately" choked because it seems to be relatively insensitive to the downstream conditions [2, 3]. This is one of the most difficult problems in fluid mechanics to analyze because it involves metastable multiphase flow with the vapor phase traveling near its sonic velocity. Like the capillary tube, the short tube, is also a fixed area expansion device and must be sized according to its application and heat load.

A major disadvantage of these devices is that they must be designed for a unique operating condition. Therefore, a cycle operating with a fixed area expansion device loses efficiency when operating away from its design point, which often occurs through changes in the heating or cooling load. Also, refrigerants are typically kept at a much higher pressure than atmospheric and therefore tend to leak out of a system over time if not perfectly sealed. When a cycle leaks refrigerant the cycle efficiency declines, and the impact is very large for a fixed area expansion.

Improved operational efficiency can be realized if the expansion device has the ability to control the mass flow rate of the refrigerant so that the demands of the application are aptly met [4]. There are a few types of expansion devices designed to control the mass flow rate of refrigerant based on information that is sensed during operation. The most common of which is the thermostatic expansion valve (TXV). The TXV is shown below in Figure 1.3 [5].

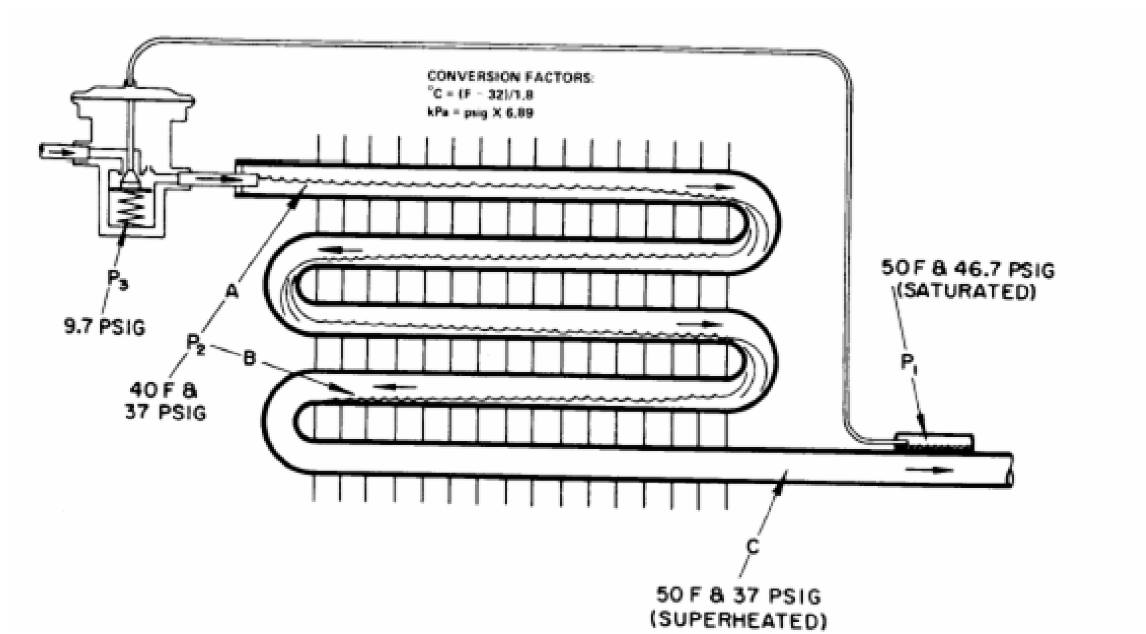


Figure 1.3 Thermostatic Expansion Valve

The TXV is controlled by a small bulb that is in thermal contact with the exit of the evaporator heat exchanger. The bulb's temperature is very close to the temperature of the refrigerant exiting the evaporator. The bulb is filled with liquid and vapor refrigerant, therefore the pressure in the bulb will vary according to the temperature of the refrigerant. A membrane on the upper portion of the expansion valve flexes in response to the changes in the pressure of the bulb, and thereby controls the movement of a plug inside the valve.

The operation is easily understood by example. If the refrigerant flow rate through the evaporator is too low, then the refrigerant would be exiting the evaporator at a warmer than desired temperature. This causes the temperature in the bulb to rise, thereby raising the pressure of the refrigerant in the bulb. The increased pressure in the bulb causes the membrane in the valve to flex downward. Since the membrane is rigidly connected to the plug in the valve, the plug also moves downward which opens the flow passage for the refrigerant. This allows more refrigerant to flow through the valve into the evaporator.

TXV's are mainly used in moderate sized refrigeration systems and residential heat pumping and air conditioning applications. Obviously, they are much more expensive than the constant area devices; therefore, they are not typically used unless the cost can be offset by the improvement in operational efficiency. The benefits seen from employing TXV's over a fixed area expansion device can be quite substantial, particularly when the cycle must operate over varying conditions [6]. Below is a figure taken from Proctor [7] which demonstrates the decline in residential air conditioner efficiency with off-design refrigerant charge. This occurs in approximately 2/3 of all residential systems at any moment in time [8].

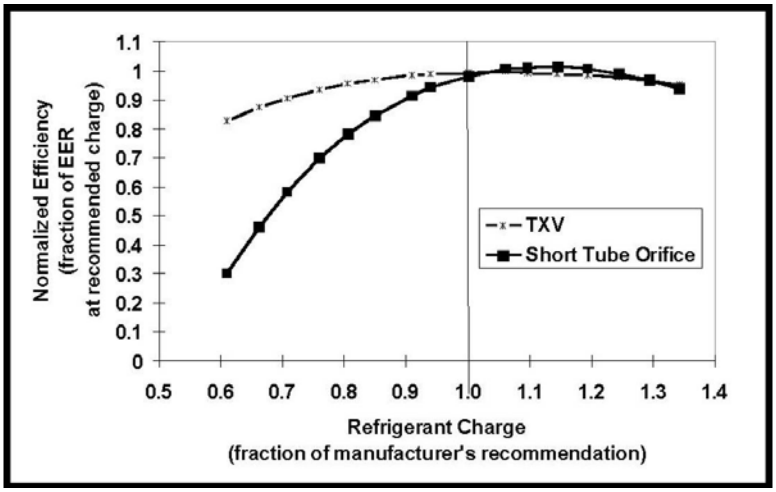


Figure 1.4 Air Conditioner Efficiency Relative to Refrigerant Charge for Systems with Short Tubes and TXV's

The obstacle for using a TXV over a constant area device is cost. If variable restriction expansion devices could be produced cheaply, they could be used in many different applications where they are currently uneconomical.

1.2 Applications

One application which would greatly benefit from an inexpensive, small, variable expansion device is that of automotive air conditioning systems. As a whole, automotive AC systems are the most inefficient vapor compression systems. These systems are all oversized for their application. This is done by necessity because such a system must be able to quickly reduce the temperature in the car when first started. Also, the compressors receive power directly from the crankshaft; therefore, these systems can not be hermetically sealed and consequently, they leak refrigerant over time.

According to the National Renewable Energy Laboratory [9], the average car in the United States has a fuel economy of 22 miles per gallon. This reduces to 18 miles per gallon while the air conditioner is operating. This means that a 15 % - 30 % increase in automotive AC efficiency, which is a reasonable expectation for a variable flow restrictor replacing its fixed area expansion device, will result in a 0.6 – 1.2 mpg improvement in the fuel economy. The cost of using a variable expansion device for automotive air conditioning is substantially larger than the savings in fuel consumption; therefore, they are rarely used in automotive AC systems. Given the current global concerns of rising fuel costs and CO_2 emissions, this will likely get more attention; but it will not become common unless one can be produced inexpensively.

Another excellent application for an inexpensive controllable expansion device is in the concept of a smart distributor [10]. Most residential air conditioning systems use a multiple circuit evaporator. By dividing the refrigerant flow between parallel circuits in the evaporator, the penalties associated with the refrigerant's pressure drop in the evaporator are reduced.

Currently, the refrigerant's pressure is reduced by the expansion device, and then divided amongst the circuits in the evaporator using a distributor. After the refrigerant passes through a circuit and exits the evaporator, it is reconnected to the other circuits and the refrigerant goes on to the compressor, see Figure 1.5a. If a TXV is used, the sensing bulb is located at a point after the circuits are merged to ensure that no liquid droplets are passed to the compressor. Non-uniform air flow or partial frosting of the evaporator can significantly impact the uniformity of the heat transfer from circuit to circuit. If the refrigerant exiting one of the circuits is not completely vaporized, the TXV will sense that there is not enough superheat in the suction line and the total mass flow rate to all of the circuits will be reduced.

The concept of a smart distributor works in a slightly different manner. Here, the distributor precedes the expansion process and the refrigerant to each circuit can be throttled individually based on the demands of that circuit, see Figure 1.5b. Therefore, if the refrigerant in one circuit does not completely vaporize, only the mass flow rate through that circuit will be reduced. As a consequence, refrigerant will be rerouted through circuits that can accommodate greater mass flow.

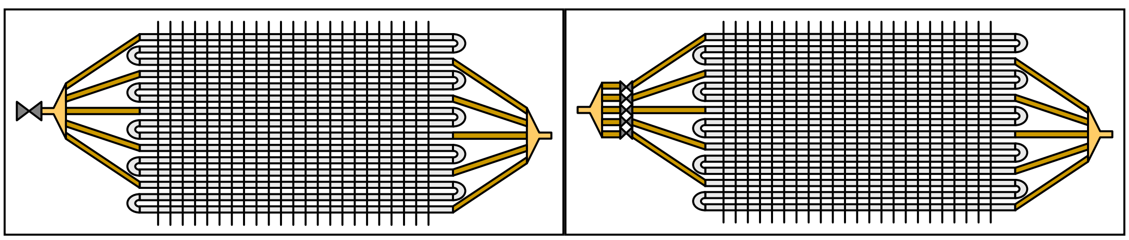


Figure 1.5 Multipath Evaporator without (a) and with (b) Smart Distributor

The benefits of a smart distributor were demonstrated at the National Institute for Standards and Technology through a series of tests. For these tests, the capacity of a three circuit evaporator was measured under conditions of uniform air flow. Next, a non-uniform air flow pattern was imposed on the evaporator, with one half of the evaporator receiving more air than the other. A reduction in the evaporator capacity resulted. Finally, the individual expansion valves for each circuit were adjusted so that the exit conditions for each circuit were identical under non-uniform air flow conditions.

Figure 1.6 shows the results of this study. In this figure, the blue diamonds depict the degraded performance of the evaporator under non-uniform air flow and fixed expansion, the pink squares depict the capacity of the evaporator with non-uniform air flow and individually controlled expansion. It was found that the performance of this evaporator was severely reduced as the air flow became more non-uniform and with a smart distributor, nearly all of the lost capacity could be recuperated.

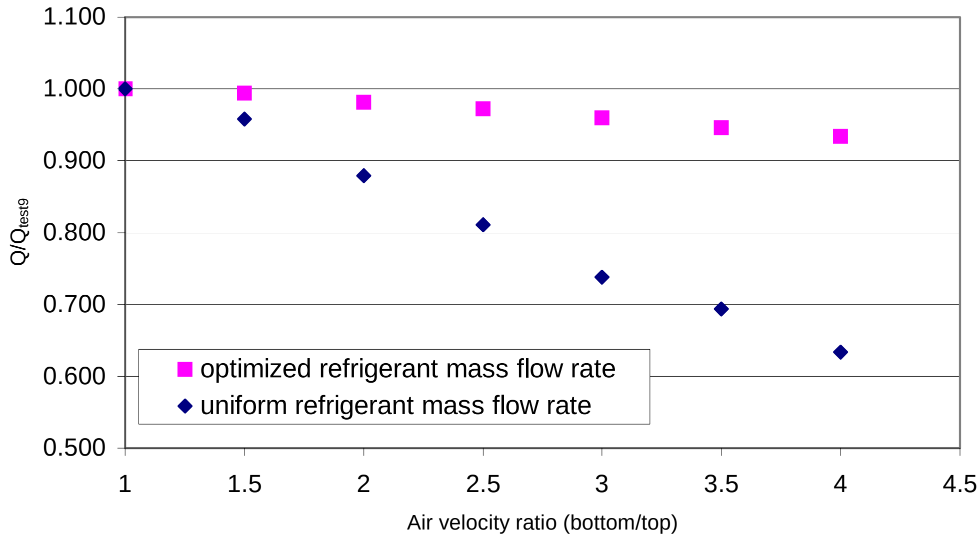


Figure 1.6 Results of Smart Distributor study at NIST

These are just two applications which would benefit greatly from a small, inexpensive, variable expansion device. In addition, there are a number of small HVAC&R systems that would benefit if their fixed area expansion device were replaced by such a device. Other applications include window-style air conditioners and household refrigerating appliances.

1.3 Existing MEMS Fluidic Valves

In order to create a product capable of satisfying the demands of applications involving the expansion of refrigerants at a market acceptable cost, the obvious course is to take advantage of the fabrication processes developed for microelectromechanical systems (MEMS). There have been many microfabricated fluidic valves developed in a number of fields. Presently, two other research groups are working towards a microfabricated device refrigerant expansion and one of these groups, Alumina Micro, has not publicly disclosed any information regarding their design.

The other research group, Redwood Microsystems, has been working towards this means since the early 1990s. Their work originates from Stanford University [11-15], and their designs have evolved towards microfabricated valves which are capable of controlling refrigerant expansion.

A schematic of their basic normally-open device is shown below in Figure 1.7 unactuated (a) and actuated (b). This device is comprised of three layers in a stack. The bottom and middle layers are made out of silicon and formed by anisotropic wet etching. The bottom layer is the orifice layer and serves as a connection point for the manifold; the middle layer contains a thin membrane. The top layer is made out of Pyrex, it has a metal resistive heaters patterned onto the lower side and two contact holes drilled through it ultrasonically. In between the Pyrex layer and the membrane layer is a reservoir of a Fluorinert™ chemical made by 3M, shown in blue.

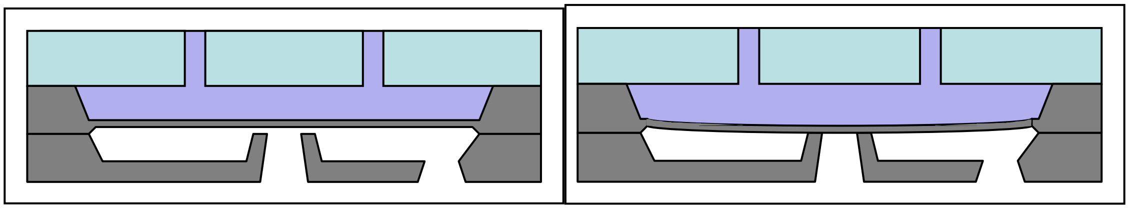


Figure 1.7 Fluidic Valve by Redwood Microsystems – basic normally-open design

The fluid being controlled flows upwards through the inlet port at the center of the stack and leaves through the exit port shown on the right hand side of the device. When the heaters are powered on, the Fluorinert™ liquid is warmed and it expands, pushing the membrane downwards. The membrane acts as a valve seat, partially or completely sealing off the inlet port to the device.

For the operation of the basic design, the Fluorinert™ liquid must undergo very large temperature changes. Although the magnitude of this temperature increase was not directly disclosed in any of their publications, it could be easily calculated from their work as being between 120 °C to 350 °C depending on the design parameters studied in their published works.

Since the basic design inherently provides a high degree of heat transfer between the Fluorinert™ liquid and the fluid passing through the device, Redwood Microsystems changed the design so that it could be used for refrigerant control. This design incorporates a fourth layer into the stack, as seen below in Figure 1.8, which greatly reduced the amount of heat transfer imparted onto the fluid.

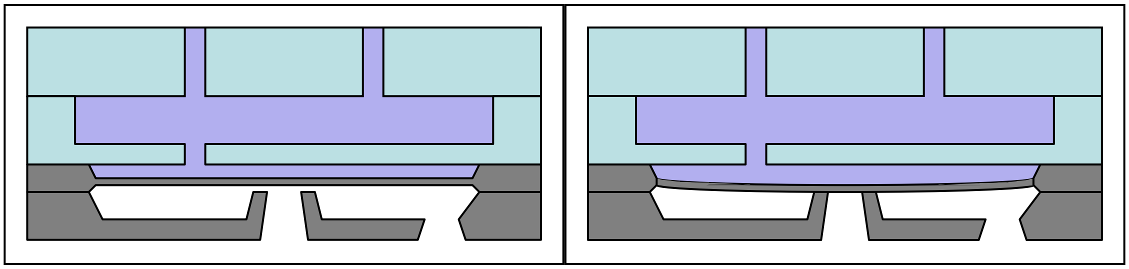


Figure 1.8 Fluidic Valve by Redwood Microsystems for Refrigerant Control

The additional layer is a Pyrex layer which sits between the membrane layer and the heater layer. This layer adds a considerable amount of volume to the Fluorinert™ reservoir, thereby requiring a smaller temperature change to push the membrane onto the valve seat. Also, this Pyrex layer provides a mechanical stop for the membrane under conditions of rapid cool down. This device was demonstrated with refrigerant HFC134a, controlling flow rates between 0 and 3 grams per second with differential pressures of up to 1 MPa. Redwood Microsystems' devices have not received much acceptance in the HVAC&R market to date, mainly due to the refrigerant path inherent to its design.

In order for a fluid to flow through this device, it must travel up through the inlet port, be impinged on the membrane, turn 90° towards the outer edge of the device, and turn another 90° before leaving through the exit port. Furthermore, the fully-open gap between the membrane and the valve seat is typically on the order of 50 μm.

Real HVAC systems are made of copper, brass, and steel components which must be brazed or soldered together; therefore, there are always particulates entrained in the refrigerant. With the flow pattern dictated by the Redwood Microsystem design, it is inevitable that this device will become clogged with particulates. Some HVAC&R systems use filters in the refrigerant lines to catch these particulates; however, filters that can reliably remove particulates to the level required for this device can cause substantial pressure drop within the system. Therefore this device is acceptable for laboratory work, but HVAC&R systems manufacturers are skeptical. It is more desirable to ensure an open flow path on the order of 500 μm.

There are literally hundreds of other designs of devices being developed at numerous research institutions worldwide for the purpose of fluid control. The common concern is the ability to completely stop flow with very little leakage. In order to accomplish this, the concept of a boss and valve seat, as shown in the Redwood Microsystems design, is the focus of nearly all research. The problem with this is type of design is that current fabrication processes make it difficult to scale up such a design so that the fluidic path can pass particulates entrained in the flow. Nguyen and Wereley [16], Gad-El-Hak [17], Cui [18], and Kovacs [19] present good overviews for the types of device concepts that have been developed for fluid control.

The only device which works on a fundamentally different basis is that of Papavasiliou [20-21], shown in Figure 1.9. This device works by opening and closing a gate across a fluidic channel, which thereby decreases or increases the resistance to the flow in the channel.

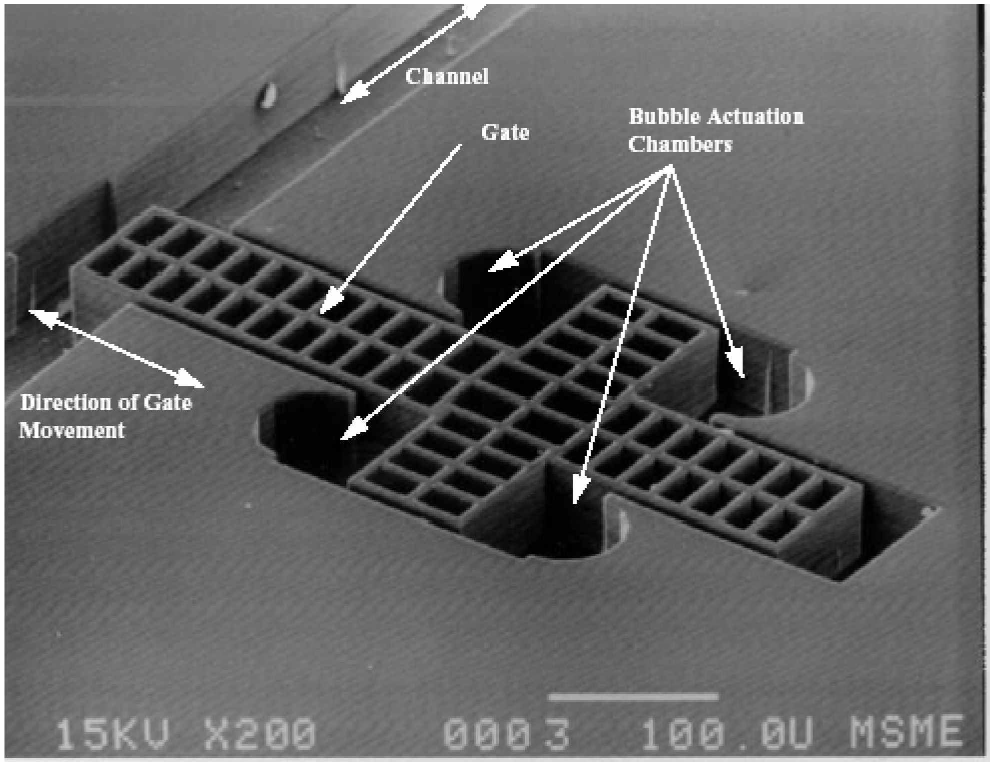


Figure 1.9 Bubble-Actuated Planar Microvalve by Papavasiliou

The Papavasiliou device works on the basis of bubble actuation. The slider is pushed back and forth by the formation of bubbles in the bubble actuation chambers. The actuation mechanism takes advantage of the relative importance of surface tension at the micro scale, using it to hold the gate in position. The flow channel for this device is 75 μm tall and 100 μm in width.

What sets the Papavasiliou device apart from other microfabricated fluid controllers is that the motion of the slider and that of the fluid are in the same plane. Therefore, it can disturb the flow without forcing it through an obscure path. Although this device is too small for the application of refrigerant expansion, and it would be difficult to scale it up because of the actuation mechanism, this concept of planar impingement on the flow channel is attractive because it allows for a wide-open fluid passage when the device is not interfering with the fluid flow.

1.4 Fabrication Options

The feature sizes necessary to fabricate a device capable of being used for the expansion of refrigerants are on the order of 100-1,000 μm. This leaves very few options for the processes that can be used to build them, because this is on the larger side of available microfabrication processes. At the present time, there are three different types of processes which can be used to produce features of this magnitude [22]: wet chemical etching, deep reactive ion etching, and LIGA (including LIGA-like derivatives).

1.4.1 Wet Etching

Wet chemical etching processes are the most common processes used to fabricate microfluidic structures. This is because wet etching is generally very inexpensive and can make features that are large enough to facilitate fluid flow. The reserve is that the possible geometries formed with wet etching are limited. Wet etching can be isotropic or anisotropic.

Anisotropic wet etching works on the basis that, in crystal form, certain silicon atoms are more readily etched based on their orientation. Specifically, the {111} crystal planes are etched considerably slower than the {110} and the {100} planes. This allows the ability to etch V-shaped grooves, inverted pyramidal shapes, and vertical channel walls into single crystal silicon. Curved features or complex geometries, however, cannot be made with wet etching.

1.4.2 Dry Etching

Reactive Ion Etching, or RIE, refers to a dry etching technique in which large quantities of material may be removed from a substrate. An RIE chamber consists of two parallel plates, with a large voltage difference between them. The chamber is filled with an inert gas at low pressure which undergoes electrical breakdown when the electrons are accelerated in the existing field and transfer an amount of kinetic energy greater than the ionization potential to the inert gas' neutrals. Collisions generate free electrons and ions which reenergize and a current begins to flow between the anode and cathode.

To use this as an etching mechanism, a wafer is placed between the parallel plates and in contact with the cathode. The energized electrons and ions bombard the surface of the wafer and remove material by reacting chemically with the substrate. A typical chemical reaction that takes place for reactive ion etching of silicon is $4F^{-} + Si^{4+} \rightarrow SiF_4$.

Deep Reactive Ion Etching (DRIE) refers to a slightly more complicated mechanism in which the RIE process can be manipulated to preferentially etch in one direction, specifically in the direction along the path from the anode to the cathode, perpendicular to the surface of the wafer. DRIE involves an iterated sequence of etching and passivation steps. The etching step is similar to the RIE process, but only lasts for a few seconds. The passivation step involves depositing a thin polymer layer on the wafer to protect the sidewalls that were created during the etching process. The momentum in the ions during the subsequent etch step is not sufficient to remove the polymer coating on the side walls, but it is sufficient to remove the polymer that is facing the anode. The result is that the silicon is etched straight downward, regardless of crystal orientation.

The flexibility provided by this process allows the creation of shapes that would otherwise be impossible to produce in silicon such as curved or complicated features. The drawback is that DRIE is a somewhat expensive process. The use of DRIE will be explored for prototyping purposes, but it is probably too expensive to be used for a real device.

1.4.3 LIGA Based Methods

LIGA is a process where a thick layer of polymethylmethacrylate (PMMA) is patterned using X-ray lithography and the resulting structures are used as a mold for electroplating. X-ray lithography offers many benefits in terms of fabrication tolerances and attainable thicknesses; however, it is very expensive. Low cost LIGA-like methods are currently being explored at numerous research institutions with promising results. Some researchers have worked with dry film photoresists, but these materials often lack the adhesive properties and chemical resistance that are necessary to make very tall structures [23, 24]. At the forefront are methods based on SU8, a negative tone, UV sensitive, epoxy based photoresist.

The SU8 molecule contains 8 epoxy groups which enable polymerization [25]. The SU8 molecule is shown below in Figure #1.10. In this figure, carbon atoms are denoted in black and oxygen atoms are red.

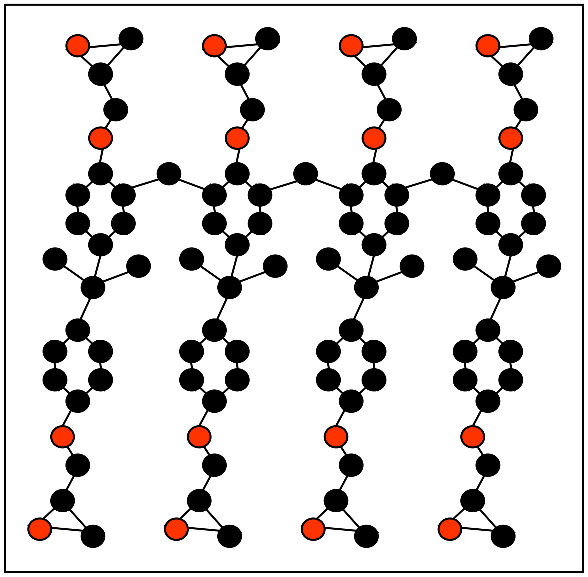
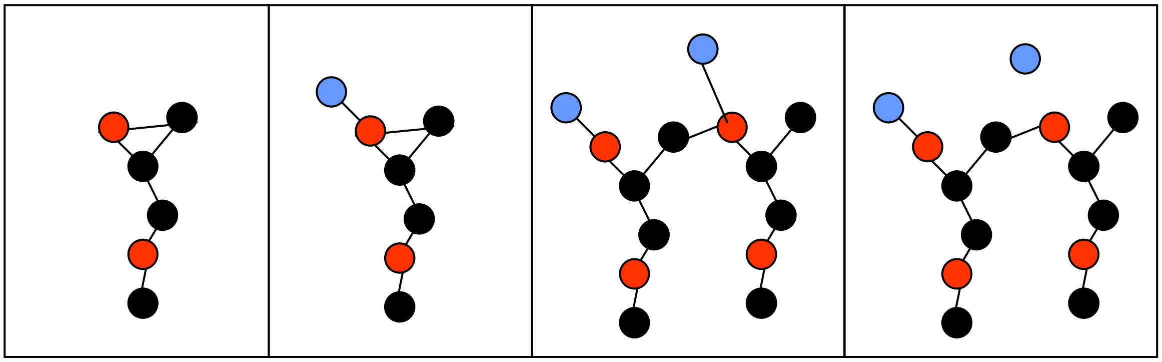


Figure 1.10 SU8 Molecule

Included with the SU8 is a photoacid generator, which forms a weak acid in the presence of ultraviolet light. This acid reacts with the epoxy groups on the SU8 molecules and enables them to cross link with other molecules, forming a rigid polymer structure. The cationic polymerization process is shown below in Figure #1.11. An epoxy group (a) becomes ionically bonded to a hydrogen atom (b). Next, the epoxy ring is opened by cross linking with an epoxy ring from another SU8 molecule (c) and a hydrogen atom is freed (d) to react with another epoxy group.



(a) (b) (c) (d)

Figure 1.11 Cationic Polymerization Process

Afterwards, the polymerized structures are rigid and resilient towards most chemicals; therefore, unpolymerized SU8 may be selectively etched with a solvent. This process is used to produce tall, rigid polymer structures with ultraviolet light, at very low cost.

There are many drawbacks involved with using SU8 as a material for a LIGA-based process. First, it is not possible to attain the same resolution with ultraviolet light as that attainable with X-ray lithography. This is simply a result of X-rays having a much smaller wavelength than UV light. Therefore, the effects of scattering are more pronounced with UV lithography. The resolution attainable with UV lithography, however, is suitable for many applications. Also, ultraviolet light, unlike X-rays, is absorbed by SU8. Because of this material property, there exists a theoretical upper limit to the thickness of a single layer of SU8 that can be patterned with UV light, approximately 2 mm.

Another issue which needs to be addressed is that SU8 is a relatively new material; therefore, the process parameters are not optimized for many feature sizes. A lot of information exists on SU8 application for 1 μm to 250 μm layers, but little information exists for thicker layers. In fact, there is currently conflicting information regarding these parameters.

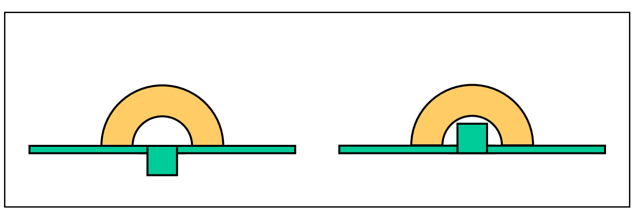
During the polymerization process, SU8 molecules become highly tangled, which induces very large stresses within the material. With thicker and thicker films, this stress can cause SU8 to lose adhesion to the substrate on which it is deposited or approach the ultimate stress of the cross-linked material causing the SU8 to shatter. Therefore, there are a lot of stability problems involved with thick SU8.

Finally, once cross linked, SU8 is very resilient towards most chemicals. Therefore, it is not easy to remove SU8 at the end of a process. For this reason, SU8 is often used as a permanent structure. Removal of SU8 has been accomplished by various methods for different applications. Methods for removing SU8 are generally application specific because most of the devised methods will attack and/or affect other materials present in the fabrication sequence. Thus, any application involving SU8 removal must involve a unique plan for that fabrication sequence.

CHAPTER 2

Design Concept

The basic concept of this refrigerant expansion device is rather simple. The operation of this device involves a small flow restrictor combined with a microfabricated actuator that is capable of moving an obstruction into and out of the refrigerant flow. Therefore, when the device is not actuated, the flow passage is similar in nature to a common short tube restrictor. When the device is actuated, the flow passage is partially blocked by an obstruction fixed to one of the boundaries. Inserting a flow obstruction into the short tube introduces a boundary discontinuity and reduces the cross sectional area of the passage, thereby producing a more restrictive tube. A sketch of this mechanism is shown in Figure 2.1, note that the flow path of the refrigerant is between the semi-circular tube and the flat wall in the direction perpendicular to this page.



(a) Unactuated (b) Actuated

Figure 2.1 Conceptual Sketch of Refrigerant Expansion Device

The actuator consists of two parts, bonded together. The first of the two pieces consists of a thin membrane, with a piston fixed to it. A sketch of this is shown below in Figure 2.2.

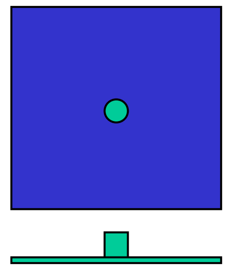


Figure 2.2 Sketch of Piston/Diaphragm

The second piece is a device containing a port slightly larger than the diameter of the piston. The port allows the piston to pass through and interact with fluid on the opposite side of this piece. Also, one of the pieces must have a rigid lip that maintains a small gap between the two pieces. A sketch of the coverplate device is shown below in Figure 2.3. In this figure, the spacer is shown as a circular divot removed from the device.

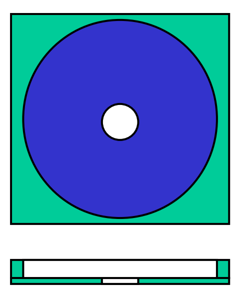


Figure 2.3 Sketch of Cover-plate Chip

The pieces are then assembled to produce the structure shown below in Figure 2.4.

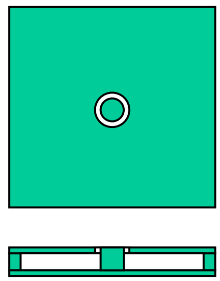
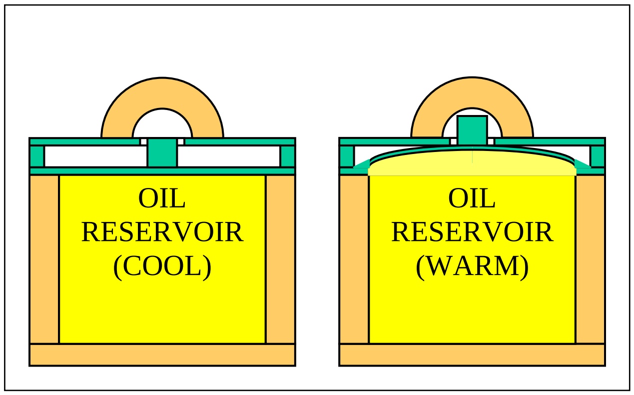


Figure 2.4 Actuator Assembly

The device's principle of operation involves the thermal expansion of a liquid which was selected because it is the only feasible actuation mechanism that is capable of producing the necessary forces to operate this device. Once the fabrication and assembly of the actuator has been completed, it is to be inserted between the short tube refrigerant flow restrictor and a reservoir filled with the actuating fluid; in this case an oil. Included in the oil reservoir is a small electric resistance heater. As thermal energy is added into the oil reservoir from the heater, the oil gets warmer and its density decreases. This expanding oil exerts pressure on the thin flexible membrane, which results in the membrane flexing outward. This movement pushes the flow obstruction into the short tube refrigerant passage. The final assembly and device actuation is shown in Figure 2.5. Note that the direction of the refrigerant flow is perpendicular to this page.



(a) Unactuated (b) Actuated

Figure 2.5 Final Assembly of Refrigerant Expansion Device Components

2.1 Simulation

2.1.1 Stresses on the Diaphragm

The membrane is the only moving part in the system. The walls of the oil cavity are much thicker than the membrane and will not flex. The membrane is exposed to the oil reservoir by a circular area. When the oil is heated, the circular area of the diaphragm will flex outward. Centered on top of the membrane is a post. When the diaphragm is flexed, the post is pushed into the refrigerant flow passage, thereby obstructing the refrigerant's flow.

The properties that are required to simulate the stresses on the diaphragm are Young's modulus, the yield strength, and Poisson's ratio. A design spreadsheet was generated to calculate the necessary dimensions of the device's features, based on the material properties and the expected movement.

The input to the design spreadsheet includes the following parameters:

- The desired deflection δ
- The thickness of the diaphragm, t
- The radius of the diaphragm, r
- The radius of the piston, r_p
- The height of the piston, h_p

The first parameter calculated from this input is the required pressure differential, w, across the diaphragm to make the center flex upward by a distance δ. For a circular diaphragm, these parameters are linearly related by the following formulas [16, 26]:

$$w = \frac{16 \cdot \delta \cdot E \cdot t^3}{3\left(1 - \nu^2\right) \cdot r^4}$$

Once the required pressure differential is known, the maximum stress in the membrane due to the flexure is calculated as:

$$\sigma_{\max,\, flex} = \frac{3 \cdot w \cdot r^2}{4 \cdot t^2}$$

Next, there exists a stress on the diaphragm at the point where it is attached to the post. This stress is due to the force exerted by the refrigerant's interaction with the top of the post. In order to calculate the stress induced on the diaphragm an assumption was made that the worst case scenario would occur if the entire pressure differential between the evaporator and condenser were held at the tip of the post. This pressure difference was based on an air conditioning cycle using R134a, operating with a condensing pressure of 1.3 MPa (T_{cond} = 50 °C) and an evaporating pressure of 200 kPa (T_{evap} = -10 °C), representing a pressure difference of: 1.1 MPa (160 psi) [27].

This pressure difference is multiplied by the cross sectional area of the flow channel that is blocked by the piston to obtain the shear force on the piston, V. The maximum stress on the diaphragm due to this shear force is [28]:

$$\tau_{s,\max} = \frac{4V}{3\pi r_p^2}$$

This stress is added to the stress resulting from the diaphragm flexure by superposition to obtain the total maximum stress on the diaphragm. This is then compared to the yield stress of the material to obtain a factor of safety.

Using this design spreadsheet, the device material could be easily changed by inserting the appropriate values for Young's modulus and the yield strength. The thickness and radius of the diaphragm, as well as the dimensions of the post and the desired flexure could easily be manipulated while monitoring their effect on the maximum stress.

2.1.2 Oil Coefficient of Thermal Expansion

It was necessary to measure the coefficient of thermal expansion of the oil used in the reservoir, so that its interaction with the membrane could be predicted. The particular oil that was selected for this application was Emkarox polyalkalene glycol (PAG) 118, a common lubricant for use with hydrofluorocarbon (HFC) refrigerants. In order to measure the coefficient of thermal expansion, a known amount of PAG was placed in a graduated cylinder and the volume of the oil in the cylinder was monitored as the temperature varied.

A 500 mL graduated cylinder was used for this experiment. A fixed mass of PAG was placed into the cylinder along with a thermocouple probe. The cylinder was then placed in a refrigerated environment for a period of time and allowed to cool. Heat was added to the cylinder by placing in quiescent air, then in a warm bath, during which time the temperature and volume was recorded. The following data was taken for a mass of 387 grams:

Table 2.1 Volume Measurements for Emkarox PAG 118

Temperature (K)	Volume (cc)	Density (g/cc)
280	399	0.9699
285	399	0.9699
290	400	0.9675
295	400	0.9675
300	401	0.9651
305	403	0.9603
310	403	0.9603
315	404	0.9579
320	405	0.9556
325	405	0.9556
330	406	0.9532

These data points were then fitted with the best fit straight line:

ρ (g/cc) = 1.07346-0.0003652*T (K).

The coefficient of thermal expansion at 295 K was calculated as a reference:

$$\beta = -\frac{1}{\rho}\left(\frac{\partial \rho}{\partial T}\right)_P = \frac{0.0003775}{K}$$

2.1.3 Relationship Between Oil Temperature and Piston Motion

Once the dimensions of the diaphragm and piston were deduced, and the thermal expansion properties of the oil were measured, the volume of additional space in the oil cavity due to the flexure was calculated. To calculate this volume, the shape of the flexed diaphragm is taken from [16].

$$y = \frac{3w\left(1-\nu^2\right)}{16Et^3}\left(r^2 - \phi^2\right)^2$$

Therefore, the volume of additional space underneath the diaphragm is calculated from the 2-dimensional axisymmetric integral underneath this curve as shown below:

$$\forall = \int 2\pi\phi y \partial\phi = \int_0^r 2\pi\phi \frac{3w\left(1-\nu^2\right)}{16Et^3}\left(r^2 - \phi^2\right)^2 \partial\phi$$

$$\forall = \frac{\pi w\left(1-\nu^2\right)}{16Et^3} r^6$$

Substituting the relationship for the pressure differential, w, the volume reduces to:

$$\forall = \frac{\pi\delta r^2}{3}$$

Another spreadsheet was generated to construct a relationship between the oil temperature and the displacement of the piston. In order to generate this relationship, all of the relevant parameters were calculated as a function of the displacement in the following manner.

The pressure differential, w, was calculated from the displacement, δ, and the material properties. Next, the additional volume of oil was calculated from the relationship derived above, which then corresponds to the additional volume that the oil needs to occupy in order to push the diaphragm outward by the distance δ.

The initial volume of the oil placed behind the diaphragm and its temperature during assembly is used in conjunction with its thermal expansion coefficient to calculate the temperature that the oil must be in order to fill this additional volume. By working with these equations in a spreadsheet form, the required oil temperature was calculated for every 10 microns of vertical displacement of the piston. Once these calculations were tabulated, the results were fit with a curve. This curve can then be used to predict the displacement as a function of the oil temperature.

CHAPTER 3

Performance Measurement Methodology

Two separate test beds were constructed to validate the performance of the device. A breadboard HVAC system capable of delivering a large range of operating conditions was constructed as the primary test apparatus. After the first design of the device was fabricated and assembled, measurement of its performance in this system was attempted. Based on the findings of the first prototype, a second test bed was constructed to test the device's ability to control the flow of compressed air.

There are two reasons for this second test apparatus. The first reason is that it is not possible to analytically or numerically predict the flow of flashing refrigerant through the geometry presented by this device. The only methods of mass flow prediction currently available rely on empirical data based on present day expansion devices. By using a single phase fluid, it is possible to predict the performance with numerical methods; thereby, providing a basis to compare with measurements. The second reason for constructing the compressed air test apparatus is that it provides a testing environment that can be operated at significantly lower pressures, without excessive vibration, and is therefore more likely to allow proper operation of the device during the developmental process.

3.1 Compressed Air Test Apparatus

A simple test apparatus was constructed to measure the flow of air through the device. A supply of compressed air is connected to the device. A manual valve is located between the apparatus and the compressed air supply to control the inlet pressure to the device. A pressure transducer is located upstream and downstream of the device. A manually adjustable needle valve is located downstream of the device to adjust the back pressure. A hose is connected to the outlet of the device and discharges into a basin full of water. As air is discharged into the basin, it is collected in an inverted container which is initially full of water. This container is delimited with markings that read up to 8 liters. A schematic of this apparatus is shown below in Figure 3.1.

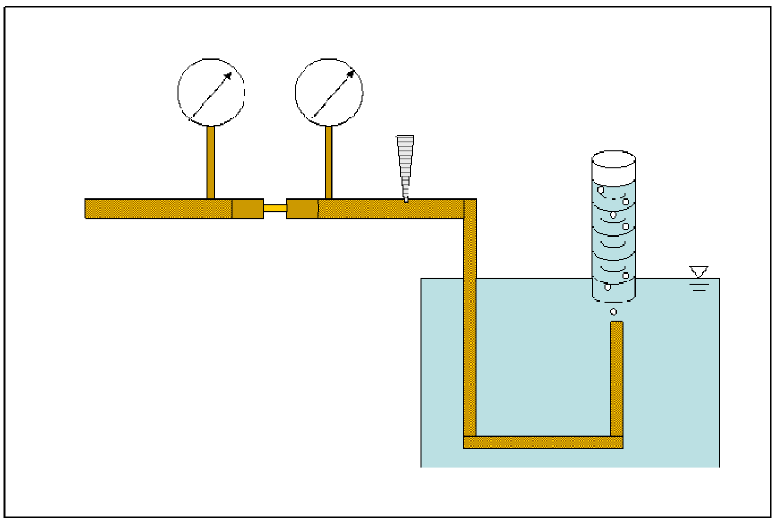


Figure 3.1 Schematic of Gas Flow Test Apparatus

With this apparatus, the air passing through the device over a period of time can be collected with the graduated cylinder and this could then be used to determine the mass flow rate of air through the device.

Initially, the manual valve to the compressed air supply is closed and the discharge hose is left outside the water basin. During this time, the ambient pressure is recorded. Next, the valve is opened and adjusted until the desired supply pressure is stable. Simultaneously, the downstream needle valve is adjusted to fix the back pressure.

The hose is then placed underneath the container and a stopwatch is used to monitor the time to fill the container. Once the container is filled to a level near the 8 liter mark, the time is logged and the discharge hose is moved so that it no longer sends air to the container.

The container is then held so that the water level inside is even with the water level outside so that the pressure of the air in the cylinder is equal to the atmospheric pressure. The volume of air in the cylinder is recorded. A thermocouple probe is then placed inside the container and the temperature of the air is recorded. The mass of the air collected inside the container is calculated from the volume, the ambient pressure and the air temperature. The mass is then divided by the amount of time to fill the container to obtain the mass flow rate.

The upstream pressure transducer was calibrated using a standard dead weight tester with 5 points in the range of 100 kPa to 275 kPa to an accuracy of 0.15 %. The thermocouple was calibrated to an accuracy of 0.1 °C in the range of 10 °C to 50 °C using a thermistor. Temperatures and pressures are recorded through a LabView Express 7.0 virtual instrument interfacing with a Hewlett-Packard 3852a data acquisition system. This virtual instrument communicates with three channels of a 20 channel relay card on the data acquisition system, one channel for the pressure transducer and one for each thermocouple.

3.2 Breadboard Vapor Compression Test Apparatus

A vapor compression system was constructed and outfitted with instrumentation to test the device's ability to control the expansion of a refrigerant. The test loop was designed so that the operating parameters could be easily manipulated and a large range of operating conditions could be obtained. The test rig consists of three major flow loops: (1) a refrigerant flow loop which contains a detachable test section, (2) a cold water-glycol (heat transfer fluid, HTF) flow loop used for to exchange heat with the refrigerant flow loop's evaporators, and (3) a warm HTF flow loop used to exchange heat with the refrigerant flow loop's condenser.

A schematic of the main loop of the experimental setup is shown in Figure 3.2. An open-drive compressor is used to pump the refrigerant through the loop. This compressor is capable of pumping 1.35 to 10.8 m^3/hr of refrigerant over its acceptable input drive of 500 to 4000 RPM. The drive shaft for this compressor is controlled by 5 horsepower motor capable of delivering up to 1745 RPM at 60 Hz input; therefore, the maximum pumping capability of the compressor is 4.71 m^3/hr. The motor speed is controlled by a variable frequency AC inverter. An oil separator was placed near the compressor discharge so that the oil concentration in the circulating refrigerant would be minimized.

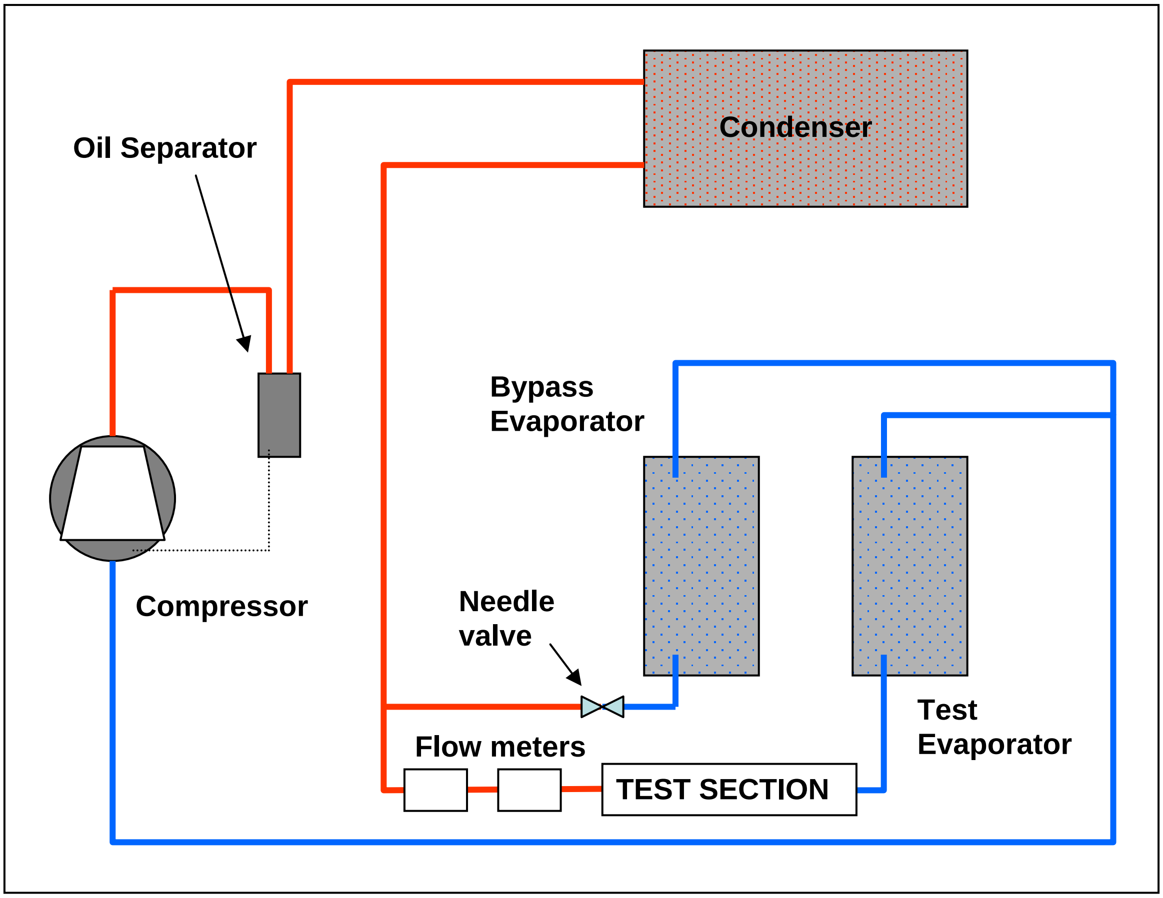


Figure 3.2 Refrigerant Flow Loop for Vapor Compression Test Apparatus

After the oil separator, the refrigerant changes phase into a liquid and is subcooled by exchanging heat with the condenser HTF flow loop. Next, the liquid line splits into two circuits.

The test circuit directs refrigerant through the test section where its pressure is reduced and it flashes to 2-phase. The test section consists of two manual shut off valves with the flow restriction device between. This allows for easy removal and exchange of flow restrictors. After passing through the test section, the refrigerant enters a brazed plate heat exchanger, where it absorbs energy from the evaporator HTF flow loop. After exiting the evaporator, the refrigerant passes through a vapor turbine meter to measure its flow rate.

Constructed in parallel to the test section and test evaporator is a bypass evaporator with a manually controlled needle valve. The bypass loop also contains a bonnet valve which can close this circuit completely. This loop allows refrigerant to bypass the test section and test evaporator. The outlet of this bypass evaporator connects to the exit of the test evaporator and the refrigerant from both circuits returns to the compressor.

Temperatures are monitored using copper-constantan (type-T) thermocouples placed at the compressor discharge, the condenser inlet, and the condenser exit. Additionally, five thermocouples are placed at the test section inlet, test section exit, test evaporator outlet, bypass evaporator inlet, and bypass evaporator outlet. Five thermocouples are used at these locations so that these temperatures can be measured with higher confidence. Pressure measurements are recorded with transducers located at the compressor exit, the test section inlet, test section exit, and the test evaporator exit.

The condenser HTF flow loop is shown in Figure 3.3. It is circulated by a single speed pump which draws a 50/50 mix of Dowtherm SR-1 and water from a 60 gallon container. A bypass valve is located in parallel with the pump so that the flow rate of HTF can be reduced from the maximum output of the pump. After the pump, the HTF passes through a heat exchanger where it is cooled by chilled water. Next, an electrical resistance heater, capable of delivering between 0 and 1.5 kW, is used to set the temperature of the HTF before it enters the condenser.

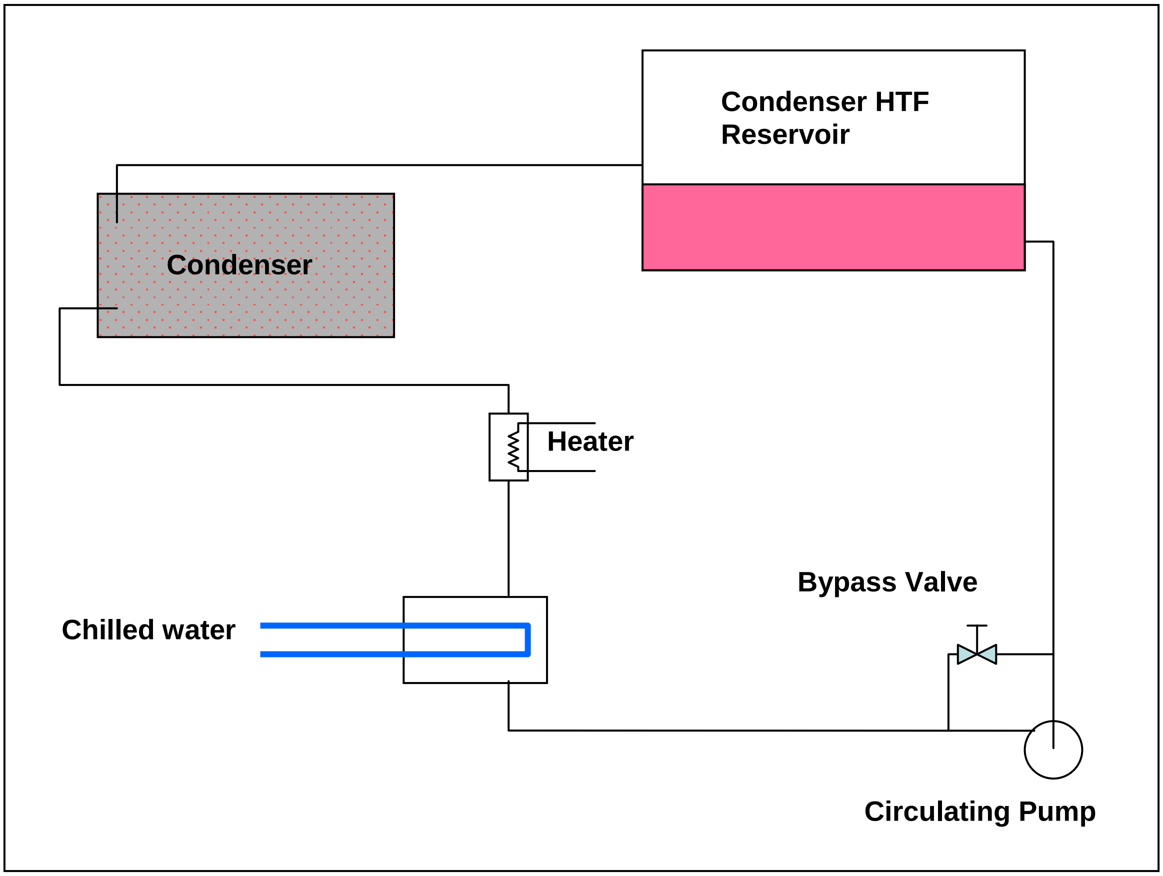


Figure 3.3 Condenser HTF Flow Loop for Vapor Compression Test Apparatus

After the HTF passes over the heater, it enters the condenser where it removes energy from the refrigerant loop. Upon leaving the condenser, the HTF returns to the 60 gallon container.

A thermocouple is located at the inlet to the condenser. Also, 10 junction thermopiles are used to monitor the temperature change that the HTF undergoes as it passes through the chilled water heat exchanger, the electrical resistance heater and the condenser. The flow rate of HTF is estimated by dividing the heat addition from the electric heater by the temperature change and the specific heat of the HTF.

The evaporator HTF loop is shown in Figure 2.4. The evaporator HTF is also drawn from a 60 gallon container containing a 50/50 mix of Dowtherm SR-1. It is circulated by a single speed pump and the flow rate is controlled by a manual bypass valve located in parallel with the pump. Down stream from the pump, the mass flow rate of HTF is measured by a Coriolis effect mass flow meter. Next, the temperature of the HTF is set by two electrical resistance heaters which are capable of adding up to a total of 3 kW of heat transferred into the flow.

The flow is then split into two parallel circuits each controllable with a manual ball valve so that all of the HTF can be routed through either circuit or split between them. Each circuit passes through an evaporator to exchange heat with the refrigerant loop. A turbine meter is located prior to the entrance of the bypass evaporator and the flow through each circuit is deduced by subtracting this reading from that of the Coriolis mass flow meter located after the pump. It would be more desirable to place the turbine meter in the opposite circuit, so that the HTF flow into the test section could be measured directly; however, the physical constraints of the test system would not allow this.

After exiting the evaporators, the HTF then enters another heat exchanger where it is cooled by a chiller. This chiller is a single speed unit; therefore, ball valves are located upstream of and in parallel with the chiller so that the flow of HTF may partially or entirely bypass the chiller. The HTF returns to the 60 gallon reservoir after passing this station.

Five type-T thermocouples are located and the entry and exit point of each evaporator. The temperature rise seen by the HTF as it passes the electrical resistance heaters is monitored with a 10 junction thermopile. Also, the temperature of the HTF is monitored with a thermocouple at the point where the flow splits between the two circuits.

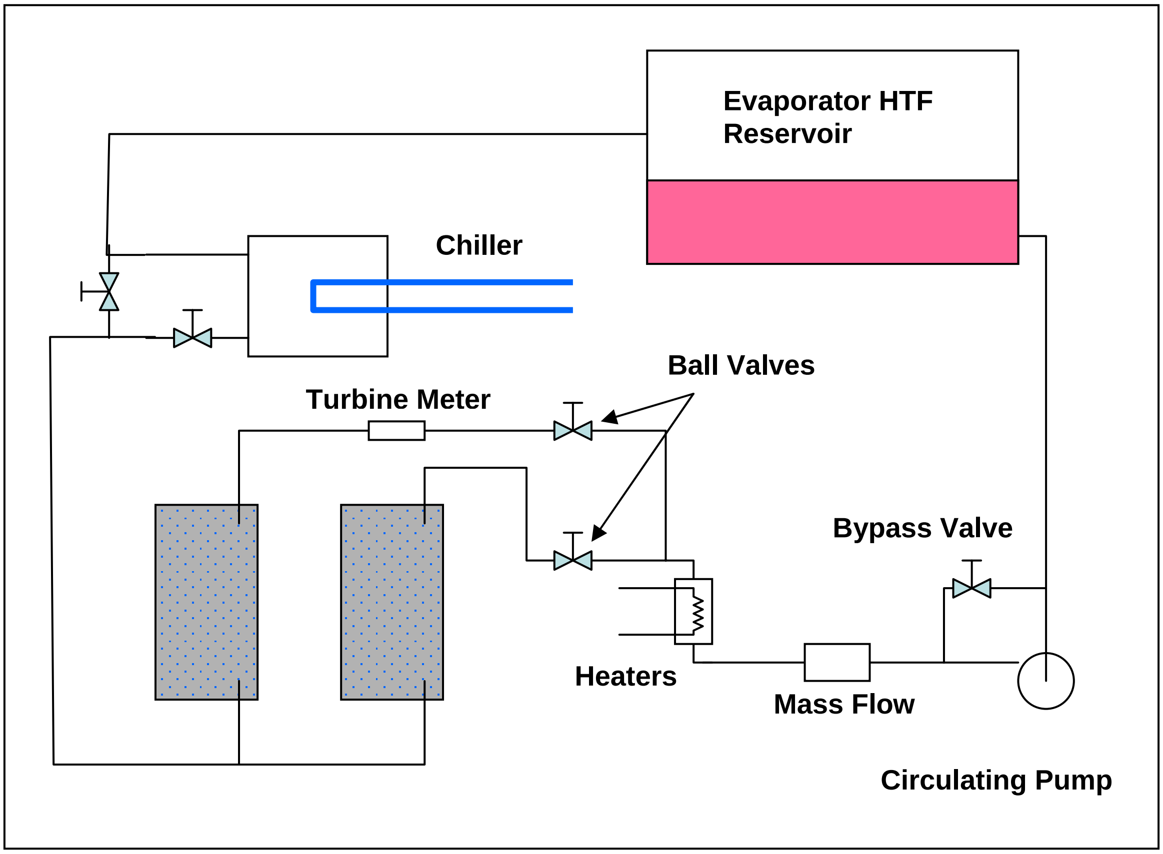


Figure 3.4 Evaporator HTF Flow Loop for Vapor Compression test Apparatus

All measurement devices are connected to a Hewlett-Packard 3852A Data Acquisition/Control Unit. This system interfaces with a personal computer through a GPIB connection controlled by LabView Express 7.0. A LabView virtual instrument was scripted to monitor the system's pressures, temperatures and flow rates and to compute the enthalpy, entropy, subcooling, saturation properties, evaporator inlet quality and evaporator capacity. The evaporator HTF loop flow rates and temperatures are also monitored and the HTF-side evaporator capacity is calculated from these parameters and compared to the refrigerant-side capacity. All of the heaters in all three loops are also controlled by the virtual instrument.

All thermocouples used in this experimental setup were calibrated to within 0.15 ^{o}C, all pressure transducers to within 0.2 % reading, and all flow rate measurement devices were calibrated to within 0.3 % reading.

CHAPTER 4

DRIE Silicon Prototype

The first method of prototyping this device was Deep Reactive Ion Etching (DRIE) of a Silicon-on-Insulator (SOI) wafer. A silicon-on-insulator (SOI) wafer is a composite of three layers, consisting of two layers of silicon, with a layer of SiO_2 sandwiched between them. The reason that SOI wafers are useful is that DRIE will etch silicon approximately 200 times faster than SiO_2. SiO_2 therefore provides a good etch stop for the DRIE process. The flexibility provided by DRIE on a SOI wafer is ideal for fabricating a prototype of the device in this study.

It is very common for the two silicon layers to have very different thicknesses; the thicker of the two is called the base and the thinner is called the handle. In order to fabricate the first device from an SOI wafer using DRIE, the simplest method is using the handle of the SOI as the diaphragm and etching the base in such a way as to leave the piston attached to the center of the diaphragm. For the second device, it is desirable to use the thin handle layer as the cover plate with a pass through for the piston while using the thick base layer to provide a space between the two chips in the assembly. Figure 4.1 describes the process flow used to produce the piston/diaphragm device and Figure 4.2 describes the process flow used to produce the coverplate device.

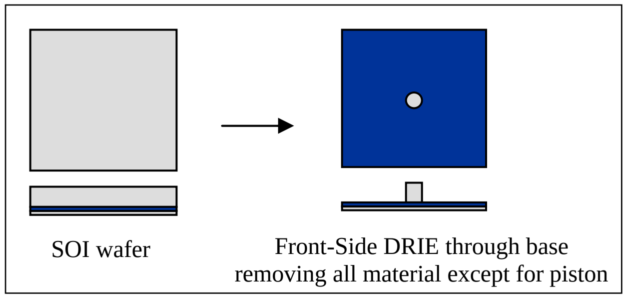


Figure 4.1 Process Flow used to Produce the Piston/Diaphragm Chip

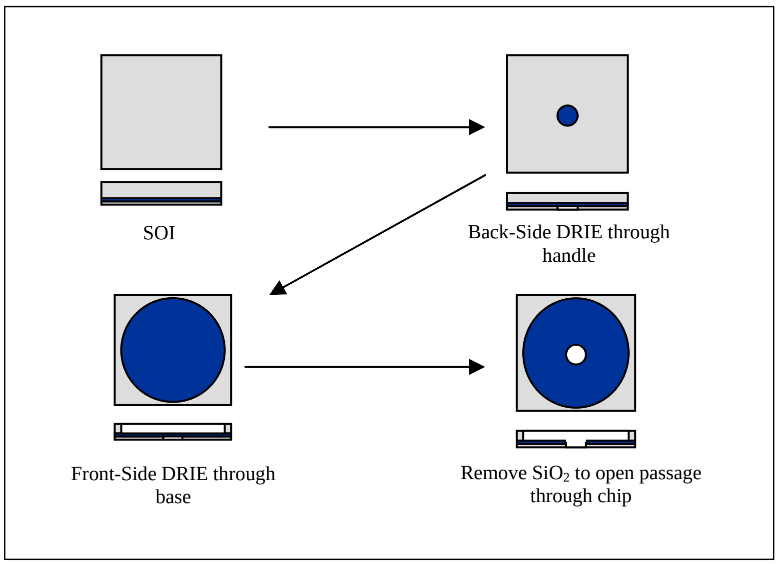


Figure 4.2 Process Flow used to Produce the Coverplate Chip

4.1 Design and Fabrication

The first prototype for this device was fabricated at the Cornell Nanofabrication Facility (CNF) in Ithaca, NY. For this fabrication run, 100 mm (4 inch) diameter SOI wafers were obtained. The base layers of these wafers were polished to a thickness of 450 μm, the handle was polished to a thickness of 75 μm, and the silicon dioxide layer between them was 1 μm thick.

The dimensions for this design are somewhat dictated by the specifications of the SOI wafers. In this case, the wafer dictates the diaphragm thickness of 75 microns and the space between the two pieces as well as the piston height is fixed to 450 microns. These specifications, incidentally, force the design to be slightly different than explained in the last section. This is because the piston height should be equal to the diaphragm thickness plus the gap spacing; therefore, the devices resulting from this fabrication run will be assembled such that the piston will be recessed 75 microns from the top of the coverplate when the diaphragm is not flexed. This could have been remedied by polishing one of the wafers by an additional 75 microns thereby reducing the gap to 375 microns. For the first fabrication run, however, this is acceptable because the actuation can still be demonstrated and the additional cost of polishing further is not warranted.

Given the constraints imposed by the specifications of the wafer, the dimensions of the features were calculated so that a safety factor of approximately 2 was maintained during operation. Since the material properties of single crystal silicon are directional, the following material properties were selected so as to result in the greatest stress on the diaphragm and they were input to the design spreadsheet [22]:

E=186.5 GPa

σ_y=1.8 GPa

ν=0.21

In addition, the desired deflection was 200 microns, which in this case would move the tip of the piston 125 microns beyond the coverplate. The piston diameter was

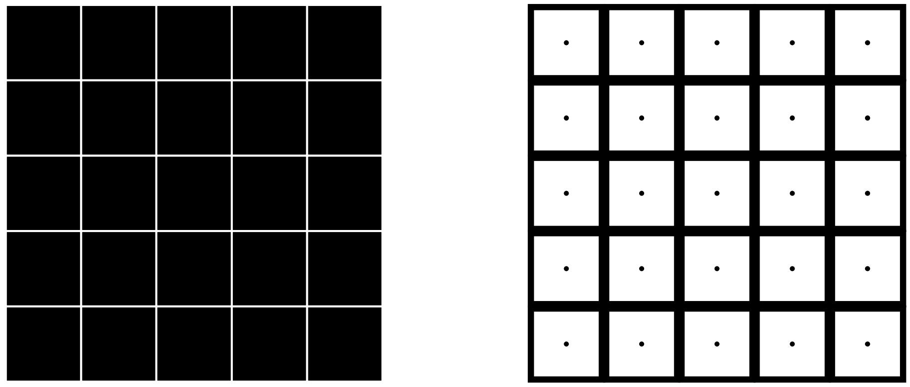
1,000 microns. With these parameters, the diaphragm diameter was found to be 8,800 microns, which results in a safety factor of 1.8 relative to diaphragm failure.

4.1.1 Masks

The first step was to create the photolithography masks for the fabrication run. SYMBAD computer aided drafting software package was used to generate the drawings needed for the masks. A total of 5 masks were needed for this fabrication run, which included one mask for each of the three DRIE etches outlined in the previous section and one mask for each etch to outline the borders of the devices on the wafers. These borders are necessary because they provide a line through which the wafer may be cut later to obtain the devices. On each of the five masks, an array of 25 (5 X 5) devices were drawn.

Mask #1 outlined the borders for the piston/diaphragm devices. For this mask, the pattern consisted of a 5 X 5 array of square dark field boxes with a side of dimension 16,950 μm. The light fields of the masks were the lines that separated the squares; the widths of these lines were 100 μm.

Mask #2 outlined the pattern for the second etch on the piston/diaphragm device. This pattern consists of a dark field circle, centered inside of a light field square. The circle has a diameter of 1,000 μm, as was the desired piston diameter. The square has a dimension of 12,000 μm on a side, which once fabricated will be wide enough to fit the coverplate device. The squares on the array of devices were separated by a dark field of 4,950 μm. A drawing of the patterns on the masks used for the piston/diaphragm devices (mask #1 and mask #2) are shown in Figure 4.3.



Mask #1
Borders for piston/diaphragm

Mask #2
Piston and diaphragm

Figure 4.3 Masks used for Piston/Diaphragm Chip

Mask #3 outlined the borders on the coverplate device. This mask is very similar in pattern to mask #1, however the dimensions are slightly different. For this mask, the sides of the dark field squares were 11,800 μm, and the light field lines were 5,150 μm thick. The dimension of these features are slightly smaller than that of mask #2 because the features produced with this mask will fit into the ones produced with mask #2.

The pattern on mask #4 is used to etch the hole through which the piston will move. This pattern was transferred to the handle side of the coverplate wafer. These holes are 1,100 μm in diameter, which is 100 μm larger than the piston.

The last mask, mask #5, was transferred onto the base side of the coverplate device. This pattern produces a large diameter hole (8,800 μm) which will provide a gap between the two devices after they are assembled. Figure 4.4 shows the patterns on the masks used for the coverplate device.

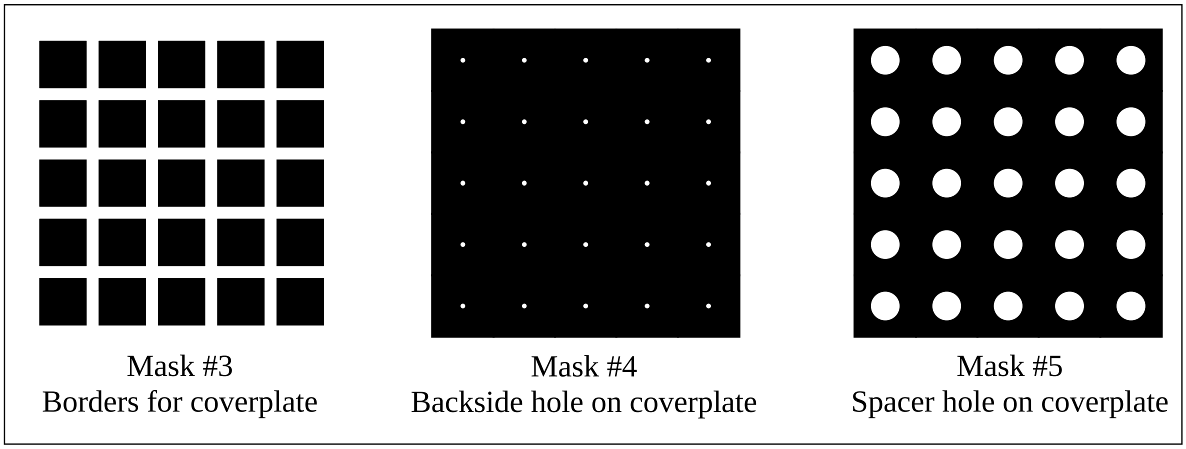


Figure 4.4 Masks used for Coverplate Chip

Once all of the mask patterns were drawn using SYMBAD CAD package, the patterns were transferred onto blank masks with a GCA PG3600F Optical Pattern Generator. The fabricated masks were 125 mm X 125 mm (5” X 5”) glass chromium masks with a resolution of 0.6 μm.

4.1.2 Device Fabrication

Once the masks were produced they were used to transfer patterns onto the SOI wafers. The piston/diaphragm device was fabricated by spinning 1.6 microns of Shipley 1813 photoresist onto the base side of a wafer. Mask #1 was used to expose the border pattern onto this photoresist using a Karl Suss MA6 contact aligner with a dose of 12.6 mW/cm^2 of UV light at 280 nm. Since this was the first pattern exposed, the mask was aligned to the primary flat. The photoresist was developed in MIF 300 in 60 seconds with high agitation.

The wafer was then placed inside of a Unaxis SLR 770 ICP, and etched for a period of 60 seconds. The photoresist was dissolved in acetone and the wafer was cleaned. The depth of this etch was measured with an AlphaStep 200 profilometer to be 3.5 microns. Regardless of the depth, however, this etch was clearly visible and could serve as a mark along which the wafer could be diced; which was the purpose of this feature.

The next step was to prepare the wafer for the deep etch. A different photoresist was used, STR 1075, which is much more viscous than Shipley 1813. The STR 1075 was spun on at a speed of 2000 RPM to leave a layer of 11.5 microns. Mask #2 was aligned to the features left from the first DRIE with the MA6, and this photoresist was administered a dose of 390 mW/cm^2, then it was developed for 80 seconds in MIF 319.

The pattern from Mask#2 was ready to be etched into the wafer by the Unaxis SLR 770 ICP. According to the tool's logbook, its selectivity had been repeatedly characterized to show that it etches silicon approximately 150 times faster than silicon dioxide and approximately 55 times faster than photoresist. The thickness of the photoresist was measured with the AlphaStep 200 and was found as 11 microns; which is adequate since the desired etch depth was 450 microns.

The wafer was etched until silicon dioxide could be seen at the bottom of all etch pits, which took slightly longer than 3 hours (3:02:12). The end product can be seen below in Figure 4.5.

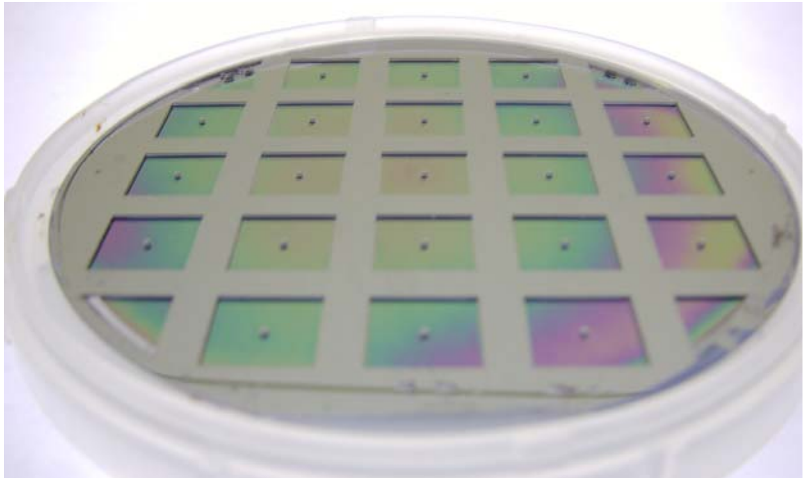


Figure 4.5 SOI Wafer after the Fabrication of Pistons and Diaphragms

The coverplate devices were fabricated next. A 1.6 micron layer of Shipley 1813 photoresist was spun onto the base side of the coverplate wafer, in the same manner as was done for the piston/diaphragm wafer. This photoresist was exposed with the MA6 contact aligner, using Mask #3 and a dose of 12.6 mW/cm^2. It was then developed and etched in the 770 ICP for a period of one minute.

The wafer was then cleaned and a layer of the same photoresist was spun onto the handle side. This layer was exposed using an EV620 contact aligner. This exposure system uses optical imaging to allow alignment with features on the back side of the wafer. With this tool, Mask #4 was aligned to the features left from Mask #3 on the opposite side of the wafer. The photoresist was exposed, developed, and etched in the 770 ICP until the layer of buried silicon dioxide was exposed (20:08).

The wafer was then cleaned and a 11 micron layer of STR 1075 was spun onto the base side. It was exposed using the MA6 with Mask #5 and a dose of 390 mW/cm^2. The photoresist was developed and the wafer was etched in the 770 ICP until the silicon dioxide was exposed in the bottom of the etch pit.

Once the fabrication of both wafers was complete, they were disassembled into the components. The wafers were diced by coating them with a very thick layer (approximately 1 mm thick from the deepest etched trenches) of photoresist. The photoresist provided an easily removable, thick, flexible layer which damped the vibrations that resulted from cutting the wafers. The wafers were then cut along the borders between the devices with a diamond-tip saw blade. After cutting the devices free from the wafers, they were soaked in acetone to remove the photoresist cleaned. Figure 4.6 shows photographs of the two chips after they have been cut from the wafers.

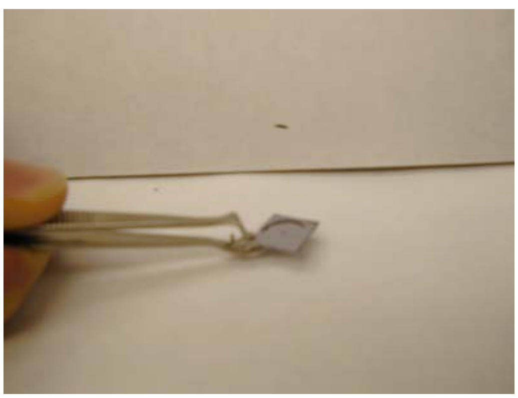


Figure 4.6a Coverplate Device

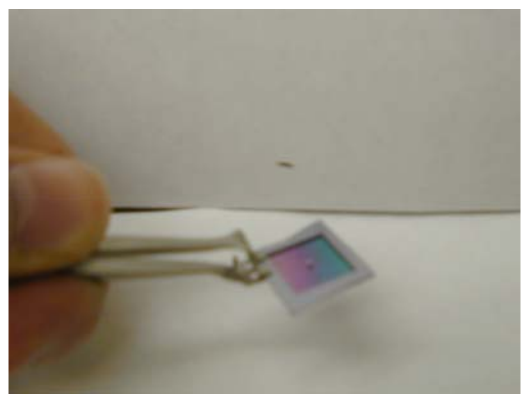


Figure 4.6b Piston/Diaphragm Device

The final fabrication step was to open the pass through hole in the coverplate device. The hole was blocked by a 1 μm thick layer of silicon dioxide. This layer of silicon dioxide was removed by dipping the device in a solution containing hydrofluoric acid (HF) for a few seconds until the SiO_2 was dissolved.

4.2 Assembly

At this point, one of each of the pieces was assembled into the first prototype. To do this, the two pieces were set together with an epoxy. This particular epoxy was formulated to work with refrigerants and was rated at pressures of up to 27.5 MPa (4,000 psi). Figure 4.7 shows a photograph of the assembled devices.

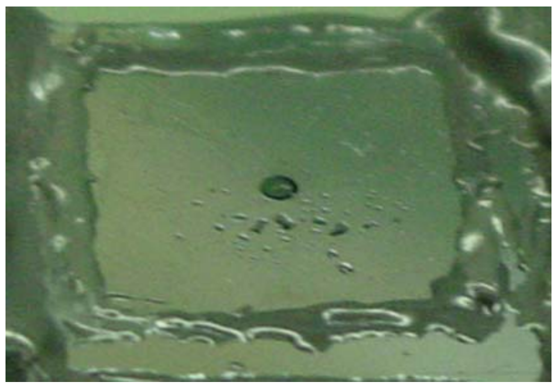


Figure 4.7 Assembled Device

Next, two small brass pieces were machined on a lathe. These pieces make up the small chamber that encapsulates the oil used to flex the membrane. The brass pieces were machined according to the specifications shown on Figures 4.8 and 4.9.

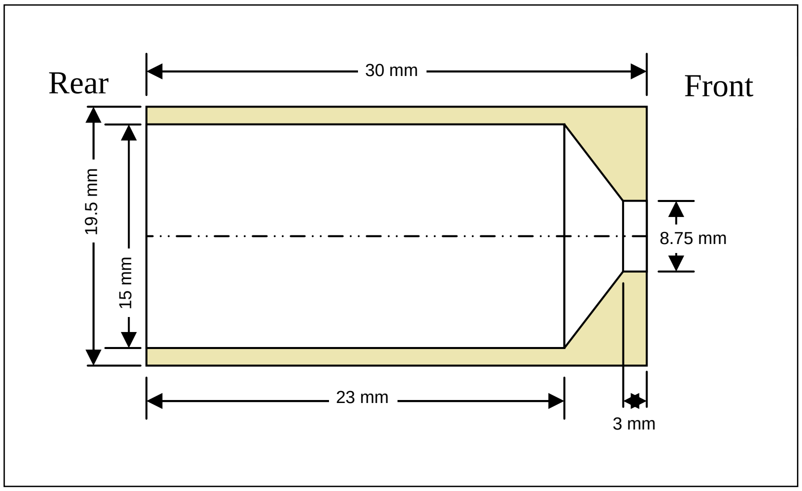


Figure 4.8 Specifications of Brass Capsule

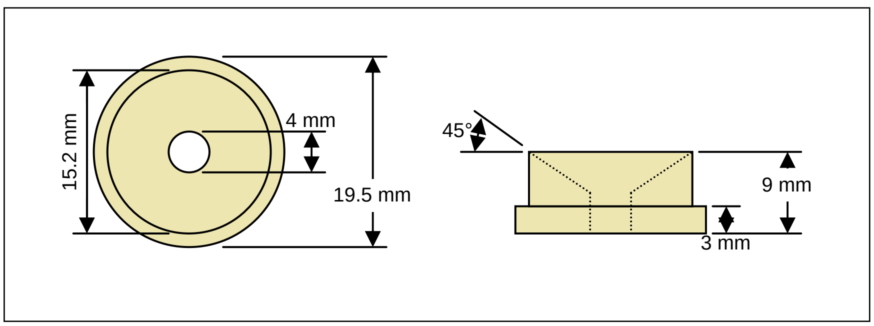


Figure 4.9 Specifications of Brass Capsule Cap

The devices were then mounted onto the brass capsule and secured with epoxy. A small 13.1 Ω electrical resistance heater was placed inside the capsule by running its wires through the cap and sealing the cap to the capsule.

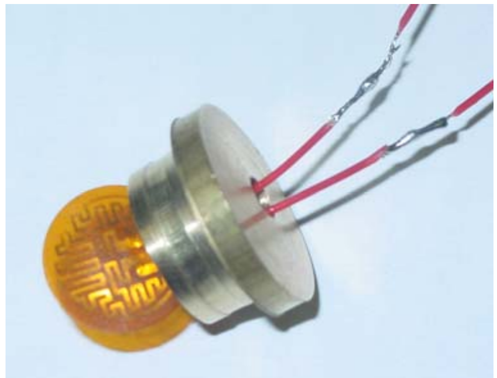


Figure 4.10 Heater and Cap Assembly

Next, the capsule was filled with Emkarox polyalkalene glycol (PAG) 118 using a syringe. The capsule was filled with oil through the hole in the rear of the cap using 4.0 cm^3 of oil at a fill temperature of 22 °C (72 °F). When the capsule was completely filled with oil, a type-T thermocouple probe was inserted through the hole and the capsule was sealed with epoxy. A picture of the final assembly is shown in Figure 4.11 below.

Figure 4.11 Final Assembly of Actuator

4.3 Characterization

Before measuring the movement of the piston, calculations were performed to estimate the displacement based on the oil temperature. This was done using the spreadsheet described earlier. The dimensions of the silicon pieces and brass oil reservoir were inserted into the spreadsheet along with the information regarding the oil in the capsule. Figure 4.12 depicts the prediction of the vertical movement of the piston in response to a changing oil temperature.

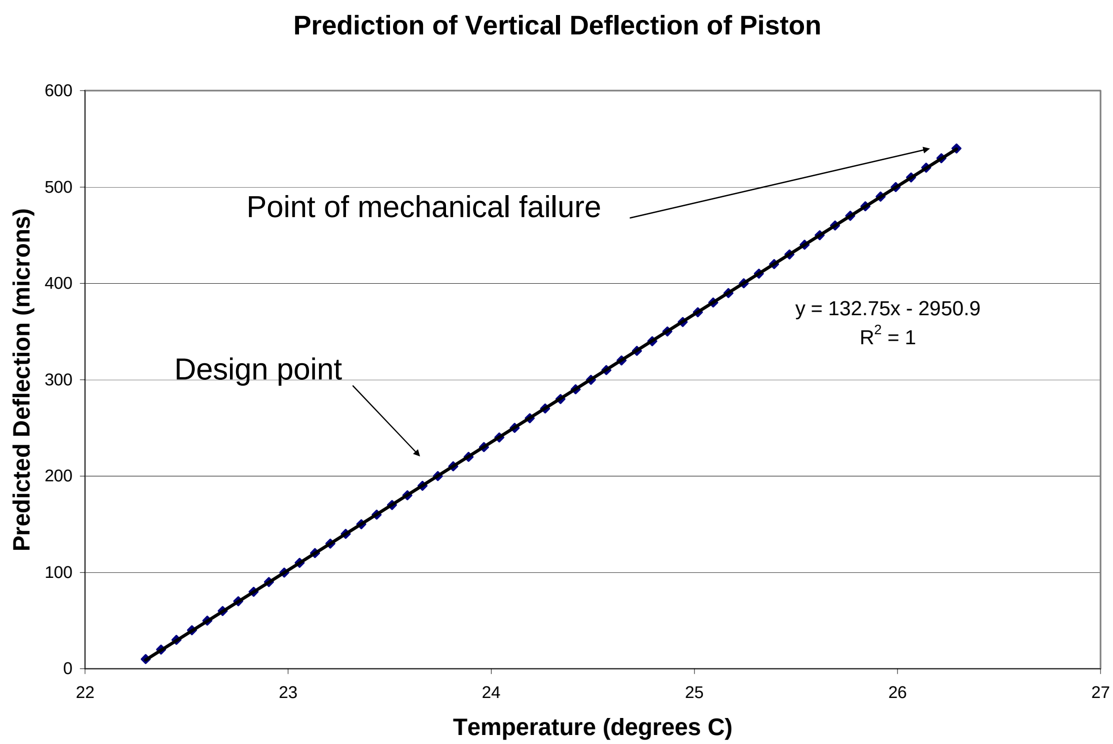


Figure 4.12 Performance Simulation for Displacement of Piston

The magnitude of the movement predicted by this model seems to be a little dangerous from a reliability point of view. The prediction is that, for a relatively small change in temperature (4.1 °C or 7.5 °F), the piston would move beyond its entire range of motion and the diaphragm would rupture.

There is, however, a major shortfall of the simulation model in that the epoxy holding the diaphragm to the oil reservoir has quite a bit of flexibility. As the pressure in the capsule increases, the epoxy will stretch and thus some of the additional volume in the capsule will be realized. There is, however, no means by which this amount may be accounted; therefore, it was left out of the simulations. This factor is helpful because it works to suppress the motion of the piston. If the motion is not as strong of a function of the oil temperature as predicted, the device will require a greater range of temperature to undergo this much motion; thereby making it easier to control. This is not an accident. The initial volume of the oil reservoir was determined through trial and error by noticing the effects of the epoxy and using a larger reservoir to attain the desired displacement.

The movement of the piston was then measured and correlated to the temperature of the oil in the capsule. For this measurement, the first step was to devise a method of measuring a small displacement that was perpendicular to the plane in which it may be viewed. The method used was to examine the device on a microscope, and focus the scope on a point on the piston. As the piston moved vertically, the focal point was tracked using the focus adjustment knob.

The focus adjustment knob on the microscope was divided by 100 tick marks per rotation. To obtain a conversion from these tick marks to actual distances, a calibration was performed. The profilometer measurements that were done on the piston/diaphragm chip verified that the distance from the top of the piston to the base was 450 μm; therefore, this chip was used as a reference for the calibration of the tick marks.

Measurements from the bottom to the top of the piston resulted in a conversion factor of 0.996 ticks/μm.

The assembled device was then placed on the microscope stage. The heater wires were connected to a variable power source connected in parallel to a handheld multimeter. This allowed the voltage input to the heater to be controlled and monitored. The thermocouple which monitors the oil temperature was connected to a handheld thermocouple reader.

The position of the piston was recorded, along with temperature and voltage information, as heat was added to the capsule through the variable power source. The voltage was increased in small discrete increments with a minimum of 1 minute between readings. This allowed a range of data to be covered without capturing any transient effects. The temperature range that was used to collect data spanned the range between the ambient temperature in the laboratory and 32.2 °C (90 °F).

Measurements were taken on three separate days; therefore, the starting point was not identical for each measurement. The position was recorded for each measurement and plotted as a position relative that at 23.9 °C (75 °F). Figure 4.13 below shows the data taken on three separate occasions.

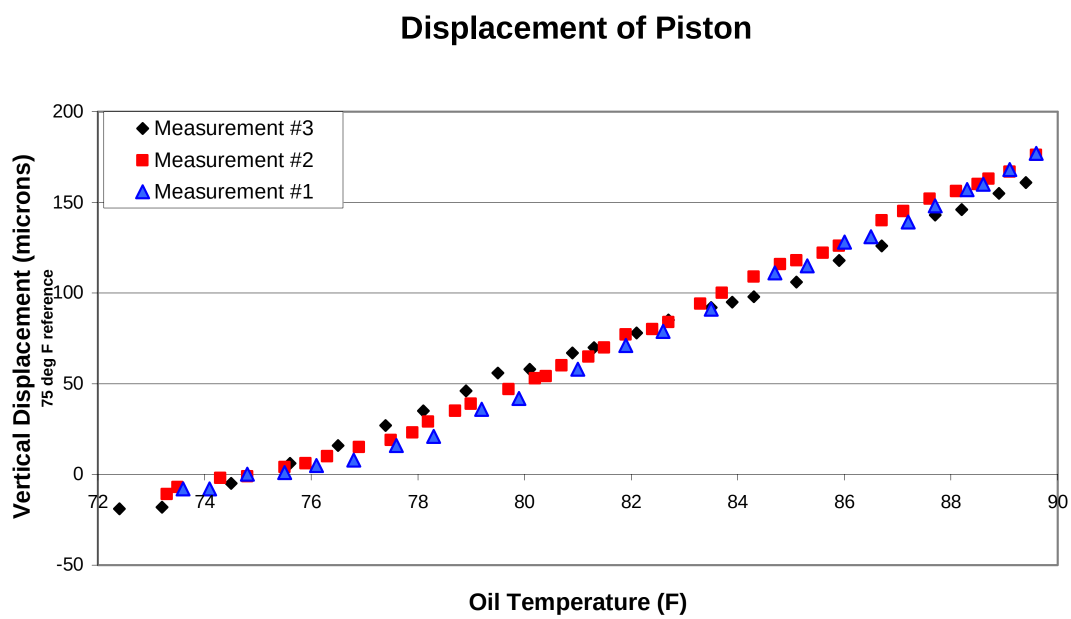


Figure 4.13 Characterization of Piston Displacement

This data demonstrated that the displacement of the piston was both linear and repeatable. The slope of a best fit line through all of the data points showed that the piston moved 20.98 μm/°C (11.66 μm/°C). This is much smaller of a slope that the 132.75 μm/°C (73.75 μm/°F) predicted in the simulations; however, this is a reasonable expectation considering the effects of the epoxy's flexibility.

4.4 Attempted Testing in an R134a System

After the motion of the piston was characterized, installation and testing in the breadboard HVAC system was attempted. The device was mounted along a cut away section of a small gage tube and installed between the evaporator and condenser heat exchangers, as the main pressure drop device in an R134a vapor compression cycle test apparatus.

The following conditions were imposed on the cycle to mimic the operating conditions of a household refrigerator:

Refrigerant mass flow rate:	2.35 $\frac{g}{s}$ ($22.6\frac{lb_m}{hr}$)
Liquid line pressure:	976 kPa
Liquid line temperature:	30.8 °C (87.4 °F), 7.7 °C subcooling
Evaporating temperature:	8.4 °C (47.1 °F), saturation pressure of 393 kPa
Cooling capacity:	385 Watts ($1300\frac{Btu}{hr}$)

The temperature of the oil in the capsule was held at 23.9 °C (75 °F) while the system parameters stabilized. Once steady state operation was achieved, the temperature of the oil in the capsule was elevated and the refrigeration cycle parameters were monitored. As heat was added into the capsule, it was expected that the piston would begin to obstruct the refrigerant flow path which would cause the mass flow to decrease, the liquid line pressure and temperature to increase, the evaporating temperature and pressure to decrease, and the capacity to decrease. None of this, unfortunately, occurred.

Once the oil temperature was raised to 29.4 °C (85 °F), within the range of device characterization, the oil temperature began to decline very rapidly. A rapid decline in the oil temperature seemed to be the result of a ruptured diaphragm, which would allow refrigerant to mix directly with the oil in the capsule.

The assumption as to why this would occur was that the piston may have been slightly misaligned with the tube to which it was mounted, and that the attempted actuation may have forced the piston into the tube wall. This would result in the piston being restrained, and eventually the rupturing of the diaphragm before any obstruction was introduced into the capillary tube. The device was removed from the system and examined. It was positioned with the tube in a vertical position, and oil droplets began to drip from the tube, indicating that the diaphragm had in fact ruptured.

4.5 Conclusions Drawn from Silicon Prototype

As this device was assembled from the last surviving set of silicon pieces, it was not possible to assemble and test another specimen. However, a lot of information was obtained through these tests, which is valuable for the second generation of such devices. The most important piece of information yielded from this experience is that such a device was possible to construct. Also, much of the knowledge gained through this fabrication and assembly may be carried over to the next generation of devices.

The first recommendation for design changes to the second generation of devices is to use a different material. The devices produced in this fabrication run were made out of silicon, which is a brittle material. This device can be made from silicon; however, at this stage of development it would be better to work with a more ductile material. Also, expensive processes and specialized wafers were needed to fabricate the features on these devices. Although the cost of fabrication of these parts may be feasible in large scale production, less expensive alternatives are possible if different materials are used.

The second recommendation is to change the design of the device so that the refrigerant flow path is fabricated as part of the device itself. This will eliminate any problems associated with trying to align the actuator to the refrigerant flow path, which is what ultimately caused the test specimen to fail in the HVAC system.

The third change is that the range of motion attainable by the piston should be larger and a higher factor of safety should be used. The features for this prototype were calculated based on the diaphragm experiencing a maximum stress equal to half of the yield stress when subject to a 200 micron extension and a large pressure differential occurring at its top. For the second generation, the minimum factor of safety will be doubled. Also, with the fabrication of the flow channel being part of the system, the range of motion of the piston will extend to the top of the flow channel. This will allow the device to completely stop the flow, rather than merely inducing more flow resistance.

Next, a different method of fixing the diaphragm to the oil reservoir is recommended. The epoxy used to hold the pieces together worked, but it had a large dampening effect on the movement attainable by the piston due to its flexure. More importantly, a lot of difficulty was experienced with the epoxy in terms of containing the oil in the capsule.

Finally, an alternative method of benchmarking the performance of the device's ability to control fluid flow is desired. The reasons for this are explained in chapter 3.

CHAPTER 5

Thick SU8-Nickel Micromolding Process

The second generation of the refrigerant expansion device is based on electroplating nickel into SU8 molds. There are many difficulties involved with working with SU8 in layers greater than 1 mm [29], the thickness necessitated by this design. In order to make this a viable option, extensive work was done to determine process parameters and tricks that would allow the formation of SU8 molds in excess of 1 mm.

The biggest problem that occurs in thick layer SU8 processing is that the material's stress becomes very large when it is cross linked [30-32]. This often causes the SU8 layer to buckle, shatter, or lose adhesion and detach from the substrate. As SU8 is deposited in thicker and thicker layers, the stresses generated during cross linkage become more pronounced and the likelihood of failure increases.

The available processing information from the manufacturer [33] gives detailed steps that instruct the user on how to build structures as tall as 260 μm. A manual put together by EV Group [34] outlines a procedure for up to 430 μm tall SU8 layers. There is also a lot of information on the internet dedicated to the sharing of processing information of SU8 [35]. Many journal articles also share a lot of processing tips that help improve SU8 deposition [36-48]. These manuals and web sites often report conflicting information, but the suggestions provided were a good starting point. Very little, however, has been reported for thicker deposition of SU8. Researchers in Switzerland have successfully deposited and patterned SU8 in excess of 1200 μm [49, 50], and Sandia National Laboratory has published work showing deposition of up to

950 μm [51]; however, the recipes that they developed are proprietary and could not be obtained.

As an example, the process flow for 260 μm tall SU8-2100 features from the MicroChem manual is described as follows:

1) Wafer pretreat: Whenever possible, the substrate should be undergo a piranha etch/clean ($H_2SO_4 + H_2O_2$); or at minimum a soak in isopropanol. Afterwards, a dehydration step is necessary, which typically consists of 5 minutes on a hot plate at 200 °C.

2) Coat: Liquid SU8 can easily be applied to a wafer through normal spin coating. However, SU8 is a very thick liquid (the kinematic viscosity of SU8-2100 at room temperature is 45000 cSt, one order of magnitude greater than that of honey) and can be difficult to dispense. Therefore, it is typically poured directly onto the wafer rather than dispensed from a pipette. A spin rate of 1000 RPM will leave a layer of 260 μm on the wafer.

3) Soft bake: After the SU8 has been applied to the wafer; it must be heated to evaporate the solvent and solidify the SU8. Most photoresists achieve best results with this step performed in an oven, it has been widely reported that a hot plate soft bake is better for SU8. This is because an oven bake tends to form a crust on the SU8 surface, which will hinder the mass transfer of solvent out of the SU8. The wafer should be slowly ramped up and down from the soft bake temperature. The manufacturer states that the soft bake for a 260 μm layer requires 60 minutes on a hot plate at 95 °C, although other resources claim that as much as 5 hours is necessary.

4) Exposure: A weak acid is formed when exposed to UV illumination. This acid reacts with the SU8 molecules and causes them to cross link and form a rigid polymer. Because of this mechanism, SU8 is relatively insensitive to overexposure. The exposure dose reported by MicroChem for a 260 μm layer is 400 mJ/cm^2, although other sources recommend a minimum of twice this dose and it has been reported the increasing the dose will typically result in better adhesion to the substrate.

5) Post Expose Bake: To promote the chemical reaction of the SU8 molecules cross linking, a post exposure bake is necessary. MicroChem recommends a post exposure bake of 15 minutes on a 95 °C hot plate for a 260 μm layer. This can be a very tricky step because the SU8 begins to forms a high stress solid with a very large coefficient of thermal expansion (~50 ppm/K) once the molecules begin to cross link. The recommendation is to slowly ramp the temperature up and down to minimize the thermal gradients within the SU8, thereby reducing the stress caused by these thermal gradients.

6) Develop: SU8 is developed in a solution of PGMEA (propylene glycol methyl ether acetate). The developer dissolves SU8 that is not cross linked. It also seems to cause a high degree of stress in the SU8. For very thick layers, this is a very delicate step because the stress caused during the development can easily cause the SU8 to shatter. If this occurs, it will take place the instant that the very first drop of PGMEA comes into contact with the SU8; if there are no problems getting the wafer into the developer, catastrophic failure is not likely. MicroChem recommends an agitated bath of PGMEA for 20 minutes to develop a layer of 260 μm.

7) Rinse: After the layer is developed, it should be rinsed in isopropanol. This also helps to determine if the development step is complete because undeveloped SU8 will

form a milky residue if it comes into contact with isopropanol; therefore if this is present, it should be returned to the developer.

With the basic process steps outlined, substantial effort was put forth to fine tune this process so that it could be used in a process flow similar to LIGA. The basic process involves depositing and patterning SU8, and then filling in the cavities by electroplating a metal into it. Afterwards, the SU8 is removed and the metal structure is free. Figure 5.1 outlines the basic process flow.

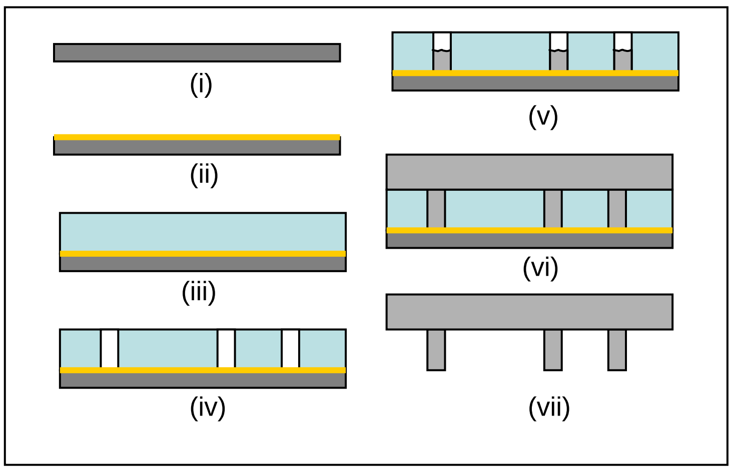


Figure 5.1 Basic Fabrication Process Goal for SU8

We begin with a clean substrate (i). Then it is coated with a layer of metal to be used as an electrical conductor for a plating base (ii). A thick layer of photoresist is deposited on top (iii), and then exposed and developed to leave the desired pattern (iv). Next, the substrate is submersed in an electrolyte solution with a mass of the plating metal. An electrical power source is connected to the plating metal (anode) and the plating base on the substrate (cathode) such that the plating metal undergoes oxidation:

$$Metal \rightarrow Metal^{n+} + ne^{-}$$

And metal is deposited on the cathode through reduction (iv):

$$Metal^{n+} + ne^{-} \rightarrow Metal$$

As the metal deposits, it will eventually grow out of the mold (vi). At this point, it may be polished to a desired level if required. Finally, the photoresist and the substrate are removed (vii) from the metal piece or pieces.

To build upon this basic process, there are a few obstacles to overcome. First, in order to fabricate the components that are required for this device, multiple layers must be deposited and patterned. With traditional LIGA, this is not a difficult task. The solution is simply to polish the deposited metal layer to the appropriate level, then repeat the process steps with a different pattern. This is not possible with thick SU8 photoresist because it has such a high stress and it does not have very good adhesion with metals, i.e. the subsequent layer of SU8 will not stick to the electroplated metal and will ultimately detach from the substrate entirely.

Also, if a thick (>500 μm) layer of SU8 is deposited onto a metal layer, it will often lose adhesion during electroplating. This doesn't seem to be much of a problem when a thin layer of SU8 is used; but the adhesion cannot overcome the stress associated with thick layers. Therefore, the SU8 can not be deposited on top of the plating base.

Another issue is that once a thick layer of SU8 is developed it is difficult, if not impossible, to deposit a second thick layer of SU8 on top. See Figure5.2. The main reason for this is that SU8 contracts slightly when developed, which is a source of a great amount of tensile stress. The magnitude of this stress can be inferred from the curvature that is introduced to the substrate [52]. For SU8 layer thicknesses in the range of 1 mm, these stresses are on the order of 25-30 MPa, which is close to the maximum stress for SU8 of 34 MPa measured by the Swiss Federal Institute of Technology [53]. If another thick layer is deposited on top of one which is already developed, then it is unlikely that the stack of SU8 will survive.

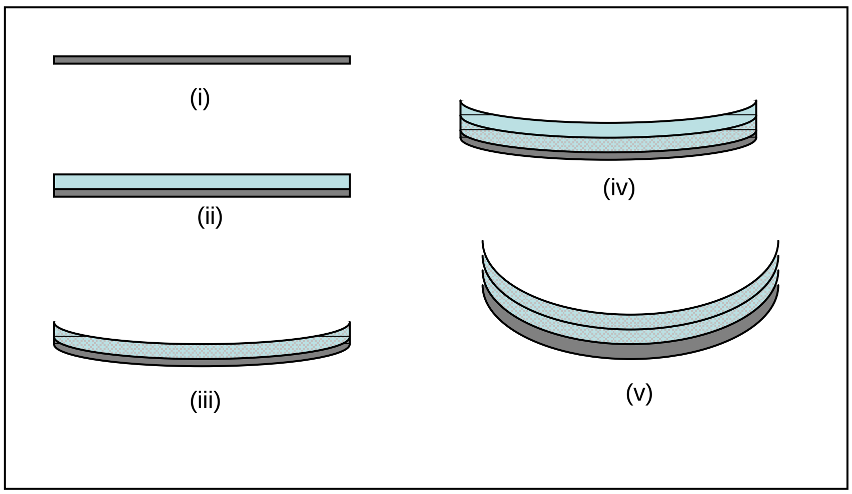


Figure 5.2 Buckling Mechanism for Multiple SU8 Layer Stacks. (i) Bare wafer. (ii) SU8 deposited on surface. (iii) SU8 developed. (iv) Second layer of SU8 deposited. (v) Second layer of SU8 developed.

A third issue is that SU8, when cured, is very resilient to chemicals. This makes it an excellent material for many applications where it is a permanent structure. However, removing SU8 has proven to be very difficult. Recently, some researchers [54-56] have reported that SU8 can be etched by certain plasma or reactive ion etch (RIE) recipes; however, the results have shown etch rates between 1 and 4 μm per minute. With layer thicknesses of greater that 1 mm, these etch procedures would take an exceedingly long time and result in very expensive equipment usage. Similar etch rates have been found with wet etching techniques [57], and selectivity is an issue.

Given these constraints, modifications to the recipe were developed to fabricate devices > 1 mm out of nickel. First, the SU8 must be deposited onto bare silicon, instead of a metallic plating base as is common for traditional LIGA based processes. The adhesion between SU8 and silicon dioxide or metals is not as good as with silicon. It can be deposited onto many different materials, however, when the stresses become large, it will detach. SU8 adheres best to silicon; therefore, this offers the most protection against separation. For this reason, it is also necessary that the wafer be soaked in HF to remove any silicon dioxide.

Secondly, it is necessary to use either a thick wafer or multiple wafers bonded together. The large stresses cause significant wafer bowing. Using a thick wafer drastically reduces the amount of bowing, because the radius of curvature of the wafer is proportional to the square of the thickness. It has been found that a 100 mm diameter, 900 μm thick silicon wafer can withstand the stress induced by the deposition of 1200 μm of SU8 unlike a standard 500 μm wafer of this diameter.

Third, most of the stress occurs when SU8 reacts with PGMEA; therefore, all layers of SU8 must be developed in one single shot. Once thick layers of SU8 are deposited and developed, they are too unstable to undergo further processing (at least processes which introduce large stresses such as additional SU8 deposition). By developing all of the layers at once, the interstitial stresses between layers will be minimized.

In order to construct tall molds with varying features at different depths, the process steps 2-4 outlined in the beginning of this chapter (coat, pre-expose bake, expose) may be iterated. It is unnecessary to perform a post exposure bake (step 5) until after the final layer has been exposed. This is because each pre-expose bake for a subsequent layer will have the same effect. Also, it is not desirable to superfluously undergo any additional thermal cycling.

In order to satisfy the single development rule, the geometry of the device itself is limited. The geometry must be constrained so that split-level features cannot include any overhangs. See Figure 5.3.

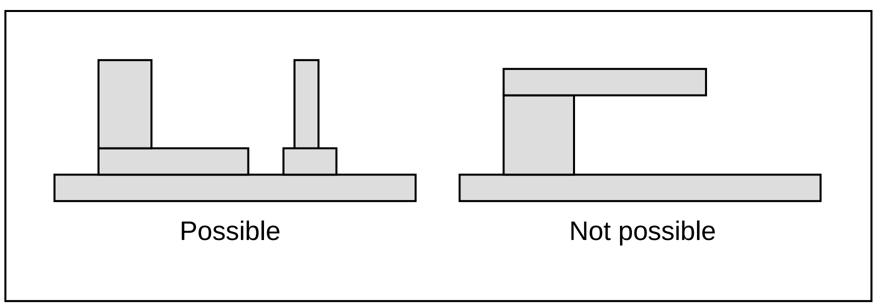


Figure 5.3 Geometrical Constraint for Nickel Device.

The reason for this constraint is that the SU8 molds must be made in such a way that every layer has a wider open area than the layer beneath it. This is because SU8 is a negative photoresist and it becomes a permanent structure when exposed to UV light. If a layer of SU8 is exposed, all layers directly beneath it will also receive UV radiation.

Therefore, it is only possible to expose areas that lie directly on top of other exposed areas.

Researchers at the Swiss Federal Institute [58, 59] have developed three methods of forming overhangs and enclosed channels with SU8. Brief process flows are shown in Figures 5.4 - 5.6.

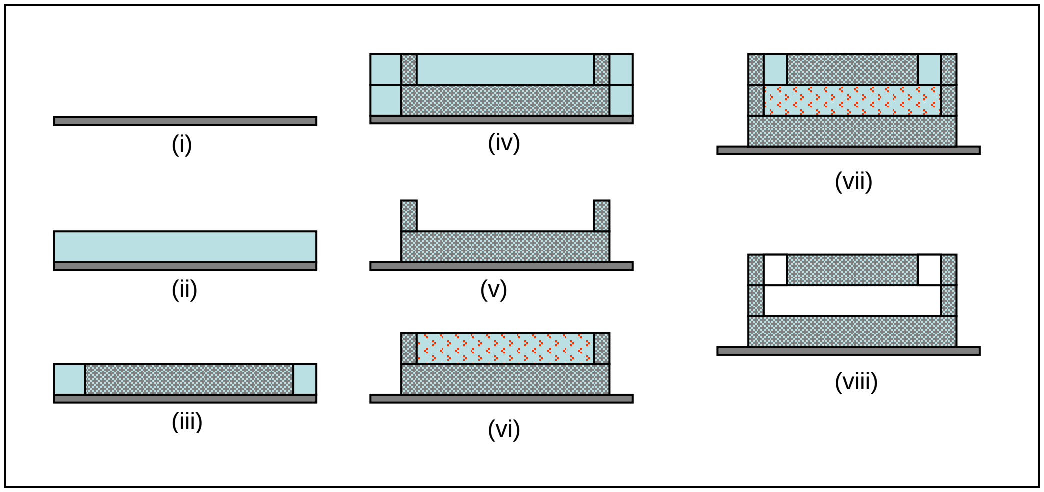


Figure 5.4 Fill Process for SU8 Overhangs or Channels

For the fill process, SU8 is deposited onto a substrate, patterned, and developed (i-v). Next, a sacrificial layer of dissolvable material is used to fill the trenches of the SU8 structures (vi). Another layer of SU8 is deposited on top of the stack, then it is exposed and developed, and the filler material is dissolved (vi-vii). This is not a feasible option for very thick layers because it involves multiple development steps.

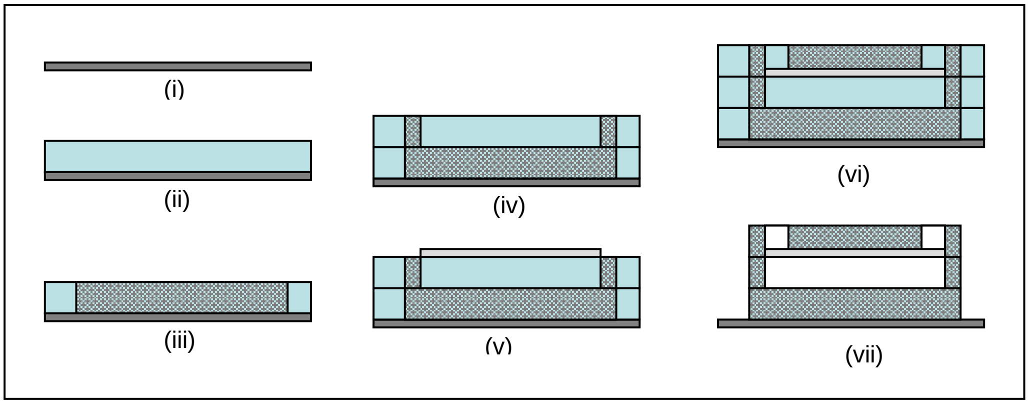


Figure 5.5 Mask Process for SU8 Overhangs or Channels

For the mask process, SU8 is deposited onto a substrate and patterned, but not developed (i-iv). Next, a layer of metal is deposited and patterned on top of the SU8 (v). This metal layer blocks the UV light from reacting with the unexposed SU8 beneath. Another layer of SU8 is deposited on top of the stack, and then exposed and all layers are developed (vi-vii). This is not a feasible option for very thick layers either because the high stress SU8 will not adhere to the metal layer.

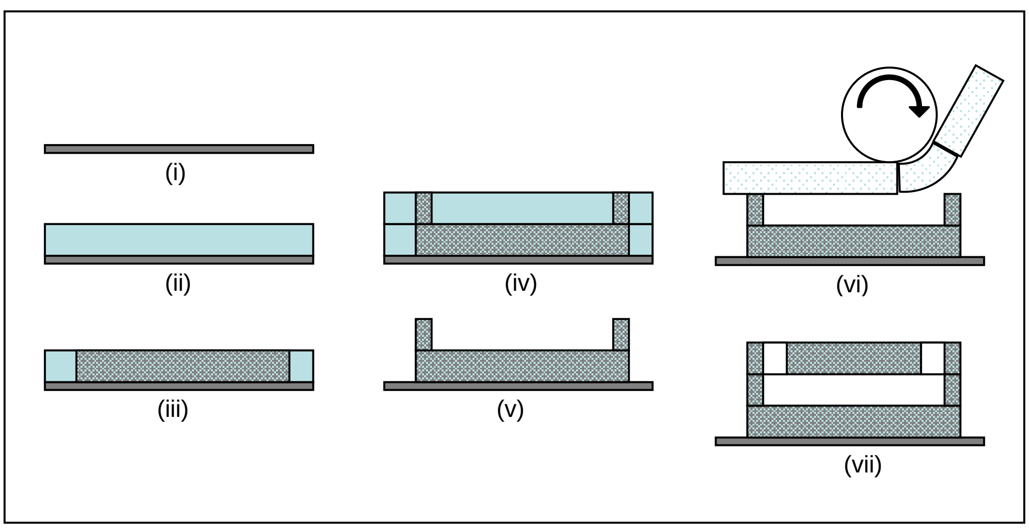


Figure 5.6 Lamination Process for SU8 Overhangs or Channels

For the lamination process, SU8 is deposited onto a substrate, patterned, and developed (i-v). Next, a layer of film laminate photoresist is deposited on top of the SU8 (vi). The laminate film is exposed and developed so that it forms the top portion of the structure or the overhangs (viii). Therefore, the structures are not completely made of SU8. This is a very useful process flow for fabricating microfluidic structures, but it has limitations for micromolding. The major limitation is that laminate photoresists have poor chemical resistance to electrolyte solutions, which are needed for electroplating. Therefore, this is not a feasible option either.

In order to deposit a metal with an electroplating process, a conductive layer must be present. Since SU8 cannot be deposited onto a metal, the metal must be deposited on top of the SU8 mold. Of the available methods for metal deposition, the process must have very good step coverage to coat within the trenches of the molding. The simplest way to achieve the required metal deposition is by sputtering.

Finally, the last step requires that the metal devices are somehow freed from the SU8 molding. The easiest way to remove SU8 is to take advantage of SU8's instability and the fact that it does not exhibit the best adhesion to metal. The simplest method of pushing this material beyond its limit is to rapidly raise its temperature. This thermal shock causes the SU8 to lose adhesion to the metal, thus it can be easily removed. It has been found through experience that if the substrate is placed on a 500 °C hotplate, the metal will be ejected from the SU8 within 5 to 10 seconds while it is still cold to touch. The SU8 is destroyed during this process, but the silicon wafer is left in tact. This is quite beneficial because the wafer may be polished, cleaned, and made to undergo this process again.

In order to use this method, an additional layer of SU8 is needed to completely cover the substrate. This sacrificial layer of SU8 is required so that the metal is fixed only to SU8 and not to the substrate. Therefore the metal is not restrained to the wafer while the SU8 is attempting to eject it.

All of the rules outlined thus far are necessary to successfully deposit layers of SU8 in excess of 1 mm total thickness. However, following these steps alone does not result in a good pattern transfer, and additional fabrication steps are necessary to deposit a thick layer of SU8 with good uniformity. This is because the edge bead resulting from the fabrication process outlined is extraordinarily large. It is impossible to accurately measure the magnitude of this problem because no good tool for this measurement exists.

In order to gauge the magnitude of the problem, a layer of 500 microns of SU8 was deposited onto a wafer prepared using the method outlined thus far. Calipers were used to measure the thickness of a layer of SU8 and wafer in a few locations, although it was impossible to reach to the center of the wafer with the calipers. In general, using the 500 micron recipe would result in an outer ridge-edge bead thickness of approximately 500 microns. However, this ridge is generally 2 to 3 centimeters wide, and the thickness of the SU8 inside the bead is much smaller; typically 100-150 microns. A typical pattern is shown below in Figure 5.7.

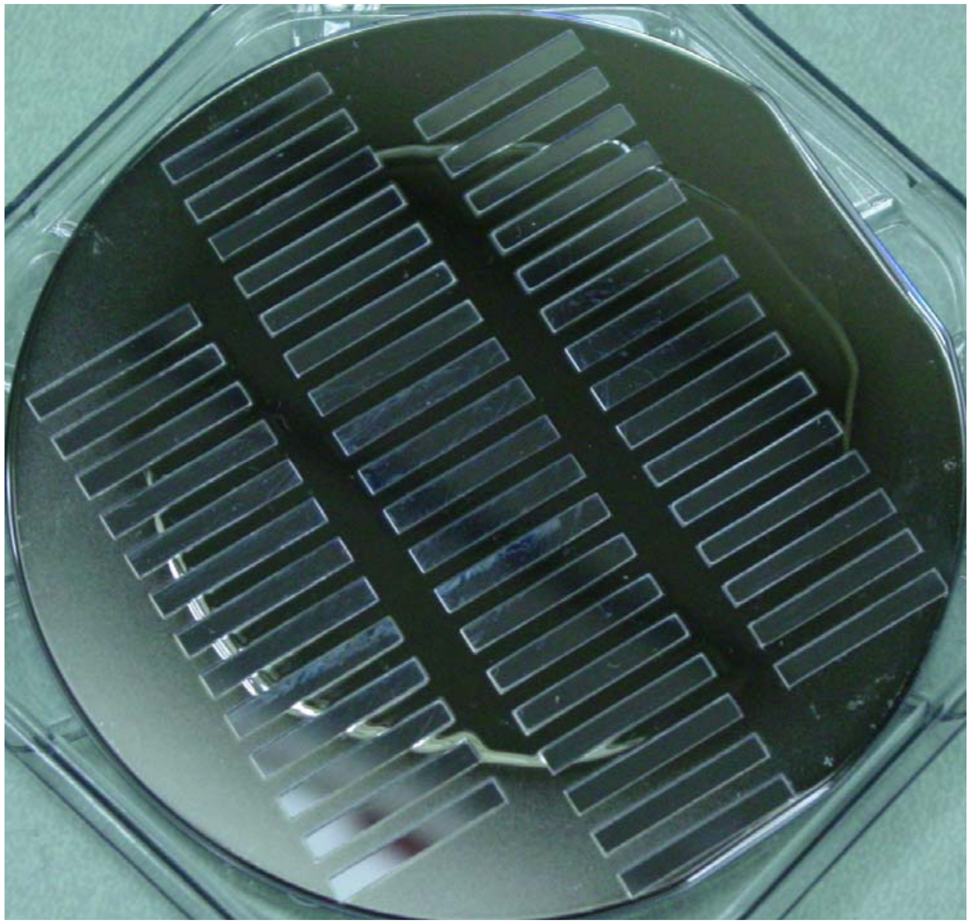


Figure 5.7 Typical Thick Layer SU8 Edge Bead Distortion

This is quite problematic not only because any resulting structure height is greatly altered; but because light passing through a mask placed on top of this will scatter terribly, resulting in a very poor pattern transfer. Furthermore, any subsequent fabrication steps will be distorted because this layer will be uneven.

Eliminating this edge bead, and the problems caused by it, is a rather challenging task. Conventional edge bead removal is generally performed by treating the photoresist near the edge with a solvent. This will not work with SU8 because it is a negative photoresist. Grinding the SU8 edge bead to the correct thickness is not a feasible option either because in order to do this, the SU8 layer must be developed and it was found that, once developed, thick SU8 cannot withstand further processing.

After trying a few different options, a procedural modification was devised which resulted in much more uniform SU8 deposition. The additional fabrication steps to deposit one layer of thick SU8 are outlined in Figures 5.8 and 5.9.

Initially, the SU8 is deposited onto a wafer using the guidelines set forth thus far. The bare wafer 5.8 (a) is cleaned, then SU8 is spun onto the wafer according to the spin-spread rates at a given temperature and the wafer undergoes a soft bake to drive off the solvents. This results in a deposition pattern similar to that shown in figure 5.8 (b). After the soft bake, a mask is placed over the wafer and held in contact. A region that is not in contact with the mask is clearly visible through the mask at this point 5.8 (c). Once the mask and the wafer are secured together, an opaque layer of black electrical tape is used to cover all parts of the mask that lie directly above areas that are not in contact with the SU8 5.8 (d). Next, the SU8 is exposed through the mask/black tape assembly.

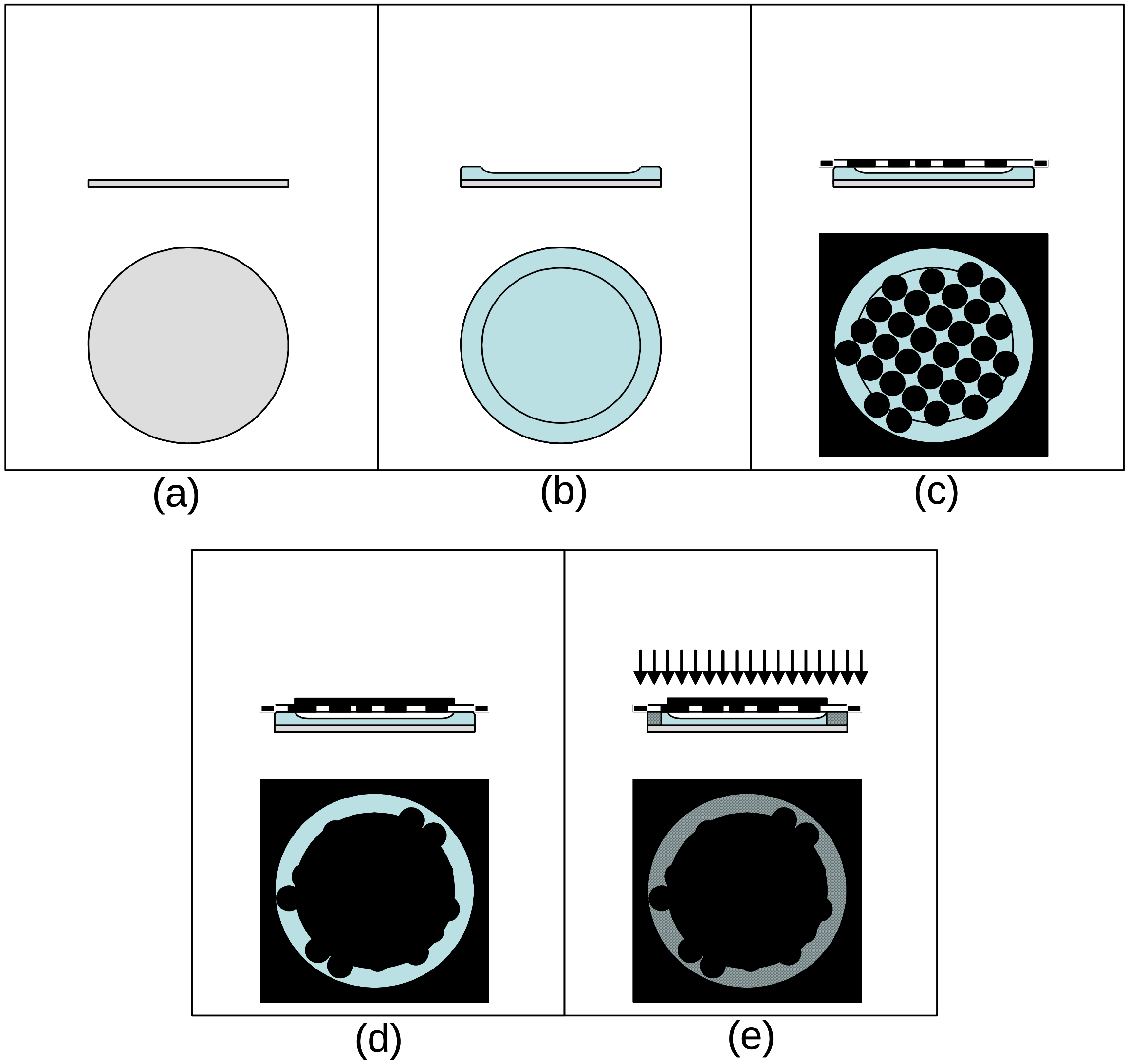


Figure 5.8 Additional Process Steps

At this point, the form of the SU8 that remains on the wafer is that of an exposed ridge, of appropriate thickness, with a thin, unexposed area in the middle, 5.9 (a). Next, a small puddle of SU8 in a less viscous formulation, SU8-2025, is placed in the center of this area 5.9 (b). It is important that no air bubbles are entrained in the SU8-2025 in this step. Next, this puddle is spread out evenly over the surface of the wafer, using a glass plate or another object that is smooth and long enough to span across the entire wafer 5.9 (c). At this point, the exposed SU8 is in the shape of a dish which contains a puddle of liquid, low viscosity SU8-2025. The wafer is then placed flat in an oven at a low baking temperature for a long period of time to allow the solvents to be expelled from the SU8-2025; 75 ºC for a period of 15-16 hours works well.

When it is removed from the oven, the thickness of the SU8 is fairly constant across the surface of the wafer. At this point, the remaining portions of the SU8 need to be exposed to a dose of UV radiation. The mask is realigned to the pattern left from the first exposure, except this time there is no black tape on the mask. The SU8 is given a dose of UV radiation, figure 5.9 (e), and then undergoes its post expose bake.

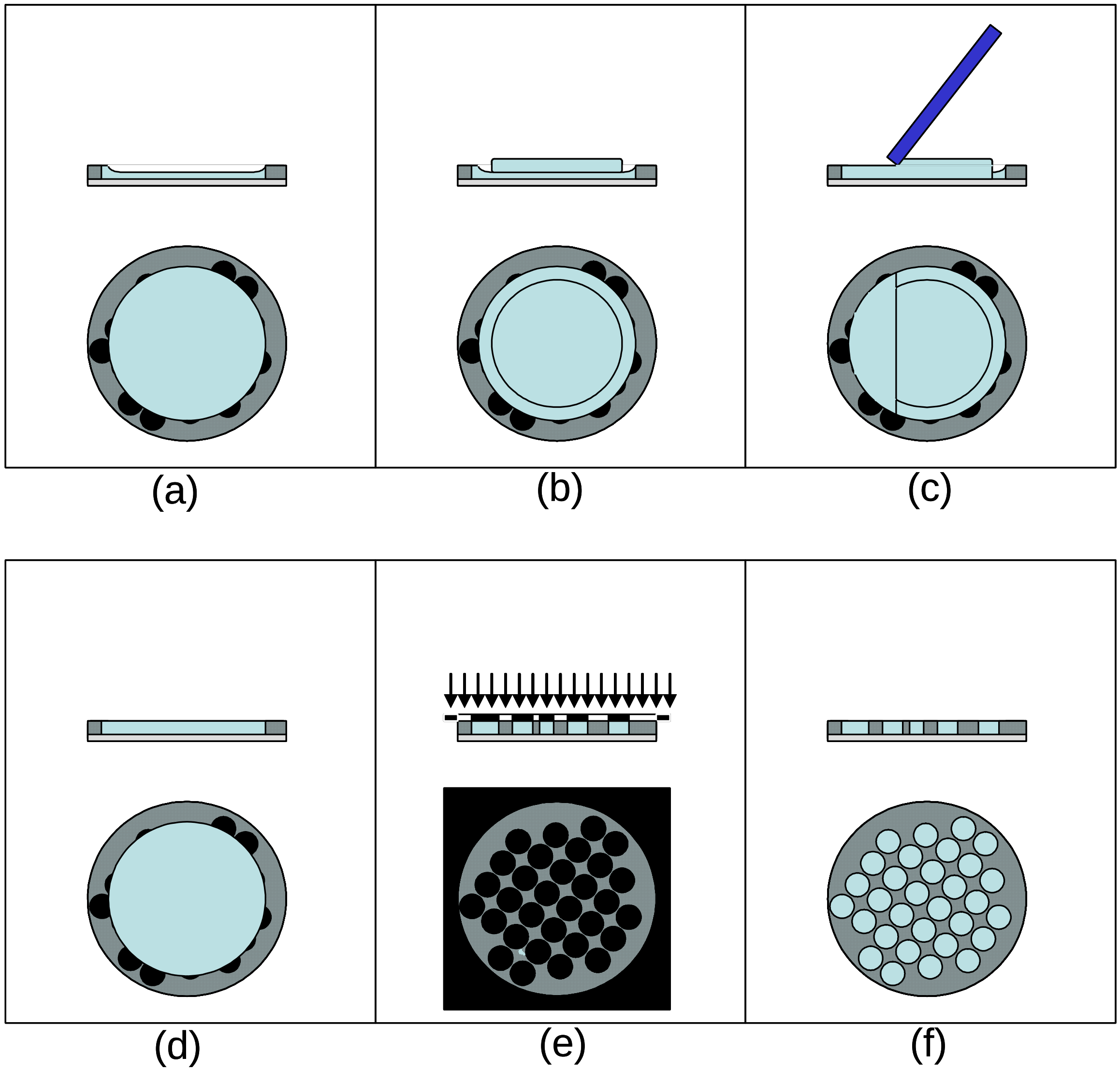


Figure 5.9. Additional Process Steps Continued

Altogether, these additional process steps roughly double the total amount of bake time needed to process a wafer, but the resulting pattern transfer and the yield are far superior to those fabricated without these additional steps. A typical product of thick layer SU8 deposition using these additional fabrication steps is shown below in Figure 5.10.

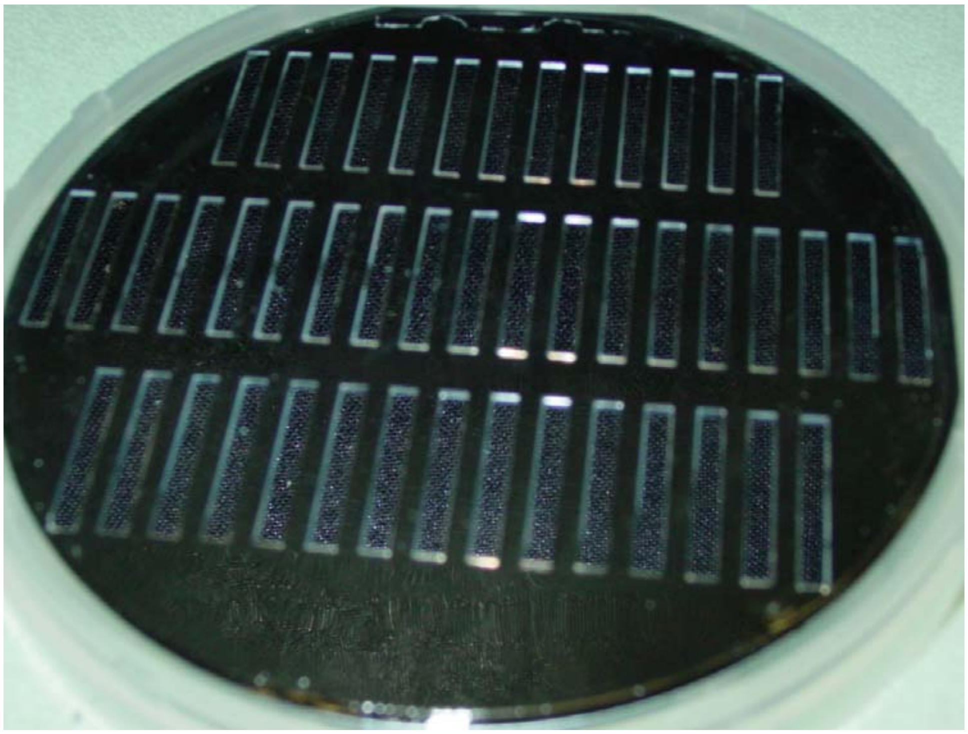


Figure 5.10 Typical Thick Layer SU8 Deposition Using Additional Fabrication Steps

CHAPTER 6

SU8 Nickel Micromolded Device

In the previous chapters, processes have been developed that will allow the fabrication of the refrigerant expansion device out of a metal using SU8 micromolds. Based on the findings of the device fabricated with DRIE and the limitations of SU8 micromolding, a number of changes were incorporated into this new design.

6.1 New Design

Nickel was selected as a new material because it is an easy metal to use for thick layer electroplating and it is substantially more ductile than silicon, which lowers the risk of catastrophic failure in a harsh environment. The electrodeposition method used to deposit nickel in this manner is also much less expensive than the fabrication techniques required to construct similar features from silicon. The most significant change to the design of the device is that the refrigerant flow passage is now incorporated directly into the device. This change eliminates many of the problems that occur during device assembly.

As a consequence of the design and fabrication process changes, the new design must be fabricated in three pieces, the diaphragm/piston section, the flow channel section, and the flow channel cap section.

The diaphragm/piston section is comprised of a thin circular membrane with a cylindrical piston located in its center and a ring on its perimeter to add stability. A sketch of this piece is shown in Figure 6.1.

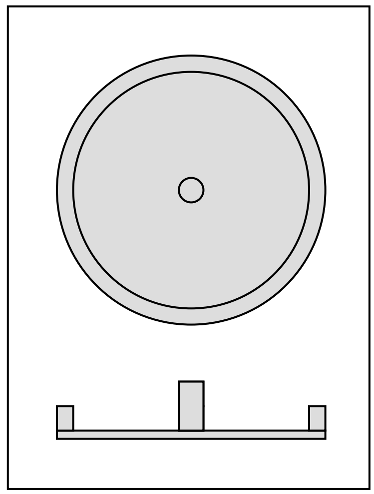


Figure 6.1 Sketch of Piston/Diaphragm Piece

Next, the flow channel section is comprised of a flat, circular mass of material with a pass through hole in the center. On one side of this piece are two vertical walls, separated by a gap such that they lie on either side of the pass through hole. These walls and the portion of the disk that lies between them make up the bottom and sides of the refrigerant flow passage. The flow passage extends a short distance beyond the perimeter of the circular disk so that connections to fluidic conduits may be made later. A sketch of the flow channel section piece is shown in Figure 6.2.

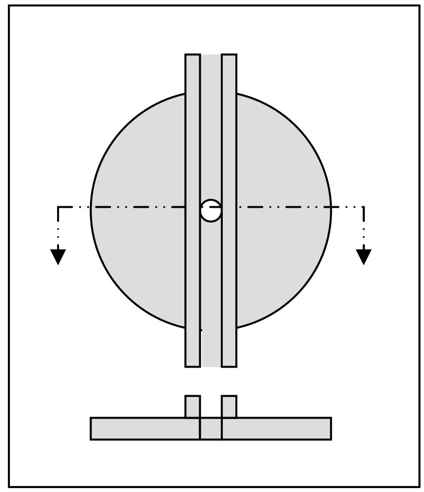


Figure 6.2 Sketch of Flow Channel Piece

The third piece is the flow channel cap section. It is simply a piece of material which seals the top of the refrigerant flow channel. This piece is comprised of a section which spans the length of the flow channel and contains a wall on either side to clasp onto the channel. A sketch of this piece is shown in Figure 6.3.

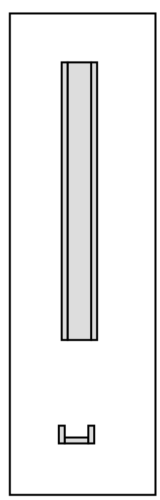


Figure 6.3 Sketch of Flow Channel Cap Piece

The three pieces are assembled as shown in Figure 6.4.

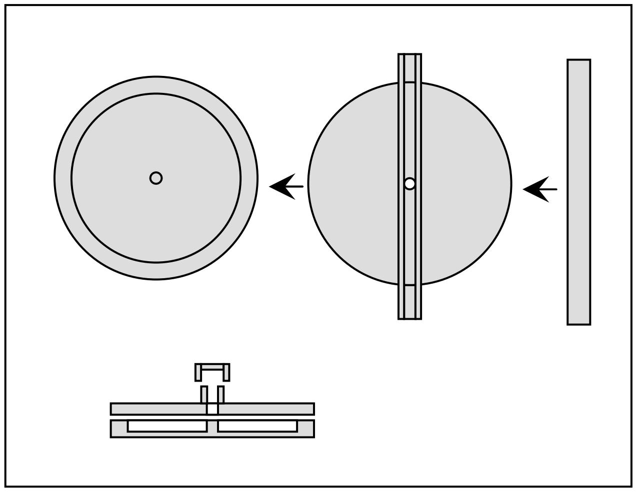


Figure 6.4 Assembly of the Micromolded Pieces

The first step to fabricating these pieces is to calculate the dimensions that are required to allow the device to operate through its desired range of motion. The flow channel was designed to be of rectangular cross section with a height of 500 μm and a width of 1000 μm. In order to close off this channel, the piston must have a 500 μm range of motion.

A spreadsheet, similar to that generated for the silicon prototype, was created to calculate the required dimensions of the nickel pieces. The mechanical properties of electroplated nickel were acquired from [60]. Young's modulus and the yield strength of electroplated nickel were found to be substantially different from cast nickel, and these properties are also affected by the current density used during the electrodeposition. The properties used for this analysis corresponded to a current density of 12.7 mA/cm^2, which is equivalent to a current of 1 Ampere over the surface area of a 100 mm diameter wafer.

The value of Poisson's ratio was taken to be 0.31 [61]. The values used for this analysis are:

E=18.8 GPa

σ_y=770 MPa

The calculations detailed in section 5 of this report were repeated with these material properties. The radius of the diaphragm was chosen to be 6200 μm (~1/4") and the selected thickness was 150 μm. The required deflection of 500 μm was held constant on this spreadsheet, as this was the minimum acceptable height of the refrigerant flow channel, and it is desired to ultimately close this channel with the piston. These dimensions result in a factor of safety of 3.5.

6.2 Fabrication

The three pieces which make up the device were fabricated using the nickel micromolding procedure. A total of 7 photolithography masks were created for the three pieces. The masks used for this work were produced by high resolution (5080 dpi) printing of the mask layers onto transparency film.

The diaphragm/piston piece was fabricated in the following manner. This device has three distinct layers; therefore, it required a three-mask process. The first mask defines the top half of the piston; the second mask defines the bottom half of the piston and the ring attached to the perimeter of the diaphragm; and the third mask defines the diaphragm. Since SU8 is a negative tone photoresist, the final pieces that are to be formed of metal were drawn as dark fields on the photolithography masks. An array of

31 identical devices was able to fit onto each mask, given the dimensions of the features. Drawings of the three masks used to fabricate the molds for this piece are shown in Figure 6.5.

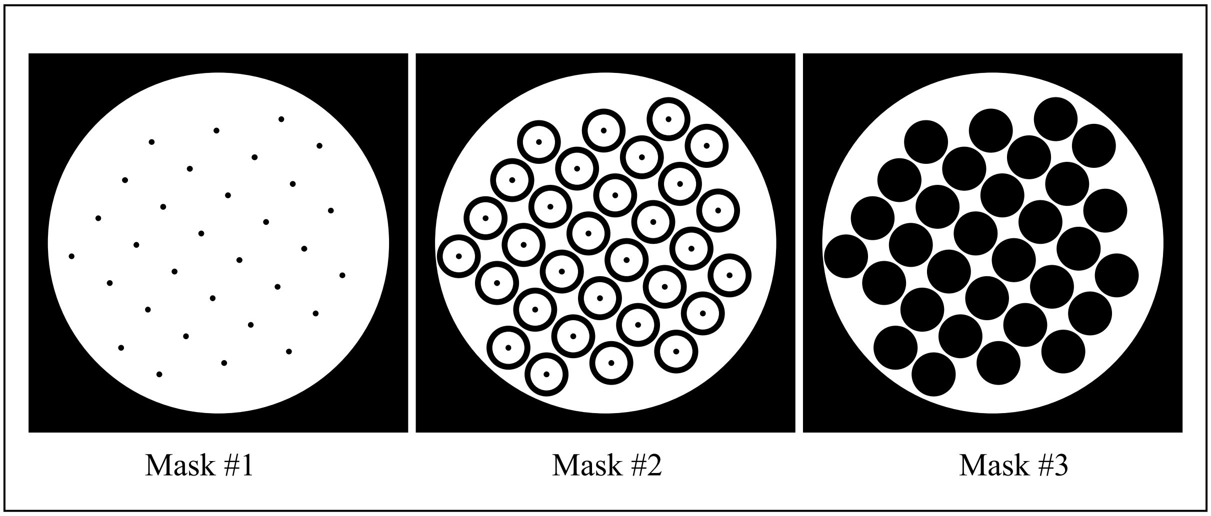


Figure 6.5 Masks used to Fabricate Molds for Piston/Diaphragm Piece

The flow channel piece and the flow channel cap piece each contain two distinct layers; therefore, a two-mask process is required to fabricate these molds. The masks for the flow channel piece are shown in Figure 6.6. Using this arrangement an array of 31 devices was able to fit on each mask. The mask designated Mask #4 defines the area which sits atop the diaphragm/piston piece, with a small opening in the center to define the pass through. Mask #5 defines the area which will make up the side walls of the refrigerant flow passage.

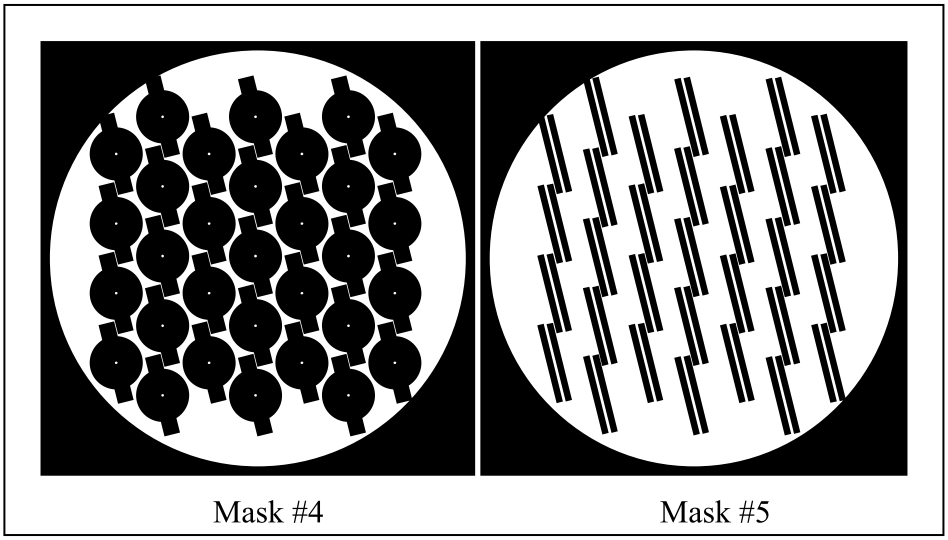


Figure 6.6 Masks used to Fabricate Molds for Flow Channel Piece

The masks needed to fabricate the flow channel cap piece are shown Figure 6.7. The area needed to fabricate this piece is significantly less than the other pieces; therefore, more of them can be made during a process run. Using this arrangement an array of 47 devices was able to fit on each mask. The mask designated Mask #6 defines the walls of the flow channel cap. Mask #7 defines the area which will seal the top of the refrigerant flow passage.

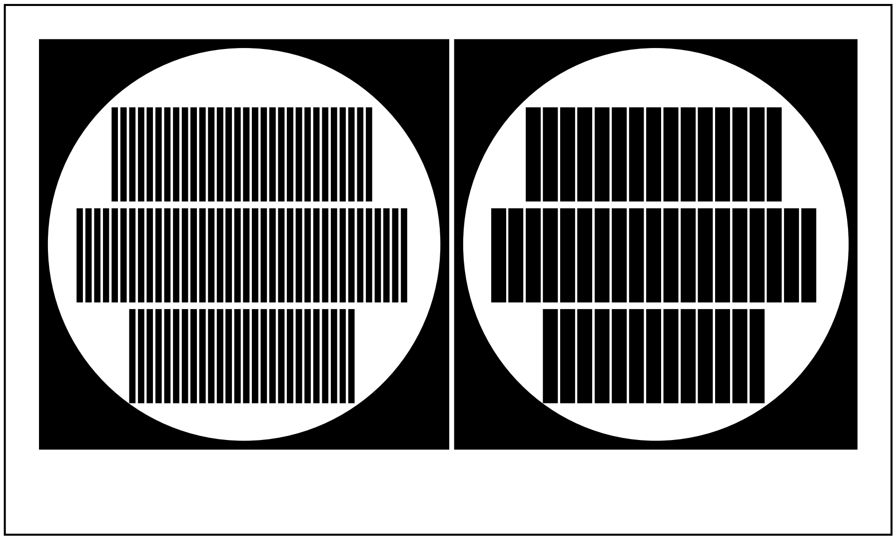


Figure 6.7 Masks used to Fabricate Molds for Flow Channel Cap Piece

In the following recipes, all liquid SU8 was brought to a temperature of 25 ºC prior to dispensing onto the wafers. Also, all temperature changes imposed on the wafer (baking ramp-up and cool-down) were done at a rate of 10 ºC/minute or less to avoid problems with rapid temperature change. The process flow for this device began with soaking 900 μm thick silicon wafers in hydrofluoric acid for 10 minutes to remove any silicon dioxide. The wafers were then rinsed with de-ionized water and allowed to dehydrate on a hot plate for 30 minutes at 120 °C. Figure 6.8 depicts the process flow for fabricating the molding for the piston/diaphragm pieces. A 40 μm thick layer of SU8-2025 was spun onto the wafer at 2000 RPM, soft baked for 10 minutes on a level hot plate at 95 ºC, and flood exposed with 1.77 J/cm^2 of UV radiation with no mask (i). This step coated the entire wafer with a 40 μm thick layer of cross linked SU8 so that the metal layers (to be deposited later) will not contact the silicon and can be easily removed.

After the "sacrificial" layer of SU8 was deposited, a layer of SU8-2100 was spun onto the wafer at 1000 RPM, and soft baked (soft bake #2) at 95 ºC for 60 minutes, to deposit a 250 micron thick ridge of SU8 onto the wafer. After soft bake #2, the spin on process (SU8-2100 at 1000 RPM) was repeated, and the wafer was soft baked again (soft bake #3) at 95 ºC for 60 minutes.

At this point, the wafer was covered with an exposed 40 μm layer of SU8. On top of this was an unexposed layer of SU8, with a thickness of 500 μm near the outer edge and much thinner near the center (ii). The wafer was sandwiched between mask #1 and a glass plate. The two glass plates were held in together using 8 binder clips along their outer edge. Upon securing the clips, a clearly visible distinction could be made between SU8 in contact with the mask and the areas where SU8 was not in contact with the mask (iii). Opaque, black electrical tape was placed over the areas where the SU8 was not in contact with the mask, so that only the thicker, outer edge of the SU8 could be seen through the mask (iv). A dose of 5.4 J/cm^2 was administered to the SU8 on the wafer (v). Next, the mask was removed and a puddle of low viscosity SU8-2025 was placed in the center of the wafer (vi). The SU8-2025 was then smoothed into place using a glass plate (vii) and placed into a low temperature oven at 75 ºC for 18 hours. Upon removing the wafer from the oven, it could be seen that the resulting layer of SU8 was level. The wafer was once again sandwiched between mask #1 and a glass plate, using 8 binder clips. This time, the mask #1 was aligned to the previous exposure, and no black tape was necessary because all of the SU8 was seen to be in contact with the mask. The wafer was then given a 5.4 J/cm^2 dose of ultraviolet radiation (viii). This completed the patterning of the first 500 micron thick layer of the micromold (ix).

Next, fabrication steps (ii) through (viii) were repeated using mask #2 (x). This time, mask #2 was aligned to the features left by mask #1 for the first exposure (with black tape), and to the features left by itself for the second exposure. This completed the patterning of the second 500 micron thick layer of the micromold.

Finally, a layer of SU8-2100 was spun onto the wafer at 1850 RPM, corresponding to a thickness of 150 microns. The wafer was then soft baked at 95 ºC for 35 minutes. Following the soft bake, the wafer was sandwiched between mask #3 and a glass plate, black tape was placed over the non-contact areas, and the wafer was given a dose of 3.3 J/cm^2. The wafer was then filled in with SU8-2025 in the same manner and placed in an oven overnight for 24 hours at 75 ºC. The wafer was then realigned to mask #3 and administered the same dose of 3.3 J/cm2 (xi), and placed back into the oven at 75 ºC for 19 hours. This completed the final lithography step for the mold fabrication.

The wafer was then developed in PGMEA. Development of molds this tall is a very slow process as well. The wafers were submerged in PGMEA and agitated. The progress was periodically checked with isopropyl alcohol and the developer solution was changed every 20 minutes. During this process run, development took approximately 1 hour and 20 minutes (xii).

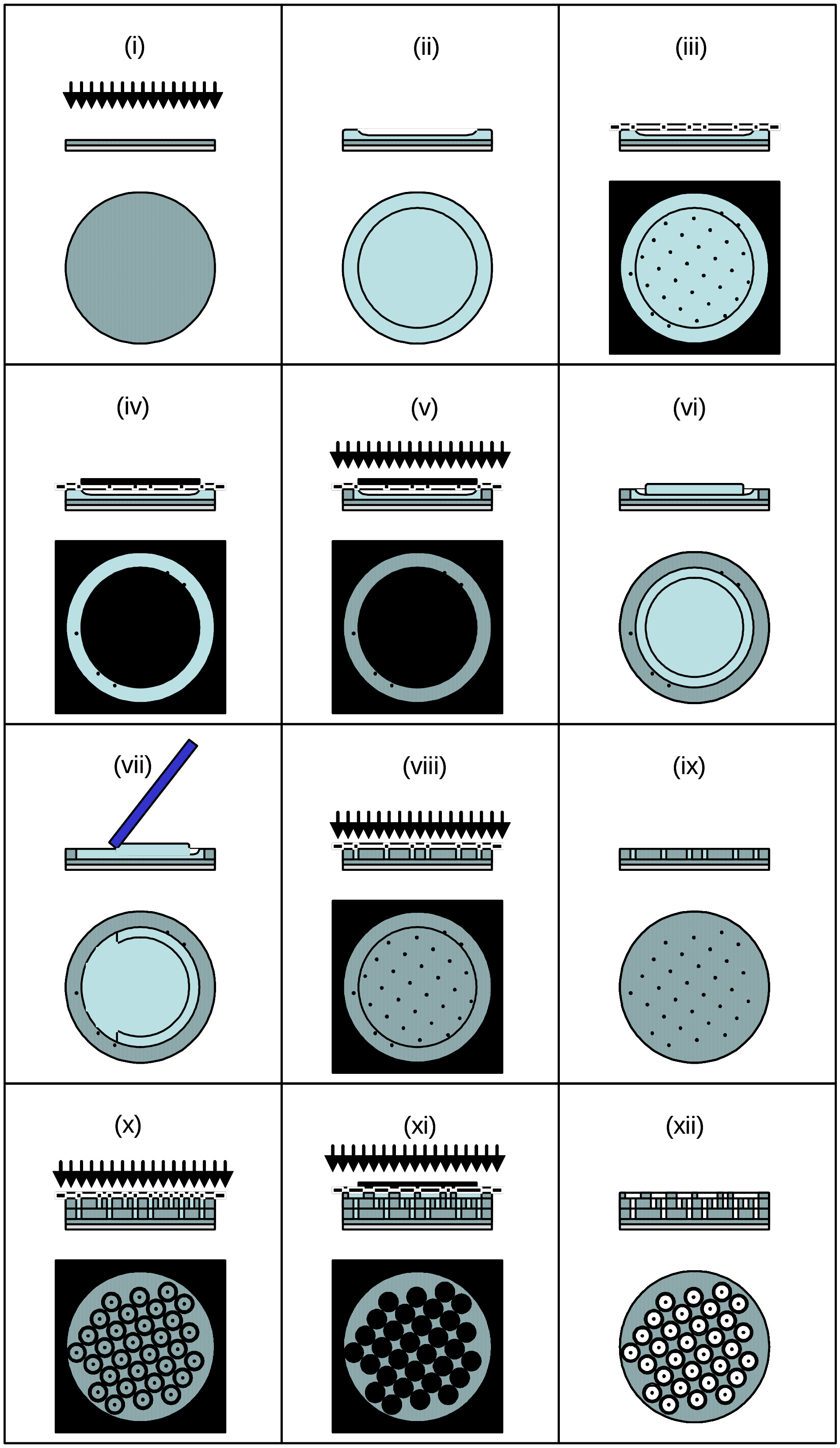


Figure 6.8 Process Flow for Fabrication of Piston/Diaphragm Molding

The same process was used to fabricate the flow channel pieces and the flow channel cap pieces with the exception that the top layer (step xi) was not needed for these devices as they are two-layer devices. The other difference is that these two wafers were given a slightly longer post exposure bake of 24.5 hours.

Once the molding was completed, a 4800 Å layer of gold was sputtered over the entire surface of the cross linked SU8. Gold was selected for this purpose because it is a good electrical conductor and its deposition rate through sputtering is very fast in comparison to other metals (approximately 500 Å/min). Also, it has been noted that gold has the worst adhesion to SU8; therefore, it will make it easier to eject the fabricated parts from the SU8 molds.

The next step was to deposit nickel into the molding. A large beaker containing a solution of 51 % nickel sulfamate was warmed to 65 °C on a hot plate. The wafer containing the molding was placed in the beaker along with a 100 mm X 150 mm X 3 mm (4" X 6" X 1/8") strip of alloy 200 nickel (>99.5 % Ni). Electrical wires were secured to the nickel strip and to the gold layer with alligator clips. These wires were connected to a DC power supply as shown in Figure 6.9.

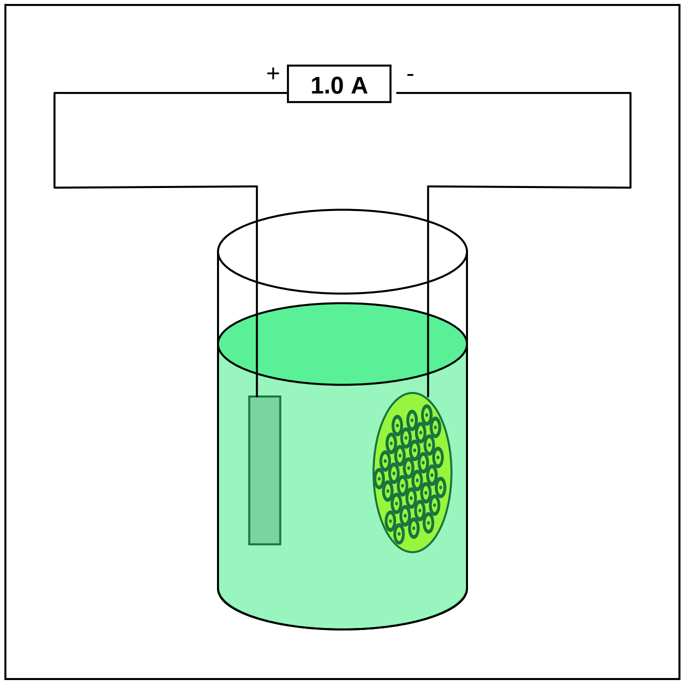


Figure 6.9 Electroplating Apparatus

A steady DC current of 1.0 Amp was held between the base plate and wafer. An estimate of the time required to fill the molds was calculated at this current for the piston/diaphragm piece. The estimate was based on assumptions that the volume of nickel transferred from the anode to the cathode was equivalent to 1150 µm in thickness over the entire surface of the wafer, that 2 electrons were transferred through the power source in order to deposit each atom of nickel, and the atomic packing density of nickel (face centered cubic) is 74 %. The resulting estimate showed it would take 73.5 hours of electroplating to fill the molds; therefore, the electroplating process was run for 91 hours to ensure that enough nickel had been deposited. Similarly, estimated electroplating times were calculated for the flow channel piece and the flow channel cap piece based on a 1,000 µm thick layer deposition. It was estimated that these devices would take approximately 64 hours to electroplate at a current of 1 Amp; therefore, the process was performed for 80 hours.

After the molds had been filled, the nickel was polished down until SU8 was exposed. At this point, the nickel devices were removed from the mold by placing the wafer on a 500 °C hot plate for 10 seconds. This thermal shock caused the SU8 to fracture and eject the nickel pieces.

6.3 Feature Characterization

The features of the micromolded pieces were measured and compared to expectations. A general observation about the SU8 molding is that the effects of edge beading were vastly improved by the additional fabrication steps. For this fabrication run, the yield of usable product was generally around 70 %. The exact tolerances of the best pieces were generally good; the main hindrance to better pattern transfer was the number of exposure alignments. This can, however, be improved by using proper alignment equipment in the future; although it may not be necessary for many applications.

Since this fabrication process is experimental, each piece is inherently unique. Therefore for the sake of brevity, a full characterization of only one of each of the pieces that were assembled to form the device will be presented in this section. Obviously the best devices on each wafer were used for the assembly; therefore this section does not represent the characterization of the average device on the wafer. The features fabricated during this process run are larger than what can be measured using a profilometer;

therefore, although less accurate, a micrometer was used to measure most of the results. The accuracy of the micrometer was +/- 3 μm. Features that are not measurable with a micrometer due to their geometry or orientation were characterized using the microscope focus dial method.

6.3.1 Piston/Diaphragm Piece

Figure 6.10 shows a photograph of the top of a piston. The intended geometry of the piston was to be that of a cylinder 1,000 μm tall, with a diameter of 950 μm. The diameter at the top of the post measured 900 μm and 913 μm along two different chords. The red circle shown on this figure outlines the intended feature geometry.

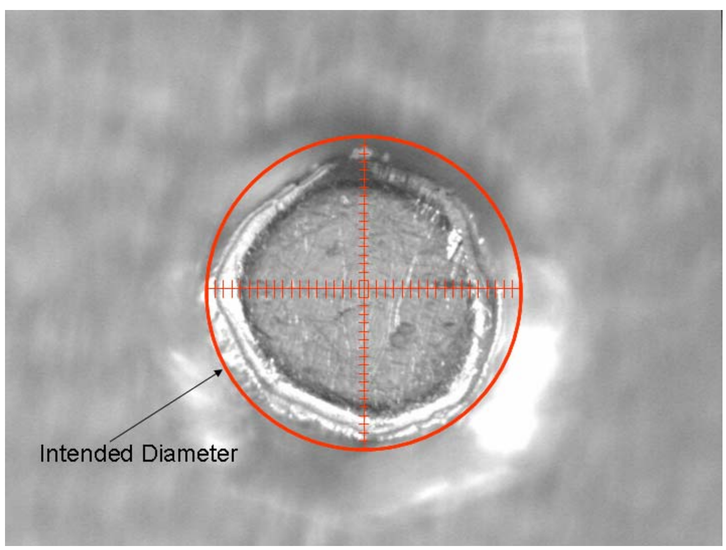


Figure 6.10 Characterization Photograph: Top of Piston

It can be seen from this photograph that the opening in the SU8 mold was slightly larger than intended. This is because SU8 is a negative type photoresist, and any misalignment or scattering will result in areas near the dark fields receiving some UV radiation. Also, there is some difficulty developing the SU8 near the bottom of the trenches, which correspond to features at the top of the piston. Since the edges at the bottom of the SU8 trenches are sharp internal corners, it is difficult to dissolve and remove all of the unexposed SU8. This results in rounded edges near the top of the micromolded features. Figure 6.11 is a photograph of the piston, taken from an angle to show the profile.

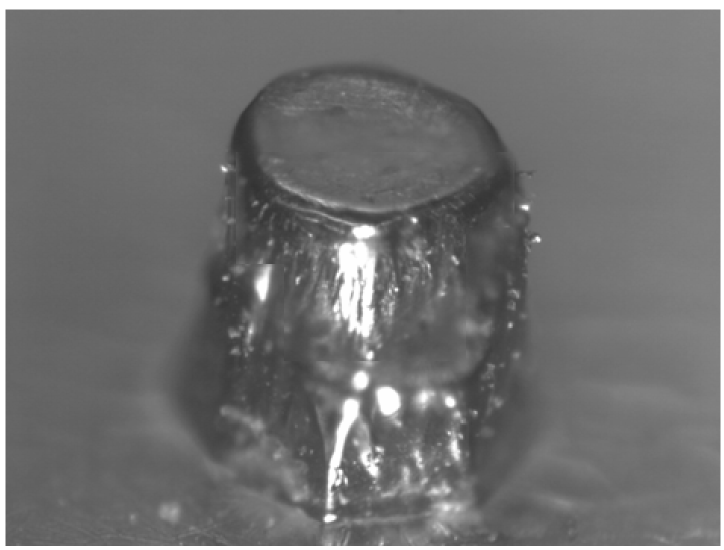


Figure 6.11 Side Profile of Piston

The figure shows that the top of the piston is slightly thinner than the bottom, and that the edges are rounder near the top of the piston. Notice that the orthogonal geometry near the bottom of the piston gives way to a smooth section near the top.

The next feature of this device to be analyzed is the ridge which stabilizes the perimeter of the diaphragm. The ridge was intended to be 500 μm in width and 500 μm tall. Measurements were taken around the ridge at the locations shown in Figure 6.12.

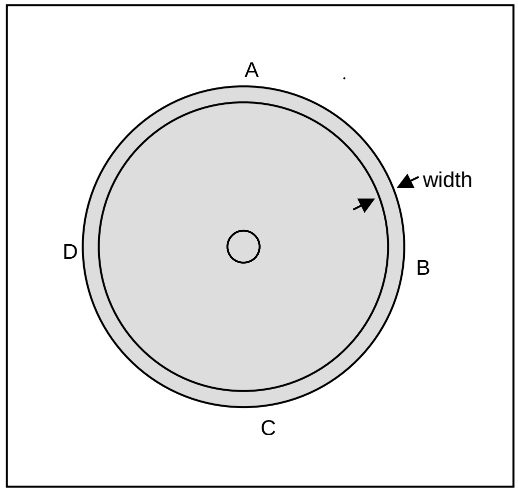


Figure 6.12 Locations of Characterization Measurements for Piston/Diaphragm Piece

The width of the ridge was measured with a micrometer to be 500 μm, 520 μm, 500 μm, and 540 μm in locations A, B, C, and D, respectively. The reason why this feature is wider than intended in some locations is because of the photolithography masks. The pattern transfer was quite good here, but the method used to make the masks has some limitations.

The layouts for the masks were drawn using AutoCAD 14 and then exported as encapsulated postscript files using Adobe Illustrator 8.0. Next, these postscript files were then printed on transparency film at a resolution of 5080 dpi. The limitations of Illustrator are such that it cannot comprehend smooth curves and they are consequently represented as a series of triangles. Therefore, some of the smoothness of the curves is lost. Figure 6.13a is a magnified clipping from the postscript file used to make Mask #2. It is apparent from this file that images of smooth curves will not be transferred as such. The resulting image transfer is illustrated by Figure 6.13b, which shows a portion of one of the ridges.

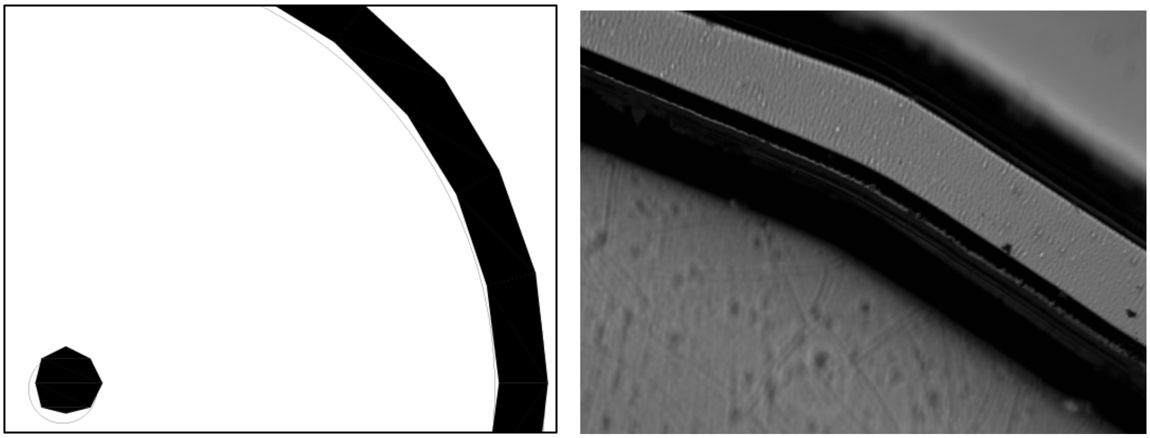


Figure 6.13 a) Portion of Mask #2 b) Resulting Curvature

This affected every non-rectilinear feature, although it is most pronounced in the example shown above. For the purposes of this device, however, this is quite acceptable. There is no reason why this would affect the performance of the device, but it is necessary to document for the purpose of SU8 micromolding procedure development.

The next feature that was examined was the thickness of the membrane. This could not be measured directly; therefore, it was calculated as the difference between the ridge height on the inner and outer edges. The height of the outer edge was measured with a micrometer. The height of the inner edge was measured using the microscope adjustment dial. The measurements at locations shown in Figure 6.12 are tabulated in Table 6.1 below.

Table 6.1 Measurements of Diaphragm Thickness

Location	Outer Ridge Height (μm)	Inner Ridge Height (μm)	Diaphragm Thickness (μm)
A	655	495	160
B	650	500	150
C	645	505	140
D	648	497	151

The value of the diaphragm's thickness varied a little bit from location to location. This is mainly because the diaphragm was manually polished to its final thickness. The average of the thickness measurements is 150.25 μm, and this is very close to the intended value of 150 μm.

The height of this piston was also very close to the intended height. This is because a significant amount of the fabrication effort was centered around zeroing in on the parameters that would yield the appropriate SU8 thickness. The piston height was measured by subtracting the diaphragm thickness from the overall height of the piston and diaphragm, measured with a micrometer. The piston height plus diaphragm thickness is 1143 μm, therefore the piston itself is 993 μm tall.

6.3.2 Flow Channel Piece

The features of the flow channel piece were measured in locations indicated by the points in Figure 6.14. For this device, all features were measured using a micrometer.

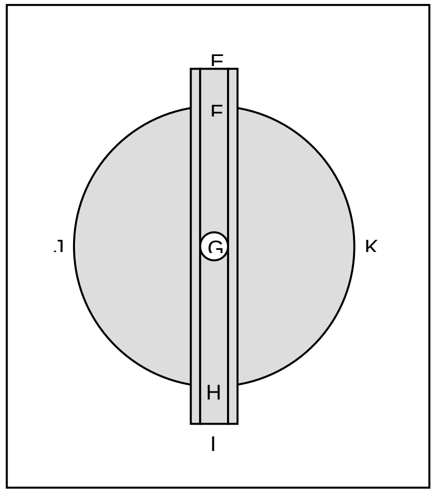


Figure 6.14 Locations of Characterization Measurements for Flow Channel Piece

The measurements of plate thickness, wall height, and wall width at these locations are tabulated in Table 6.2. The target value for each of these features is 500 μm. The target value for the channel width was 1000 μm.

Table 6.2 Measurements for Flow Channel Piece

Location	Plate Thickness (μm)	Channel Width (μm)	Left Wall		Right Wall	
			Height (μm)	Width (μm)	Height (μm)	Width (μm)
E	450	1050	400	400	375	300
F	450	1080	400	400	375	300
G	NA	1100	300	300	300	300
H	360	1080	390	300	400	300
I	320	1100	400	300	400	300
J	500					
K	500					

The measured plate thickness was slightly thinner than the target thickness of 500 μm near one of the edges. This is again because the back ends of these devices were polished manually, and there is a degree of difficulty in keeping the wafer perfectly parallel to the sand paper. This should not affect the performance of the device, since the affected area is merely a point of connection to the tubing that supplies the flow through the device.

Figure 6.15a shows a photograph of one of the channel walls. It can be seen from this photograph that the walls have a slight trapezoidal shape to them where the top of the flow channel wall is thinner than the bottom. This is likely the result of the same factors explained for the piston being too narrow. Distortion of the channel walls for this piece, and also those on the flow channel cap piece, will not affect the performance of the device. This is because these pieces are used to establish a gap between the top and bottom of the flow channel. As long as a 500 μm gap can be maintained on each end of the channel, the flow channel itself will be 500 μm tall, regardless of the lengthwise profile of the walls.

Figure 6.15b is a picture of the center hole of this piece. The opening of this hole, measured with a micrometer, is 1,092 μm in the direction perpendicular to the channel walls and 1,078 μm in the direction parallel to the walls. The intended shape was to be a circular opening with a diameter of 1,000 μm. The main cause of this slight distortion is due to the pattern on the photolithography mask. This is inferred from the shape of the hole. The edge looks more like a series of straight lines than a continuous curve.

Figure 6.15 a) Photograph of Channel Wall b) Photograph of Channel Through Hole

Figure 6.16 is a photograph of the top of the piston from the piston/diaphragm piece assembled to the through port on the flow channel piece. As detailed earlier, the target diameter for the piston was 950 μm and that of the port was 1,000 μm; while the diameters as fabricated are between 900 μm and 913 μm for the piston and between 1,078 μm and 1,092 μm for the port.

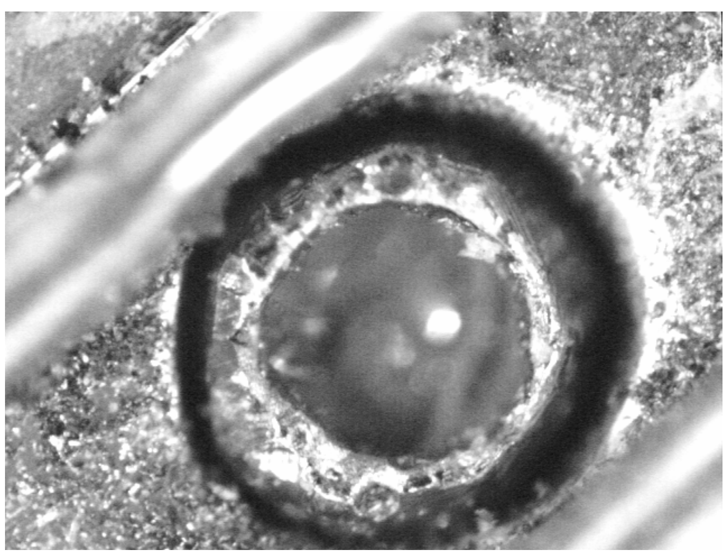


Figure 6.16 Piston and Port Assembly

In all instances, the distortion that occurs with SU8 would not prevent the device from functioning. This is because SU8 is a negative photoresist, therefore any errors due to alignment or scattering will cause cured SU8 to be present where it is not wanted. Also, any problems due to underdevelopment will also leave SU8 where it is not wanted. Ultimately, any imperfections in the pattern transfer will result in the nickel pieces having structures that are thinner than desired and open areas being wider than desired. If this were not the case, then a less than perfect pattern transfer could result in nickel pieces that would not properly assemble. In the case shown above in figure 6.16, the gap left between the piston and the edges of the port is between 82.5 μm and 96 μm, depending on location; the desired gap is 25 μm uniformly around the piston. Therefore, the piston will still be able to enter the flow passage, but it will not have the ability to completely seal it off.

6.3.3 Flow Channel Cap Piece

The features of the flow channel cap piece were measured in locations indicated by the points in Figure 6.17. For this device, all features were measured using a micrometer.

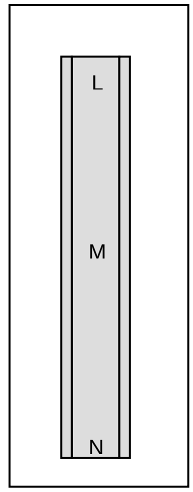


Figure 6.17 Locations of Characterization Measurements for Flow Channel Cap Piece

The measurements of wall height and thickness at these locations are tabulated in Table 6.3. The target value for each of these features is 500 μm.

Table 6.3 Measurements for Flow Channel Cap Piece

Location	Left Wall		Right Wall	
	Height (μm)	Width (μm)	Height (μm)	Width (μm)
L	440	300	500	350
M	500	300	500	350
N	500	300	500	350

The features on this piece showed similar distortions as the channel walls on the flow channel piece, which is to be expected. Again, these distortions should not affect the performance of the device, since the walls merely serve as a spacer.

6.4 Assembly

Many different options were examined before a method of assembling this prototype was devised. The assembly procedure used for the silicon prototype proved undesirable because it was difficult to seal the oil cavity with epoxy. Also, once a working prototype was assembled, the epoxy that held the silicon pieces to the oil cavity proved to be quite flexible which substantially degraded the motion of the piston. Ultimately, such a device would most likely be assembled using a technique similar to [62], but an alternative method must be used for this device due to the mask layouts.

Soldering the pieces to each other and to the oil cavity was an attractive option; however, this presented obstacles which needed to be overcome. Soldering offers a great deal of comfort in terms of creating a seal between the pieces that can withstand high pressure. The difficulty of soldering these pieces together lies in keeping molten solder from flowing into the thin flow channel. The flow channel is a conduit that is approximately 500 μm tall by 1,000 μm wide, which makes it a good conduit for capillary forces to draw molten solder.

Using a laser to weld the pieces together offers the benefits of superior seals between the pieces and to the capsule. The drawbacks associated with this method are the start up time and cost associated with devising a good method of guiding the laser around the perimeter to create a quality, uniform seal. For this reason, energy and time was focused towards solving the difficulties of soldering these pieces.

Rather than machining an oil capsule for this prototype, commercially available fittings were used. This allows for the possibility of disassembly and repair should the oil leak from the cavity. The cavity was made from two Swagelok fittings; the top portion is a 3/8" to 3/8" tube to female NPT fitting and the bottom portion is a 1/16" tube to ¼" male NPT fitting.

The top portion of the oil capsule is shown below in Figure 6.18a. The left hand side of this fitting is a 3/8" compression fitting, which has an outer diameter of 12,700 µm (½"). The size of the piston/diaphragm molded piece was designed to fit on top of this opening. The bottom portion of the capsule is shown in Figure 6.18b. The left hand side of this fitting fits into the other fitting. The right hand side allows a connection to a 1/16" tube, which will be used for a thermocouple probe. When these two pieces are assembled, a void of approximately 2.0 to 2.5 mL is left between them, which will be filled with oil when the assembly is complete.

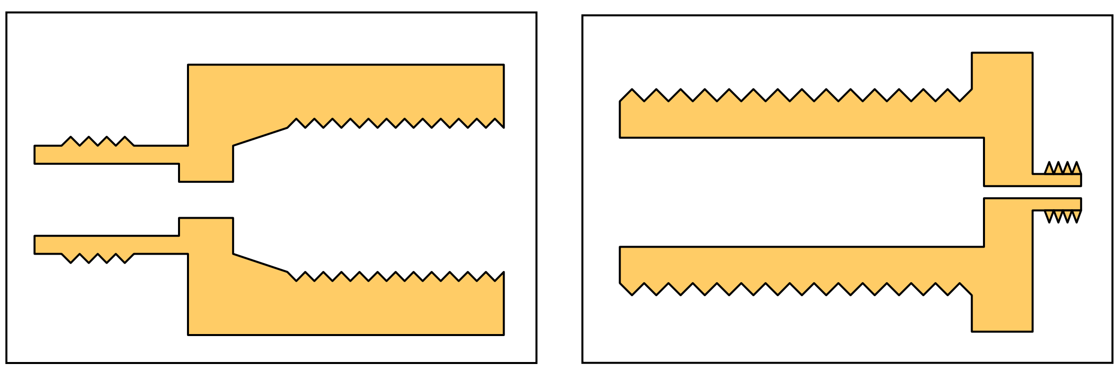


Figure 6.18 a)Top portion of oil capsule b) Bottom portion of oil capsule

In order to properly solder these pieces together and to the top of the oil capsule, they had to be held together, therefore they were spot welded. Welding does not work very well between nickel and brass due to conflicting material properties. Also it is not possible to form a seal that would withstand high pressure in the manner; however, this did work well enough to hold the pieces together so that the assembly could be soldered.

The capsule and pieces were soldered together using a hot plate. Soldering flux was carefully painted into the crevices where solder was desired using a thin wire. Ground up chards of silver solder was then placed on and around the soldering flux and the assembly was placed onto the hot plate. The assembly was monitored while it heated towards the melting point of the solder. Once the solder melted, it was drawn into the crevices and the assembly was quickly removed from the hot plate.

Visual inspection showed that this method formed a continuous seal in all areas. The capsule top was then pressure tested by connecting 1 MPa (150 psi) of compressed air to the back end and submersing the assembly in water. No bubbles were present, indicating that the diaphragm/piston piece was well connected to the capsule. This portion of the assembly is shown below in Figure 6.19.

Figure 6.19 Oil Capsule Top Connected to Flow Restrictor

For the next step, a 14.4 Ohm electric resistance heating element was placed into the bottom portion of the oil capsule and its wires were fed through a 1.5 mm (1/16”) diameter hole that was drilled through the rear of the fitting. The heater wires were secured into the hole with refrigerant epoxy. The bottom portion of the oil capsule is shown below in Figure 6.20.

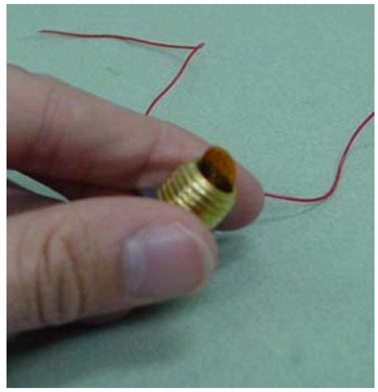


Figure 6.20 Bottom Portion of the Oil Capsule, Including Heater

Next, the two portions of the capsule were fixed together. The reservoir was then filled with 2.1 mL of polyalkalene glycol at a temperature of 24.3 °C, through the compression fitting hole. A thermocouple, calibrated to +/-0.15 °F, was then secured into this hole.

The measurements taken from the device characterization and the amount and initial temperature of oil were used in a prediction of performance spreadsheet. Figure 6.21 shows the predicted displacement of the piston in this assembly.

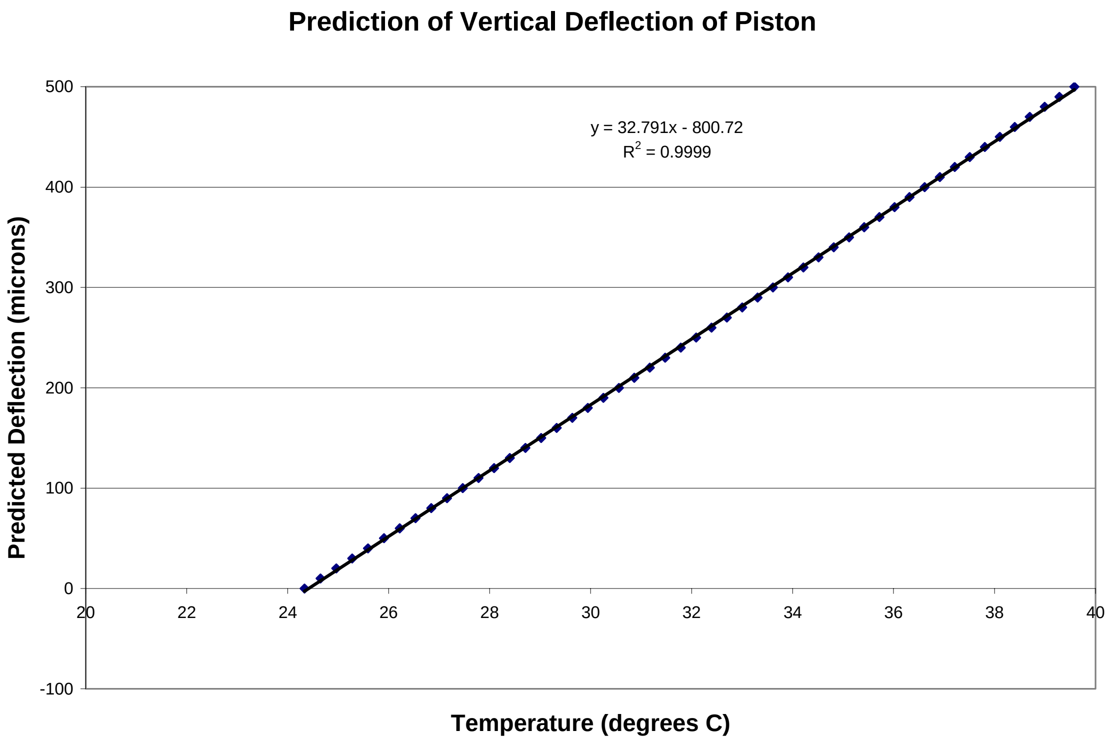


Figure 6.21 Predicted Displacement of Piston

According to the prediction curve, the tip of the piston should reach the top of the flow channel when the oil reservoir temperature is 39.6 °C (103.3 °F). There should be some flexibility in the other components surrounding the oil reservoir, but not nearly to the extent that was seen while testing the silicon prototype, since this prototype was soldered together. In the interest of avoiding problems with the piston pushing against the top of the channel, it is not desired to test the device far beyond this point.

6.5 Measured Piston Actuation

Figure 6.21 served as a tool to estimate the motion of the piston while testing the prototype's ability to control flow. In order to truly know the position of the piston, it is necessary to have a measured curve of the relationship between oil temperature and piston position. However, this could only be found through destructive testing. Therefore, after all of the flow experiments were carried out with this device, the flow channel cap piece was cut from the prototype and measurements were taken using the microscope method outlined in Chapter 4 of this dissertation. Figure 6.22 shows the results of these measurements.

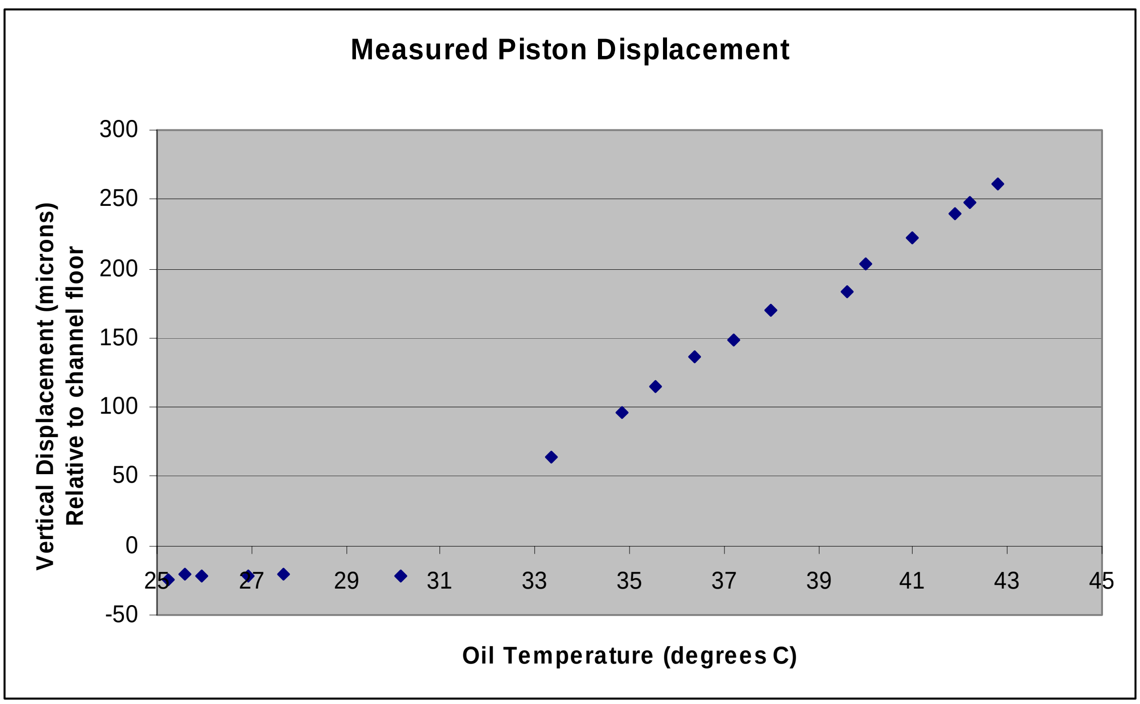


Figure 6.22 Characterization of Piston Displacement for Nickel Micromolded Prototype

There are three useful bits of information that came from these measurements. First, the results of these measurements show that the piston does not exhibit significant motion until the oil temperature is warmed past approximately 30 ºC. The most logical explanation for this is that a small air bubble must be present within the capsule, and that the expanding oil must first collapse this bubble before a significant amount of pressure can be applied to the diaphragm.

The second piece of information is the relationship between oil temperature and displacement. Once the piston begins to move with changes in the oil temperature the relationship is linear, as was expected, but the slope of the curve is different than the predicted slope. The measured slope was determined from a best fit straight line through the points above 30 ºC oil temperature. The slope of this line is 20.19 microns/ºC, which is about 2/3 of the predicted slope.

The third piece of information is that, when unactuated, the top of the piston lies approximately 20-25 microns below the surface of the channel floor.

CHAPTER 7

Temporal Response Analysis

The speed at which the device actuates is a rather complicated feature to analyze. It is dependent on the properties of the oil in the reservoir, the properties of the materials making up the capsule, the mass of these materials, the geometry of the capsule, the heater input, and the ambient conditions outside of the capsule.

There are many tradeoffs that must be considered when designing the capsule. As an example, if the amount of oil contained within the capsule is decreased, the thermal mass of this system decreases which tends to speed up the device's response time. Concurrently, the temperature change which must be realized to flex the diaphragm increases, which typically slows down the device's response time. All in all, most design parameters influence the response time in more than one way, and every aspect must be taken into account.

From an initial design and testing point of view, there exists a tradeoff between controllability and response. At this stage of development, controllability is far more important. Although a fast responding device may ultimately be desired, this may be counterproductive to the initial design and testing phase because the user must be able to react faster than the device. Therefore, at this stage of design, the device was designed and assembled in such a way that the oil reservoir and chamber have a large thermal capacitance; i.e. the device will respond slowly to heat input.

What follows in this chapter is an analysis to predict the response time of the device as it was designed. Ultimately, this type of analysis would be used as a design tool which would enable an engineer to speed up the device's response.

7.1 Overview

Since this device is made up of multiple materials, has multiple boundary conditions, and a complex geometry, an analytical solution is impossible to determine. Therefore, a numerical approach is used to determine how fast the oil in the reservoir will change temperature in response to a change in the heater output. Before this can be determined, it is necessary to ascertain the physics of this situation. A sketch of the capsule is shown below in Figure 7.1

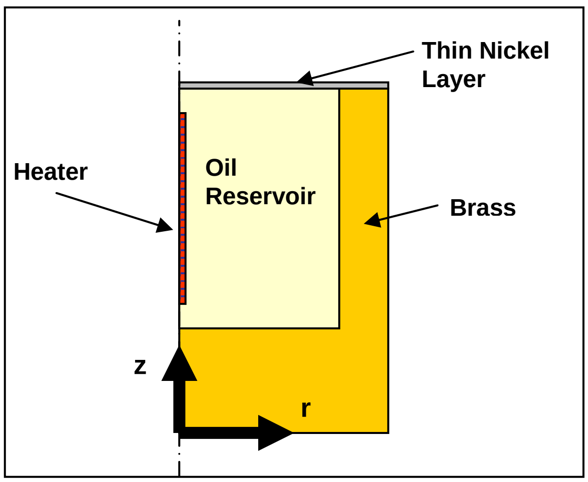


Figure 7.1 Sketch of Capsule

The capsule is approximated by a cylindrical vessel and it is assumed that there are no rotational effects; therefore, a 2-dimensional analysis is adequate. The capsule containing the oil consists of a brass piece that makes up the bottom and sides, and a thin nickel membrane at the top. A heater is located near the center of the capsule. The outer edge of the brass part of the capsule is exposed to ambient conditions. The top of the membrane is exposed to the fluid that is passing through the device.

As the heater is powered up, heat is dissipated into the oil reservoir. This raises the temperature of the oil, which changes its density and flexes the membrane outward. As the temperature of the oil is raised, it dissipates heat to the ambient through the brass portion and to the fluid in the channel through the nickel membrane. At some point, the temperature will stabilize; i.e. the energy input from the heater will balance with the dissipation through the brass and nickel sides of the capsule.

The first step is to identify the mode of heat transfer that is occurring within the capsule. The oil inside the capsule is a liquid and there are no forced currents; therefore, the initial assumption is that energy is being transferred through natural convection. Certain thermodynamic properties of this particular oil are not known; therefore, they are approximated by the properties of glycerin [63].

$$\nu = 0.00831\frac{m^2}{s}$$
$$k = 0.282\frac{W}{mK}$$
$$C_P = 2261\frac{J}{kgK}$$

The Grashof number is calculated in order to verify or reject the occurrence of natural convection in the capsule. The oil capsule has dimensions of 12.6 mm in diameter and 24 mm in height. The characteristic length is found by the ratio of the capsule volume to that of the internal surface area, or one quarter of the diameter, L_c=3.15 mm. The temperature differences within this capsule are typically 10-20K; cautiously estimating the Grashof number based on a temperature difference of 40K results in:

$$Gr = \frac{g\beta\Delta T L_c{}^3}{\nu^2} = \frac{\left(9.8\frac{m}{s^2}\right)\left(0.0003775\frac{1}{K}\right)(40K)(0.00315m)^3}{\left(0.00831\frac{m^2}{s}\right)^2} = 6.7\times10^{-5}$$

Natural convection can be neglected for Gr<10^4 [64]. Since this situation represents more than eight orders of magnitude below this limit, it is safe to assume that the energy is transferred through the oil solely through conduction.

7.2 Derivation of Nodal Equations

The heat conduction equation in 2-dimensional radial coordinates without heat generation is shown below for points within a single, continuous medium:

$$\frac{1}{r}\frac{\partial}{\partial r}\left(kr\frac{\partial T}{\partial r}\right)+\frac{\partial}{\partial z}\left(k\frac{\partial T}{\partial z}\right)=\rho C_p\frac{\partial T}{\partial t}$$

By assuming that the material properties do not change within the limits of a medium (oil, brass, or nickel), this equation becomes:

$$\frac{1}{r}\left(\frac{\partial T}{\partial r}+r\frac{\partial^2 T}{\partial r^2}\right)+\frac{\partial^2 T}{\partial z^2}=\frac{1}{\alpha}\frac{\partial T}{\partial t}$$

Next, the coordinates are discretized $(r,z)\rightarrow(m\Delta r,n\Delta z)$ and the equation can be written in the form:

$$\frac{1}{m\cdot\Delta r}\left(\frac{T_{(m+1,n)}-T_{(m,n)}}{m\cdot\Delta r}+m\cdot\Delta r\frac{T_{(m+1,n)}+T_{(m-1,n)}-2T_{(m,n)}}{(\Delta r)^2}\right)+\left(\frac{T_{(m,n+1)}+T_{(m,n-1)}-2T_{(m,n)}}{(\Delta z)^2}\right)=\frac{1}{\alpha(\Delta t)}\left(T_{(m,n)}\Big|_{t+\Delta t}-T_{(m,n)}\Big|_t\right)$$

Or more apt for computer calculations:

$$\boxed{T_{(m,n)}\Big|_{t+\Delta t}=T_{(m,n)}\Big|_t+\frac{\alpha(\Delta t)}{(a\cdot\Delta r)^2}\left(T_{(m+1,n)}-T_{(m,n)}+m^2\left(T_{(m+1,n)}+T_{(m-1,n)}-2T_{(m,n)}\right)\right)+\frac{\alpha(\Delta t)}{(\Delta z)^2}\left(T_{(m,n+1)}+T_{(m,n-1)}-2T_{(m,n)}\right)}$$

This is the general form that can be used to calculate the temperature distribution as time is marched forward. In addition to the relationship derived above, special relationships must be derived for nodes that are aligned to a change in medium, i.e. the oil-brass interface, oil-nickel interface, and the brass-nickel interface.

For medium changes that occur along a horizontal line, the relationship is derived as follows, where A and B represent the two media:

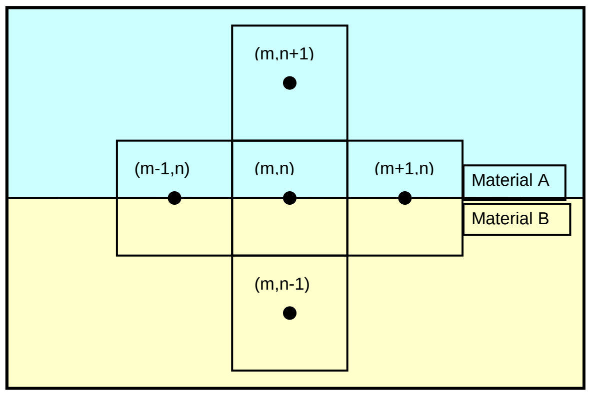


Figure 7.2 Nodal Network for Horizontal Medium Change

The energy transferred into and out of the node in the radial direction is:

$$\frac{1}{2}(k_A+k_B)\left\{\left(m-\frac{1}{2}\right)\Delta r\Delta\Theta\Delta z\right\}\frac{1}{\Delta r}\left(T_{(m-1,n)}-T_{(m,n)}\right)-\frac{1}{2}(k_A+k_B)\left\{\left(m+\frac{1}{2}\right)\Delta r\Delta\Theta\Delta z\right\}\frac{1}{\Delta r}\left(T_{(m,n)}-T_{(m+1,n)}\right)$$

Which is simplified to:

$$(\Delta r\Delta\Theta\Delta z)\frac{(k_A+k_B)}{2\Delta r}\left\{\left(m-\frac{1}{2}\right)\left(T_{(m-1,n)}-T_{(m,n)}\right)-\left(m+\frac{1}{2}\right)\left(T_{(m,n)}-T_{(m+1,n)}\right)\right\}$$

The energy transferred into and out of the node in the vertical direction is:

$$k_B(m\Delta r\Delta\Theta\Delta r)\frac{1}{\Delta z}\left(T_{(m,n-1)}-T_{(m,n)}\right)-k_A(m\Delta r\Delta\Theta\Delta r)\frac{1}{\Delta z}\left(T_{(m,n)}-T_{(m,n+1)}\right)$$

Which is simplified to:

$$\left(\Delta r\Delta\Theta\Delta z\right)\frac{m\Delta r}{\left(\Delta z\right)^2}\left\{k_B\left(T_{(m,n-1)}-T_{(m,n)}\right)-k_A\left(T_{(m,n)}-T_{(m,n+1)}\right)\right\}$$

And the energy stored in the node is:

$$\rho C_P\forall\frac{\Delta T}{\Delta t}=\rho C_P\left(m\Delta r\Delta\Theta\right)\left(\Delta r\right)\left(\Delta z\right)\frac{\Delta T}{\Delta t}=\left(\Delta r\Delta\Theta\Delta z\right)\left\{\frac{m\Delta r}{2}\left(\rho_A C_{P_A}+\rho_B C_{P_B}\right)\right\}\frac{\left(T_{(m,n)}\Big|_{t+\Delta t}-T_{(m,n)}\Big|_t\right)}{\Delta t}$$

Canceling similar terms and assembling these terms results in the following relationship:

$$\left\{\frac{m\Delta r}{2}\left(\rho_A C_{P_A}+\rho_B C_{P_B}\right)\right\}\frac{\left(T_{(m,n)}\Big|_{t+\Delta t}-T_{(m,n)}\Big|_t\right)}{\Delta t}=\frac{\left(k_A+k_B\right)}{2\Delta r}\left\{\left(m-\frac{1}{2}\right)\left(T_{(m-1,n)}-T_{(m,n)}\right)-\left(m+\frac{1}{2}\right)\left(T_{(m,n)}-T_{(m+1,n)}\right)\right\}$$
$$+\frac{m\Delta r}{\left(\Delta z\right)^2}\left\{k_B\left(T_{(m,n-1)}-T_{(m,n)}\right)-k_A\left(T_{(m,n)}-T_{(m,n+1)}\right)\right\}$$

Which can then be rewritten as:

$$\boxed{\begin{aligned}T_{(m,n)}\Big|_{t+\Delta t}&=T_{(m,n)}\Big|_t+\frac{\left(k_A+k_B\right)\Delta t}{m\left(\Delta r\right)^2\left(\rho_A C_{P_A}+\rho_B C_{P_B}\right)}\left\{\left(m-\frac{1}{2}\right)\left(T_{(m-1,n)}-T_{(m,n)}\right)-\left(m+\frac{1}{2}\right)\left(T_{(m,n)}-T_{(m+1,n)}\right)\right\}\\&+\frac{2\Delta t}{\left(\rho_A C_{P_A}+\rho_B C_{P_B}\right)\left(\Delta z\right)^2}\left\{k_B\left(T_{(m,n-1)}-T_{(m,n)}\right)-k_A\left(T_{(m,n)}-T_{(m,n+1)}\right)\right\}\end{aligned}}$$

This relationship can then be used to calculate the temperature distribution along a change of medium that takes place in the horizontal direction.

Similarly, a relationship is needed to calculate the heat transfer along a set of points that correspond to a change of medium in the vertical direction.

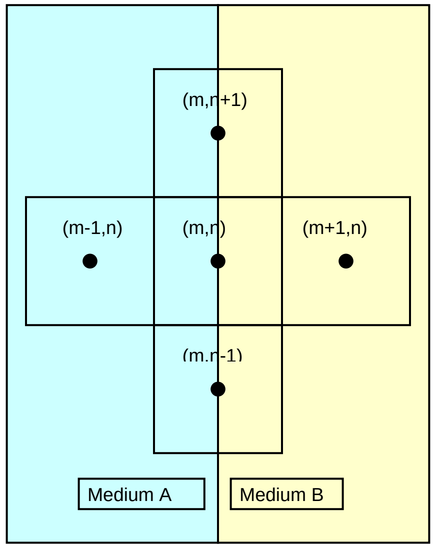


Figure 7.3 Nodal Network for Vertical Medium Change

The energy transferred into and out of the node in the radial direction is:

$$k_A\left[\left(m-\frac{1}{2}\right)\Delta r\Delta\Theta\Delta z\right]\frac{1}{\Delta r}\left(T_{(m-1,n)}-T_{(m,n)}\right)-k_B\left[\left(m+\frac{1}{2}\right)\Delta r\Delta\Theta\Delta z\right]\frac{1}{\Delta r}\left(T_{(m,n)}-T_{(m+1,n)}\right)$$

Which is simplified to:

$$\left(\Delta r\Delta\Theta\Delta z\right)\left\{\frac{k_A}{\Delta r}\left[\left(m-\frac{1}{2}\right)\left(T_{(m-1,n)}-T_{(m,n)}\right)\right]-\frac{k_B}{\Delta r}\left[\left(m+\frac{1}{2}\right)\left(T_{(m,n)}-T_{(m+1,n)}\right)\right]\right\}$$

The energy transferred into and out of the node in the vertical direction is:

$$\frac{1}{2}\left(k_A+k_B\right)\left(m\Delta r\Delta\Theta\Delta r\right)\frac{1}{\Delta z}\left(T_{(m,n-1)}-T_{(m,n)}\right)-\frac{1}{2}\left(k_A+k_B\right)\left(m\Delta r\Delta\Theta\Delta r\right)\frac{1}{\Delta z}\left(T_{(m,n)}-T_{(m,n+1)}\right)$$

Which is simplified to:

$$\frac{m\left(k_A+k_B\right)\Delta r}{2\left(\Delta z\right)^2}\left(\Delta r\Delta\Theta\Delta z\right)\left(T_{(m,n-1)}+T_{(m,n+1)}-2T_{(m,n)}\right)$$

And the energy stored in the node is:

$$\rho C_P\forall\frac{\Delta T}{\Delta t}=\left(\Delta r\Delta\Theta\Delta z\right)\left\{\frac{m\Delta r}{2}\left(\rho_A C_{P_A}+\rho_B C_{P_B}\right)\right\}\frac{\left(T_{(m,n)}\Big|_{t+\Delta t}-T_{(m,n)}\Big|_{t}\right)}{\Delta t}$$

Canceling similar terms and assembling these terms results in the following relationship:

$$\left\{\frac{m\Delta r}{2}\left(\rho_A C_{P_A}+\rho_B C_{P_B}\right)\right\}\frac{\left(T_{(m,n)}\Big|_{t+\Delta t}-T_{(m,n)}\Big|_{t}\right)}{\Delta t}=\left\{\frac{k_A}{\Delta r}\left[\left(m-\frac{1}{2}\right)\left(T_{(m-1,n)}-T_{(m,n)}\right)\right]-\frac{k_B}{\Delta r}\left[\left(m+\frac{1}{2}\right)\left(T_{(m,n)}-T_{(m+1,n)}\right)\right]\right\}$$
$$+\frac{m\left(k_A+k_B\right)\Delta r}{2\left(\Delta z\right)^2}\left(T_{(m,n-1)}+T_{(m,n+1)}-2T_{(m,n)}\right)$$

Which is rewritten as:

$$\boxed{\begin{aligned}T_{(m,n)}\Big|_{t+\Delta t}&=T_{(m,n)}\Big|_{t}+\frac{2\Delta t}{m\left(\Delta r\right)^2\left(\rho_A C_{P_A}+\rho_B C_{P_B}\right)}\left\{k_A\left[\left(m-\frac{1}{2}\right)\left(T_{(m-1,n)}-T_{(m,n)}\right)\right]-k_B\left[\left(m+\frac{1}{2}\right)\left(T_{(m,n)}-T_{(m+1,n)}\right)\right]\right\}\\&+\frac{\left(k_A+k_B\right)\Delta t}{\left(\rho_A C_{P_A}+\rho_B C_{P_B}\right)\left(\Delta z\right)^2}\left(T_{(m,n-1)}+T_{(m,n+1)}-2T_{(m,n)}\right)\end{aligned}}$$

This relationship can then be used to calculate the temperature distribution along a change of medium that takes place in the vertical direction. Within the geometry shown in Figure 7.1, there also exists two points where a change of medium occurs in corners. The first of these points is shown below in Figure 7.4

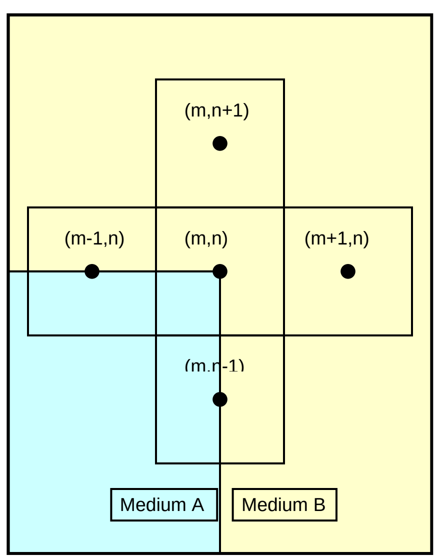


Figure 7.4 Nodal Network for Upper-Corner Medium Change

For this situation the energy transferred into and out of the node in the radial direction is:

$$\frac{1}{2}(k_A+k_B)\left[\left(m-\frac{1}{2}\right)\Delta r\Delta\Theta\Delta z\right]\frac{1}{\Delta r}\left(T_{(m-1,n)}-T_{(m,n)}\right)-k_B\left[\left(m+\frac{1}{2}\right)\Delta r\Delta\Theta\Delta z\right]\frac{1}{\Delta r}\left(T_{(m,n)}-T_{(m+1,n)}\right)$$

Which is simplified to:

$$(\Delta r\Delta\Theta\Delta z)\left\{\frac{(k_A+k_B)}{2\Delta r}\left[\left(m-\frac{1}{2}\right)\left(T_{(m-1,n)}-T_{(m,n)}\right)\right]-\frac{k_B}{\Delta r}\left[\left(m+\frac{1}{2}\right)\left(T_{(m,n)}-T_{(m+1,n)}\right)\right]\right\}$$

The energy transferred into and out of the node in the vertical direction is:

$$\frac{1}{2}(k_A+k_B)(m\Delta r\Delta\Theta\Delta r)\frac{1}{\Delta z}\left(T_{(m,n-1)}-T_{(m,n)}\right)-k_B\,(m\Delta r\Delta\Theta\Delta r)\frac{1}{\Delta z}\left(T_{(m,n)}-T_{(m,n+1)}\right)$$

Which is simplified to:

$$\frac{m\Delta r}{(\Delta z)^2}(\Delta r\Delta\Theta\Delta z)\left\{\frac{(k_A+k_B)}{2}\left(T_{(m,n-1)}-T_{(m,n)}\right)-k_B\left(T_{(m,n)}-T_{(m,n+1)}\right)\right\}$$

And the energy stored in the node is:

$$\rho C_P\forall\frac{\Delta T}{\Delta t}=(\Delta r\Delta\Theta\Delta z)\left\{\frac{m\Delta r}{4}\left(\rho_A C_{P_A}+3\rho_B C_{P_B}\right)\right\}\frac{\left(T_{(m,n)}\big|_{t+\Delta t}-T_{(m,n)}\big|_{t}\right)}{\Delta t}$$

Canceling similar terms and assembling these terms results in the following relationship:

$$\left\{\frac{m\Delta r}{4}\left(\rho_A C_{P_A}+3\rho_B C_{P_B}\right)\right\}\frac{\left(T_{(m,n)}\big|_{t+\Delta t}-T_{(m,n)}\big|_{t}\right)}{\Delta t}=\left\{\frac{(k_A+k_B)}{2\Delta r}\left[\left(m-\frac{1}{2}\right)\left(T_{(m-1,n)}-T_{(m,n)}\right)\right]-\frac{k_B}{\Delta r}\left[\left(m+\frac{1}{2}\right)\left(T_{(m,n)}-T_{(m+1,n)}\right)\right]\right\}$$
$$+\frac{m\Delta r}{(\Delta z)^2}\left\{\frac{(k_A+k_B)}{2}\left(T_{(m,n-1)}-T_{(m,n)}\right)-k_B\left(T_{(m,n)}-T_{(m,n+1)}\right)\right\}$$

Which is rewritten as:

$$\boxed{\begin{aligned}T_{(m,n)}\big|_{t+\Delta t}&=T_{(m,n)}\big|_{t}+\frac{4\Delta t}{m(\Delta r)^2\left(\rho_A C_{P_A}+3\rho_B C_{P_B}\right)}\left\{\frac{(k_A+k_B)}{2}\left[\left(m-\frac{1}{2}\right)\left(T_{(m-1,n)}-T_{(m,n)}\right)\right]-k_B\left[\left(m+\frac{1}{2}\right)\left(T_{(m,n)}-T_{(m+1,n)}\right)\right]\right\}\\&+\frac{4\Delta t}{\left(\rho_A C_{P_A}+3\rho_B C_{P_B}\right)(\Delta z)^2}\left\{\frac{(k_A+k_B)}{2}\left(T_{(m,n-1)}-T_{(m,n)}\right)-k_B\left(T_{(m,n)}-T_{(m,n+1)}\right)\right\}\end{aligned}}$$

This relationship can then be used to calculate the temperature distribution when a change of medium takes place in an upper internal corner. The relationship for the lower internal corner is derived next, Figure 7.5 shows this situation.

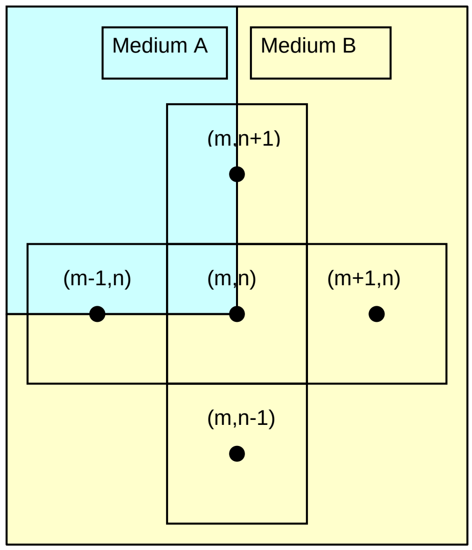


Figure 7.5 Nodal Network for Lower-Corner Medium Change

For this situation the energy transferred into and out of the node in the radial direction is the same as the previous case:

$$(\Delta r\Delta\Theta\Delta z)\left\{\frac{(k_A+k_B)}{2\Delta r}\left[\left(m-\frac{1}{2}\right)\left(T_{(m-1,n)}-T_{(m,n)}\right)\right]-\frac{k_B}{\Delta r}\left[\left(m+\frac{1}{2}\right)\left(T_{(m,n)}-T_{(m+1,n)}\right)\right]\right\}$$

The energy transferred into and out of the node in the vertical direction is:

$$k_B\left(m\Delta r\Delta\Theta\Delta r\right)\frac{1}{\Delta z}\left(T_{(m,n-1)}-T_{(m,n)}\right)-\frac{(k_A+k_B)}{2}\left(m\Delta r\Delta\Theta\Delta r\right)\frac{1}{\Delta z}\left(T_{(m,n)}-T_{(m,n+1)}\right)$$

Which is simplified to:

$$\frac{m\Delta r}{(\Delta z)^2}(\Delta r\Delta\Theta\Delta z)\left\{k_B\left(T_{(m,n-1)}-T_{(m,n)}\right)-\frac{(k_A+k_B)}{2}\left(T_{(m,n)}-T_{(m,n+1)}\right)\right\}$$

And the energy stored in the node is again:

$$\rho C_P \forall \frac{\Delta T}{\Delta t}=(\Delta r\Delta\Theta\Delta z)\left\{\frac{m\Delta r}{4}\left(\rho_A C_{P_A}+3\rho_B C_{P_B}\right)\right\}\frac{\left(T_{(m,n)}\big|_{t+\Delta t}-T_{(m,n)}\big|_t\right)}{\Delta t}$$

Canceling similar terms and assembling these terms results in the following relationship:

$$\left\{\frac{m\Delta r}{4}\left(\rho_A C_{P_B}+3\rho_B C_{P_B}\right)\right\}\frac{\left(T_{(m,n)}\big|_{t+\Delta t}-T_{(m,n)}\big|_t\right)}{\Delta t}=\left\{\frac{(k_A+k_B)}{2\Delta r}\left[\left(m-\frac{1}{2}\right)\left(T_{(m-1,n)}-T_{(m,n)}\right)\right]-\frac{k_B}{\Delta r}\left[\left(m+\frac{1}{2}\right)\left(T_{(m,n)}-T_{(m+1,n)}\right)\right]\right\}$$
$$+\frac{m\Delta r}{(\Delta z)^2}\left\{k_B\left(T_{(m,n-1)}-T_{(m,n)}\right)-\frac{(k_A+k_B)}{2}\left(T_{(m,n)}-T_{(m,n+1)}\right)\right\}$$

Which can be rewritten as:

$$\boxed{\begin{aligned}T_{(m,n)}\big|_{t+\Delta t}&=T_{(m,n)}\big|_t+\frac{4\Delta t}{m(\Delta r)^2\left(\rho_A C_{P_B}+3\rho_B C_{P_B}\right)}\left\{\frac{(k_A+k_B)}{2}\left[\left(m-\frac{1}{2}\right)\left(T_{(m-1,n)}-T_{(m,n)}\right)\right]-k_B\left[\left(m+\frac{1}{2}\right)\left(T_{(m,n)}-T_{(m+1,n)}\right)\right]\right\}\\&+\frac{4\Delta t}{\left(\rho_A C_{P_B}+3\rho_B C_{P_B}\right)(\Delta z)^2}\left\{k_B\left(T_{(m,n-1)}-T_{(m,n)}\right)-\frac{(k_A+k_B)}{2}\left(T_{(m,n)}-T_{(m,n+1)}\right)\right\}\end{aligned}}$$

This relationship can then be used to calculate the temperature distribution when a change of medium takes place in a lower internal corner.

Next, the nodes along the centerline (r=0) require a special derivation. For this case, a heat generation term is also included because it is assumed that the heater will reside along the centerline. See Figure 7.6 below. In this analysis, a simplification was used that assumes the heat generation occurs wholly within the centerline nodes. This is not completely accurate, but it is good for modeling purposes. Inaccuracies derived from this assumption are due to the resulting heat generating nodes which form a heater that is smaller than the actual heater. This will result in a warmer centerline temperature in the oil because the modeled heat flux must be greater than the actual heat flux to result in the same output.

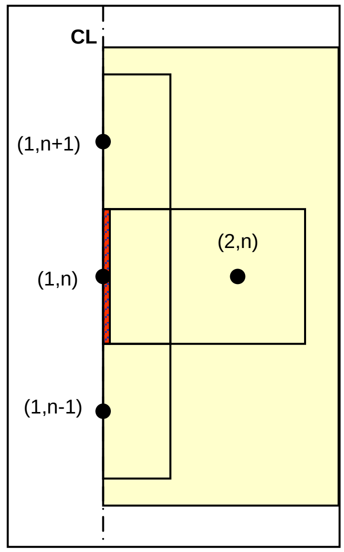


Figure 7.6 Nodal Network for Nodes Along Centerline

For this situation, symmetry dictates that there is no energy transferred into or out of the cells from the left hand side; therefore, the energy transferred in the radial direction is simply:

$$k\left(\frac{\Delta r}{2}\Delta\Theta\Delta z\right)\frac{1}{\Delta r}\left(T_{(2,n)}-T_{(1,n)}\right)$$

The energy transferred into and out of the node in the vertical direction is:

$$k\left(\frac{\Delta r}{8}\right)(\Delta\Theta\Delta r)\frac{1}{\Delta z}\left(T_{(1,n-1)}-T_{(1,n)}\right)-k\frac{\Delta r}{8}(\Delta\Theta\Delta r)\frac{1}{\Delta z}\left(T_{(1,n)}-T_{(1,n+1)}\right)$$

Which is simplified to:

$$\frac{k\Delta r}{8(\Delta z)^2}(\Delta r\Delta\Theta\Delta z)\left(T_{(1,n-1)}+T_{(1,n+1)}-2T_{(1,n)}\right)$$

The energy input to the node through the heater is simply:

$$\dot{q}_{gen} = q'''\forall = q'''\left(\frac{\Delta r}{8}\right)(\Delta r \Delta \Theta \Delta z)$$

And the energy stored in the node is again:

$$\rho C_P \forall \frac{\Delta T}{\Delta t} = \rho C_P \left(\frac{\Delta r}{8}\right)(\Delta r \Delta \Theta \Delta z)\frac{\left(T_{(m,n)}\Big|_{t+\Delta t} - T_{(m,n)}\Big|_{t}\right)}{\Delta t}$$

Canceling similar terms and assembling these terms results in the following relationship:

$$\left(\frac{\Delta r}{8\alpha}\right)\frac{\left(T_{(m,n)}\Big|_{t+\Delta t} - T_{(m,n)}\Big|_{t}\right)}{\Delta t} = \frac{1}{2\Delta r}\left(T_{(2,n)} - T_{(1,n)}\right) + \frac{\Delta r}{8(\Delta z)^2}\left(T_{(1,n-1)} + T_{(1,n+1)} - 2T_{(1,n)}\right) + q'''\left(\frac{\Delta r}{8k}\right)$$

Which can be rewritten as:

$$\boxed{T_{(m,n)}\Big|_{t+\Delta t} = T_{(m,n)}\Big|_{t} + \frac{4\alpha\Delta t}{(\Delta r)^2}\left(T_{(2,n)} - T_{(1,n)}\right) + \frac{\alpha\Delta t}{(\Delta z)^2}\left(T_{(1,n-1)} + T_{(1,n+1)} - 2T_{(1,n)}\right) + q'''\left(\frac{\alpha\Delta t}{k}\right)}$$

This relationship can then be used to calculate the temperature distribution along the centerline with heat generation.

Finally, relationship for the last case of a change of medium along the centerline is analyzed. For this case, the heat generation term is left out because the heater in the capsule resides only in the oil. See Figure 7.7 below.

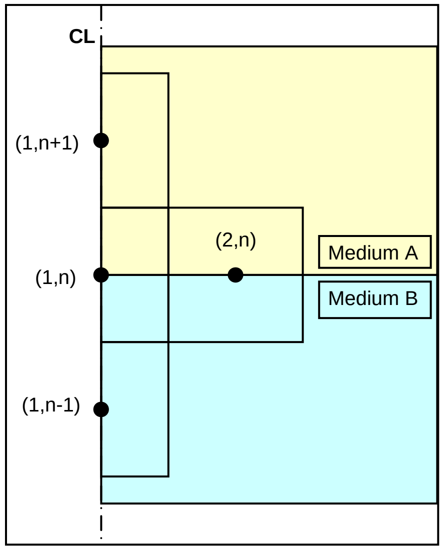


Figure 7.7 Nodal Network for Nodes Along Centerline with Medium Change

For this situation the energy transferred in the radial direction is:

$$\frac{(k_A + k_B)}{2}\left(\frac{\Delta r}{2}\Delta\Theta\Delta z\right)\frac{1}{\Delta r}\left(T_{(2,n)} - T_{(1,n)}\right)$$

The energy transferred into and out of the node in the vertical direction is:

$$k_B\left(\frac{\Delta r}{8}\right)(\Delta\Theta\Delta r)\frac{1}{\Delta z}\left(T_{(1,n-1)} - T_{(1,n)}\right) - k_A\frac{\Delta r}{8}(\Delta\Theta\Delta r)\frac{1}{\Delta z}\left(T_{(1,n)} - T_{(1,n+1)}\right)$$

Which is simplified to:

$$\frac{\Delta r(\Delta r\Delta\Theta\Delta z)}{8(\Delta z)^2}\left[k_B\left(T_{(1,n-1)} - T_{(1,n)}\right) + k_A\left(T_{(1,n+1)} - T_{(1,n)}\right)\right]$$

And the energy stored in the node is again:

$$\rho C_P \forall \frac{\Delta T}{\Delta t} = \frac{\left(\rho_A C_{P_A} + \rho_B C_{P_B}\right)}{2}\left(\frac{\Delta r}{8}\right)(\Delta r\Delta\Theta\Delta z)\frac{\left(T_{(m,n)}\big|_{t+\Delta t} - T_{(m,n)}\big|_{t}\right)}{\Delta t}$$

Canceling similar terms and assembling these terms results in the following relationship:

$$\frac{\left(\rho_A C_{P_A} + \rho_B C_{P_B}\right)}{2}\left(\frac{\Delta r}{8}\right)\frac{\left(T_{(m,n)}\big|_{t+\Delta t} - T_{(m,n)}\big|_t\right)}{\Delta t} = \frac{\left(k_A + k_B\right)}{4\Delta r}\left(T_{(2,n)} - T_{(1,n)}\right)$$

$$+\frac{\Delta r}{8(\Delta z)^2}\left[k_B\left(T_{(1,n-1)} - T_{(1,n)}\right) + k_A\left(T_{(1,n+1)} - T_{(1,n)}\right)\right]$$

Which is rewritten as:

$$\boxed{\begin{aligned} T_{(m,n)}\big|_{t+\Delta t} &= T_{(m,n)}\big|_t + \frac{4\left(k_A + k_B\right)\Delta t}{\left(\rho_A C_{P_A} + \rho_B C_{P_B}\right)\left(\Delta r\right)^2}\left(T_{(2,n)} - T_{(1,n)}\right) \\ &+ \frac{2\Delta t}{\left(\rho_A C_{P_A} + \rho_B C_{P_B}\right)\left(\Delta z\right)^2}\left[k_B\left(T_{(1,n-1)} - T_{(1,n)}\right) + k_A\left(T_{(1,n+1)} - T_{(1,n)}\right)\right] \end{aligned}}$$

This relationship can then be used to calculate the temperature distribution along the centerline at interfaces between two media.

7.3 Nodal Spacing and Code Structure

Now that relations have been established for each type of node in the domain, the node size and time step must be determined. Numerical codes involving forward marching in time require that each nodal solution have some dependence on its solution at the previous time step; therefore, the selection of an appropriate time step is critical for stability [59]. For simplicity, the node size is selected such that the radial increments are equal to the vertical increments, i.e. $\Delta r = \Delta z$. Then the dependence of a future time step's solution on the previous time step is found by gathering temperature terms for the (m,n) node.

$$T_{(m,n)}\big|_{t+\Delta t} = T_{(m,n)}\big|_t\left(1 - \frac{\alpha(\Delta t)}{(m\cdot\Delta r)^2} - \frac{2\alpha(\Delta t)}{(\Delta r)^2} + \frac{2\alpha(\Delta t)}{(\Delta z)^2}\right) + other\_terms$$

And checking the stability criterion at the limiting nodes along m=1, the relation of the previous time step to the future time step is:

$$T_{(m,n)}\Big|_{t+\Delta t} = T_{(m,n)}\Big|_{t}\left(1-\frac{5\alpha(\Delta t)}{(\Delta r)^2}\right)$$

In order to have stable iterations throughout the code, the time step must be selected such that

$$\left(1-\frac{5\alpha(\Delta t)}{(\Delta r)^2}\right) > 0$$

$$\therefore \Delta t < \frac{(\Delta r)^2}{5\alpha}$$

To begin this analysis, a nodal distance must be selected. Since the smallest feature on this device is the thickness of the membrane, at 150 microns, this is the largest possible node size. According to the relationship derived above, considering nodal spacing of 150 microns and the thermal properties of brass (the highest thermal diffusivity of all materials used here), the maximum allowable time step is 133 microseconds. Thus a time step of 100 microseconds will be used. Using the maximum spacing of 150 micron by 150 micron nodes, the grid for this device is represented by an array 52 nodes wide and 216 nodes tall, for an overall total of 11,232 nodes.

A C++ code was created to simulate the transient thermal response of the capsule [65]. The flowchart for this code consists is rather simplistic, it is seen below in Figure 7.8. The raw code can be found in Appendix A.

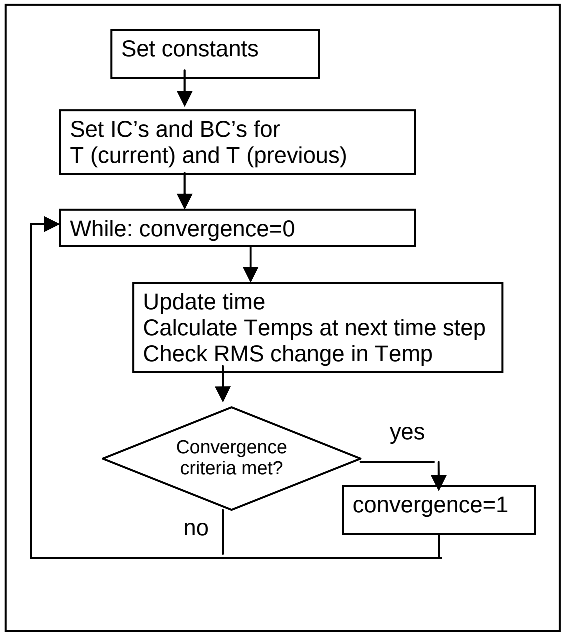


Figure 7.8 Flowchart for Code Execution

At the onset of the program, all of the initial of the constants are set. Next, the temperatures at the boundaries are set and the initial temperature distribution is read from a file. Then the code enters a loop in which all temperatures within the domain are calculated at the next time step. As the code iterates through the time steps, the root mean square (rms) temporal change and the total running time are calculated. Either of these parameters may be used to determine the stopping condition. For the first set of runs, the rms temperature change was used for the convergence test. According to the physics of the simulated situation, the temperature distribution will always change as it asymptotically approaches a solution. Once the rms change becomes less than a specified level (1.5×10^{-8} for this code which corresponds to a rate of change of less than 0.0001 °C/s) the convergence parameter is set to a value that will kick it out of the loop.

Once the code has converged on a temperature distribution, it calculates the average oil temperature. Since this system is in cylindrical coordinates, the average oil temperature is calculated by weighting the temperature at each node by its distance from the z-axis.

For these simulations, constant temperature boundaries were fixed: 5 °C at the top of the nickel membrane (due to the flashing refrigerant) and 25 °C at the outer edges of the brass portion (ambient condition). For the first test of this code, an initial temperature distribution was imposed, with 20 °C throughout the device. The output from the code was the steady state temperature distribution, the time required to bring the system to steady state from the imposed isothermal initial condition, and the average oil temperature.

The output of this run showed convergence at time=490.27040 seconds with an average oil temperature of 21.302290 °C. The steady state temperature distribution is shown below in Figure 7.9.

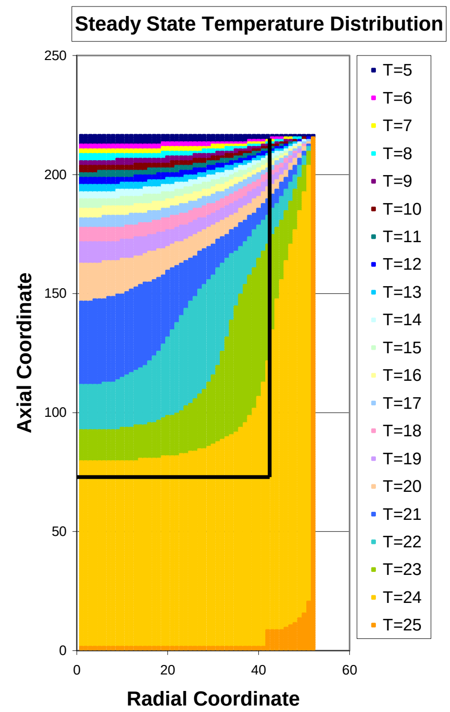


Figure 7.9 Steady State Temperature Distribution

The solid dark line on this figure denotes the transition between the brass capsule and the oil contained in the reservoir. The nickel membrane at the top is difficult to delineate due to the very steep temperature gradients in its vicinity.

After the results were inspected, the next step was to verify that the nodal spacing was appropriate. To perform this task, the grid spacing was divided in half. The code was modified for 75 micron by 75 micron grid spacing. For this nodal spacing, the maximum allowable time step is 33.15 microseconds; therefore, a time step of 30 microseconds was used.

Because the steady state criteria in the original code was based on the root mean square of the temperature change of all the nodes, a change in the grid spacing, time step and number of nodes would change the steady state criteria. Therefore, a better comparison between the two codes is made by marching forward for an equivalent time period. This modified code was marched out in time for 490.27040 seconds, the same amount of time that was determined to bring the system to steady state for the grid with 150 micron by 150 micron nodes. The average oil temperature was found to be 21.254787, which is 0.0475 °C colder than the previous solution, and the temperature distribution plot looks identical to that shown in Figure 7.9. This demonstrates that the solutions are close enough to continue with the 150 micron by 150 micron grid spacing.

7.4 Transient Response Experiments

Once this code was developed, it was used to analyze the device's response to thermal input from the heater in the capsule. For this task, a series of simulations were performed with the heater load set to four levels of heat dissipation: 0.25 Watt, 0.50 Watt, 0.75 Watt, and 1.00 Watt. At the onset of each of these simulations, the initial power-off temperature distribution found in the previous section was fed into the code as the starting point. The temperature distribution was calculated in response to steady heat input and was output from the code at discrete time intervals. Figure 7.10 shows some of the results from the simulation of the device's response to a 1 Watt input from the heater.

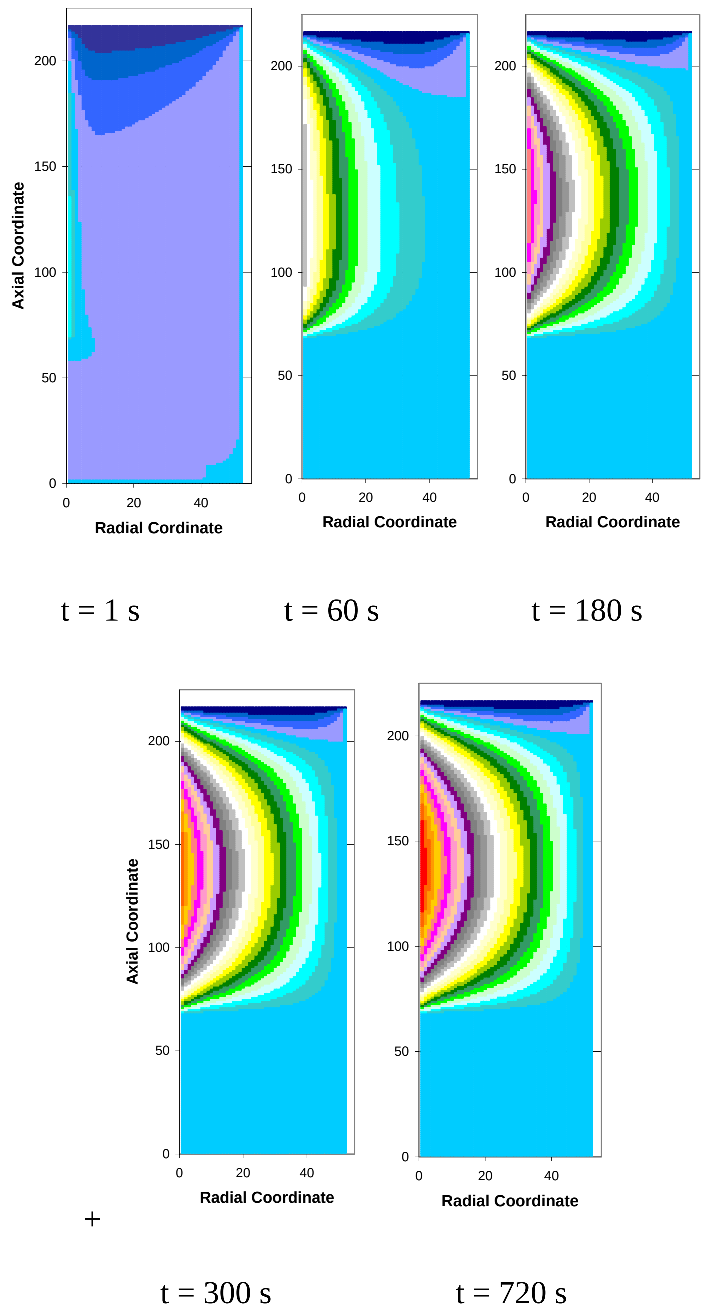


Figure 7.10 Time Elapsed Temperature Distribution at 1 Watt of Heat Generation

The overall average oil temperature (the variable of interest in this section) was calculated from each temperature distribution returned from the code. Figure 7.11 below shows how the average oil temperature relates to time and the heater output.

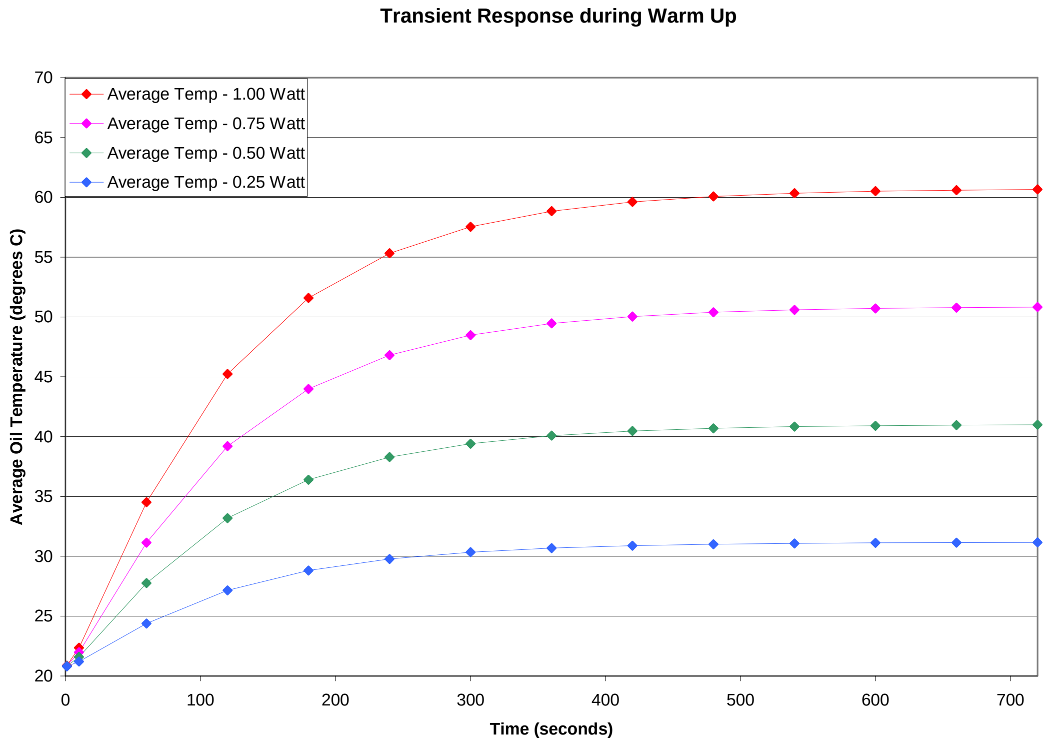


Figure 7.11 Transient Thermal Response of Device to Heat Input

The generalized functional form of this response somewhat resembles that of a simple exponential decay, which was expected. There exists an effect, however, which causes slight deviations from this functional form. It is caused by differences in the material properties. Since the heater is centered in the oil, which has a much lower thermal diffusivity than the brass and nickel sections, there exists a time lag between the heater switch and the point where the remainder of the system reacts to the addition of this energy. This can be seen in Figure 7.12, which shows the first 120s of transient response. Notice that the thermal response tends to be concave upwards during the first 10 to 15 seconds, until the temperature gradients within the oil capsule are established.

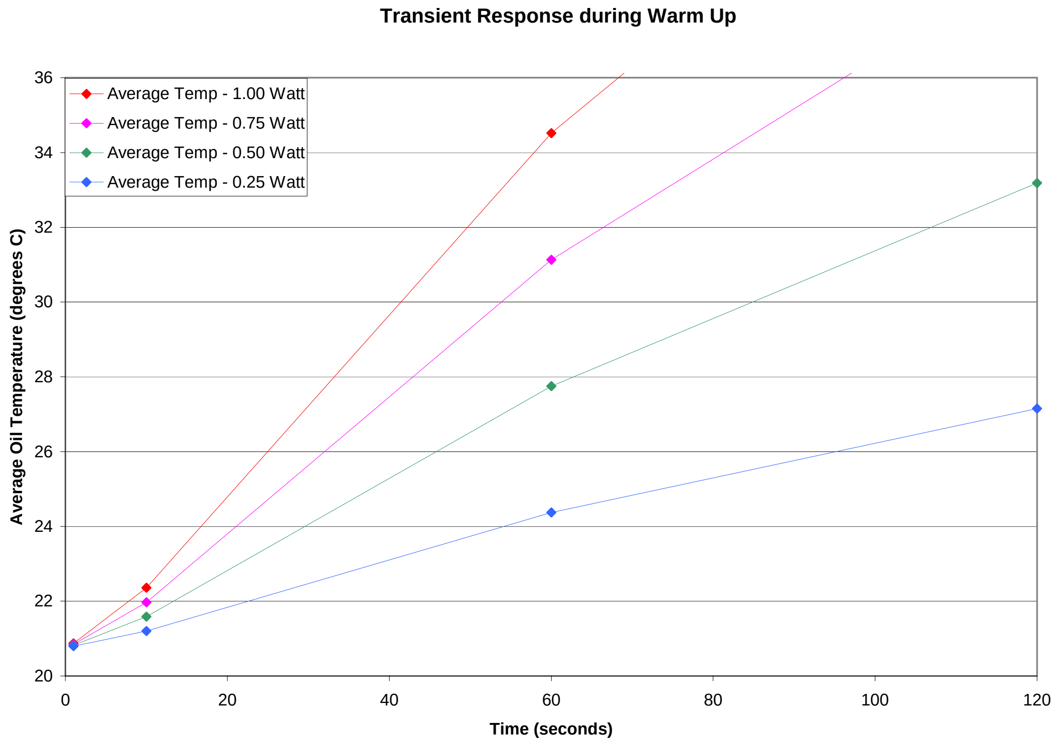


Figure 7.12 Immediate Response to Heat Input

The temperatures that would be acquired at steady state and the time constant of the system were determined by curve fitting. For these fits, the initial two data points (at time = 1 s and 10 s) were left out, so that the time lag brought about by the large differences in material property would be left out. The device's time response must be of the following functional form:

$$T = \Theta - \left(\Theta - \Theta_0\right)\exp\left(-(t-\varepsilon)/\tau\right)$$

In which case Θ_0 is the steady state temperature with no power input, Θ is the steady state temperature at a given power input, ε is the time lag necessary to establish the thermal gradients, and τ is the device's thermal time constant. The time constant was found first by plotting the natural log of (Θ-Θ_0) against the time, and adjusting the steady state temperature until the locus of points could be fit with a straight line having the resulting R^2 greater than 0.9999999. The slope of this best fit straight line is equal to the device's thermal time constant, τ.

Using the thermal time constant, the steady state power on temperature, and the steady state power off temperature, the time lag term is determined from a least squares fit of the functional form. Table 7.1 shows the results of these curve fits.

Table 7.1 Curve fit Parameters

Heat Input (Watts)	Steady State Temp (ºC)	Time Constant (s)	Time Lag (s)
0.00	21.30229	N/A	N/A
0.25	31.176	114.21817	17.482
0.50	41.033	114.21049	14.768
0.75	50.890	114.20765	13.849
1.00	60.747	114.2063	13.385

The thermal time constant for system response to steady input, τ, is approximately 114.21 seconds, as was determined for each set of data. The time lag is more significantly pronounced at the lowest heater input, due to the lower driving potential. The steady state oil temperature is proportional to the heater output, which was also expected, and can be approximated by:

$$\Theta = 21.30229 + 39.450 * Q$$

Where Q is the heat generated by the heater, in Watts. This parameter is directly tied to the displacement of the piston on top of the nickel membrane, as outlined in Chapter 6. Therefore, we can combine the relationship between the oil temperature and the piston displacement with those derived in this section.

7.5 Summary

This section outlined a method for predicting the transient response of the heater-oil reservoir system. Since this device is comprised of a complex geometry and three different materials, an analytic solution is not possible. Therefore, a numerical code was developed to simulate the time dependent response of the system to steady thermal input from the heater. Derivations of each type of nodal equation were presented in this section, as well as a code structure and demonstration of the code developed for the device as designed. In the future, a design engineer can use this approach to determine the transient response with different design parameters.

CHAPTER 8

Numerical Simulations

Computationally describing the expansion of a refrigerant as it passes through a short tube, or in this case a short tube with an obstruction, is not possible with current methods. The problem involves multiphase fluid mechanics, with the liquid phase experiencing metastable conditions and vapor phase flowing at or near its sonic velocity. The full physics of this situation are not well understood today. Most of the information used to predict refrigerant expansion is based on black-box or grey-box modeling of experimental data.

In order to predict the functionality of this device, however, a physically based description of the device's performance must be computed. For this reason, a CFD based analysis was performed with the device's geometry, for a single phase gaseous fluid passing through the flow channel. CFD-ACE+, developed by CFD Research Corporation, was used to perform the simulations at various levels of actuation. These calculations were used to generate a tool for the prediction of the device's performance over a range of conditions. The results of these simulations were then compared to the laboratory results for gaseous flow through the prototype.

The software package by CFDRC consists of three modules. The pre-processing software, CFD-GEOM, is a general purpose geometry and grid generation software package. The solver, CFD-ACE+, solves the appropriate differential equations specified by the user over the domains generated with CFD-GEOM. The post processing software, CFD-VIEW, is an interactive graphics program that allows the user to view the results of the CFD-ACE+ simulations.

8.1 Initial Simulations

Initial simulations were performed with CFD-ACE+ to verify the methodology. The task was to find the mass flow rate of compressed air through the device as it entered at a pressure of 316 kPa (31.2 psi) and 300 K (80.3 °F), and exited at a lower pressure of 202 kPa (14.7 psi), while the device was in the fully open or unactuated position. These are representative of conditions that could be easily observed under laboratory conditions.

The first task was to generate the domain over which to solve the equations of mass, momentum, and energy conservation. The unactuated flow channel can be described as a rectangular channel, 500 μm tall by 1,000 μm wide, with a length of 19,600 μm. Each end of the flow channel is abruptly connected to a 6.35 mm (1/4”) diameter section of tubing. By selecting the geometry of an unactuated device, it was possible to take advantage of two planes of symmetry, which drastically reduced the computational time. The computational domain for this simulation can be seen below in Figure 8.1.

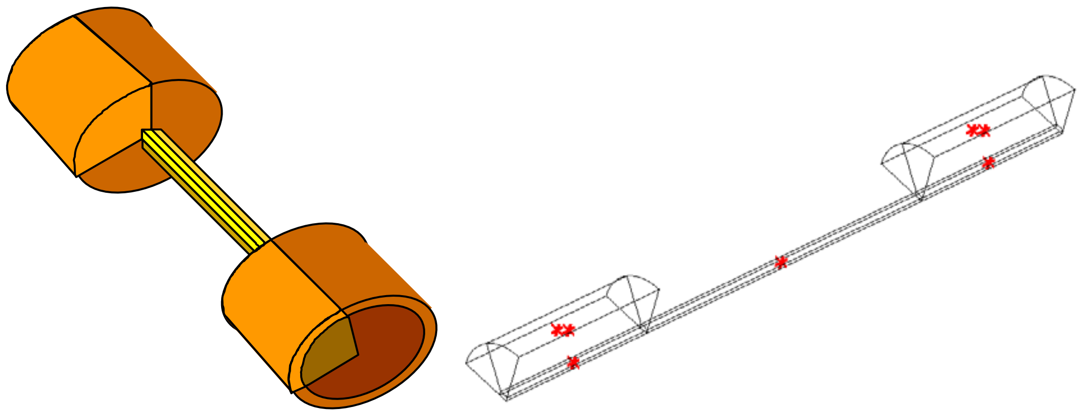


Figure 8.1 Portion of Device used for Initial CFD Simulations

After utilizing symmetry to reduce the computational domain, the remaining flow field was divided into 7 volumes, three forming the flow inlet (termed i1, i2, and i3), three forming the outlet (termed e1, e2, and e3), and one representing the channel. The domain that represented the flow channel was of rectangular shape, with a length of 19600 μm, width of 500 μm and a height of 250 μm. The inlet and exit plane volumes (i1 and e1) were of the same cross sectional area, but had a length of 10,000 μm. These volumes were a projection of the flow channel into the pipe connections. Finally, the remaining 4 volumes can each be described as a 45 degree sweep of the connected pipe, minus the volume occupied by volumes i1 and e1.

A mesh was generated which divided each entity by 25 points, so that 24 evenly spaced sections were bounded on each entity. Altogether, this created a mesh of 96,768 cells over which to solve for the flow field.

Once the geometry was constructed and the mesh was generated, the data file was imported into the CFD-ACE+ environment. The problem types of "flow" and "heat transfer" were selected so that the continuity of mass, momentum, and energy equations were computed. The heat transfer calculations were combined into the analysis so that the temperature distribution (and therefore the density) would be more accurate.

Gravitational and transient effects were turned off. The fluid was set to “air” which obtains information from CFD-ACE+’s database. The density was calculated using the ideal gas law, and the dynamic viscosity of air was computed using Sutherland’s law.

Next, the boundary conditions were set. For this problem, the inlet surfaces of volumes i1, i2, and i3 were held at a constant pressure of 316 kPa and a temperature of 300 K. At the opposite end of the flow field, the exit planes of the volumes e1, e2, and e3 were held at a constant pressure of 202 kPa. All wall surfaces were modeled as adiabatic and given the boundary condition of zero velocity. All symmetry planes were given the boundary conditions of zero gradients for all properties and velocities. The interface planes between all of the volumes were left unbounded and were to be determined by the solver. The initial conditions used are shown in Table 8.1.

Table 8.1 Initial Conditions used for Preliminary Simulations

	U_x (m/s)	U_y (m/s)	U_z (m/s)	P (kPa)	T (K)
i1	10	0	0	316	300
i2	10	0	0	316	300
i3	10	0	0	316	300
Flow channel	150	0	0	251	280
e1	100	0	0	202	260
e2	10	0	0	202	260
e3	10	0	0	202	260

The solver was set to calculate the velocity and density with an upwind spatial differencing. The convergence criteria were set to a maximum residual of 0.0001 for the each component of velocity, pressure and enthalpy. The inertial relaxation parameters for the velocity, pressure correction, and enthalpy were continuously manipulated throughout each simulation; therefore, it would not be accurate to state the number of iterations required for convergence. The process time is a much more informative bit of information. The process time for this situation was approximately 30 seconds per iteration on a personal computer with a 3.0 GHz Pentium IV processor.

The critical piece of information obtained from this exercise is the mass flow rate through the device. The output data file from CFD-ACE+ showed the mass flow rate into the device as 6.8687E-5 kg/s. Multiplying by 4, the total mass flow rate through an entire device was found to be 2.74748E-4 kg/s.

The convergence of these calculations were rather time consuming; therefore, another simulation was run with the same configuration, except this time the heat transfer model was turned off. The heat transfer model was initially used so that the temperature field would be solved and this information would be used to calculate the density of air at each node using the ideal gas law. Upon examining the results of the CFD simulation, it was investigated whether including the temperature effects on density was necessary, considering the large pressure effect on the air density.

The next simulations were performed in the same manner, using an isothermal flowfield with all nodes held at 300 K. The end result was a mass flow rate through the device of as 6.86263E-5 kg/s. Multiplying by 4, the total mass flow rate through an entire device was found to be 2.745052E-4 kg/s, which is less than a 0.1 % difference from the calculations that included the heat transfer analysis. The computational time, however, was vastly improved. Each iteration took approximately 8 seconds, roughly one quarter of the time of the previous simulation. More importantly, with the elimination of the heat transfer analysis, the number of iterations was drastically decreased.

One more test was required before this simulation tool could be properly used. This test was needed to determine whether the mesh was fine enough for this flow situation. In order to test this, another mesh was generated with the same geometry. This time, however, the grid was doubled so that each entity was divided by 50 points into 49 sections. This increased the number of cells by a factor of 8 to 774,144. The data file for this configuration was very large, 108 MB.

This mesh was brought into the solver and ran with the same initial conditions, boundary conditions, and convergence criteria as the previous problem. The convergence of this problem was extremely slow; the iterations each took approximately 2 minutes of computational time. The largest obstacle to overcome with this problem was memory allocation; this problem required a minimum of 1.1 GB of RAM to avoid the use of hard disk space for file usage. This analysis was initially started with an insufficient amount of RAM, and until extra memory was added the iterations took approximately 15 minutes.

The end result of this simulation showed that the mass flow through the device was 6.92669E-5 kg/s, which is less than one percent above the previous calculation. Therefore, it was determined that 25 nodes per entity would be adequate for these simulations, and this mesh structure would be used for the remainder of this analysis.

8.2 Verification of Initial Simulation

Now that the initial simulations have been performed, it is necessary to verify the CFD results with a physical model. Intuitively, this problem does not have an exact analytical solution, which is why the CFD analysis was performed; however, with a few assumptions, the results of portions of the CFD work can be checked against an analytical model.

The CFD results show that the flow through the channel is subsonic throughout the entire domain. This can be easily verified by examining some of the pressures input to the CFD solver. The flow situation occurring within the flow channel is flow with friction, Fanno flow. Therefore, since the flow begins from stagnant air, the maximum flow rate would result in a Mach number of unity at the flow channel exit; below this flow rate, the flow will be subsonic throughout the entire channel [66].

If the flow rate of air through the channel were at this maximum flow rate, then the pressure at the flow channel outlet would have to be greater than or equal to 202 kPa, the pressure at the exit plane of the downstream tube fitting. With the known bound on the static pressure and a Mach number of one, the stagnation pressure can be calculated:

$$P_0 = P\left[1 + \frac{\gamma - 1}{2} M^2\right]^{\gamma/\gamma-1}$$

$$P_0 \geq 202kPa\left[1 + \frac{1.4 - 1}{2}(1)^2\right]^{1.4/1.4-1} \geq 382.37kPa$$

In order for sonic conditions to exist at the exit of the flow channel, the exit stagnation pressure must be greater than 382.37 kPa. This is not possible because the stagnation pressure at the inlet of the upstream tube fitting is 316 kPa, and stagnation pressure can only decrease with friction. Therefore, the flow is in fact subsonic throughout the entire domain.

At this point, it is not possible to analytically determine the mass flow rate through the device; therefore, the approach is to approximate the flow properties based on the one dimensional analytic equations, the mass flow rate of 2.74748E-4 kg/s returned from the CFD solver, and the other known properties. It is known that, since the flow is entirely subsonic, the channel exit pressure is 202 kPa. And, since there is no heat addition, the stagnation temperature is known to be 300 K. Based on these properties and the mass flow rate, a one dimensional analysis can be used to calculate the exit Mach number as follows:

The mass flow rate is related to the static temperature, static pressure and Mach number

$$\dot{m} = \rho U A_{cs} = \rho C M A_{cs}$$

$$= \left(\frac{P}{RT}\right)\left(\sqrt{\gamma RT}\right) M A_{cs}$$

And the static temperature is related to the stagnation temperature through the one dimensional isentropic relationship:

$$T = \frac{T_0}{\left(1 + \frac{\gamma - 1}{2} M^2\right)}$$

Therefore, the mass flow rate is related to the static pressure, Mach number and stagnation temperature through the following relationship:

$$\dot{m} = PMA_{cs}\sqrt{\frac{\gamma\left(1 + \frac{\gamma - 1}{2} M^2\right)}{RT_0}}$$

Substituting the known values results in a flow channel exit Mach number of 0.647951. With this Mach number, the flow channel exit static temperature is found from the one dimensional relationship:

$$T = \frac{T_0}{\left(1 + \frac{\gamma - 1}{2} M^2\right)} = \frac{300K}{\left(1 + \frac{1.4 - 1}{2}(0.647951)^2\right)} = 276.76K$$

And the stagnation pressure at the flow channel exit is found from the one dimensional relationship:

$$P_0 = \frac{P}{\left(1 + \frac{\gamma - 1}{2} M^2\right)^{\left(-\gamma/\gamma-1\right)}} = \frac{202kPa}{\left(1 + \frac{\gamma - 1}{2}(0.647951)^2\right)^{\left(-1.4/1.4-1\right)}} = 267.8608kPa$$

The speed of sound at the flow channel exit is:

$$C = \sqrt{\gamma RT} = \sqrt{1.4 * 287 \frac{J}{kgK} * 276.76K} = 333.47 \frac{m}{s}$$

And the one dimensional approximation of the velocity at the flow channel exit is:

$$U = MC = 0.647951 * 333.47 \frac{m}{s} = 216.0721 \frac{m}{s}.$$

The static pressure that would result if the flow length were increased until choking conditions occur, P*, is calculated from the relationship:

$$P^* = PM \left[\frac{1 + \frac{\gamma - 1}{2} M^2}{(\gamma + 1) / 2} \right]^{1/2}$$

$$= (202 kPa)(0.647951) \left[\frac{1 + \frac{1.4 - 1}{2} (0.647951)^2}{(1.4 + 1) / 2} \right]^{1/2} = 124.397 kPa$$

At this point, all of the parameters for a one dimensional approximation are known at the flow channel exit. However, it is not possible to use this information for a closed form analytical solution because the integrals involved do not have exact solutions; therefore, the flowfield must be numerically integrated backwards from the exit plane to the flow channel entrance.

The sequence used to solve the parameters in this flowfield is as follows. First, the static density is calculated from the static temperature and static pressure using the ideal gas law. Second, the velocity is calculated from the mass flow rate, cross sectional area, and the density. The third step is to calculate the dynamic viscosity using Sutherland's Law with the static temperature. The fourth step is to calculate the kinematic viscosity using the dynamic viscosity and the density. The fifth step is to calculate the Reynolds number from the kinematic viscosity, the velocity, and the hydraulic diameter. The sixth step is to calculate the smooth tube friction factor using the Reynolds number and the relationship:

$$f = \frac{0.3164}{\mathrm{Re}^{1/4}}$$

Next, the downstream pressure gradient due to friction is calculated from:

$$\frac{dP}{dx} = f \frac{\rho}{D_h} \frac{U^2}{2}$$

Finally, the static pressure at a location one incremental element upstream is then calculated by:

$$P_{upstream} = P_{downstream} + \frac{dP}{dx} \Delta x$$

With this upstream pressure and the Fanno frictional choking pressure, P*=124.397 kPa, the upstream Mach number is calculated. Once the Mach number is known, the static temperature and the stagnation pressure are calculated from the one dimensional isentropic relationships. This entire process is marched backwards from the flow channel exit to the flow channel inlet to produce an estimate of each of the flow properties within the flow channel. Figures 8.2 through 8.5 show the one dimensional analytical solution compared to the three dimensional CFD solution at various locations relative to the channel centerline.

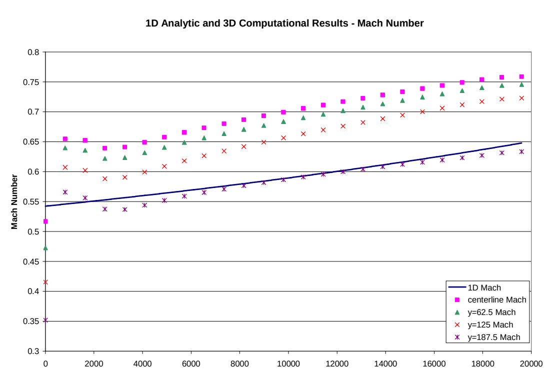


Figure 8.2 Comparison of Mach Number

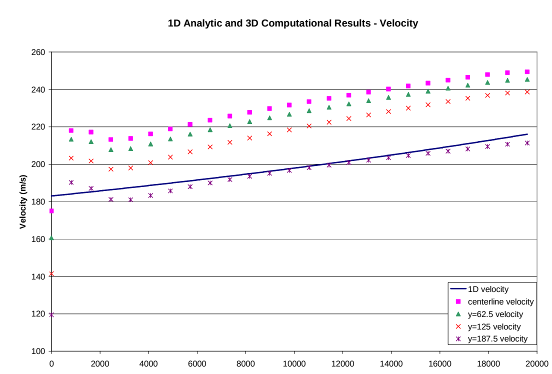
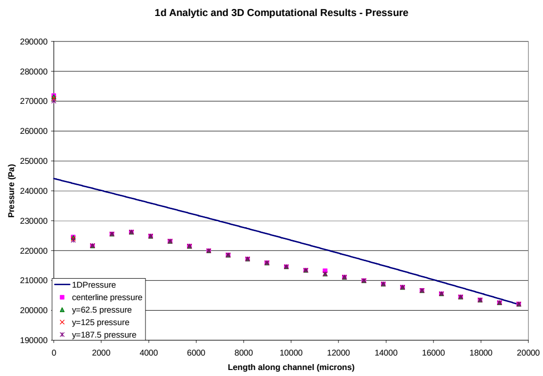


Figure 8.3 Comparison of Velocity



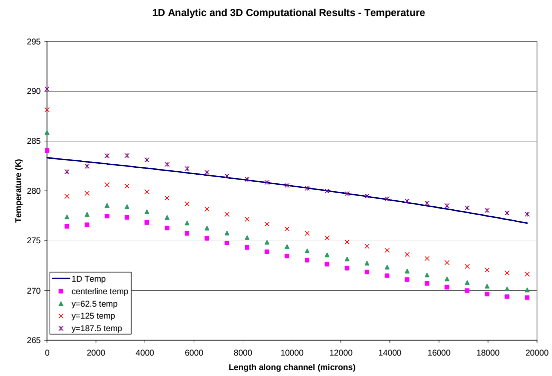


Figure 8.4 Comparison of Pressure   Figure 8.5 Comparison of Temperature

It is seen from these figures that the analytically based solution is generally bounded and in proximity of the CFD solution. The differences are due to the wall effects and the entrance effects which are taken into account in the CFD solution, but not in the 1D solution. This does, however, verify that solutions of this flow situation developed with the CFD solver can be used to predict the flow rate of air through this device.

8.3 Flow Control Prediction Curve

Using the CFD analysis, it was possible to formulate a curve which predicts the flow control ability of the device. The geometry of the device including the flow obstruction was created using CFD-GEOM. This time, however, the inclusion of the flow obstruction limited the available symmetrical planes to one.

The flow obstruction was modeled as a cylinder. The width of the flow obstruction spanned the entire width of the channel. In order to fit a continuous grid throughout the flow channel, it was divided into 5 sections; one semi-cylindrical volume at the center of the channel, two volumes upstream of the cylinder, and two volumes downstream of the cylinder. Figure 8.6 below illustrates the geometrical configuration used for these simulations. Figure 8.7 shows a close up of the flow obstruction within the device. Note that the plane of symmetry in this device is towards the rear of the snapshot and that only the upper and lower walls are shaded.

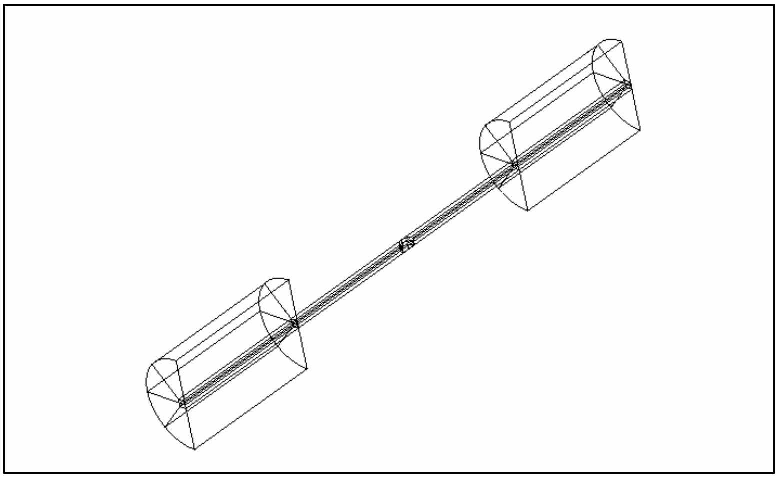


Figure 8.6 Geometry used for CFD Analysis

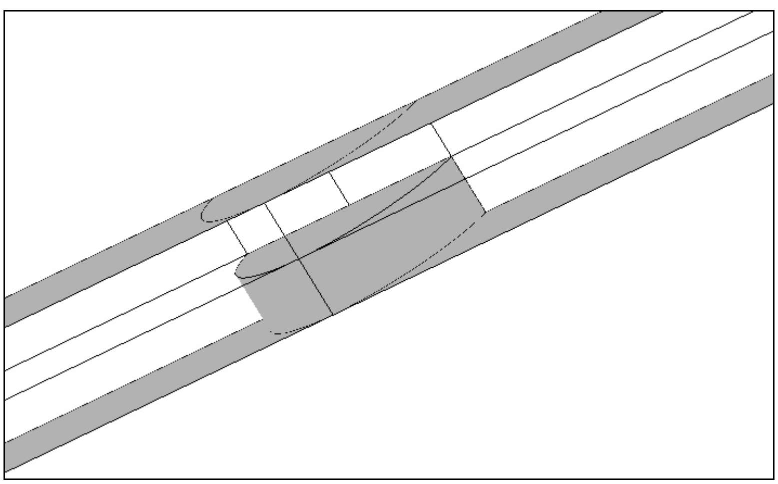


Figure 8.7 Close-Up of Flow Obstruction Geometry

Using a single symmetry plane resulted in a mesh that consists of 17 independent volumes: 5 for the channel as stated above and 6 sections each upstream and downstream representing the device's connection to a ¼" tube at each end. Each entity was again evenly divided by 25 nodes resulting in 24 sections per entity. Therefore, each volume contained a total of 13,824 cells and each entire configuration consists of 235,008 cells.

Geometries were constructed to determine the mass flow rate of air through the device when the flow obstruction is elevated to various positions. For these simulations, the inlet and exit pressures were held constant at 316 kPa and 202 kPa respectively. The only variable that was changed was the position of the flow obstruction. The piston positions used to generate a predictive curve are shown below in Table 5.2.

Table 8.2 Test Matrix for Simulations

Obstruction Position (μm)	% Closure of Channel	Comments
0	0	Used information from initial simulation
125	25	
180	36	
250	50	
320	64	
375	75	
500	100	No simulation, mass flow is zero

Unfortunately, due to the nature of the CFD preprocessing package, a new geometry had to be constructed for each position of the flow obstruction position. There was one exception which expedited the generation of the geometries. The flow obstruction is modeled as a cylinder that has a range of motion from zero actuation (forming a continuous boundary with the wall) to fully closed (extending to the top of the flow channel). For any position within this range, there exists a complimentary position. In other words, since the flow channel is 500 μm tall, the geometry created to simulate the situation when the obstruction was 125 μm into the flow can be used to simulate the situation when the obstruction is 375 μm into the flow with very little adjustment. The only changes needed were the addition of a complimentary volume of the piston, and the removal of the original piston.

The speed at which these numerical simulations converged was highly dependent on the initial conditions that were given to the solver. For this reason, the simulations were ran in order of lowest to highest position of the obstruction and the solutions from each run were used to determine the initial conditions for the present run. This provided a good starting point for the solver. The data obtained through the simulations is shown below in Figure 8.8.

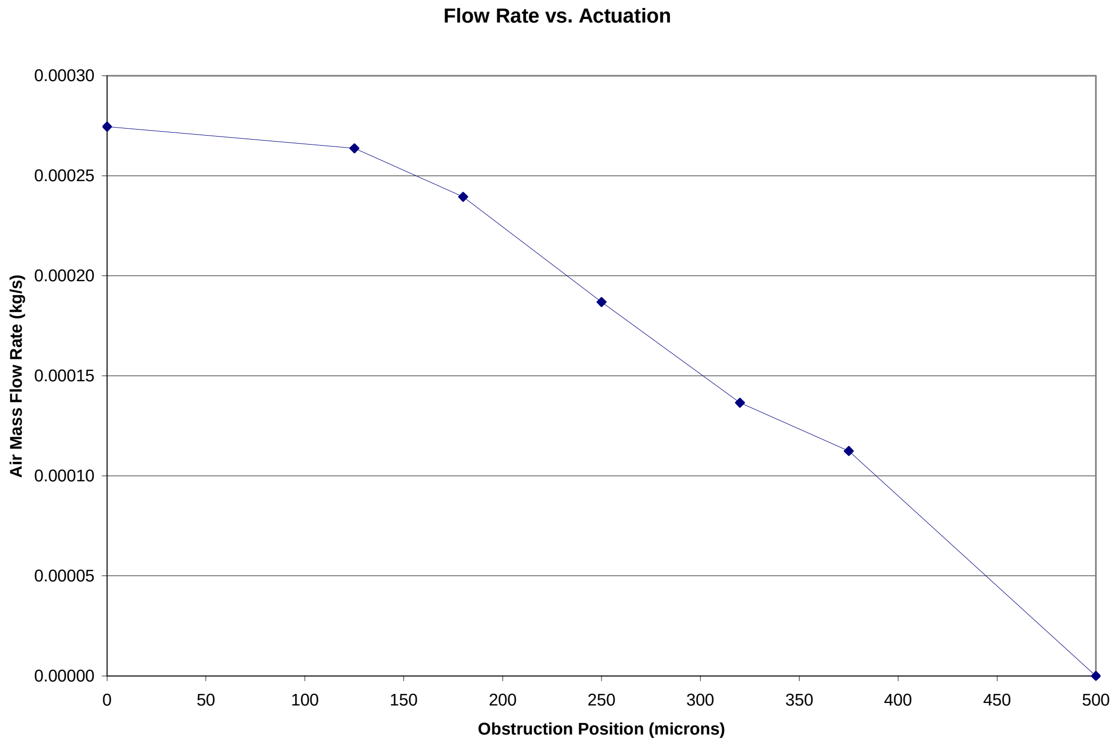


Figure 8.8 Results from CFD Simulations

It is interesting to note that two flow regimes exist over the range simulated with the CFD package. The results from the first two data points, which correspond to zero actuation and a piston height of 125 μm, show a flow regime that is subsonic throughout the entire domain. A transition between flow regimes occurs somewhere between the 125 μm data point and the 180 μm data point. Here, the passage becomes small enough to choke the flow between the piston top and the upper channel wall. For any level of actuation beyond this transition point, the flow rate is directly related to the cross sectional flow area or 500 μm less the obstruction position.

CHAPTER 9

Gas Flow Measurements

9.1 Flow Control Measurement

Once the prototype was assembled, its ability to control flow was demonstrated in the compressed air test apparatus. To do this, a pair of 6.35 mm (1/4”) copper tubes were glued to the ends of the flow channel and it was connected to the test apparatus.

The objective of these tests was to measure the flow rate of air through the prototype for a varying position of the piston, while holding the inlet and exit pressure constant. Measurements were performed on four separate occasions. Each set of measurements was taken by increasing the oil temperature from 22.9 ºC (73.2 ºC) to 44.8 °C (112.7 °F) in small increments. At each increment, a measure of the air flow rate was taken, 19 points in all.

The supply and back pressures were held as close to 316 kPa and 202 kPa as could be attained with manual control. In all cases, the supply pressure was less than 317.6 kPa and greater than 312.5 kPa; the back pressure was between 204 and 200 kPa. These conditions correspond to those in the CFD simulations. The data collected during these tests is shown below in Figure 9.1. The measurement data for these tests is in Appendix B.

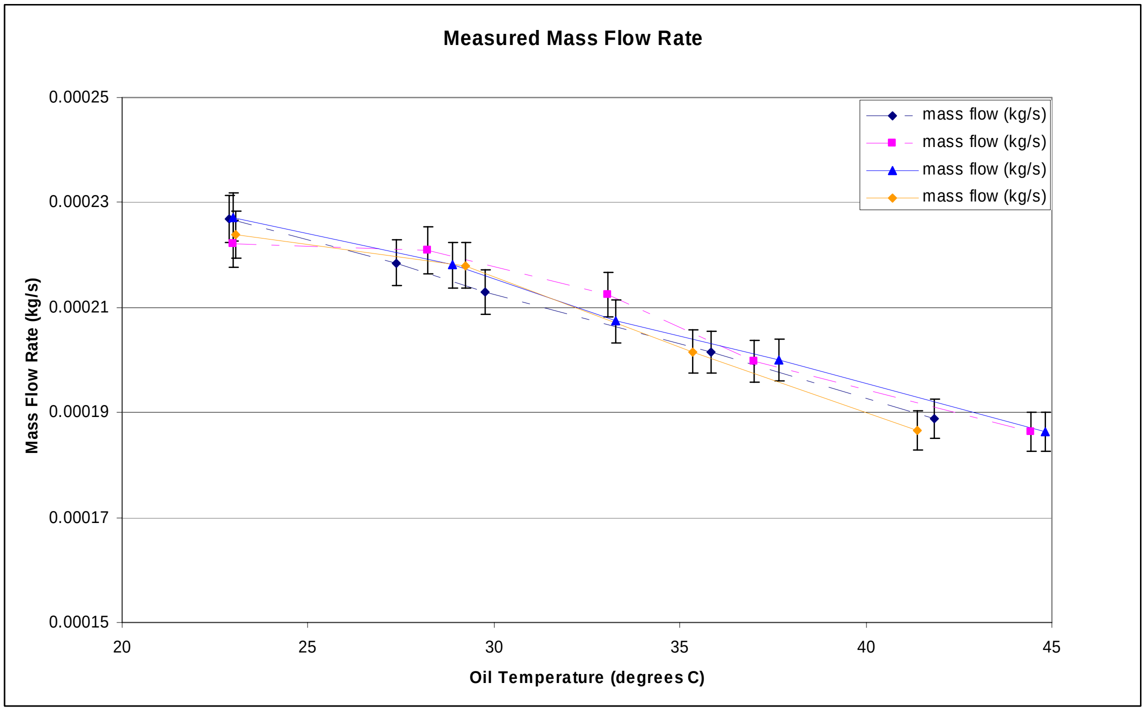


Figure 9.1 Results of Air Flow Measurements

These measurements show that the air flow rate was reduced by 22 % as the piston was pushed into the flow channel. Using the curve generated for the relationship between the oil temperature and the piston position, the range of operating temperatures corresponds to piston positions ranging from 0 to 300 microns above the floor of the channel. All things considered, the flow rate of air through the device proved to be quite reasonable. This demonstrates that the prototype can induce the marginal flow resistance on demand.

9.2 Comparison to CFD Simulations

The results of these air flow measurements are shown below in Figure 9.3 compared to the results of the CFD analysis.

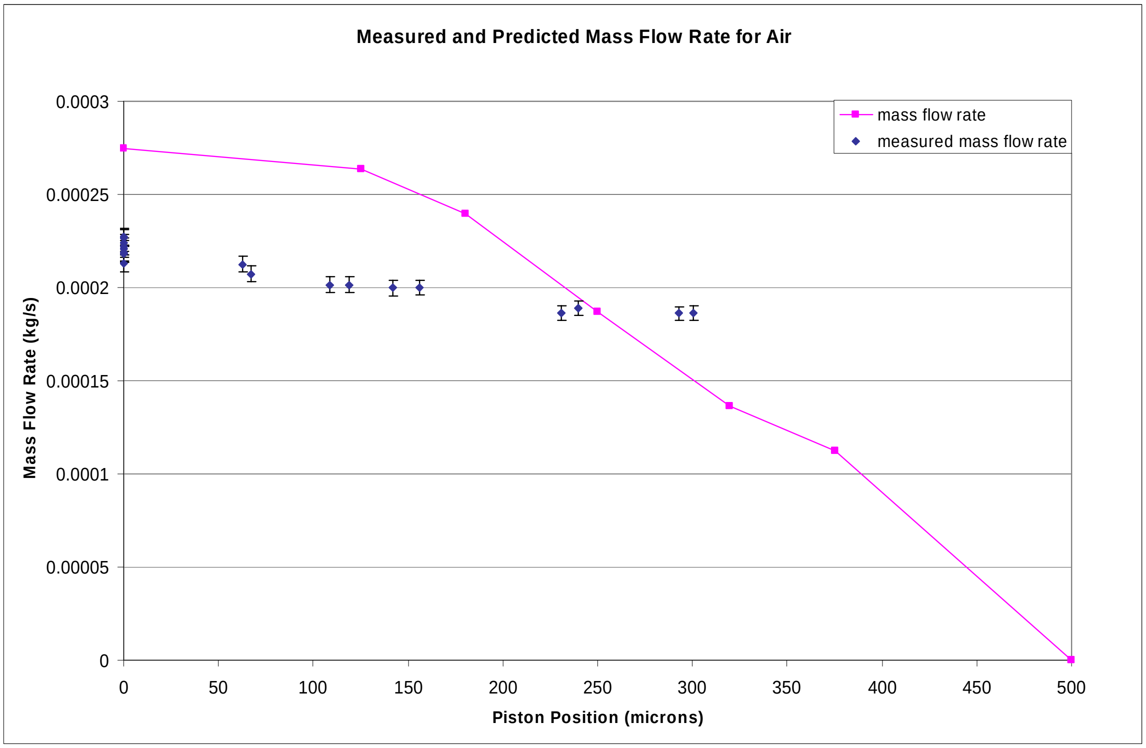


Figure 9.2 Comparison Between Gas Flow Measurements and CFD Analysis

Comparison of these measurements to the CFD simulations gives a lot of information about the device. First of all, it is seen that the measured air flow rate at low actuation is 17 % less than the simulated value. This is because the simulated device dimensions were different than those of the actual device. The simulated geometry was a rectangular cross section with a width of 1,000 μm and a height of 500 μm, which results in a cross sectional area of 500,000 μm^2. The fabricated device is has a slightly different configuration with a cross sectional area that is 14 % less than that of the simulated device. The difference in the flow rate of the fully open device is attributed to this.

Another difference between the simulated and measured data is seen by the trends is the data. The slope of the simulated data changes in the vicinity of 150 μm piston displacement, whereas the slope of the measured data does not change significantly over the range of data. This difference is because of the fact that the piston, as fabricated, does not entirely block off the flow channel, as it was modeled in the CFD work. In other words, the discontinuity in the boundary introduced by the piston is affecting the flow, but it does not restrict the flow in the same manner. The CFD analysis showed that, at a certain level of actuation, the flow became choked. Once the flow is choked, the mass flow rate should be directly proportional to the cross sectional flow area, which is inversely related to the piston displacement. This is why, at a certain level, the CFD results show a change in the relationship between the mass flow rate and the displacement. The measurements do not show this shift in flow regime because the piston is not blocking enough of the flow path to choke the flow; but it does affect the mass flow rate through protrusion and area reduction.

Chapter 10

R134a Vapor Compression Test Results and Discussion

This chapter presents the results of the device's ability to control flashing of R134a within a vapor compression system. Tests were performed to measure the mass flow rate of the refrigerant passing through the device under conditions similar to those that would occur in a household refrigerating appliance, using the vapor compression test apparatus described in chapter 3. Two sets of test data were taken with the vapor compression system. The first data set demonstrated steady state performance with a fixed set of operating conditions, the second data set shows the HVAC system's response to the device's actuation.

It needs to be noted that the pressure that the device is subject to in the vapor compression system is considerably higher than the pressures used in the air flow test bench; therefore precautions were taken to ensure proper operation prior to inserting the device into the vapor compression system. To do this, the connections to the 1/4" copper tubes were reinforced with multiple layers of epoxy. Also, to help prevent the pipe connections from leaking, the upstream pressure used during testing was slightly lower than typical design point. Typical household refrigerating appliances have a design liquid line pressure of approximately 963 kPa, which corresponds to a condensing temperature of 38 ºC; for these measurements, the liquid line pressure was kept at 750 kPa for the steady state tests, which corresponds to a condensing temperature of 29 ºC, and slightly lower for the transient response tests. All raw test data is located in Appendix C.

10.1 Steady State Operation

The first set of data was taken under conditions of steady state operation. The condenser exit pressure was held constant at 750 kPa, while the level of liquid line subcooling was varied by changing the condenser HTF temperature and adding or removing refrigerant from the system. The evaporator HTF inlet was held constant at 4 ºC.

Two levels of actuation were used to characterize the operation of the device, corresponding to high and low levels of interaction between the piston and the flashing refrigerant. For the low actuation level, the measured oil temperature in the device was held constant at 25 ºC, which corresponds to no actuation; while the measured oil temperature was held at 40 ºC, corresponding to a piston height of 202 μm for the high actuation level tests.

A total of 781 data points were taken to characterize the steady state operation of the device under constant inlet pressure, two different levels of actuation, and a range of subcooling. Figure 10.1 shows the results of these measurements.

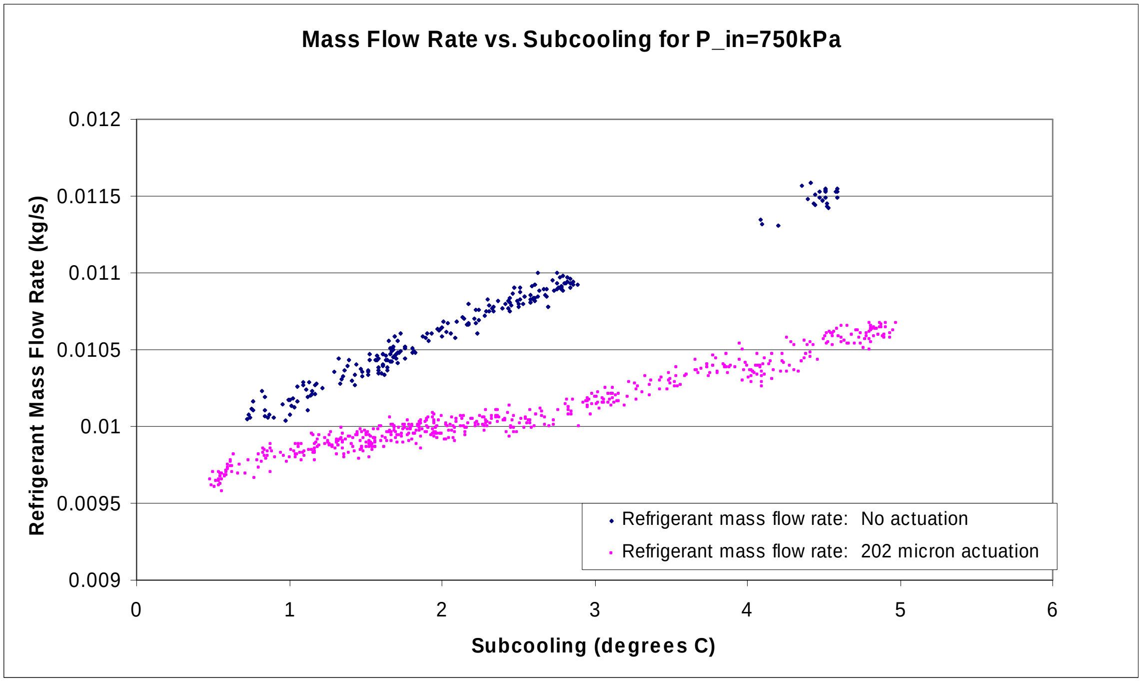


Figure 10.1 Steady State Refrigerant Mass Flow Rate for Two Levels of Actuation

It is interesting that the effect on the mass flow rate from actuating the device seems to be strongly related to the level of subcooling. At low levels of subcooling the effect is very small, showing on average 3.5 % difference at 0.6 ºC subcooling. As the level of subcooling is increased, so is the impact of the device's actuation; at 5 ºC subcooling, there is a 10.7 % difference in the refrigerant mass flow rate.

10.2 Quasi-Transient Operation

The second set of data seems to give a bit more information, as it depicts the system's response to the device. For these tests, the power to the device's electrical resistance heater was abruptly switched up and down, and the system's response was recorded. For these tests, three power-up periods were input to the device, with progressively higher power each time until the maximum output of 2.75 W from the heater was reached. The three power-on periods brought the measured oil temperature from 25 ºC up to 46 ºC, 49 ºC, and 52 ºC respectively, which correspond to actuation levels of zero up to 324 μm, 384 μm, and 445 μm. For the initial operation, the condenser exit conditions were approximately 725 kPa with 4 ºC of subcooling.

Figures 10.2 through 10.4 depict the system response to the changing valve oil temperature. Figure 10.2 shows the change in condensing pressure and subcooling, Figure 10.3 shows the change in refrigerant mass flow rate and system capacity, and Figure 10.4 shows the response of the evaporator exit superheat. The measured quantities in figures 10.2 and 10.3 are normalized from zero to one to better illustrate the change in each of the quantities.

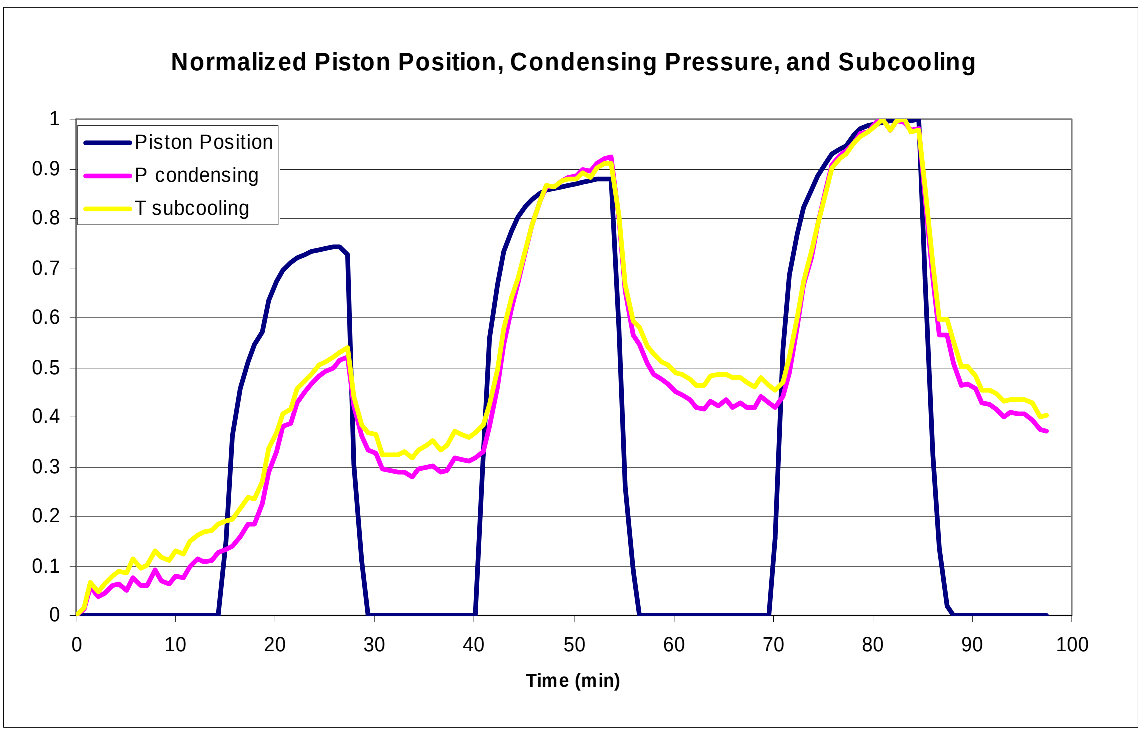


Figure 10.2 System Response – Pressure and Subcooling

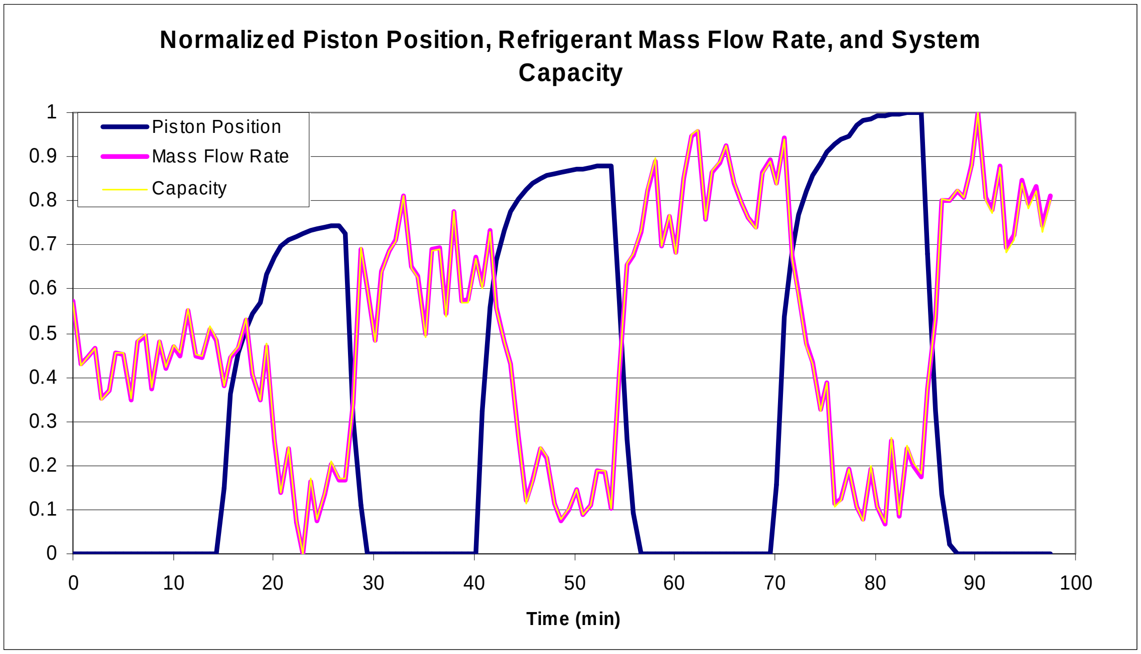


Figure 10.3 System Response – Mass Flow Rate and Capacity

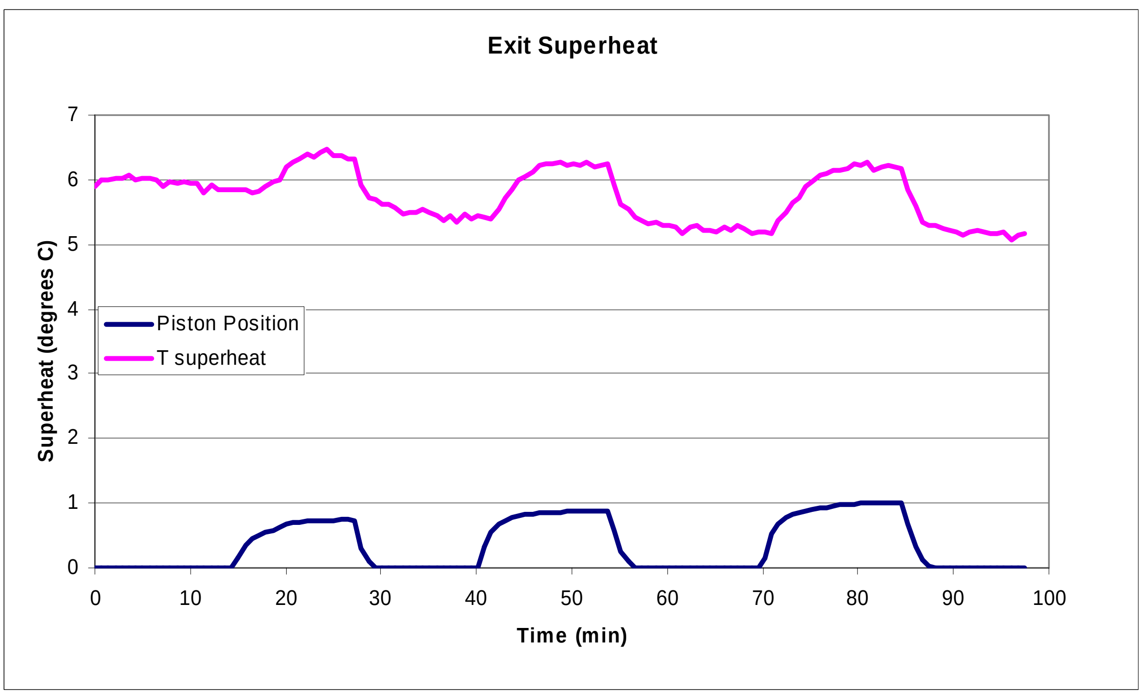


Figure 10.4 System Response – Evaporator Exit Superheat

The qualitative system response to the change in oil temperature is as would be expected. Heat is added to the oil reservoir in the device, which causes the piston to move into the refrigerant flow path, thereby creating a more restrictive metering device. This, in turn, reduces the refrigerant mass flow rate and therefore system capacity. This reduction in mass flow rate causes more refrigerant to accumulate in the condensing portion of the system which, in turn, causes the condensing pressure and subcooling to increase. Since less refrigerant remains in the evaporator, each unit of refrigerant that passes through evaporator must absorb a little more energy and therefore its exit temperature is higher.

Quantitatively, however, the system response is somewhat diminished by the changing operational parameters. The quantitative system capacity is shown below in Figure 10.5.

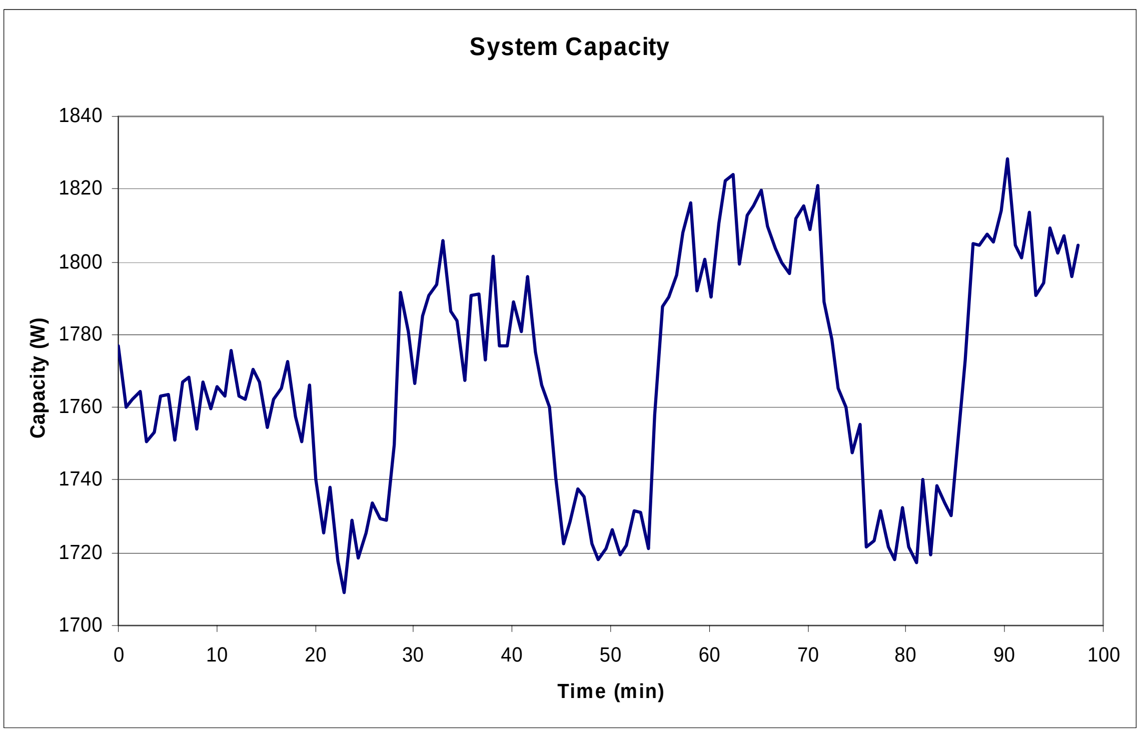


Figure 10.5 System Capacity in Response to Device Operation

10.3 Discussion

It is shown in the figure above that the change in system capacity is approximately 5 %, when comparing the low and high actuation levels. Since this work represents a very preliminary look into the way flashing refrigerant responds to this new geometrical configuration, it is not surprising that the magnitude of the shift is in this range. There are a few factors that can help explain why the magnitude is in this range.

The first reason has to do with the way that the oil temperature is measured. The capsule consists of a brass tubular section, approximately 3.3 mm in length with a diameter varying between 7.0 and 1.1 mm. Within the capsule are an electrical resistance heater and the tip of a thermocouple probe, with the probe aligned to the centerline of the tubular section. The oil in the capsule has a relatively low thermal diffusivity, as was discussed in chapter 8, and the brass walls of the capsule have a large thermal conductivity. The inherent obstacle to obtain a good measurement of the overall average oil temperature is the thermal gradient within the capsule.

The oil in the reservoir rejects heat through the brass wall of the reservoir, which causes the oil near the walls to be colder than that along the centerline, where the thermocouple probe is placed. Furthermore, since the top of the capsule is kept cold by contact with the flashing refrigerant and the capsule itself is a very good thermal conductor, all of the walls of the capsule will be near the refrigerant flashing temperature. For this reason, a temperature measured at the centerline of the oil reservoir during operation in the vapor compression system will be warmer that the true average oil temperature.

It is apparent from the data shown in Figures 10.2 through 10.4 that this may be a factor because the illustrated properties all begin to change when the piston position, based on the measured oil temperature, is around 200 μm. Since any interaction between the piston and the refrigerant should impart some change in these properties, it is logical that the measured oil temperature must be a little warmer than the average oil temperature.

The exact relationship between the measured and true average oil temperature, however, is not known. When performing the measurements to obtain the relationship between measured oil temperature and piston displacement, an attempt was made to hold the top of the device at a cold temperature by packing the tube connections is dry ice, however this did not work very well and therefore the relationship found under ambient conditions was used.

The second reason for this level of response is that width of the piston, as fabricated, is smaller than the width of the flow channel, and therefore does not completely block off this area. As fabricated, the piston blocks off 81 – 83 % of the width of the flow channel, depending in orientation. Therefore, at the highest piston elevation experienced in these tests, the maximum blockage is approximately 73 % of the flow channel. For the measurements in chapter 9, it was demonstrated that this device could change the mass flow of air by approximately 22 % at 300 μm elevation. However, the underlying physics of flow with liquid to vapor phase change is vastly different from single phase gaseous flow.

The third reason for the small change in capacity is the compounded effect of the increased inlet pressure and increased subcooling. The behavior of this device is, in general, similar to that of a short tube restrictor; and the flow rate through a short tube restrictor is strongly influenced by the inlet pressure and the level of subcooling.

When the device is actuated, the condensing pressure increases and the evaporating pressure decreases. This is due to the migration of refrigerant from the low pressure side of the system to the high pressure side. With any type of flow metering device, the pressure differential across the device is the driving potential for the flow, and therefore raising the condensing pressure and lowering the evaporating pressure will increase the potential (although with short tubes the evaporating pressure is not very influential). This is a common obstacle for all flow controlling devices.

The subcooling, however, is not an obstacle for most other types of flow controlling devices. Needle valves and traditional boss-and-valve-seat type devices, which are the general basis for most other types of flow restricting devices, are not affected by the level of subcooling in the upstream liquid line, provided that the flow is not two phase at the entrance of the device. This is because the refrigerant is flashed at the exit plane of these devices due to the abrupt changes in flow area and geometry. The flow through the device is single phase throughout, and the thermodynamic properties relative to saturation are not a factor in the flow.

With short tube restrictors, however, subcooling is one of the most important parameters governing the flow. In typical applications, subcooled refrigerant enters a short tube and a large pressure reduction is realized due to the abrupt area change. As the refrigerant flows through the short tube, the pressure is further reduced through friction until the exit plane. Within this portion, some of the refrigerant changes phase to vapor. When phase change occurs, the flow begins to exhibit some properties similar to choked flow. It is not choked, per se, but it exhibits some behavior similar to that of choked flow; the flow is relatively insensitive to, but not independent of the downstream pressure. In typical refrigerant applications the liquid density is approximately 100 times that of the vapor density and the speed of sound is about 4 times faster in liquid than the vapor phase. Therefore, the generally accepted theory is that as some of the liquid begins to change phase to vapor, the two phases flow together and the vapor phase is choked but some downstream information is able to propagate upstream within the liquid portion.

Due to the fact that the upstream pressure and subcooling both increase when the device is actuated, two driving potentials for the flow are increased and the overall impact of the increase restriction is lessened.

However, given all of these effects the fact does remain that in the case of the measurements shown in Figure 10.5, a device input of 2.75 W of power was able to change the system capacity by approximately 100 W, and this may be a sufficient level of modulation for some applications. Different operating conditions will, of course, produce different results.

10.3.1 Subcooling Influence

It is known from the steady state data that, although greater subcooling results in greater mass flow, the loci of points from the actuated device vs. those of the unactuated device diverge. In other words, the influence that subcooling has on the mass flow rate is greatly reduced when the device is powered on. Therefore, during transient operation, when the device is powered up, the piston will engage the flow in the short tube which will increase the restriction. This will, in turn, increase the subcooling which increases the driving potential for the flow. However, since the slope of the actuated device's mass flow rate vs. subcooling (Figure 10.1) diverges from that of the unactuated device, the impact that the device has on the mass flow rate will be greater if the initial degree of subcooling is high. Therefore, operation with a larger degree of inlet subcooling at a given inlet pressure would allow the device more control over the system.

10.3.2 Inlet Pressure Influence

By selecting data points from the quasi-transient data that correspond to the same level of subcooling while in the hot and cold position, and comparing this to the steady state data, we can see that the inlet pressure will also affect the level of influence that the device will have on the flow. Figure 10.6 shows four data points that were measured with a constant subcooling of 4.62 ºC.

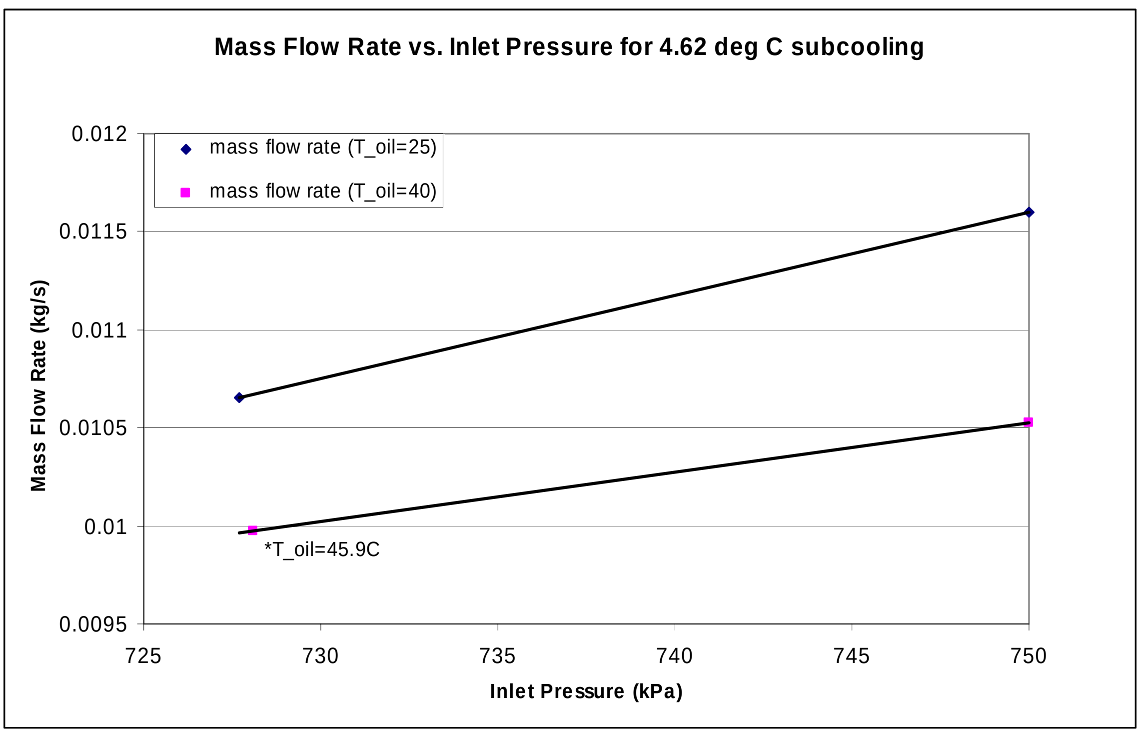


Figure 10.6 Mass Flow Rate vs. Inlet Pressure for Constant Subcooling

These four points are shown in this figure with the mass flow rate is plotted vs. the inlet pressure. It is seen from this figure that as the pressure increases, the two curves diverge. Note that the low pressure, high actuation data point was measured with an oil temperature of 45.9 ºC, not 40.0 ºC, and therefore the difference between the slopes of the curves is actually larger than what is depicted, since an oil temperature of 40.0 ºC would result in greater mass flow than the data point shown above. Since these curves diverge as the inlet pressure is raised, the device's influence on the flow of refrigerant will be better at higher pressures than at lower pressures.

10.3.3 Temporal Response

The quasi-transient data also gives some insight into the transient response of the device. The data acquisition system requires a total of 40 seconds to multiplex through each channel and there is a 3 second delay between successive scans, therefore the total time lapse between successive scans of each channel is 43 seconds. The device's thermal time constant is determined from this data in the same manner as was done in chapter 7 of this dissertation. First, a section of the data was selected to encompass the power-up response of the device. For this analysis, only the third power-up sequence from the data in Figure 10.2 was used because the power was adjusted slightly during the other two sequences.

The data points which correspond to the first two scans after the obvious point of the heater switch were discarded. This is because exact time that the heater was switched on relative to the successive multiplexer scans is unknown. Next, the natural logarithm of the difference between the final steady state temperature and each scanned temperature was plotted against the elapsed time. This locus was fit with a straight line using a least squares regression, and the final temperature was adjusted until the highest R^2 value was obtained. This resulted in a final high power temperature of 51.13 ºC and a thermal time constant of 126.46 seconds, the R^2 for this linear fit was 0.9981044. This measured time constant is within 11 % of the value from the simulations of 114.21 seconds. This is remarkably good considering all of the differences between the actual device and the simplified estimations used in the simulations.

The geometry used in the simulations was a simple tubular section of oil surrounded by a brass cavity, with a heavy brass weight near the bottom. The actual device's oil capsule consists of at least four different diameters within the capsule.

The heat source used in the simulations consisted of a very thin heater located along the centerline of the device. In fact, the heater that was actually used in the capsule was fitted into the capsule and consequently took on the circular shape of the capsule; therefore the heat in the actual device was added into the oil near the outer edge of the reservoir rather than along its centerline.

Finally, isothermal boundary conditions at the outer edges of the capsule were used for the simulations. The isothermal boundary condition of the top of the nickel membrane is probably fairly accurate, since the flashing refrigerant has an extremely large convection coefficient, but the boundary condition around the outside of the brass capsule is probably not very accurate. Since brass and nickel are very good thermal conductors, thermal energy in the brass would tend to leave the system readily via conduction to the nickel membrane. Instead, a simplified isothermal boundary condition was used for the outer edge of the brass. The true exit path of thermal energy in the brass must be two-fold, through the outer edge of the brass capsule into the ambient and through conduction to the nickel membrane; therefore, a more accurate simulation solution would lie somewhere between the case simulated in chapter 7 and a case where the outer edge of the brass were treated as perfectly insulated, forcing all of the heat loss through the nickel membrane.

It is obvious from the simulation results' temperature distribution that this should not have much of an effect on the time constant, since the overwhelming majority of the heat transfer resistance between the heat source and sink occurs within the oil. This is confirmed by the time constant measured in the test results. The parameter that is greatly affected is the relationship between heat input and the device's final temperature. The simulation results estimate that the oil temperature should increase by 39.45 ºC for every one watt of power input; whereas the actual measured temperature was considerably colder in the laboratory measurements. The warmest oil temperature was experienced during the quasi-transient tests; the oil temperature reached 51.86 ºC at the maximum heater output of 2.75 Watts. According to the estimate from the simulation work, power input of approximately 0.77 W should bring the oil temperature to this level. This is the result of the actual heat sink being greater than that modeled in the simulations.

10.4 Summary

The results of this section show the device's ability to modulate the expansion of refrigerant passing through it. Steady state data was taken to map the flow rate for a given inlet pressure. These results showed that the device has greater influence over the flow when the refrigerant inlet subcooling is high. Next, quasi-transient measurements were taken to depict the HVAC system's response to the device's actuation. The results of the steady state and quasi-transient were used to further understand the inlet conditions that impact the device's ability to control the mass flow rate.

Next, information from the quasi-transient measurements was compared to computer simulations. The data showed that the computer code predicted the device's time constant fairly well, but the assumed thermal boundary conditions used in the simulations resulted in an estimate which underpredicted the amount of heat loss. Therefore, the actual level of increased temperature was not as high as that found in the simulations.

CHAPTER 11

Summary and Future Work

11.1 Summary

The design, fabrication and testing of a microfabricated thermopneumatic refrigerant expansion device is presented in this work. An initial prototype of this device was fabricated out of silicon using deep reactive ion etching. A vapor compression system test apparatus was constructed and outfitted with measurement equipment, and testing of the silicon prototype was attempted. Based on the findings of this experiment, changes were made to the device's design and material to improve the reliability and ease of assembly.

The material of the device was changed to nickel, which is a more ductile material than silicon, thereby reducing the chance of fracture. A process for forming micromolded nickel pieces with characteristic heights of 150 μm to 1.2 mm was developed as part of this project. Traditionally, the drive for new fabrication techniques has focused on moving towards smaller, better tolerance features in order to produce lighter, faster responding products. Through this motivation, however, the difficulties associated with meso-scale fabrication techniques are often neglected. Fabrication processes were developed to make thick layer nickel electroplating within SU8 micromolds a feasible option with inexpensive processes. Until recently, very little work had been done with SU8-nickel micromolding in the meso-scale. Many obstacles were overcome to develop these processes.

A second test apparatus was constructed to characterize the performance of the device using compressed air. There are two reasons for this second test method. First, it is not possible to analytically or numerically calculate parameters associated with refrigerant expansion through this device. Using compressed air flow instead of refrigerant expansion as a test bench allows for a basis of comparison to computational fluid dynamics (CFD) simulations. Secondly, using compressed air instead of a refrigerant is less stressful on the device, which is desired during the developmental stage.

Optimal fabrication process parameters for this device were determined and a working prototype was fabricated. The prototype components were characterized to document the capabilities of these new fabrication techniques.

Three dimensional CFD simulations were performed on the flowfield within the device at various levels of actuation to predict the device's ability to control mass flow rate of compressed air. The assembled prototype was demonstrated on the air flow test bench and the results were compared to the CFD results.

A numerical code was developed to determine the device's temporal response. Simulations were performed with this code at various levels of power input to the device and the results were used to determine the device's time constant and relationship between actuation level and power input.

Next, the device was tested in an R134a vapor compression system. Both steady state and transient tests were performed. Testing in the vapor compression system showed greater heat input to the device was necessary to overcome the heat loss to the refrigerant to improve mass flow rate control. The steady state tests showed that the level of flow control is strongly dependent on the refrigerant subcooling. The transient tests were performed to demonstrate the HVAC system's response to actuation of the device, and to benchmark the device's time constant. The measured time constant matched well with the calculated time constant from the temporal response simulation code; but the relationship between the actuation level and power input was offset by the device's refrigerant heat sink.

11.2 Significant Contributions

A number of significant contributions were made through this effort. The development of this flow metering device is a novel contribution. This device was designed to be used as the main throttling device in a small HVAC&R system, where traditional active expansion devices are too large or too costly. However, it was also demonstrated with compressed air and due to the structural and material integrity of this device, it may be used to vary the flow rate of many fluids in many different flow scenarios.

This device works on the principle of introduction or removal of a boundary discontinuity which can be applied to numerous situations. As demonstrated in this dissertation, this principle can be used to vary the flow rate of a passing fluid. However, this principle can also be used in external flow situations by assembling the device without the top piece, i.e. so that the lower flow channel wall is the uppermost piece. This type of device could be used for vortex generation or to encourage laminar to turbulent boundary layer transition.

Theoretical and numerical descriptions of the device were derived to predict the motion of, the stresses within, the flow rate through, and the temporal response of the device. These efforts provide tools for future engineers to continue this work with a map of how different materials and alternate dimensions affect the response.

Lastly, fabrication steps were developed to enable the deposition of very tall SU8 layers. This method was used to prepare molds with depths as deep as 1.2 millimeters, which were then filled with metal through electrodeposition. Through this work an inexpensive UV lithography method to create meso-scale structures has been contributed.

11.3 Future Work

In order to bring this device to a usable standard within industry, a considerable amount of work must be done. First, the prototype tested during this effort demonstrated a lot of the difficulties inherent to initial designs. A number of the auxiliary components should be redesigned to improve the performance of this device.

One major shortcoming was due to the uncertainty of the actual piston position within the flow path during actuation in the vapor compression system. The piston position was measured in relation to the oil reservoir temperature under ambient conditions, but the relationship between the oil temperature and position in the system could not be determined very well. A method of benchmarking this relationship should be devised and used to help describe the fluid mechanics occurring within the flow channel

In addition, the oil used for this prototype was selected because it already exists within the HVAC test apparatus, and if it were to leak into the system there would be no catastrophic consequence. This oil has a low thermal diffusivity and a high heat flux exists from the heater to the membrane; therefore, large temperature gradients can exist within the oil reservoir. This adds considerably to the uncertainty of the oil temperature measurement. Another way to improve this aspect of the device is to select a different liquid to be used in the chamber. The search for an appropriate candidate fluid should find one with a large coefficient of thermal expansion, a higher thermal diffusivity, and have the ability to exist in the vicinity of an electrical resistance heater without causing damage to the heater.

Thirdly, the heater used in this prototype was unable to raise the oil temperature to a level capable to bringing the piston to the top of the flow path when operating in the HVAC system. This is because, during the numerical simulations, a constant temperature boundary condition was assigned to the outer wall of the cavity. Since the cavity walls have a high thermal conductivity, a large amount of heat is conducted up the walls to the membrane. Because of this, the outer edge of the chamber wall will not be isothermal. The true boundary condition for the outer edge of the chamber wall will lie somewhere between isothermal and adiabatic conditions, with the adiabatic assumption producing a result that would be indicative of the greatest amount heat loss from the oil chamber. The numerical simulations should be performed again with this boundary condition, and the resulting information should be used to resize the heater.

These steps are all intermediate design steps, as commercially available parts would likely be too expensive to use in a real world device. After all of the relevant information is obtained, new chamber materials geometry would have to be developed for mass production.

On the fabrication front, there are certain feature limitations that are inherent to the processes. Specifically, since SU8 is a negative type photoresist, any alignment, dosage, or scattering imperfections will ultimately result in nickel pieces whose vertical structures are thinner than the mask dark fields, and whose trench structures are wider than the mask light fields. Although these affects have been minimized through process development, they are still not perfect. The piston described in the prototype had a diameter at its tip between 900 microns and 913 microns; the target diameter for this feature was 950 microns. This ultimately resulted in the piston blocking off a smaller portion of the channel than desired. In order to improve the device performance, the simplest method is to factor in these process limitations during the design at the mask level; i.e. generate new masks with 1000 micron diameter dark fields if 950 microns are desired.

Another task that needs to be done to bring this device from laboratory exploratory work to a commercially viable product is the determination of appropriate assembling and packaging. Specifically, a bonding technique such as that described by Lee [62] should be explored as a possible method of assembling these devices at the wafer level. Individual assembly of these devices would likely lead to a product that was too costly for market acceptance.

Finally, the results of the HVAC system tests bring about questions related to refrigerant expansion within the geometry prescribed by this device. The steady state data shows that the device’s ability to affect the mass flow rate of refrigerant is heavily dependent on the level of subcooling. Specifically, when plotting the mass flow rate against the subcooling, the actuated device and unactuated device data points diverge. It was observed by Kim [67] through a series of short tube flow visualization experiments, that as subcooling is increased the transition point from liquid to two-phase moves further downstream within the short tube. Extending these observations to the work in this dissertation, it seems likely that these trends can be explained by the transition point from liquid to two-phase being fixed at the point of interaction with the piston. This is purely speculative and not completely understood at the present, laboratory experimentation would be necessary to verify or reject any plausible explanations.

Appendix A

Raw Code for Transient Analysis

```
#include<stdio.h>
#include<math.h>

void main()
{
 int m, n, conv, weight_factor;
 double t, totalheatgen, heatgen, timestep, change;
 double heatgenpercell, mschange, rms_change, weighted_temp, average_temp;
 double T_old[53][217], T_new[53][217];



conv=0;
totalheatgen=0.0;
timestep=0.0001;
t=0.0-timestep;
heatgen=totalheatgen/146.0;
heatgenpercell=4*heatgen/(0.000000000003375*3.1415927);

/**********************/
/* Set initial values */
/**********************/
for(m=1; m<52; m++){
 for(n=1; n<=216; n++){
  T_old[m][n]=20;
  }
 }

/****************************/
/*Set the boundary conditions*/
/****************************/
for(n=1; n<=216; n++){
 T_old[52][n]=25.0;
 T_new[52][n]=25.0;}

for(m=1; m<=52;m++){
 T_old[m][1]=25.0;
 T_new[m][1]=25.0;
 T_old[m][216]=5.0;
 T_new[m][216]=5.0;}

/******************************/
/* Temperature calculation loop*/
/******************************/

while(conv==0){
```

```
 t=t+timestep;
 mschange=0.0;
/************************/
/*Calculate temperatures*/
/************************/
 for(m=1; m<=51; m++){
  for(n=2; n<=215; n++){
   if(m==1){
    if(n==68){
     /*USE EQUATION #7 FOR OIL-BRASS*/
     T_new[m][n]=T_old[m][n]+
      0.36149573*(T_old[m+1][n]-T_old[m][n])+
      0.00163896*(110*(T_old[m][n-1]-T_old[m][n])+
       0.282*(T_old[m][n+1]-T_old[m][n]));
     }
    else{
     if(n==215){
      /*USE EQUATION #7 FOR NI-OIL*/
      T_new[m][n]=T_old[m][n]+
       0.26370056*(T_old[m+1][n]-T_old[m][n])+
       0.00144919*(0.282*(T_old[m][n-1]-T_old[m][n])+
        90.7*(T_old[m][n+1]-T_old[m][n]));
      }
     else{
      if(n>68){
       /*USE EQUATION #6 FOR OIL*/
       T_new[m][n]=T_old[m][n]+
        0.002297422*(T_old[m+1][n]-T_old[m][n])+
        0.000574356*(T_old[m][n-1]+T_old[m][n+1]-2*T_old[m][n])+
        +0.000000000045826*heatgenpercell;
       }
      else{
       /*USE EQUATION #6 FOR BRASS*/
       T_new[m][n]=T_old[m][n]+
        0.603306667*(T_old[m+1][n]-T_old[m][n])+
        0.150826667*(T_old[m][n-1]+T_old[m][n+1]-2*T_old[m][n]);
       }
      }
     }
    }
   else{
    if(n==68){
     if(m==42){
      /*USE EQUATION #5 FOR OIL-BRASS*/
      T_new[m][n]=T_old[m][n]+
       (0.001493141536/m)*(55.141*((m-0.5)*(T_old[m-1][n]-T_old[m][n]))-
```

```
          110*((m+0.5)*(T_old[m][n]-T_old[m+1][n])))+
          0.001493141536*(110*(T_old[m][n-1]-T_old[m][n])-55.141*(T_old[m][n]-
          T_old[m][n+1]));
     }
    else{
     if(m>42){
      /*USE EQUATION #1 FOR BRASS*/
      T_new[m][n]=T_old[m][n]+
       (0.15082646/(m*m))*(T_old[m+1][n]-
T_old[m][n]+m*m*(T_old[m+1][n]+T_old[m-1][n]-
          2*T_old[m][n]))+0.15082646*(T_old[m][n+1]+T_old[m][n-1]-2*T_old[m][n]);
       }
     else{
      /*USE EQUATION #2 FOR OIL-BRASS*/
      T_new[m][n]=T_old[m][n]+(0.090373933/m)*((m-0.5)*(T_old[m-1][n]-
T_old[m][n])-
           (m+0.5)*(T_old[m-1][n]-T_old[m][n]))+0.0016389607*(110*(T_old[m][n-1]-
           T_old[m][n])-0.282*(T_old[m][n]-T_old[m][n+1]));
      }
     }
    }
   else{
    if(n==215){
     if(m==42){
      /*USE EQUATION #4 FOR NI-OIL*/
      T_new[m][n]=T_old[m][n]+(0.0012665039/m)*(45.491*(m-0.5)*(T_old[m-1][n]-
          T_old[m][n])-90.7*(m+0.5)*(T_old[m][n]-T_old[m+1][n]))+
          0.0012665039*(45.491*(T_old[m][n-1]-T_old[m][n])-90.7*(T_old[m][n]-
           T_old[m][n+1]));
      }
     else{
      if(m>42){
       /*USE EQUATION #2 FOR NI-BRASS*/
       T_new[m][n]=T_old[m][n]+(0.1240094536/m)*((m-0.5)*(T_old[m-1][n]-
T_old[m][n])-
           (m+0.5)*(T_old[m-1][n]-T_old[m][n]))+0.00123576934*(110*(T_old[m][n-1]-
            T_old[m][n])-90.7*(T_old[m][n]-T_old[m][n+1]));

       }
      else{
       /*USE EQUATION #2 FOR NI-OIL*/
       T_new[m][n]=T_old[m][n]+(0.06592514/m)*((m-0.5)*(T_old[m-1][n]-
T_old[m][n])-
           (m+0.5)*(T_old[m-1][n]-T_old[m][n]))+0.00144919083*(0.282*(T_old[m][n-
1]-
           T_old[m][n])-90.7*(T_old[m][n]-T_old[m][n+1]));
```

```
     }
    }
   }
  else{
   if(m==42){
    if(n>68){
     /*USE EQUATION #1 FOR BRASS*/
     T_new[m][n]=T_old[m][n]+(0.15082646/(m*m))*(T_old[m+1][n]-
          T_old[m][n]+m*m*(T_old[m+1][n]+T_old[m-1][n]-2*T_old[m][n]))+
          0.15082646*(T_old[m][n+1]+T_old[m][n-1]-2*T_old[m][n]);
     }
    else{
     /*USE EQUATION #3 FOR OIL-BRASS*/
     T_new[m][n]=T_old[m][n]+(0.00163896072/m)*(0.282*((m-0.5)*(T_old[m-1][n]-
          T_old[m][n]))-110*((m+0.5)*(T_old[m][n]-T_old[m+1][n])))+
          (0.090373933)*(T_old[m][n-1]+T_old[m][n+1]-2*T_old[m][n]);
     }
    }
   else{
    if(n>68 && m<42){
     /*USE EQUATION #1 FOR OIL*/
     T_new[m][n]=T_old[m][n]+(0.00057435556/(m*m))*(T_old[m+1][n]-
         T_old[m][n]+m*m*(T_old[m+1][n]+T_old[m-1][n]-2*T_old[m][n]))+
         0.00057435556*(T_old[m][n+1]+T_old[m][n-1]-2*T_old[m][n]);
     }
    else{
     /*USE EQUATION #1 FOR BRASS*/
     T_new[m][n]=T_old[m][n]+(0.15082646/(m*m))*(T_old[m+1][n]-
         T_old[m][n]+m*m*(T_old[m+1][n]+T_old[m-1][n]-2*T_old[m][n]))+
         0.15082646*(T_old[m][n+1]+T_old[m][n-1]-2*T_old[m][n]);
     }
    }
   }
  }
 }
 change=(T_old[m][n]-T_new[m][n])/T_old[m][n];
 mschange=mschange+change*change;
 T_old[m][n]=T_new[m][n];

 }/*next n*/
}/*next m*/
rms_change=sqrt(mschange/(10650.0));
if(rms_change<0.000001){
 conv=1;
 }
```

```
 /*if(floor(t)==t){
  printf("The temperature distribution at time %d is\n", t);
  printf("        m       n        Temperature\n");
  for(m=0;m<51;m++){
   for(n=0;n<215;n++){
    printf("      %d      %d      %f\n", m, n, T_old[m][n]);
    }
   }
  }*/

 } /*closes while*/

/**********************************/
/*Calculate average oil temperature*/
/**********************************/
weighted_temp=0.0;
weight_factor=0;
for(m=1; m<42; m++){
 for(n=68; n<215; n++){
  weighted_temp=weighted_temp+m*T_old[m][n];
  weight_factor=weight_factor+m;
  } /*next n*/
 } /*next m*/
average_temp=weighted_temp/weight_factor;

/***************/
/*Output Results*/
/***************/

printf("The solution achieved steady state at time %f\n", t);
printf("The average oil temperature is %f\n", average_temp);
printf("m       n        Temperature\n");
for(m=1;m<=52;m++){
 for(n=1;n<=216;n++){
  printf("        %d      %d      %f\n", m, n, T_old[m][n]);
  }
 }
}/*closes main*/
```

Appendix B

Air Flow Measurement Data and Uncertainty

B.1 Raw Data

Table B.1 Data Set #1 – Data Taken November 4, 2005, 9 am

Point	Oil Temperature (°C)	Upstream Pressure (kPa)	Time (s)	Volume of Air Collected (l)	Air Temperature (°C)	Calculated Air Density (kg/m^3)	Calculated Mass Flow Rate (kg/s)
1	22.89	312.5	40	7.8	29.44	1.1635736	0.000226897
2	27.39	315.8	40	7.5	27.44	1.1655004	0.000218531
3	29.78	315.0	40	7.3	28.56	1.1670035	0.000212978
4	35.83	313.5	45	7.8	29.67	1.1627193	0.000201538
5	41.83	316.3	45	7.3	29.28	1.1642152	0.000188862

Table B.2 Data Set #2 – Data Taken November 4, 2005, 1 pm

Point	Oil Temperature (°C)	Upstream Pressure (kPa)	Time (s)	Volume of Air Collected (l)	Air Temperature (°C)	Calculated Air Density (kg/m^3)	Calculated Mass Flow Rate (kg/s)
6	23.00	315.0	40	7.6	28.00	1.1691574	0.00022214
7	28.22	316.6	40	7.6	29.61	1.1629328	0.000220957
8	30.06	315.6	40	7.3	29.28	1.1642152	0.000212469
9	37.00	314.1	45	7.7	28.44	1.1674336	0.000199761
10	44.44	315.0	50	8.0	29.39	1.1637874	0.000186206

Table B.3 Data Set #3 – Data Taken November 4, 2005, 5 pm

Point	Oil Temperature (°C)	Upstream Pressure (kPa)	Time (s)	Volume of Air Collected (l)	Air Temperature (°C)	Calculated Air Density (kg/m^3)	Calculated Mass Flow Rate (kg/s)
11	23.06	316.2	40	7.8	29.0	1.1652860	0.000227231
12	28.89	317.6	40	7.5	29.56	1.1631463	0.000218090
13	33.28	315.2	45	8.0	28.72	1.1663588	0.000207353
14	37.67	316.5	45	7.7	27.94	1.1693732	0.000200093
15	44.83	315.6	45	7.2	29.17	1.1646433	0.000186343

Table B.4 Data Set #4 – Data Taken November 4, 2005, 7 pm

Point	Oil Temperature (°C)	Upstream Pressure (kPa)	Time (s)	Volume of Air Collected (l)	Air Temperature (°C)	Calculated Air Density (kg/m^3)	Calculated Mass Flow Rate (kg/s)
16	23.06	315.9	40	7.7	29.61	1.1629328	0.000223865
17	29.22	317.0	40	7.5	29.78	1.1622926	0.00021793
18	35.33	312.7	45	7.8	29.61	1.1629328	0.000201575
19	41.39	317.6	45	7.2	29.00	1.1652860	0.000186446

B.2 Uncertainty Analysis for Gas Flow Measurements

The air flow rate is calculated from the measured atmospheric air pressure, the volume and temperature of the air collected in the cylinder, and the time elapsed during the collection. The mass flow rate is related through these parameters as follows:

$$\dot{m} = \frac{\rho \forall}{t} = \frac{\forall}{t} \rho\left(P_{atm}, T_{air}\right)$$

Although Refprop was used to calculate the density of the air in the cylinder, it is convenient to use the ideal gas law for the purposes of the uncertainty analysis.

$$\dot{m} = \frac{\forall}{t} \frac{P_{atm}}{RT_{air}}$$

Therefore the influence of each measured parameter is:

$$\frac{\partial \dot{m}}{\partial \forall} = \frac{P_{atm}}{tRT_{air}}$$

$$\frac{\partial \dot{m}}{\partial P_{atm}} = \frac{\forall}{tRT_{air}}$$

$$\frac{\partial \dot{m}}{\partial t} = -\frac{\forall P_{atm}}{t^2 RT_{air}}$$

$$\frac{\partial \dot{m}}{\partial T_{air}} = -\frac{\forall P_{atm}}{tR\left(T_{air}\right)^2}$$

And the uncertainty of the mass flow rate is found from the uncertainty of each measurement.

$$U_{\dot{m}} = \sqrt{\left(\frac{\partial \dot{m}}{\partial \forall} \times U_{\forall}\right)^2 + \left(\frac{\partial \dot{m}}{\partial P_{atm}} \times U_{P_{atm}}\right)^2 + \left(\frac{\partial \dot{m}}{\partial t} \times U_t\right)^2 + \left(\frac{\partial \dot{m}}{\partial T_{air}} \times U_{T_{air}}\right)^2}$$

Table B.5 Calculated Uncertainty for all data

Point	dm_dot/dV	dm_dot/dP_atm	dm_dot/dt	dm_dot/dT_air	Uncertainty	U (%)
1	0.029214725	2.24729E-09	5.69687E-06	7.53444E-07	4.08096E-06	1.799%
2	0.029263103	2.16443E-09	5.48683E-06	7.26866E-07	4.01185E-06	1.836%
3	0.029300841	2.10943E-09	5.3474E-06	7.09309E-07	3.96725E-06	1.863%
4	0.025949578	1.99612E-09	4.49793E-06	6.68745E-07	3.43455E-06	1.704%
5	0.025982963	1.87057E-09	4.21501E-06	6.27488E-07	3.34614E-06	1.772%
6	0.029354921	2.20017E-09	5.57744E-06	7.41187E-07	4.04964E-06	1.823%
7	0.029198635	2.18846E-09	5.54774E-06	7.33316E-07	4.02807E-06	1.823%
8	0.029230833	2.10439E-09	5.33463E-06	7.05924E-07	3.95777E-06	1.863%
9	0.026054792	1.97852E-09	4.45826E-06	6.65535E-07	3.42957E-06	1.717%
10	0.023376074	1.84427E-09	3.74017E-06	6.18437E-07	2.99424E-06	1.608%
11	0.02925772	2.25059E-09	5.70526E-06	7.55663E-07	4.08697E-06	1.799%
12	0.029203996	2.16006E-09	5.47575E-06	7.23933E-07	4.00374E-06	1.836%
13	0.026030805	2.05371E-09	4.6277E-06	6.90193E-07	3.48349E-06	1.680%
14	0.02609808	1.98181E-09	4.46567E-06	6.67749E-07	3.43527E-06	1.717%
15	0.025992517	1.84562E-09	4.1588E-06	6.19347E-07	3.32924E-06	1.787%
16	0.029198635	2.21725E-09	5.62074E-06	7.42965E-07	4.05331E-06	1.811%
17	0.029182562	2.15847E-09	5.47173E-06	7.22871E-07	4.0008E-06	1.836%
18	0.025954342	1.99649E-09	4.49875E-06	6.6899E-07	3.43518E-06	1.704%
19	0.026006862	1.84664E-09	4.1611E-06	6.20031E-07	3.33108E-06	1.787%

Appendix C

Test Data and Uncertainty for Refrigerant Flow Control Measurements

In the interest of saving space, the measurement uncertainty methodology is presented in the beginning of this section and the Uncertainty is included in the raw data portion of this appendix.

C.1 Uncertainty Analysis

The capacity of heat transferred in the evaporator is measured on the refrigerant side and on the HTF side.

HTF side uncertainty

The HTF side capacity is determined by measuring the HTF temperature at the inlet and exit of the evaporator, and the HTF mass flow rate. The average of the inlet and exit temperature is used to determine the HTF specific heat, Cp.

$$C_p = 1.805\left(T_{HTF,in} + T_{HTF,out}\right) + 3304.357$$

Therefore, the uncertainty of the specific heat measurement is:

$$U_{C_p} = \sqrt{1.805\left(U_{T_{HTF,in}}{}^2 + U_{T_{HTF,out}}{}^2\right)}$$

Since each temperature is measured with 5 thermocouples, each having a measurement uncertainty of 0.15 ºC, the uncertainty of each of these values is 0.0067 ºC, and the uncertainty of the specific heat is a constant 0.00127, which is insignificant for specific heats in the range of 3300 and will be left off of the remainder of the calculations.

The capacity is calculated from the product of the mass flow rate with the difference between the inlet temperature and the exit temperature.

$$Q = \dot{m} C_P \left(T_{HTF,in} - T_{HTF,out} \right)$$

Therefore the uncertainty due to the mass flow measurement uncertainty is:

$$\frac{\partial Q}{\partial \dot{m}} = \frac{C_P}{\left(T_{HTF,in} - T_{HTF,out} \right)}$$

And the uncertainties due to the measured temperatures are:

$$\frac{\partial Q}{\partial T_{HTF,in}} = \dot{m} C_P$$

$$\frac{\partial Q}{\partial T_{HTF,iout}} = -\dot{m} C_P$$

Therefore, the measurement uncertainty of the HTF side capacity is

$$U_Q = \sqrt{\left[\left(\frac{\partial Q}{\partial \dot{m}} \right) U_{\dot{m}} \right]^2 + \left[\left(\frac{\partial Q}{\partial T_{HTF,in}} \right) U_{T_{HTF,in}} \right]^2 + \left[\left(\frac{\partial Q}{\partial T_{HTF,in}} \right) U_{T_{HTF,in}} \right]^2}$$

The refrigerant side capacity is calculated by measuring the valve inlet temperature, the evaporator exit temperature, pressure, and volumetric flow rate. The valve inlet temperature is used to determine the liquid enthalpy, the evaporator exit temperature and pressure are used to determine the vapor enthalpy and the vapor density. The capacity is then calculated from:

$$Q = \rho \dot{\forall} \left(h_{ref,vap} - h_{ref,liq} \right)$$

The uncertainty of the liquid enthalpy is:

$$U_{h_{rev,liq}} = \frac{\partial h_{liq}}{\partial T_{ref,liq}} U_{T_{ref,liq}}$$

And the uncertainty of the vapor enthalpy is:

$$U_{h_{rev,vap}} = \sqrt{\left(\frac{\partial h_{vap}}{\partial T_{ref,vap}} U_{T_{ref,vap}}\right)^2 + \left(\frac{\partial h_{vap}}{\partial P_{ref,vap}} U_{P_{ref,vap}}\right)^2}$$

The uncertainty of the density term is

$$U_{\rho} = \sqrt{\left(\frac{\partial \rho}{\partial T_{ref,vap}} U_{T_{ref,vap}}\right)^2 + \left(\frac{\partial \rho}{\partial P_{ref,vap}} U_{P_{ref,vap}}\right)^2}$$

Therefore, the uncertainty of the capacity measurement is:

$$U_{Q_{ref}} = \sqrt{\left(\rho \dot{\forall} U_{h_{ref,vap}}\right)^2 + \left(\rho \dot{\forall} U_{h_{ref,liq}}\right)^2 + \left(\dot{\forall} \Delta h U_{\rho}\right)^2 + \left(\Delta h \rho U_{\dot{\forall}}\right)^2}$$

C.2 Steady State Data – No Actuation

Point	HX2 T ref in	HX2 T HTF ou	HX2 T HTF in	Turbine for ref HX2	Total HTF m dot	ref micromotion	P comp disch
C.2.1	4.180702496	7.118671036	8.938179207	0.000737567	0.274461627	0.012822837	738.8515015
C.2.2	4.178533077	7.161312676	8.978081131	0.000739749	0.273133129	0.012818844	747.1981201
C.2.3	4.144928455	7.197923088	8.997948074	0.000736476	0.274938434	0.012824757	752.1885986
C.2.4	4.139591789	7.173619557	8.988619995	0.000738658	0.274134576	0.012818385	761.3911133
C.2.5	4.094209862	7.232821464	9.034402275	0.00074084	0.274797052	0.01282299	765.5348511
C.2.6	4.084136629	7.235859013	9.04640007	0.000736476	0.274547875	0.012820283	755.7277832
C.2.7	4.094503689	7.262430286	9.048830795	0.000748478	0.274679005	0.01282316	773.3521118
C.2.8	4.107497787	7.313715077	9.088774109	0.000736476	0.274305165	0.012817355	748.7715454
C.2.9	4.101010513	7.296056938	9.107055855	0.000738658	0.271848112	0.012826314	774.2072144
C.2.10	4.096284104	7.313445091	9.115968704	0.00074084	0.274755627	0.012841791	754.2453003
C.2.11	4.135602856	7.309739781	9.12179985	0.000745205	0.274965852	0.012841634	754.2944946
C.2.12	4.115741634	7.317645359	9.149012756	0.000734294	0.274930805	0.012830663	742.1307373
C.2.13	4.144511795	7.329244518	9.135358429	0.000736476	0.273675174	0.012837636	753.411438
C.2.14	4.163120937	7.370416546	9.15748291	0.00074084	0.274109155	0.01284695	759.3189697
C.2.15	4.181771565	7.369179726	9.185488701	0.000732112	0.274473369	0.01285095	765.7390137
C.2.16	4.231077957	7.370051765	9.197881508	0.000734294	0.27442956	0.012854717	776.0617065
C.2.17	4.235106182	7.388441086	9.20818882	0.000738658	0.274855822	0.012863859	757.2908936
C.2.18	4.257624721	7.379660893	9.226857758	0.000739749	0.274469525	0.012855771	776.9347534
C.2.19	4.286678314	7.395115852	9.232956696	0.000737567	0.274722636	0.012865775	748.3148804
C.2.20	4.305149364	7.417624187	9.276397515	0.000743022	0.272455633	0.012853563	771.6652222
C.2.21	4.346335506	7.421014309	9.259200859	0.000739749	0.275216937	0.012865308	744.1525879
C.2.22	4.389372444	7.456003094	9.269617844	0.000743022	0.274575263	0.012862282	756.8493652
C.2.23	4.407480621	7.454117966	9.294096947	0.000732112	0.274933606	0.012870646	766.6121216
C.2.24	4.417549419	7.44317379	9.297153664	0.000738658	0.275191486	0.012878243	760.5903931
C.2.25	4.477793312	7.48991251	9.299418068	0.000745205	0.275039524	0.012864447	739.614502
C.2.26	4.500996876	7.464916515	9.335586357	0.000736476	0.275197387	0.012864504	772.6786499
C.2.27	4.466787434	7.470831299	9.306189346	0.000736476	0.27357161	0.012857295	787.3497925
C.2.28	4.477689838	7.48138113	9.296945763	0.000735385	0.273527712	0.012870804	752.2752686
C.2.29	4.440455723	7.470955372	9.29175129	0.000743022	0.275269121	0.012870187	737.5535278
C.2.30	4.416179848	7.426006031	9.261477089	0.000745205	0.275041163	0.012875696	762.8684692
C.2.31	4.420138836	7.415382958	9.23809967	0.000741931	0.274908751	0.012876864	762.0651855
C.2.32	4.469653225	7.392267895	9.238952446	0.000738658	0.272463024	0.01286749	761.3796997
C.2.33	4.396247291	7.379445648	9.212154007	0.000746296	0.273972362	0.012859317	781.6177979
C.2.34	4.409044266	7.388330459	9.224817085	0.00074084	0.274859995	0.01287156	759.9696045
C.2.35	4.414802551	7.368666458	9.208892822	0.000739749	0.274530798	0.012862652	761.5687256
C.2.36	4.442075157	7.370061398	9.217555427	0.00074084	0.275006205	0.012877736	730.3373413
C.2.37	4.474652481	7.381511307	9.238659477	0.000741931	0.272765785	0.012874091	743.2991943
C.2.38	4.516218853	7.393756008	9.264016533	0.000749569	0.275343686	0.012890972	772.8099365
C.2.39	4.558564949	7.422911549	9.276319504	0.000744114	0.274035305	0.012888023	739.505249
C.2.40	4.595477009	7.450069714	9.279072571	0.000745205	0.275409818	0.012902075	755.4389648
C.2.41	4.611497307	7.428828621	9.301441193	0.000746296	0.273621827	0.012886752	749.0323486
C.2.42	4.645279121	7.434778404	9.28663044	0.000738658	0.274763256	0.01289959	779.2216797
C.2.43	4.663268948	7.430892372	9.298314476	0.000745205	0.274591774	0.012906069	759.498291
C.2.44	4.693248844	7.429049587	9.310826492	0.000739749	0.275354207	0.01290321	742.6383667
C.2.45	4.701194668	7.445308304	9.301468468	0.000743022	0.27344501	0.012906633	759.7814331
C.2.46	4.72852068	7.451734447	9.310800743	0.000738658	0.274330854	0.012913821	785.734375
C.2.47	4.742368793	7.449672413	9.305296707	0.000739749	0.274495035	0.0129027	780.6212158
C.2.48	4.75059967	7.450649261	9.310847092	0.000744114	0.272401869	0.012900081	741.9320068
C.2.49	4.746945095	7.474525928	9.299319649	0.000741931	0.272908479	0.012887385	737.5861206
C.2.50	4.676651573	7.451016808	9.308366394	0.000749569	0.274827421	0.012895394	761.5255737
C.2.51	4.668172455	7.442533493	9.299113083	0.000741931	0.274874598	0.012892433	758.1925659
C.2.52	4.659927368	7.448374272	9.297934532	0.000741931	0.27490291	0.012913305	756.763855
C.2.53	4.684337425	7.450886536	9.293803787	0.000745205	0.274404049	0.012919802	737.3010254
C.2.54	4.691784763	7.429453373	9.278312301	0.000745205	0.274403393	0.012912086	761.3625488
C.2.55	4.746788025	7.422847653	9.303927231	0.000741931	0.274774909	0.012917139	717.0322876
C.2.56	4.762338638	7.417768383	9.310235596	0.000748478	0.274571836	0.012910914	748.4472656
C.2.57	4.769873142	7.418741417	9.267777252	0.000745205	0.274952471	0.012924958	754.5639038
C.2.58	4.791892338	7.424504852	9.273102379	0.000741931	0.274783194	0.012922742	764.8516846
C.2.59	4.768773937	7.404819584	9.275730896	0.000743022	0.274304509	0.012907591	788.7098999
C.2.60	4.805434227	7.385928631	9.26883831	0.000746296	0.273554057	0.012904593	759.9733276
C.2.61	4.824605751	7.397327423	9.270133591	0.000739749	0.274340451	0.012899394	743.4053345
C.2.62	4.836998844	7.400588036	9.267094994	0.00074084	0.272683144	0.01291319	751.2531738
C.2.63	4.833556175	7.386843777	9.261408043	0.000744114	0.274129003	0.012919718	754.8510132
C.2.64	4.85975914	7.397793198	9.274751282	0.000747387	0.274541706	0.012914814	775.6127319
C.2.65	4.840119934	7.365659523	9.264508057	0.000744114	0.274433315	0.012913497	787.1033325
C.2.66	4.883917999	7.344709587	9.233579826	0.000744114	0.274071068	0.01292114	776.901001
C.2.67	4.873520947	7.374470234	9.239659309	0.000744114	0.274239928	0.012918966	765.0687256

Point	HX2 T ref in	HX2 T HTF ou	HX2 T HTF in	Turbine for ref HX2	Total HTF m dot	ref micromotion	P comp disch
C.2.68	4.863422108	7.373764706	9.262571335	0.000743022	0.274360865	0.012912069	751.0132446
C.2.69	4.882738399	7.373833752	9.251340866	0.000745205	0.273825407	0.012940784	764.2439575
C.2.70	4.929843903	7.376478672	9.243982697	0.000749569	0.27331987	0.01293344	759.940979
C.2.71	4.915040112	7.318531132	9.259210014	0.00074084	0.273775756	0.012931497	759.1757202
C.2.72	4.905850315	7.33832426	9.235312462	0.000739749	0.274202257	0.012912596	758.3781738
C.2.73	4.899062729	7.340810299	9.246330643	0.000746296	0.27521947	0.012921185	755.1773071
C.2.74	4.897404766	7.354495049	9.239608765	0.000746296	0.274299413	0.012910231	749.3952637
C.2.75	4.908019447	7.3682971	9.208499718	0.000739749	0.274490178	0.012912651	747.6585693
C.2.76	4.904791069	7.374486351	9.216557503	0.000746296	0.274278492	0.012924081	768.0050659
C.2.77	4.929732704	7.365740776	9.213013649	0.000743022	0.27173996	0.01292652	730.9244385
C.2.78	4.919992637	7.349465179	9.209678841	0.000741931	0.274510622	0.012929025	767.2623901
C.2.79	4.936583614	7.350156117	9.21351738	0.000743022	0.273992717	0.012925195	767.1957397
C.2.80	4.943807888	7.307524872	9.205449867	0.000746296	0.273879647	0.01292253	770.3640137
C.2.81							
C.2.82	5.028945541	7.425163269	9.233469582	0.000737567	0.27266708	0.012918892	756.7787476
C.2.83	4.984455204	7.386656284	9.239470673	0.000731021	0.274187177	0.012898412	763.392334
C.2.84	5.005423355	7.401344013	9.257571983	0.000732112	0.274982244	0.012905084	763.9282837
C.2.85	5.022987175	7.383454895	9.270499611	0.000738658	0.27523759	0.012909791	734.5354004
C.2.86	5.042121506	7.400961208	9.252938652	0.000736476	0.27612558	0.01289246	729.819458
C.2.87	5.066598606	7.412481404	9.27474308	0.000737567	0.275000483	0.012936307	759.9976196
C.2.88	5.115046692	7.404286194	9.292114258	0.000737567	0.274548858	0.012931084	787.6469116
C.2.89	5.112014961	7.425852776	9.283875847	0.000733203	0.275384635	0.012919865	740.3605957
C.2.90	5.146662712	7.421904087	9.269938469	0.000735385	0.275460541	0.012903227	777.8967896
C.2.91	5.142667294	7.430800056	9.294296646	0.000737567	0.27460286	0.012908616	749.4573364
C.2.92	5.163566017	7.42621994	9.278566933	0.000734294	0.274702936	0.012942382	758.5585938
C.2.93	5.204116058	7.426240349	9.293821526	0.000738658	0.274172395	0.012916788	757.8179321
C.2.94	5.171935558	7.397006702	9.28073349	0.000737567	0.274883151	0.012931106	739.5544434
C.2.95	5.193699169	7.440216541	9.266818047	0.000739749	0.276170701	0.01294863	756.65802
C.2.96	5.252576542	7.416539478	9.270616722	0.000738658	0.275890887	0.012923135	756.5290527
C.2.97	5.215815926	7.368081474	9.255808258	0.000737567	0.275931269	0.012939999	743.1842651
C.2.98	5.203846455	7.35725975	9.190917015	0.000741931	0.276397169	0.012931194	735.0864258
C.2.99	5.189510155	7.32289629	9.210465431	0.000743022	0.27365005	0.012928768	745.1368408
C.2.100	5.211629772	7.28950901	9.187457657	0.000736476	0.274789035	0.012926472	780.3495483
C.2.101	5.235402679	7.302636909	9.195092011	0.000737567	0.276263326	0.012951177	788.8156738
C.2.102	5.24954443	7.299090481	9.179806328	0.000738658	0.275667727	0.012949068	748.5170288
C.2.103	5.267628861	7.295292092	9.15023098	0.000736476	0.273695856	0.01293057	777.6728516
C.2.104	5.294348145	7.296537495	9.171458816	0.000741931	0.275730908	0.012933309	739.28479
C.2.105	5.260919285	7.278553486	9.170444107	0.000737567	0.275473505	0.012928771	742.4536133
C.2.106	5.25140171	7.292420483	9.155423164	0.000743022	0.27498135	0.012929717	735.5379639
C.2.107	5.348593617	7.316493702	9.214178657	0.000739749	0.275921673	0.012939809	740.7145996
C.2.108	5.335411453	7.324226665	9.225372887	0.000741931	0.27558583	0.012940556	779.1848145
C.2.109	5.331215954	7.3439641	9.223739243	0.000741931	0.275501311	0.01288635	759.4573975
C.2.110	5.362407684	7.342409134	9.250249291	0.000743022	0.275535464	0.012956621	756.6448975
C.2.111	5.384240246	7.35210104	9.250162124	0.000737567	0.273937255	0.012959442	761.9588013
C.2.112	5.407239914	7.365690231	9.239646149	0.000744114	0.274671614	0.012969651	769.6508179
C.2.113	5.4239048	7.355654335	9.267342949	0.00074084	0.275675684	0.012967337	764.6154785
C.2.114	5.40842638	7.34946537	9.263404846	0.000738658	0.274434477	0.012955852	754.6402588
C.2.115	5.425981999	7.370417213	9.247709846	0.00074084	0.275709569	0.012944778	758.7255859
C.2.116	5.411154747	7.376707363	9.254494667	0.000741931	0.276549935	0.012976627	652.2250977
C.2.117	5.439326573	7.351338959	9.259809494	0.000739749	0.274676681	0.0129818	742.4376221
C.2.118	5.439046479	7.354376888	9.235714531	0.000743022	0.275335073	0.012969007	740.802124
C.2.119	5.463721752	7.384994888	9.2819067	0.000737567	0.274569869	0.012967886	742.8920288
C.2.120	5.449562454	7.36618433	9.256863213	0.000741931	0.275857419	0.012981149	749.2416992
C.2.121	5.470263385	7.357526398	9.237282753	0.000744114	0.275583029	0.012964125	753.1754761
C.2.122	5.464730263	7.353594971	9.255758858	0.000746296	0.275224566	0.013008297	771.5665283
C.2.123	5.467251396	7.345462895	9.256843757	0.000737567	0.273960382	0.012927817	760.2158203
C.2.124	5.48457756	7.368251991	9.235128212	0.000745205	0.274584472	0.013023453	782.1929321
C.2.125	5.475814533	7.373864937	9.252017784	0.000741931	0.275236368	0.012990426	743.4439087
C.2.126	5.504488563	7.333622456	9.221674728	0.000744114	0.274449825	0.012993406	759.0493164
C.2.127	5.531508637	7.373170757	9.237108993	0.000743022	0.272734106	0.012973682	758.2108765
C.2.128	5.558804608	7.368753243	9.228462792	0.000741931	0.274723232	0.012991379	755.0214233
C.2.129	5.570602036	7.341349697	9.21645813	0.000741931	0.276106685	0.012991868	771.8988037
C.2.130	5.597800541	7.356103706	9.230814171	0.000736476	0.275146037	0.012971545	760.0925293
C.2.131	5.591155243	7.335996342	9.245458031	0.000745205	0.274682194	0.012960044	771.7952881
C.2.132	5.591851425	7.330074596	9.219317818	0.000739749	0.273794234	0.013032057	738.3156128
C.2.133	5.632409573	7.330779743	9.2253788	0.00074084	0.274395913	0.013003363	760.3931274
C.2.134	5.608347035	7.333634949	9.246342469	0.000745205	0.274207115	0.012950934	787.8104858

Point	HX2 T ref in	HX2 T HTF ou	HX2 T HTF in	Turbine for ref HX2	Total HTF m dot	ref micromotion	P comp disch
C.2.135	5.621119785	7.307805061	9.213310242	0.000744114	0.276358515	0.012995082	741.4404297
C.2.136	5.6633358	7.314284134	9.19641304	0.000747387	0.275444448	0.012970664	772.40271
C.2.137	5.699219417	7.306241131	9.211162567	0.000739749	0.275636941	0.013000596	774.2609253
C.2.138	5.691458035	7.291529083	9.168499756	0.000745205	0.276056081	0.012949098	760.6149902
C.2.139	5.686900806	7.283699799	9.174697494	0.000743022	0.275636464	0.0130057	756.0803833
C.2.140	5.675448418	7.254081631	9.156501197	0.000744114	0.275342554	0.012989519	761.0411377
C.2.141	5.652450943	7.235950184	9.149622345	0.000747387	0.275481045	0.012990012	758.6289673
C.2.142	5.657878018	7.252796269	9.138217163	0.000746296	0.273853391	0.01298852	769.8569946
C.2.143	5.662581539	7.236636543	9.145780945	0.000741931	0.275053054	0.01299136	757.0512695
C.2.144	5.690514565	7.242925835	9.116727257	0.000747387	0.274702221	0.012989899	774.5852661
C.2.145	5.714144993	7.216520119	9.137023163	0.000743022	0.275110751	0.0129915	758.6409912
C.2.146	5.712372685	7.22558403	9.145895767	0.000738658	0.273810476	0.013009035	763.7912598
C.2.147	5.71628294	7.219553185	9.102262116	0.000745205	0.274719268	0.012991072	758.1253662
C.2.148	5.723991394	7.2123106	9.136940193	0.000745205	0.276031852	0.012999209	751.2471924
C.2.149	5.739651871	7.183452129	9.11698494	0.000745205	0.275590092	0.013000879	754.2684937
C.2.150	5.781657886	7.202107143	9.100288391	0.00074084	0.274364471	0.013005462	736.2803955
C.2.151	5.81484251	7.196519947	9.109138107	0.000743022	0.27516973	0.01300589	766.6104126
C.2.152	5.793729496	7.164544487	9.087603378	0.000743022	0.274626076	0.013004749	731.8435669
C.2.153	5.818698311	7.1529953	9.078941154	0.000746296	0.276075602	0.013009595	763.2573853
C.2.154	5.828213978	7.164147186	9.075897026	0.000744114	0.275791466	0.013009324	778.7463989
C.2.155	5.846405983	7.175492001	9.090062904	0.000745205	0.275997639	0.013014676	783.9018555
C.2.156	5.835105038	7.147710037	9.076380157	0.000748478	0.275781035	0.013015203	766.1339722
C.2.157	5.875170231	7.132955647	9.055753899	0.000738658	0.276181698	0.013015871	766.8614502
C.2.158	5.891827679	7.135202408	9.063704681	0.000746296	0.27561143	0.013011179	758.0907593
C.2.159	5.860461426	7.132826805	9.047197723	0.000743022	0.275868595	0.013012857	764.8939819
C.2.160	5.891666985	7.130614567	9.02185154	0.000741931	0.275283068	0.013021443	778.1815796
C.2.161	5.912298965	7.117680836	9.04384861	0.000744114	0.275068909	0.013016752	741.3314819
C.2.162	5.912722683	7.108178234	9.039130974	0.000744114	0.273469299	0.01301855	738.6890869
C.2.163	5.925160217	7.117192364	9.013465881	0.00074084	0.275111556	0.013005836	751.9309692
C.2.164	5.896413517	7.089550304	9.015662956	0.00074084	0.27565065	0.013037491	763.0377808
C.2.165	5.942956066	7.071904373	8.979385757	0.000745205	0.275653601	0.013012462	756.3915405
C.2.166	5.937585068	7.091589546	9.011415481	0.000739749	0.274827272	0.013006289	774.1945801
C.2.167	5.936904049	7.081631565	9.002257156	0.000743022	0.275264919	0.013017635	763.7340698
C.2.168	5.946237564	7.062409401	8.983685494	0.000743022	0.276008159	0.013006089	756.2894287
C.2.169	5.925772762	7.058994389	8.972986793	0.000744114	0.274892479	0.013018307	756.7509766
C.2.170	5.930788994	7.031527901	8.993066597	0.000741931	0.274609417	0.013010633	779.8931274
C.2.171	5.918121719	7.047625256	8.955607223	0.000737567	0.275626928	0.013015296	758.74646
C.2.172	5.966459274	7.031698608	8.978754806	0.000739749	0.275357485	0.013011599	747.2021484
C.2.173	5.978085709	7.027784634	8.968580818	0.000747387	0.275308341	0.013023562	782.2910156
C.2.174	5.968313408	7.034400272	8.966201591	0.000743022	0.275111496	0.013011512	757.0232544
C.2.175	6.002648926	7.064375114	8.966907883	0.000749569	0.275514275	0.013006784	767.1463013
C.2.176	6.016080093	7.031985951	8.961288834	0.000744114	0.274728537	0.013023804	765.5940552
C.2.177	6.024039078	7.045398235	8.9647295	0.000741931	0.275565237	0.013025761	760.4465942
C.2.178	6.067777348	7.051181507	8.960504723	0.000745205	0.274460226	0.01302942	776.4943848
C.2.179	6.052327156	7.031742859	8.95541172	0.000745205	0.275715798	0.013034207	759.546936
C.2.180	6.040409756	7.016606712	8.921971703	0.000743022	0.275936693	0.013020213	750.0298462
C.2.181	6.039669132	7.00583458	8.941326523	0.000746296	0.273790777	0.013015007	732.3779907
C.2.182	6.029897976	6.978927612	8.936141586	0.000737567	0.274302125	0.013034308	761.9442139
C.2.183	6.089956951	6.977984429	8.919418144	0.000747387	0.27507481	0.013027382	758.1854248
C.2.184	6.06970787	6.997179604	8.915788078	0.000744114	0.27376765	0.013032318	750.612915
C.2.185	6.058313846	6.966035175	8.938529587	0.00074084	0.274471492	0.013040069	760.6593628
C.2.186	6.076204491	6.977486706	8.909380913	0.000741931	0.274312228	0.013036466	731.185791
C.2.187	6.113795471	6.988925171	8.904161644	0.000747387	0.274890929	0.013035359	765.8039551
C.2.188	6.075019455	6.985604095	8.909884262	0.000745205	0.275304556	0.013041132	774.649292
C.2.189	6.090334415	6.965338135	8.90476551	0.000745205	0.275956124	0.013034998	767.8912354
C.2.190	6.11048975	6.962785911	8.889027786	0.00074084	0.27519986	0.013036598	763.5170288
C.2.191	6.094776916	6.94997406	8.904463196	0.00074084	0.275089502	0.013035929	736.3695679
C.2.192	6.103609753	6.95841322	8.874990654	0.000744114	0.274607867	0.013027101	710.0314331
C.2.193	6.122369003	6.95924778	8.881586456	0.000744114	0.275624961	0.013034943	754.0128174
C.2.194	6.138797092	6.952544403	8.867919922	0.00074084	0.275809497	0.013029676	756.9325562
C.2.195	6.116791534	6.937761497	8.839306831	0.000745205	0.275768489	0.013038	767.5895386
C.2.196	6.115493393	6.947460937	8.874762726	0.000743022	0.27525261	0.013031467	738.6242065
C.2.197	6.117151547	6.933455849	8.87154541	0.000746296	0.276119649	0.013028143	739.3339844
C.2.198	6.149682331	6.926403141	8.842947197	0.000745205	0.275241554	0.01303005	755.7026367
C.2.199	6.137050343	6.923091602	8.824658203	0.000739749	0.275460213	0.013030699	781.9769897
C.2.200	6.144670963	6.902456093	8.833706474	0.00074084	0.27424404	0.013036794	763.3217163
C.2.201	6.138613796	6.935713673	8.826412201	0.000741931	0.275265992	0.013049047	782.1022339

Point	HX2 T ref in	HX2 T HTF ou	HX2 T HTF in	Turbine for ref HX2	Total HTF m dot	ref micromotion	P comp disch
C.2.202	6.187576103	6.932267475	8.837030029	0.000744114	0.275004834	0.01303386	781.1342163
C.2.203	6.181514263	6.885412121	8.831542587	0.000744114	0.275903195	0.013043085	763.7640991
C.2.204	6.185057068	6.892250729	8.821507835	0.00074084	0.274201125	0.013037996	752.7445679
C.2.205							
C.2.206	6.55590601	6.955425835	11.08005352	0.00075066	0.134261265	0.013108757	729.2546387
C.2.207	6.587770176	6.968052101	11.11790409	0.000746296	0.13443552	0.013096888	722.7416992
C.2.208	6.64072237	7.01158886	11.12940025	0.000743022	0.134712577	0.013101867	720.8942871
C.2.209	6.979769135	7.331270313	11.76010666	0.000741931	0.134659454	0.013118112	795.916626
C.2.210	7.294327068	7.708529949	12.08605423	0.000739749	0.134845093	0.013135813	721.9944458
C.2.211	7.587129784	8.031740951	12.22143383	0.000735385	0.134879336	0.013141952	741.0689697
C.2.212	7.520115662	7.953643799	12.09248905	0.000744114	0.134939387	0.013151359	772.7667236
C.2.213	7.413820553	7.827950954	11.94999962	0.000741931	0.134910256	0.013145481	731.8521118
C.2.214	7.286895275	7.715399456	11.85896225	0.000739749	0.134859458	0.01314446	735.248291
C.2.215	7.168109799	7.55025301	11.73464069	0.000749569	0.134666771	0.013142142	770.2919922
C.2.216	7.197892761	7.585987091	11.7548439	0.000748478	0.134723008	0.013138181	752.350769
C.2.217	7.24974575	7.629022789	11.8340765	0.000747387	0.134638309	0.013142829	749.270874
C.2.218	7.246827984	7.633282185	11.85244503	0.000739749	0.13480325	0.013146193	730.7502441
C.2.219	7.268696213	7.662106037	11.84320507	0.000738658	0.134949997	0.013148068	732.80896
C.2.220	7.283551597	7.665232658	11.80785675	0.000737567	0.134758487	0.013131081	718.3348999
C.2.221	7.297898006	7.694065761	11.8505825	0.000739749	0.134706751	0.013139949	754.6136475
C.2.222	7.275310135	7.652920723	11.82510605	0.000745205	0.134732217	0.013144506	714.5786743
C.2.223	7.259584713	7.631220436	11.77548828	0.000741931	0.134626105	0.013136761	701.9515991
C.2.224	7.296736526	7.656171894	11.7833456	0.000743022	0.134807914	0.013142268	792.5379028
C.2.225	7.29319706	7.67250061	11.84106007	0.000744114	0.134887278	0.01313793	780.7121582
C.2.226	7.330440617	7.713655472	11.81609497	0.000741931	0.134729162	0.013149416	788.7836914
C.2.227	7.311198425	7.679700852	11.82086353	0.000735385	0.135078862	0.013139086	736.9783936
C.2.228	7.334856129	7.690095711	11.83101902	0.000739749	0.134866774	0.013138932	748.093811
C.2.229	7.353614044	7.699890518	11.82924881	0.000739749	0.134964168	0.013130739	719.0255127

Point	P EV2 in	P valve inlet	P EV2 out	Voltage	T oil	HTF mass flow	T HTF in
C.2.1	299.2644653	750.1508789	291.0874023	24.05525971	26.18491936	0.274461627	8.938179016
C.2.2	299.52771	750.7816162	290.4845886	24.05543518	26.18151665	0.273133129	8.978081703
C.2.3	298.9307861	750.4320068	290.0104065	24.05561447	26.21845055	0.274938434	8.997947693
C.2.4	298.6715393	750.7479858	289.9900208	24.05561066	26.19609642	0.274134576	8.988619804
C.2.5	298.9758606	751.6305542	291.3045349	24.05530548	26.20727348	0.274797052	9.034401894
C.2.6	298.8495178	751.1090088	290.3248901	24.05529594	26.19560814	0.274547875	9.04640007
C.2.7	299.1010437	752.5033569	290.3866272	24.05499077	26.1999836	0.274679005	9.048830986
C.2.8	298.2309265	752.4746094	290.440918	24.05495071	26.18880653	0.274305165	9.088773727
C.2.9	299.3092651	753.0112915	290.0882263	24.05533028	26.20192337	0.271848112	9.107055664
C.2.10	298.5862732	752.3397827	289.9837036	24.05525971	26.20970154	0.274755627	9.115968704
C.2.11	298.8167114	752.576355	290.8332214	24.05501938	26.20435715	0.274965852	9.121799469
C.2.12	299.478363	752.7042847	291.0627136	24.0550499	26.19415093	0.274930805	9.149012566
C.2.13	299.1643677	753.4557495	290.4897461	24.05504036	26.1999836	0.273675174	9.13535881
C.2.14	299.7070923	754.2558594	291.1373901	24.05500984	26.21116447	0.274109155	9.157483101
C.2.15	300.992218	754.7778931	291.3656921	24.05521011	26.21747398	0.274473369	9.185488701
C.2.16	300.5264893	755.4069214	291.7089233	24.05534554	26.20289993	0.27442956	9.197881699
C.2.17	300.8955383	755.145874	292.7815857	24.05505562	26.19901276	0.274855822	9.208189011
C.2.18	301.0900269	755.0596313	292.4119873	24.05514908	26.18832398	0.274469525	9.226857185
C.2.19	301.2970886	755.2289429	292.1595154	24.05479431	26.19560814	0.274722636	9.232956886
C.2.20	302.2080078	755.8640137	293.5024719	24.05513573	26.17033958	0.272455633	9.276397705
C.2.21	301.0013428	755.6239624	292.5205383	24.05500984	26.15381432	0.275216937	9.25920105
C.2.22	302.5605164	757.2548828	292.9608154	24.05481911	26.14701653	0.274575263	9.269618034
C.2.23	303.215332	757.5845947	293.4884033	24.05481529	26.14166641	0.274933606	9.294096947
C.2.24	302.72052	757.6719971	293.3074646	24.05464554	26.13535118	0.275191486	9.297153473
C.2.25	302.6617737	757.8413086	293.5056152	24.05448532	26.14312553	0.275039524	9.299418449
C.2.26	303.54245	758.2078857	294.3735352	24.05411911	26.15430641	0.275197387	9.335586548
C.2.27	302.2850037	756.260437	293.2916565	24.05414581	26.18637276	0.27357161	9.306189537
C.2.28	301.769104	755.718811	292.7936707	24.05414963	26.19172287	0.273527712	9.296945572
C.2.29	302.6660461	755.831543	293.7813416	24.05421066	26.17617226	0.275269121	9.291750908
C.2.30	302.3765564	756.7928467	293.1808167	24.05418015	26.1596508	0.275041163	9.261476517
C.2.31	302.3001404	756.1604004	294.0211487	24.05395508	26.16353798	0.274908751	9.238100052
C.2.32	302.4293213	755.0372314	293.6773682	24.05384064	26.15770531	0.272463024	9.238952637
C.2.33	301.7183228	753.5118408	292.9858093	24.05369568	26.11980057	0.273972362	9.212154388
C.2.34	301.5939941	754.0516968	293.4625549	24.05394554	25.91958427	0.274859995	9.224817276
C.2.35	302.2120056	753.4135132	293.2480164	24.05401039	25.79858208	0.274530798	9.208892822
C.2.36	302.7028198	753.192688	294.0530396	24.05365562	25.73783875	0.275006205	9.217556
C.2.37	302.6018677	754.7965698	294.2563782	24.05389023	25.6892395	0.272765785	9.238659859
C.2.38	304.1773071	755.8582764	295.6119385	24.05368996	25.67952156	0.275343686	9.264016151
C.2.39	304.1014404	754.5895996	294.9499512	24.05381584	25.64939117	0.274035305	9.276319504
C.2.40	304.1331177	754.6873169	295.3804626	24.0536747	25.64502144	0.275409818	9.279072762
C.2.41	304.4753418	754.8563843	295.9695129	24.05371094	25.64793778	0.273621827	9.301441193
C.2.42	305.0853882	755.782959	295.2417603	24.05389023	25.63724327	0.274763256	9.28663063
C.2.43	304.4838867	756.4516602	295.7342834	24.05378532	25.61003304	0.274591774	9.298314095
C.2.44	304.9305115	755.0631104	295.7113342	24.05368042	25.59691238	0.275354207	9.310826302
C.2.45	304.8600769	756.3846436	296.1335144	24.05376434	25.56872559	0.27344501	9.301468849
C.2.46	306.4888611	756.5510864	296.7627563	24.05407524	25.56337738	0.274330854	9.310800552
C.2.47	305.8434448	757.2999878	297.1769104	24.05379486	25.54151154	0.274495035	9.305296898
C.2.48	305.7407837	755.6702271	296.9821777	24.05399513	25.54102325	0.272401869	9.310847282
C.2.49	304.5945435	752.7298584	296.5108948	24.05389977	25.54636765	0.272908479	9.299320221
C.2.50	304.7993164	752.8138428	295.9807129	24.05384064	25.5366497	0.274827421	9.308366776
C.2.51	304.5614624	751.774292	295.2960205	24.05386543	25.49972153	0.274874598	9.299113274
C.2.52	305.0745544	751.9936523	296.0186157	24.05393028	25.48027992	0.27490291	9.297934532
C.2.53	304.6184998	752.93573	295.5246277	24.05427551	25.4579258	0.274404049	9.293804169
C.2.54	305.6937256	753.463501	297.1576538	24.05275536	25.42439652	0.274403393	9.278312683
C.2.55	305.0252075	751.717041	295.9715271	24.05417442	25.39863968	0.274774909	9.303927422
C.2.56	305.9421082	752.0585938	296.987915	24.05444527	25.38065529	0.274571836	9.310235977
C.2.57	305.8129272	752.8319092	297.1524963	24.05441475	25.36948013	0.274952471	9.267777443
C.2.58	305.9107361	754.1802368	297.1743164	24.0542202	25.37045479	0.274783194	9.27310276
C.2.59	306.6474304	753.5684814	297.315918	24.05429459	25.36219406	0.274304509	9.275731087
C.2.60	306.1466064	752.9368286	296.9741516	24.05430985	25.35830689	0.273554057	9.268837929
C.2.61	306.4757385	753.1774902	297.0215149	24.05422974	25.35198784	0.274340451	9.270133972
C.2.62	306.2826538	752.7229614	297.070343	24.05426407	25.34372711	0.272683144	9.267094612
C.2.63	306.7118835	752.6071167	298.2857666	24.05451584	25.33303833	0.274129003	9.261407852
C.2.64	306.6385803	754.0873413	297.5559998	24.05383492	25.34372711	0.274541706	9.274751663
C.2.65	306.5915222	754.5455933	298.0327454	24.05422974	25.31845856	0.274433315	9.264508247
C.2.66	306.1831055	755.0222778	297.8572693	24.05399513	25.32623673	0.274071068	9.233579636
C.2.67	307.2340698	753.6903687	297.5531311	24.05454063	25.33352089	0.274239928	9.239659309

Point	P EV2 in	P valve inlet	P EV2 out	Voltage	T oil	HTF mass flow	T HTF in
C.2.68	306.7646484	752.4349365	297.9916992	24.05436516	25.317482	0.274360865	9.262571335
C.2.69	307.4077454	755.2505493	298.3067322	24.05414009	25.32186127	0.273825407	9.251340866
C.2.70	306.9859619	754.0899658	298.7757568	24.0541153	25.32039833	0.27331987	9.243982315
C.2.71	307.3313293	754.2923584	298.664032	24.05420494	25.30241585	0.273775756	9.259210587
C.2.72	307.2417603	753.8329468	297.5404968	24.05410957	25.3155365	0.274202257	9.235312462
C.2.73	306.7626343	753.1668701	297.7633667	24.05436516	25.30824661	0.27521947	9.246331215
C.2.74	307.5606384	754.4136353	298.8834534	24.05433083	25.31845284	0.274299413	9.239608765
C.2.75	307.5834351	752.7244263	297.8457947	24.05450058	25.30679321	0.274490178	9.208499908
C.2.76	307.4031982	754.7520142	298.5123901	24.05435562	25.3033905	0.274278492	9.216557503
C.2.77	306.892395	753.9450684	297.8727722	24.05443001	25.27277756	0.27173996	9.213013649
C.2.78	307.2035522	753.6796875	299.1930542	24.0545845	25.28055	0.274510622	9.20967865
C.2.79	307.9433594	755.4129639	299.2562256	24.05442429	25.28638649	0.273992717	9.213517189
C.2.80	307.5463562	754.6065674	298.9069824	24.05414581	25.28055	0.273879647	9.205450058
C.2.81							
C.2.82	308.5345764	751.493103	299.9624634	24.05581474	25.31894112	0.27266708	9.233469963
C.2.83	308.6232605	752.2825317	300.2571106	24.0559845	25.31699944	0.274187177	9.239470482
C.2.84	308.5836182	752.9742432	299.5336609	24.05575943	25.3033905	0.274982244	9.257572174
C.2.85	308.5896301	752.5378418	300.5351257	24.05605507	25.30387878	0.27523759	9.270499229
C.2.86	308.8776855	752.4550171	299.4802551	24.05599976	25.3033905	0.27612558	9.252939224
C.2.87	309.3100281	753.7492676	300.6020508	24.05646515	25.305336	0.275000483	9.27474308
C.2.88	309.6534119	753.9071045	300.663208	24.05598068	25.30630684	0.274548858	9.292114258
C.2.89	310.0900574	753.3471069	301.3208923	24.05615044	25.2912426	0.275384635	9.283875465
C.2.90	309.7076111	754.3236694	300.3895264	24.0562706	25.2824955	0.275460541	9.269938469
C.2.91	309.879303	753.8317871	300.8496094	24.05587959	25.28589821	0.27460286	9.294296265
C.2.92	310.5706177	755.2160034	301.6328125	24.05590057	25.28832817	0.274702936	9.278567314
C.2.93	310.2166748	754.524353	301.277832	24.05591011	25.29464722	0.274172395	9.293821335
C.2.94	310.1468201	754.315918	301.3352661	24.0557003	25.29950333	0.274883151	9.280734062
C.2.95	310.9490662	755.3956909	301.5265503	24.05583572	25.31165123	0.276170701	9.266818047
C.2.96	311.066864	755.1763306	301.6882324	24.05577469	25.32768822	0.275890887	9.270616531
C.2.97	311.005249	753.8616943	302.2379456	24.0555191	25.33497429	0.275931269	9.255807877
C.2.98	310.8703613	753.6593018	302.3789368	24.05550003	25.32331467	0.276397169	9.190917015
C.2.99	310.6407776	753.6524048	301.1448669	24.05558968	25.34129334	0.27365005	9.210465431
C.2.100	311.4025269	755.1685791	301.4834595	24.05565453	25.33983612	0.274789035	9.187458038
C.2.101	310.9715881	755.7113647	301.4010315	24.05540466	25.32866478	0.276263326	9.195092201
C.2.102	310.6433411	754.9926758	301.4360657	24.0553894	25.29075623	0.275667727	9.179806709
C.2.103	310.8287048	755.6081543	301.4742737	24.05555534	25.28492928	0.273695856	9.150231361
C.2.104	310.8968811	752.8103638	302.176178	24.05543518	25.28151894	0.275730908	9.171459198
C.2.105	310.9741821	752.3239136	301.3840942	24.05550003	25.28978539	0.275473505	9.170444489
C.2.106	311.4524536	752.6194458	302.4022217	24.05553436	25.28151894	0.27498135	9.155423164
C.2.107	311.820343	754.9633179	303.2080994	24.05532455	25.27374649	0.275921673	9.214178085
C.2.108	311.742218	754.840271	302.7479858	24.05562973	25.26160049	0.27558583	9.225373268
C.2.109	311.9561157	754.8126831	302.8654785	24.05538559	25.23487282	0.275501311	9.223739624
C.2.110	312.3120422	755.7228394	303.4944458	24.05525589	25.21446037	0.275535464	9.250248909
C.2.111	312.1717224	753.760498	303.3700867	24.05550575	25.18967819	0.273937255	9.250162125
C.2.112	312.854187	755.4882813	304.1486816	24.0553093	25.1984272	0.274671614	9.239645958
C.2.113	312.7492371	756.6669312	303.1885681	24.05540085	25.17607498	0.275675684	9.267342567
C.2.114	313.2956848	755.1159668	303.6885681	24.05529976	25.17024231	0.274434477	9.263404846
C.2.115	312.3696594	752.6835938	302.6480408	24.0555706	25.16003609	0.275709569	9.247709274
C.2.116	312.7931519	754.3135986	303.3416443	24.05541992	25.14593887	0.276549935	9.254494667
C.2.117	313.4836426	752.9664917	304.4602966	24.05571556	25.14302635	0.274676681	9.259809494
C.2.118	313.4927673	752.4719849	303.3218384	24.05559921	25.12212753	0.275335073	9.235714912
C.2.119	313.253479	752.6939087	304.6696472	24.0553093	25.08956718	0.274569869	9.281907082
C.2.120	312.9765625	752.4564819	304.604187	24.05571938	25.07110024	0.275857419	9.25686264
C.2.121	312.6035156	753.3689575	304.0352173	24.05542564	25.04145813	0.275583029	9.237282753
C.2.122	313.1661987	753.9074097	304.0978394	24.05581093	25.0419445	0.275224566	9.255759239
C.2.123	313.4368591	752.6174927	303.7236328	24.05573463	25.02591133	0.273960382	9.256843567
C.2.124	312.9468994	753.9286499	304.3132324	24.05581093	25.02541924	0.274584472	9.235128403
C.2.125	313.1231384	754.3162231	304.3675232	24.05574989	25.01521874	0.275236368	9.252017975
C.2.126	313.4696655	754.5462036	303.9226379	24.05566979	25.00549889	0.274449825	9.221674919
C.2.127	313.6590271	755.2850342	304.9468079	24.05571938	25.01667595	0.272734106	9.237109184
C.2.128	313.6575928	754.3570557	304.4686279	24.05548477	25.00841522	0.274723232	9.228463173
C.2.129	314.1863709	755.90625	305.2107239	24.05534935	25.00112534	0.276106685	9.216458321
C.2.130	314.8243408	755.9732666	304.832489	24.05550957	25.00939179	0.275146037	9.23081398
C.2.131	314.7938232	756.0330811	305.6777344	24.05550957	25.02153397	0.274682194	9.245457649
C.2.132	314.7938232	754.4904175	305.259552	24.05504036	25.02590752	0.273794234	9.219317436
C.2.133	314.3591919	755.8197632	305.149292	24.05578041	25.04195023	0.274395913	9.22537899
C.2.134	314.5457153	756.567749	305.4700928	24.05507088	25.03417206	0.274207115	9.246342659

Point	P EV2 in	P valve inlet	P EV2 out	Voltage	T oil	HTF mass flow	T HTF in
C.2.135	315.3379822	756.9573364	306.2886047	24.05514908	25.03028679	0.276358515	9.213310242
C.2.136	315.1594543	757.5119019	306.4299011	24.05518913	25.01133156	0.275444448	9.19641304
C.2.137	315.5553284	755.6478271	306.6309509	24.05496407	25.01862145	0.275636941	9.211162567
C.2.138	315.4797363	753.0897827	306.7139282	24.05503464	25.00452995	0.276056081	9.168499947
C.2.139	315.4512329	754.2423096	306.3578186	24.0545845	25.00355339	0.275636464	9.174696922
C.2.140	315.0299683	755.7004395	305.8000793	24.05493927	24.99140739	0.275342554	9.15650177
C.2.141	314.6535034	754.5283813	305.1946411	24.05476952	24.986063	0.275481045	9.149621964
C.2.142	314.7176819	756.1118164	305.2753601	24.05488014	24.95253372	0.273853391	9.138216972
C.2.143	315.5715637	753.1228638	306.5387573	24.05475998	24.93989754	0.275053054	9.145780563
C.2.144	315.1520386	752.4725952	306.3945618	24.05469513	24.92774582	0.274702221	9.116726875
C.2.145	315.7135925	752.442688	307.1097107	24.0547905	24.95933533	0.275110751	9.137022972
C.2.146	316.7414551	754.5162964	307.6398621	24.05501556	24.99869728	0.273810476	9.145895958
C.2.147	315.9634399	753.3284302	306.5737915	24.05489922	24.96370888	0.274719268	9.102262497
C.2.148	315.4651794	752.5539551	305.7756653	24.05505943	24.95204544	0.276031852	9.136940002
C.2.149	316.5281372	752.9466553	306.9500122	24.05508423	24.92240143	0.275590092	9.116985321
C.2.150	317.0680237	753.4586182	307.8213806	24.05496979	24.94086456	0.274364471	9.100288391
C.2.151	316.2144165	753.2381592	307.5858765	24.05516434	24.94621277	0.27516973	9.109137535
C.2.152	316.5595093	754.3081665	307.1708679	24.05524063	24.93552017	0.274626076	9.087603569
C.2.153	316.1972961	756.1621094	306.9729919	24.05518532	24.97877312	0.276075602	9.078941345
C.2.154	316.8338623	754.0249634	307.3816834	24.0553894	25.09588814	0.275791466	9.075897217
C.2.155	317.0312195	754.4576416	307.2851868	24.05549049	25.11678314	0.275997639	9.090063095
C.2.156	317.6626587	753.5540771	307.8397522	24.0552845	25.11143875	0.275781035	9.07638073
C.2.157	318.2920837	754.1046143	308.4072571	24.05518532	25.12893486	0.276181698	9.055753708
C.2.158	317.1552734	754.3391724	308.0155334	24.05378914	25.13525009	0.27561143	9.063704491
C.2.159	317.8734131	756.3444214	307.686676	24.05554581	25.14302635	0.275868595	9.047197342
C.2.160	318.0411072	755.6898193	308.3595886	24.05558586	25.11824036	0.275283068	9.02185154
C.2.161	317.3922729	754.8934937	308.0244446	24.05541992	25.14205742	0.275068909	9.043848038
C.2.162	318.1500549	756.3754272	307.9428711	24.05558014	25.13088036	0.273469299	9.039131165
C.2.163	317.4781189	755.5345459	308.1878357	24.05587006	25.13136292	0.275111556	9.013465881
C.2.164	318.6234741	757.7622681	309.26828	24.05581474	25.11143875	0.27565065	9.015663147
C.2.165	317.6241455	754.5194702	307.6444702	24.05529022	25.11435509	0.275653601	8.979385376
C.2.166	318.1654663	755.2479248	308.6335754	24.05558586	25.08033752	0.274827272	9.011415482
C.2.167	318.3337097	755.5164185	308.6467896	24.05564499	25.10706329	0.275264919	9.002257347
C.2.168	317.8659973	752.6416016	308.1528015	24.05544472	25.11921501	0.276008159	8.983685493
C.2.169	318.2313232	753.2249146	308.5612183	24.05565453	25.14156342	0.274892479	8.972987175
C.2.170	317.6364136	755.6153564	308.208252	24.05524063	25.14302635	0.274609417	8.993066788
C.2.171	318.6325989	753.8237305	309.074707	24.05522537	25.12844658	0.275626928	8.955607414
C.2.172	319.1131592	755.1766357	309.3467102	24.05524445	25.12358475	0.275357485	8.978754997
C.2.173	318.302063	755.1412964	308.5864868	24.05500412	25.1318512	0.275308341	8.968580246
C.2.174	318.9685669	756.6295776	309.5431519	24.05503082	25.14302635	0.275111496	8.966201782
C.2.175	319.5957336	755.2766724	309.8650818	24.05492973	25.13962364	0.275514275	8.966907501
C.2.176	319.173645	755.5618896	308.9905701	24.05470467	25.12455559	0.274728537	8.961288452
C.2.177	318.9936829	756.215332	309.0118103	24.05483437	25.10998535	0.275565237	8.964729309
C.2.178	319.0062256	756.1713257	308.7174377	24.05455971	25.11338425	0.274460226	8.960504532
C.2.179	319.3350525	754.5726318	309.1769714	24.05481529	25.11338425	0.275715798	8.955411911
C.2.180	319.1411133	752.7683716	309.7085571	24.05434418	25.1405983	0.275936693	8.921971321
C.2.181	319.3353271	754.6370239	309.091095	24.05478478	25.1405983	0.273790777	8.941327095
C.2.182	319.316803	755.562439	308.5299072	24.05459023	25.13816452	0.274302125	8.936141968
C.2.183	318.9380493	758.5663452	308.5276184	24.05327034	25.12553024	0.27507481	8.919418335
C.2.184	319.7132263	755.4400024	309.6324768	24.05529022	25.10414887	0.27376765	8.915788651
C.2.185	319.6886902	755.2749634	310.0827942	24.05480576	25.07742119	0.274471492	8.938529968
C.2.186	319.3190918	753.9421997	309.5256348	24.05479431	25.05847168	0.274312228	8.909380913
C.2.187	318.9534607	753.4980469	309.1476746	24.05475044	25.04291534	0.274890929	8.904161453
C.2.188	319.2660522	753.8919067	309.5787659	24.05483437	25.03562546	0.275304556	8.909884453
C.2.189	319.4902039	754.9127197	309.5503235	24.05503464	25.03465462	0.275956124	8.904766083
C.2.190	320.1781006	755.4244385	310.5339966	24.05503082	25.01036072	0.27519986	8.889027596
C.2.191	319.7791138	753.7633667	310.4544373	24.05521965	25.0001545	0.275089502	8.904462814
C.2.192	319.3227844	753.9832764	308.7763367	24.05516434	24.99772263	0.274607867	8.874990463
C.2.193	320.0163879	755.5558472	309.6534424	24.05510521	24.99237824	0.275624961	8.881586075
C.2.194	321.1771545	754.2420044	311.00354	24.05481911	24.99091911	0.275809497	8.867919922
C.2.195	319.852417	755.1418457	310.0566711	24.05527496	25.00209618	0.275768489	8.839306831
C.2.196	320.0007019	755.7058716	310.3903809	24.05513954	24.99529266	0.27525261	8.874762535
C.2.197	320.1130676	754.7485962	309.8912354	24.05555916	24.99091911	0.276119649	8.871545792
C.2.198	320.130188	753.6087036	310.4610291	24.05522919	24.98557472	0.275241554	8.842947006
C.2.199	320.1367493	753.8257446	310.7229614	24.05537987	24.97002411	0.275460213	8.824658394
C.2.200	320.3757324	753.1251831	309.6327515	24.05542946	24.99383545	0.27424404	8.833706856
C.2.201	320.2177429	754.7091675	310.7378845	24.05513001	25.00646973	0.275265992	8.826412201

Point	P EV2 in	P valve inlet	P EV2 out	Voltage	T oil	HTF mass flow	T HTF in
C.2.202	320.2271729	753.7441406	310.2605591	24.05545044	25.00646973	0.275004834	8.837030411
C.2.203	320.8474731	753.230957	310.6899414	24.05549431	24.99189568	0.275903195	8.831542969
C.2.204	320.1706848	755.0521851	310.1591797	24.05562019	24.98508644	0.274201125	8.821507454
C.2.205							
C.2.206	323.8426209	745.5838623	314.2922668	24.05508041	25.33789444	0.134261265	11.08005333
C.2.207	325.1160278	745.2731323	315.7788086	24.05544472	25.26305771	0.13443552	11.11790466
C.2.208	325.3624573	747.6767578	315.8721619	24.05493546	25.24847794	0.134712577	11.12940025
C.2.209	330.5214233	754.1175537	321.2229919	24.05484963	25.23876	0.134659454	11.76010704
C.2.210	334.534729	755.2453613	325.3804932	24.05480957	25.27569199	0.134845093	12.08605385
C.2.211	335.0075989	757.5687866	324.4341736	24.05491447	25.32817268	0.134879336	12.22143364
C.2.212	333.1603394	757.9261475	323.0254517	24.05479431	25.33400345	0.134939387	12.09248924
C.2.213	332.6164856	757.3873901	322.7856445	24.05479431	25.33012199	0.134910256	11.94999981
C.2.214	331.5769348	754.6269531	321.3751831	24.05483437	25.35927773	0.134859458	11.85896206
C.2.215	331.100647	753.9019165	321.048645	24.05467987	25.32671356	0.134666771	11.73464108
C.2.216	331.473114	750.9454346	321.0205078	24.0547142	25.31359673	0.134723008	11.75484371
C.2.217	331.0245056	752.7896729	321.2479553	24.05471993	25.29610443	0.134638309	11.83407688
C.2.218	332.2981873	750.3955078	322.9208984	24.05517006	25.27520561	0.13480325	11.85244465
C.2.219	331.7164001	749.05896	322.0934753	24.05458069	25.22904015	0.134949997	11.8432045
C.2.220	331.8955078	750.7131958	321.9570618	24.05480003	25.19890976	0.134758487	11.80785656
C.2.221	332.2277527	750.618042	321.6471863	24.05476952	25.19016266	0.134706751	11.85058212
C.2.222	331.9317322	749.4657593	321.5213928	24.0549202	25.18287087	0.134732217	11.82510567
C.2.223	331.7717285	751.9990845	321.7767029	24.05466461	25.16877937	0.134626105	11.7754879
C.2.224	332.2973328	751.8978882	322.290802	24.05454063	25.16975403	0.134807914	11.78334618
C.2.225	332.286499	752.1850586	322.2522888	24.05451965	25.15565682	0.134887278	11.84105969
C.2.226	332.1302185	751.7236938	322.8559875	24.05456924	25.13233757	0.134729162	11.8160944
C.2.227	332.7054749	750.5952759	322.6833801	24.05518532	25.12747192	0.135078862	11.82086372
C.2.228	331.9796448	749.7406006	322.1538086	24.05517578	25.13719559	0.134866774	11.8310194
C.2.229	333.0205994	750.296875	322.6517944	24.0543499	25.16052437	0.134964168	11.82924843

Point	CP HTF	T HTF out	Capacity - HTF	T ref out	h refrigerant out	h refrigerant in	T refrigerant inlet
C.2.1	3333.339844	7.11867094	1664.620972	5.666166306	403.7070618	239.8575439	0.830702543
C.2.2	3333.48877	7.16131258	1654.1427	5.693480492	403.7473145	239.9142151	0.828533113
C.2.3	3333.59082	7.197923183	1649.781006	5.713634014	403.7777405	239.9308472	0.794928491
C.2.4	3333.530029	7.173619747	1658.612427	5.715395927	403.7798462	239.9419556	0.789591789
C.2.5	3333.719482	7.232821465	1650.421509	5.740688801	403.7675476	239.9583588	0.744210005
C.2.6	3333.746826	7.235858917	1657.139648	5.754272461	403.805542	239.9414673	0.734136522
C.2.7	3333.799072	7.262430191	1635.850952	5.769210339	403.8171692	239.9328156	0.744503736
C.2.8	3333.963623	7.313714981	1623.333252	5.789338112	403.8336182	239.9045868	0.757497847
C.2.9	3333.964844	7.296056747	1641.366577	5.80573082	403.8575134	239.8932648	0.751010358
C.2.10	3334.012451	7.313445091	1651.181152	5.827973843	403.8800049	239.8910828	0.746284068
C.2.11	3334.016113	7.30973959	1661.188965	5.841590405	403.8696594	239.9000092	0.785602927
C.2.12	3334.07959	7.317645073	1678.706909	5.851610184	403.8725281	239.8894043	0.765741646
C.2.13	3334.075928	7.329244614	1647.995483	5.86854744	403.90271	239.879776	0.794511735
C.2.14	3334.190186	7.370416641	1633.256958	5.888656616	403.9034729	239.8542175	0.813120961
C.2.15	3334.238525	7.369179726	1662.212646	5.890539169	403.8991089	239.85495	0.831771612
C.2.16	3334.262451	7.370051861	1672.501099	5.907098293	403.9047546	239.8540039	0.881078005
C.2.17	3334.314209	7.388441086	1667.718018	5.927372456	403.8944397	239.8470154	0.885106206
C.2.18	3334.332031	7.379661083	1690.503662	5.935545444	403.9114685	239.8455658	0.907624722
C.2.19	3334.37085	7.395115852	1683.512207	5.951739788	403.9325562	239.8320618	0.93667829
C.2.20	3334.48999	7.417624474	1688.696411	5.966665745	403.9103394	239.8243561	0.955149353
C.2.21	3334.465088	7.421014309	1686.905884	5.979001045	403.9472351	239.8395386	0.996335626
C.2.22	3334.547119	7.456003189	1660.516968	5.98818922	403.9437866	239.8345032	1.039372444
C.2.23	3334.587891	7.454118252	1686.874512	5.991296291	403.9326172	239.8301697	1.057480693
C.2.24	3334.573486	7.443173885	1701.297607	5.994730473	403.9404602	239.8410187	1.067549348
C.2.25	3334.662109	7.48991251	1659.613037	6.016280651	403.9543762	239.8400574	1.127793312
C.2.26	3334.682129	7.464916706	1716.705933	6.026271343	403.9403381	239.8477783	1.150996685
C.2.27	3334.639893	7.470831394	1674.328979	6.028819084	403.9711914	239.8412323	1.116787434
C.2.28	3334.64209	7.481381416	1656.007446	6.034770012	403.989624	239.8303833	1.127689838
C.2.29	3334.614014	7.470955372	1671.337891	6.030803204	403.960022	239.7664948	1.090455651
C.2.30	3334.478271	7.42600584	1683.344849	6.002743244	403.9509277	239.6999969	1.066179872
C.2.31	3334.416748	7.415382862	1670.812134	5.983499527	403.9115906	239.6626434	1.070138812
C.2.32	3334.376709	7.392267704	1677.702148	5.970389843	403.9090271	239.6192474	1.119653344
C.2.33	3334.305176	7.379445553	1674.192749	5.953326225	403.9121399	239.6030884	1.046247244
C.2.34	3334.343994	7.38833046	1683.099243	5.939727783	403.8874207	239.5450439	1.059044361
C.2.35	3334.279785	7.368666172	1684.474609	5.949305534	403.9016113	239.4807129	1.064802647
C.2.36	3334.297852	7.370061398	1694.064697	5.944318295	403.875885	239.3875275	1.092075229
C.2.37	3334.356689	7.381511211	1689.073364	5.95732069	403.8820801	239.3316956	1.124652386
C.2.38	3334.424561	7.393755913	1717.110107	5.973739147	403.8608093	239.3167877	1.166218877
C.2.39	3334.499268	7.422911644	1693.589478	5.985056877	403.8884277	239.289093	1.208564878
C.2.40	3334.553467	7.450069904	1679.698853	6.003207684	403.8931885	239.2799377	1.24547708
C.2.41	3334.55542	7.428828716	1708.585083	6.014732361	403.8878479	239.2573242	1.261497378
C.2.42	3334.539307	7.434778214	1696.683105	6.00812149	403.9012451	239.2494049	1.295279145
C.2.43	3334.553467	7.430892467	1709.888184	6.023472786	403.9018555	239.2472382	1.3132689
C.2.44	3334.572754	7.429049492	1727.825806	6.025483131	403.9042664	239.2310944	1.343248725
C.2.45	3334.585205	7.445308208	1692.494385	6.019147396	403.8874512	239.2313538	1.35119462
C.2.46	3334.613525	7.451734543	1700.650391	6.024405479	403.8754578	239.2364197	1.378520608
C.2.47	3334.599854	7.449672222	1698.510742	6.028931141	403.8685303	239.2304077	1.392368793
C.2.48	3334.611816	7.450649261	1689.718994	6.021796703	403.8673401	239.2364044	1.400599599
C.2.49	3334.634033	7.474525928	1660.653442	6.038872719	403.8950195	239.2380371	1.396945119
C.2.50	3334.60791	7.451016903	1702.152832	6.034879208	403.9055176	239.2084351	1.326651573
C.2.51	3334.575928	7.442533493	1701.722656	6.031633854	403.9207459	239.10495	1.318172336
C.2.52	3334.584229	7.448374271	1695.467529	6.030507565	403.9006042	238.9935913	1.309927344
C.2.53	3334.581299	7.450886726	1686.311035	6.034000397	403.9167786	238.9262848	1.334337473
C.2.54	3334.514893	7.429453373	1691.709961	6.023956299	403.8645935	238.880127	1.341784716
C.2.55	3334.549072	7.422847748	1723.540161	6.024647713	403.896637	238.853653	1.39678812
C.2.56	3334.55127	7.417768478	1732.693604	6.023159981	403.8683777	238.8546143	1.412338734
C.2.57	3334.476318	7.418741226	1695.237549	6.014357567	403.8562012	238.8519897	1.419873118
C.2.58	3334.496338	7.424504757	1693.802734	6.013767719	403.855072	238.8337555	1.441892385
C.2.59	3334.465576	7.404819489	1711.24585	6.011441231	403.8492432	238.836853	1.41877389
C.2.60	3334.419189	7.385928631	1717.484497	6.002040863	403.8499451	238.8291626	1.455434322
C.2.61	3334.442139	7.397327423	1713.191284	6.018647671	403.8634949	238.8200378	1.474605799
C.2.62	3334.442383	7.400588036	1697.114502	5.999409199	403.8450317	238.8149719	1.486998796
C.2.63	3334.407227	7.386843681	1713.459961	5.996007919	403.8097839	238.8192902	1.483556271
C.2.64	3334.451172	7.397793293	1718.253784	6.000282764	403.8329468	238.7996216	1.509759188
C.2.65	3334.374756	7.365659237	1737.567261	5.99352932	403.81427	238.7981873	1.490119934
C.2.66	3334.281006	7.344709396	1726.106323	5.98536253	403.8116455	238.8041992	1.533918023
C.2.67	3334.345703	7.374470234	1705.549072	5.991491795	403.8251953	238.8133087	1.523520947

Point	CP HTF	T HTF out	Capacity - HTF	T ref out	h refrigerant out	h refrigerant in	T refrigerant inlet
C.2.68	3334.385742	7.373764515	1727.927734	5.980378628	403.8036499	238.8176117	1.513422132
C.2.69	3334.365723	7.373833656	1714.227905	5.978307247	403.7934265	238.8138123	1.532738447
C.2.70	3334.357178	7.376478672	1701.942383	5.98445034	403.7864685	238.8123474	1.579843879
C.2.71	3334.280029	7.318531036	1771.539429	5.969132423	403.7757568	238.7986603	1.565040112
C.2.72	3334.272705	7.33832407	1734.350342	5.967761993	403.8043823	238.8032074	1.555850267
C.2.73	3334.297119	7.340810299	1748.626465	5.971507072	403.8017883	238.8003235	1.54906261
C.2.74	3334.30957	7.354495049	1724.123657	5.963288307	403.7647095	238.8176422	1.547404766
C.2.75	3334.27832	7.3682971	1684.202515	5.957713127	403.7872925	238.8144836	1.558019519
C.2.76	3334.304199	7.374486446	1684.625488	5.953041077	403.7654419	238.8094788	1.554790974
C.2.77	3334.281982	7.365740776	1673.73584	5.941000462	403.771698	238.8145142	1.579732656
C.2.78	3334.246582	7.34946537	1702.627686	5.943755627	403.7390747	238.8063354	1.569992661
C.2.79	3334.254639	7.35015583	1702.294922	5.95067358	403.7435608	238.796524	1.586583495
C.2.80	3334.163086	7.307524681	1733.108032	5.939935684	403.7432556	238.8005829	1.593807817
C.2.81							
C.2.82	3334.426025	7.425163269	1644.090942	5.946167469	403.7207642	238.8110962	1.678945541
C.2.83	3334.367432	7.386656284	1693.918457	5.962591648	403.7275696	238.7885284	1.634455204
C.2.84	3334.426514	7.401344299	1701.990234	5.978775024	403.761261	238.7781982	1.655423284
C.2.85	3334.417725	7.3834548	1731.848755	5.981537819	403.7370911	238.7572937	1.672987103
C.2.86	3334.41748	7.400961399	1705.149048	5.991804123	403.774292	238.7618561	1.692121506
C.2.87	3334.477783	7.412481308	1707.662231	6.001965523	403.75354	238.7436066	1.71659863
C.2.88	3334.494141	7.404286385	1728.271729	6.000328541	403.7504578	238.7414551	1.765046716
C.2.89	3334.518311	7.425852776	1706.176514	6.007632732	403.7394714	238.7400055	1.762014985
C.2.90	3334.486084	7.421904087	1697.4552	6.004483223	403.7614441	238.7364197	1.796662569
C.2.91	3334.546143	7.430799961	1706.358887	6.002449989	403.747406	238.7421722	1.79266727
C.2.92	3334.509277	7.42621994	1696.749023	6.005151749	403.7289734	238.7275391	1.813566089
C.2.93	3334.536865	7.426240444	1707.413696	6.002631187	403.736145	238.7316132	1.854116082
C.2.94	3334.460693	7.397006989	1726.599609	6.00381279	403.7356873	238.7393036	1.821935534
C.2.95	3334.513428	7.440216541	1682.108154	5.999403954	403.7266541	238.7436371	1.843699098
C.2.96	3334.477539	7.416539669	1705.662231	5.986704826	403.7109985	238.7347565	1.902576566
C.2.97	3334.363281	7.36808157	1736.8125	5.974885464	403.685791	238.7570801	1.865815997
C.2.98	3334.226807	7.35725975	1689.844849	5.961930752	403.6704712	238.719101	1.853846431
C.2.99	3334.199951	7.322896481	1722.22583	5.934067249	403.6784668	238.6953125	1.839510083
C.2.100	3334.098145	7.28950882	1738.850464	5.917844772	403.6549683	238.6597748	1.861629605
C.2.101	3334.135742	7.3026371	1743.139282	5.90123558	403.642334	238.6746826	1.885402799
C.2.102	3334.101563	7.299090385	1728.573975	5.893336296	403.6343384	238.6484833	1.899544358
C.2.103	3334.041504	7.295292377	1692.656494	5.882090569	403.6232605	238.6605072	1.917628884
C.2.104	3334.082031	7.296537876	1723.632568	5.875783443	403.5989075	238.6633301	1.944348216
C.2.105	3334.047607	7.278553486	1737.591309	5.869983196	403.6148682	238.6539612	1.910919309
C.2.106	3334.045654	7.292420387	1708.001465	5.87742424	403.5943298	238.5967865	1.901401758
C.2.107	3334.195068	7.316493511	1745.825806	5.893733501	403.5874023	238.5389557	1.99859345
C.2.108	3334.229248	7.324226856	1746.89917	5.908384323	403.6127625	238.4902039	1.985411406
C.2.109	3334.261963	7.3439641	1726.74939	5.933668613	403.6322327	238.4440918	1.981215954
C.2.110	3334.306885	7.342409134	1752.770386	5.944045544	403.6247253	238.416748	2.012407541
C.2.111	3334.324219	7.352100849	1733.680664	5.948221684	403.6317749	238.4073486	2.034240246
C.2.112	3334.329834	7.365690231	1716.254395	5.954884052	403.6169434	238.3843384	2.057239771
C.2.113	3334.361816	7.35565424	1757.228882	5.962115765	403.6490479	238.3836365	2.073904991
C.2.114	3334.343506	7.34946537	1751.36731	5.950078011	403.624939	238.3723297	2.05842638
C.2.115	3334.353027	7.370417118	1725.819214	5.963072777	403.6643066	238.3590698	2.075982094
C.2.116	3334.376465	7.376707554	1731.54834	5.970193863	403.6521912	238.3343811	2.061154604
C.2.117	3334.340332	7.351338863	1747.90271	5.955644608	403.609314	238.2661896	2.08932662
C.2.118	3334.302246	7.354376793	1727.162842	5.970977783	403.6534119	238.1985168	2.089046478
C.2.119	3334.440918	7.384994984	1736.692993	5.964341164	403.6114807	238.1570129	2.113721848
C.2.120	3334.361816	7.366184235	1739.0625	5.967649937	403.6162109	238.1301422	2.099562407
C.2.121	3334.310791	7.357526302	1727.269653	5.97029829	403.6337585	238.1054535	2.120263577
C.2.122	3334.337158	7.35359478	1745.599731	5.962191105	403.6248474	238.0894012	2.114730358
C.2.123	3334.324463	7.345462799	1745.994385	5.959269047	403.6322327	238.0740204	2.117251396
C.2.124	3334.326416	7.368251801	1709.226563	5.970594883	403.6266174	238.0678101	2.134577751
C.2.125	3334.366943	7.373864651	1723.654419	5.967477322	403.6223755	238.0716553	2.125814438
C.2.126	3334.239502	7.333622456	1727.72168	5.952107906	403.6205139	238.0678253	2.154488564
C.2.127	3334.338867	7.373170853	1695.042969	5.955542564	403.5962219	238.0642395	2.181508541
C.2.128	3334.315186	7.368753433	1703.519531	5.956908226	403.610199	238.0663757	2.208804607
C.2.129	3334.244141	7.341349602	1726.238159	5.942374706	403.5773621	238.0640259	2.220602036
C.2.130	3334.296631	7.356103897	1719.894043	5.952302456	403.5963745	238.0817719	2.247800589
C.2.131	3334.286865	7.335996151	1748.817017	5.939716816	403.5625	238.0728912	2.241155386
C.2.132	3334.229004	7.330074787	1724.676147	5.935714722	403.5700989	238.0781403	2.24185133
C.2.133	3334.241211	7.330779552	1733.372925	5.939314842	403.5762634	238.0879974	2.28240943
C.2.134	3334.28418	7.333634853	1748.758667	5.929564953	403.55896	238.0419769	2.258347273

Point	CP HTF	T HTF out	Capacity - HTF	T ref out	h refrigerant out	h refrigerant in	T refrigerant inlet
C.2.135	3334.177979	7.307805061	1755.786499	5.926527023	403.5343323	238.0084076	2.271119833
C.2.136	3334.15918	7.314283848	1728.501343	5.925403595	403.5295715	237.9887543	2.313335657
C.2.137	3334.171143	7.306241035	1750.662231	5.909270287	403.5097351	237.9879913	2.349219322
C.2.138	3334.067627	7.291529179	1727.544312	5.899106979	403.4984131	237.9790649	2.341458082
C.2.139	3334.064697	7.283699989	1737.807373	5.893255711	403.5027161	237.9862823	2.336900711
C.2.140	3333.978271	7.254081726	1746.394897	5.882088184	403.5076599	237.9163055	2.325448513
C.2.141	3333.933105	7.235949993	1757.584351	5.864441872	403.5080566	237.830719	2.302450895
C.2.142	3333.943115	7.252796173	1721.411133	5.853015423	403.495697	237.7892914	2.307878017
C.2.143	3333.92749	7.236636639	1750.698853	5.849676609	403.4588318	237.774353	2.312581778
C.2.144	3333.886475	7.242925644	1716.07605	5.848498344	403.4616394	237.7501373	2.340514421
C.2.145	3333.875488	7.216519833	1761.456665	5.849859715	403.4436951	237.7307281	2.364145041
C.2.146	3333.907715	7.22558403	1752.973511	5.846946239	403.4268494	237.6740112	2.362372637
C.2.147	3333.818115	7.219552994	1724.305664	5.850759029	403.4588623	237.6368408	2.36628294
C.2.148	3333.867676	7.212310791	1771.147583	5.833554745	403.4648743	237.6028137	2.373991489
C.2.149	3333.779541	7.183452129	1776.445923	5.83099699	403.4310608	237.5831757	2.389651775
C.2.150	3333.782959	7.20210743	1736.212646	5.829259396	403.4061279	237.5879822	2.43165803
C.2.151	3333.789063	7.196519852	1754.555176	5.821736336	403.4057007	237.5805511	2.464842558
C.2.152	3333.692383	7.164544106	1760.59668	5.812068462	403.4082031	237.5793762	2.443729401
C.2.153	3333.656006	7.15299511	1772.526978	5.800044537	403.4027405	237.5607605	2.468698263
C.2.154	3333.67041	7.164147377	1757.658569	5.801915169	403.3934326	237.5640564	2.478214025
C.2.155	3333.716553	7.17549181	1761.592651	5.792051792	403.387207	237.5736389	2.49640584
C.2.156	3333.641846	7.147710323	1773.132935	5.776125908	403.3580322	237.5587616	2.485105038
C.2.157	3333.577881	7.132955551	1770.268799	5.780819893	403.3469543	237.5652466	2.525170326
C.2.158	3333.596191	7.135202408	1771.863892	5.774366379	403.3517151	237.5609436	2.54182744
C.2.159	3333.562256	7.132826805	1760.503296	5.757647038	403.3455811	237.5605164	2.510461569
C.2.160	3333.512451	7.130614758	1735.511475	5.75672245	403.3266602	237.5487671	2.541666985
C.2.161	3333.528809	7.117681026	1766.199585	5.744280815	403.3245239	237.5496979	2.562299013
C.2.162	3333.503174	7.108178139	1760.2771	5.732255459	403.3159485	237.5348969	2.562722683
C.2.163	3333.473145	7.117192268	1739.028809	5.730982304	403.308197	237.5370331	2.575160265
C.2.164	3333.427246	7.089550495	1769.830566	5.721912861	403.2709656	237.5404358	2.54641366
C.2.165	3333.329834	7.071904659	1752.678467	5.710384846	403.3043823	237.5329285	2.592956066
C.2.166	3333.423096	7.091589451	1758.782104	5.700317383	403.2687073	237.5279236	2.587584972
C.2.167	3333.388672	7.08163166	1762.299072	5.693665981	403.2623901	237.5413361	2.586904049
C.2.168	3333.320557	7.062409401	1767.619141	5.688130856	403.270752	237.5398254	2.596237659
C.2.169	3333.294922	7.058994293	1753.786865	5.684619427	403.2565918	237.5575562	2.575772762
C.2.170	3333.281738	7.031527996	1795.495361	5.673364639	403.256012	237.5217133	2.580789089
C.2.171	3333.243164	7.047625065	1752.923218	5.672101974	403.2315369	237.4931641	2.568121672
C.2.172	3333.256104	7.031698704	1787.0802	5.655490875	403.2092896	237.4809875	2.616459131
C.2.173	3333.230713	7.027784824	1781.00293	5.646800041	403.2220154	237.4671021	2.628085613
C.2.174	3333.238281	7.034400463	1771.485107	5.654524326	403.203125	237.4582825	2.618313551
C.2.175	3333.293701	7.064374924	1747.229126	5.647984028	403.1885681	237.4604034	2.652648926
C.2.176	3333.225098	7.03198576	1766.724609	5.631569386	403.1974487	237.4529877	2.666079998
C.2.177	3333.255615	7.045398235	1762.962036	5.631651878	403.1969604	237.4542084	2.674039125
C.2.178	3333.258301	7.051181316	1746.738403	5.63285017	403.2059631	237.4544373	2.717777491
C.2.179	3333.214111	7.03174305	1767.889526	5.620158672	403.1821899	237.4632568	2.702327251
C.2.180	3333.126465	7.016606808	1752.424805	5.613974094	403.1622925	237.4565125	2.690409899
C.2.181	3333.141846	7.005834579	1766.298218	5.612416267	403.1775818	237.4366913	2.689669132
C.2.182	3333.083984	6.978927612	1789.426025	5.607435226	403.1882324	237.3806915	2.679898024
C.2.183	3333.052002	6.977984428	1779.981323	5.585976601	403.1690674	237.2898407	2.739956856
C.2.184	3333.080078	6.997179508	1750.710205	5.580195427	403.1340637	237.2435761	2.719707727
C.2.185	3333.064941	6.966035366	1804.499634	5.570821285	403.1134644	237.2160492	2.708313942
C.2.186	3333.032959	6.97748661	1766.314941	5.551578999	403.1112671	237.1992645	2.726204634
C.2.187	3333.044189	6.98892498	1754.784912	5.544918537	403.115509	237.1860962	2.763795376
C.2.188	3333.048584	6.985603809	1765.726196	5.52854538	403.0891724	237.1729584	2.725019455
C.2.189	3333.002686	6.96533823	1783.812866	5.49813509	403.0626526	237.1595917	2.740334272
C.2.190	3332.969727	6.962785721	1766.812134	5.499145508	403.0369568	237.1586456	2.760489702
C.2.191	3332.974609	6.94997406	1792.005005	5.481330395	403.0231018	237.1526184	2.744776964
C.2.192	3332.936523	6.958413124	1754.14856	5.46026659	403.0496521	237.1401825	2.753609896
C.2.193	3332.949951	6.959247589	1765.945313	5.444458485	403.0117188	237.1347351	2.772368908
C.2.194	3332.913086	6.952544212	1760.707275	5.415306091	402.9489746	237.128479	2.78879714
C.2.195	3332.834961	6.937761307	1747.692993	5.275827885	402.8494873	237.13591	2.766791582
C.2.196	3332.91626	6.947460651	1768.095215	5.367544174	402.9227295	237.1361694	2.765493393
C.2.197	3332.885254	6.933455944	1783.575806	5.395898819	402.9617004	237.1308746	2.767151594
C.2.198	3332.821045	6.926403046	1758.104858	5.382120132	402.9338989	237.1334839	2.799682379
C.2.199	3332.781982	6.923091412	1745.731079	5.33229351	402.8820496	237.1275024	2.787050486
C.2.200	3332.760986	6.902456284	1765.143188	5.185782909	402.7802124	237.1203003	2.794671059
C.2.201	3332.807861	6.935713768	1734.543091	5.267328262	402.8233337	237.1337433	2.788613796

Point	CP HTF	T HTF out	Capacity - HTF	T ref out	h refrigerant out	h refrigerant in	T refrigerant inlet
C.2.202	3332.820801	6.932267666	1745.794312	4.867460251	402.477356	237.1133881	2.837576151
C.2.203	3332.726318	6.885412216	1789.486084	4.814425945	402.4179993	237.1234131	2.83151412
C.2.204	3332.720459	6.892251015	1763.024048	4.774312019	402.3965149	237.1325684	2.835057259
C.2.205							
C.2.206	3336.911377	6.955425739	1847.906982	3.466950178	401.1059265	234.6443024	3.205905914
C.2.207	3337.002441	6.96805191	1861.672119	2.70640707	400.3779602	234.6338348	3.237770319
C.2.208	3337.101807	7.01158905	1851.160156	2.625213146	400.302002	234.627533	3.29072237
C.2.209	3338.817139	7.331270218	1991.219604	3.004199505	400.4915466	234.7776794	3.629769087
C.2.210	3340.086426	7.708529949	1971.611816	3.349480867	400.6855774	234.8278503	3.944327116
C.2.211	3340.914307	8.031741142	1887.960693	3.638233423	400.9741821	234.8785553	4.237129688
C.2.212	3340.540527	7.953643799	1865.669312	3.611654043	400.9900208	234.8726349	4.170115948
C.2.213	3340.056396	7.827950954	1857.42749	3.322354794	400.7349548	234.838623	4.063820362
C.2.214	3339.688965	7.715399742	1866.213623	3.217575312	400.6802673	234.7494354	3.936895132
C.2.215	3339.166504	7.550252914	1881.613525	4.72443676	402.0514526	234.6629334	3.818109751
C.2.216	3339.267578	7.585987091	1875.469238	3.100486755	400.5844421	234.6295624	3.847893
C.2.217	3339.488281	7.629022598	1890.689209	3.537559748	400.9733276	234.5206604	3.899745703
C.2.218	3339.529053	7.633282185	1899.380005	3.148873329	400.5740051	234.4628754	3.896827936
C.2.219	3339.564453	7.662106037	1884.313354	3.18514967	400.6304626	234.3883057	3.918696404
C.2.220	3339.506104	7.665232658	1864.29187	3.196626186	400.6447449	234.3629761	3.93355155
C.2.221	3339.635254	7.694065571	1869.898071	3.184238911	400.6423645	234.3553772	3.947897911
C.2.222	3339.515137	7.652920723	1877.234253	3.275684595	400.7286987	234.3605499	3.925310135
C.2.223	3339.386475	7.631220341	1863.132568	3.135070562	400.5941772	234.3514099	3.909584761
C.2.224	3339.445557	7.656171799	1857.986328	3.182599545	400.6225281	234.3499756	3.946736574
C.2.225	3339.579346	7.67250061	1877.797485	3.202809572	400.6419373	234.3661346	3.943197012
C.2.226	3339.608398	7.713655472	1845.862427	3.250978231	400.668335	234.3578033	3.980440617
C.2.227	3339.555908	7.679700851	1868.092407	3.17993927	400.6089172	234.3482666	3.961198568
C.2.228	3339.592773	7.690095901	1865.072388	3.20438838	400.6461487	234.3456116	3.984856129
C.2.229	3339.607422	7.699890614	1861.2146	3.208852053	400.6360168	234.3603516	4.003613949

Point	T Valve in	Capacity - refrigerant	refrigerant mass flow	T sat	T valve inlet	T subcooling
C.2.1	28.32128906	1656.403198	0.010109295	29.08147632	28.32128779	0.760188528
C.2.2	28.35953903	1657.171387	0.010114999	29.11100626	28.35953776	0.751468495
C.2.3	28.37076759	1646.884644	0.010051362	29.09464051	28.37076823	0.723872277
C.2.4	28.37825584	1651.533203	0.010080287	29.10943222	28.37825712	0.7311751
C.2.5	28.38932419	1664.105835	0.010158807	29.15072248	28.38932292	0.761399561
C.2.6	28.37792969	1648.68457	0.010061295	29.1263268	28.37792969	0.748397116
C.2.7	28.37207413	1676.028809	0.0102269	29.19151995	28.37207286	0.819447095
C.2.8	28.35302734	1649.781128	0.010063997	29.19017677	28.35302671	0.837150062
C.2.9	28.34537697	1652.705933	0.010079673	29.21524594	28.34537633	0.869869605
C.2.10	28.34391403	1657.011597	0.010104411	29.18387671	28.3439134	0.839963313
C.2.11	28.34993362	1671.790283	0.010195729	29.19493049	28.34993362	0.844996861
C.2.12	28.34277344	1648.786377	0.010054612	29.20090687	28.34277344	0.858133436
C.2.13	28.33626175	1650.406372	0.010062046	29.23599698	28.33626175	0.899735229
C.2.14	28.31900597	1664.328491	0.010145298	29.27332953	28.3190066	0.954322928
C.2.15	28.31949616	1646.059448	0.010034246	29.2976711	28.31949615	0.978174945
C.2.16	28.31884956	1653.021973	0.010076284	29.32698472	28.3188502	1.00813452
C.2.17	28.31413078	1669.319946	0.010175837	29.31482178	28.31413015	1.000691638
C.2.18	28.31315231	1669.607422	0.010176443	29.31080279	28.31315168	0.997651117
C.2.19	28.304039	1663.337402	0.010136091	29.31869254	28.30403837	1.014654177
C.2.20	28.29882813	1683.772827	0.010261527	29.34827427	28.29882813	1.049446143
C.2.21	28.30908394	1670.362915	0.010178454	29.33709485	28.3090833	1.028011546
C.2.22	28.30566406	1680.450317	0.010239824	29.4129954	28.30566343	1.107331968
C.2.23	28.30273438	1658.932739	0.010109127	29.42832459	28.30273501	1.125589578
C.2.24	28.3100605	1672.58313	0.010192498	29.43238731	28.31005923	1.122328078
C.2.25	28.30940819	1688.629883	0.01028935	29.44025639	28.30940819	1.130848204
C.2.26	28.31461716	1673.933105	0.010201151	29.4572892	28.31461652	1.142672679
C.2.27	28.31022072	1667.58313	0.010160139	29.36673019	28.31022199	1.056508201
C.2.28	28.30289841	1662.279175	0.010126016	29.34151236	28.30289841	1.038613956
C.2.29	28.25976563	1686.106812	0.010269021	29.34676223	28.25976435	1.08699788
C.2.30	28.21484184	1688.104492	0.010277594	29.39150555	28.21484121	1.176664346
C.2.31	28.18961716	1686.07959	0.010265389	29.36207357	28.18961716	1.172456412
C.2.32	28.16031838	1677.021484	0.010207704	29.30975888	28.16031837	1.149440506
C.2.33	28.14941406	1690.345703	0.0102876	29.23861513	28.14941343	1.089201709
C.2.34	28.11018944	1681.417847	0.010231188	29.2638063	28.11019071	1.153615588
C.2.35	28.06673241	1678.327515	0.010207507	29.23402543	28.06673368	1.16729175
C.2.36	28.00374413	1686.568848	0.010253423	29.22371617	28.00374349	1.21997268
C.2.37	27.96598434	1690.859375	0.010275633	29.29854173	27.96598498	1.33255675
C.2.38	27.95589066	1716.654663	0.010432797	29.34800711	27.95589066	1.392116452
C.2.39	27.93717575	1700.47522	0.010330997	29.28889276	27.93717512	1.351717642
C.2.40	27.93099022	1705.677856	0.010361729	29.2934486	27.93098958	1.362459013
C.2.41	27.91569138	1711.979248	0.010398917	29.30132991	27.91569201	1.385637901
C.2.42	27.91032028	1690.183716	0.010265199	29.34449977	27.91032028	1.434179492
C.2.43	27.90885353	1708.171997	0.010374272	29.37563017	27.90885353	1.466776637
C.2.44	27.89794922	1695.697876	0.010297354	29.31096493	27.89794985	1.413015072
C.2.45	27.89811325	1705.730347	0.010359352	29.37251125	27.89811325	1.474398001
C.2.46	27.90152931	1699.427368	0.010322141	29.38025703	27.90153058	1.478726443
C.2.47	27.89746094	1704.484863	0.010352918	29.41509275	27.89746157	1.517631173
C.2.48	27.90153122	1713.297729	0.0104069	29.33924965	27.90153122	1.437718428
C.2.49	27.90266991	1705.44397	0.010357556	29.20210149	27.90266927	1.299432218
C.2.50	27.88265038	1720.088257	0.010443952	29.2060244	27.88265038	1.323374027
C.2.51	27.81266213	1699.513916	0.010311597	29.15744368	27.81266212	1.344781553
C.2.52	27.73730469	1705.006226	0.010339198	29.16769913	27.73730469	1.430394446
C.2.53	27.69173241	1710.245972	0.010365724	29.21171717	27.69173177	1.5199854
C.2.54	27.66048241	1720.586426	0.010428778	29.2363588	27.66048114	1.575877664
C.2.55	27.64257813	1706.163452	0.010337692	29.15476673	27.64257813	1.512188605
C.2.56	27.64323044	1727.37915	0.010468091	29.17073482	27.6432298	1.527505016
C.2.57	27.64143944	1720.838501	0.010429059	29.20686824	27.64144007	1.565428168
C.2.58	27.62907028	1713.600098	0.010384113	29.26980232	27.62906965	1.640732672
C.2.59	27.63118362	1716.939331	0.010404911	29.24125878	27.63118299	1.610075794
C.2.60	27.62597847	1722.503052	0.010438098	29.21176848	27.62597847	1.585790009
C.2.61	27.61979294	1707.789795	0.010347516	29.22300658	27.61979294	1.603213638
C.2.62	27.61637116	1710.634644	0.010365593	29.20177932	27.61637243	1.58540689
C.2.63	27.61930084	1725.487305	0.010458102	29.19636763	27.61930148	1.577066148
C.2.64	27.60595703	1728.859253	0.010475819	29.26546909	27.60595703	1.659512058
C.2.65	27.60498047	1724.176392	0.010448535	29.28684092	27.60498047	1.681860449
C.2.66	27.60905075	1723.044556	0.010442222	29.30906198	27.60904948	1.700012499
C.2.67	27.61523247	1721.118286	0.010430269	29.24694724	27.6152331	1.63171414

Point	T Valve in	Capacity - refrigerant	refrigerant mass flow	T sat	T valve inlet	T subcooling
C.2.68	27.61816406	1721.18396	0.010432301	29.18832306	27.6181647	1.570158362
C.2.69	27.61556053	1728.182983	0.010475131	29.31969929	27.6155599	1.70413939
C.2.70	27.61458397	1741.181274	0.010554271	29.26559152	27.61458333	1.651008185
C.2.71	27.60530281	1720.360107	0.010427872	29.27503183	27.60530408	1.669727752
C.2.72	27.60839653	1711.02771	0.010369793	29.25360047	27.60839717	1.645203299
C.2.73	27.60644531	1727.554321	0.010469933	29.22251071	27.60644531	1.616065397
C.2.74	27.61816406	1734.152832	0.010513389	29.2806877	27.61816343	1.662524277
C.2.75	27.61604881	1712.734009	0.010381917	29.20184774	27.61604818	1.585799566
C.2.76	27.61263084	1731.978638	0.010499642	29.29646471	27.61262957	1.683835137
C.2.77	27.61604881	1720.457642	0.010429723	29.2588318	27.61604818	1.642783626
C.2.78	27.61051559	1725.975464	0.010464724	29.24644878	27.61051496	1.635933825
C.2.79	27.60384178	1729.005249	0.010482184	29.32726622	27.60384115	1.723425072
C.2.80	27.60660744	1734.450439	0.010515474	29.28968387	27.60660807	1.683075799
C.2.81						
C.2.82	27.61376953	1720.386353	0.010432296	29.14429433	27.61377017	1.530524167
C.2.83	27.5984726	1707.117676	0.010349992	29.18120128	27.59847132	1.582729954
C.2.84	27.59147263	1705.484619	0.010337332	29.21351579	27.59147326	1.622042531
C.2.85	27.57731247	1726.969116	0.010467761	29.19313115	27.57731311	1.615818041
C.2.86	27.58040428	1715.515259	0.010396278	29.18926133	27.58040301	1.608858322
C.2.87	27.56803513	1724.983643	0.010453817	29.2496958	27.56803513	1.681660675
C.2.88	27.56656838	1725.37146	0.010456226	29.25706056	27.56656837	1.690492187
C.2.89	27.56559372	1719.106323	0.010418858	29.23092548	27.56559308	1.665332399
C.2.90	27.56315231	1718.68689	0.010414705	29.27649212	27.56315104	1.713341081
C.2.91	27.56705666	1726.484009	0.010463208	29.25354635	27.56705729	1.686489063
C.2.92	27.55713081	1723.654785	0.010446304	29.31808962	27.55713018	1.760959447
C.2.93	27.55989647	1731.721313	0.010494991	29.28585054	27.55989711	1.725953434
C.2.94	27.56510544	1729.428589	0.010481615	29.27613061	27.5651048	1.71102581
C.2.95	27.56803322	1735.645752	0.010520148	29.32646153	27.56803385	1.758427672
C.2.96	27.56201363	1734.137573	0.010511437	29.31624101	27.56201299	1.754228015
C.2.97	27.57715035	1734.627441	0.010517436	29.25494182	27.57715035	1.677791472
C.2.98	27.55143166	1746.131104	0.010585733	29.24549742	27.55143166	1.694065766
C.2.99	27.53531647	1741.46106	0.010555387	29.24517555	27.53531647	1.709859082
C.2.100	27.51123047	1728.502075	0.010476076	29.31587981	27.51122983	1.804649973
C.2.101	27.52132225	1730.394531	0.010489297	29.34116557	27.52132161	1.819843957
C.2.102	27.50357819	1733.432129	0.01050655	29.30768236	27.50357819	1.804104176
C.2.103	27.51171684	1728.402588	0.010477532	29.33635855	27.51171684	1.824641712
C.2.104	27.51367188	1745.407471	0.01058236	29.2058619	27.51367187	1.69219003
C.2.105	27.50732422	1730.478149	0.010490232	29.18313513	27.50732549	1.675809643
C.2.106	27.46858788	1750.048828	0.010606513	29.19694361	27.46858851	1.728355099
C.2.107	27.42936134	1747.823975	0.010589764	29.30631408	27.42936198	1.876952105
C.2.108	27.39632416	1750.730469	0.010602611	29.30057883	27.39632289	1.904255941
C.2.109	27.36507034	1751.955688	0.01060582	29.29929285	27.36506971	1.934223142
C.2.110	27.34651566	1758.644287	0.010645033	29.34169997	27.34651502	1.99518495
C.2.111	27.34016991	1745.087646	0.010561923	29.25021986	27.34017054	1.910049317
C.2.112	27.32454491	1765.555176	0.010685271	29.33077485	27.32454554	2.006229312
C.2.113	27.32405853	1752.000854	0.010601136	29.38564735	27.32405853	2.061588812
C.2.114	27.31640625	1749.960815	0.010589611	29.31342812	27.31640689	1.997021234
C.2.115	27.30745316	1748.996094	0.010580402	29.19994032	27.30745316	1.892487169
C.2.116	27.29068947	1756.039063	0.010622202	29.27602244	27.2906901	1.98533234
C.2.117	27.24446678	1758.338013	0.01063448	29.21315379	27.24446678	1.968687011
C.2.118	27.19856834	1759.947388	0.010637023	29.19005414	27.19856771	1.991486434
C.2.119	27.17041016	1755.57959	0.01061065	29.20042218	27.17041016	2.03001202
C.2.120	27.15218163	1765.860596	0.010670752	29.18932978	27.15218163	2.037148151
C.2.121	27.13541412	1767.860718	0.010680111	29.23194552	27.13541476	2.096530765
C.2.122	27.12451363	1773.590698	0.010714266	29.2570748	27.12451299	2.13256181
C.2.123	27.11409378	1750.750732	0.010574834	29.19685237	27.11409314	2.082759221
C.2.124	27.10986328	1772.549561	0.010706466	29.25806579	27.10986392	2.148201875
C.2.125	27.11246681	1765.04895	0.010661682	29.27614485	27.11246618	2.163678669
C.2.126	27.10986328	1767.559326	0.010676718	29.28686938	27.10986328	2.177006096
C.2.127	27.10742188	1771.231323	0.010700237	29.32130605	27.10742124	2.213884807
C.2.128	27.10888672	1765.707764	0.010666105	29.27804914	27.10888672	2.169162424
C.2.129	27.10725784	1770.221069	0.010695336	29.35024098	27.10725848	2.242982497
C.2.130	27.11930466	1754.748291	0.010601774	29.35336139	27.11930466	2.234056734
C.2.131	27.11327934	1780.779053	0.01076067	29.35614628	27.11327998	2.242866305
C.2.132	27.11686325	1765.152588	0.010666092	29.28426817	27.11686325	2.167404914
C.2.133	27.12353516	1766.986206	0.01067741	29.34621368	27.12353516	2.222678526
C.2.134	27.09228516	1779.835693	0.010753189	29.38103239	27.09228452	2.288747865

Point	T Valve in	Capacity - refrigerant	refrigerant mass flow	T sat	T valve inlet	T subcooling
C.2.135	27.06949806	1782.571289	0.010769136	29.39915731	27.06949806	2.329659244
C.2.136	27.05615234	1791.488403	0.010822035	29.42494534	27.05615171	2.368793629
C.2.137	27.05566406	1774.390747	0.010719987	29.33820637	27.0556647	2.282541675
C.2.138	27.04964256	1788.068848	0.010802779	29.21891124	27.04964193	2.169269314
C.2.139	27.05452538	1780.58313	0.010757742	29.27269756	27.05452538	2.21817218
C.2.140	27.00699806	1780.541992	0.010752628	29.34065675	27.00699806	2.333658688
C.2.141	26.9488945	1785.574585	0.01077742	29.28603837	26.94889514	2.337143234
C.2.142	26.92073822	1783.89563	0.010765401	29.35981186	26.92073822	2.439073636
C.2.143	26.91064262	1781.302246	0.010751171	29.22045594	26.91064326	2.30981268
C.2.144	26.89420509	1793.77771	0.010824702	29.19008266	26.89420509	2.295877567
C.2.145	26.8810215	1787.870483	0.01078896	29.18868525	26.8810215	2.307663753
C.2.146	26.84244919	1781.187744	0.010746047	29.28547487	26.84244855	2.44302632
C.2.147	26.81722069	1790.861206	0.0107999	29.23005359	26.81722005	2.412833533
C.2.148	26.79410744	1786.331543	0.010769984	29.19388397	26.7941068	2.399777167
C.2.149	26.78076172	1793.722534	0.010815468	29.2122274	26.78076108	2.431466322
C.2.150	26.78401756	1788.463623	0.010785693	29.23613088	26.78401756	2.452113318
C.2.151	26.77897072	1792.367798	0.010808782	29.22583919	26.77897008	2.446869104
C.2.152	26.77815628	1789.839478	0.010793297	29.2757691	26.77815628	2.49761282
C.2.153	26.76546288	1796.702026	0.010833818	29.36215312	26.76546351	2.596689614
C.2.154	26.76774216	1793.911377	0.010817814	29.26255916	26.76774152	2.494817644
C.2.155	26.77425003	1795.837891	0.010830465	29.28273981	26.77425003	2.508489784
C.2.156	26.76416016	1807.280396	0.010900414	29.24058649	26.76415952	2.47642697
C.2.157	26.76855469	1786.947144	0.010778916	29.26627484	26.76855532	2.497719515
C.2.158	26.76562309	1803.063232	0.010875534	29.27721513	26.76562373	2.511591404
C.2.159	26.76529884	1793.136841	0.010816034	29.37063923	26.76529821	2.605341025
C.2.160	26.75732422	1794.730103	0.010826113	29.34016214	26.75732358	2.582838555
C.2.161	26.75797463	1797.937988	0.010845664	29.30305964	26.75797526	2.54508438
C.2.162	26.74788284	1797.588257	0.010843148	29.37208231	26.74788284	2.62419947
C.2.163	26.74934769	1791.147461	0.010804939	29.33292995	26.74934832	2.583581624
C.2.164	26.75162697	1797.677856	0.010846992	29.436583	26.75162697	2.684956027
C.2.165	26.74658203	1798.397583	0.010848658	29.28562286	26.74658203	2.539040831
C.2.166	26.74316406	1791.286987	0.010807761	29.319577	26.74316533	2.576411665
C.2.167	26.75227928	1799.141479	0.010856445	29.33208555	26.75227992	2.579805632
C.2.168	26.75130272	1796.137451	0.010837672	29.19797865	26.75130336	2.446675298
C.2.169	26.76334572	1801.075073	0.010869557	29.22522081	26.76334508	2.461875731
C.2.170	26.73893356	1794.019531	0.010824672	29.33669401	26.73893356	2.597760447
C.2.171	26.71956253	1789.024292	0.010794268	29.25317043	26.71956317	2.533607261
C.2.172	26.71126556	1796.086792	0.010837538	29.31625523	26.71126493	2.604990298
C.2.173	26.70182419	1810.103638	0.010920363	29.31460847	26.70182355	2.612784919
C.2.174	26.69580078	1805.480347	0.010893132	29.38390933	26.69580205	2.688107282
C.2.175	26.69726753	1823.342285	0.011002006	29.32091645	26.6972688	2.623647644
C.2.176	26.69222069	1804.786621	0.01088897	29.33420362	26.69222069	2.641982934
C.2.177	26.69303513	1799.610474	0.010857853	29.36463065	26.69303449	2.671596159
C.2.178	26.69319725	1805.745117	0.010894289	29.36258215	26.69319661	2.669385541
C.2.179	26.69921875	1808.45166	0.010912764	29.28810163	26.69921875	2.588882878
C.2.180	26.69466209	1806.471191	0.010901678	29.20390048	26.69466146	2.509239024
C.2.181	26.68115425	1810.855469	0.010925822	29.29110386	26.68115298	2.609950881
C.2.182	26.64306641	1786.871582	0.010776781	29.33422921	26.64306704	2.691162167
C.2.183	26.58121681	1811.618652	0.010921311	29.47393876	26.58121681	2.892721949
C.2.184	26.5498066	1810.949951	0.010916539	29.32852583	26.5498066	2.778719237
C.2.185	26.53108788	1806.021606	0.010886376	29.32083682	26.53108788	2.789748946
C.2.186	26.51969147	1805.441406	0.010881921	29.25869797	26.51969147	2.739006498
C.2.187	26.5107441	1816.528198	0.010947596	29.23797129	26.51074346	2.727227834
C.2.188	26.50178909	1813.998413	0.010933219	29.25635148	26.50178973	2.754561748
C.2.189	26.49267578	1813.940918	0.010933739	29.30395577	26.49267642	2.811279356
C.2.190	26.49202538	1809.333008	0.010907593	29.32780078	26.49202538	2.835775401
C.2.191	26.48795509	1808.89624	0.010905473	29.25035372	26.48795509	2.762398627
C.2.192	26.4794941	1806.716431	0.010889774	29.26061437	26.47949282	2.781121545
C.2.193	26.47574997	1812.137695	0.010924587	29.33392217	26.47574933	2.858172832
C.2.194	26.47151756	1812.450439	0.010930195	29.27268332	26.47151629	2.801167031
C.2.195	26.4765625	1817.097778	0.010965292	29.31463407	26.47656377	2.838070297
C.2.196	26.47672463	1813.904297	0.010941202	29.34090974	26.47672526	2.86418448
C.2.197	26.47314453	1818.910156	0.010968468	29.29630537	26.47314517	2.823160206
C.2.198	26.47493553	1819.70874	0.010975297	29.24313602	26.4749349	2.768201128
C.2.199	26.47086525	1808.002563	0.01090771	29.25326441	26.47086461	2.782399795
C.2.200	26.46598244	1803.953369	0.010889499	29.22056424	26.46598117	2.754583072
C.2.201	26.47509575	1813.297607	0.010943945	29.29446727	26.47509638	2.819370884

Point	T Valve in	Capacity - refrigerant	refrigerant mass flow	T sat	T valve inlet	T subcooling
C.2.202	26.46126175	1815.550171	0.010979115	29.24945655	26.46126175	2.788194805
C.2.203	26.46809769	1818.023926	0.010998691	29.22550293	26.46809832	2.757404607
C.2.204	26.47428322	1806.648315	0.010931896	29.31045577	26.47428322	2.836172556
C.2.205						
C.2.206	24.77522659	1883.114868	0.011312607	28.86709962	24.77522596	4.091873667
C.2.207	24.7680645	1881.009399	0.011348875	28.85247825	24.7680645	4.084413749
C.2.208	24.76367188	1873.351563	0.011307424	28.96546228	24.76367187	4.201790406
C.2.209	24.86637497	1902.514526	0.01148072	29.26687843	24.86637497	4.40050346
C.2.210	24.90071487	1922.453735	0.01159098	29.31945756	24.90071551	4.418742045
C.2.211	24.93538284	1904.897461	0.011468681	29.42758974	24.93538348	4.492206264
C.2.212	24.93131638	1918.748291	0.011550557	29.44419894	24.93131638	4.512882566
C.2.213	24.90803909	1911.796265	0.011524042	29.41915663	24.90803973	4.511116898
C.2.214	24.84700584	1898.349854	0.011440608	29.29063433	24.84700648	4.44362785
C.2.215	24.78775978	1923.666016	0.011492223	29.25681851	24.78775978	4.469058725
C.2.216	24.76497459	1919.81543	0.011568298	29.11867287	24.76497523	4.35369764
C.2.217	24.69026756	1920.035156	0.011535022	29.20489546	24.69026883	4.514626624
C.2.218	24.65071487	1911.205322	0.011505581	29.0929316	24.65071487	4.442216726
C.2.219	24.59960938	1904.120361	0.011453895	29.03031058	24.59961001	4.430700571
C.2.220	24.58219528	1900.758057	0.011430947	29.10780384	24.58219465	4.525609197
C.2.221	24.5769825	1904.52832	0.011453262	29.10334981	24.57698377	4.52636604
C.2.222	24.58056641	1917.791992	0.0115274	29.04937915	24.58056704	4.468812108
C.2.223	24.57422066	1910.965454	0.01149503	29.16795307	24.57421939	4.59373368
C.2.224	24.57324219	1917.045654	0.011529538	29.16322228	24.57324155	4.589980728
C.2.225	24.58431053	1919.447876	0.01154376	29.17664585	24.5843099	4.592335951
C.2.226	24.57861137	1917.724731	0.011530988	29.15507781	24.57861201	4.576465802
C.2.227	24.57210159	1899.791138	0.011426582	29.10228409	24.57210223	4.530181865
C.2.228	24.5703125	1907.812622	0.011472077	29.06225784	24.57031186	4.491945972
C.2.229	24.58040428	1910.751099	0.011491466	29.08831324	24.58040365	4.507909596

Point	T sat gas	T evap exit	T superheat	capacity difference	HTF	dQ/dm_dot	dQ/dT_in
C.2.1	-0.077318503	5.666166496	5.743485	-0.496%		1832.000576	914.8738769
C.2.2	-0.135237573	5.693480491	5.828718064	0.183%		1834.844465	910.4862181
C.2.3	-0.180869582	5.713633728	5.89450331	-0.176%		1851.969683	916.5322397
C.2.4	-0.18283279	5.715396118	5.898228908	-0.429%		1836.655606	913.8358412
C.2.5	-0.05648119	5.740689277	5.797170467	0.822%		1850.441662	916.096286
C.2.6	-0.150598758	5.754272651	5.90487141	-0.513%		1841.298565	915.2731069
C.2.7	-0.144659499	5.769210625	5.913870124	2.397%		1866.210025	915.724612
C.2.8	-0.13943748	5.789338493	5.928775973	1.603%		1878.227203	914.5234417
C.2.9	-0.173376382	5.80573082	5.979107202	0.686%		1840.953527	906.3320482
C.2.10	-0.183441173	5.827974129	6.011415301	0.352%		1849.635937	916.0386814
C.2.11	-0.101728034	5.8415905	5.943318534	0.634%		1839.903941	916.7405812
C.2.12	-0.079688617	5.851610184	5.9312988	-1.815%		1820.540991	916.6411856
C.2.13	-0.134741603	5.868547058	6.003288661	0.146%		1845.993977	912.4538097
C.2.14	-0.072520208	5.888656426	5.961176633	1.867%		1865.733737	913.9320544
C.2.15	-0.050614574	5.890539169	5.941153743	-0.981%		1835.7221	915.1596811
C.2.16	-0.017708982	5.907098007	5.924806989	-1.178%		1824.164581	915.0201774
C.2.17	0.084914753	5.927372742	5.842457989	0.096%		1832.294552	916.4556727
C.2.18	0.04959082	5.935545349	5.885954529	-1.252%		1805.077451	915.1725288
C.2.19	0.025439204	5.951739693	5.926300489	-1.213%		1814.286866	916.0271492
C.2.20	0.15370323	5.96666584	5.81296261	-0.292%		1793.919739	908.500581
C.2.21	0.059969407	5.979001236	5.919031829	-0.990%		1813.996921	917.701268
C.2.22	0.102030724	5.988188743	5.886158019	1.186%		1838.619224	915.5841522
C.2.23	0.152362155	5.991296196	5.838934041	-1.684%		1812.297012	916.7902733
C.2.24	0.135109466	5.994730759	5.859621292	-1.717%		1798.603128	917.6462329
C.2.25	0.154002855	6.016280556	5.8622777	1.718%		1842.857786	917.1638793
C.2.26	0.236629683	6.026271057	5.789641374	-2.555%		1782.613935	917.6958084
C.2.27	0.133601716	6.028818703	5.895216986	-0.405%		1816.88784	912.2628042
C.2.28	0.086069116	6.034770202	5.948701086	0.377%		1836.697469	912.1170212
C.2.29	0.180274863	6.030803299	5.850528436	0.876%		1831.404981	917.9162684
C.2.30	0.12302805	6.00274353	5.87971548	0.282%		1816.688391	917.1187818
C.2.31	0.203107269	5.983499527	5.780392258	0.906%		1829.365941	916.6603435
C.2.32	0.17037045	5.970389748	5.800019298	-0.041%		1805.601296	908.4943613
C.2.33	0.104416866	5.953326035	5.848909169	0.956%		1819.331643	913.5074646
C.2.34	0.149898041	5.939727593	5.789829551	-0.100%		1815.61009	916.4777736
C.2.35	0.129439034	5.949305344	5.81986631	-0.366%		1811.885392	915.3624902
C.2.36	0.20614245	5.94431839	5.73817594	-0.444%		1804.767304	916.9525985
C.2.37	0.225488382	5.957320785	5.731832403	0.106%		1795.417234	909.4984199
C.2.38	0.354167225	5.973739242	5.619572017	-0.027%		1782.866626	918.1127492
C.2.39	0.291390115	5.985056686	5.693666571	0.405%		1799.117906	913.7705238
C.2.40	0.33222975	6.00320797	5.670978219	1.523%		1823.153776	918.3687634
C.2.41	0.388026493	6.014732361	5.626705868	0.198%		1780.697	912.4071462
C.2.42	0.319077576	6.0081213	5.689043724	-0.385%		1800.650677	916.2088772
C.2.43	0.365756195	6.023472786	5.657716591	-0.100%		1785.645736	915.6409519
C.2.44	0.363582672	6.025483131	5.661900459	-1.895%		1772.034141	918.1886363
C.2.45	0.403544339	6.019147491	5.615603152	0.776%		1796.496021	911.8256847
C.2.46	0.463015192	6.02440567	5.561390478	-0.072%		1793.703671	914.7873762
C.2.47	0.502098833	6.028931427	5.526832594	0.350%		1797.022801	915.3311035
C.2.48	0.483727756	6.021796417	5.538068661	1.376%		1792.611205	908.3544912
C.2.49	0.439224235	6.03887291	5.599648674	2.626%		1827.402708	910.049902
C.2.50	0.389086468	6.034879112	5.645792644	1.043%		1795.357977	916.441692
C.2.51	0.324223324	6.031633949	5.707410625	-0.130%		1796.085448	916.5902176
C.2.52	0.392673378	6.030507278	5.637833901	0.559%		1802.906506	916.6869081
C.2.53	0.345894315	6.034000206	5.688105891	1.400%		1809.403515	915.0226101
C.2.54	0.500282625	6.023956108	5.523673483	1.678%		1803.552533	915.0022005
C.2.55	0.388217117	6.024647522	5.636430405	-1.018%		1772.678275	916.2504179
C.2.56	0.484269161	6.023159981	5.53889082	-0.308%		1762.012437	915.5738643
C.2.57	0.499796175	6.014357758	5.514561582	1.488%		1803.359116	916.8225032
C.2.58	0.501854183	6.013767815	5.511913632	1.155%		1803.797436	916.2635541
C.2.59	0.515206503	6.011441231	5.496234728	0.332%		1782.267842	914.6589426
C.2.60	0.482970351	6.002041054	5.519070703	0.291%		1770.886783	912.143897
C.2.61	0.487439654	6.018647575	5.531207921	-0.316%		1780.451986	914.7723602
C.2.62	0.492046544	5.999409103	5.507362559	0.790%		1786.461631	909.2462324
C.2.63	0.606512345	5.996007538	5.389495193	0.697%		1778.763981	914.0577286
C.2.64	0.537832585	6.00028286	5.462450275	0.613%		1776.518449	915.4459133
C.2.65	0.582716339	5.99352932	5.410812981	-0.777%		1755.997838	915.0635177
C.2.66	0.566203099	5.985362625	5.419159526	-0.178%		1765.225019	913.8299563
C.2.67	0.537562326	5.991491699	5.453929373	0.905%		1787.671689	914.4107256

Point	T sat gas	T evap exit	T superheat	capacity difference	HTF	dQ/dm_dot	dQ/dT_in
C.2.68	0.578854422	5.980378723	5.401524301	-0.392%		1765.339741	914.8249565
C.2.69	0.608483329	5.978307152	5.369823823	0.808%		1775.953618	913.0340511
C.2.70	0.652545576	5.98445034	5.331904765	2.254%		1785.462208	911.3460704
C.2.71	0.642055028	5.969132042	5.327077014	-2.975%		1718.099223	912.8450357
C.2.72	0.536372011	5.967762184	5.431390173	-1.363%		1757.666372	914.2651012
C.2.73	0.55736294	5.971506882	5.414143942	-1.220%		1749.808722	917.663486
C.2.74	0.662654699	5.963288307	5.300633608	0.578%		1768.75779	914.5991579
C.2.75	0.565122986	5.957713127	5.392590141	1.666%		1811.908071	915.2266496
C.2.76	0.627811044	5.953041267	5.325230223	2.734%		1810.084463	914.5279276
C.2.77	0.567662343	5.941000557	5.373338214	2.716%		1804.97534	906.0576525
C.2.78	0.691698554	5.943755913	5.252057359	1.353%		1792.400161	915.2861031
C.2.79	0.69762154	5.950673675	5.253052136	1.545%		1789.376292	913.5614876
C.2.80	0.66486288	5.939935493	5.275072614	0.077%		1756.740874	913.159409
C.2.81							
C.2.82	0.763765967	5.946167564	5.182401598	4.435%		1843.94939	909.1882078
C.2.83	0.791322421	5.962591553	5.171269131	0.773%		1799.623208	914.2407932
C.2.84	0.723621357	5.978775024	5.255153667	0.205%		1796.345459	916.9080852
C.2.85	0.817302138	5.98153801	5.164235871	-0.283%		1767.005415	917.7570986
C.2.86	0.718618047	5.991804314	5.273186267	0.604%		1800.462962	920.7179608
C.2.87	0.823553015	6.001965332	5.178412317	1.004%		1790.552667	916.9830009
C.2.88	0.829264128	6.000328445	5.171064318	-0.168%		1766.31259	915.4815583
C.2.89	0.890618513	6.007632637	5.117014124	0.752%		1794.659629	918.2751079
C.2.90	0.803698866	6.004483223	5.200784357	1.235%		1804.342017	918.5193407
C.2.91	0.846664909	6.002449989	5.15578508	1.166%		1789.403143	915.6759076
C.2.92	0.919676936	6.005151558	5.085474622	1.561%		1800.153321	915.9994886
C.2.93	0.886604997	6.002630997	5.116026	1.404%		1785.484571	914.2379586
C.2.94	0.891958138	6.003812599	5.111854461	0.164%		1770.140028	916.5870623
C.2.95	0.909780465	5.999403572	5.089623107	3.085%		1825.528675	920.8949108
C.2.96	0.924837148	5.986704636	5.061867487	1.642%		1798.457015	919.9519659
C.2.97	0.975977581	5.974885368	4.998907788	-0.126%		1766.338303	920.0550915
C.2.98	0.989081292	5.961930656	4.972849364	3.223%		1818.347883	921.5708502
C.2.99	0.874208631	5.934067535	5.059858904	1.105%		1766.399024	912.4039833
C.2.100	0.905766454	5.917844772	5.012078318	-0.599%		1756.68459	916.1736117
C.2.101	0.898086723	5.90123558	5.003148857	-0.737%		1761.80441	921.0994295
C.2.102	0.901351042	5.893336487	4.991985445	0.280%		1772.782806	919.1041993
C.2.103	0.904910712	5.882090759	4.977180047	2.068%		1797.386077	912.5133434
C.2.104	0.970235255	5.875783348	4.905548093	1.248%		1778.251702	919.3094658
C.2.105	0.896508474	5.86998291	4.973474437	-0.411%		1762.283135	918.4417803
C.2.106	0.991244886	5.87742424	4.886179354	2.403%		1789.608526	916.800375
C.2.107	1.066037679	5.893733406	4.827695727	0.114%		1756.980646	919.9766814
C.2.108	1.023355877	5.908384132	4.885028255	0.219%		1753.799301	918.8663347
C.2.109	1.034260215	5.933668518	4.899408303	1.439%		1773.755387	918.593542
C.2.110	1.092572157	5.944045639	4.851473482	0.334%		1747.687059	918.7197946
C.2.111	1.081050979	5.948221397	4.867170419	0.654%		1756.699987	913.3956238
C.2.112	1.153116784	5.954883766	4.801766982	2.792%		1779.300218	915.8457571
C.2.113	1.064227019	5.962116051	4.897889032	-0.298%		1744.197404	919.2024744
C.2.114	1.110548406	5.95007782	4.839529414	-0.080%		1742.136336	915.0588162
C.2.115	1.01407725	5.963072586	4.948995336	1.325%		1776.150301	919.3130361
C.2.116	1.078415381	5.970193672	4.891778291	1.395%		1775.694615	922.1215946
C.2.117	1.18191511	5.955644607	4.773729498	0.593%		1747.126876	915.8655357
C.2.118	1.076579952	5.970977974	4.894398021	1.863%		1772.30356	918.0503523
C.2.119	1.201248318	5.964341354	4.763093037	1.076%		1757.825743	915.537006
C.2.120	1.195204394	5.967650223	4.772445829	1.518%		1763.579574	919.8084447
C.2.121	1.142624528	5.970298386	4.827673858	2.296%		1773.799361	918.8794674
C.2.122	1.148415721	5.9621912	4.813775479	1.578%		1752.91739	917.6914973
C.2.123	1.113794439	5.959268951	4.845474512	0.272%		1744.458519	913.4728036
C.2.124	1.168327125	5.970594788	4.802267662	3.572%		1786.045426	915.5542584
C.2.125	1.173343973	5.967477417	4.794133444	2.345%		1775.343312	917.7390471
C.2.126	1.132210787	5.952107811	4.819897024	2.254%		1765.967613	915.0814478
C.2.127	1.226826136	5.955542374	4.728716237	4.301%		1788.867588	909.38793
C.2.128	1.182684711	5.956908226	4.774223515	3.522%		1792.922365	916.0138443
C.2.129	1.251163118	5.94237442	4.691211302	2.485%		1778.160438	920.6070966
C.2.130	1.216278622	5.952302551	4.736023929	1.986%		1778.566543	917.4185042
C.2.131	1.294184165	5.939716721	4.645532555	1.795%		1746.192248	915.8692316
C.2.132	1.255663816	5.935714722	4.680050906	2.293%		1764.849531	912.8926761
C.2.133	1.245499799	5.939314652	4.693814852	1.902%		1759.86604	914.9021612
C.2.134	1.27506318	5.929564857	4.654501677	1.746%		1743.227151	914.2844455

Point	T sat gas	T evap exit	T superheat	capacity difference	HTF	dQ/dm_dot	dQ/dT_in
C.2.135	1.350372424	5.926527214	4.57615479	1.503%		1749.760647	921.4284749
C.2.136	1.363355244	5.925403976	4.562048732	3.516%		1771.482635	918.3756348
C.2.137	1.381819556	5.909270287	4.527450731	1.337%		1750.293168	919.0207345
C.2.138	1.389437115	5.899106979	4.509669864	3.385%		1776.302372	920.3896429
C.2.139	1.356732686	5.893255615	4.536522929	2.402%		1763.125386	918.9898039
C.2.140	1.305445259	5.882088089	4.57664283	1.918%		1752.493242	917.9860923
C.2.141	1.249680565	5.864441872	4.614761306	1.568%		1742.165406	918.4353759
C.2.142	1.257120784	5.853015709	4.595894925	3.503%		1768.275346	913.0116275
C.2.143	1.373353834	5.849676704	4.47632287	1.718%		1746.294477	917.006938
C.2.144	1.36010862	5.848498535	4.488389916	4.332%		1779.210313	915.8260191
C.2.145	1.425746749	5.84985981	4.42411306	1.477%		1735.938578	917.1849893
C.2.146	1.474320592	5.846945953	4.372625361	1.584%		1736.128212	912.8588583
C.2.147	1.376571122	5.850758934	4.474187812	3.716%		1770.755451	915.8640723
C.2.148	1.303198405	5.833554649	4.530356244	0.850%		1732.212967	920.2536689
C.2.149	1.411100632	5.830996895	4.419896263	0.963%		1724.19049	918.7566104
C.2.150	1.490935254	5.8292593	4.338324046	2.922%		1756.304076	914.671598
C.2.151	1.469377585	5.821736336	4.352358751	2.110%		1743.050424	917.3578362
C.2.152	1.43135381	5.812068558	4.380714748	1.634%		1733.535778	915.5188577
C.2.153	1.413208531	5.800044441	4.38683591	1.346%		1730.91852	920.3410887
C.2.154	1.450674587	5.801914978	4.351240391	2.021%		1743.77962	919.3978496
C.2.155	1.441832299	5.792051506	4.350219207	1.907%		1741.233967	920.0978976
C.2.156	1.492616362	5.776125908	4.283509545	1.889%		1728.466323	919.3551985
C.2.157	1.544503972	5.780819702	4.23631573	0.933%		1733.711814	920.6731996
C.2.158	1.508697027	5.774366379	4.265669352	1.730%		1728.593513	918.7772134
C.2.159	1.47860635	5.757647324	4.279040973	1.820%		1741.335959	919.6251359
C.2.160	1.540148752	5.756722641	4.216573889	3.300%		1762.609782	917.6595348
C.2.161	1.509512018	5.744281196	4.234769179	1.765%		1730.654085	916.9501325
C.2.162	1.502050751	5.732255745	4.230204993	2.076%		1726.351252	911.6107762
C.2.163	1.524451772	5.730982018	4.206530246	2.910%		1757.907256	917.0769837
C.2.164	1.623071673	5.721912766	4.098841093	1.549%		1730.6502	918.8613871
C.2.165	1.474742488	5.710384941	4.235642453	2.542%		1747.503817	918.8443721
C.2.166	1.565173614	5.700317573	4.13514396	1.815%		1736.315188	916.1155758
C.2.167	1.566380055	5.693666077	4.127286022	2.048%		1735.574347	917.5649628
C.2.168	1.521248977	5.688130951	4.166881974	1.588%		1734.951354	920.0236702
C.2.169	1.558566656	5.684619713	4.126053057	2.626%		1741.539874	916.2977043
C.2.170	1.526318065	5.673364639	4.147046574	-0.082%		1699.319816	915.3505548
C.2.171	1.605424692	5.672101784	4.066677092	2.018%		1746.998952	918.7315736
C.2.172	1.630219014	5.655490875	4.025271862	0.501%		1711.946447	917.8370175
C.2.173	1.560874087	5.64679985	4.085925763	1.608%		1717.455985	917.6662177
C.2.174	1.648113899	5.654524231	4.006410332	1.883%		1725.456054	917.0121701
C.2.175	1.677419045	5.647984314	3.970565269	4.174%		1752.029764	918.3699974
C.2.176	1.597751425	5.631569672	4.033818247	2.109%		1727.683847	915.7320546
C.2.177	1.599688698	5.631651687	4.031962989	2.036%		1736.675689	918.5293736
C.2.178	1.572829443	5.632850456	4.060021013	3.268%		1745.780009	914.8468265
C.2.179	1.614748757	5.620158768	4.005410011	2.243%		1732.737988	919.0197886
C.2.180	1.663173945	5.61397419	3.950800244	2.992%		1749.337957	919.7318941
C.2.181	1.606919058	5.612416077	4.005497019	2.461%		1722.115595	912.5834958
C.2.182	1.555707221	5.607435036	4.051727815	-0.143%		1702.973399	914.2720197
C.2.183	1.555498188	5.585976601	4.030478412	1.746%		1716.799109	916.8386462
C.2.184	1.656247739	5.580195427	3.923947688	3.326%		1737.23767	912.4895003
C.2.185	1.697222469	5.570820999	3.873598531	0.084%		1689.771388	914.8313074
C.2.186	1.646518574	5.551579285	3.905060711	2.167%		1725.266726	914.291697
C.2.187	1.612077855	5.544918823	3.932840969	3.399%		1740.278152	916.2236136
C.2.188	1.651357117	5.528545189	3.877188072	2.661%		1732.101081	917.6034605
C.2.189	1.648767015	5.498135185	3.84936817	1.661%		1718.549458	919.7625024
C.2.190	1.738226403	5.499145508	3.760919105	2.350%		1730.296579	917.2328021
C.2.191	1.731000012	5.481330299	3.750330287	0.934%		1705.292293	916.8663255
C.2.192	1.578205284	5.460266686	3.882061402	2.910%		1739.004451	915.2505895
C.2.193	1.658156551	5.44445858	3.786302029	2.549%		1733.799732	918.6442003
C.2.194	1.780842714	5.415305901	3.634463187	2.855%		1740.083195	919.2490818
C.2.195	1.694846912	5.27582798	3.580981068	3.820%		1752.69796	919.0908613
C.2.196	1.725180598	5.367544365	3.642363767	2.525%		1729.31718	917.3938994
C.2.197	1.679798643	5.39589901	3.716100367	1.943%		1719.675307	920.2751065
C.2.198	1.731598807	5.382120132	3.650521325	3.385%		1738.974485	917.3308436
C.2.199	1.755383736	5.33229351	3.576909774	3.444%		1752.650322	918.0488348
C.2.200	1.656272746	5.185782814	3.529510067	2.151%		1725.70097	913.9898372
C.2.201	1.756738317	5.267328071	3.510589754	4.343%		1762.738998	917.4086621

Point	T sat gas	T evap exit	T superheat	capacity difference	HTF	dQ/dm_dot	dQ/dT_in
C.2.202	1.71338334	4.867460441	3.154077101	3.842%		1749.730149	916.5418311
C.2.203	1.752386284	4.814425659	3.062039375	1.570%		1712.488389	919.5098393
C.2.204	1.704167765	4.77431221	3.070144445	2.415%		1727.463696	913.8356992
C.2.205							
C.2.206	2.077788401	3.466950321	1.38916192	1.870%		809.021252	448.0179427
C.2.207	2.211133856	2.706407165	0.495273309	1.028%		804.1255052	448.6116585
C.2.208	2.219489752	2.625213146	0.405723394	1.185%		810.4067045	449.5495841
C.2.209	2.694913396	3.004199505	0.309286108	-4.663%		753.8812724	449.6032929
C.2.210	3.059619043	3.349480724	0.289861682	-2.557%		763.0081532	450.3942647
C.2.211	2.976960358	3.638233375	0.661273018	0.889%		797.4127715	450.6203033
C.2.212	2.853526104	3.611653995	0.758127891	2.766%		807.1189351	450.770491
C.2.213	2.832467647	3.322354794	0.489887146	2.844%		810.2903469	450.6078635
C.2.214	2.70833552	3.217575359	0.509239839	1.693%		805.9946272	450.3886437
C.2.215	2.679530561	4.724436569	2.044906009	2.186%		798.0059152	449.6747709
C.2.216	2.677047307	3.100486851	0.423439544	2.310%		801.0032202	449.8761726
C.2.217	2.697115356	3.537559605	0.840444249	1.528%		794.1605641	449.6230551
C.2.218	2.844346511	3.148873425	0.304526914	0.619%		791.514686	450.1793698
C.2.219	2.771609665	3.185149479	0.413539814	1.040%		798.7289666	450.6742129
C.2.220	2.759602399	3.196626282	0.437023883	1.919%		806.1330651	450.0267898
C.2.221	2.732310526	3.184238816	0.451928289	1.818%		803.4697353	449.8714146
C.2.222	2.721224966	3.275684738	0.554459773	2.115%		800.4235626	449.9402781
C.2.223	2.743720285	3.135070705	0.39135042	2.503%		805.7844787	449.5685942
C.2.224	2.788970809	3.182599354	0.393628545	3.081%		809.136046	450.1836894
C.2.225	2.785583072	3.202809525	0.417226453	2.170%		801.135185	450.4667676
C.2.226	2.838646157	3.250978279	0.412332122	3.747%		814.0543854	449.9426409
C.2.227	2.823483284	3.17993927	0.356455986	1.669%		806.4295008	451.1034117
C.2.228	2.776918863	3.204388332	0.42746947	2.240%		806.4850202	450.4001038
C.2.229	2.82070785	3.208852196	0.388144345	2.593%		808.7474063	450.7273371

Point	dQ/dT_out	U_Q	U_Q (%)	refrigerant	dh_vap/dT	dh_vap/dP	U_h_vap	dh_liq/dT
C.2.1	-914.8738769	86.69953528	5.208%		0.710051133	-0.026502549	0.047606553	1.481352601
C.2.2	-910.4862181	86.28377096	5.216%		0.70899654	-0.026475537	0.047535877	1.481596023
C.2.3	-916.5322397	86.85697891	5.265%		0.70820694	-0.026454907	0.047482959	1.481671727
C.2.4	-913.8358412	86.60122931	5.221%		0.708146861	-0.026453636	0.047478933	1.481717905
C.2.5	-916.096286	86.81564171	5.260%		0.707966093	-0.026475854	0.047466886	1.481782881
C.2.6	-915.2731069	86.73749934	5.234%		0.707154626	-0.026445331	0.047412479	1.481712941
C.2.7	-915.724612	86.78064796	5.305%		0.706745374	-0.026440458	0.047385066	1.48166392
C.2.8	-914.5234417	86.66699088	5.339%		0.706182032	-0.026433166	0.04734733	1.481540422
C.2.9	-906.3320482	85.89017722	5.233%		0.705555765	-0.02641727	0.04730536	1.481486514
C.2.10	-916.0386814	86.81016869	5.257%		0.704864643	-0.026405104	0.047259057	1.481482298
C.2.11	-916.7405812	86.87654492	5.230%		0.70482758	-0.026420557	0.047256614	1.481519533
C.2.12	-916.6411856	86.86684749	5.175%		0.70463332	-0.026422009	0.047243611	1.481472028
C.2.13	-912.4538097	86.47038845	5.247%		0.703899252	-0.026400374	0.047194409	1.481423831
C.2.14	-913.9320544	86.61076218	5.303%		0.703588765	-0.026407967	0.04717364	1.481305514
C.2.15	-915.1596811	86.72666628	5.218%		0.703630537	-0.02641288	0.047176449	1.481304577
C.2.16	-915.0201774	86.71328046	5.185%		0.703294933	-0.026414369	0.047153983	1.481295425
C.2.17	-916.4556727	86.84943332	5.208%		0.703160233	-0.02643256	0.04714501	1.481266849
C.2.18	-915.1725288	86.72744696	5.130%		0.702766841	-0.026419768	0.04711864	1.481261179
C.2.19	-916.0271492	86.80856622	5.156%		0.702190684	-0.026406479	0.047080031	1.481200705
C.2.20	-908.500581	86.09501465	5.098%		0.702325906	-0.026433736	0.047089153	1.48116189
C.2.21	-917.701268	86.96721153	5.155%		0.701553397	-0.026403808	0.047037356	1.481230326
C.2.22	-915.5841522	86.76693119	5.225%		0.701473332	-0.026410887	0.047032013	1.48119526
C.2.23	-916.7902733	86.88085479	5.150%		0.70160638	-0.026422776	0.047040951	1.481173653
C.2.24	-917.6462329	86.96177728	5.111%		0.70143042	-0.02641676	0.047029155	1.481220489
C.2.25	-917.1638793	86.91669698	5.237%		0.700890445	-0.026412455	0.046992992	1.481214926
C.2.26	-917.6958084	86.96625014	5.066%		0.700968439	-0.026429917	0.046998258	1.481245827
C.2.27	-912.2628042	86.45186764	5.163%		0.700437374	-0.026401705	0.04696263	1.481232694
C.2.28	-912.1170212	86.4383342	5.220%		0.700055146	-0.026386691	0.046937001	1.481189445
C.2.29	-917.9162684	86.98783394	5.205%		0.700586852	-0.026413116	0.046972667	1.480908791
C.2.30	-917.1187818	86.9120496	5.163%		0.70114494	-0.02641014	0.047010025	1.48061008
C.2.31	-916.6603435	86.86878649	5.199%		0.702057696	-0.026439507	0.04707121	1.480451712
C.2.32	-908.4943613	86.09458923	5.132%		0.702292017	-0.026436523	0.047086891	1.480270912
C.2.33	-913.5074646	86.5698569	5.171%		0.702493956	-0.026426512	0.047100386	1.480212354
C.2.34	-916.4777736	86.85128927	5.160%		0.703090127	-0.026444343	0.047140346	1.479954431
C.2.35	-915.3624902	86.74554556	5.150%		0.702721487	-0.026434826	0.047115641	1.479678604
C.2.36	-916.9525985	86.89613333	5.129%		0.703207217	-0.026457211	0.047148218	1.479273664
C.2.37	-909.4984199	86.18959777	5.103%		0.702916269	-0.026456714	0.047128737	1.479017519
C.2.38	-918.1127492	87.00576736	5.067%		0.703015576	-0.02648376	0.047135454	1.478944089
C.2.39	-913.7705238	86.59449914	5.113%		0.702406298	-0.026462188	0.047094607	1.478833439
C.2.40	-918.3687634	87.03059758	5.181%		0.70206299	-0.02646518	0.047071629	1.478792813
C.2.41	-912.4071462	86.46503975	5.061%		0.701979233	-0.026475031	0.047066047	1.478692929
C.2.42	-916.2088772	86.82559375	5.117%		0.701861797	-0.026459566	0.047058145	1.478651043
C.2.43	-915.6409519	86.77156313	5.075%		0.701626196	-0.026465326	0.047042385	1.478636334
C.2.44	-918.1886363	87.01280677	5.036%		0.701558244	-0.026463879	0.047037832	1.478577036
C.2.45	-911.8256847	86.41015691	5.105%		0.701921008	-0.026477252	0.047062154	1.478567694
C.2.46	-914.7873762	86.69078545	5.098%		0.702036182	-0.02649084	0.047069899	1.47858839
C.2.47	-915.3311035	86.74235903	5.107%		0.702081289	-0.02649933	0.047072941	1.47855629
C.2.48	-908.3544912	86.08115117	5.094%		0.702205137	-0.026497509	0.047081228	1.478595325
C.2.49	-910.049902	86.24230782	5.193%		0.701510111	-0.026478223	0.047034646	1.478625749
C.2.50	-916.441692	86.84758171	5.102%		0.701400552	-0.026466597	0.047027281	1.478496191
C.2.51	-916.5902176	86.86166737	5.104%		0.701204009	-0.026450774	0.047014082	1.47805407
C.2.52	-916.6869081	86.87092638	5.124%		0.701543217	-0.026469442	0.04703684	1.4775682
C.2.53	-915.0226101	86.71329893	5.142%		0.701232463	-0.026455501	0.047015999	1.477268363
C.2.54	-915.0022005	86.7112827	5.126%		0.702217247	-0.026501002	0.047082048	1.477063826
C.2.55	-916.2504179	86.82913921	5.038%		0.701692902	-0.026470791	0.047046865	1.476962744
C.2.56	-915.5738643	86.76487769	5.008%		0.702168069	-0.026497062	0.047078745	1.476964248
C.2.57	-916.8225032	86.88378343	5.125%		0.702493222	-0.026505036	0.047100535	1.476946726
C.2.58	-916.2635541	86.83081998	5.126%		0.702519615	-0.026505844	0.047102304	1.476856895
C.2.59	-914.6589426	86.67845568	5.065%		0.702647373	-0.026510431	0.047110869	1.47687523
C.2.60	-912.143897	86.43995799	5.033%		0.702774348	-0.026505876	0.047119359	1.476846832
C.2.61	-914.7723602	86.68917869	5.060%		0.702313127	-0.026499867	0.047088464	1.476805321
C.2.62	-909.2462324	86.16557375	5.077%		0.702891637	-0.026509448	0.047127221	1.476786968
C.2.63	-914.0577286	86.62143283	5.055%		0.703508717	-0.026541685	0.047168617	1.476806638
C.2.64	-915.4459133	86.75295376	5.049%		0.703073268	-0.026521348	0.047139412	1.476709573
C.2.65	-915.0635177	86.716433	4.991%		0.703472598	-0.026536353	0.047166186	1.476699727
C.2.66	-913.8299563	86.59966145	5.017%		0.703634704	-0.026535461	0.047177037	1.476722048
C.2.67	-914.4107256	86.65500941	5.081%		0.703327075	-0.026525096	0.047156414	1.476772095

Point	dQ/dT_out	U_Q	U_Q (%)	refrigerant	dh_vap/dT	dh_vap/dP	U_h_vap	dh_liq/dT
C.2.68	-914.8249565	86.69395408	5.017%		0.70383677	-0.026541036	0.04719058	1.476800703
C.2.69	-913.0340511	86.52438454	5.047%		0.704031495	-0.026549924	0.04720364	1.476761956
C.2.70	-911.3460704	86.3645536	5.074%		0.704053618	-0.026559147	0.047205144	1.476764801
C.2.71	-912.8450357	86.50568481	4.883%		0.704450752	-0.02656299	0.047231743	1.476703784
C.2.72	-914.2651012	86.6407943	4.996%		0.704010458	-0.026535094	0.047202194	1.476727194
C.2.73	-917.663486	86.96273575	4.973%		0.703996861	-0.026539111	0.047201293	1.47671991
C.2.74	-914.5991579	86.67260388	5.027%		0.704714444	-0.026571112	0.047249418	1.476785196
C.2.75	-915.2266496	86.73267278	5.150%		0.704432699	-0.026547204	0.047230494	1.47678488
C.2.76	-914.5279276	86.66643146	5.145%		0.704853457	-0.026566156	0.047258713	1.476747097
C.2.77	-906.0576525	85.86366349	5.130%		0.704929905	-0.026555166	0.047263803	1.47677532
C.2.78	-915.2861031	86.73803233	5.094%		0.705414914	-0.026587513	0.047296358	1.476741958
C.2.79	-913.5614876	86.57455504	5.086%		0.705240808	-0.026586098	0.047284697	1.476685627
C.2.80	-913.159409	86.53600093	4.993%		0.705403449	-0.026581905	0.047295576	1.476709672
C.2.81								
C.2.82	-909.1882078	86.16088552	5.241%		0.705674778	-0.026606052	0.047313803	1.476779921
C.2.83	-914.2407932	86.63907285	5.115%		0.705323537	-0.026606372	0.047290287	1.476675767
C.2.84	-916.9080852	86.89179522	5.105%		0.704542878	-0.026580878	0.047237956	1.476625546
C.2.85	-917.7570986	86.97184317	5.022%		0.704892049	-0.026605162	0.047261395	1.476538311
C.2.86	-920.7179608	87.25290054	5.117%		0.704141536	-0.02657383	0.047211067	1.476558738
C.2.87	-916.9830009	86.89881293	5.089%		0.704327238	-0.026597925	0.047223561	1.476469447
C.2.88	-915.4815583	86.75619	5.020%		0.704401026	-0.026600199	0.047228507	1.476458824
C.2.89	-918.2751079	87.02131818	5.100%		0.704471219	-0.02661376	0.047233241	1.476456968
C.2.90	-918.5193407	87.0446001	5.128%		0.704162954	-0.026591413	0.047212546	1.476433691
C.2.91	-915.6759076	86.77492831	5.085%		0.704419397	-0.026604019	0.047229747	1.476462542
C.2.92	-915.9994886	86.80574402	5.116%		0.704677349	-0.026622805	0.047247065	1.47638817
C.2.93	-914.2379586	86.63860504	5.074%		0.70459803	-0.026614854	0.047241734	1.476411297
C.2.94	-916.5870623	86.86100701	5.031%		0.704588375	-0.026615801	0.04724109	1.476446255
C.2.95	-920.8949108	87.27002613	5.188%		0.7047987	-0.026622614	0.047255189	1.476456533
C.2.96	-919.9519659	87.18028133	5.111%		0.705237375	-0.026632314	0.047284584	1.476419725
C.2.97	-920.0550915	87.18960509	5.020%		0.705817821	-0.026651558	0.047323495	1.476526906
C.2.98	-921.5708502	87.33398182	5.168%		0.706255616	-0.026660865	0.04735283	1.476363911
C.2.99	-912.4039833	86.46454499	5.021%		0.706535235	-0.026641538	0.047371502	1.47626088
C.2.100	-916.1736117	86.82164303	4.993%		0.707153678	-0.026657328	0.047412948	1.476094985
C.2.101	-921.0994295	87.28851118	5.008%		0.707602311	-0.02666252	0.047442999	1.476155249
C.2.102	-919.1041993	87.09958466	5.039%		0.707847775	-0.026666892	0.047459444	1.476047452
C.2.103	-912.5133434	86.4753402	5.109%		0.708192324	-0.026672819	0.047482527	1.476094651
C.2.104	-919.3094658	87.1191133	5.054%		0.708679525	-0.026693608	0.047515199	1.476129064
C.2.105	-918.4417803	87.0366648	5.009%		0.708506764	-0.026675836	0.047503588	1.476092296
C.2.106	-916.800375	86.88149622	5.087%		0.708729333	-0.026698691	0.047518547	1.475842451
C.2.107	-919.9766814	87.18204618	4.994%		0.708601845	-0.026712209	0.047510045	1.475573631
C.2.108	-918.8663347	87.07677954	4.985%		0.707975305	-0.026693917	0.047468051	1.475363772
C.2.109	-918.593542	87.05120419	5.041%		0.707288832	-0.026685784	0.047422069	1.475164682
C.2.110	-918.7197946	87.06280806	4.967%		0.707258226	-0.026697354	0.047420049	1.475039284
C.2.111	-913.3956238	86.55838421	4.993%		0.707082775	-0.026692318	0.04740829	1.475014212
C.2.112	-915.8457571	86.79088486	5.057%		0.707225399	-0.02670938	0.047417882	1.474901138
C.2.113	-919.2024744	87.10850115	4.957%		0.706599592	-0.026681532	0.047375912	1.4748888
C.2.114	-915.0588162	86.71579817	4.951%		0.707166379	-0.026699678	0.047413906	1.474852211
C.2.115	-919.3130361	87.11942029	5.048%		0.70633843	-0.026667254	0.047358391	1.474814204
C.2.116	-922.1215946	87.38556899	5.047%		0.70643049	-0.026681897	0.047364591	1.474694727
C.2.117	-915.8655357	86.7923153	4.966%		0.707338144	-0.026717058	0.04742545	1.474411103
C.2.118	-918.0503523	86.99970793	5.037%		0.706399101	-0.026681043	0.047362488	1.474123126
C.2.119	-915.537006	86.76132798	4.996%		0.707175365	-0.026718598	0.047414555	1.473942487
C.2.120	-919.8084447	87.1661932	5.012%		0.707050598	-0.026715451	0.047406194	1.473828568
C.2.121	-918.8794674	87.07830038	5.041%		0.70672721	-0.026699654	0.047384502	1.473714997
C.2.122	-917.6914973	86.96543264	4.982%		0.706990465	-0.026704844	0.047402141	1.473641597
C.2.123	-913.4728036	86.56553097	4.958%		0.706913742	-0.026696521	0.047396983	1.473585539
C.2.124	-915.5542584	86.76335481	5.076%		0.706838856	-0.026706668	0.047391995	1.473548472
C.2.125	-917.7390471	86.97024865	5.046%		0.706953167	-0.026709441	0.047399655	1.473561957
C.2.126	-915.0814478	86.71827037	5.019%		0.707208476	-0.026704796	0.047416737	1.473543645
C.2.127	-909.38793	86.17903604	5.084%		0.707551939	-0.026729627	0.047439796	1.473522377
C.2.128	-916.0138443	86.80700428	5.096%		0.707304923	-0.026716714	0.047423225	1.473538927
C.2.129	-920.6070966	87.24208186	5.054%		0.708050417	-0.026742261	0.047473202	1.473516487
C.2.130	-917.4185042	86.93991756	5.055%		0.707596836	-0.026728117	0.047442798	1.473592397
C.2.131	-915.8692316	86.79265315	4.963%		0.708330727	-0.026755487	0.047492003	1.4735537
C.2.132	-912.8926761	86.51083473	5.016%		0.708265902	-0.026746472	0.04748764	1.473588497
C.2.133	-914.9021612	86.70119609	5.002%		0.708113017	-0.026742033	0.047477392	1.473620445
C.2.134	-914.2844455	86.64242999	4.955%		0.708536795	-0.026754632	0.047505797	1.473416324

Point	dQ/dT_out	U_Q	U_Q (%)	refrigerant	dh_vap/dT	dh_vap/dP	U_h_vap	dh_liq/dT
C.2.135	-921.4284749	87.31952658	4.973%		0.708981336	-0.026777128	0.047535617	1.47326878
C.2.136	-918.3756348	87.0305232	5.035%		0.709075633	-0.026781282	0.047541941	1.473179835
C.2.137	-919.0207345	87.0913635	4.975%		0.709634529	-0.026793663	0.047579392	1.473191333
C.2.138	-920.3896429	87.22145003	5.049%		0.709967764	-0.026800337	0.047601719	1.473173134
C.2.139	-918.9898039	87.08861011	5.011%		0.70998364	-0.026793717	0.047602766	1.473195092
C.2.140	-917.9860923	86.99334683	4.981%		0.710067253	-0.026784245	0.04760834	1.4728826
C.2.141	-918.4353759	87.03578209	4.952%		0.710319817	-0.026776422	0.04762523	1.472524015
C.2.142	-913.0116275	86.52215652	5.026%		0.710689219	-0.026783587	0.04764998	1.472333588
C.2.143	-917.006938	86.90047226	4.964%		0.711337651	-0.026817818	0.047693481	1.472293091
C.2.144	-915.8260191	86.78901642	5.057%		0.711309222	-0.026814601	0.047691569	1.472194262
C.2.145	-917.1849893	86.91720441	4.934%		0.711581641	-0.026832564	0.047709854	1.472111194
C.2.146	-912.8588583	86.50724016	4.935%		0.711898812	-0.026847652	0.047731127	1.471851437
C.2.147	-915.8640723	86.79250562	5.033%		0.711321252	-0.026818245	0.047692384	1.471701461
C.2.148	-920.2536689	87.20795765	4.924%		0.711476902	-0.026805204	0.047702772	1.471561674
C.2.149	-918.7566104	87.06598049	4.901%		0.712064518	-0.026836834	0.047742194	1.471474452
C.2.150	-914.671598	86.67930101	4.992%		0.712496695	-0.026860287	0.047771189	1.471491002
C.2.151	-917.3578362	86.93368187	4.955%		0.71261418	-0.026857518	0.047779048	1.47146089
C.2.152	-915.5188577	86.75928183	4.928%		0.712716069	-0.026851035	0.047785853	1.471447425
C.2.153	-920.3410887	87.21622587	4.920%		0.712982208	-0.026851257	0.047803672	1.471352944
C.2.154	-919.3978496	87.12701517	4.957%		0.713106228	-0.026861064	0.047812	1.471383968
C.2.155	-920.0978976	87.19332023	4.950%		0.713353439	-0.026862962	0.047828557	1.47142163
C.2.156	-919.3551985	87.12276466	4.913%		0.714064171	-0.026884556	0.047876196	1.471365054
C.2.157	-920.6731996	87.24773702	4.929%		0.714175372	-0.026897274	0.047883674	1.471388478
C.2.158	-918.7772134	87.06799389	4.914%		0.714192996	-0.026889934	0.047884835	1.471368169
C.2.159	-919.6251359	87.14852133	4.950%		0.714539992	-0.02688884	0.047908065	1.471350479
C.2.160	-917.6595348	86.96254328	5.011%		0.714862684	-0.026906842	0.047929715	1.47130532
C.2.161	-916.9501325	86.89487884	4.920%		0.715081293	-0.026903661	0.047944343	1.471315637
C.2.162	-911.6107762	86.38883639	4.908%		0.715399203	-0.026906924	0.047965637	1.471240472
C.2.163	-917.0769837	86.90727289	4.997%		0.715544358	-0.026913905	0.047975373	1.471256268
C.2.164	-918.8613871	87.07599975	4.920%		0.716287003	-0.026946301	0.048025176	1.471253235
C.2.165	-918.8443721	87.0746182	4.968%		0.715911756	-0.026908933	0.047999958	1.471246748
C.2.166	-916.1155758	86.81586957	4.936%		0.716643478	-0.026939368	0.048049026	1.47121954
C.2.167	-917.5649628	86.95321116	4.934%		0.716845309	-0.026942708	0.048062547	1.471274885
C.2.168	-920.0236702	87.186203	4.932%		0.716790858	-0.026932242	0.048058875	1.471291122
C.2.169	-916.2977043	86.83320108	4.951%		0.717074251	-0.026944534	0.04807788	1.471362483
C.2.170	-915.3505548	86.74287597	4.831%		0.717250565	-0.026940337	0.048089674	1.471190011
C.2.171	-918.7315736	87.06392251	4.967%		0.717669863	-0.026963659	0.048117806	1.471081946
C.2.172	-917.8370175	86.97867388	4.867%		0.718280175	-0.026978305	0.048158705	1.471019145
C.2.173	-917.6662177	86.96256235	4.883%		0.718201058	-0.026962229	0.048153368	1.470959969
C.2.174	-917.0121701	86.90068947	4.906%		0.718395527	-0.026983913	0.048166442	1.47091045
C.2.175	-918.3699974	87.02972634	4.981%		0.718731021	-0.026995348	0.048188933	1.470930236
C.2.176	-915.7320546	86.77940948	4.912%		0.718829228	-0.026979726	0.048195469	1.470896233
C.2.177	-918.5293736	87.04461968	4.937%		0.718836191	-0.026980248	0.048195937	1.47089626
C.2.178	-914.8468265	86.69576633	4.963%		0.718670748	-0.026971961	0.048184839	1.470897623
C.2.179	-919.0197886	87.0910406	4.926%		0.719248787	-0.026989786	0.048223585	1.470947999
C.2.180	-919.7318941	87.15875122	4.974%		0.719666834	-0.027006596	0.048251617	1.47093335
C.2.181	-912.5834958	86.48096175	4.896%		0.719439671	-0.02699102	0.048236369	1.470833774
C.2.182	-914.2720197	86.64071888	4.842%		0.719338861	-0.026978488	0.048229588	1.47058694
C.2.183	-916.8386462	86.88412999	4.881%		0.719972362	-0.02698811	0.048272027	1.470174732
C.2.184	-912.4895003	86.47225873	4.939%		0.720632499	-0.027019869	0.048316304	1.470001856
C.2.185	-914.8313074	86.69354459	4.804%		0.721109786	-0.027036018	0.048348301	1.469885639
C.2.186	-914.291697	86.64288263	4.905%		0.721432636	-0.027030001	0.048369901	1.469824489
C.2.187	-916.2236136	86.82616443	4.948%		0.721462405	-0.027023026	0.048371877	1.469771798
C.2.188	-917.6034605	86.95681458	4.925%		0.722138999	-0.027041842	0.048417224	1.469712567
C.2.189	-919.7625024	87.16123294	4.886%		0.723028637	-0.027054877	0.048476821	1.469647467
C.2.190	-917.2328021	86.92166514	4.920%		0.723436155	-0.02708051	0.04850417	1.469639401
C.2.191	-916.8663255	86.88659923	4.849%		0.723929974	-0.027086498	0.048537247	1.469626795
C.2.192	-915.2505895	86.73393899	4.945%		0.723809465	-0.027051542	0.048529092	1.469572022
C.2.193	-918.6442003	87.05546424	4.930%		0.724669451	-0.027081983	0.048586747	1.469536318
C.2.194	-919.2490818	87.11287196	4.948%		0.72613948	-0.02713119	0.048685293	1.46952
C.2.195	-919.0908613	87.09805183	4.984%		0.729880275	-0.027169593	0.048935848	1.469544646
C.2.196	-917.3938994	86.93691863	4.917%		0.72728932	-0.027136625	0.048762292	1.469541269
C.2.197	-920.2751065	87.20982588	4.890%		0.726221018	-0.027110396	0.0486907	1.469526272
C.2.198	-917.3308436	86.93107517	4.945%		0.726886161	-0.02713186	0.048735287	1.469546355
C.2.199	-918.0488348	86.99930346	4.984%		0.728490507	-0.027161607	0.048842778	1.46951915
C.2.200	-913.9898372	86.61428463	4.907%		0.732388509	-0.02719943	0.049103858	1.469493979
C.2.201	-917.4086621	86.93877612	5.012%		0.730440212	-0.027191731	0.048973393	1.469538812

Point	dQ/dT_out	U_Q	U_Q (%)	refrigerant	dh_vap/dT	dh_vap/dP	U_h_vap	dh_liq/dT
C.2.202	-916.5418311	86.85645123	4.975%		0.742279983	-0.027362958	0.049766539	1.469459588
C.2.203	-919.5098393	87.13720952	4.869%		0.744086945	-0.027399246	0.049887612	1.469506429
C.2.204	-913.8356992	86.5997018	4.912%		0.745065957	-0.027403371	0.049953172	1.469531046
C.2.205								
C.2.206	-448.0179427	42.45198507	2.297%		0.78778681	-0.028141617	0.052815383	1.459119277
C.2.207	-448.6116585	42.50822749	2.283%		0.813159948	-0.028561202	0.054515313	1.459078153
C.2.208	-449.5495841	42.59712006	2.301%		0.815878587	-0.028604712	0.054697452	1.45903315
C.2.209	-449.6032929	42.60203859	2.139%		0.806109075	-0.028575153	0.054043231	1.459607997
C.2.210	-450.3942647	42.67701263	2.165%		0.796965789	-0.028526126	0.053430902	1.459808292
C.2.211	-450.6203033	42.69853324	2.262%		0.787229967	-0.028353878	0.052778608	1.460001483
C.2.212	-450.770491	42.71279443	2.289%		0.787391334	-0.028325607	0.052789344	1.459973954
C.2.213	-450.6078635	42.69739485	2.299%		0.796561103	-0.02846242	0.053403653	1.459836375
C.2.214	-450.3886437	42.67660961	2.287%		0.799252648	-0.028472808	0.053583896	1.459486279
C.2.215	-449.6747709	42.60894239	2.264%		0.751615342	-0.027728048	0.050392484	1.459131769
C.2.216	-449.8761726	42.62803533	2.273%		0.802874637	-0.02852079	0.053826531	1.459016071
C.2.217	-449.6230551	42.6040301	2.253%		0.788893925	-0.028310043	0.052889916	1.458548652
C.2.218	-450.1793698	42.65673562	2.246%		0.802243069	-0.028553346	0.05378432	1.458327245
C.2.219	-450.6742129	42.70364647	2.266%		0.800657047	-0.028510425	0.053678021	1.458027966
C.2.220	-450.0267898	42.64232269	2.287%		0.800217807	-0.028500611	0.053648587	1.457909925
C.2.221	-449.8714146	42.62759179	2.280%		0.800466303	-0.028497571	0.053665219	1.457879122
C.2.222	-449.9402781	42.63410768	2.271%		0.797445865	-0.028448154	0.05346286	1.457909609
C.2.223	-449.5685942	42.59890534	2.286%		0.802125072	-0.028526054	0.053776354	1.457851831
C.2.224	-450.1836894	42.65719906	2.296%		0.800837171	-0.028517592	0.053690099	1.45784669
C.2.225	-450.4667676	42.68399735	2.273%		0.800163196	-0.02850632	0.053644944	1.457911462
C.2.226	-449.9426409	42.63437367	2.310%		0.798901807	-0.028500205	0.05356047	1.457880516
C.2.227	-451.1034117	42.74433895	2.288%		0.801117459	-0.02853065	0.053708898	1.457849762
C.2.228	-450.4001038	42.67769711	2.288%		0.800063446	-0.028502593	0.053638257	1.457845462
C.2.229	-450.7273371	42.70871113	2.295%		0.80016472	-0.028515213	0.053645068	1.45790227

Point	U_h_liq	drho/dT	drho/dP	U_rho	rho	U_Q	U (%)
C.2.1	0.099250624	-0.068397119	0.052447134	-0.004582607	13.93027478	53.49380889	3.230%
C.2.2	0.099266934	-0.068166522	0.052415136	-0.004567157	13.89680353	53.36260176	3.220%
C.2.3	0.099272006	-0.067986752	0.052390461	-0.004555112	13.8705831	53.26415957	3.234%
C.2.4	0.0992751	-0.0679782	0.052389097	-0.004554539	13.86939528	53.25813504	3.225%
C.2.5	0.099279453	-0.068401391	0.052429937	-0.004582893	13.93656359	53.51137192	3.216%
C.2.6	0.099274767	-0.068055759	0.052388484	-0.004559736	13.88429442	53.31960754	3.234%
C.2.7	0.099271483	-0.068062838	0.052385733	-0.00456021	13.88651198	53.33142329	3.182%
C.2.8	0.099263208	-0.068062567	0.052380941	-0.004560192	13.88798595	53.34435393	3.233%
C.2.9	0.099259596	-0.067927769	0.052362151	-0.004551161	13.86840034	53.27484644	3.223%
C.2.10	0.099259314	-0.067871768	0.052350699	-0.004547408	13.86141759	53.25202876	3.214%
C.2.11	0.099261809	-0.068147126	0.052377932	-0.004565857	13.90497597	53.41622993	3.195%
C.2.12	0.099258626	-0.068215699	0.052383141	-0.004570452	13.91631374	53.46198055	3.243%
C.2.13	0.099255397	-0.06800561	0.052355913	-0.004556376	13.88515412	53.34874993	3.232%
C.2.14	0.099247469	-0.068206556	0.052373367	-0.004569839	13.9176982	53.47807933	3.213%
C.2.15	0.099247407	-0.068282303	0.052381289	-0.004574914	13.92952756	53.52270168	3.252%
C.2.16	0.099246793	-0.068383441	0.05238854	-0.004581691	13.94637618	53.58851734	3.242%
C.2.17	0.099244879	-0.068729399	0.052421918	-0.00460487	14.00119933	53.79862815	3.223%
C.2.18	0.099244499	-0.068595888	0.052405253	-0.004595924	13.9812662	53.72506206	3.218%
C.2.19	0.099240447	-0.068494851	0.052390271	-0.004589155	13.96692719	53.6756199	3.227%
C.2.20	0.099237847	-0.068938145	0.052435618	-0.004618856	14.03628982	53.93979898	3.204%
C.2.21	0.099242432	-0.068592081	0.052394543	-0.004595669	13.98397345	53.74230886	3.217%
C.2.22	0.099240082	-0.068733285	0.052407937	-0.00460513	14.00641368	53.82880996	3.203%
C.2.23	0.099238635	-0.068910119	0.05242669	-0.004616978	14.03385456	53.93314617	3.251%
C.2.24	0.099241773	-0.068845208	0.052418723	-0.004612629	14.0241327	53.8952907	3.222%
C.2.25	0.0992414	-0.068892435	0.052418819	-0.004615793	14.0330354	53.93194872	3.194%
C.2.26	0.09924347	-0.06917913	0.052448022	-0.004635002	14.07785371	54.10060822	3.232%
C.2.27	0.09924259	-0.068807736	0.052406517	-0.004610118	14.020958	53.88810031	3.232%
C.2.28	0.099239693	-0.06863268	0.052385818	-0.00459839	13.99445646	53.79104205	3.236%
C.2.29	0.099220889	-0.068972737	0.052424222	-0.004621173	14.0464883	53.9966769	3.202%
C.2.30	0.099200875	-0.068794519	0.052411238	-0.004609233	14.01694301	53.89251882	3.192%
C.2.31	0.099190265	-0.06909927	0.052449377	-0.004629651	14.06232868	54.06669175	3.207%
C.2.32	0.099178151	-0.068994303	0.052440923	-0.004622618	14.04520425	54.00756384	3.220%
C.2.33	0.099174228	-0.068774574	0.052420749	-0.004607896	14.01012067	53.87581773	3.187%
C.2.34	0.099156947	-0.068949943	0.052443308	-0.004619646	14.03605383	53.98101689	3.210%
C.2.35	0.099138466	-0.068867731	0.052431973	-0.004614138	14.02414394	53.94809627	3.214%
C.2.36	0.099111335	-0.069147254	0.052463963	-0.004632866	14.0667099	54.12293852	3.209%
C.2.37	0.099094174	-0.069204439	0.052467175	-0.004636697	14.07647873	54.1707357	3.204%
C.2.38	0.099089254	-0.06965304	0.052512656	-0.004666754	14.14649205	54.43911652	3.171%
C.2.39	0.09908184	-0.069415379	0.052483813	-0.00465083	14.11095194	54.31147596	3.194%
C.2.40	0.099079118	-0.069545541	0.052493822	-0.004659551	14.13228782	54.39589467	3.189%
C.2.41	0.099072426	-0.069736516	0.052512085	-0.004672347	14.16241213	54.51470457	3.184%
C.2.42	0.09906962	-0.06949334	0.052486911	-0.004656054	14.12466571	54.37292885	3.217%
C.2.43	0.099068634	-0.069647472	0.052500215	-0.004666381	14.149452	54.46880306	3.189%
C.2.44	0.099064661	-0.069637683	0.05249866	-0.004665725	14.14810717	54.46669473	3.212%
C.2.45	0.099064035	-0.069788575	0.052516758	-0.004675834	14.17071656	54.55090691	3.198%
C.2.46	0.099065422	-0.069999705	0.05253871	-0.00468998	14.2034017	54.67389755	3.217%
C.2.47	0.099063271	-0.070137822	0.052552805	-0.004699234	14.22484662	54.75629437	3.212%
C.2.48	0.099065887	-0.070077684	0.052547899	-0.004695205	14.21511357	54.71763421	3.194%
C.2.49	0.099067925	-0.069899248	0.052524227	-0.00468325	14.18915906	54.62204907	3.203%
C.2.50	0.099059245	-0.069721079	0.052505595	-0.004671312	14.16159542	54.52257903	3.170%
C.2.51	0.099029623	-0.069489518	0.052480903	-0.004655798	14.12587957	54.40466872	3.201%
C.2.52	0.098997069	-0.069738266	0.052508525	-0.004672464	14.16389043	54.56615795	3.200%
C.2.53	0.09897698	-0.069565563	0.052488705	-0.004660893	14.13771345	54.47909581	3.185%
C.2.54	0.098963276	-0.07013599	0.052553789	-0.004699111	14.22418358	54.81130369	3.186%
C.2.55	0.098956504	-0.069727718	0.052508759	-0.004671757	14.16182649	54.5806945	3.199%
C.2.56	0.098956605	-0.070078345	0.052547647	-0.004695249	14.2153195	54.78201021	3.171%
C.2.57	0.098955431	-0.070143469	0.052556898	-0.004699612	14.22458575	54.81613324	3.185%
C.2.58	0.098949412	-0.07015155	0.052557926	-0.004700154	14.22577394	54.82355348	3.199%
C.2.59	0.09895064	-0.070202556	0.052564084	-0.004703571	14.23337993	54.85138202	3.195%
C.2.60	0.098948738	-0.070093951	0.052554394	-0.004696295	14.21607636	54.78609211	3.181%
C.2.61	0.098945956	-0.070094253	0.052550469	-0.004696315	14.21740139	54.7949627	3.209%
C.2.62	0.098944727	-0.070129598	0.052558937	-0.004698683	14.22131639	54.80782677	3.204%
C.2.63	0.098946045	-0.070552037	0.05260614	-0.004726986	14.2854657	55.04845301	3.190%
C.2.64	0.098939541	-0.070296063	0.052577015	-0.004709836	14.24678503	54.9065241	3.176%
C.2.65	0.098938882	-0.070467067	0.052597404	-0.004721293	14.27233107	55.00210401	3.190%
C.2.66	0.098940377	-0.070414417	0.052593572	-0.004717766	14.26367709	54.96731519	3.190%
C.2.67	0.09894373	-0.070303575	0.052579937	-0.00471034	14.24725222	54.90475808	3.190%

Point	U_h_liq	drho/dT	drho/dP	U_rho	rho	U_Q	U (%)
C.2.68	0.098945647	-0.070465651	0.052600388	-0.004721199	14.27109877	54.99234807	3.195%
C.2.69	0.098943051	-0.070576479	0.05261305	-0.004728624	14.28781771	55.05570108	3.186%
C.2.70	0.098943242	-0.070732676	0.052628726	-0.004739089	14.31206416	55.14821256	3.167%
C.2.71	0.098939154	-0.070708948	0.052629783	-0.0047375	14.30726748	55.13022685	3.205%
C.2.72	0.098940722	-0.070322171	0.052587641	-0.004711585	14.24825635	54.9068455	3.209%
C.2.73	0.098940234	-0.070395436	0.052594795	-0.004716494	14.25971388	54.95104631	3.181%
C.2.74	0.098944608	-0.070790584	0.05264014	-0.004742969	14.31923016	55.17130082	3.181%
C.2.75	0.098944587	-0.070437256	0.052602681	-0.004719296	14.26502079	54.96672327	3.209%
C.2.76	0.098942055	-0.070672161	0.052629592	-0.004735035	14.30042409	55.10032768	3.181%
C.2.77	0.098943946	-0.070462779	0.052609476	-0.004721006	14.26761737	54.974125	3.195%
C.2.78	0.098941711	-0.070916912	0.052658675	-0.004751433	14.3369144	55.23703813	3.200%
C.2.79	0.098937937	-0.070932043	0.05265868	-0.004752447	14.33975029	55.25035876	3.195%
C.2.80	0.098939548	-0.070821523	0.052649121	-0.004745042	14.32212236	55.18170923	3.182%
C.2.81							
C.2.82	0.098944255	-0.071181515	0.052687123	-0.004769162	14.37727007	55.38864542	3.220%
C.2.83	0.098937276	-0.071267734	0.052692641	-0.004774938	14.3916252	55.44888632	3.248%
C.2.84	0.098933912	-0.071000722	0.052659488	-0.004757048	14.35236553	55.30500323	3.243%
C.2.85	0.098928067	-0.071345713	0.052696646	-0.004780163	14.4049241	55.50698167	3.214%
C.2.86	0.098929435	-0.070969452	0.052652941	-0.004754953	14.3486285	55.29552474	3.223%
C.2.87	0.098923453	-0.071348852	0.052692094	-0.004780373	14.40699324	55.52002485	3.219%
C.2.88	0.098922741	-0.071371725	0.052694993	-0.004781906	14.41033264	55.53273722	3.219%
C.2.89	0.098922617	-0.071593362	0.052717515	-0.004796755	14.44447459	55.66270062	3.238%
C.2.90	0.098921057	-0.071272521	0.052683128	-0.004775259	14.39561629	55.47871836	3.228%
C.2.91	0.09892299	-0.071434455	0.052701356	-0.004786108	14.42000417	55.56937351	3.219%
C.2.92	0.098918007	-0.071704496	0.052730278	-0.004804201	14.46109801	55.7270924	3.233%
C.2.93	0.098919557	-0.071583315	0.052717615	-0.004796082	14.44256262	55.65618708	3.214%
C.2.94	0.098921899	-0.071602148	0.052719394	-0.004797344	14.44550586	55.66615474	3.219%
C.2.95	0.098922588	-0.071673158	0.052728227	-0.004802102	14.45590695	55.70397912	3.209%
C.2.96	0.098920122	-0.071742115	0.052738824	-0.004806722	14.46534363	55.73919767	3.214%
C.2.97	0.098927303	-0.071945732	0.052763951	-0.004820364	14.4951909	55.8461613	3.219%
C.2.98	0.098916382	-0.072007908	0.05277387	-0.00482453	14.50356329	55.88225632	3.200%
C.2.99	0.098909479	-0.071604849	0.052736428	-0.004797525	14.4404605	55.6444814	3.195%
C.2.100	0.098898364	-0.071739012	0.052755023	-0.004806514	14.45948253	55.71981324	3.224%
C.2.101	0.098902402	-0.071726729	0.052757667	-0.004805691	14.45632536	55.70299728	3.219%
C.2.102	0.098895179	-0.071746796	0.052761764	-0.004807035	14.4587404	55.7153767	3.214%
C.2.103	0.098898342	-0.0717713	0.052767152	-0.004808677	14.46156341	55.72235327	3.224%
C.2.104	0.098900647	-0.072022911	0.052796234	-0.004825535	14.49906459	55.86224844	3.201%
C.2.105	0.098898184	-0.071751835	0.052767929	-0.004807373	14.45767374	55.70705411	3.219%
C.2.106	0.098881444	-0.072100385	0.052804323	-0.004830726	14.51088152	55.91827812	3.195%
C.2.107	0.098863433	-0.072366455	0.052829521	-0.004848552	14.55226743	56.08641003	3.209%
C.2.108	0.098849373	-0.072190509	0.052806737	-0.004836764	14.52690616	56.00123319	3.199%
C.2.109	0.098836034	-0.072206359	0.052802385	-0.004837826	14.53128482	56.02923626	3.198%
C.2.110	0.098827632	-0.072416382	0.05282286	-0.004851898	14.56375184	56.15779305	3.193%
C.2.111	0.098825952	-0.072368584	0.052816627	-0.004848695	14.55688093	56.13409312	3.217%
C.2.112	0.098818376	-0.072635119	0.052844161	-0.004866553	14.59753138	56.29224214	3.188%
C.2.113	0.09881755	-0.072291039	0.052804801	-0.0048435	14.54628981	56.10020849	3.202%
C.2.114	0.098815098	-0.07247842	0.052828191	-0.004856054	14.57356944	56.20323997	3.212%
C.2.115	0.098812552	-0.072100866	0.052783767	-0.004830758	14.517684	55.99663115	3.202%
C.2.116	0.098804547	-0.072336576	0.052807836	-0.004846551	14.55378908	56.13802805	3.197%
C.2.117	0.098785544	-0.072743863	0.052855861	-0.004873839	14.61394493	56.37438163	3.206%
C.2.118	0.098766249	-0.072328849	0.052806802	-0.004846033	14.55268645	56.15704373	3.191%
C.2.119	0.098754147	-0.072808694	0.052860846	-0.004878183	14.62437794	56.43361958	3.215%
C.2.120	0.098746514	-0.072782328	0.052857167	-0.004876416	14.6206769	56.42472541	3.195%
C.2.121	0.098738905	-0.072579741	0.052834393	-0.004862843	14.59041679	56.31512946	3.185%
C.2.122	0.098733987	-0.072609896	0.052839643	-0.004864863	14.59431409	56.33138708	3.176%
C.2.123	0.098730231	-0.072481483	0.052826311	-0.004856259	14.57475564	56.25976335	3.213%
C.2.124	0.098727748	-0.072677086	0.052844959	-0.004869365	14.60508549	56.3769404	3.181%
C.2.125	0.098728651	-0.072699308	0.052848139	-0.004870854	14.60818116	56.38751273	3.195%
C.2.126	0.098727424	-0.072558531	0.052836459	-0.004861422	14.58578868	56.30141256	3.185%
C.2.127	0.098725999	-0.072915129	0.052874596	-0.004885314	14.6396719	56.50586876	3.190%
C.2.128	0.098727108	-0.072745516	0.052855737	-0.00487395	14.61429336	56.40993071	3.195%
C.2.129	0.098725605	-0.073021437	0.052889386	-0.004892436	14.65458915	56.56026014	3.195%
C.2.130	0.098730691	-0.072878169	0.052871341	-0.004882837	14.63386369	56.48048511	3.219%
C.2.131	0.098728098	-0.073188816	0.052908304	-0.004903651	14.67948775	56.65229662	3.181%
C.2.132	0.098730429	-0.073045406	0.052893612	-0.004894042	14.65765812	56.5684515	3.205%
C.2.133	0.09873257	-0.073002895	0.0528881	-0.004891194	14.65156349	56.54429959	3.200%
C.2.134	0.098718894	-0.07312589	0.052903888	-0.004899435	14.66924493	56.61744874	3.181%

Point	U_h_liq	drho/dT	drho/dP	U_rho	rho	U_Q	U (%)
C.2.135	0.098709008	-0.073418021	0.052936513	-0.004919007	14.71278332	56.78702342	3.186%
C.2.136	0.098703049	-0.073469132	0.052942362	-0.004922432	14.72034596	56.81876887	3.172%
C.2.137	0.098703819	-0.073556782	0.052955833	-0.004928304	14.7321774	56.86116078	3.205%
C.2.138	0.0987026	-0.073596574	0.052962636	-0.00493097	14.7373196	56.88059627	3.181%
C.2.139	0.098704071	-0.073476519	0.052950951	-0.004922927	14.71889146	56.80897034	3.190%
C.2.140	0.098683134	-0.073290728	0.05293337	-0.004910479	14.69018306	56.7109982	3.185%
C.2.141	0.098659109	-0.073094917	0.052916247	-0.004897359	14.65943193	56.60697529	3.170%
C.2.142	0.09864635	-0.073135023	0.052923393	-0.004900047	14.66453899	56.63166339	3.175%
C.2.143	0.098643637	-0.073585205	0.052973372	-0.004930209	14.73167876	56.88718031	3.194%
C.2.144	0.098637016	-0.07353534	0.052968213	-0.004926868	14.72412728	56.86265644	3.170%
C.2.145	0.09863145	-0.073787435	0.052995401	-0.004943758	14.76191688	57.00884694	3.189%
C.2.146	0.098614046	-0.073978678	0.053016973	-0.004956571	14.79023347	57.1250734	3.207%
C.2.147	0.098603998	-0.073596507	0.052974344	-0.004930966	14.73345502	56.91764976	3.178%
C.2.148	0.098594632	-0.073331615	0.052949582	-0.004913218	14.69244858	56.76608754	3.178%
C.2.149	0.098588788	-0.073750175	0.052995909	-0.004941262	14.75484505	57.00472788	3.178%
C.2.150	0.098589897	-0.074061472	0.053030298	-0.004962119	14.80116741	57.17856514	3.197%
C.2.151	0.09858788	-0.073985513	0.053023839	-0.004957029	14.78923619	57.13368007	3.188%
C.2.152	0.098586977	-0.07384804	0.053011184	-0.004947819	14.76794808	57.05207257	3.188%
C.2.153	0.098580647	-0.073790164	0.053007784	-0.004943941	14.75834639	57.01724005	3.173%
C.2.154	0.098582726	-0.073933394	0.053022964	-0.004953537	14.77987516	57.09824424	3.183%
C.2.155	0.098585249	-0.073909275	0.053022727	-0.004951921	14.77548775	57.07857387	3.178%
C.2.156	0.098581459	-0.07412296	0.053049916	-0.004966238	14.80607861	57.19428216	3.165%
C.2.157	0.098583028	-0.074320262	0.0530703	-0.004979458	14.8358421	57.30621988	3.207%
C.2.158	0.098581667	-0.074187372	0.053057372	-0.004970554	14.81553493	57.22934399	3.174%
C.2.159	0.098580482	-0.074087588	0.053050547	-0.004963868	14.79932725	57.16575318	3.188%
C.2.160	0.098577456	-0.074328289	0.053077037	-0.004979995	14.83510316	57.30270628	3.193%
C.2.161	0.098578148	-0.074221726	0.053068437	-0.004972856	14.81824023	57.23704136	3.183%
C.2.162	0.098573112	-0.074205122	0.05306955	-0.004971743	14.81480366	57.22484172	3.183%
C.2.163	0.09857417	-0.074293767	0.053079534	-0.004977682	14.82789962	57.27371914	3.198%
C.2.164	0.098573967	-0.074689103	0.053124868	-0.00500417	14.88594916	57.49089181	3.198%
C.2.165	0.098573532	-0.074121461	0.053065736	-0.004966138	14.80059024	57.1682849	3.179%
C.2.166	0.098571709	-0.074484743	0.053107839	-0.004990478	14.85384669	57.36868378	3.203%
C.2.167	0.098575417	-0.074496392	0.05311073	-0.004991258	14.85504395	57.36989294	3.189%
C.2.168	0.098576505	-0.074325765	0.053093456	-0.004979826	14.82922403	57.27188274	3.189%
C.2.169	0.098581286	-0.074475242	0.053110626	-0.004989841	14.85117303	57.35113317	3.184%
C.2.170	0.098569731	-0.074360899	0.053100887	-0.00498218	14.83326607	57.2880763	3.193%
C.2.171	0.09856249	-0.074671899	0.053135135	-0.005003017	14.87938454	57.46689837	3.212%
C.2.172	0.098558283	-0.074786658	0.053151707	-0.005010706	14.89508104	57.52577331	3.203%
C.2.173	0.098554318	-0.074523676	0.053125128	-0.004993086	14.8553328	57.37686904	3.170%
C.2.174	0.098551	-0.074858058	0.053159731	-0.00501549	14.90559536	57.56925295	3.189%
C.2.175	0.098552326	-0.074980363	0.053174666	-0.005023684	14.92320144	57.63435225	3.161%
C.2.176	0.098550048	-0.074684143	0.053146357	-0.005003838	14.87794029	57.46237582	3.184%
C.2.177	0.098550049	-0.074691662	0.053147157	-0.005004341	14.87906302	57.4664158	3.193%
C.2.178	0.098550141	-0.074585057	0.053135229	-0.004997199	14.86333023	57.40717152	3.179%
C.2.179	0.098553516	-0.074762837	0.053157729	-0.00500911	14.88870057	57.49950619	3.179%
C.2.180	0.098552534	-0.074959924	0.053180744	-0.005022315	14.91742756	57.60816225	3.189%
C.2.181	0.098545863	-0.074740174	0.053157145	-0.005007592	14.88471437	57.48791981	3.175%
C.2.182	0.098529325	-0.074544485	0.053136997	-0.00499448	14.85526069	57.38569838	3.212%
C.2.183	0.098501707	-0.074566049	0.053144585	-0.004995925	14.8567389	57.40381375	3.169%
C.2.184	0.098490124	-0.074968097	0.053189888	-0.005022863	14.9159134	57.63440976	3.183%
C.2.185	0.098482338	-0.075139725	0.053210906	-0.005034362	14.94057405	57.73090275	3.197%
C.2.186	0.098478241	-0.074959799	0.053195975	-0.005022307	14.91237533	57.62447524	3.192%
C.2.187	0.09847471	-0.074831142	0.053183556	-0.005013687	14.89277056	57.55173777	3.168%
C.2.188	0.098470742	-0.075003086	0.053206331	-0.005025207	14.9169291	57.6428035	3.178%
C.2.189	0.09846638	-0.075024842	0.053216142	-0.005026664	14.91769682	57.64348517	3.178%
C.2.190	0.09846584	-0.0753778	0.053254422	-0.005050313	14.96998695	57.84122459	3.197%
C.2.191	0.098464995	-0.075367975	0.053257714	-0.005049654	14.96709272	57.82867731	3.197%
C.2.192	0.098461325	-0.074786609	0.053199374	-0.005010703	14.87935128	57.49642464	3.182%
C.2.193	0.098458933	-0.075118431	0.053239497	-0.005032935	14.9272152	57.67573179	3.183%
C.2.194	0.09845784	-0.075636159	0.05330317	-0.005067623	15.00133412	57.95224217	3.197%
C.2.195	0.098459491	-0.075442034	0.053316196	-0.005054616	14.96139288	57.77930699	3.180%
C.2.196	0.098459265	-0.07546536	0.053296239	-0.005056179	14.97226134	57.83401111	3.188%
C.2.197	0.09845826	-0.075255293	0.05326634	-0.005042105	14.94352941	57.73073267	3.174%
C.2.198	0.098459606	-0.075475418	0.053293763	-0.005056853	14.9749265	57.84672294	3.179%
C.2.199	0.098457783	-0.07562296	0.053322105	-0.005066738	14.99265393	57.90719079	3.203%
C.2.200	0.098456097	-0.075384225	0.05333198	-0.005050743	14.94557834	57.70888633	3.199%
C.2.201	0.0984591	-0.075697463	0.053346204	-0.00507173	14.99836514	57.9178977	3.194%

Point	U_h_liq	drho/dT	drho/dP	U_rho	rho	U_Q	U (%)
C.2.202	0.098453792	-0.075950948	0.053472434	-0.005088713	15.00319114	57.87957577	3.188%
C.2.203	0.098456931	-0.07616436	0.053508934	-0.005103012	15.03019279	57.97157783	3.189%
C.2.204	0.09845858	-0.076013766	0.053502329	-0.005092922	15.00484624	57.86845188	3.203%
C.2.205							
C.2.206	0.097760992	-0.078986388	0.054156367	-0.005292088	15.32862594	59.33098317	3.151%
C.2.207	0.097758236	-0.08042301	0.05450887	-0.005388342	15.47000966	59.74903724	3.176%
C.2.208	0.097755221	-0.080553117	0.054544102	-0.005397059	15.48163503	59.78137137	3.191%
C.2.209	0.097793736	-0.082177069	0.054626291	-0.005505864	15.74287548	60.7973628	3.196%
C.2.210	0.097807156	-0.083381392	0.054669666	-0.005586553	15.94149271	61.591119	3.204%
C.2.211	0.097820099	-0.082666035	0.054517121	-0.005538624	15.86585687	61.342841	3.220%
C.2.212	0.097818255	-0.082153083	0.054467781	-0.005504257	15.79128256	61.05851019	3.182%
C.2.213	0.097809037	-0.08240448	0.05456952	-0.0055211	15.80201176	61.05932897	3.194%
C.2.214	0.097785581	-0.081982712	0.054550074	-0.005492842	15.73366946	60.801574	3.203%
C.2.215	0.097761829	-0.080102403	0.053961554	-0.005366861	15.5938414	60.52533494	3.146%
C.2.216	0.097754077	-0.081984187	0.054580297	-0.005492941	15.72391586	60.76828494	3.165%
C.2.217	0.09772276	-0.08155584	0.054421247	-0.005464241	15.70057258	60.76900495	3.165%
C.2.218	0.097707925	-0.082664359	0.054642675	-0.005538512	15.82371562	61.1827636	3.201%
C.2.219	0.097687874	-0.082299544	0.054593242	-0.005514069	15.77553135	61.02051004	3.205%
C.2.220	0.097679965	-0.082232974	0.054582974	-0.005509609	15.76714064	60.99531998	3.209%
C.2.221	0.097677901	-0.082127592	0.054574567	-0.005502549	15.75124602	60.93478767	3.199%
C.2.222	0.097679944	-0.081970413	0.054533815	-0.005492018	15.73688042	60.89406851	3.175%
C.2.223	0.097676073	-0.082236271	0.054599155	-0.00550983	15.76235665	60.96966161	3.191%
C.2.224	0.097675728	-0.082379161	0.05460265	-0.005519404	15.78651495	61.06857724	3.186%
C.2.225	0.097680068	-0.08234012	0.054593164	-0.005516788	15.78274771	61.05460075	3.181%
C.2.226	0.097677995	-0.082516973	0.054600213	-0.005528637	15.81173718	61.17313219	3.190%
C.2.227	0.097675934	-0.082534819	0.054620443	-0.005529833	15.80817359	61.15017286	3.219%
C.2.228	0.097675646	-0.082300034	0.054588352	-0.005514102	15.77724164	61.03784018	3.199%
C.2.229	0.097679452	-0.082487999	0.054607862	-0.005526696	15.80406292	61.1370321	3.200%

C.3 Steady State Data – With Actuation

Point	HX2 T ref in	HX2 T HTF ou	HX2 T HTF in	Turbine for ref HX2	Total HTF m dot	ref micromotion	P comp disch
C.3.1	2.953186131	7.675458622	9.38866024	0.000734294	0.272193462	0.012731669	736.5588989
C.3.2	3.046518135	7.670341968	9.381698799	0.000731021	0.272859395	0.012733665	781.3999023
C.3.3	3.033845615	7.652047253	9.368214989	0.000732112	0.271289766	0.012729272	772.0906982
C.3.4	3.129634428	7.655290985	9.368699074	0.00072993	0.272793591	0.012728906	730.6398926
C.3.5	3.12167716	7.636010361	9.377469253	0.000734294	0.273228079	0.012746816	770.6711426
C.3.6	3.120408773	7.630994225	9.361057854	0.000734294	0.273066014	0.012727791	752.1843262
C.3.7	3.15654192	7.651478958	9.377960396	0.000725565	0.272330254	0.012721289	781.151123
C.3.8	3.171899319	7.630782509	9.365556145	0.000731021	0.272039056	0.012739367	782.6741943
C.3.9	3.173162699	7.610851002	9.349721336	0.000727747	0.27233395	0.012735065	744.3155518
C.3.10	3.176481915	7.619534302	9.336071396	0.000728838	0.273504496	0.012727289	766.7387695
C.3.11	3.148594761	7.619929504	9.370971489	0.000731021	0.272823393	0.012735278	741.1733398
C.3.12	3.135740042	7.608998394	9.329789352	0.000731021	0.272891164	0.012728318	751.7794189
C.3.13	3.163531685	7.57093029	9.302850914	0.000733203	0.273771405	0.012737971	760.3419189
C.3.14	3.172467137	7.549917602	9.295960427	0.000733203	0.273095727	0.01274995	730.703064
C.3.15	3.174915028	7.540594578	9.277005768	0.000733203	0.272996098	0.012731717	727.4610596
C.3.16	3.163031817	7.521998405	9.235546303	0.000728838	0.273252845	0.012746034	738.3553467
C.3.17	3.271327448	7.507743072	9.239838409	0.00072993	0.272917241	0.012737839	753.414856
C.3.18	3.229259634	7.486327648	9.23368969	0.000728838	0.273788482	0.012738477	734.5308228
C.3.19	3.197411156	7.465268707	9.198199654	0.000734294	0.272686839	0.012747934	753.8875732
C.3.20	3.207531214	7.496749306	9.187065697	0.000734294	0.273544371	0.012729893	749.3964233
C.3.21	3.227333593	7.481115818	9.213495255	0.000736476	0.271723628	0.01276047	839.7147217
C.3.22	3.211905432	7.474578476	9.198735809	0.000734294	0.272441924	0.012760244	734.5985718
C.3.23	3.24527297	7.451965427	9.204159164	0.000735385	0.272574037	0.012755869	763.7632446
C.3.24	3.253829765	7.479194355	9.187306786	0.00072993	0.272858739	0.012745024	746.2744751
C.3.25	3.238990259	7.445477676	9.162594223	0.000731021	0.272457689	0.012752196	780.4442139
C.3.26	3.274583244	7.440905666	9.153960419	0.000734294	0.271781325	0.012747615	730.6724854
C.3.27	3.242542172	7.430687809	9.164577103	0.000731021	0.272287577	0.012750941	736.0350342
C.3.28	3.288603449	7.430739212	9.161029816	0.000732112	0.272730738	0.012747839	756.8290405
C.3.29	3.270354366	7.473789787	9.185889053	0.000736476	0.272273213	0.012744635	744.6421509
C.3.30	3.234071207	7.449307823	9.202515221	0.000736476	0.272576809	0.012750369	755.4172363
C.3.31	3.256372452	7.489642334	9.233854294	0.000733203	0.272796214	0.012745507	736.1236572
C.3.32	3.266198301	7.543822098	9.269240951	0.000733203	0.27286005	0.012756912	756.9251099
C.3.33	3.547290325	7.569852447	9.30579567	0.000731021	0.272034287	0.012764737	754.9436646
C.3.34	3.485761261	7.567860985	9.349826241	0.000732112	0.271833092	0.012756385	760.1608887
C.3.35	3.423900461	7.594792652	9.357500267	0.000736476	0.273078889	0.012771372	757.5671387
C.3.36	3.425957155	7.641407871	9.385408402	0.000733203	0.273053199	0.012748715	782.9561768
C.3.37	3.38284936	7.64714241	9.394372368	0.000735385	0.272844404	0.012763198	768.3027344
C.3.38	3.422222662	7.662317372	9.412738609	0.000736476	0.27097854	0.012739054	758.1159058
C.3.39	3.389120579	7.67953949	9.427303123	0.000734294	0.272517174	0.012769055	734.3189087
C.3.40	3.388642025	7.671885967	9.425715446	0.000739749	0.272268951	0.01276743	757.3632202
C.3.41	3.423693514	7.662593746	9.433973503	0.000738658	0.271930903	0.012759921	753.2415771
C.3.42	3.426947641	7.655466557	9.404016876	0.000735385	0.272159994	0.01276064	752.6636353
C.3.43	3.424885321	7.630977059	9.407831383	0.000737567	0.273230374	0.012770252	756.2843018
C.3.44	3.434494162	7.627384949	9.403084946	0.00074084	0.271575958	0.012756896	738.4345703
C.3.45	3.408558416	7.627413464	9.378265381	0.000733203	0.271341681	0.012758077	754.6436768
C.3.46	3.369942427	7.605820084	9.388564873	0.00072993	0.27260077	0.012749674	725.4318237
C.3.47	3.313768625	7.611442852	9.384508324	0.000726656	0.273548812	0.012767334	754.2473145
C.3.48	3.34460702	7.639165878	9.380506325	0.000731021	0.274143189	0.012769155	752.2775269
C.3.49	3.323883629	7.643350124	9.400324059	0.000731021	0.271666288	0.012738645	778.9228516
C.3.50	3.304127741	7.638796997	9.354660034	0.000736476	0.273095727	0.012717973	737.7167969
C.3.51	3.334101915	7.583810901	9.350532341	0.000737567	0.273030967	0.012732167	750.5620117
C.3.52	3.335966826	7.575946713	9.355733681	0.000736476	0.272857755	0.012809048	749.4833374
C.3.53	3.365344334	7.555566216	9.318980026	0.000734294	0.272463411	0.012797052	752.0882568
C.3.54	3.384815121	7.589914036	9.328097153	0.000732112	0.272158772	0.012718664	753.3505249
C.3.55	3.5920681	7.547028065	9.297364044	0.000733203	0.273003399	0.012786426	731.0007935
C.3.56	3.562026739	7.551732445	9.304841995	0.000738658	0.272094995	0.012753002	751.9452515
C.3.57	3.462325668	7.525727272	9.292246628	0.000733203	0.272331744	0.01272552	762.116333
C.3.58	3.485698462	7.523160362	9.239965439	0.000734294	0.272903383	0.012768344	751.5480347
C.3.59	3.496683502	7.484324741	9.254098129	0.000732112	0.272232205	0.012783739	746.6685181
C.3.60	3.498601198	7.505238152	9.2644207	0.000732112	0.271794945	0.012723556	744.5340576
C.3.61	3.516440201	7.448145104	9.216954041	0.000732112	0.272650838	0.012687624	757.1341553
C.3.62	3.523429155	7.454192925	9.202286911	0.000732112	0.272244275	0.012830024	769.7249146
C.3.63	3.533437681	7.525716591	9.197970962	0.000733203	0.273543239	0.012827953	773.7684937
C.3.64	3.560659552	7.460934258	9.196040344	0.000735385	0.273061752	0.012782318	737.9490356
C.3.65	3.547361136	7.441005134	9.176269531	0.000733203	0.272586584	0.012810325	731.8755493
C.3.66	3.533819151	7.459874058	9.198557281	0.00072993	0.272967309	0.012786811	752.6501465
C.3.67	3.510154152	7.421386433	9.199082947	0.000737567	0.272863835	0.012759764	746.6962891

Point	HX2 T ref in	HX2 T HTF ou	HX2 T HTF in	Turbine for ref HX2	Total HTF m dot	ref micromotion	P comp disch
C.3.68	3.496215105	7.458920097	9.207883263	0.000736476	0.272417396	0.012789425	737.1091309
C.3.69	3.507414913	7.458144951	9.222350311	0.000734294	0.273000538	0.012785502	748.4135132
C.3.70	3.454859257	7.468365288	9.236803246	0.00072993	0.271939933	0.012785578	766.1851196
C.3.71	3.630971622	7.539597321	9.232114029	0.000732112	0.274471074	0.012732518	741.3532104
C.3.72	3.535319519	7.467509365	9.229546165	0.000735385	0.273343444	0.012768283	767.1720581
C.3.73	3.519617701	7.478180695	9.23553009	0.000732112	0.273230374	0.012772243	759.3862305
C.3.74	3.512008667	7.472371388	9.223524666	0.000728838	0.272618085	0.012780065	753.305603
C.3.75	3.52931881	7.482280826	9.250432015	0.000732112	0.272255659	0.012776677	755.9302368
C.3.76	3.545057916	7.536686611	9.280020714	0.000734294	0.27221185	0.012789093	752.6521606
C.3.77	3.632966614	7.485619259	9.253120613	0.000737567	0.272154748	0.012768439	754.5424194
C.3.78	3.615560913	7.495422745	9.276913261	0.000732112	0.272471547	0.012787757	816.6523438
C.3.79	3.595828581	7.522203922	9.305308723	0.000736476	0.273330152	0.01279376	746.5066528
C.3.80	3.592007303	7.514248943	9.311989021	0.000734294	0.273101777	0.012765129	750.5869141
C.3.81	3.606735563	7.56976347	9.339598465	0.000739749	0.272672087	0.012781189	754.5627441
C.3.82	3.540516186	7.581720257	9.364960861	0.000738658	0.272828639	0.012748887	754.2390137
C.3.83	3.546299219	7.591275024	9.370808792	0.000736476	0.273279518	0.012772422	748.9848633
C.3.84	3.571747255	7.617087936	9.380688095	0.000734294	0.272385955	0.012784314	755.0811768
C.3.85	3.561071014	7.611075974	9.403306961	0.000734294	0.273480445	0.01278131	749.8447876
C.3.86	3.564185286	7.589324188	9.381212807	0.000734294	0.271844983	0.012791374	750.9042969
C.3.87	3.580025387	7.614946079	9.38237133	0.000737567	0.273051411	0.012791614	753.2581177
C.3.88	3.586299562	7.632456112	9.398397255	0.000736476	0.272325069	0.012791585	765.5391235
C.3.89	3.589637089	7.624542618	9.397201919	0.000736476	0.273312002	0.012789423	753.9578857
C.3.90	3.604484749	7.655295372	9.405681229	0.000739749	0.271026045	0.01281561	759.852356
C.3.91	3.70780921	7.65379324	9.411146164	0.000739749	0.272780627	0.012816736	751.3095703
C.3.92	3.674033117	7.619960499	9.409662056	0.000738658	0.272528172	0.012795856	753.3471069
C.3.93	3.639268875	7.588936329	9.382848549	0.000731021	0.273136079	0.012778189	740.2192993
C.3.94	3.645528746	7.618186187	9.367436981	0.000736476	0.27205053	0.012772679	751.8334351
C.3.95	3.603683233	7.573581028	9.382289886	0.000736476	0.272526264	0.012813919	758.7130127
C.3.96	3.617657232	7.564200306	9.342276573	0.000737567	0.273058951	0.01279044	755.1118164
C.3.97	3.617628479	7.606395054	9.351993561	0.000738658	0.272908241	0.012794527	751.8574829
C.3.98	3.600345945	7.597560501	9.370999527	0.000734294	0.272695959	0.012760025	742.4990845
C.3.99	3.682738304	7.695667362	9.364195824	0.000734294	0.273317426	0.012774048	750.9460449
C.3.100	3.603703594	7.645356751	9.382359314	0.000734294	0.272587478	0.01277973	726.6640625
C.3.101	3.556028032	7.646073627	9.387790298	0.000736476	0.272806227	0.012777316	762.3051147
C.3.102	3.543472958	7.61995945	9.369309807	0.000734294	0.272274137	0.012788708	748.8049927
C.3.103	3.556627941	7.590611076	9.383251953	0.000735385	0.272536367	0.012779118	768.4385986
C.3.104	3.5137043	7.554123783	9.357786179	0.000731021	0.273666292	0.012793926	745.6101685
C.3.105	3.54885664	7.552251625	9.308551597	0.000737567	0.272347063	0.012790696	738.2409668
C.3.106	3.521066475	7.503624344	9.294997025	0.000737567	0.271410853	0.012773713	766.7261963
C.3.107	3.466245842	7.464872456	9.227102852	0.000738658	0.271936983	0.012783918	776.0491333
C.3.108	3.458484125	7.392659187	9.161631203	0.000732112	0.272749305	0.012780137	765.4418945
C.3.109	3.517917013	7.44222517	9.158566094	0.000735385	0.27258715	0.012795202	780.1490479
C.3.110	3.547991514	7.368904304	9.119180679	0.000738658	0.272690535	0.012783064	747.7145996
C.3.111	3.507182169	7.345424748	9.11197319	0.000735385	0.272940814	0.012772082	734.2785645
C.3.112	3.50293479	7.330852794	9.120399475	0.000732112	0.271026611	0.012766235	726.4973145
C.3.113	3.501606321	7.348250866	9.112164307	0.000732112	0.272832096	0.012771808	776.4597778
C.3.114	3.480302668	7.391591454	9.148824882	0.000738658	0.273398072	0.012785462	753.7325439
C.3.115	3.545937681	7.44557209	9.157697868	0.000735385	0.272607356	0.012781656	738.8400879
C.3.116	3.624695635	7.384863377	9.207018852	0.000734294	0.271784276	0.012799365	732.7071533
C.3.117	3.60430193	7.395898533	9.212327575	0.000731021	0.271192759	0.012783843	735.2806396
C.3.118	3.565290833	7.435126114	9.226982307	0.000738658	0.27251929	0.012784885	752.6355591
C.3.119	3.574437714	7.458345032	9.283179665	0.000733203	0.271378785	0.012780888	765.9023438
C.3.120	3.586351681	7.47479763	9.309127045	0.000737567	0.272155076	0.012776403	761.6450806
C.3.121	3.5565135	7.53364296	9.322098732	0.000735385	0.272609383	0.012790804	732.8152466
C.3.122	3.642614698	7.54458971	9.345796966	0.000732112	0.272609562	0.01278944	731.9527588
C.3.123	3.592692041	7.563775349	9.372063065	0.000734294	0.272363633	0.012784465	778.6303101
C.3.124	3.596114302	7.593446446	9.342194557	0.00074084	0.273379534	0.012800711	747.9168091
C.3.125	3.604475165	7.556641388	9.364953232	0.000739749	0.273041964	0.012789374	780.2720337
C.3.126	3.584730244	7.563710117	9.369299126	0.000734294	0.272620797	0.01279309	756.8007202
C.3.127	3.562618733	7.556089115	9.36460228	0.000738658	0.27356416	0.012779263	752.3024292
C.3.128	3.583558226	7.564790821	9.349700928	0.000734294	0.272302121	0.012780212	752.7268066
C.3.129	3.580101347	7.563440704	9.389130211	0.000735385	0.272410572	0.01279624	740.1835938
C.3.130	3.586187315	7.56763916	9.362808228	0.000737567	0.272473693	0.012798778	770.1524048
C.3.131	3.619600487	7.577796173	9.368397141	0.000739749	0.273521155	0.012797536	751.1514282
C.3.132	3.602207661	7.575246239	9.364840508	0.000727747	0.27478081	0.012795683	763.9337158
C.3.133	3.566363525	7.555806351	9.369203377	0.000737567	0.271642566	0.012786551	774.1296997
C.3.134	3.602915096	7.570603562	9.382925415	0.000735385	0.271667033	0.012791933	749.1144409

Point	HX2 T ref in	HX2 T HTF ou	HX2 T HTF in	Turbine for ref HX2	Total HTF m dot	ref micromotion	P comp disch
C.3.135	3.735613442	7.63429842	9.374594879	0.000737567	0.273652196	0.012812371	771.7158203
C.3.136	3.640601921	7.56554575	9.395157433	0.000731021	0.273929596	0.012793934	770.7789917
C.3.137	3.650859594	7.569472599	9.369859314	0.000732112	0.272459149	0.01278782	767.5114746
C.3.138	3.596909666	7.573566627	9.383940697	0.000732112	0.271841139	0.012804349	770.7987061
C.3.139	3.618035507	7.578199482	9.404199028	0.000731021	0.273093998	0.012785912	769.9733887
C.3.140	3.614202022	7.594629001	9.394446373	0.000733203	0.272392213	0.012798598	766.647583
C.3.141	3.575317812	7.560295868	9.371125412	0.000735385	0.272843152	0.012792586	766.5631714
C.3.142	3.595530081	7.56919899	9.387677002	0.000734294	0.272156149	0.012785289	735.887146
C.3.143	3.587881851	7.538932419	9.323711777	0.00074084	0.272533238	0.012774813	753.5755615
C.3.144	3.596205997	7.544506741	9.350329208	0.000728838	0.273182541	0.012769922	750.9543457
C.3.145	3.519682407	7.533832168	9.322131729	0.000739749	0.272512913	0.012779433	744.8411865
C.3.146	3.511320019	7.507434654	9.28409729	0.000744114	0.273391992	0.012780774	772.3858643
C.3.147	3.478424215	7.496776104	9.254735756	0.00074084	0.272551209	0.012783551	723.7111206
C.3.148	3.483452177	7.465939522	9.254015923	0.000741931	0.272458911	0.01278594	735.644104
C.3.149	3.471365595	7.434523487	9.21932354	0.000733203	0.273497194	0.012800109	739.4555054
C.3.150	3.51939826	7.429050732	9.202410126	0.000733203	0.271904826	0.012808738	733.6234131
C.3.151	3.520868206	7.399654102	9.211144829	0.000733203	0.273027211	0.01278431	747.1707153
C.3.152	3.55592928	7.369016647	9.196300316	0.000732112	0.272723287	0.012784955	767.5946655
C.3.153	3.560255861	7.377611255	9.171731567	0.000739749	0.272335082	0.0128045	756.0978394
C.3.154	3.505362797	7.359995747	9.172212219	0.000737567	0.273152411	0.012790474	761.4694824
C.3.155	3.69949007	7.348396492	9.154542732	0.000737567	0.273815483	0.012807006	753.4949341
C.3.156	3.688067007	7.347549534	9.143836594	0.000731021	0.273714632	0.012785666	732.8618774
C.3.157	3.58112092	7.355597878	9.151094627	0.000736476	0.272567302	0.012804274	748.5441895
C.3.158	3.622160578	7.395474243	9.185499191	0.000737567	0.272511184	0.012781425	779.2228394
C.3.159	3.585795117	7.4051651	9.16456337	0.000736476	0.272849798	0.012795501	743.3924561
C.3.160	3.579635334	7.437346745	9.212346077	0.000733203	0.272776693	0.012784004	764.4187012
C.3.161	3.564001131	7.468175125	9.266398048	0.000736476	0.272132903	0.012794593	766.567749
C.3.162	3.541304016	7.485320473	9.248490906	0.000737567	0.273212075	0.012802999	752.9038086
C.3.163	3.558289432	7.503193474	9.302354813	0.000743022	0.272700548	0.012776557	772.1190186
C.3.164	3.555645752	7.543030834	9.327139282	0.000737567	0.272075385	0.012774521	754.0491333
C.3.165	3.55356946	7.566952133	9.334711265	0.000736476	0.27223441	0.012801207	753.3018799
C.3.166	3.558213663	7.581300926	9.360060501	0.00074084	0.271804303	0.012787035	733.8156128
C.3.167	3.570686579	7.595296573	9.374196052	0.000737567	0.272341251	0.012799278	764.7790527
C.3.168	3.819732142	7.579246998	9.366945267	0.00074084	0.272788256	0.01280529	748.897644
C.3.169	3.734430838	7.595958805	9.383740425	0.000737567	0.274373502	0.012800198	735.5880127
C.3.170	3.671564913	7.593321896	9.419021797	0.000738658	0.27262032	0.012805288	779.6932373
C.3.171	3.664203167	7.612025261	9.381316376	0.000735385	0.272194058	0.0128157	747.7595215
C.3.172	3.682970762	7.610948753	9.395732689	0.000738658	0.273085296	0.012789768	750.2177124
C.3.173	3.648577929	7.626309586	9.403001785	0.000738658	0.271495223	0.012786537	726.8427734
C.3.174	3.659667635	7.612781906	9.413343239	0.000733203	0.272468269	0.012792615	735.3346558
C.3.175	3.644737816	7.629410362	9.40408268	0.00074084	0.272514611	0.01279229	742.8699951
C.3.176	3.641908979	7.62945404	9.40871048	0.00074084	0.272427827	0.012805137	754.661377
C.3.177	3.637666512	7.619537449	9.414621544	0.000736476	0.272798181	0.012799345	770.1561279
C.3.178	3.637776041	7.620009232	9.405831718	0.000739749	0.273201495	0.012794978	764.3000488
C.3.179	3.674993706	7.605612659	9.399985695	0.000736476	0.272926271	0.012793924	738.4966431
C.3.180	3.654191971	7.588328362	9.401023102	0.000736476	0.273280323	0.012795503	747.2024536
C.3.181	3.650736141	7.603202057	9.405978012	0.000741931	0.274228364	0.012783466	741.7249756
C.3.182	3.646114588	7.62844677	9.434472466	0.000737567	0.27282691	0.012788702	731.0571289
C.3.183	3.572276545	7.62037096	9.420977593	0.000733203	0.272930712	0.012785467	770.142395
C.3.184	3.728248072	7.609156418	9.398211098	0.000737567	0.272690147	0.012799071	759.451416
C.3.185	3.672263431	7.613252258	9.394949722	0.000736476	0.272198796	0.012808689	769.4506226
C.3.186	3.621758652	7.578478527	9.360502243	0.000741931	0.27307415	0.012797873	755.2587891
C.3.187	3.609998464	7.555251408	9.300207329	0.00074084	0.273211479	0.012791779	727.2720337
C.3.188	3.612691879	7.524473762	9.271802521	0.000735385	0.273223728	0.012789636	769.0354004
C.3.189	3.538644505	7.484523201	9.234733772	0.00074084	0.272859573	0.012794961	725.1501465
C.3.190	3.554482651	7.452974701	9.195410538	0.000738658	0.27244702	0.012778584	761.8220825
C.3.191	3.529310036	7.43686142	9.182344818	0.000733203	0.272624969	0.012782516	742.1367798
C.3.192	3.519216872	7.42211647	9.186472511	0.000741931	0.270927995	0.01278374	763.4321289
C.3.193	3.703904009	7.405046654	9.168812752	0.000733203	0.272986591	0.012792744	756.7072144
C.3.194	3.644961739	7.346083736	9.152094269	0.000738658	0.272994876	0.012801798	732.295105
C.3.195	3.588070059	7.337873936	9.133513451	0.000733203	0.272377849	0.012803717	756.6251831
C.3.196	3.569199944	7.341416073	9.119153786	0.000741931	0.272955328	0.012796195	732.0731812
C.3.197	3.627066946	7.320680046	9.122988701	0.000738658	0.272191763	0.012791062	763.397522
C.3.198	3.571761274	7.347288799	9.151289368	0.00074084	0.273397505	0.012783715	778.897644
C.3.199	3.769391442	7.335324383	9.170546913	0.000734294	0.272534877	0.012799015	769.729187
C.3.200	3.740146923	7.39345417	9.216755486	0.000738658	0.272946626	0.012796802	758.2589111
C.3.201	3.726579333	7.428163338	9.249194145	0.000738658	0.272500515	0.01280634	745.6896362

Point	HX2 T ref in	HX2 T HTF ou	HX2 T HTF in	Turbine for ref HX2	Total HTF m dot	ref micromotion	P comp disch
C.3.202	3.70351696	7.457346535	9.289965821	0.000733203	0.272467613	0.012792955	751.4954224
C.3.203	3.696537352	7.504806519	9.310519218	0.00074084	0.27155444	0.012789682	765.1959839
C.3.204	3.641202068	7.537688351	9.344331741	0.00074084	0.273201227	0.012794462	832.2153931
C.3.205	3.649492454	7.495710945	9.323408127	0.000739749	0.272054642	0.012794008	749.4487305
C.3.206	3.600747156	7.511150742	9.354543877	0.000735385	0.272059739	0.012801086	750.4401855
C.3.207	3.622176075	7.523189545	9.368982506	0.000737567	0.271978587	0.012816195	766.6895752
C.3.208	3.770800447	7.530218887	9.378930664	0.000735385	0.271705359	0.012813894	757.1147461
C.3.209	3.764546156	7.536301708	9.37952137	0.000735385	0.272567958	0.0128086	751.3761597
C.3.210	3.714798641	7.550301933	9.398661423	0.000737567	0.271510303	0.012797724	756.1344604
C.3.211	3.685851955	7.567411518	9.396129227	0.000736476	0.271737278	0.012791468	743.449646
C.3.212	3.702719736	7.588836002	9.385529327	0.000743022	0.27253145	0.012794504	745.3178711
C.3.213	3.7131392	7.61736393	9.419018936	0.000736476	0.272004664	0.012807812	753.901001
C.3.214	3.694874906	7.616712666	9.435033226	0.000743022	0.272647709	0.012809394	751.3189697
C.3.215	3.696140528	7.617008877	9.427107239	0.00074084	0.273025155	0.012808718	761.2218628
C.3.216	3.683756208	7.619830513	9.444297409	0.000741931	0.271586448	0.012814131	750.4968262
C.3.217	3.683572388	7.623099804	9.423349762	0.00074084	0.271952659	0.012820226	751.1694336
C.3.218	3.721243286	7.62531023	9.436740303	0.000735385	0.272388339	0.012802858	780.9160767
C.3.219	3.715659905	7.636590767	9.44606266	0.000738658	0.271368593	0.012804836	751.5946655
C.3.220	3.681315231	7.61713295	9.452874947	0.000741931	0.273466587	0.012796506	744.3272705
C.3.221	3.653965187	7.622308636	9.425427437	0.00074084	0.27244249	0.012804301	732.9782715
C.3.222	3.630613089	7.648690701	9.427159309	0.00074084	0.272031426	0.012800189	745.2709961
C.3.223	3.608828735	7.609293842	9.412140656	0.000738658	0.273042887	0.012791558	736.7247925
C.3.224	3.571536732	7.569482994	9.370107269	0.000743022	0.272916675	0.01280907	730.9758911
C.3.225	3.581613874	7.550201511	9.327834892	0.000734294	0.272941381	0.012799284	735.7009888
C.3.226	3.689649057	7.548022842	9.312693787	0.000741931	0.271760732	0.012798208	732.5227051
C.3.227	3.641413832	7.49655199	9.296450996	0.00074084	0.273701191	0.012811415	758.885437
C.3.228	3.583545875	7.473860454	9.223637199	0.000735385	0.273659825	0.012809684	772.8245239
C.3.229	3.602806616	7.444524765	9.239859962	0.000741931	0.273037374	0.012798532	756.2116699
C.3.230	3.585740423	7.38798008	9.219605446	0.000738658	0.273566365	0.012803001	734.4484253
C.3.231	3.594155502	7.402175904	9.184502411	0.000737567	0.272699565	0.012786527	763.7875977
C.3.232	3.595042372	7.373490143	9.181405831	0.000731021	0.272844136	0.012807745	749.8654175
C.3.233	3.560039282	7.321510982	9.155230331	0.000738658	0.272003204	0.01279341	735.4321899
C.3.234	3.715673923	7.349724484	9.13742218	0.000737567	0.272686839	0.012810161	751.3341064
C.3.235	3.719351339	7.343889904	9.13332386	0.000734294	0.273237914	0.01279614	760.03479
C.3.236	3.607797527	7.323688888	9.145310402	0.000739749	0.273088098	0.012797264	758.6775513
C.3.237	3.626885891	7.319748115	9.128005409	0.000738658	0.272625715	0.012794522	750.9624023
C.3.238	3.610757494	7.351001263	9.16801281	0.000744114	0.272496641	0.012786009	764.2751465
C.3.239	3.620880795	7.381489849	9.197394753	0.000735385	0.273755163	0.012797253	752.2540894
C.3.240	3.649060726	7.389942646	9.22129612	0.000738658	0.272515684	0.012789951	756.2070923
C.3.241	3.66385498	7.480565357	9.263631248	0.000736476	0.272836596	0.012785403	765.7304688
C.3.242	3.671189022	7.468102837	9.293793297	0.000734294	0.272792459	0.012809206	737.8446045
C.3.243	3.643779087	7.472812271	9.300882149	0.000743022	0.272704571	0.012802157	745.007019
C.3.244	3.852639627	7.490672207	9.296749115	0.000735385	0.271610081	0.012806625	781.432251
C.3.245	3.798723507	7.476002788	9.322740364	0.000738658	0.271853536	0.012796761	745.4554443
C.3.246	3.723432541	7.483080578	9.339036942	0.000736476	0.272445112	0.012810723	756.2427979
C.3.247	3.731901932	7.485018253	9.349931717	0.000732112	0.272243291	0.012805458	768.2017822
C.3.248	3.740863228	7.526419735	9.35819149	0.000732112	0.272605866	0.012801656	750.62323
C.3.249	3.717629671	7.512077427	9.348752976	0.000737567	0.272492319	0.012798124	752.8823853
C.3.250	3.691131115	7.543631935	9.365261841	0.000735385	0.273403645	0.012795039	762.6307983
C.3.251	3.635615635	7.584337139	9.377361679	0.000737567	0.272698253	0.012799836	769.0345459
C.3.252	3.623938274	7.578563023	9.372811699	0.000741931	0.273124278	0.012794975	748.5805054
C.3.253	3.829260922	7.57550621	9.376970673	0.00074084	0.272498965	0.01280367	744.7539673
C.3.254	3.75338726	7.575598049	9.399183273	0.000737567	0.273208469	0.012805903	732.2341919
C.3.255	3.715596819	7.571905708	9.390349579	0.000743022	0.273385674	0.012808084	771.934021
C.3.256	3.70829997	7.575436974	9.385022354	0.000736476	0.272642791	0.012805029	753.1694946
C.3.257	3.712174177	7.586086464	9.429467201	0.000737567	0.273040086	0.012807694	761.2332764
C.3.258	3.691922665	7.59118824	9.434865379	0.000736476	0.272136122	0.01280022	750.0950317
C.3.259	3.70440011	7.63640995	9.419742393	0.000738658	0.274070174	0.012807281	751.1825562
C.3.260	3.682766771	7.623073578	9.425135422	0.000745205	0.272988647	0.012797537	747.7437744
C.3.261	3.645458889	7.61142273	9.424139786	0.000736476	0.272116333	0.012800623	759.5266113
C.3.262	3.623335266	7.622806835	9.384153938	0.000734294	0.272850305	0.012798464	733.7323608
C.3.263	3.575377989	7.603786659	9.369987106	0.000738658	0.272702843	0.012796476	749.5617065
C.3.264	3.761659241	7.598412418	9.350828934	0.00074084	0.272392452	0.012813637	735.2714844
C.3.265	3.695129061	7.530047798	9.320844078	0.000735385	0.272323191	0.012806925	758.3792725
C.3.266	3.66046834	7.49424839	9.263259888	0.000733203	0.271646827	0.012803902	751.4233398
C.3.267	3.607429314	7.467773914	9.219218064	0.000739749	0.271820456	0.012793824	746.9190674
C.3.268	3.621664476	7.420633221	9.186183548	0.000735385	0.272553116	0.012789792	749.611145

Point	HX2 T ref in	HX2 T HTF ou	HX2 T HTF in	Turbine for ref HX2	Total HTF m dot	ref micromotion	P comp disch
C.3.269	3.602424049	7.410768223	9.168694687	0.000739749	0.273427218	0.012805708	730.3724976
C.3.270	3.573829317	7.396963501	9.150214386	0.000735385	0.273007095	0.012800341	728.0921631
C.3.271	3.708410978	7.373075581	9.130660439	0.000737567	0.271908998	0.012794837	767.7076416
C.3.272	3.692792415	7.342059994	9.098504067	0.00074084	0.27335608	0.012820365	731.9910889
C.3.273	3.633878565	7.329251003	9.096176338	0.000737567	0.271492839	0.012797433	753.880127
C.3.274	3.623047209	7.300653362	9.086898994	0.000741931	0.272770137	0.012805803	751.6544189
C.3.275	3.635231018	7.308796692	9.0963274	0.000733203	0.273584336	0.012804232	759.6570435
C.3.276	3.789348221	7.353442764	9.148313141	0.000736476	0.27304256	0.012812473	750.7578735
C.3.277	3.769725132	7.339218521	9.17506485	0.000737567	0.273577511	0.012811125	778.977478
C.3.278	3.747410393	7.388353729	9.202970123	0.000737567	0.272118956	0.012811566	755.8112793
C.3.279	3.726033926	7.403624058	9.201414108	0.000735385	0.273250222	0.012796671	745.3748169
C.3.280	3.690466881	7.412458229	9.224323273	0.000739749	0.271882504	0.012790509	750.8991699
C.3.281	3.811104774	7.416120148	9.203004646	0.000735385	0.272338957	0.012816189	759.7982788
C.3.282	3.770301962	7.383555126	9.221389007	0.000739749	0.272853345	0.012812749	770.6571655
C.3.283	3.730727434	7.393996143	9.198686218	0.000737567	0.272396237	0.01280067	734.6663818
C.3.284	3.688125706	7.39323864	9.207695198	0.00074084	0.272809505	0.012813089	759.0241699
C.3.285	3.711393976	7.400427151	9.241603088	0.000737567	0.272665858	0.012790043	750.9804077
C.3.286	3.802419472	7.406549072	9.232385826	0.000739749	0.273089647	0.012817213	763.4169312
C.3.287	3.802840567	7.384430122	9.215781403	0.000738658	0.272184938	0.012817412	742.178772
C.3.288	3.753052664	7.390328789	9.202576828	0.000737567	0.272276521	0.01280408	728.1642456
C.3.289	3.736440945	7.422235012	9.20869484	0.000739749	0.272624969	0.012814224	730.4557495
C.3.290	3.715950537	7.426840782	9.206648254	0.000743022	0.271456242	0.012817642	743.9609375
C.3.291	3.745338249	7.423814297	9.204264831	0.000738658	0.271911949	0.012821339	764.9918213
C.3.292	3.756682205	7.407688999	9.198934746	0.000738658	0.272598386	0.012818746	738.039917
C.3.293	3.753198004	7.355351257	9.179493713	0.000735385	0.272634655	0.0128154	755.2550659
C.3.294	3.72137146	7.354999542	9.181208229	0.000737567	0.272176981	0.012806571	764.2070923
C.3.295	3.87964778	7.37425766	9.211952019	0.000733203	0.27258411	0.012819073	746.2904663
C.3.296	3.838088656	7.394796562	9.201027298	0.000736476	0.273752719	0.012822391	763.4786987
C.3.297	3.797744989	7.381426716	9.199563027	0.000741931	0.273343772	0.012829262	729.3990479
C.3.298	3.795091772	7.404167366	9.196200371	0.000738658	0.271518111	0.012810459	778.5101929
C.3.299	3.790756941	7.387583351	9.207125282	0.000739749	0.273824245	0.012812758	735.6280518
C.3.300	3.749991989	7.401568604	9.206030083	0.000739749	0.272816241	0.012809429	750.8925781
C.3.301	3.717266369	7.427905655	9.271367264	0.000739749	0.273050845	0.012805945	738.7431641
C.3.302	3.747514343	7.509464264	9.305521965	0.000736476	0.272995353	0.012814122	747.5089722
C.3.303	3.870928097	7.484622288	9.279372406	0.00074084	0.273988366	0.01281145	753.6398926
C.3.304	3.875520802	7.510746384	9.32143116	0.000738658	0.272805572	0.012809748	750.892334
C.3.305	3.843422318	7.519643306	9.337941551	0.000735385	0.272151142	0.012814236	735.8031006
C.3.306	3.79538126	7.476931095	9.30599308	0.000739749	0.272859395	0.012817838	748.298584
C.3.307	3.793057871	7.487164593	9.272304916	0.00074084	0.27215153	0.012811637	758.2429199
C.3.308	3.739365339	7.466279793	9.245737648	0.000738658	0.272388756	0.012812411	761.0202637
C.3.309	3.680114269	7.420365906	9.211449242	0.000735385	0.27275306	0.012807813	752.4608765
C.3.310	3.670716715	7.427177143	9.203013039	0.00074084	0.273333669	0.01281531	734.0978394
C.3.311	3.825025654	7.427081489	9.22042923	0.000737567	0.272755682	0.012818447	743.4330444
C.3.312	3.823168993	7.418095589	9.211440086	0.000736476	0.271983922	0.012822424	765.6046143
C.3.313	3.771987152	7.421412468	9.225590515	0.000731021	0.272718847	0.012812776	753.2363892
C.3.314	3.77927208	7.458512211	9.232182503	0.000735385	0.272381604	0.012828592	759.7107544
C.3.315	3.781217861	7.413594246	9.242609215	0.000737567	0.272596091	0.012819661	725.1678467
C.3.316	3.774209261	7.386314869	9.233260536	0.000733203	0.273283869	0.012819266	750.543396
C.3.317	3.786142492	7.389433765	9.247711372	0.000732112	0.271955937	0.012824745	765.6200562
C.3.318	3.754486704	7.392761517	9.240058708	0.000732112	0.272873104	0.012815394	777.6445313
C.3.319	3.765962267	7.398016167	9.227372551	0.000734294	0.273632079	0.012819796	725.7220459
C.3.320	3.903133393	7.43344593	9.248005867	0.000734294	0.27296713	0.01282836	733.0057373
C.3.321	3.891646147	7.431122017	9.24672699	0.000731021	0.271543443	0.012824036	752.7233887
C.3.322	3.847819519	7.426232147	9.25105381	0.000734294	0.272519797	0.012830622	730.3925171
C.3.323	3.86544652	7.46105442	9.283313751	0.000737567	0.272771209	0.012814335	831.3397827
C.3.324	3.846531439	7.457334995	9.283305931	0.000731021	0.271513432	0.012809096	742.1424561
C.3.325	3.778077269	7.436801243	9.272495461	0.000737567	0.271441877	0.012818245	764.9608765
C.3.326	3.925727462	7.445763015	9.29261837	0.000734294	0.273287147	0.012833235	758.1367798
C.3.327	3.882622576	7.463527012	9.297643471	0.000733203	0.272434533	0.012823575	755.2719727
C.3.328	3.833091831	7.448243427	9.294204521	0.000733203	0.273001283	0.012819787	773.1070557
C.3.329	3.847338104	7.493626785	9.288504219	0.000734294	0.270509422	0.012823902	750.0272217
C.3.330	3.816305399	7.484288597	9.315127945	0.000733203	0.272127748	0.012826575	749.9491577
C.3.331	3.981042957	7.482857418	9.316039276	0.000736476	0.272958696	0.012827572	777.9185181
C.3.332	3.914438534	7.480561447	9.307292747	0.000738658	0.272415012	0.012826725	750.6312256
C.3.333	3.882028913	7.507160568	9.34178009	0.000736476	0.272789508	0.01281769	738.1062622
C.3.334	3.988125324	7.48432951	9.336752319	0.000731021	0.27202487	0.012845959	756.5856934
C.3.335	3.987919951	7.474157429	9.312895393	0.000737567	0.272016823	0.012842974	733.829895

Point	HX2 T ref in	HX2 T HTF ou	HX2 T HTF in	Turbine for ref HX2	Total HTF m dot	ref micromotion	P comp disch
C.3.336	3.958064079	7.488137627	9.323196602	0.000738658	0.272627354	0.012822918	738.6724854
C.3.337	3.894199705	7.481505108	9.297243881	0.000735385	0.272697121	0.01283581	770.3374634
C.3.338	3.861783123	7.44743061	9.256067467	0.000734294	0.272704661	0.01280848	760.0350952
C.3.339	3.75628171	7.432166672	9.217655563	0.000734294	0.272491813	0.012819233	738.9899292
C.3.340	3.889881372	7.416594982	9.196996498	0.000734294	0.272890419	0.012822951	743.5291748
C.3.341	3.865817261	7.360456943	9.180896759	0.000738658	0.271513104	0.012828008	747.6560059
C.3.342	3.815713882	7.321107006	9.163373184	0.000731021	0.273031801	0.012830215	751.1828613
C.3.343	3.816010523	7.301765537	9.159850311	0.000731021	0.272178054	0.012831702	755.1383667
C.3.344	4.032640886	7.314557362	9.157581139	0.000738658	0.272403866	0.012843797	751.526001
C.3.345	3.999538946	7.319466781	9.179422379	0.000727747	0.272666991	0.012844366	771.7301025
C.3.346	3.999018621	7.368819046	9.211829376	0.000735385	0.272299826	0.01283635	737.4168091
C.3.347	3.982844782	7.36392231	9.230707359	0.000738658	0.273141176	0.012849422	761.5999146
C.3.348	3.983823633	7.370750523	9.249055863	0.000733203	0.272700131	0.012847804	771.7075195
C.3.349	3.959940815	7.404604816	9.260484314	0.000734294	0.274086833	0.012829047	735.4596558
C.3.350	3.926670361	7.394931125	9.26204319	0.00074084	0.272714913	0.012833924	774.9772949
C.3.351	3.901999283	7.424380589	9.264534569	0.000736476	0.27179569	0.012835583	774.9824219
C.3.352	3.904801559	7.421529484	9.262571144	0.000736476	0.273257673	0.012822558	748.5679321
C.3.353	3.953548527	7.413202381	9.286647034	0.000738658	0.2727561	0.012831922	730.5601196
C.3.354	3.941166973	7.409592915	9.278463745	0.000737567	0.272186339	0.012829906	748.197876
C.3.355	3.906105471	7.431610394	9.277987099	0.000738658	0.272909552	0.012829019	754.6156616
C.3.356	4.061513949	7.415327835	9.282240296	0.000736476	0.272481143	0.012851675	768.3225098
C.3.357	4.038228178	7.413291168	9.285171318	0.000736476	0.272316545	0.012846587	757.2568359
C.3.358	4.014352083	7.43690176	9.298529625	0.000739749	0.272992402	0.012834697	742.8817139
C.3.359	4.001009274	7.432873917	9.321725845	0.000736476	0.27263695	0.012851607	750.0115356
C.3.360	3.991269731	7.441447544	9.31916275	0.000741931	0.271799773	0.012847161	751.6932983
C.3.361	3.978981829	7.451842785	9.309248543	0.000735385	0.271781325	0.01284942	748.590271
C.3.362	4.009550905	7.442875576	9.340570832	0.000737567	0.273105651	0.012853854	745.8186035
C.3.363	4.006516934	7.450777626	9.333722687	0.000739749	0.272735685	0.012850369	755.9805908
C.3.364	3.993165636	7.463588047	9.298601723	0.00074084	0.27267921	0.012843614	734.8453979
C.3.365	4.198099899	7.482777596	9.328531456	0.000734294	0.273317903	0.01286797	757.9823608
C.3.366	4.130008411	7.441685867	9.335402489	0.000734294	0.272484332	0.01285592	752.3141479
C.3.367	4.100125313	7.484358215	9.344120598	0.000738658	0.273051083	0.012844021	753.1803589
C.3.368	4.090768051	7.47192831	9.351896477	0.000735385	0.27220431	0.012866499	767.2197876
C.3.369	4.051958466	7.441709995	9.329185104	0.000739749	0.272921681	0.012849501	766.5466309
C.3.370	3.997181654	7.448437786	9.296376038	0.00074084	0.272717118	0.012844414	770.2542114
C.3.371	3.977814197	7.409890175	9.293211174	0.000738658	0.271785676	0.012839558	769.9224854
C.3.372	4.075653982	7.370806599	9.260083008	0.000738658	0.27235955	0.012835373	737.2146606
C.3.373	4.014061642	7.344112587	9.189165115	0.000737567	0.272084594	0.012856372	730.3899536
C.3.374	3.977925587	7.331597328	9.177043915	0.00074084	0.272956789	0.012845391	770.859314
C.3.375	4.147793484	7.291955948	9.159366798	0.000735385	0.273598611	0.012857645	759.1968994
C.3.376	4.114956188	7.303311539	9.160524177	0.000741931	0.271398485	0.012850031	760.3933716
C.3.377	4.085581589	7.282698345	9.180361557	0.000733203	0.272961408	0.012847848	733.8916626
C.3.378	4.048446178	7.285651588	9.174382591	0.000741931	0.273109406	0.012848512	779.5428467
C.3.379	4.075749064	7.322221947	9.224023437	0.000734294	0.27278623	0.012846325	733.8730469
C.3.380	4.068280029	7.346522713	9.233471489	0.000739749	0.272460788	0.012854171	768.7351685
C.3.381	4.057875013	7.351570606	9.228760147	0.000739749	0.271860331	0.012853394	764.9954834
C.3.382	4.024997902	7.345983982	9.245631409	0.000736476	0.27390787	0.012839064	765.7876587
C.3.383	4.013884306	7.378297806	9.226611137	0.000739749	0.273028105	0.012847008	734.5170898
C.3.384	4.030572128	7.378862095	9.255374718	0.000739749	0.272462279	0.012850305	729.7948608
C.3.385	4.19516182	7.381521225	9.278178978	0.000734294	0.27203536	0.012850171	765.9758301
C.3.386	4.16054554	7.377971077	9.262822914	0.000741931	0.272657633	0.012859594	735.5757446
C.3.387	4.153881836	7.420813084	9.273171425	0.000739749	0.272492707	0.01286565	763.6196899
C.3.388	4.127063179	7.39784565	9.270819473	0.000737567	0.273045331	0.012858665	754.2335815
C.3.389	4.145122719	7.390110874	9.269931221	0.000735385	0.271924168	0.012853624	750.8336792
C.3.390	4.345751858	7.430975437	9.291448212	0.000737567	0.27127409	0.0128622	729.6452637
C.3.391	4.290931892	7.410353661	9.299983215	0.000733203	0.273990154	0.012872572	756.5273438
C.3.392	4.267537021	7.403876209	9.284870529	0.000737567	0.271649301	0.012866825	752.1974487
C.3.393	4.239262962	7.447922039	9.312519646	0.000739749	0.272808701	0.012886455	764.1690674
C.3.394	4.249953747	7.426888561	9.324374008	0.000738658	0.272990018	0.012868494	769.9636841
C.3.395	4.212838078	7.444529152	9.312774658	0.000738658	0.273079455	0.01285704	751.7265015
C.3.396	4.170702171	7.473159123	9.31387825	0.000734294	0.272747993	0.012860979	774.9667358
C.3.397	4.383177471	7.482328797	9.347573662	0.00074084	0.271864116	0.012859775	739.6136475
C.3.398	4.281207276	7.444340706	9.339823914	0.000736476	0.272972077	0.012870833	750.4013062
C.3.399	4.30626564	7.481295777	9.355630875	0.000739749	0.272363573	0.012878366	740.8510132
C.3.400	4.46864481	7.480707455	9.352510452	0.000738658	0.272288889	0.012900172	735.2994995
C.3.401	4.413520622	7.444288254	9.3491539	0.000739749	0.272576481	0.012885178	760.4337158
C.3.402	4.382705116	7.422969437	9.326025009	0.000734294	0.273368537	0.012880563	747.3056641

Point	HX2 T ref in	HX2 T HTF ou	HX2 T HTF in	Turbine for ref HX2	Total HTF m dot	ref micromotion	P comp disch
C.3.403	4.339466858	7.410558987	9.309952927	0.000737567	0.272450447	0.012902288	767.5109253
C.3.404	4.332100296	7.385526848	9.257068062	0.00074084	0.273520499	0.012878465	766.9401245
C.3.405	4.298806286	7.362477398	9.2247118	0.000737567	0.271746278	0.012877882	751.4150391
C.3.406	4.282784557	7.336294937	9.218830299	0.000735385	0.272609323	0.012876485	750.6455078
C.3.407	4.245041466	7.322701645	9.181460762	0.000737567	0.273858219	0.012879882	769.170105
C.3.408	4.218229961	7.297228241	9.143150139	0.000739749	0.273521811	0.012855971	734.9437256
C.3.409	4.221631527	7.27278595	9.130247307	0.00074084	0.270274937	0.012888496	752.9049683
C.3.410	4.202608299	7.253017902	9.15464077	0.00074084	0.273334146	0.01286095	753.1952515
C.3.411	4.181284332	7.298526669	9.141457176	0.00074084	0.272766858	0.0128682	765.4055786
C.3.412	4.375700378	7.323345279	9.180461311	0.000739749	0.272862613	0.012881761	775.2037964
C.3.413	4.354328728	7.284521675	9.202016068	0.000743022	0.272077948	0.012877634	766.0507202
C.3.414	4.330317783	7.310861778	9.207616997	0.00074084	0.272194386	0.012869976	731.5638428
C.3.415	4.596174908	7.358153057	9.228361702	0.000744114	0.272669613	0.012900838	733.1924438
C.3.416	4.522310734	7.321129131	9.248605919	0.000738658	0.272211373	0.012901118	750.762207
C.3.417	4.489460278	7.313678074	9.242691421	0.000739749	0.272399664	0.012881575	732.6373901
C.3.418	4.465906334	7.322315121	9.21439457	0.000743022	0.272385627	0.012889302	770.3848877
C.3.419	4.459534454	7.286940098	9.233033943	0.000736476	0.27291888	0.012890915	755.4841309
C.3.420	4.409994316	7.311254025	9.217139435	0.000743022	0.273739159	0.012887143	752.3301392
C.3.421	4.404124927	7.314851952	9.204977989	0.000739749	0.272790879	0.012888131	756.1238403
C.3.422	4.395162964	7.297358894	9.237896156	0.000741931	0.273837864	0.012883142	751.8091431
C.3.423	4.518938923	7.33281889	9.200154114	0.000736476	0.272515923	0.012895934	741.5459595
C.3.424	4.471005821	7.317691803	9.214502144	0.000737567	0.272891074	0.012902964	755.6611328
C.3.425	4.474135018	7.288925552	9.21311512	0.000739749	0.273746312	0.012882326	740.5839233
C.3.426	4.414037132	7.266386127	9.215346527	0.000745205	0.272767425	0.012886684	752.4145508
C.3.427	4.422697354	7.275299644	9.181260109	0.000741931	0.272583723	0.012907537	735.4602051
C.3.428	4.41520567	7.28442936	9.191576767	0.000739749	0.273637742	0.012885867	732.4266357
C.3.429	4.365585232	7.304676056	9.188806343	0.000741931	0.272743315	0.012901158	752.3988037
C.3.430	4.575324631	7.311910725	9.174396706	0.000738658	0.271774173	0.012898578	736.3484497
C.3.431	4.526036644	7.278465748	9.165215874	0.000743022	0.272990853	0.012898773	749.5968628
C.3.432	4.4908535	7.270653248	9.192887497	0.000738658	0.273106128	0.012902114	769.9110718
C.3.433	4.497907925	7.261989594	9.183621216	0.000738658	0.272424936	0.012910024	757.5013428
C.3.434	4.507743168	7.270641136	9.174580002	0.00074084	0.272556156	0.012908506	776.5232544
C.3.435	4.453925419	7.291378117	9.180860138	0.000739749	0.272145957	0.012902853	739.0579834
C.3.436	4.460813522	7.273501587	9.170246887	0.00074084	0.272823632	0.012905461	758.4356079
C.3.437	4.474663162	7.306463337	9.175164604	0.000743022	0.271918774	0.012900718	764.7281494
C.3.438	4.646983814	7.322334576	9.160028267	0.000741931	0.272916347	0.012907164	772.475647
C.3.439	4.61416235	7.28055687	9.163975906	0.000745205	0.272038877	0.012898613	765.0137939
C.3.440	4.573761749	7.263612366	9.171924973	0.000734294	0.273105562	0.012883001	798.75
C.3.441	4.528530121	7.239435577	9.180480385	0.000732112	0.273797512	0.012913363	753.9061279
C.3.442	4.519061756	7.254972744	9.159138489	0.000736476	0.273846239	0.012909136	767.3267212
C.3.443	4.509440136	7.26115551	9.131036186	0.000738658	0.272335172	0.012891647	774.5671997
C.3.444	4.609023475	7.259648132	9.138125229	0.000736476	0.271958888	0.012913551	757.9763794
C.3.445	4.572764778	7.234746838	9.131822586	0.000735385	0.272256911	0.01290343	741.8076172
C.3.446	4.547358799	7.246694088	9.117962646	0.000736476	0.273016304	0.012893884	762.0151367
C.3.447	4.537541962	7.233751392	9.133466148	0.000735385	0.27249977	0.012909885	751.4831543
C.3.448	4.535101128	7.198631573	9.130267143	0.000732112	0.272860795	0.01290773	734.2473755
C.3.449	4.502373505	7.211342525	9.116182136	0.000732112	0.272559434	0.012915816	732.1312256
C.3.450	4.517198944	7.221901226	9.117285347	0.000734294	0.2728526	0.012915348	733.9179688
C.3.451	4.51258688	7.197056484	9.127207184	0.000736476	0.272520781	0.012900494	768.7219849
C.3.452	4.500261783	7.204300594	9.090355301	0.000738658	0.272247374	0.012906327	727.7578735
C.3.453	4.479670715	7.20900917	9.095061302	0.000736476	0.273341715	0.012909118	722.2649536
C.3.454	4.494788456	7.196250534	9.103226662	0.000735385	0.272739202	0.012910242	750.1150513
C.3.455	4.495193958	7.189987374	9.093185043	0.00072993	0.273070842	0.012918605	730.2140503
C.3.456	4.478736305	7.214837074	9.088990211	0.000736476	0.272065639	0.012896763	748.9785767
C.3.457	4.480147362	7.167990685	9.081777382	0.000736476	0.272941053	0.012904231	767.3501587
C.3.458	4.657079983	7.198937416	9.062822533	0.000736476	0.27224952	0.012912657	755.5015869
C.3.459	4.645691585	7.187249184	9.073435211	0.000736476	0.271112025	0.012904153	735.1773682
C.3.460	4.586156654	7.152783584	9.078258514	0.000731021	0.272630394	0.012898992	728.7007446
C.3.461	4.557771969	7.158758164	9.050537109	0.000736476	0.273166686	0.012908455	755.6865845
C.3.462	4.585644245	7.149259758	9.048752975	0.000741931	0.272945642	0.012905476	724.1320801
C.3.463	4.523359204	7.148407459	9.045128441	0.000736476	0.27258411	0.012911418	722.2363892
C.3.464	4.506086635	7.160548115	9.034425736	0.000738658	0.272351742	0.01291967	730.1586304
C.3.465	4.629658508	7.148532677	9.021239281	0.000732112	0.272693157	0.012922511	764.4675903
C.3.466	4.569750786	7.119481468	9.038647652	0.000733203	0.272645593	0.012897955	771.1713257
C.3.467	4.563555336	7.07858839	9.023322678	0.000738658	0.273110151	0.012891375	737.5023193
C.3.468	4.721832657	7.13813982	9.024280739	0.000738658	0.272479594	0.012914393	745.8300781
C.3.469	4.680348969	7.109273052	9.024067116	0.000732112	0.272131354	0.012926759	764.5673828

Point	HX2 T ref in	HX2 T HTF ou	HX2 T HTF in	Turbine for ref HX2	Total HTF m dot	ref micromotion	P comp disch
C.3.470	4.663182545	7.104512024	9.028338242	0.00072993	0.271677524	0.012906406	744.0387573
C.3.471	4.666628742	7.119839096	9.019175148	0.000735385	0.272162855	0.012929521	725.1529541
C.3.472	4.657012463	7.119169712	9.035525513	0.000738658	0.272818059	0.012914471	778.4832764
C.3.473	4.613103581	7.128206634	9.015859222	0.000732112	0.273552746	0.012909816	756.5339355
C.3.474	4.771531677	7.152764893	9.023712349	0.000733203	0.273582697	0.012932761	777.8395996
C.3.475	4.721224308	7.130778313	9.02144165	0.000737567	0.27209869	0.0129091	776.4563599
C.3.476	4.679629421	7.151460361	9.027543449	0.000734294	0.272724837	0.012925237	733.2433472
C.3.477	4.630256271	7.11155386	9.006225586	0.000732112	0.272257477	0.012925834	735.8614502
C.3.478	4.661814022	7.127503776	9.00200386	0.000736476	0.272467434	0.012935419	750.8216553
C.3.479	4.811636448	7.142729759	9.012798882	0.000735385	0.272111923	0.012928687	738.1506348
C.3.480	4.736975765	7.113092041	9.016709519	0.000736476	0.272002876	0.012932257	736.9998779
C.3.481	4.741891575	7.084302425	8.988439179	0.000735385	0.273249805	0.012923663	739.5057983
C.3.482	4.712462902	7.081411266	8.981148529	0.000731021	0.272916019	0.012926994	743.5180054
C.3.483	4.708398628	7.079159641	8.991087914	0.000733203	0.272599638	0.012935897	738.1691895
C.3.484	4.706944943	7.065931797	9.004420852	0.000741931	0.273224771	0.012918233	749.4187012
C.3.485	4.796281719	7.112884712	8.993211746	0.000743022	0.272081226	0.01292202	769.491272
C.3.486	4.756618118	7.075165176	8.997151184	0.000733203	0.272890419	0.012925483	756.5839844
C.3.487	4.731005383	7.04101181	8.977210236	0.000738658	0.272505939	0.012924933	727.3100586
C.3.488	4.730304623	7.056356812	8.963181305	0.000734294	0.272903234	0.012927505	756.2402344
C.3.489	4.832149315	7.061646175	8.976721763	0.000738658	0.272884667	0.012935054	751.4411011
C.3.490	4.814468002	7.035408593	8.984086418	0.000741931	0.273697495	0.012919271	738.4542847
C.3.491	4.754160786	7.0271142	8.963253212	0.00074084	0.272356331	0.012916422	751.7759399
C.3.492	4.751097107	7.039172268	8.978179359	0.000743022	0.272877216	0.012926133	768.0980225
C.3.493	4.85495472	7.043091869	8.968441391	0.000738658	0.27396825	0.012937704	762.750061
C.3.494	4.810664368	7.034865188	8.959400749	0.000737567	0.273820966	0.012932832	749.6314697
C.3.495	4.952704429	7.062831116	8.968532562	0.000736476	0.272892892	0.012939176	739.6639404
C.3.496	4.870186615	7.021718979	8.953630638	0.00074084	0.273283362	0.012945013	731.5712891
C.3.497	4.869215298	7.041116524	8.955473327	0.00074084	0.272847682	0.012939671	754.4580688
C.3.498	4.940844154	7.058481598	8.96119194	0.000736476	0.273039579	0.012938757	762.9451294
C.3.499	4.906633091	7.054890156	8.981996155	0.000739749	0.272732705	0.012937684	763.4121094
C.3.500	4.881381035	7.029819298	8.973167229	0.000743022	0.273800284	0.012940247	761.3634033
C.3.501	4.867169857	7.04478426	8.940344811	0.000736476	0.273210764	0.012936794	728.546875
C.3.502	4.861271763	7.039846706	8.939464188	0.00074084	0.272399902	0.012941896	765.428772
C.3.503	4.848391724	7.042177391	8.962567711	0.000743022	0.272991687	0.012930002	747.9619751
C.3.504	4.834738445	7.055983162	8.942797279	0.00074084	0.272825181	0.012958111	747.7889404
C.3.505	4.852955437	7.038605309	8.953810501	0.00074084	0.271974057	0.012939178	730.0782471
C.3.506	4.944598961	7.017810726	8.963077545	0.00074084	0.273631513	0.012948909	750.4934082
C.3.507	4.917950153	7.013429642	8.956263924	0.000735385	0.272621632	0.012949428	751.0618896
C.3.508	4.919128895	7.027215004	8.963432693	0.000736476	0.27286014	0.012948439	762.8753052
C.3.509	4.890057087	7.00836916	8.950597	0.000745205	0.274178237	0.012943326	743.5205688
C.3.510	4.883938694	7.014031124	8.942048645	0.000741931	0.272371948	0.012937501	767.9918823
C.3.511	4.881212807	7.005515957	8.931705666	0.000737567	0.273217082	0.01294347	749.5559692
C.3.512	4.97355833	7.041156673	8.939273453	0.000734294	0.27367869	0.012940401	747.6782837
C.3.513	4.91951294	7.007246304	8.946049118	0.000736476	0.273071766	0.01295293	749.8894043
C.3.514	4.921422291	7.005703068	8.931302261	0.00074084	0.273699045	0.012934539	747.4624023
C.3.515	4.905687141	7.021608162	8.940371322	0.000738658	0.27193436	0.012947074	749.682373
C.3.516	4.893760681	6.98611536	8.93227005	0.000736476	0.272376269	0.012942296	757.8914185
C.3.517	4.950955105	7.02585001	8.936123466	0.000737567	0.271456718	0.01295372	733.8104248
C.3.518	4.936334801	7.011773968	8.937491798	0.000743022	0.272108138	0.012948097	731.317627
C.3.519	4.931347275	6.99835186	8.948297119	0.000737567	0.272235811	0.012947594	737.0747681
C.3.520	4.924054718	6.993440056	8.925510216	0.000733203	0.272789657	0.012958949	733.4418335
C.3.521	4.917038059	6.985624122	8.913233185	0.000741931	0.272706389	0.012957413	747.1369629
C.3.522	5.045668411	6.984625149	8.928930283	0.000738658	0.272613078	0.012947871	769.4351807
C.3.523	4.961974907	6.95340786	8.906158066	0.000741931	0.273519516	0.012950481	733.0231934
C.3.524	4.982901764	6.956655598	8.89369812	0.000738658	0.27292487	0.012952584	769.854126
C.3.525	4.967280006	6.966112232	8.902979279	0.00074084	0.271387726	0.012944629	733.9614258
C.3.526	4.957560062	6.952853107	8.908012962	0.000738658	0.273969412	0.01295441	765.3074951
C.3.527	4.923840141	6.976120472	8.888075256	0.000738658	0.272619724	0.012935932	767.3095703
C.3.528	5.025341988	6.98825779	8.886710739	0.000739749	0.273037881	0.012941292	779.2236938
C.3.529	4.97170763	6.959124756	8.882829285	0.000737567	0.273260564	0.012942531	772.40271
C.3.530	4.959208679	6.963723469	8.90083065	0.000736476	0.273684353	0.01295562	766.7233276
C.3.531	4.932282639	6.960465908	8.870373344	0.000737567	0.273190498	0.012953353	765.3329468
C.3.532	5.03528614	6.97387228	8.895212173	0.000739749	0.272351265	0.01295353	761.2607422
C.3.533	5.01234169	6.942097282	8.874391365	0.000739749	0.273134351	0.012948126	755.0686035
C.3.534	4.983283806	6.948366642	8.877735519	0.000738658	0.27292949	0.012955172	753.3198853
C.3.535	4.984475708	6.959298897	8.902281952	0.000735385	0.272288084	0.012964477	736.8783569
C.3.536	4.97539587	6.960328197	8.904548645	0.000738658	0.273512363	0.012956788	729.4628296

Point	HX2 T ref in	HX2 T HTF ou	HX2 T HTF in	Turbine for ref HX2	Total HTF m dot	ref micromotion	P comp disch
C.3.537	5.003320122	6.945647621	8.876256561	0.00074084	0.273546517	0.012959962	748.2974243
C.3.538	4.980043316	6.961074734	8.910172272	0.000741931	0.273504585	0.012951946	730.9310303
C.3.539	5.047695732	6.978706169	8.899441147	0.00074084	0.272491485	0.012959075	747.6185303
C.3.540	5.037714386	6.96220808	8.900346947	0.00072993	0.272434801	0.012947125	746.5075073
C.3.541	5.015710926	6.952857018	8.894147491	0.00074084	0.272712111	0.012951558	749.977478
C.3.542	5.001057625	6.974385357	8.906430054	0.000734294	0.27278015	0.012951613	746.6533813
C.3.543	4.97562685	6.982713413	8.875390625	0.000739749	0.273263663	0.012954725	745.2123413
C.3.544	5.028024673	6.980627918	8.887185478	0.000739749	0.273370504	0.012958705	750.9360352
C.3.545	5.026340198	6.95482769	8.883130837	0.000741931	0.273494244	0.012947499	741.3591919
C.3.546	5.008339405	6.9267272	8.858780861	0.000736476	0.272296369	0.012957093	729.3024292
C.3.547	4.977314472	6.954202461	8.856629753	0.000735385	0.272760779	0.012953852	756.2539673
C.3.548	4.985753059	6.951588249	8.881578636	0.000737567	0.271993756	0.01296509	744.2289429
C.3.549	5.040270806	6.921543789	8.876442719	0.000741931	0.272766769	0.012970629	729.2260742
C.3.550	5.06147604	6.92952671	8.85859127	0.000738658	0.2725555	0.012965648	750.4859619
C.3.551	5.004915905	6.939952564	8.886773682	0.000739749	0.273152262	0.012964435	749.2885742
C.3.552	5.017114926	6.936346436	8.891696739	0.00074084	0.271710098	0.01296027	763.8536377

Point	P EV2 in	P valve inlet	P EV2 out	Voltage	T oil	HTF mass flow	T HTF in
C.3.1	288.8661194	751.8363647	280.4590149	24.05709076	40.282547	0.272193462	9.388660431
C.3.2	289.4793091	752.1040039	281.0701599	24.05669022	40.26456451	0.272859395	9.381698608
C.3.3	289.8845825	751.8855591	281.5035706	24.0568409	40.24560928	0.271289766	9.368214607
C.3.4	289.566864	751.6569824	281.1557617	24.05666542	40.2509613	0.272793591	9.368699074
C.3.5	289.491272	752.4889526	281.4667969	24.05668068	40.22472	0.273228079	9.377469063
C.3.6	290.7233276	752.71521	282.0383301	24.05683518	40.18729782	0.273066014	9.361058235
C.3.7	290.207428	752.121582	281.7766724	24.05678558	40.20042038	0.272330254	9.377960205
C.3.8	290.43927	752.5562134	282.391571	24.0568409	40.17709351	0.272039056	9.365556717
C.3.9	290.3796692	751.0975342	281.6618042	24.05690575	40.15328217	0.27233395	9.349721909
C.3.10	290.2051392	750.7856445	281.6974182	24.05686569	40.1421051	0.273504496	9.336071014
C.3.11	290.2536316	750.2854004	281.8051147	24.05693436	40.15377045	0.272823393	9.37097168
C.3.12	290.4190369	751.3651733	281.790741	24.05686569	40.15619659	0.272891164	9.329789162
C.3.13	290.4161682	751.7233887	281.9076538	24.0567894	40.12850189	0.273771405	9.302850723
C.3.14	289.9535828	750.4047241	282.2623291	24.0566349	40.10322571	0.273095727	9.295960426
C.3.15	291.1354675	749.75354	282.1586609	24.05665588	40.07212448	0.272996098	9.277006149
C.3.16	292.2582703	750.8770142	283.6256714	24.05674553	40.05025864	0.273252845	9.235546112
C.3.17	292.0640564	750.3865967	283.0524292	24.0564003	40.05025482	0.272917241	9.2398386
C.3.18	291.0233765	749.7750854	282.1460266	24.0565052	40.01381302	0.273788482	9.233690262
C.3.19	290.4501343	750.4234009	282.1799011	24.05619431	39.98368454	0.272686839	9.198199272
C.3.20	291.114624	750.0134277	282.3818054	24.05592918	39.94820786	0.273544371	9.187065125
C.3.21	291.172821	750.5797729	282.8263855	24.05619431	39.91030502	0.271723628	9.213495255
C.3.22	291.1360168	750.5128174	282.7132263	24.05603409	39.90544128	0.272441924	9.198736191
C.3.23	291.0019836	751.6445923	282.6311035	24.05569077	39.91030502	0.272574037	9.204159737
C.3.24	291.574646	748.9264526	282.552124	24.05546951	39.91127396	0.272858739	9.187306404
C.3.25	291.1069336	751.3399048	282.6380005	24.05563545	39.90738678	0.272457689	9.162593842
C.3.26	291.1351624	749.9283447	283.1006775	24.05562592	39.88357544	0.271781325	9.153960228
C.3.27	291.9605408	750.2304688	283.8169556	24.05566979	39.89231873	0.272287577	9.16457653
C.3.28	291.4891052	750.4245605	282.5167847	24.05571938	40.09885025	0.272730738	9.161029816
C.3.29	291.2170105	750.2089233	283.0647583	24.05574036	40.18827057	0.272273213	9.185889244
C.3.30	291.4560242	750.487793	283.9450378	24.05568504	40.24415207	0.272576809	9.202514648
C.3.31	291.5626831	749.5839233	282.8648682	24.05586433	40.28886795	0.272796214	9.233854294
C.3.32	294.8989258	754.430603	285.9428101	24.05583954	40.31267548	0.27286005	9.269241333
C.3.33	293.7966309	751.505188	285.1262817	24.05574417	40.31704712	0.272034287	9.30579567
C.3.34	293.0434265	753.369812	284.953125	24.05561447	40.3053894	0.271833092	9.349825859
C.3.35	293.0197754	752.7062988	284.5751648	24.0555954	40.30197907	0.273078889	9.357500076
C.3.36	293.4891968	752.4472656	284.0682373	24.05555916	40.30926895	0.273053199	9.385408401
C.3.37	292.6273193	751.7026978	284.6503906	24.05580521	40.3087883	0.272844404	9.394371986
C.3.38	292.7710571	752.1379395	285.0720215	24.05588532	40.31850815	0.27097854	9.4127388
C.3.39	293.0069275	752.09021	284.7388611	24.05595017	40.32287979	0.272517174	9.427303314
C.3.40	293.3043823	752.845459	284.8402405	24.05591583	40.32579804	0.272268951	9.425715446
C.3.41	293.4806519	752.5936279	284.4594116	24.05617523	40.33016968	0.271930903	9.433973312
C.3.42	292.9804077	752.133606	284.5501709	24.05484581	40.33016968	0.272159994	9.404017448
C.3.43	293.0728149	752.6812744	284.534668	24.0560894	40.31607819	0.273230374	9.407831192
C.3.44	293.0177612	751.3953857	283.8562927	24.05606461	40.30490112	0.271575958	9.403084755
C.3.45	292.9812622	750.298645	284.4151917	24.05614471	40.28011704	0.271341681	9.378265381
C.3.46	291.6625061	748.1200562	283.4206238	24.05603981	40.2349205	0.27260077	9.388565063
C.3.47	292.4998474	748.9624023	283.727356	24.05624962	40.22034454	0.273548812	9.384508133
C.3.48	292.4411011	748.0450439	284.0148315	24.05643463	40.19361877	0.274143189	9.380506516
C.3.49	292.008728	748.5806274	283.212677	24.05471039	40.17952728	0.271666288	9.400323868
C.3.50	291.8980713	748.1450806	283.750885	24.05629921	40.18341446	0.273095727	9.354660034
C.3.51	292.3592529	748.3081055	284.1914673	24.05615997	40.16688538	0.273030967	9.350531578
C.3.52	292.4633484	748.3043213	283.9117126	24.05603027	40.13043976	0.272857755	9.355733871
C.3.53	292.9524536	748.8347778	284.5481567	24.05620575	40.13919067	0.272463411	9.318980217
C.3.54	293.069397	748.2974243	284.4757996	24.05631447	40.11489105	0.272158772	9.328097343
C.3.55	294.5838013	748.7139893	286.0556641	24.0564003	40.0896225	0.273003399	9.297364235
C.3.56	293.7407532	749.4042358	285.3060913	24.05605507	40.06921005	0.272094995	9.304841995
C.3.57	293.7815247	749.3671875	285.2572632	24.05620956	40.08524704	0.272331744	9.292246819
C.3.58	294.1713867	749.2628174	285.491333	24.0562191	40.11100388	0.272903383	9.239965439
C.3.59	293.8120422	749.3482056	285.2911377	24.05595017	40.11489105	0.272232205	9.254097939
C.3.60	294.4950867	750.519104	286.3213196	24.05606079	40.11343384	0.271794945	9.264420509
C.3.61	294.041626	750.4437866	285.9499817	24.05603409	40.10905838	0.272650838	9.216954231
C.3.62	293.760437	749.578186	285.5458984	24.05599594	40.07310104	0.272244275	9.20228672
C.3.63	294.7341003	751.6311035	285.951416	24.05587578	40.03082275	0.273543239	9.197971344
C.3.64	294.7215576	750.2017212	286.3259277	24.05599976	40.03276825	0.273061752	9.196040154
C.3.65	294.5535584	751.8375244	285.4878845	24.05588532	40.00458145	0.272586584	9.176269531
C.3.66	294.6300049	750.5895386	286.0301209	24.05587578	39.96133041	0.272967309	9.1985569
C.3.67	294.0926819	749.7193604	285.4413452	24.05584526	39.93460083	0.272863835	9.199083328

Point	P EV2 in	P valve inlet	P EV2 out	Voltage	T oil	HTF mass flow	T HTF in
C.3.68	293.5947266	749.6411743	285.2394409	24.05573082	39.97104645	0.272417396	9.207882881
C.3.69	293.6939697	749.3485107	285.1366272	24.05521965	40.10079956	0.273000538	9.222350121
C.3.70	293.8066406	749.1162109	285.2971802	24.05571556	40.13481522	0.271939933	9.236803055
C.3.71	295.0435486	749.9863892	286.3833618	24.05566979	40.15328217	0.274471074	9.232113838
C.3.72	294.2198792	750.8735962	285.6487122	24.05579948	40.19069672	0.273343444	9.229545593
C.3.73	294.7509155	750.3903198	285.9333191	24.05562592	40.20285034	0.273230374	9.2355299
C.3.74	294.4742737	750.296875	285.9149475	24.05566025	40.20673752	0.272618085	9.223525047
C.3.75	295.3948975	750.0283813	286.2434998	24.05584908	40.20721817	0.272255659	9.250432014
C.3.76	295.2774048	751.7020874	286.9465637	24.0555706	40.22714233	0.27221185	9.280020714
C.3.77	295.5953979	750.5720215	286.9528809	24.05571556	40.23638535	0.272154748	9.253120422
C.3.78	295.4319763	752.2532349	287.1843567	24.05414009	40.21499634	0.272471547	9.276913643
C.3.79	294.8424683	750.3397217	286.6972656	24.05570984	40.14696121	0.273330152	9.305308342
C.3.80	295.098877	749.9030151	286.7251282	24.05577469	40.10420227	0.273101777	9.311988831
C.3.81	294.6100464	749.3266602	286.6892395	24.05569458	40.09885788	0.272672087	9.339598656
C.3.82	294.9690857	749.2050171	286.796936	24.0559845	40.09302521	0.272828639	9.36496067
C.3.83	294.9796448	749.1204834	285.915802	24.05594063	40.06872177	0.273279518	9.370808601
C.3.84	295.5751343	749.5134888	286.8575439	24.05587006	40.06823731	0.272385955	9.380687714
C.3.85	295.2366028	750.3374023	286.489624	24.05576515	40.10079956	0.273480445	9.403306961
C.3.86	294.63797	749.8165283	286.6992798	24.05612946	40.0896225	0.271844983	9.381212234
C.3.87	294.9839172	750.7243652	286.2047119	24.05591583	40.07601547	0.273051411	9.382370949
C.3.88	295.0515137	750.5412598	286.3833618	24.05608559	40.03665543	0.272325069	9.398397446
C.3.89	295.3926086	748.9046021	287.1378479	24.0561409	40.03179169	0.273312002	9.397201538
C.3.90	296.1404114	750.9796753	287.7007446	24.05628014	40.02547455	0.271026045	9.40568161
C.3.91	296.0203247	749.6908569	286.8968811	24.05614471	39.98465347	0.272780627	9.411146164
C.3.92	295.6972046	751.2010498	287.1542053	24.05591583	39.95695496	0.272528172	9.409662247
C.3.93	296.3172302	750.2282104	287.2774048	24.05603981	39.93265533	0.273136079	9.38284874
C.3.94	295.2614136	750.3598633	286.8029785	24.0561409	39.91758728	0.27205053	9.367437363
C.3.95	295.3124695	750.4495239	286.4810181	24.05596542	39.93071747	0.272526264	9.382289886
C.3.96	295.4813232	750.0968018	285.8830566	24.05611038	39.97639084	0.273058951	9.342276573
C.3.97	295.455658	749.1552734	286.739502	24.0561409	39.97056198	0.272908241	9.351993561
C.3.98	295.5674438	747.1843262	287.1519165	24.05631065	39.95258331	0.272695959	9.370999336
C.3.99	295.2035217	749.0397339	286.9063416	24.05599594	39.91370773	0.273317426	9.364195824
C.3.100	294.7349548	746.1916504	286.2127686	24.05584908	39.89426422	0.272587478	9.382359505
C.3.101	294.2943115	748.3060913	286.2633057	24.05607987	39.90106964	0.272806227	9.38779068
C.3.102	294.4463196	747.015564	286.2785339	24.05591011	40.10808182	0.272274137	9.369309425
C.3.103	294.4905396	748.2005615	285.8224792	24.05575562	40.2509613	0.272536367	9.383252144
C.3.104	294.7372437	748.1488037	286.1395264	24.05581474	40.3087883	0.273666292	9.357786179
C.3.105	294.2963257	746.0469971	286.1602173	24.05571938	40.32336807	0.272347063	9.308551788
C.3.106	294.3858643	747.9579468	285.9585876	24.05573082	40.36370087	0.271410853	9.294997215
C.3.107	294.0179443	747.3378296	285.0019226	24.0554657	40.37147522	0.271936983	9.227103233
C.3.108	294.0496216	748.1660767	285.1547241	24.05562592	40.35106659	0.272749305	9.161631584
C.3.109	294.9422913	749.2700195	286.1932373	24.05526543	40.34523392	0.27258715	9.158566475
C.3.110	294.4654236	747.9194336	286.1455688	24.05444527	40.37438965	0.272690535	9.119180679
C.3.111	294.3328247	747.4738159	285.8503113	24.05511475	40.37487793	0.272940814	9.111972809
C.3.112	294.1511536	747.2665405	285.5657043	24.0554657	40.36126709	0.271026611	9.120399475
C.3.113	294.3493652	748.6593628	285.873291	24.05533409	40.38168335	0.272832096	9.112164497
C.3.114	294.1465759	747.6589355	285.7454834	24.0553093	40.40986633	0.273398072	9.148824692
C.3.115	294.9000854	748.0809937	286.5812378	24.05504036	40.44679642	0.272607356	9.157697678
C.3.116	295.8038635	748.4935303	287.3701782	24.05514526	40.45991898	0.271784276	9.207018852
C.3.117	295.236908	750.78302	286.5238037	24.05361939	40.45798111	0.271192759	9.212327003
C.3.118	295.3404236	749.8840942	286.6470032	24.05517578	40.47158432	0.27251929	9.226982117
C.3.119	295.3039246	750.4671021	286.7010193	24.0550499	40.45262909	0.271378785	9.283179283
C.3.120	294.8418884	748.93396	286.7863159	24.05518913	40.42444611	0.272155076	9.309126854
C.3.121	295.7399902	749.0084229	287.3607178	24.05545425	40.43465042	0.272609383	9.322098732
C.3.122	296.481781	749.1760254	287.0628662	24.05535507	40.41959	0.272609562	9.345796585
C.3.123	295.3236084	750.2201538	287.7846069	24.0553894	40.41326904	0.272363633	9.372063637
C.3.124	295.4924316	749.581665	286.540741	24.0539856	40.38411331	0.273379534	9.342194557
C.3.125	295.0406799	750.5579224	286.3127136	24.05533981	40.36127091	0.273041964	9.364953041
C.3.126	295.1034241	750.557373	287.1019287	24.05564499	40.37342072	0.272620797	9.369298935
C.3.127	295.2317505	750.9696045	286.6533203	24.0555706	40.36904526	0.27356416	9.364602089
C.3.128	295.1924133	750.9026489	286.8816528	24.05544472	40.36029816	0.272302121	9.349700928
C.3.129	295.0463867	749.5169678	286.8537903	24.05550003	40.33454132	0.272410572	9.389129639
C.3.130	296.0146484	750.291748	287.3486328	24.05574417	40.29955292	0.272473693	9.362808228
C.3.131	295.2814026	749.5405273	286.845459	24.05553055	40.27477264	0.273521155	9.368396759
C.3.132	296.1543884	750.5530396	286.9545898	24.05579948	40.26990891	0.27478081	9.364840508
C.3.133	295.3720703	751.1047363	286.7739563	24.05544472	40.28303528	0.271642566	9.369203568
C.3.134	295.0024719	749.4793091	285.9847412	24.05556488	40.27719879	0.271667033	9.382925987

Point	P EV2 in	P valve inlet	P EV2 out	Voltage	T oil	HTF mass flow	T HTF in
C.3.135	296.265625	750.7996826	287.2466736	24.0555706	40.26456833	0.273652196	9.374594688
C.3.136	296.5222778	750.8215332	287.7024841	24.05587006	40.25144196	0.273929596	9.395157814
C.3.137	295.9744263	751.2803955	287.0881653	24.05571556	40.24075317	0.272459149	9.369859695
C.3.138	295.5289307	751.2947388	287.1889648	24.05583	40.2281189	0.271841139	9.383940697
C.3.139	295.4476624	750.8065796	287.0625916	24.05599594	40.20236588	0.273093998	9.404198647
C.3.140	295.7394104	751.1124878	287.5209656	24.05586433	40.21208191	0.272392213	9.394446373
C.3.141	295.8010254	750.555603	286.8977356	24.05571556	40.19604874	0.272843152	9.371125221
C.3.142	296.2396545	751.135498	287.3673096	24.05578423	40.19556046	0.272156149	9.387677193
C.3.143	295.0107422	749.7474976	286.9026184	24.05565453	40.15571594	0.272533238	9.323711395
C.3.144	294.9405823	749.2363892	286.294342	24.05563545	40.13433075	0.273182541	9.350329399
C.3.145	294.1705322	747.7069702	286.1567688	24.05582047	40.12169266	0.272512913	9.322132111
C.3.146	294.3157043	749.1090088	285.7469177	24.05571938	40.10225678	0.273391992	9.284096718
C.3.147	294.4297791	748.1790161	286.2710571	24.05569458	40.11780548	0.272551209	9.254735947
C.3.148	294.7081299	747.5646362	285.5272217	24.05539513	40.08864594	0.272458911	9.254015923
C.3.149	294.6605225	748.1859131	286.0166016	24.05521965	40.10031128	0.273497194	9.219323158
C.3.150	294.5989075	747.3551025	285.7322693	24.05534935	40.09885788	0.271904826	9.202410698
C.3.151	294.813385	748.5115967	286.1846313	24.05533409	40.08087158	0.273027211	9.211145401
C.3.152	295.3036499	749.68396	286.8153076	24.05513001	40.05220413	0.272723287	9.196300507
C.3.153	295.1219482	749.1348877	286.6386719	24.05504417	40.02304459	0.272335082	9.171731949
C.3.154	294.5664063	749.6454468	285.7862854	24.0549202	40.02401352	0.273152411	9.172212601
C.3.155	296.6246643	750.1626587	287.9126892	24.05511093	40.02595902	0.273815483	9.154542923
C.3.156	296.031189	749.1162109	287.1725769	24.05503082	40.03179169	0.273714632	9.143836975
C.3.157	295.58255	751.7030029	286.8802185	24.05514526	40.00846481	0.272567302	9.151094437
C.3.158	295.7308655	752.0307007	287.4991455	24.05529594	39.99194336	0.272511184	9.185499191
C.3.159	295.0378418	751.1067505	286.2403259	24.05507469	39.98319626	0.272849798	9.164563179
C.3.160	295.6792297	749.3525391	286.5582581	24.05518532	40.00749207	0.272776693	9.212346077
C.3.161	295.7351379	749.7719727	286.846344	24.0552845	40.11585999	0.272132903	9.266397476
C.3.162	295.0349731	749.1365967	286.5605774	24.0550499	40.14647293	0.273212075	9.248491287
C.3.163	295.7151794	749.6187134	286.5841064	24.0550251	40.12898636	0.272700548	9.302354813
C.3.164	295.4776001	749.951355	287.5473938	24.05525017	40.11051559	0.272075385	9.327138901
C.3.165	295.0158691	747.9073486	285.9683533	24.0554409	40.10273743	0.27223441	9.334711075
C.3.166	295.4382629	748.2279053	287.1461792	24.05521965	40.10954666	0.271804303	9.360060692
C.3.167	295.1869812	749.2530518	286.1291809	24.05542946	40.08913422	0.272341251	9.374196053
C.3.168	297.4905396	749.6531982	289.0712585	24.05545998	40.08719254	0.272788256	9.366945267
C.3.169	296.5339966	750.1505737	288.6956177	24.05584908	40.0614357	0.274373502	9.383740425
C.3.170	296.3189392	751.9002075	287.9195862	24.05569458	40.04831314	0.27262032	9.419021606
C.3.171	296.639801	750.2756348	287.9980164	24.05574036	40.04928589	0.272194058	9.381316185
C.3.172	296.181488	751.0952148	287.9098206	24.05586433	40.04977036	0.273085296	9.39573288
C.3.173	296.2479248	749.803833	287.6964417	24.05568504	40.04005432	0.271495223	9.403001785
C.3.174	296.4216003	749.1104736	287.7794495	24.05590057	40.02838898	0.272468269	9.41334343
C.3.175	296.7068176	751.1055908	287.7599182	24.05578423	40.04102707	0.272514611	9.404083252
C.3.176	295.9932556	749.4657593	287.377655	24.05603409	40.01624298	0.272427827	9.40871048
C.3.177	296.4045105	751.328125	287.6602478	24.05604935	40.02693558	0.272798181	9.414621353
C.3.178	296.2901306	751.1357422	287.8661804	24.05610085	40.02352905	0.273201495	9.405831337
C.3.179	296.2459412	748.9138184	287.7323303	24.05545425	40.04151154	0.272926271	9.399985313
C.3.180	296.5205688	749.8515625	288.1217957	24.05602074	40.00846481	0.273280323	9.401022911
C.3.181	296.0032349	747.3769531	287.1763306	24.05587006	40.01624298	0.274228364	9.405978203
C.3.182	295.5580444	747.637085	287.0284119	24.05599976	39.98902893	0.27282691	9.434472084
C.3.183	295.9844055	749.2467041	287.6235046	24.05606079	39.94577408	0.272930712	9.420977592
C.3.184	296.3796997	749.3386841	287.2372131	24.05584908	39.95500946	0.272690147	9.398211479
C.3.185	296.980896	750.4291382	287.9040833	24.05579948	40.00944138	0.272198796	9.394949913
C.3.186	296.1167297	749.6917114	287.4827576	24.05570412	40.12023926	0.27307415	9.360502243
C.3.187	295.7086182	747.7192993	286.8983154	24.05554581	40.14259338	0.273211479	9.300207138
C.3.188	295.0900269	749.9602661	286.545929	24.05529022	40.16835022	0.273223728	9.271802902
C.3.189	295.2554321	747.8670654	286.5372925	24.05545425	40.18244171	0.272859573	9.234733582
C.3.190	294.8148193	748.5283203	286.0820923	24.05545425	40.17514801	0.27244702	9.195410728
C.3.191	294.8039551	747.2800293	286.503418	24.05487442	40.16348648	0.272624969	9.182344437
C.3.192	294.7283936	748.9319458	287.0263977	24.05513954	40.15231323	0.270927995	9.186472893
C.3.193	296.9212952	749.8504028	288.2920837	24.05545044	40.15084839	0.272986591	9.168812752
C.3.194	295.7037659	748.1496582	287.0795288	24.05488014	40.15328217	0.272994876	9.152094841
C.3.195	295.7277222	750.7120361	287.386261	24.05512428	40.13092804	0.272377849	9.133513451
C.3.196	296.1221619	748.2824707	287.0401917	24.05486488	40.13627243	0.272955328	9.119153976
C.3.197	295.7052002	749.8156738	286.723114	24.0549202	40.11974716	0.272191763	9.122988701
C.3.198	295.5058289	751.2136841	287.2963867	24.05499458	40.1153717	0.273397505	9.15128994
C.3.199	297.5167847	750.8529053	289.2131348	24.05484581	40.09156799	0.272534877	9.170547485
C.3.200	296.5682068	752.4449463	288.5956726	24.05496025	40.08378983	0.272946626	9.216755867
C.3.201	296.9535217	751.9335327	288.2110901	24.05605507	40.06581116	0.272500515	9.249194145

Point	P EV2 in	P valve inlet	P EV2 out	Voltage	T oil	HTF mass flow	T HTF in
C.3.202	297.4794312	751.3002319	288.8624573	24.05533981	40.05316925	0.272467613	9.28996563
C.3.203	296.5334167	750.4647827	288.425354	24.05529022	40.02109909	0.27155444	9.310519218
C.3.204	296.2832947	748.0314941	287.724884	24.05529022	40.00992203	0.273201227	9.344331741
C.3.205	296.4578247	748.6297607	287.7400818	24.05526924	40.00214768	0.272054642	9.323408127
C.3.206	295.6869507	749.7429199	287.2926331	24.05522537	39.97542191	0.272059739	9.354543686
C.3.207	295.4542236	749.7302856	287.4118347	24.05521965	39.96472931	0.271978587	9.368982315
C.3.208	297.7224121	751.0328369	289.4980469	24.05512047	39.92099381	0.271705359	9.378931046
C.3.209	297.4044189	750.7068481	288.550293	24.05525589	39.86462021	0.272567958	9.37952137
C.3.210	296.7504578	752.0812988	288.7645264	24.0552845	39.83498001	0.271510303	9.398661613
C.3.211	297.453186	749.9806519	288.7542114	24.05529022	39.81165695	0.271737278	9.396129608
C.3.212	297.2315674	750.7424927	288.2369385	24.05543518	39.80728149	0.27253145	9.385529518
C.3.213	296.6625977	751.6144409	288.1011047	24.05554009	39.76985931	0.272004664	9.419018745
C.3.214	297.1077881	751.1484375	289.041687	24.05561447	39.83255005	0.272647709	9.435032845
C.3.215	296.8180542	751.6008911	288.5623474	24.05549431	39.89134979	0.273025155	9.427106857
C.3.216	297.0413513	751.3735352	288.0591736	24.05594063	39.88891983	0.271586448	9.444297791
C.3.217	297.2284546	750.0332642	288.4543762	24.05587959	39.91953278	0.271952659	9.42334938
C.3.218	296.9800415	751.6748047	288.3222351	24.05564499	39.95938492	0.272388339	9.436739922
C.3.219	296.934967	750.1741333	288.3127747	24.05577087	39.95840836	0.271368593	9.446062088
C.3.220	297.1443176	749.4421997	288.3745117	24.05599976	39.95597839	0.273466587	9.452875137
C.3.221	296.7858276	747.5206909	287.8989258	24.05574036	39.96618652	0.27244249	9.425427437
C.3.222	295.9447632	748.5041504	287.7814636	24.05577087	39.97542191	0.272031426	9.427159309
C.3.223	295.8765869	747.8777466	287.5433655	24.05555534	39.94285965	0.273042887	9.412140846
C.3.224	295.6601257	747.0529175	287.1320801	24.05590057	39.91176224	0.272916675	9.370107651
C.3.225	295.628479	747.6491699	286.8960266	24.05569077	39.90592957	0.272941381	9.327835083
C.3.226	296.207428	747.8440552	287.9098206	24.05529976	39.89183044	0.271760732	9.312693596
C.3.227	296.2878418	747.8397827	287.8348694	24.05520439	39.88405991	0.273701191	9.296450615
C.3.228	295.8141479	750.4081421	287.2782898	24.0552845	39.91807556	0.273659825	9.223636627
C.3.229	296.3409119	750.032959	287.5551453	24.05545998	39.9807663	0.273037374	9.239859581
C.3.230	295.9727173	748.0490723	287.5074768	24.05513954	39.97347641	0.273566365	9.219605446
C.3.231	295.7160339	749.0400391	287.4181519	24.05543518	39.94820786	0.272699565	9.184502602
C.3.232	295.6085205	748.4489746	287.0640259	24.05526543	39.93994522	0.272844136	9.181406021
C.3.233	295.826416	747.227417	287.837738	24.05511093	39.94966507	0.272003204	9.155230522
C.3.234	297.3020325	749.7075806	288.2651062	24.05504036	39.94675064	0.272686839	9.137422562
C.3.235	296.8850708	750.6936035	287.7742615	24.05491447	39.92196655	0.273237914	9.133323669
C.3.236	295.8765869	748.6016235	287.3538208	24.05513954	39.92731094	0.273088098	9.145310402
C.3.237	295.9156799	750.4498291	287.4962769	24.05500984	39.90641785	0.272625715	9.128005028
C.3.238	296.3266296	750.3069458	287.6565247	24.05504417	39.90155411	0.272496641	9.168012619
C.3.239	296.7011108	748.7131348	287.5488281	24.05500984	39.89718247	0.273755163	9.197394371
C.3.240	296.2730408	750.7137451	287.9744568	24.05492592	40.02401352	0.272515684	9.22129631
C.3.241	296.9187012	750.4101563	288.0115051	24.05514526	40.05609131	0.272836596	9.263631821
C.3.242	296.5354004	749.8725586	288.1269531	24.05507088	40.05463028	0.272792459	9.293793678
C.3.243	296.8625183	749.1719971	287.8340149	24.05520439	40.02402115	0.272704571	9.300882339
C.3.244	298.4613647	751.9254761	289.4377441	24.0552845	40.00652313	0.271610081	9.296749115
C.3.245	298.313324	750.9247437	289.2203369	24.05535507	39.98465347	0.271853536	9.322740555
C.3.246	297.3282471	752.8313599	289.0457153	24.05533409	39.98319626	0.272445112	9.339036942
C.3.247	297.3305359	752.5654297	288.5474243	24.05533028	39.95452881	0.272243291	9.349931717
C.3.248	297.8447571	750.7200928	289.390625	24.05546951	39.94335175	0.272605866	9.35819149
C.3.249	296.8154602	750.0349731	288.5092163	24.05563545	39.92877197	0.272492319	9.348752975
C.3.250	296.5847473	749.5255737	288.1993408	24.0557003	39.92779923	0.273403645	9.365262032
C.3.251	296.219696	749.8225708	287.5789795	24.05583	39.90447235	0.272698253	9.377361298
C.3.252	296.620697	747.9016113	288.2254639	24.05582047	40.00554657	0.273124278	9.372811317
C.3.253	298.0535278	749.4260864	289.3452454	24.05573463	39.96910095	0.272498965	9.376970291
C.3.254	297.9317322	749.6304932	289.0080872	24.05612946	39.9068985	0.273208469	9.399183273
C.3.255	297.7663269	751.8501587	288.5505676	24.05586052	39.86997223	0.273385674	9.390349388
C.3.256	297.5395813	750.7700806	288.8613281	24.05602074	39.84518433	0.272642791	9.385022163
C.3.257	297.1539917	751.6259155	288.883728	24.0561142	39.81894684	0.273040086	9.429467201
C.3.258	297.4289246	751.9140015	288.8621826	24.05583	39.79999161	0.272136122	9.434864998
C.3.259	297.1916504	749.7960815	288.621521	24.05632019	39.79076004	0.274070174	9.419742584
C.3.260	296.8884888	747.5370483	288.0402222	24.05647469	39.85344696	0.272988647	9.425135612
C.3.261	297.2133179	750.2687378	288.2208557	24.05599594	39.85296249	0.272116333	9.424139977
C.3.262	296.2476501	748.4768066	287.5749512	24.05603981	39.82380295	0.272850305	9.38415432
C.3.263	295.504425	747.5991211	287.081543	24.05606079	39.8140831	0.272702843	9.369986534
C.3.264	297.5033875	748.6495972	289.1022949	24.05603409	39.83352661	0.272392452	9.350829124
C.3.265	296.5550842	750.3770752	288.5161133	24.05605507	39.86072922	0.272323191	9.320843697
C.3.266	296.6452026	748.8430786	287.6398621	24.05567551	39.85296249	0.271646827	9.263259888
C.3.267	296.487793	747.6911621	288.3001404	24.05547905	39.88260269	0.271820456	9.219218254
C.3.268	296.2710266	748.086731	287.3988953	24.05553055	40.13870239	0.272553116	9.186183929

Point	P EV2 in	P valve inlet	P EV2 out	Voltage	T oil	HTF mass flow	T HTF in
C.3.269	295.5674438	748.0919189	286.9112244	24.05540085	40.20479584	0.273427218	9.168694496
C.3.270	296.2042847	747.8638916	286.8957214	24.05526543	40.23783875	0.273007095	9.150214195
C.3.271	297.1776733	750.8724365	288.2702637	24.05528069	40.25727463	0.271908998	9.130660057
C.3.272	297.8558655	749.4761353	288.5224304	24.05526924	40.2650528	0.27335608	9.098504066
C.3.273	296.6101379	749.9122314	288.4017944	24.05511475	40.27477264	0.271492839	9.096176147
C.3.274	296.3890991	749.4649048	287.7145386	24.0553894	40.25436401	0.272770137	9.086898804
C.3.275	296.5559387	750.4093018	288.5250244	24.05533981	40.24560928	0.273584336	9.096327782
C.3.276	297.7862854	750.8428345	289.2803345	24.05535507	40.24415588	0.27304256	9.148312569
C.3.277	298.0857544	751.638855	289.6560059	24.05509567	40.24512863	0.273577511	9.175065041
C.3.278	297.6630859	752.0151978	289.0569153	24.05530548	40.21013641	0.272118956	9.202970505
C.3.279	297.2104797	748.7571411	288.427948	24.05525589	40.22034454	0.273250222	9.201414108
C.3.280	297.203064	750.0315552	288.8969421	24.05537987	40.21646118	0.271882504	9.224323273
C.3.281	298.2708435	751.8136597	290.1646423	24.05529022	40.21014023	0.272338957	9.203004837
C.3.282	298.1636047	752.0200806	289.1594238	24.0555954	40.19945145	0.272853345	9.221388817
C.3.283	297.8501892	750.5550537	288.6488037	24.05555534	40.14356232	0.272396237	9.1986866
C.3.284	297.736084	747.8883667	289.039093	24.05536079	40.133358	0.272809505	9.207695007
C.3.285	297.0071411	750.3311157	288.8662109	24.05556488	40.08913422	0.272665858	9.241602898
C.3.286	298.7693787	752.1586304	290.4788208	24.05575943	40.03227997	0.273089647	9.232385635
C.3.287	298.3372803	748.1419067	289.5397034	24.05566025	40.0138092	0.272184938	9.215781212
C.3.288	297.629425	749.8731689	288.9770508	24.05590057	40.01137924	0.272276521	9.202576637
C.3.289	298.1912842	749.4143066	289.3960876	24.05591965	39.98563004	0.272624969	9.208695412
C.3.290	298.6983643	749.414917	289.437439	24.05599022	39.96667481	0.271456242	9.206648827
C.3.291	297.7486572	751.7121582	289.2493286	24.05609512	39.94917679	0.271911949	9.204264641
C.3.292	297.6191711	749.2021484	288.843811	24.05579948	39.91224289	0.272598386	9.198934555
C.3.293	297.3465271	749.1118774	289.2926941	24.05602455	39.88794708	0.272634655	9.179493904
C.3.294	297.7212524	750.7304077	289.3004456	24.05620575	39.9248848	0.272176981	9.181207657
C.3.295	299.1010437	749.6138306	290.5428772	24.05588913	39.99048615	0.27258411	9.211952209
C.3.296	298.9456177	752.7404785	290.6738281	24.05591583	39.9438324	0.273752719	9.201026917
C.3.297	298.5246582	750.9342651	289.7978821	24.05596924	39.93799973	0.273343772	9.199563026
C.3.298	298.6190796	751.0363159	289.7415771	24.05586433	39.9705658	0.271518111	9.196200371
C.3.299	298.3181763	750.7508545	289.3865967	24.05595589	39.98222351	0.273824245	9.207125664
C.3.300	297.5792236	750.7439575	289.4503784	24.05621529	39.98416519	0.272816241	9.206029892
C.3.301	298.2343445	748.4607544	289.5241699	24.05584908	40.06532288	0.273050845	9.271367073
C.3.302	297.5800781	749.0388794	288.8914795	24.05567551	40.16980362	0.272995353	9.305521965
C.3.303	299.7478943	751.6224976	290.9535828	24.05562019	40.20333099	0.273988366	9.279372215
C.3.304	298.7342834	750.1470947	290.1264343	24.05523491	40.22714233	0.272805572	9.32143116
C.3.305	298.7827759	752.0200806	290.4139099	24.05525589	40.22568893	0.272151142	9.337942123
C.3.306	298.6498718	751.1486816	290.2243652	24.05517006	40.19847488	0.272859395	9.30599308
C.3.307	298.0763245	748.9750366	289.3076172	24.05519486	40.18146515	0.27215153	9.272304535
C.3.308	297.7463684	747.7190552	288.5448303	24.05528069	40.16883087	0.272388756	9.245738029
C.3.309	296.9666443	747.885498	288.7079468	24.05537987	40.16008377	0.27275306	9.211449623
C.3.310	297.3667603	747.196106	288.311615	24.05508041	40.11683655	0.273333669	9.20301342
C.3.311	298.7636719	747.6256104	289.9153442	24.05588532	40.06775665	0.272755682	9.22042942
C.3.312	299.1786194	748.6766357	289.9259644	24.05537987	39.99971771	0.271983922	9.211440086
C.3.313	298.2736816	749.4893799	289.2051086	24.05566025	39.93362808	0.272718847	9.225590706
C.3.314	297.9887695	751.671936	289.7530823	24.05546951	39.90398789	0.272381604	9.232182503
C.3.315	298.2477417	748.340271	289.74646	24.05555916	40.0123558	0.272596091	9.242609024
C.3.316	297.9599915	749.3585205	289.8400879	24.05545998	40.06921387	0.273283869	9.233260155
C.3.317	298.1231079	749.4850464	289.5080872	24.0553894	40.06192398	0.271955937	9.247711182
C.3.318	297.9403076	749.9306641	289.5733032	24.05553055	40.06386566	0.272873104	9.240058899
C.3.319	298.4519348	749.3654175	289.579895	24.05506516	40.07552719	0.273632079	9.227372169
C.3.320	299.8331604	750.473999	291.0980225	24.05550957	40.08816147	0.27296713	9.248005867
C.3.321	299.4444275	750.8270264	290.6482849	24.05558586	40.16300201	0.271543443	9.24672699
C.3.322	299.8320313	751.4192505	290.8022156	24.0557003	40.20187759	0.272519797	9.25105381
C.3.323	299.5254211	752.3748169	290.657196	24.05563545	40.27282333	0.272771209	9.283313751
C.3.324	298.3301697	748.1028442	290.0684204	24.05563927	40.26407623	0.271513432	9.283306122
C.3.325	298.4847412	750.8060303	290.0210266	24.05579567	40.27234268	0.271441877	9.27249527
C.3.326	300.0966797	750.1531372	291.3346863	24.05598068	40.24269486	0.273287147	9.292618752
C.3.327	299.4216309	748.9060669	290.7798157	24.05576515	40.25241852	0.272434533	9.297643661
C.3.328	299.3309326	751.8651123	290.4277039	24.05583	40.23249435	0.273001283	9.294204712
C.3.329	298.6641235	749.4111328	290.4429321	24.05608559	40.24609757	0.270509422	9.288504601
C.3.330	298.9082642	746.598999	290.2243652	24.05602074	40.22568893	0.272127748	9.315128326
C.3.331	300.1691284	750.9733276	291.4960938	24.05592918	40.22034454	0.272958696	9.316039085
C.3.332	299.8134766	748.8134766	291.1448364	24.05571556	40.22763062	0.272415012	9.307292938
C.3.333	299.1364136	750.651062	290.5905457	24.05576515	40.21645355	0.272789508	9.341779709
C.3.334	301.3837891	751.6078491	292.100647	24.05589485	40.19167328	0.27202487	9.336751938
C.3.335	300.7623291	749.6558228	291.8401489	24.05403519	40.18486404	0.272016823	9.312895775

Point	P EV2 in	P valve inlet	P EV2 out	Voltage	T oil	HTF mass flow	T HTF in
C.3.336	300.036499	756.0316162	291.8094177	24.05556488	40.19944763	0.272627354	9.323196411
C.3.337	300.2712402	749.8265991	291.239624	24.05535507	40.20333099	0.272697121	9.297244072
C.3.338	298.8255615	748.6953125	289.8734131	24.05530548	40.20673752	0.272704661	9.25606823
C.3.339	298.3002319	748.1033936	289.5807495	24.05520058	40.22131729	0.272491813	9.217656136
C.3.340	299.4025269	747.1820068	290.8829346	24.05516052	40.22180557	0.272890419	9.196996689
C.3.341	299.3009949	750.1413574	290.9257202	24.05517006	40.19944763	0.271513104	9.180896759
C.3.342	298.7693787	748.3296509	290.8386841	24.05488014	40.17271805	0.273031801	9.163372993
C.3.343	299.6437988	748.5993042	291.0497742	24.05506516	40.14258957	0.272178054	9.159850121
C.3.344	301.6923828	750.288269	292.6078491	24.05528069	40.09156799	0.272403866	9.157581329
C.3.345	300.7697449	751.8415527	292.1448669	24.05525589	40.07649994	0.272666991	9.179422379
C.3.346	300.9437256	752.8184204	292.5392151	24.05529594	40.07261276	0.272299826	9.211829185
C.3.347	301.4023132	752.5096436	292.5458069	24.05533981	40.05754471	0.273141176	9.230707169
C.3.348	300.5093689	753.2510986	292.1454468	24.0553894	40.05900192	0.272700131	9.249055862
C.3.349	300.616333	750.527771	291.7416382	24.05537415	40.02935791	0.274086833	9.260484695
C.3.350	299.865387	750.5691528	291.9056396	24.05511475	40.04151154	0.272714913	9.262042999
C.3.351	300.0818481	749.8049927	291.6235962	24.05532455	40.05074692	0.27179569	9.26453495
C.3.352	299.5553894	748.7053833	290.9909058	24.05574036	40.01818085	0.273257673	9.262571335
C.3.353	300.97052	747.7802734	291.9581909	24.05554009	39.99388504	0.2727561	9.286646843
C.3.354	300.1277771	747.6819458	291.9073486	24.05561447	39.99534226	0.272186339	9.278463364
C.3.355	299.877655	746.9989014	291.1445618	24.05574989	40.28351975	0.272909552	9.27798748
C.3.356	301.087738	751.2180176	293.1598511	24.05555534	40.4016037	0.272481143	9.282239914
C.3.357	301.5172729	748.331665	293.1411743	24.05578423	40.42638397	0.272316545	9.285171509
C.3.358	301.0075989	751.0455322	292.4961243	24.05586433	40.44291306	0.272992402	9.298529625
C.3.359	301.7554016	749.1627808	292.7770081	24.05569458	40.45991898	0.27263695	9.321725845
C.3.360	301.6629944	749.9671631	292.8981934	24.05587578	40.43999481	0.271799773	9.319162369
C.3.361	300.9491577	749.9188843	292.3947449	24.05594444	40.42298889	0.271781325	9.309247971
C.3.362	301.3860779	748.2106323	292.9814758	24.05581474	40.40597916	0.273105651	9.34057045
C.3.363	300.8772888	748.156311	292.6040955	24.05600548	40.39869309	0.272735685	9.333723068
C.3.364	301.190979	748.8494263	293.0308838	24.05579948	40.41473007	0.27267921	9.298602104
C.3.365	302.8226013	752.4904175	294.169342	24.0557251	40.39480209	0.273317903	9.328531265
C.3.366	302.3697205	749.710144	293.9237976	24.05577469	40.35933304	0.272484332	9.335402489
C.3.367	302.225708	752.3831787	293.676239	24.05552483	40.3525238	0.273051083	9.344120979
C.3.368	302.3084106	751.5560913	294.1532593	24.05554009	40.33745956	0.27220431	9.351896286
C.3.369	301.9581909	749.6132813	293.0593262	24.0554409	40.34037399	0.272921681	9.329185486
C.3.370	300.7415161	748.9333496	292.0340271	24.05523491	40.31899262	0.272717118	9.296376228
C.3.371	301.1325378	750.2537842	292.2554626	24.05529594	40.29809952	0.271785676	9.293210983
C.3.372	301.826416	749.8009644	292.9662781	24.05521584	40.26651001	0.27235955	9.260083199
C.3.373	301.2169495	749.0342407	292.4544678	24.05511093	40.25193024	0.272084594	9.189165115
C.3.374	301.2788391	748.607666	292.3803711	24.05499458	40.24075317	0.272956789	9.177043915
C.3.375	302.1281433	751.1636353	293.2451477	24.05575562	40.23492813	0.273598611	9.159366608
C.3.376	302.1809082	749.6434326	293.3778381	24.0551548	40.24172211	0.271398485	9.160524368
C.3.377	302.262207	752.2095337	293.6968994	24.05503464	40.21839905	0.272961408	9.180361748
C.3.378	302.5690613	750.5550537	293.4312439	24.0551796	40.19701767	0.273109406	9.17438221
C.3.379	301.9915466	750.1842041	293.2669678	24.05537987	40.18924332	0.27278623	9.224023819
C.3.380	301.868042	750.1707153	293.3034363	24.05516052	40.16640472	0.272460788	9.233470917
C.3.381	301.4750671	749.8639526	293.2103882	24.05536079	40.15863037	0.271860331	9.228760719
C.3.382	301.7000732	749.583374	292.9639587	24.05523491	40.1508522	0.27390787	9.245631218
C.3.383	301.016449	749.4732666	292.6147461	24.05510521	40.1523056	0.273028105	9.226611137
C.3.384	301.5357971	748.9414063	293.262085	24.05536079	40.11634827	0.272462279	9.255374908
C.3.385	303.4953918	750.6947632	294.7339783	24.0554409	40.09204865	0.27203536	9.278179169
C.3.386	302.8884888	750.4337158	294.6682129	24.05533028	40.04636765	0.272657633	9.262823105
C.3.387	302.9081726	752.1879883	293.7632446	24.05542564	40.04783249	0.272492707	9.273171425
C.3.388	302.4538574	748.7588501	294.2061157	24.05574036	40.02595902	0.273045331	9.270819664
C.3.389	302.1609497	748.4081421	293.720459	24.05546951	40.02547836	0.271924168	9.269931793
C.3.390	304.5831604	750.7243652	295.9485474	24.05565453	40.02255631	0.27127409	9.291448593
C.3.391	304.1849976	752.5185547	295.6303406	24.05574036	40.01867676	0.273990154	9.299983025
C.3.392	303.7027283	753.3830566	295.0283508	24.05563545	40.01381302	0.271649301	9.284870148
C.3.393	304.3133545	754.3639526	295.8971558	24.05578041	40.01915741	0.272808701	9.312519073
C.3.394	303.8946838	749.7811279	295.2474976	24.05554581	39.99728775	0.272990018	9.324374199
C.3.395	303.420105	749.3030396	294.6995239	24.05557442	40.02353287	0.273079455	9.312774658
C.3.396	303.500824	748.8721313	294.3543091	24.05558014	40.00944138	0.272747993	9.313878059
C.3.397	305.3489075	749.0141602	296.1286316	24.05555534	40.00846863	0.271864116	9.34757328
C.3.398	305.2114563	748.7223511	296.3244934	24.05546951	39.99145508	0.272972077	9.339823723
C.3.399	304.8167114	749.6627197	296.3623962	24.05559921	40.01283646	0.272363573	9.355630875
C.3.400	306.1303406	753.0561523	297.2205505	24.0554142	40.03811264	0.272288889	9.352510452
C.3.401	305.5180359	750.3483276	297.079834	24.05509949	40.01041031	0.272576481	9.349153519
C.3.402	305.1307373	751.7711182	297.0332947	24.05526543	39.99437714	0.273368537	9.326025009

Point	P EV2 in	P valve inlet	P EV2 out	Voltage	T oil	HTF mass flow	T HTF in
C.3.403	305.106781	751.0164795	296.2506714	24.0541954	40.02061081	0.272450447	9.309952736
C.3.404	304.4901733	752.4219971	295.9715271	24.05484009	40.30733109	0.273520499	9.25706768
C.3.405	304.5865784	750.5044556	295.8988647	24.05476952	40.43465042	0.271746278	9.224711418
C.3.406	304.2825623	750.2324829	295.6489868	24.05479431	40.49442673	0.272609323	9.218830109
C.3.407	304.4693604	751.1420898	295.3169861	24.05463409	40.51435089	0.273858219	9.181461334
C.3.408	303.3354187	751.4796143	294.4513855	24.05465508	40.56148911	0.273521811	9.14315033
C.3.409	303.6314392	749.7331543	295.0142822	24.05475044	40.5682869	0.270274937	9.130247116
C.3.410	303.8327942	747.0678711	294.999939	24.05462074	40.56391907	0.273334146	9.154641151
C.3.411	303.5133667	747.7399902	295.0567932	24.0547657	40.56051254	0.272766858	9.141457558
C.3.412	305.4775391	749.3220215	296.2900391	24.05475998	40.552742	0.272862613	9.18046093
C.3.413	305.2419434	748.7404785	296.6073914	24.05473518	40.55662918	0.272077948	9.202015877
C.3.414	305.0985107	751.5736084	296.5737915	24.05493546	40.53913117	0.272194386	9.207616806
C.3.415	307.1950073	753.1245728	298.429657	24.05500412	40.51823044	0.272669613	9.228362083
C.3.416	306.9742432	752.9940796	298.5301819	24.05494499	40.5211525	0.272211373	9.248605728
C.3.417	306.4948425	751.8481445	297.9376831	24.05495071	40.51580429	0.272399664	9.24269104
C.3.418	306.9445801	750.1241455	298.009491	24.05357933	40.48032761	0.272385627	9.214394569
C.3.419	306.357666	751.713623	297.644165	24.05508041	40.45797348	0.27291888	9.233034134
C.3.420	305.9555359	751.1190796	297.2567444	24.05504036	40.42736054	0.273739159	9.217139244
C.3.421	305.6734619	748.9546509	297.3693237	24.05513573	40.39480209	0.272790879	9.204977989
C.3.422	305.6708984	749.451416	296.9100952	24.05525589	40.36856079	0.273837864	9.237895966
C.3.423	306.6722412	751.4364624	298.3196716	24.05519486	40.32336807	0.272515923	9.200154305
C.3.424	306.5230713	750.6956177	297.7823181	24.05536079	40.28108978	0.272891074	9.214502335
C.3.425	306.3374023	751.1849365	297.8027039	24.05541039	40.22666168	0.273746312	9.213114738
C.3.426	305.9546814	749.5198364	297.2891846	24.05556488	40.16494751	0.272767425	9.215346336
C.3.427	306.4614563	746.7588501	296.6438599	24.05574417	40.15279388	0.272583723	9.181260109
C.3.428	305.9452515	748.1807251	296.9408264	24.05583954	40.14307404	0.273637742	9.191576958
C.3.429	306.4897156	749.7113037	297.5227051	24.05553055	40.13043976	0.272743315	9.188806534
C.3.430	307.3892212	749.6546631	298.2053528	24.05562019	40.10225678	0.271774173	9.174396515
C.3.431	307.6667175	749.1343384	298.956665	24.05569458	40.08718872	0.272990853	9.165215492
C.3.432	307.7246094	749.6629639	298.1502075	24.05533409	40.08524704	0.273106128	9.192887306
C.3.433	307.8483887	749.730835	298.627533	24.05534554	40.05852127	0.272424936	9.183621407
C.3.434	306.9534302	751.7265625	298.106842	24.05547524	40.05463409	0.272556156	9.17457962
C.3.435	306.399292	751.4580688	297.4029236	24.05528069	40.03227615	0.272145957	9.180859566
C.3.436	306.6317444	749.0491943	297.767395	24.05506516	40.01964569	0.272823632	9.170247078
C.3.437	306.7238464	751.1262817	297.8564148	24.05508423	40.01089096	0.271918774	9.175164223
C.3.438	308.8597107	751.5267334	300.0842285	24.05508041	39.9909668	0.272916347	9.160028458
C.3.439	307.8649292	751.2602539	299.7619934	24.05500984	39.98027802	0.272038877	9.163975716
C.3.440	307.2183838	752.3610229	298.1654358	24.05499077	39.96910095	0.273105562	9.171925545
C.3.441	307.6938171	751.4085693	298.4443054	24.05475998	39.96910858	0.273797512	9.180480957
C.3.442	307.2118225	748.5532837	297.8885803	24.05477905	39.93946457	0.273846239	9.15913868
C.3.443	306.5287781	749.5137939	298.1645813	24.05486488	39.99243164	0.272335172	9.131035805
C.3.444	307.7984924	746.1266479	299.1896057	24.05458069	39.98125458	0.271958888	9.13812542
C.3.445	307.3173523	750.5194092	298.9759216	24.05508041	39.94091797	0.272256911	9.131822586
C.3.446	307.3327637	749.6175537	299.2269287	24.05496407	39.91808319	0.273016304	9.117962837
C.3.447	307.252594	751.7030029	298.0109253	24.05521965	39.90787506	0.27249977	9.133465767
C.3.448	307.0292969	750.9989014	298.1166077	24.05518532	39.96375656	0.272860795	9.130267143
C.3.449	307.2337952	749.3096924	298.1025391	24.05521584	39.95112228	0.272559434	9.116182327
C.3.450	307.095459	750.6082153	298.3768311	24.05529022	39.89183044	0.2728526	9.117285728
C.3.451	307.5098572	749.239502	298.2834778	24.05511093	39.87871552	0.272520781	9.127206802
C.3.452	306.894104	749.8421021	298.4796448	24.05523491	39.87434387	0.272247374	9.090354919
C.3.453	307.0669556	749.1150513	298.2165527	24.05534554	39.8860054	0.273341715	9.095061302
C.3.454	306.9828186	750.2428589	298.5123901	24.05534554	40.04880142	0.272739202	9.103226662
C.3.455	306.9234924	750.246582	297.9773254	24.05559921	40.0721283	0.273070842	9.093185425
C.3.456	307.3421631	748.5236816	298.4968567	24.05578041	40.02402115	0.272065639	9.088990211
C.3.457	307.1861572	749.0319824	297.9457397	24.0561142	39.97104645	0.272941053	9.081777573
C.3.458	308.4986572	749.6828003	299.1439209	24.05566979	39.92682648	0.27224952	9.062822342
C.3.459	308.2151489	751.1654053	299.4880066	24.05558586	39.87288284	0.271112025	9.07343483
C.3.460	308.2411194	751.1716919	298.9207764	24.05595017	39.64253998	0.272630394	9.078258514
C.3.461	307.9778748	749.5292969	298.8027344	24.05583	39.46370316	0.273166686	9.050537109
C.3.462	307.8580933	749.3961792	299.077301	24.05594444	39.50161362	0.272945642	9.048752785
C.3.463	308.4378967	749.7647705	299.1560059	24.05604935	39.84616089	0.27258411	9.045128822
C.3.464	307.2443237	748.826416	298.3920288	24.05581474	39.99437714	0.272351742	9.034425735
C.3.465	307.8244324	747.7127075	298.8986511	24.05583572	40.04296875	0.272693157	9.021239281
C.3.466	308.3186951	748.1442261	298.8093567	24.05599976	40.06774902	0.272645593	9.038647652
C.3.467	307.9399414	749.0773926	299.500061	24.05551529	40.07698822	0.273110151	9.023323059
C.3.468	309.2917786	751.4324341	300.3501587	24.05574989	40.1192627	0.272479594	9.024280548
C.3.469	308.937561	751.895874	299.7596741	24.05575562	40.13287354	0.272131354	9.024066925

Point	P EV2 in	P valve inlet	P EV2 out	Voltage	T oil	HTF mass flow	T HTF in
C.3.470	309.553009	753.2669067	300.712616	24.05544472	40.1702919	0.271677524	9.028338432
C.3.471	308.7313538	751.3574219	300.1873169	24.0555706	40.19410324	0.272162855	9.019175529
C.3.472	308.1230469	750.2698975	299.0819092	24.05514526	40.21986008	0.272818059	9.035525322
C.3.473	309.0776062	750.4506836	299.9466553	24.05518532	40.23297882	0.273552746	9.015859604
C.3.474	309.5142212	748.7338257	300.4762573	24.05528069	40.24755478	0.273582697	9.023712158
C.3.475	309.2743835	749.5965576	300.6379395	24.05516434	40.33648682	0.27209869	9.02144146
C.3.476	309.0396729	751.5215454	299.8817444	24.05484009	40.34814835	0.272724837	9.027543068
C.3.477	308.6965637	749.3295288	299.6020203	24.05495071	40.34037781	0.272257477	9.006225586
C.3.478	308.9595337	749.0328369	299.4980469	24.05478478	40.34474945	0.272467434	9.00200367
C.3.479	309.5481873	751.5969238	300.8493347	24.0547657	40.37002182	0.272111923	9.012799263
C.3.480	310.1984253	751.6687622	301.1632385	24.05534554	40.35301209	0.272002876	9.016709328
C.3.481	309.6636658	751.9763794	300.9219971	24.05517578	40.34523392	0.273249805	8.98843956
C.3.482	310.1251221	750.2086182	300.2203674	24.05524445	40.35495758	0.272916019	8.98114872
C.3.483	309.9257813	750.524292	301.1287842	24.05547905	40.34912109	0.272599638	8.991087914
C.3.484	310.0643921	749.2119141	300.436615	24.05533409	40.37584686	0.273224771	9.004421234
C.3.485	309.7774658	748.2192383	301.4007568	24.05546951	40.37924957	0.272081226	8.993211746
C.3.486	309.7067566	749.6239014	301.1425476	24.05540466	40.36904526	0.272890419	8.997151375
C.3.487	310.3467407	750.6424561	300.5437317	24.05554009	40.40258026	0.272505939	8.977210045
C.3.488	310.0104675	751.24646	300.9136658	24.05532455	40.42493439	0.272903234	8.963181496
C.3.489	310.3684082	750.3776855	301.7252808	24.05562019	40.42298889	0.272884667	8.976721764
C.3.490	310.1550903	748.8206787	301.4139709	24.0552845	40.45991898	0.273697495	8.98408699
C.3.491	309.4751587	749.2355347	301.0621338	24.0554657	40.44922638	0.272356331	8.963253021
C.3.492	309.7326965	746.253418	300.6675415	24.05551529	40.43902588	0.272877216	8.978179932
C.3.493	311.3965454	748.4377441	302.1563721	24.05582428	40.44048309	0.27396825	8.96844101
C.3.494	311.0794067	750.2097778	302.316925	24.05553436	40.44485855	0.273820966	8.959401131
C.3.495	312.2105103	750.9500732	302.6463318	24.05586052	40.43659592	0.272892892	8.968532562
C.3.496	311.5157471	750.7149048	302.530304	24.05590057	40.43222427	0.273283362	8.953630447
C.3.497	311.8023987	750.3432007	302.9315186	24.05573082	40.46575165	0.272847682	8.9554739
C.3.498	312.1560364	749.3085327	303.4777832	24.05577087	40.45991898	0.273039579	8.961192131
C.3.499	311.4672852	749.2967529	302.8692017	24.05595589	40.49053955	0.272732705	8.981996536
C.3.500	311.8742676	749.7161865	302.4045105	24.05563927	40.47450256	0.273800284	8.973167419
C.3.501	312.0653381	750.8109131	303.0308838	24.05578423	40.46429443	0.273210764	8.94034481
C.3.502	311.2733459	750.3311157	302.1655579	24.05571938	40.45311737	0.272399902	8.939464569
C.3.503	311.2579346	749.3991089	302.2287292	24.05601502	40.48324966	0.272991687	8.962567329
C.3.504	311.763031	749.2271729	302.9958496	24.05583954	40.49053955	0.272825181	8.942797661
C.3.505	311.6184387	751.6376953	302.6469116	24.05594063	40.48470688	0.271974057	8.953810692
C.3.506	313.1145935	751.0437622	304.0814819	24.05558586	40.53232575	0.273631513	8.963077545
C.3.507	312.1805725	752.18396	303.0897827	24.05534554	40.57460022	0.272621632	8.956263542
C.3.508	312.562439	749.8800659	304.0042114	24.05531502	40.58578491	0.27286014	8.963432312
C.3.509	311.4823914	750.4627686	302.5337524	24.05378914	40.57946396	0.274178237	8.950596809
C.3.510	311.3106995	748.4480591	302.4883728	24.05531502	40.58626938	0.272371948	8.942049026
C.3.511	311.6672058	751.0374756	302.3209229	24.05503082	40.55322266	0.273217082	8.931705475
C.3.512	312.957428	752.2808228	303.4967346	24.05483437	40.52309418	0.27367869	8.939273834
C.3.513	311.7388	747.5933838	302.90625	24.0550251	40.52406311	0.273071766	8.946048737
C.3.514	312.3006287	748.0890503	303.6325684	24.05497932	40.52309418	0.273699045	8.931302071
C.3.515	311.6355591	748.9350586	302.5127869	24.05500412	40.49539566	0.27193436	8.940371513
C.3.516	311.8468628	748.7600098	302.8468018	24.0555706	40.51677704	0.272376269	8.93227005
C.3.517	312.3519592	751.1587524	303.1698914	24.05501556	40.48276138	0.271456718	8.936123848
C.3.518	312.3713684	750.9457397	303.8235779	24.05508423	40.46040726	0.272108138	8.937491417
C.3.519	312.6237488	750.151123	303.0426636	24.0552845	40.49491501	0.272235811	8.948297501
C.3.520	312.1486206	749.9453125	303.175354	24.05506516	40.48081589	0.272789657	8.925510406
C.3.521	311.6646423	750.1528931	302.3800964	24.05528069	40.52406693	0.272706389	8.913232803
C.3.522	312.619751	751.770813	303.4855347	24.05518532	40.47595215	0.272613078	8.928930283
C.3.523	312.4101563	750.8120728	303.2227478	24.05610085	40.44582748	0.273519516	8.906158447
C.3.524	313.158783	748.5349121	304.2816467	24.05545044	40.43708038	0.27292487	8.893697739
C.3.525	312.77948	750.6864624	303.2416992	24.0554142	40.46964264	0.271387726	8.902979851
C.3.526	312.9717102	750.2293091	303.9729004	24.05574036	40.44777298	0.273969412	8.90801239
C.3.527	312.302063	748.65625	302.9295044	24.05574417	40.45651627	0.272619724	8.888074875
C.3.528	312.6788025	748.2017212	303.7612305	24.05599976	40.45798111	0.273037881	8.886710167
C.3.529	313.150238	748.383667	304.0576172	24.05587006	40.44242859	0.273260564	8.882829666
C.3.530	313.197876	748.4176025	303.9875488	24.05599594	40.42930222	0.273684353	8.900830269
C.3.531	313.1011658	750.4659424	303.3660584	24.05574417	40.41569519	0.273190498	8.870373726
C.3.532	313.0278931	749.067627	303.982666	24.05575562	40.40403748	0.272351265	8.895212173
C.3.533	313.5888672	749.7414551	304.1173706	24.05570984	40.41570282	0.273134351	8.874391556
C.3.534	312.641449	750.2284546	303.3066101	24.05567932	40.43708038	0.27292949	8.877735138
C.3.535	313.370697	750.1203613	304.2893982	24.05562973	40.46866989	0.272288084	8.902281761
C.3.536	312.6810913	751.1237183	303.5220032	24.05560494	40.47401428	0.273512363	8.904548645

Point	P EV2 in	P valve inlet	P EV2 out	Voltage	T oil	HTF mass flow	T HTF in
C.3.537	312.6077881	748.7991333	303.8258667	24.05529022	40.50608826	0.273546517	8.876256943
C.3.538	312.8399353	750.0565796	303.4619751	24.0554657	40.50511551	0.273504585	8.910172462
C.3.539	313.2888489	748.6223145	304.1391907	24.05514526	40.50802994	0.272491485	8.899440765
C.3.540	313.0136108	748.8180542	304.2529297	24.05501938	40.53670502	0.272434801	8.900346756
C.3.541	313.1191406	749.9740601	304.5007935	24.05501938	40.52017593	0.272712111	8.894147873
C.3.542	313.5001831	748.432251	303.6986389	24.0550499	40.50608444	0.27278015	8.906430244
C.3.543	313.1599426	748.2143555	304.0401001	24.05485535	40.50171661	0.273263663	8.875391006
C.3.544	313.1835938	748.7496338	304.2270813	24.05488586	40.48130417	0.273370504	8.887185097
C.3.545	313.1856079	749.4821777	304.1794128	24.05491447	40.4667244	0.273494244	8.883131027
C.3.546	313.0310364	749.8846436	303.6722107	24.05481911	40.46138001	0.272296369	8.858780861
C.3.547	313.7882385	747.6000366	304.3781433	24.05472946	40.48519135	0.272760779	8.856630325
C.3.548	314.2944641	750.1123047	304.5045166	24.05507088	40.48470306	0.271993756	8.881578445
C.3.549	313.1958618	750.5366821	304.2354126	24.05516434	40.45991898	0.272766769	8.876442909
C.3.550	313.3156433	748.9555054	304.5139771	24.05491066	40.49588013	0.2725555	8.85859108
C.3.551	313.0720825	747.630188	303.9935913	24.05498505	40.47984695	0.273152262	8.886774063
C.3.552	312.9246521	748.350647	304.298584	24.05361557	40.5090065	0.271710098	8.89169693

Point	CP HTF	T HTF out	Capacity - HTF	T ref out	h refrigerant out	h refrigerant in	T refrigerant inlet
C.3.1	3335.157959	7.675458908	1555.258423	6.116690159	404.3856506	240.3278046	-0.39681381
C.3.2	3335.13623	7.670341969	1557.374634	6.12127161	404.3737793	240.3087311	-0.303481877
C.3.3	3335.078857	7.652047157	1552.741821	6.120610237	404.3618774	240.3082581	-0.31615442
C.3.4	3335.085449	7.65529108	1558.841675	6.121108532	404.3713989	240.2901459	-0.220365584
C.3.5	3335.06665	7.63601017	1586.876099	6.114187717	404.3571777	240.2884521	-0.228322804
C.3.6	3335.027832	7.63099432	1575.539185	6.109579086	404.3381653	240.2867737	-0.229591236
C.3.7	3335.095459	7.651478767	1568.072388	6.111935139	404.3470764	240.2865295	-0.193458155
C.3.8	3335.035645	7.630782604	1573.890869	6.106570721	404.3262939	240.2848358	-0.178100705
C.3.9	3334.971191	7.610850811	1579.287109	6.102356434	404.3416138	240.2874756	-0.17683728
C.3.10	3334.962158	7.619534492	1565.699829	6.09318018	404.3325806	240.2930298	-0.173518077
C.3.11	3335.025879	7.619929314	1593.226074	6.103940487	404.3392639	240.271286	-0.201405227
C.3.12	3334.931885	7.608998299	1566.045898	6.084283352	404.3222656	240.2401733	-0.214259908
C.3.13	3334.814453	7.570930481	1581.203247	6.066222191	404.3032227	240.2225494	-0.186468348
C.3.14	3334.76416	7.549917698	1590.138428	6.047174454	404.2771301	240.2010498	-0.177532852
C.3.15	3334.713135	7.540594578	1580.765747	6.02938652	404.2640991	240.2111816	-0.175084919
C.3.16	3334.604736	7.521998405	1561.368042	6.013776779	404.2119141	240.208786	-0.186968178
C.3.17	3334.58667	7.507742882	1576.321411	5.999408722	404.2142029	240.1858521	-0.078672551
C.3.18	3334.536865	7.486327648	1595.267944	5.974714279	404.2160339	240.1592865	-0.120740369
C.3.19	3334.434814	7.465268612	1575.678711	5.961264133	404.2032471	240.1308289	-0.152588814
C.3.20	3334.471436	7.496749401	1541.78125	5.952514648	404.1902466	240.0936737	-0.142468795
C.3.21	3334.490967	7.481115818	1569.640015	5.933468342	404.1617432	240.0931854	-0.122666359
C.3.22	3334.452637	7.474578381	1566.301514	5.929290771	404.1610107	240.0840302	-0.138094589
C.3.23	3334.421631	7.451965332	1592.528198	5.923882484	404.1583862	240.0821075	-0.104727052
C.3.24	3334.440186	7.479194164	1554.093994	5.928781509	404.1647644	240.0866547	-0.096170262
C.3.25	3334.334717	7.445477486	1559.940552	5.915503979	404.1507874	240.072937	-0.111009747
C.3.26	3334.311035	7.440905571	1552.376099	5.911610126	404.1352234	240.0791931	-0.075416721
C.3.27	3334.311768	7.430687904	1574.183594	5.90623188	404.1116638	240.0758209	-0.107457787
C.3.28	3334.30542	7.430739403	1573.470215	5.901913643	404.1419373	240.0697784	-0.061396562
C.3.29	3334.427979	7.473789692	1554.372681	5.916963577	404.1408997	240.0736389	-0.079645634
C.3.30	3334.413818	7.449307919	1593.461792	5.931917667	404.131073	240.0656891	-0.115928806
C.3.31	3334.543213	7.489642143	1586.623901	5.939139366	404.165741	240.05336	-0.093627512
C.3.32	3334.704834	7.543822289	1569.971924	5.985538483	404.1261902	240.0085602	-0.083801664
C.3.33	3334.817871	7.569852352	1574.821289	6.012191772	404.1712036	239.9834442	0.197290361
C.3.34	3334.893799	7.56786108	1615.412964	6.035153389	404.196106	239.9533234	0.135761172
C.3.35	3334.956055	7.594792843	1605.308716	6.067689896	404.2348022	239.934494	0.073900476
C.3.36	3335.090576	7.641407967	1588.186646	6.092029572	404.2696228	239.9270172	0.075957134
C.3.37	3335.117188	7.64714241	1589.92334	6.106920242	404.2675781	239.905304	0.032849342
C.3.38	3335.177734	7.662317276	1581.963379	6.134501934	404.2810059	239.8804779	0.072222695
C.3.39	3335.235107	7.679539204	1588.557861	6.135857105	404.2909241	239.8756561	0.039120585
C.3.40	3335.218506	7.671885967	1592.611206	6.139866352	404.2918091	239.8710785	0.038642086
C.3.41	3335.216553	7.662593842	1606.550171	6.147489548	404.3085327	239.853241	0.073693484
C.3.42	3335.149658	7.655466557	1587.149292	6.143877983	404.302948	239.8498535	0.076947629
C.3.43	3335.112305	7.630977154	1619.165649	6.138380527	404.2984924	239.848175	0.074885316
C.3.44	3335.097168	7.627385139	1608.308594	6.137134075	404.315094	239.8392334	0.084494129
C.3.45	3335.05249	7.62741375	1584.413696	6.131458759	404.2954712	239.8213806	0.058558431
C.3.46	3335.032227	7.605820179	1620.751099	6.127951145	404.3183594	239.7859039	0.019942449
C.3.47	3335.034912	7.611443043	1617.558228	6.122855663	404.3058472	239.7502441	-0.036231406
C.3.48	3335.077881	7.639165878	1592.088257	6.119939804	404.2957459	239.6526337	-0.00539302
C.3.49	3335.121094	7.643350124	1591.888794	6.117975712	404.3149719	239.5726471	-0.026116386
C.3.50	3335.030518	7.638797283	1562.778198	6.108682632	404.2926636	239.5027771	-0.045872241
C.3.51	3334.923828	7.583810806	1608.665649	6.095141888	404.269165	239.4529266	-0.015898092
C.3.52	3334.918945	7.575946808	1619.532227	6.084862709	404.2673645	239.4180145	-0.014033195
C.3.53	3334.815918	7.555566311	1602.264771	6.069932461	404.2375183	239.4069519	0.015344352
C.3.54	3334.894287	7.589913845	1577.61084	6.070491314	404.2398987	239.3956146	0.03481511
C.3.55	3334.761475	7.547028065	1593.508057	6.05267334	404.1827393	239.3864899	0.242068097
C.3.56	3334.783447	7.55173254	1590.732788	6.043531895	404.1942749	239.3804779	0.21202676
C.3.57	3334.713623	7.525727272	1604.261597	6.03273201	404.1859741	239.3816834	0.112325668
C.3.58	3334.614746	7.523159981	1562.340454	6.014053822	404.1632996	239.3920288	0.135698423
C.3.59	3334.570068	7.484324932	1606.560181	6.000083923	404.1561584	239.384079	0.146683499
C.3.60	3334.626465	7.505238056	1594.408203	5.987009048	404.1175537	239.3744812	0.148601189
C.3.61	3334.437744	7.448144913	1608.089966	5.978123665	404.1194153	239.385788	0.166440189
C.3.62	3334.422119	7.454193115	1586.879883	5.959949017	404.1139221	239.3881836	0.173429176
C.3.63	3334.543457	7.525716305	1525.33313	5.945293427	404.090271	239.3867798	0.183437645
C.3.64	3334.423096	7.460934162	1579.820068	5.932693481	404.0692749	239.3807373	0.210659578
C.3.65	3334.351318	7.44100523	1577.180908	5.928901672	404.0879211	239.3802795	0.197361171
C.3.66	3334.425781	7.459874153	1582.530762	5.928889751	404.0736694	239.3809814	0.18381916
C.3.67	3334.357178	7.421386242	1617.393677	5.924412727	404.0851746	239.3742218	0.160154119

Point	CP HTF	T HTF out	Capacity - HTF	T ref out	h refrigerant out	h refrigerant in	T refrigerant inlet
C.3.68	3334.440918	7.458920002	1588.6875	5.932984352	404.098053	239.3703613	0.146215037
C.3.69	3334.465576	7.458145142	1605.97522	5.936404228	404.1037903	239.3419495	0.157414913
C.3.70	3334.51001	7.468365192	1603.595581	5.949509621	404.1111755	239.3118591	0.104859278
C.3.71	3334.630127	7.539597511	1549.092163	5.954596996	404.0871887	239.2974243	0.280971527
C.3.72	3334.495361	7.467509747	1606.029907	5.952517509	404.1046448	239.2733765	0.185319558
C.3.73	3334.525391	7.478180885	1601.109619	5.953308582	404.0978699	239.2661438	0.169617683
C.3.74	3334.493408	7.472371101	1591.874146	5.953490734	404.0985107	239.2661438	0.162008628
C.3.75	3334.559814	7.482280731	1605.220825	5.961997509	404.0974121	239.2389526	0.179318815
C.3.76	3334.711426	7.53668642	1582.507935	5.982122421	404.0968018	239.2254944	0.195057899
C.3.77	3334.570801	7.485619068	1604.041626	5.9900527	404.1036682	239.2334137	0.282966614
C.3.78	3334.631348	7.49542284	1618.648193	6.003305912	404.1093445	239.2375488	0.265560895
C.3.79	3334.730957	7.522203922	1625.268677	6.006145954	404.1246643	239.2307739	0.245828554
C.3.80	3334.728516	7.514248848	1637.238403	6.015704155	404.1323853	239.2290802	0.242007345
C.3.81	3334.878662	7.56976366	1609.360962	6.043848515	404.1582947	239.2247314	0.256735593
C.3.82	3334.946045	7.581720352	1622.515015	6.065149784	404.1743469	239.1972961	0.190516219
C.3.83	3334.973877	7.591275215	1621.831421	6.083420277	404.2136536	239.140274	0.196299255
C.3.84	3335.03833	7.617087841	1602.085449	6.093666077	404.1980591	239.1109314	0.221747264
C.3.85	3335.068115	7.611075878	1634.650879	6.108695984	404.2210083	239.094101	0.211070985
C.3.86	3334.989014	7.589323997	1624.526123	6.108302116	404.2151794	239.079895	0.214185312
C.3.87	3335.037354	7.614945889	1609.4823	6.120432377	404.2388916	239.0715027	0.230025351
C.3.88	3335.0979	7.632456303	1603.882202	6.125302315	404.2385254	239.0676422	0.236299545
C.3.89	3335.081543	7.624542713	1615.810547	6.125417233	404.2188721	239.0632782	0.239637062
C.3.90	3335.152344	7.655295372	1582.196899	6.141025543	404.2179565	239.0556183	0.254484743
C.3.91	3335.159424	7.653793335	1598.781616	6.14836216	404.2455139	239.0570374	0.357809216
C.3.92	3335.095703	7.619960308	1626.673218	6.143488884	404.2344666	239.057312	0.324033141
C.3.93	3334.991211	7.588936329	1634.086426	6.128741741	404.2181396	239.0608978	0.289268881
C.3.94	3335.016357	7.618185997	1587.083252	6.121783257	404.2244263	239.0464783	0.29552874
C.3.95	3334.962646	7.573580742	1643.871948	6.120825768	404.2319946	239.0484009	0.253683209
C.3.96	3334.873535	7.564200401	1619.146729	6.098360538	404.2277527	239.0392609	0.26765722
C.3.97	3334.967041	7.606395245	1588.739258	6.09505558	404.2023926	239.0445251	0.267628491
C.3.98	3334.985596	7.597560406	1612.831177	6.09473753	404.1912842	239.0319824	0.250346005
C.3.99	3335.150391	7.695667267	1520.954956	6.100093842	404.2024841	239.0308075	0.33273831
C.3.100	3335.092285	7.645356655	1579.116577	6.105592251	404.2255249	238.9845734	0.253703594
C.3.101	3335.103271	7.646073818	1584.678223	6.113976955	404.2316284	238.9057465	0.20602794
C.3.102	3335.022949	7.619959354	1588.480835	6.114967346	404.2321167	238.8653412	0.193472981
C.3.103	3334.995117	7.590610981	1629.344604	6.11400032	404.2431946	238.8396454	0.206627935
C.3.104	3334.883301	7.554123878	1646.103638	6.105979919	404.2277832	238.8338623	0.163704246
C.3.105	3334.791016	7.552251816	1595.107788	6.07725668	404.2017822	238.8326263	0.198856667
C.3.106	3334.678711	7.503624439	1621.314331	6.047970772	404.1810913	238.8278503	0.171066493
C.3.107	3334.486328	7.46487236	1597.937866	6.004312515	404.1674805	238.8324127	0.116245829
C.3.108	3334.237793	7.392659187	1608.722656	5.95652771	404.1211548	238.8271332	0.108484149
C.3.109	3334.321777	7.442224979	1559.970703	5.908163071	404.0510254	238.8295593	0.167917028
C.3.110	3334.118164	7.368904591	1591.320557	5.893447399	404.0392151	238.8396301	0.197991505
C.3.111	3334.062744	7.345424652	1607.562256	5.866091728	404.0227356	238.8453827	0.157182172
C.3.112	3334.051758	7.330852985	1617.064209	5.853778362	404.0192871	238.8326569	0.152934715
C.3.113	3334.068359	7.348250866	1604.527466	5.852115154	404.0097351	238.8276215	0.151606321
C.3.114	3334.212646	7.391591549	1601.83667	5.854241848	404.0149841	238.8355408	0.130302608
C.3.115	3334.326172	7.445571899	1556.256714	5.888856888	404.0237122	238.8381958	0.195937693
C.3.116	3334.305664	7.384863377	1651.258789	5.902429581	404.0149841	238.835556	0.274695575
C.3.117	3334.335205	7.395898342	1642.501343	5.921482086	404.0541382	238.8218994	0.254301935
C.3.118	3334.432373	7.435126305	1628.254639	5.949299812	404.0755615	238.8240509	0.215290859
C.3.119	3334.575684	7.458344936	1651.353149	5.974377632	404.0963745	238.8105927	0.224437729
C.3.120	3334.652344	7.474797726	1664.732178	6.00265789	404.1192322	238.8338776	0.236351654
C.3.121	3334.781982	7.533643246	1625.872192	6.03290987	404.1309814	238.8045654	0.206513479
C.3.122	3334.844482	7.54458952	1637.496338	6.050979137	404.1548157	238.8067322	0.292614669
C.3.123	3334.926514	7.563775063	1642.490967	6.061718941	404.1453857	238.789444	0.242692038
C.3.124	3334.926025	7.593446255	1594.334595	6.079501152	404.1937866	238.7966461	0.246114299
C.3.125	3334.900635	7.556641579	1646.590576	6.080372334	404.2005615	238.7865753	0.254475176
C.3.126	3334.921387	7.563710213	1641.585571	6.08116293	404.1805725	238.7807922	0.234730229
C.3.127	3334.89917	7.556088924	1649.922607	6.08614397	404.1967468	238.7735901	0.212618753
C.3.128	3334.887939	7.564790726	1620.871582	6.092680931	404.1965332	238.7740784	0.233558238
C.3.129	3334.956543	7.5634408	1658.597656	6.095223904	404.1995239	238.7689972	0.230101347
C.3.130	3334.916748	7.567639351	1631.22876	6.095336437	404.1866455	238.7651672	0.236187309
C.3.131	3334.945068	7.577795982	1633.346924	6.105093479	404.2084961	238.7569885	0.269600511
C.3.132	3334.934082	7.575246334	1639.941162	6.10404253	404.2047119	238.7488251	0.252207667
C.3.133	3334.906982	7.55580616	1642.761475	6.095915794	404.20224	238.7493286	0.216363519
C.3.134	3334.958496	7.570603371	1641.960571	6.099633217	404.2262268	238.749527	0.252915084

Point	CP HTF	T HTF out	Capacity - HTF	T ref out	h refrigerant out	h refrigerant in	T refrigerant inlet
C.3.135	3335.05835	7.634298325	1588.274536	6.108510971	404.2010193	238.769989	0.385613441
C.3.136	3334.971436	7.565545559	1671.437134	6.103135109	404.1842957	238.7510071	0.290601879
C.3.137	3334.932861	7.56947279	1635.890747	6.105877876	404.2028503	238.7519684	0.3008596
C.3.138	3334.965576	7.573566437	1641.250488	6.111748219	404.2054138	238.740921	0.246909603
C.3.139	3335.010498	7.578199387	1663.068115	6.110375404	404.207489	238.7394714	0.268035501
C.3.140	3335.022461	7.594629288	1635.015503	6.110280037	404.1954041	238.7392273	0.264202029
C.3.141	3334.918457	7.560296059	1647.691162	6.112421513	404.213623	238.7466736	0.225317806
C.3.142	3334.964355	7.569199085	1650.50708	6.101354122	404.1914978	238.741394	0.245530069
C.3.143	3334.794434	7.538932323	1622.083008	6.081376076	404.1859741	238.7430573	0.237881839
C.3.144	3334.852539	7.54450655	1645.146606	6.084294319	404.2044983	238.7538605	0.24620603
C.3.145	3334.782227	7.533832073	1625.155151	6.068561077	404.1941528	238.7379608	0.169682428
C.3.146	3334.666016	7.507434845	1619.731567	6.046490669	404.1853333	238.7312622	0.161320016
C.3.147	3334.59375	7.496776104	1597.717529	6.02852726	404.1556702	238.7055359	0.128424287
C.3.148	3334.536865	7.465939522	1624.510742	6.005752563	404.1549988	238.672348	0.133452177
C.3.149	3334.41748	7.434523582	1627.655151	5.975646973	404.1154785	238.6757355	0.12136557
C.3.150	3334.376953	7.429050922	1607.786499	5.970327854	404.1182251	238.6737976	0.169398278
C.3.151	3334.339844	7.399653912	1649.118774	5.946777821	404.0854797	238.6788635	0.170868188
C.3.152	3334.257568	7.369016647	1661.603149	5.92196846	404.0469055	238.6676025	0.205929264
C.3.153	3334.22876	7.37761116	1629.110718	5.920892715	404.0505981	238.6709442	0.210255846
C.3.154	3334.197998	7.359995842	1650.465698	5.910435677	404.0637207	238.6764832	0.1553628
C.3.155	3334.14502	7.348396778	1648.904053	5.889938354	403.989624	238.6762543	0.349490106
C.3.156	3334.124268	7.347549438	1639.28894	5.88902092	404.0083008	238.6800842	0.338067055
C.3.157	3334.151855	7.355597973	1631.712769	5.889632702	404.01651	238.6712341	0.231120884
C.3.158	3334.285889	7.395473957	1626.470703	5.893045902	404.0032654	238.666687	0.272160649
C.3.159	3334.265625	7.405165195	1600.619019	5.895969391	404.0389709	238.6796417	0.23579514
C.3.160	3334.409912	7.437346458	1614.449585	5.919408798	404.0513916	238.6685486	0.229635328
C.3.161	3334.563232	7.468174934	1631.787109	5.948239803	404.069397	238.6452484	0.214001104
C.3.162	3334.561768	7.485320568	1606.323364	5.976748466	404.1021729	238.6113739	0.191304043
C.3.163	3334.691162	7.503193378	1636.107178	5.999686241	404.1218872	238.5688629	0.208289385
C.3.164	3334.807861	7.543030739	1618.755737	6.028614521	404.1222534	238.5369263	0.20564577
C.3.165	3334.864746	7.566952229	1604.886597	6.045435905	404.1785889	238.5349579	0.203569472
C.3.166	3334.936523	7.581300735	1612.356689	6.070315361	404.1697693	238.5063934	0.208213598
C.3.167	3334.987305	7.595296383	1615.693604	6.088003159	404.2121277	238.4924774	0.22068654
C.3.168	3334.945068	7.579246998	1626.329712	6.094927788	404.1410828	238.4840851	0.469732136
C.3.169	3335.005615	7.59595871	1635.886597	6.110578537	404.1648254	238.4826508	0.384430796
C.3.170	3335.064453	7.5933218	1659.937866	6.115659714	404.1896973	238.4757385	0.321564943
C.3.171	3335.030273	7.612025261	1606.119019	6.119863987	404.1913757	238.4656067	0.314203173
C.3.172	3335.054199	7.610948563	1625.499878	6.127358913	404.2003479	238.4653931	0.332970738
C.3.173	3335.095215	7.626309872	1608.727905	6.130069256	404.2083435	238.4588776	0.298577875
C.3.174	3335.089355	7.612782001	1636.180786	6.133610725	404.2093201	238.4362946	0.309667587
C.3.175	3335.102783	7.629410267	1612.936401	6.13527441	404.2113037	238.452179	0.294737756
C.3.176	3335.111084	7.629454136	1616.591553	6.14180088	404.2271118	238.4326935	0.291908979
C.3.177	3335.104004	7.619537354	1633.186035	6.129922867	404.2091675	238.4392242	0.28766647
C.3.178	3335.088867	7.620008945	1627.154419	6.128542423	404.2025452	238.4497833	0.287775993
C.3.179	3335.052246	7.605612755	1633.280273	6.132169247	404.209259	238.4247589	0.324993759
C.3.180	3335.022949	7.588328362	1652.083374	6.134488106	404.2011108	238.447113	0.304191947
C.3.181	3335.058838	7.603202343	1648.760864	6.138681889	404.2296143	238.4256897	0.300736129
C.3.182	3335.155762	7.628446579	1643.339478	6.141461849	404.2359619	238.4264069	0.296114624
C.3.183	3335.116943	7.620370865	1639.012817	6.138985634	404.2181702	238.3966827	0.222276539
C.3.184	3335.055664	7.609156609	1627.032227	6.135955811	404.2256165	238.3784332	0.378248066
C.3.185	3335.057129	7.613252163	1617.422241	6.13195467	404.2045593	238.3573303	0.322263449
C.3.186	3334.932129	7.578478336	1622.860107	6.111729145	404.1976929	238.3695679	0.271758676
C.3.187	3334.78125	7.555251598	1589.830322	6.078462124	404.1835022	238.3601532	0.259998471
C.3.188	3334.674561	7.524473667	1592.012573	6.044908047	404.1629944	238.3813324	0.262691855
C.3.189	3334.5354	7.484523296	1592.446411	6.003212929	404.1262512	238.3582306	0.188644528
C.3.190	3334.407471	7.452974796	1582.914551	5.971837521	404.1103821	238.3618622	0.20448266
C.3.191	3334.35498	7.436861515	1586.694092	5.944227695	404.0748291	238.3793488	0.179310054
C.3.192	3334.335693	7.42211628	1593.8573	5.923039436	404.0422974	238.3945007	0.169216916
C.3.193	3334.272949	7.405046463	1605.400879	5.913734436	404.0007629	238.3890076	0.353904068
C.3.194	3334.136475	7.346083641	1643.834839	5.892951965	404.0142212	238.3800812	0.294961691
C.3.195	3334.088135	7.337873936	1630.677368	5.879160881	403.993927	238.3755798	0.238070086
C.3.196	3334.068604	7.341416359	1617.833252	5.865130901	403.9906006	238.3841705	0.219199926
C.3.197	3334.038086	7.320680141	1635.591064	5.856710911	403.9914551	238.3868408	0.277067006
C.3.198	3334.137207	7.347288609	1644.427612	5.860394955	403.9796448	238.3887939	0.221761256
C.3.199	3334.150391	7.335324287	1667.616089	5.87114048	403.9386902	238.3722382	0.419391483
C.3.200	3334.338623	7.393454075	1659.380127	5.907909393	403.9875793	238.3854675	0.390146911
C.3.201	3334.459961	7.428163528	1654.665161	5.944802284	404.0304565	238.3837738	0.376579314

Point	CP HTF	T HTF out	Capacity - HTF	T ref out	h refrigerant out	h refrigerant in	T refrigerant inlet
C.3.202	3334.586182	7.457346439	1665.057007	5.977262974	404.0421143	238.3777618	0.353516996
C.3.203	3334.708984	7.504806519	1635.172241	6.008684158	404.0815125	238.3700562	0.346537381
C.3.204	3334.829346	7.537688255	1645.995605	6.039461613	404.1272278	238.3534393	0.291202039
C.3.205	3334.71582	7.49571085	1658.132324	6.049132347	404.1354065	238.3308868	0.299492478
C.3.206	3334.799805	7.511150837	1672.445435	6.060639858	404.1573486	238.2826691	0.250747144
C.3.207	3334.847656	7.523189545	1674.147339	6.073050022	404.1652222	238.2483521	0.272176117
C.3.208	3334.878174	7.530219078	1675.125488	6.090160847	404.1256409	238.2311096	0.420800507
C.3.209	3334.890381	7.536301613	1675.457642	6.104623318	404.1633606	238.2107086	0.414546162
C.3.210	3334.950195	7.550302029	1673.640015	6.112988472	404.1651611	238.2078552	0.364798635
C.3.211	3334.976563	7.567411423	1657.252441	6.108994007	404.1618958	238.1965332	0.335851908
C.3.212	3334.996094	7.588836193	1632.998901	6.120319366	404.1855164	238.197998	0.352719754
C.3.213	3335.10791	7.61736393	1634.398438	6.140659809	404.2071228	238.1778564	0.363139153
C.3.214	3335.135742	7.61671257	1653.42981	6.144438744	404.1858215	238.1773682	0.344874918
C.3.215	3335.121826	7.617008686	1648.22522	6.150108337	404.2034302	238.1908112	0.346140504
C.3.216	3335.157959	7.619830608	1652.572388	6.153234482	404.2193909	238.183609	0.333756179
C.3.217	3335.125977	7.623099804	1632.820068	6.171994686	404.2256775	238.1730194	0.333572417
C.3.218	3335.154297	7.625310421	1645.606445	6.164385319	404.2223816	238.1721039	0.371243298
C.3.219	3335.191406	7.636590958	1637.691895	6.171042919	404.2285461	238.1627045	0.365659893
C.3.220	3335.168701	7.617133141	1674.301758	6.168787479	404.2249146	238.1730194	0.331315219
C.3.221	3335.128418	7.622308731	1638.369019	6.168588638	404.2372131	238.1580963	0.303965151
C.3.222	3335.179199	7.648690701	1613.557495	6.165174007	404.2372742	238.1391602	0.280613154
C.3.223	3335.081055	7.609293938	1641.708496	6.156271458	404.2355957	238.1084442	0.2588287
C.3.224	3334.933105	7.569482803	1638.85437	6.119935989	404.2141418	238.0942688	0.221536696
C.3.225	3334.822021	7.550201416	1618.02124	6.09875679	404.2015686	238.0892487	0.23161386
C.3.226	3334.790771	7.548022747	1599.26001	6.07128334	404.1506042	238.0820465	0.339649081
C.3.227	3334.668701	7.496551991	1642.772583	6.038752556	404.1237183	238.0858917	0.291413814
C.3.228	3334.496338	7.473860264	1596.702026	6.014942646	404.1171875	238.0878754	0.233545884
C.3.229	3334.472656	7.444524765	1634.537109	5.991116524	404.0888062	238.0933838	0.252806604
C.3.230	3334.333984	7.387979984	1670.738525	5.959837914	404.0622864	238.0870972	0.235740393
C.3.231	3334.296143	7.402175903	1620.600342	5.943069935	404.0497742	238.1101532	0.244155511
C.3.232	3334.23877	7.373489857	1644.710693	5.918343544	404.0371399	238.1034241	0.245042399
C.3.233	3334.097656	7.321510792	1662.973145	5.893326759	403.9945984	238.1218567	0.210039333
C.3.234	3334.116455	7.349724293	1625.320801	5.884047985	403.9751282	238.1252747	0.3656739
C.3.235	3334.098633	7.343889713	1630.178345	5.883065224	403.9871826	238.1281738	0.369351298
C.3.236	3334.08374	7.323688984	1658.58374	5.872327805	403.9887085	238.1322021	0.257797569
C.3.237	3334.04541	7.319747925	1643.609131	5.863533497	403.9771729	238.1370544	0.276885867
C.3.238	3334.174072	7.351001263	1650.848145	5.877597809	403.9854126	238.1291351	0.260757476
C.3.239	3334.282227	7.381489754	1657.516113	5.895978928	404.0045776	238.1302948	0.270880818
C.3.240	3334.340576	7.389942646	1664.077759	5.916203499	404.0112915	238.1279449	0.299060732
C.3.241	3334.580566	7.480565548	1622.225708	5.960820198	404.0499268	238.1092224	0.313854992
C.3.242	3334.612549	7.468102932	1660.752441	5.977532864	404.0617065	238.10849	0.321189016
C.3.243	3334.633789	7.472812176	1662.391602	6.000862598	404.0901184	238.1031952	0.293779075
C.3.244	3334.658447	7.490672112	1635.812622	6.022277832	404.0669556	238.09198	0.502639651
C.3.245	3334.678955	7.476002693	1674.14917	6.031839371	404.0811462	238.1013184	0.448723525
C.3.246	3334.721191	7.483080387	1686.189575	6.045214653	404.0976257	238.1025696	0.373432487
C.3.247	3334.744385	7.485018253	1693.083496	6.060075283	404.1239014	238.0816956	0.38190192
C.3.248	3334.833984	7.52641964	1665.255127	6.064861298	404.1059875	238.0761261	0.39086321
C.3.249	3334.791016	7.512077332	1668.99585	6.084201813	404.1463318	238.0756226	0.367629677
C.3.250	3334.87793	7.54363203	1660.903442	6.082560539	404.1530151	238.0681763	0.341131121
C.3.251	3334.973145	7.584337234	1630.650635	6.091032982	404.1767883	238.0545197	0.285615593
C.3.252	3334.95459	7.578562737	1634.303955	6.091804981	404.1605225	238.015625	0.273938298
C.3.253	3334.956543	7.57550621	1637.120605	6.11484623	404.1515808	237.980896	0.479260921
C.3.254	3334.996826	7.575597763	1661.558228	6.118793011	404.1639404	237.9466095	0.403387249
C.3.255	3334.974121	7.571905613	1657.937378	6.125693321	404.1820679	237.934906	0.365596861
C.3.256	3334.970947	7.575437069	1645.375732	6.129143715	404.1769714	237.9348907	0.358299941
C.3.257	3335.070313	7.586086273	1678.597046	6.133219719	404.1799927	237.9147797	0.362174153
C.3.258	3335.089355	7.591187954	1673.318237	6.146597862	404.1924438	237.9164581	0.341922671
C.3.259	3335.143555	7.63640976	1630.078735	6.151791096	404.2033691	237.9092102	0.354400128
C.3.260	3335.129395	7.623073578	1640.691528	6.163113117	404.2286377	237.9216156	0.332766801
C.3.261	3335.106445	7.611422539	1645.10791	6.158511162	404.2198181	237.9116211	0.295458853
C.3.262	3335.054932	7.622807026	1602.774292	6.144837856	404.2246399	237.8804169	0.273335248
C.3.263	3334.994873	7.603786945	1606.292969	6.127160549	404.2218933	237.8499451	0.225377947
C.3.264	3334.950684	7.598412514	1591.922119	6.109881878	404.1535339	237.8288879	0.411659211
C.3.265	3334.773193	7.530047894	1626.286499	6.072690487	404.1359253	237.8191071	0.345129043
C.3.266	3334.604492	7.49424839	1602.432251	6.047259331	404.1363831	237.8018036	0.310468346
C.3.267	3334.477295	7.467773914	1587.472656	6.001656532	404.0785522	237.815918	0.257429242
C.3.268	3334.33252	7.420633316	1604.501587	5.962569714	404.0675659	237.8085022	0.2716645

Point	CP HTF	T HTF out	Capacity - HTF	T ref out	h refrigerant out	h refrigerant in	T refrigerant inlet
C.3.269	3334.283203	7.410768032	1602.672974	5.937569618	404.0582275	237.8140106	0.252424031
C.3.270	3334.224854	7.396963596	1595.926636	5.910711765	404.0348206	237.8235931	0.223829269
C.3.271	3334.146484	7.373075485	1593.399048	5.88182497	403.9730225	237.8311005	0.358410984
C.3.272	3334.032471	7.342060089	1600.784302	5.86755085	403.9537048	237.8396912	0.342792451
C.3.273	3334.005127	7.329250813	1599.347656	5.840399265	403.9327698	237.8282013	0.283878595
C.3.274	3333.936768	7.300653458	1624.408936	5.832091331	403.943512	237.8312988	0.273047268
C.3.275	3333.968506	7.308796406	1630.445313	5.821167469	403.9124756	237.8179016	0.285231054
C.3.276	3334.142822	7.353442669	1633.983276	5.843127728	403.9120483	237.8203125	0.43934828
C.3.277	3334.165527	7.339218616	1674.572266	5.87065506	403.9265747	237.8347168	0.41972515
C.3.278	3334.304688	7.388353825	1646.451416	5.893246174	403.9624329	237.8296967	0.397410452
C.3.279	3334.329346	7.403624058	1637.977905	5.91199398	403.995636	237.832489	0.376033932
C.3.280	3334.386719	7.41245842	1642.566772	5.924863338	403.9947205	237.8138275	0.340466887
C.3.281	3334.354736	7.416120052	1622.624512	5.932891846	403.9684448	237.7992401	0.461104721
C.3.282	3334.329102	7.383554935	1672.029663	5.931611061	403.9937744	237.7539673	0.420301974
C.3.283	3334.307129	7.393996239	1639.114502	5.934463978	404.0097656	237.7194214	0.38072744
C.3.284	3334.322021	7.393238544	1650.492798	5.937104225	404.0018311	237.6915588	0.338125706
C.3.285	3334.395996	7.400427341	1673.952759	5.942078114	404.0108032	237.6786804	0.361394018
C.3.286	3334.390625	7.406548977	1662.584229	5.952054977	403.9771729	237.6341705	0.45241946
C.3.287	3334.320557	7.384429932	1662.046143	5.955560684	404.0050354	237.6024475	0.452840567
C.3.288	3334.307373	7.390328884	1645.256104	5.95720005	404.0213013	237.5857391	0.403052658
C.3.289	3334.375977	7.422235012	1623.953369	5.9497962	404.0036926	237.5608063	0.386440933
C.3.290	3334.380615	7.426840782	1610.972168	5.939836979	403.9937744	237.5426178	0.365950555
C.3.291	3334.37085	7.423814297	1614.254761	5.940631866	403.9994202	237.5244751	0.395338207
C.3.292	3334.332275	7.407689095	1628.123413	5.940520287	404.0100098	237.516983	0.406682253
C.3.293	3334.202637	7.355350971	1658.18042	5.927324295	403.9864807	237.5366211	0.403198093
C.3.294	3334.205078	7.354999542	1657.273193	5.920767784	403.9804382	237.5189362	0.371371448
C.3.295	3334.29541	7.374257565	1670.23645	5.933766842	403.9592285	237.5253754	0.529647768
C.3.296	3334.312744	7.394796848	1648.686035	5.926632881	403.9494324	237.5113373	0.488088638
C.3.297	3334.285889	7.381426811	1657.060669	5.930438519	403.9759216	237.5359497	0.447744995
C.3.298	3334.320801	7.404167175	1622.378662	5.939736843	403.9856567	237.5278015	0.445091724
C.3.299	3334.310791	7.387583256	1661.269287	5.932821274	403.9888611	237.5407257	0.440756917
C.3.300	3334.333984	7.401568413	1641.447021	5.925863743	403.9810181	237.5467224	0.399991959
C.3.301	3334.499512	7.42790556	1678.449219	5.943230629	403.9944763	237.538269	0.367266387
C.3.302	3334.708252	7.509464264	1635.059082	5.981650829	404.0452576	237.5138702	0.397514343
C.3.303	3334.616211	7.484622478	1639.766235	6.00633049	404.0128784	237.4729919	0.520928085
C.3.304	3334.739258	7.510746479	1647.244141	6.024695873	404.0509644	237.4808502	0.525520742
C.3.305	3334.785156	7.519643307	1650.225098	6.032322407	404.0501709	237.4773102	0.4934223
C.3.306	3334.650391	7.476931095	1664.246826	6.032625198	404.0554504	237.4528656	0.445381284
C.3.307	3334.608154	7.487164497	1620.048218	6.024123669	404.0720215	237.4549713	0.443057835
C.3.308	3334.522461	7.466279984	1616.257446	5.996265411	404.0673523	237.4551697	0.389365315
C.3.309	3334.377686	7.42036581	1628.921753	5.973450661	404.0428162	237.4549255	0.330114275
C.3.310	3334.374756	7.427176952	1618.491333	5.958965778	404.0403748	237.4017639	0.320716739
C.3.311	3334.406006	7.427081585	1631.010864	5.950290203	403.990448	237.368988	0.475025654
C.3.312	3334.373535	7.418095589	1626.376953	5.945201874	403.9856567	237.3309631	0.473169029
C.3.313	3334.405029	7.421412468	1640.638672	5.94364357	404.0032654	237.3209381	0.421987176
C.3.314	3334.483887	7.458512306	1610.939819	5.964164257	404.0070496	237.3102264	0.429272056
C.3.315	3334.421631	7.413594246	1662.483887	5.956945419	404.000824	237.2881165	0.431217819
C.3.316	3334.355469	7.386314869	1682.984009	5.963300228	404.0039978	237.3039398	0.424209267
C.3.317	3334.387207	7.389433861	1685.098022	5.969634056	404.0183716	237.2862396	0.436142415
C.3.318	3334.379395	7.392761707	1680.786377	5.970583439	404.0174866	237.2872009	0.404486686
C.3.319	3334.365967	7.398015976	1669.085571	5.972655296	404.019165	237.280014	0.415962249
C.3.320	3334.467285	7.43344593	1651.612549	5.96973896	403.9765625	237.273819	0.553133368
C.3.321	3334.460693	7.431121826	1643.941284	5.975391388	403.9934387	237.2790833	0.541646183
C.3.322	3334.459717	7.426231861	1658.226807	5.967366219	403.9822388	237.2690582	0.497819513
C.3.323	3334.580811	7.461054325	1657.486084	5.994920254	404.0105591	237.2623901	0.515446484
C.3.324	3334.574219	7.457334995	1653.200562	5.999145031	404.0298157	237.2641754	0.496531457
C.3.325	3334.517578	7.436800957	1661.537842	6.00254631	404.0340881	237.2534943	0.428077251
C.3.326	3334.570068	7.445763111	1683.030151	6.012782574	404.0085754	237.2218933	0.575727522
C.3.327	3334.611084	7.463526726	1666.227539	6.020134926	404.0297241	237.181427	0.532622576
C.3.328	3334.577393	7.448243618	1680.459106	6.018440723	404.0374756	237.151123	0.483091801
C.3.329	3334.648926	7.493626595	1619.076416	6.030949593	404.0481873	237.1273804	0.497338086
C.3.330	3334.680176	7.484288692	1661.411743	6.033201694	404.0559387	237.1167755	0.466305345
C.3.331	3334.679199	7.482857227	1668.616577	6.042005062	404.0302734	237.1221619	0.631042957
C.3.332	3334.659424	7.480561256	1659.42334	6.042284012	404.0397949	237.080246	0.564438522
C.3.333	3334.769531	7.507160664	1668.935059	6.050988674	404.0621033	237.0652313	0.532028854
C.3.334	3334.719238	7.4843297	1680.381836	6.044448853	404.01651	237.0444489	0.6381253
C.3.335	3334.657959	7.474157333	1667.887939	6.047859669	404.0264282	237.0420074	0.637919903

Point	CP HTF	T HTF out	Capacity - HTF	T ref out	h refrigerant out	h refrigerant in	T refrigerant inlet
C.3.336	3334.70166	7.488137722	1668.30896	6.041627407	404.021698	237.0273743	0.608064115
C.3.337	3334.642822	7.481504917	1651.137451	6.030193806	404.0265503	237.0326843	0.544199705
C.3.338	3334.50708	7.447430611	1644.658203	6.006336212	404.0413208	237.0369568	0.511783183
C.3.339	3334.410156	7.432166576	1622.294434	5.988777161	404.0334473	237.0240173	0.406281739
C.3.340	3334.344727	7.416594982	1620.00647	5.949608803	403.964325	236.9649353	0.539881408
C.3.341	3334.214355	7.360456944	1648.012939	5.92252779	403.9391479	236.904068	0.515817225
C.3.342	3334.111816	7.321106911	1677.049072	5.91063261	403.9308777	236.8672028	0.465713829
C.3.343	3334.070557	7.301765442	1686.139038	5.902603149	403.9181824	236.8375854	0.466010481
C.3.344	3334.089355	7.314557552	1673.868774	5.895791531	403.8709412	236.8211365	0.682640791
C.3.345	3334.137695	7.319466591	1690.902832	5.907689571	403.8937683	236.8144989	0.649538994
C.3.346	3334.2854	7.36881876	1673.315796	5.927706718	403.9011536	236.7970886	0.649018705
C.3.347	3334.310547	7.363922119	1700.151123	5.948532581	403.9194946	236.7966003	0.632844746
C.3.348	3334.355957	7.370750427	1707.904175	5.956841469	403.937439	236.8009186	0.633823574
C.3.349	3334.437744	7.404604912	1696.135498	5.974698544	403.9639893	236.7996368	0.609940708
C.3.350	3334.423096	7.394931316	1697.852417	5.967271805	403.953064	236.7862701	0.576670289
C.3.351	3334.480713	7.424380302	1667.727051	5.986912727	403.9779663	236.7487335	0.551999271
C.3.352	3334.472168	7.421529293	1677.502197	5.99336195	404.0003662	236.7102356	0.554801583
C.3.353	3334.500488	7.413202286	1703.907837	5.99988842	403.9806519	236.6717377	0.603548527
C.3.354	3334.479248	7.409593105	1696.186401	5.998929977	403.9811401	236.6399689	0.591167033
C.3.355	3334.518066	7.431610584	1680.243164	6.003129482	404.0050049	236.5845337	0.556105494
C.3.356	3334.496338	7.415328026	1696.252808	6.007125378	403.9553833	236.5409698	0.711513996
C.3.357	3334.498047	7.413291454	1699.73999	6.010077477	403.9584961	236.5337219	0.68822819
C.3.358	3334.564697	7.436902046	1694.659912	6.02263689	403.9866943	236.5204315	0.664352179
C.3.359	3334.599365	7.432873726	1717.221313	6.033682346	403.9891052	236.5093842	0.651009262
C.3.360	3334.610107	7.441447735	1701.860229	6.035023689	403.9870911	236.5005798	0.641269684
C.3.361	3334.611084	7.451842785	1683.338745	6.04101181	404.0057068	236.496521	0.628981829
C.3.362	3334.651367	7.442875862	1728.253906	6.045584202	403.9942932	236.4881134	0.659550965
C.3.363	3334.65332	7.450777531	1712.498657	6.045589924	404.0042419	236.482132	0.656516969
C.3.364	3334.613037	7.463588238	1668.540771	6.049334526	403.9963379	236.4812012	0.643165648
C.3.365	3334.70166	7.482777596	1682.282349	6.060265064	403.9759827	236.4925537	0.848099947
C.3.366	3334.639893	7.441685677	1720.701416	6.05634737	403.9790039	236.4934082	0.780008495
C.3.367	3334.732666	7.484358311	1693.411133	6.063952923	403.9923096	236.5006561	0.750125289
C.3.368	3334.724365	7.47192812	1706.496704	6.075872898	403.9902954	236.5056458	0.740768075
C.3.369	3334.628662	7.441709995	1717.776978	6.056149483	404.0016479	236.5103607	0.701958477
C.3.370	3334.581543	7.448437691	1680.510376	6.042685032	404.0166931	236.5160675	0.64718163
C.3.371	3334.506348	7.409890175	1706.799316	6.026268959	403.9962769	236.4805298	0.627814293
C.3.372	3334.375977	7.370806694	1715.744751	5.999586105	403.9537964	236.4523468	0.725654006
C.3.373	3334.199707	7.344112396	1673.802734	5.961427689	403.9333801	236.4508972	0.664061725
C.3.374	3334.155273	7.331597328	1679.504761	5.928878307	403.9063721	236.4301147	0.627925456
C.3.375	3334.052002	7.291955948	1703.437134	5.904479027	403.8618164	236.4335327	0.797793448
C.3.376	3334.074463	7.303311348	1680.522461	5.889243126	403.8447571	236.4158173	0.764956176
C.3.377	3334.072998	7.282698154	1727.012573	5.892569065	403.8392639	236.4089966	0.735581636
C.3.378	3334.067627	7.285651684	1719.812866	5.883860588	403.838562	236.4079742	0.698446095
C.3.379	3334.223145	7.322221756	1729.745728	5.902713299	403.8596802	236.3948364	0.725749135
C.3.380	3334.28418	7.346522808	1714.220703	5.922828674	403.8765869	236.3893433	0.718280077
C.3.381	3334.284668	7.351570606	1701.596924	5.935433865	403.8902893	236.3974609	0.707874954
C.3.382	3334.305176	7.345983982	1734.933716	5.93719101	403.8983459	236.379776	0.674997926
C.3.383	3334.329102	7.378297806	1682.640625	5.954792023	403.9232483	236.3248901	0.663884342
C.3.384	3334.38208	7.378861904	1704.799072	5.966794968	403.9168091	236.2912292	0.680572152
C.3.385	3334.427979	7.381521225	1720.424683	5.957975864	403.8700256	236.2710114	0.845161855
C.3.386	3334.393799	7.377971172	1713.609253	5.978301048	403.8898621	236.239975	0.810545623
C.3.387	3334.48999	7.420813084	1683.0979	5.989851475	403.9240723	236.2340698	0.803881764
C.3.388	3334.444092	7.397845745	1705.257446	5.992773533	403.914978	236.2198792	0.777063191
C.3.389	3334.428711	7.39011097	1704.455322	5.993370533	403.9283447	236.2077026	0.795122683
C.3.390	3334.54126	7.430975437	1682.936401	6.001338005	403.8764954	236.2101746	0.995751917
C.3.391	3334.519531	7.410353661	1726.413696	6.012274265	403.8946533	236.1847076	0.940931916
C.3.392	3334.480469	7.403876305	1703.822266	6.011614799	403.9100037	236.141571	0.917537034
C.3.393	3334.609863	7.44792223	1696.244019	6.027348995	403.901001	236.1136932	0.889262974
C.3.394	3334.593262	7.426888466	1727.30127	6.035964489	403.9258728	236.1066284	0.899953783
C.3.395	3334.604248	7.444529057	1701.246704	6.035927296	403.9403381	236.100174	0.862838089
C.3.396	3334.657959	7.473158836	1674.173218	6.053734303	403.9653015	236.0617523	0.820702195
C.3.397	3334.735107	7.482328892	1691.02124	6.06251049	403.9262085	235.9835663	1.033177376
C.3.398	3334.652588	7.444340706	1725.395996	6.059569836	403.918396	235.9313507	0.931207359
C.3.399	3334.747803	7.481295586	1702.390625	6.071005344	403.9275818	235.8829956	0.956265569
C.3.400	3334.741211	7.480707169	1699.621582	6.074040413	403.9075623	235.8635712	1.118644834
C.3.401	3334.669434	7.444288254	1731.432373	6.070505619	403.9081421	235.8577576	1.06352067
C.3.402	3334.589111	7.422969341	1734.771729	6.06153059	403.9013977	235.8385162	1.032705069

Point	CP HTF	T HTF out	Capacity - HTF	T ref out	h refrigerant out	h refrigerant in	T refrigerant inlet
C.3.403	3334.537842	7.410559177	1725.592407	6.036616325	403.8999023	235.8418121	0.989466846
C.3.404	3334.397217	7.385527134	1706.894165	6.017886162	403.890625	235.8451996	0.982100308
C.3.405	3334.297119	7.362477303	1687.338501	5.996466637	403.8734741	235.8520508	0.948806167
C.3.406	3334.239258	7.336295128	1711.120361	5.969624043	403.8561707	235.8532257	0.932784498
C.3.407	3334.147217	7.322701454	1697.202637	5.93182373	403.8312988	235.8484955	0.895041406
C.3.408	3334.032227	7.297228336	1683.352295	5.895173073	403.8215942	235.8418274	0.868229985
C.3.409	3333.964844	7.27278614	1673.734497	5.874682426	403.7884521	235.8088837	0.871631444
C.3.410	3333.973145	7.253017902	1732.927612	5.862783432	403.7782288	235.7935333	0.852608442
C.3.411	3334.031494	7.298526764	1675.985474	5.868997574	403.7822571	235.76474	0.831284285
C.3.412	3334.146729	7.323345184	1689.537109	5.884151459	403.763031	235.7181091	1.02570045
C.3.413	3334.115479	7.28452158	1739.434448	5.907216072	403.775177	235.6797333	1.004328847
C.3.414	3334.173096	7.310861588	1721.387329	5.920785427	403.788147	235.6505432	0.980317771
C.3.415	3334.295898	7.358152866	1700.321411	5.946006775	403.7613525	235.6213074	1.246174812
C.3.416	3334.265625	7.321129322	1749.426025	5.952247143	403.7642517	235.6070099	1.17231071
C.3.417	3334.241455	7.313677788	1752.019165	5.947387695	403.7756653	235.5891113	1.139460206
C.3.418	3334.206055	7.322315216	1718.36731	5.956441879	403.7818298	235.5833282	1.115906239
C.3.419	3334.175781	7.286940098	1770.866699	5.943456173	403.7799377	235.5671997	1.109534383
C.3.420	3334.190918	7.311254025	1739.499023	5.944337845	403.7910156	235.5366974	1.059994459
C.3.421	3334.175537	7.314851761	1719.131714	5.94765377	403.7909851	235.5104218	1.054124951
C.3.422	3334.203369	7.29735899	1771.770996	5.94207716	403.7982178	235.4771118	1.045163035
C.3.423	3334.199219	7.332818985	1696.702759	5.936119556	403.7554626	235.4643402	1.168938994
C.3.424	3334.197754	7.317691803	1725.856567	5.940529346	403.7736816	235.4086151	1.121005893
C.3.425	3334.143555	7.288925648	1756.226074	5.929478645	403.7632751	235.3776855	1.124135017
C.3.426	3334.106689	7.266386032	1772.454102	5.918737888	403.767334	235.3450317	1.064037204
C.3.427	3334.061279	7.275299549	1732.157349	5.913842678	403.7801209	235.3344421	1.072697282
C.3.428	3334.096436	7.284429073	1739.956787	5.918339252	403.7762451	235.3109436	1.065205693
C.3.429	3334.12793	7.304676056	1713.35498	5.911872387	403.7550354	235.2824554	1.015585303
C.3.430	3334.11499	7.311910629	1687.647583	5.923727512	403.747467	235.2510529	1.225324512
C.3.431	3334.038086	7.278465748	1717.248047	5.910925388	403.7160645	235.2148743	1.176036716
C.3.432	3334.073975	7.270653248	1750.302124	5.907212734	403.7341919	235.2263184	1.140853405
C.3.433	3334.041504	7.261989594	1745.37207	5.90378046	403.7184448	235.2125244	1.147907972
C.3.434	3334.040771	7.270641327	1730.134521	5.903311253	403.7318726	235.2135468	1.157743096
C.3.435	3334.0896	7.291378021	1714.438354	5.894417286	403.7426453	235.2078247	1.103925347
C.3.436	3334.03833	7.273501396	1725.287964	5.882985115	403.7227783	235.2229614	1.110813498
C.3.437	3334.106689	7.306463242	1694.175659	5.88796711	403.7248535	235.2308807	1.124663234
C.3.438	3334.10791	7.322334766	1672.177246	5.888751984	403.6662598	235.2330475	1.296983838
C.3.439	3334.039551	7.280557156	1708.239258	5.888748169	403.6748352	235.2413635	1.264162421
C.3.440	3334.023438	7.26361227	1737.595825	5.881321907	403.7106934	235.2271271	1.223761797
C.3.441	3333.995117	7.239435673	1771.862671	5.89157629	403.7124329	235.2204285	1.178530216
C.3.442	3333.984619	7.254972935	1738.501831	5.873992443	403.7115173	235.1625214	1.16906178
C.3.443	3333.945068	7.261155605	1697.759155	5.862278461	403.6937561	235.1587524	1.159440041
C.3.444	3333.955322	7.259648323	1703.212646	5.86470747	403.6686401	235.1360321	1.259023547
C.3.445	3333.898926	7.234746933	1721.931885	5.853965759	403.6647339	235.0941162	1.22276473
C.3.446	3333.895508	7.246694088	1703.243164	5.853866577	403.657959	235.0614929	1.197358847
C.3.447	3333.900146	7.233751297	1725.866089	5.851258278	403.6880188	235.0237885	1.187541962
C.3.448	3333.830811	7.198631763	1757.154297	5.845953941	403.6804504	235.0083008	1.185101151
C.3.449	3333.828369	7.211342812	1730.863892	5.847126484	403.6818848	234.9930115	1.152373433
C.3.450	3333.849365	7.221901417	1724.135132	5.842957973	403.6708679	234.9868927	1.167199016
C.3.451	3333.82251	7.197056293	1753.611206	5.836867809	403.6679077	234.9754181	1.162586927
C.3.452	3333.769043	7.204300404	1711.801758	5.837692738	403.6634521	234.9716492	1.150261879
C.3.453	3333.786133	7.209009171	1718.689209	5.831119537	403.6645813	234.9609222	1.129670858
C.3.454	3333.777832	7.196250439	1733.921753	5.813840389	403.6412964	234.9519348	1.144788504
C.3.455	3333.748291	7.189987659	1732.575195	5.814242363	403.6558838	234.9552612	1.145194054
C.3.456	3333.785645	7.214837074	1699.872803	5.811894417	403.6399841	234.9442596	1.128736258
C.3.457	3333.687988	7.167990685	1741.355103	5.812756538	403.655426	234.9378662	1.130147338
C.3.458	3333.709717	7.198937416	1691.663696	5.805634022	403.617157	234.9457245	1.307079911
C.3.459	3333.707764	7.187249184	1704.75061	5.804646492	403.6070862	234.9441223	1.29569149
C.3.460	3333.654297	7.152783394	1749.978516	5.798199654	403.6164551	234.9277344	1.236156702
C.3.461	3333.61499	7.158758163	1722.715454	5.790587425	403.6128235	234.926712	1.207771897
C.3.462	3333.594727	7.149259567	1728.3302	5.78707552	403.602356	234.9369202	1.235644221
C.3.463	3333.58667	7.148407459	1723.5177	5.775236607	403.5897217	234.9347992	1.173359275
C.3.464	3333.589111	7.16054821	1701.310059	5.766948223	403.6026917	234.9209747	1.156086564
C.3.465	3333.543701	7.148532391	1702.355347	5.772327423	403.5939636	234.8771973	1.279658556
C.3.466	3333.522705	7.119481564	1744.272949	5.756103039	403.5818787	234.8598785	1.219750762
C.3.467	3333.421143	7.078588486	1770.468994	5.749278545	403.557373	234.8525391	1.213555336
C.3.468	3333.530518	7.138139725	1713.217773	5.735868454	403.5227051	234.8417206	1.371832728
C.3.469	3333.478027	7.109272957	1736.99353	5.747792244	403.5491028	234.8300934	1.330348849

Point	CP HTF	T HTF out	Capacity - HTF	T ref out	h refrigerant out	h refrigerant in	T refrigerant inlet
C.3.470	3333.477051	7.104512215	1742.276245	5.746528149	403.5225525	234.8534393	1.313182592
C.3.471	3333.488281	7.119839191	1723.175781	5.742632866	403.5331116	234.8405151	1.316628814
C.3.472	3333.516357	7.119169712	1742.817261	5.747672558	403.5671082	234.868515	1.307012558
C.3.473	3333.497314	7.12820673	1721.326538	5.74096632	403.5380249	234.8621063	1.263103604
C.3.474	3333.555908	7.152764797	1706.309937	5.738157272	403.5213928	234.8397064	1.421531677
C.3.475	3333.511963	7.130778313	1714.915283	5.741951942	403.5204468	234.8071899	1.371224284
C.3.476	3333.560303	7.151460171	1705.630981	5.741558552	403.5402832	234.7785187	1.32962954
C.3.477	3333.449951	7.111553669	1719.521973	5.728757381	403.5363464	234.7149963	1.280256271
C.3.478	3333.470947	7.127503872	1702.53772	5.734313965	403.5440674	234.6624908	1.311813951
C.3.479	3333.518066	7.142729759	1696.320801	5.735706329	403.5092163	234.6419373	1.461636424
C.3.480	3333.471436	7.113091946	1726.036255	5.735781193	403.5009155	234.6279449	1.386975765
C.3.481	3333.368652	7.084302425	1734.368408	5.724390984	403.4971924	234.6072845	1.391891479
C.3.482	3333.350098	7.081411362	1728.237671	5.723862171	403.5154724	234.6019897	1.362462878
C.3.483	3333.364014	7.079159737	1737.31897	5.716243267	403.484375	234.5977325	1.358398557
C.3.484	3333.364258	7.065931797	1765.494019	5.706368446	403.4940491	234.5779724	1.356944919
C.3.485	3333.428711	7.112884521	1705.387817	5.708812237	403.470459	234.5738831	1.446281791
C.3.486	3333.367676	7.075165272	1748.323608	5.713515282	403.4815674	234.5399933	1.406617999
C.3.487	3333.27002	7.04101181	1758.718506	5.702961922	403.4881592	234.5132141	1.381005406
C.3.488	3333.272461	7.056356907	1734.563721	5.699250221	403.4749451	234.4866486	1.380304694
C.3.489	3333.306396	7.061646461	1741.968384	5.690263271	403.4452209	234.4728394	1.482149363
C.3.490	3333.272461	7.035408497	1777.795044	5.693032265	403.4560242	234.4547424	1.464468002
C.3.491	3333.219971	7.027114391	1757.672607	5.694478512	403.4667358	234.4552307	1.404160738
C.3.492	3333.268555	7.039172173	1763.668823	5.686079025	403.4697876	234.3971863	1.401097059
C.3.493	3333.258057	7.043091774	1758.242432	5.681387424	403.4257507	234.3669128	1.504954815
C.3.494	3333.226807	7.034865379	1756.538086	5.677760601	403.4182129	234.3387604	1.460664392
C.3.495	3333.293945	7.062830925	1733.487671	5.684438229	403.4153442	234.3217011	1.602704525
C.3.496	3333.192871	7.021718979	1759.790039	5.680028915	403.4145203	234.3058014	1.520186663
C.3.497	3333.231201	7.041116238	1741.039429	5.68413496	403.4074402	234.2948608	1.519215345
C.3.498	3333.272705	7.058481693	1731.686035	5.679749489	403.3888855	234.3021698	1.590844154
C.3.499	3333.303711	7.054890156	1751.934204	5.683835506	403.408844	234.2915039	1.556633115
C.3.500	3333.242676	7.029819489	1773.58252	5.676784515	403.414978	234.2654266	1.53138113
C.3.501	3333.210449	7.044784069	1726.228027	5.676597595	403.3980408	234.2362976	1.517169833
C.3.502	3333.199951	7.039846897	1724.783081	5.665749073	403.4115295	234.2016449	1.511271715
C.3.503	3333.24585	7.0421772	1747.456055	5.659618855	403.4043579	234.2023163	1.498391747
C.3.504	3333.235107	7.055983067	1715.851074	5.663323402	403.3871155	234.2037201	1.484738469
C.3.505	3333.223633	7.038605213	1736.230103	5.668793201	403.4013367	234.1974335	1.502955317
C.3.506	3333.202637	7.017810822	1774.218384	5.668395996	403.3625183	234.1933746	1.594598889
C.3.507	3333.182617	7.013429642	1765.448975	5.667411804	403.3882446	234.1993561	1.56795013
C.3.508	3333.220459	7.027215004	1760.995728	5.664316654	403.3609619	234.2018585	1.56912899
C.3.509	3333.163086	7.008368969	1774.964722	5.661746979	403.3980713	234.2092438	1.540057182
C.3.510	3333.157959	7.01403141	1750.36731	5.653044224	403.39151	234.2131805	1.533938646
C.3.511	3333.124023	7.005516052	1754.116089	5.662637234	403.4045715	234.1864929	1.531212807
C.3.512	3333.201904	7.041156769	1731.512207	5.652450562	403.3639526	234.1585693	1.623558283
C.3.513	3333.152832	7.007246494	1764.678589	5.65688467	403.3837585	234.1384277	1.569513083
C.3.514	3333.123535	7.005702972	1756.671631	5.651589394	403.3595276	234.0971985	1.571422338
C.3.515	3333.168701	7.021608353	1739.172852	5.650610447	403.3887024	234.0768433	1.555687189
C.3.516	3333.089844	6.986115456	1766.825439	5.650907516	403.3800049	234.0322571	1.543760538
C.3.517	3333.168701	7.025849819	1728.436523	5.654631138	403.3746643	233.995636	1.600955129
C.3.518	3333.145752	7.011774063	1746.579956	5.656592369	403.3588867	233.9802094	1.586334825
C.3.519	3333.140869	6.998352051	1769.380859	5.644759655	403.3692627	233.9614563	1.581347346
C.3.520	3333.091064	6.993440151	1756.701294	5.639955997	403.3613892	233.9602509	1.574054599
C.3.521	3333.054688	6.985624313	1752.091064	5.640552044	403.3832703	233.9503174	1.567038059
C.3.522	3333.081299	6.984624863	1766.676758	5.636939526	403.3503723	233.9411469	1.69566834
C.3.523	3332.983643	6.953407764	1780.197632	5.628953457	403.3502808	233.9508209	1.611974835
C.3.524	3332.967041	6.956655502	1762.030029	5.626123905	403.3193359	233.9270172	1.632901669
C.3.525	3333.000977	6.966112137	1751.965088	5.621025085	403.3427124	233.9477234	1.617280006
C.3.526	3332.986084	6.952853203	1785.327148	5.61810112	403.3204651	233.9292145	1.607560158
C.3.527	3332.992188	6.976120472	1737.277588	5.617894173	403.3482666	233.9199066	1.573840141
C.3.528	3333.011475	6.988257885	1727.664917	5.614855766	403.3232422	233.9194183	1.675341964
C.3.529	3332.951904	6.959124565	1752.041504	5.611561775	403.3123169	233.8852997	1.621707678
C.3.530	3332.992676	6.96372366	1767.005737	5.605495453	403.3087769	233.8350525	1.609208584
C.3.531	3332.931885	6.960465908	1739.019165	5.610940456	403.3303528	233.805069	1.582282662
C.3.532	3333.000977	6.973872185	1744.090454	5.603834152	403.3074341	233.7971802	1.685286164
C.3.533	3332.906006	6.942097187	1759.027344	5.602156162	403.3023071	233.786087	1.662341595
C.3.534	3332.92334	6.948366642	1755.056152	5.607245445	403.3286438	233.7898865	1.633283854
C.3.535	3332.987305	6.959299088	1763.320557	5.606070518	403.301178	233.7889404	1.634475827
C.3.536	3332.993408	6.960328102	1772.380615	5.603553295	403.3195496	233.7918396	1.625395894

Point	CP HTF	T HTF out	Capacity - HTF	T ref out	h refrigerant out	h refrigerant in	T refrigerant inlet
C.3.537	3332.915771	6.945647717	1760.150635	5.607355118	403.3147888	233.7912445	1.653320074
C.3.538	3333.004883	6.961074829	1776.78186	5.604819775	403.3222961	233.8095551	1.630043268
C.3.539	3333.017334	6.97870636	1744.447754	5.604418755	403.3037415	233.8104248	1.697695732
C.3.540	3332.989258	6.962207794	1759.873291	5.602757454	403.2991943	233.8267822	1.687714458
C.3.541	3332.961182	6.952857018	1764.514404	5.604613781	403.29422	233.8154755	1.665711045
C.3.542	3333.022217	6.974385262	1756.580566	5.601209641	403.3127136	233.7850647	1.65105772
C.3.543	3332.981201	6.982713699	1723.817505	5.593374729	403.2965393	233.7608948	1.625626802
C.3.544	3332.998535	6.980628014	1737.147461	5.61086607	403.3071594	233.7329712	1.67802465
C.3.545	3332.944824	6.954827785	1757.727905	5.602762699	403.301178	233.7280273	1.676340222
C.3.546	3332.850098	6.926727295	1753.382935	5.586638927	403.3003845	233.7046051	1.658339381
C.3.547	3332.895752	6.954202652	1729.464966	5.590138435	403.2845459	233.7104187	1.627314448
C.3.548	3332.936035	6.951588154	1749.609131	5.598639488	403.2887573	233.7008209	1.635752916
C.3.549	3332.872559	6.921543598	1777.192505	5.59005785	403.2883301	233.6916046	1.690270901
C.3.550	3332.854736	6.929526806	1752.338867	5.589557648	403.2803955	233.6912994	1.711476088
C.3.551	3332.924561	6.939952374	1772.37793	5.594934464	403.2991638	233.6850739	1.654915929
C.3.552	3332.926758	6.936346531	1770.745605	5.59534359	403.2913513	233.6879578	1.667114973

Point	T Valve in	Capacity - refrigerant	refrigerant mass flov	T sat	T valve inlet	T subcooling
C.3.1	28.63850784	1582.296387	0.009644748	29.16034591	28.63850848	0.521837431
C.3.2	28.62565231	1579.005005	0.009624263	29.1728574	28.62565168	0.54720572
C.3.3	28.62532616	1583.904175	0.009654795	29.16264588	28.62532616	0.537319722
C.3.4	28.61311913	1577.32666	0.009613083	29.15195834	28.61311849	0.538839848
C.3.5	28.61197853	1588.59375	0.00968249	29.19084694	28.6119779	0.578869044
C.3.6	28.61083794	1591.963501	0.009704052	29.20141723	28.61083857	0.590578654
C.3.7	28.61067581	1571.525391	0.009578934	29.17367901	28.61067708	0.563001932
C.3.8	28.60953713	1586.949463	0.009674075	29.19398948	28.60953649	0.584452987
C.3.9	28.61132622	1575.56311	0.009603922	29.12578993	28.61132685	0.514463073
C.3.10	28.61507225	1578.06958	0.009620056	29.11119479	28.61507161	0.496123179
C.3.11	28.60042381	1583.645996	0.009652376	29.08777593	28.60042318	0.487352751
C.3.12	28.57942581	1583.84082	0.009652735	29.13831068	28.57942645	0.558884237
C.3.13	28.56754494	1589.40564	0.009686733	29.15506354	28.56754494	0.587518605
C.3.14	28.55306053	1591.675659	0.009700839	29.09336312	28.55306053	0.540302588
C.3.15	28.55989647	1590.949097	0.009697781	29.06286407	28.55989647	0.502967605
C.3.16	28.55826759	1590.049438	0.009695238	29.11547098	28.55826632	0.557204661
C.3.17	28.54280853	1589.284302	0.009689083	29.09251437	28.54280853	0.549705834
C.3.18	28.52490234	1581.846313	0.009642067	29.0638735	28.52490171	0.538971792
C.3.19	28.50569916	1594.147705	0.009716121	29.09423758	28.50569852	0.588539054
C.3.20	28.48063278	1595.687256	0.009724075	29.07503864	28.48063342	0.594405218
C.3.21	28.48030472	1603.037354	0.009770534	29.10155836	28.48030535	0.62125301
C.3.22	28.474123	1597.706299	0.009737541	29.09842388	28.47412364	0.624300244
C.3.23	28.47282028	1599.609009	0.00974918	29.15137894	28.47282028	0.678558661
C.3.24	28.47591019	1587.241699	0.009673695	29.02409767	28.47590955	0.54818812
C.3.25	28.46663284	1590.235962	0.00969196	29.13712871	28.46663348	0.67049523
C.3.26	28.47086525	1600.014648	0.009752856	29.07105323	28.47086525	0.600187982
C.3.27	28.46858788	1597.107422	0.009736331	29.0852036	28.46858851	0.616615084
C.3.28	28.46451759	1591.914063	0.009702525	29.09429187	28.46451823	0.629773643
C.3.29	28.46712303	1604.617676	0.009780244	29.08419463	28.46712303	0.617071598
C.3.30	28.46175003	1609.910156	0.009812613	29.09725232	28.46175003	0.635502294
C.3.31	28.45344925	1596.532471	0.009728287	29.05491659	28.45344989	0.601466705
C.3.32	28.42317581	1615.125977	0.009841272	29.28147896	28.42317645	0.858302511
C.3.33	28.40625	1605.802734	0.009780282	29.14485954	28.40624936	0.73861018
C.3.34	28.38590431	1607.501465	0.00978735	29.23198541	28.38590495	0.846080466
C.3.35	28.37321091	1615.07019	0.009829989	29.20100096	28.37321027	0.82779069
C.3.36	28.36816406	1605.008057	0.009766232	29.18889914	28.36816279	0.820736354
C.3.37	28.35351563	1613.450928	0.009816431	29.15409604	28.35351499	0.800581053
C.3.38	28.33675194	1618.612671	0.009845545	29.17444356	28.33675194	0.837691625
C.3.39	28.33349609	1611.900757	0.00980384	29.17221265	28.33349737	0.83871528
C.3.40	28.33040428	1624.528198	0.009880313	29.20750111	28.33040365	0.877097465
C.3.41	28.31835938	1620.057007	0.009851049	29.19573746	28.31836001	0.877377445
C.3.42	28.31608009	1613.443359	0.009810964	29.17424102	28.31608009	0.858160922
C.3.43	28.31494141	1618.149658	0.009839748	29.19983198	28.31494141	0.884890573
C.3.44	28.30891991	1621.381226	0.009857867	29.13972388	28.30891991	0.83080397
C.3.45	28.296875	1608.125732	0.009777379	29.08839613	28.296875	0.791521125
C.3.46	28.27294922	1595.455688	0.009696906	28.98627014	28.27294858	0.713321553
C.3.47	28.24885941	1590.430908	0.009665007	29.02578334	28.24886004	0.776923296
C.3.48	28.18294525	1602.618774	0.009733896	28.98274981	28.18294462	0.799805193
C.3.49	28.12890434	1598.678467	0.009704116	29.00787898	28.12890498	0.878973999
C.3.50	28.08170509	1614.47168	0.009797153	28.98744447	28.08170573	0.905738745
C.3.51	28.04801369	1619.954224	0.009828852	28.99509414	28.04801369	0.947080452
C.3.52	28.02441216	1616.230591	0.009804288	28.99491659	28.02441152	0.970505068
C.3.53	28.01692581	1615.297974	0.009799749	29.0197988	28.01692645	1.002872358
C.3.54	28.00927544	1610.182129	0.009767898	28.99459298	28.00927544	0.985317546
C.3.55	28.00309372	1621.986084	0.009842373	29.01413412	28.00309308	1.011041033
C.3.56	27.99902344	1629.64209	0.009887777	29.04649576	27.99902344	1.047472323
C.3.57	27.99983597	1617.294678	0.009813425	29.04475935	27.9998366	1.044922744
C.3.58	28.00683594	1620.9646	0.009837666	29.03986729	28.00683657	1.033030722
C.3.59	28.00146294	1615.029785	0.009801598	29.04386966	28.00146357	1.042406089
C.3.60	27.99495506	1621.188843	0.00984071	29.09871819	27.99495506	1.103763131
C.3.61	28.00260353	1618.876831	0.009827239	29.09519203	28.00260353	1.092588498
C.3.62	28.00423241	1616.449951	0.009812978	29.05464774	28.00423304	1.0504147
C.3.63	28.00325584	1621.25354	0.009843467	29.15074817	28.00325648	1.147491685
C.3.64	27.99918747	1628.344849	0.00988742	29.08385735	27.99918683	1.084670517
C.3.65	27.99885941	1618.561157	0.009826873	29.16040013	27.99886004	1.161540087
C.3.66	27.99934959	1614.518311	0.009803217	29.10201552	27.99935023	1.102665288
C.3.67	27.99479103	1627.973999	0.009883824	29.06126267	27.99479167	1.066471008

Point	T Valve in	Capacity - refrigerant	refrigerant mass flo	T sat	T valve inlet	T subcooling
C.3.68	27.9921875	1624.414551	0.009861211	29.05759927	27.99218877	1.065410496
C.3.69	27.97298241	1619.276001	0.00982798	29.04388396	27.97298177	1.070902194
C.3.70	27.95263672	1610.904175	0.009774944	29.03299467	27.95263608	1.080358587
C.3.71	27.94286919	1622.279175	0.009844539	29.07377215	27.94286919	1.130902962
C.3.72	27.92659569	1625.410645	0.009861059	29.11531103	27.92659505	1.188715974
C.3.73	27.92171288	1619.928101	0.00982777	29.09268869	27.92171288	1.170975816
C.3.74	27.92171097	1612.577759	0.009783138	29.08831324	27.9217116	1.166601638
C.3.75	27.90332222	1622.036499	0.009838964	29.07573905	27.90332158	1.172417464
C.3.76	27.89420509	1631.190918	0.009893723	29.1540675	27.89420509	1.259862409
C.3.77	27.89957428	1638.429565	0.009937691	29.10119549	27.89957492	1.201620579
C.3.78	27.90234566	1627.651855	0.009872227	29.17983213	27.90234439	1.277487742
C.3.79	27.89778519	1634.530029	0.009912618	29.09031954	27.89778455	1.19253499
C.3.80	27.89664841	1629.878784	0.009883845	29.06986669	27.89664841	1.173218286
C.3.81	27.89372063	1641.84668	0.009954594	29.0428598	27.89371999	1.149139813
C.3.82	27.87516213	1640.362427	0.009942973	29.03715785	27.87516212	1.161995725
C.3.83	27.83658791	1630.862183	0.00987962	29.03319497	27.83658791	1.196607063
C.3.84	27.81673241	1631.913452	0.009885165	29.05161594	27.81673304	1.234882901
C.3.85	27.80533409	1629.913818	0.009870673	29.09021094	27.80533536	1.284875577
C.3.86	27.79573631	1631.296875	0.009878549	29.06581508	27.79573631	1.270078768
C.3.87	27.79003906	1635.718628	0.009903399	29.10832664	27.7900397	1.318286944
C.3.88	27.78743744	1634.404663	0.009895235	29.09975542	27.7874368	1.312318616
C.3.89	27.78450584	1638.936646	0.009923592	29.02307308	27.78450457	1.238568505
C.3.90	27.77929688	1649.678223	0.009988224	29.12027516	27.77929624	1.34097892
C.3.91	27.78027344	1644.867065	0.009957517	29.05992718	27.78027344	1.279653743
C.3.92	27.78043747	1643.968872	0.009952762	29.13063302	27.78043683	1.350196183
C.3.93	27.78287888	1627.647583	0.009855139	29.08509784	27.78287824	1.3022196
C.3.94	27.77311134	1637.106934	0.009911172	29.09126264	27.77311134	1.3181513
C.3.95	27.77441406	1635.171387	0.009899114	29.09546064	27.77441279	1.321047854
C.3.96	27.76823044	1634.098389	0.009892326	29.07894366	27.7682298	1.310713857
C.3.97	27.77180862	1641.57019	0.0099394	29.03482594	27.77180799	1.263017954
C.3.98	27.76334572	1634.44165	0.009896153	28.94233734	27.76334635	1.178990986
C.3.99	27.76253319	1633.001831	0.009886695	29.02940917	27.76253382	1.26687535
C.3.100	27.73128128	1629.348755	0.009860442	28.8956859	27.73128128	1.164404624
C.3.101	27.67789841	1635.280029	0.009891253	28.99499964	27.67789841	1.317101229
C.3.102	27.65055466	1630.924805	0.00986247	28.93440952	27.65055466	1.283854866
C.3.103	27.63314056	1630.888428	0.009860056	28.99004796	27.63313929	1.356908671
C.3.104	27.6292305	1623.132446	0.009813737	28.98761919	27.62922986	1.358389327
C.3.105	27.62841797	1637.773804	0.009903744	28.88888396	27.62841797	1.26046599
C.3.106	27.62516022	1636.587891	0.009897524	28.978662	27.62515958	1.353502419
C.3.107	27.62825584	1633.203979	0.009878145	28.94954719	27.62825521	1.321291985
C.3.108	27.62467384	1619.636353	0.009798517	28.98842975	27.62467321	1.363756542
C.3.109	27.62630081	1632.979858	0.009883583	29.04020489	27.62630145	1.413903444
C.3.110	27.63313675	1639.848267	0.009926466	28.97685431	27.63313675	1.343717566
C.3.111	27.637043	1630.740479	0.009872665	28.95593337	27.637043	1.318890367
C.3.112	27.62841988	1621.909424	0.009818647	28.94619898	27.62841988	1.317779102
C.3.113	27.625	1623.778198	0.009830231	29.01157204	27.625	1.386572044
C.3.114	27.630373	1637.45813	0.009913208	28.96462553	27.63037364	1.334251896
C.3.115	27.63216209	1635.182495	0.009899068	28.98443696	27.63216146	1.352275505
C.3.116	27.630373	1637.483154	0.009913361	29.00379336	27.630373	1.373420362
C.3.117	27.62109375	1625.332275	0.009836654	29.11107196	27.62109311	1.489978844
C.3.118	27.6225605	1643.057251	0.009942766	29.06898034	27.62255987	1.446420478
C.3.119	27.61344338	1631.401245	0.009870185	29.09628363	27.61344337	1.482840252
C.3.120	27.6292305	1641.419189	0.009930821	29.02444969	27.62922986	1.395219828
C.3.121	27.60937691	1640.302612	0.009921601	29.02794113	27.60937627	1.418564859
C.3.122	27.61083984	1631.234375	0.009865456	29.03579878	27.61084048	1.424958297
C.3.123	27.59912109	1640.567993	0.009921432	29.08472055	27.59912173	1.485598823
C.3.124	27.60400391	1647.683228	0.00996198	29.05481077	27.60400391	1.450806861
C.3.125	27.59716988	1643.992676	0.009938656	29.10053547	27.59716988	1.503365589
C.3.126	27.59326172	1636.616333	0.009894914	29.10050975	27.59326235	1.507247395
C.3.127	27.58837891	1643.738647	0.00993657	29.1198039	27.58837891	1.531424997
C.3.128	27.58870506	1635.38562	0.009886115	29.11667065	27.58870506	1.527965582
C.3.129	27.585289	1637.702637	0.00989964	29.05177898	27.58528837	1.466490613
C.3.130	27.58268356	1645.554688	0.009947648	29.08807317	27.58268293	1.505390239
C.3.131	27.57715035	1647.502075	0.009957612	29.05288303	27.57714971	1.475733321
C.3.132	27.57161331	1621.494385	0.009800161	29.10030688	27.57161395	1.528692934
C.3.133	27.57193947	1642.281738	0.009925976	29.1261269	27.5719401	1.554186799
C.3.134	27.5721035	1632.727661	0.009866814	29.05001416	27.57210286	1.477911294

Point	T Valve in	Capacity - refrigerant	refrigerant mass flov	T sat	T valve inlet	T subcooling
C.3.135	27.5859375	1644.911743	0.009943188	29.11185182	27.58593877	1.525913044
C.3.136	27.57308006	1633.19104	0.009872203	29.11287447	27.57308006	1.539794403
C.3.137	27.57373047	1631.980835	0.009863839	29.13434495	27.57372983	1.560615118
C.3.138	27.56624413	1632.693359	0.009867335	29.13501592	27.56624476	1.568771162
C.3.139	27.56526756	1629.525146	0.009847976	29.11217461	27.56526693	1.546907683
C.3.140	27.56510544	1637.112549	0.00989454	29.12648958	27.5651048	1.561384776
C.3.141	27.57014847	1638.203125	0.009900484	29.10042689	27.57014847	1.53027842
C.3.142	27.56656838	1638.604614	0.00990392	29.12756617	27.56656837	1.560997791
C.3.143	27.56771088	1650.389038	0.00997558	29.06258097	27.56771024	1.494870733
C.3.144	27.57503319	1619.96106	0.009791204	29.03862847	27.57503382	1.463594642
C.3.145	27.564291	1643.529907	0.009933323	28.96688071	27.56429164	1.40258907
C.3.146	27.55973244	1650.802124	0.009977403	29.03265702	27.55973307	1.472923949
C.3.147	27.54232025	1646.920532	0.00995418	28.98903694	27.54232025	1.446716693
C.3.148	27.51985741	1645.185181	0.009941739	28.96019797	27.51985677	1.440341203
C.3.149	27.52213287	1628.670776	0.009844495	28.98936059	27.52213287	1.467227714
C.3.150	27.52083588	1626.996704	0.009834098	28.95035841	27.52083524	1.429523171
C.3.151	27.52425194	1629.607666	0.009852131	29.00464086	27.52425194	1.480388926
C.3.152	27.51660347	1631.006958	0.009862219	29.05960402	27.51660347	1.543000555
C.3.153	27.51888084	1646.929443	0.009958477	29.03387026	27.51887957	1.514990683
C.3.154	27.52262306	1636.915283	0.00989747	29.05779946	27.5226237	1.535175763
C.3.155	27.52246094	1649.597168	0.009978607	29.082028	27.52246221	1.559565788
C.3.156	27.52506638	1630.53479	0.009862411	29.03299467	27.52506638	1.507928294
C.3.157	27.51904106	1641.047607	0.009924973	29.15411031	27.5190417	1.635068614
C.3.158	27.51595116	1647.224854	0.009962858	29.16943098	27.51595116	1.653479825
C.3.159	27.52474022	1637.154907	0.00990059	29.12622114	27.52474022	1.601480923
C.3.160	27.51725388	1631.899536	0.009867406	29.04407277	27.51725324	1.526819534
C.3.161	27.50146484	1641.163574	0.009920944	29.06372766	27.50146484	1.56226282
C.3.162	27.47851563	1642.25354	0.009923533	29.03395037	27.47851499	1.555435385
C.3.163	27.44970703	1654.990723	0.009996741	29.05654681	27.44970703	1.606839776
C.3.164	27.42806244	1648.945068	0.009958279	29.0721311	27.4280618	1.644069294
C.3.165	27.42675591	1637.117188	0.009883368	28.97628707	27.42675527	1.549531801
C.3.166	27.40739059	1654.201294	0.009985316	28.99133104	27.40738996	1.583941079
C.3.167	27.39794922	1640.968018	0.009902073	29.03940953	27.39794795	1.641461585
C.3.168	27.39225578	1666.017334	0.01005703	29.05816267	27.39225515	1.66590752
C.3.169	27.39127731	1656.438843	0.009997688	29.08146203	27.39127668	1.690185349
C.3.170	27.38655663	1654.313843	0.009982946	29.16333071	27.38655663	1.776774085
C.3.171	27.3797226	1647.555542	0.009941457	29.08731863	27.37972132	1.707597311
C.3.172	27.37955666	1654.370605	0.009982025	29.12568141	27.37955666	1.746124752
C.3.173	27.37516403	1653.15979	0.009973846	29.06522032	27.37516276	1.69005756
C.3.174	27.35986328	1641.671265	0.009903126	29.0327257	27.35986392	1.672861779
C.3.175	27.37060738	1658.497314	0.010005467	29.12616688	27.37060674	1.755560143
C.3.176	27.35742188	1656.401611	0.009990696	29.04937915	27.35742124	1.691957911
C.3.177	27.36181641	1648.255127	0.009943027	29.13657768	27.36181641	1.774761274
C.3.178	27.36897659	1656.709473	0.009995065	29.12757759	27.36897723	1.758600359
C.3.179	27.35205078	1648.831909	0.009945633	29.02350524	27.35205142	1.671453825
C.3.180	27.3671875	1650.938721	0.009960175	29.06745636	27.36718814	1.700268219
C.3.181	27.35270119	1657.696289	0.00999793	28.9513846	27.35270182	1.598682774
C.3.182	27.35318947	1647.055786	0.00993342	28.96359964	27.35318947	1.610410169
C.3.183	27.33300781	1641.141113	0.009897035	29.03911198	27.33300845	1.706103537
C.3.184	27.32063866	1648.776367	0.009941541	29.04342338	27.32063866	1.722784725
C.3.185	27.30631447	1650.528931	0.009952104	29.0945062	27.3063151	1.788191093
C.3.186	27.31461716	1660.074707	0.010010816	29.05996722	27.31461716	1.74535006
C.3.187	27.30826759	1654.17981	0.009975553	28.96745953	27.30826632	1.659193203
C.3.188	27.32259178	1639.652588	0.009890434	29.07254851	27.32259242	1.749956095
C.3.189	27.30696678	1651.951904	0.009965444	28.97439621	27.30696742	1.66742879
C.3.190	27.3094101	1644.290283	0.009920391	29.00542536	27.3094101	1.696015266
C.3.191	27.32128906	1634.452026	0.009864191	28.94683252	27.32129033	1.625542186
C.3.192	27.33154106	1656.884521	0.010002454	29.02435525	27.33154106	1.692814186
C.3.193	27.32780075	1644.967285	0.009932673	29.06740203	27.32780012	1.739601913
C.3.194	27.32177734	1650.006104	0.009961751	28.98765929	27.32177671	1.665882581
C.3.195	27.31868172	1639.675415	0.009900325	29.10774956	27.31868235	1.78906721
C.3.196	27.324543	1657.011597	0.010005721	28.99389135	27.32454364	1.669347719
C.3.197	27.326334	1647.765991	0.009950001	29.06577505	27.326334	1.73944105
C.3.198	27.32763672	1656.063599	0.010000938	29.13122409	27.32763672	1.803587372
C.3.199	27.31640816	1653.029785	0.009984086	29.1143427	27.31640879	1.797933908
C.3.200	27.32535934	1659.056274	0.010018327	29.18879077	27.32535998	1.863430793
C.3.201	27.32422066	1656.805054	0.010002042	29.16488867	27.32422002	1.840668645

Point	T Valve in	Capacity - refrigerant	refrigerant mass flo	T sat	T valve inlet	T subcooling
C.3.202	27.32014847	1648.538208	0.009951073	29.13527289	27.32014847	1.815124421
C.3.203	27.31494141	1663.190918	0.010036669	29.09617504	27.31494141	1.781233633
C.3.204	27.30371094	1659.176514	0.010008679	28.98211389	27.30370967	1.678404221
C.3.205	27.28841019	1657.059692	0.009994056	29.0101836	27.28841019	1.721773413
C.3.206	27.25569534	1645.102295	0.009917742	29.0623665	27.25569471	1.806671795
C.3.207	27.23242188	1651.051758	0.009951077	29.06177456	27.23242188	1.829352682
C.3.208	27.22070313	1658.820557	0.009999248	29.12276274	27.22070313	1.902059615
C.3.209	27.20686913	1653.374512	0.009962928	29.10750673	27.20686849	1.90063824
C.3.210	27.20491409	1659.601807	0.010000173	29.17179612	27.20491536	1.966880755
C.3.211	27.19726753	1657.19397	0.00998518	29.07350341	27.1972669	1.876236512
C.3.212	27.19824219	1668.798096	0.010053756	29.10917511	27.19824155	1.910933556
C.3.213	27.18457222	1653.503052	0.009959105	29.14996896	27.18457158	1.965397374
C.3.214	27.18424416	1673.890137	0.010083163	29.12817156	27.18424479	1.943926764
C.3.215	27.19335938	1665.958374	0.010035132	29.14933531	27.19336065	1.95597466
C.3.216	27.18847656	1665.453491	0.010030691	29.13870181	27.18847656	1.950225252
C.3.217	27.18131447	1665.508911	0.010030005	29.07596775	27.18131574	1.894652012
C.3.218	27.18066406	1652.456299	0.009951542	29.15279174	27.18066533	1.972126406
C.3.219	27.1743145	1659.855225	0.009995163	29.08256538	27.1743145	1.908250878
C.3.220	27.18131828	1667.477173	0.010041903	29.04827502	27.18131828	1.866956733
C.3.221	27.17122459	1662.310547	0.010009148	28.9581345	27.17122459	1.786909909
C.3.222	27.15836525	1661.789185	0.010004866	29.00429156	27.15836525	1.845926308
C.3.223	27.13753319	1655.762207	0.009966836	28.97489758	27.13753319	1.837364393
C.3.224	27.12792969	1663.16626	0.010011843	28.93616437	27.12793032	1.808234043
C.3.225	27.12451363	1642.247681	0.00988637	28.96416704	27.12451299	1.839654045
C.3.226	27.11962891	1665.488281	0.010028921	28.97331609	27.11962827	1.853687819
C.3.227	27.12223244	1662.516235	0.010012877	28.97311553	27.12223307	1.850882461
C.3.228	27.12353706	1646.902588	0.009919347	29.09352315	27.12353706	1.969986089
C.3.229	27.12727928	1663.154053	0.010019277	29.07595346	27.12727865	1.948674812
C.3.230	27.12304878	1655.561646	0.009974753	28.98293886	27.12304815	1.859890718
C.3.231	27.13867188	1652.334229	0.009957442	29.02942348	27.13867188	1.890751607
C.3.232	27.13411522	1635.606201	0.009856984	29.00170318	27.13411458	1.867588593
C.3.233	27.1466465	1657.130981	0.009990375	28.94436137	27.14664714	1.797714235
C.3.234	27.14892578	1657.202271	0.009992184	29.06071075	27.14892515	1.911785606
C.3.235	27.15088081	1646.888062	0.009929447	29.10688679	27.15087954	1.956007244
C.3.236	27.15364647	1656.544434	0.009987816	29.00886382	27.15364647	1.855217355
C.3.237	27.15690231	1654.89917	0.009978883	29.09547493	27.15690231	1.938572619
C.3.238	27.15152931	1668.18457	0.010058012	29.08878482	27.15152931	1.937255504
C.3.239	27.15234375	1647.979614	0.009935113	29.01409404	27.15234311	1.861750926
C.3.240	27.15071869	1657.914063	0.009994457	29.10782955	27.15071805	1.957111501
C.3.241	27.13801956	1653.46936	0.009964218	29.09361746	27.13801956	1.955597895
C.3.242	27.13753128	1649.283447	0.009938243	29.06843995	27.13753128	1.930908668
C.3.243	27.13395119	1667.195801	0.01004414	29.03560993	27.13395182	1.901658111
C.3.244	27.12630081	1659.782837	0.0100002	29.16451202	27.12630145	2.038210575
C.3.245	27.13264847	1665.780273	0.010036039	29.11770462	27.13264847	1.985056147
C.3.246	27.13346291	1659.814209	0.009999178	29.20684258	27.13346291	2.073379679
C.3.247	27.11930275	1647.233398	0.009920569	29.19442006	27.11930339	2.075116676
C.3.248	27.11555862	1652.314941	0.009951914	29.10812666	27.11555862	1.992568041
C.3.249	27.11523247	1659.363525	0.00999191	29.0760478	27.11523374	1.960814059
C.3.250	27.11018753	1652.673218	0.009950778	29.05218228	27.1101888	1.941993473
C.3.251	27.10091209	1654.001099	0.009956528	29.06609816	27.10091146	1.965186704
C.3.252	27.07454109	1668.080322	0.010039913	28.97601777	27.07454173	1.901476043
C.3.253	27.05094338	1672.750366	0.010066459	29.04751984	27.05094337	1.996576467
C.3.254	27.027668	1663.682495	0.01000908	29.05709878	27.027668	2.02943078
C.3.255	27.01969147	1673.345215	0.010065407	29.16099083	27.01969147	2.141299358
C.3.256	27.01969528	1660.468872	0.009988259	29.11046635	27.01969465	2.090771699
C.3.257	27.00602341	1663.268677	0.010003707	29.15050556	27.00602341	2.14448215
C.3.258	27.00716019	1660.675537	0.009987465	29.16397559	27.00715955	2.156816034
C.3.259	27.00227928	1664.226318	0.010007727	29.06485717	27.00227865	2.062578522
C.3.260	27.01074219	1675.335571	0.010073751	28.95890258	27.01074219	1.948160396
C.3.261	27.00390625	1656.890381	0.009962769	29.08699567	27.00390689	2.083088783
C.3.262	26.98274803	1648.416016	0.009909668	29.00300884	26.98274867	2.020260171
C.3.263	26.96207619	1655.532227	0.009950791	28.96181716	26.96207682	1.999740339
C.3.264	26.94775391	1672.80896	0.010057492	29.01111401	26.94775327	2.063360734
C.3.265	26.94108391	1657.039673	0.009963151	29.09206855	26.94108327	2.150985279
C.3.266	26.92936134	1647.035889	0.009901945	29.02018807	26.92936198	2.090826087
C.3.267	26.93896294	1665.533569	0.010017484	28.96613855	26.93896294	2.027175609
C.3.268	26.93391991	1650.344482	0.009926341	28.98470621	26.93392054	2.050785673

Point	T Valve in	Capacity - refrigerant	refrigerant mass flo	T sat	T valve inlet	T subcooling
C.3.269	26.93766403	1657.121338	0.009967994	28.98494969	26.9376634	2.04728629
C.3.270	26.94417191	1647.130493	0.009909864	28.97424723	26.94417191	2.030075322
C.3.271	26.94921684	1660.170532	0.009992485	29.11525675	26.94921684	2.166039912
C.3.272	26.95507622	1668.959351	0.010047072	29.04986542	26.95507685	2.094788565
C.3.273	26.94726563	1660.94873	0.009999416	29.07029842	26.94726499	2.123033436
C.3.274	26.94938088	1666.584473	0.010032883	29.0493391	26.94938151	2.099957593
C.3.275	26.94026756	1651.939941	0.00994578	29.09357745	26.9402682	2.15330925
C.3.276	26.94189453	1663.844482	0.010017624	29.11387139	26.94189517	2.171976219
C.3.277	26.95166016	1668.449829	0.010045344	29.15111065	26.95166016	2.199450493
C.3.278	26.9482441	1664.922241	0.010021639	29.1687063	26.94824537	2.220460928
C.3.279	26.95019722	1656.219238	0.009967428	29.01615791	26.95019658	2.065961327
C.3.280	26.93750191	1669.074829	0.010043724	29.07588771	26.93750127	2.138386434
C.3.281	26.92757225	1666.979004	0.010031818	29.15928435	26.92757161	2.231712733
C.3.282	26.89681053	1671.265503	0.01005334	29.16893454	26.89681053	2.272124012
C.3.283	26.87337303	1663.614136	0.010004274	29.10040117	26.87337367	2.227027505
C.3.284	26.8544941	1673.637207	0.010063343	28.97539608	26.85449282	2.120903259
C.3.285	26.84570313	1665.33667	0.010012118	29.08991657	26.84570313	2.244213448
C.3.286	26.81542778	1680.453491	0.01010234	29.17541064	26.81542842	2.359982225
C.3.287	26.79394531	1672.636841	0.010051748	28.98729554	26.79394531	2.193350223
C.3.288	26.78255081	1666.949341	0.010015584	29.06846854	26.78255208	2.285916457
C.3.289	26.765625	1674.653931	0.010061434	29.04696776	26.765625	2.281342756
C.3.290	26.75325584	1682.488892	0.010108004	29.04699636	26.75325457	2.293741789
C.3.291	26.74088478	1671.655029	0.010041481	29.15453841	26.74088542	2.413652995
C.3.292	26.73583984	1669.284912	0.010026156	29.03702337	26.73583984	2.301183531
C.3.293	26.74918747	1664.373413	0.009999249	29.03279151	26.74918683	2.283604675
C.3.294	26.73714256	1669.529785	0.010029525	29.10860947	26.73714193	2.371467539
C.3.295	26.74153709	1667.037354	0.010016215	29.05631801	26.74153646	2.31478155
C.3.296	26.73193359	1675.401611	0.010066214	29.20259757	26.73193359	2.47066398
C.3.297	26.74869728	1682.259399	0.010107304	29.11815019	26.74869665	2.369453541
C.3.298	26.74316406	1674.589233	0.010060139	29.12292553	26.74316343	2.3797621
C.3.299	26.75195313	1674.782104	0.010061885	29.10956648	26.75195376	2.357612722
C.3.300	26.7560215	1675.099976	0.010064633	29.10924367	26.75602214	2.353221535
C.3.301	26.75032425	1675.647705	0.010066598	29.0022558	26.75032489	2.251930912
C.3.302	26.73372269	1664.711426	0.009996383	29.02936911	26.73372396	2.295645153
C.3.303	26.70589256	1687.489258	0.010132643	29.15034572	26.70589193	2.444453792
C.3.304	26.71126366	1677.466309	0.010070631	29.08129909	26.71126302	2.370036074
C.3.305	26.70882225	1671.802734	0.010036465	29.16893454	26.70882225	2.460112294
C.3.306	26.69222069	1680.825928	0.010088836	29.12818298	26.69222005	2.435962926
C.3.307	26.69368553	1677.728027	0.010069366	29.02637574	26.69368426	2.332691479
C.3.308	26.69384766	1668.155884	0.010012208	28.96744806	26.69384829	2.273599772
C.3.309	26.69368172	1661.723511	0.009975056	28.97526143	26.69368172	2.281579713
C.3.310	26.65755272	1672.172729	0.010034725	28.94289066	26.65755336	2.285337305
C.3.311	26.63525581	1674.768677	0.010051338	28.96306089	26.63525454	2.327806348
C.3.312	26.609375	1672.731934	0.010037113	29.01238219	26.60937564	2.403006554
C.3.313	26.60253906	1656.131958	0.009935858	29.05048612	26.60253843	2.447947692
C.3.314	26.59521675	1669.440308	0.01001483	29.1526576	26.59521675	2.557440846
C.3.315	26.58024216	1674.569458	0.010044643	28.9966033	26.58024216	2.416361147
C.3.316	26.59098434	1665.07019	0.009988421	29.04435313	26.59098498	2.453368146
C.3.317	26.57893944	1660.787598	0.009960813	29.05028303	26.57893944	2.471343595
C.3.318	26.57959175	1661.169067	0.009963212	29.07116188	26.57959175	2.491570126
C.3.319	26.57470703	1666.234009	0.009993059	29.04467639	26.5747064	2.469969992
C.3.320	26.57047653	1675.410645	0.010050289	29.09660653	26.57047653	2.526129996
C.3.321	26.57405281	1665.205444	0.009988376	29.11313155	26.57405281	2.539078742
C.3.322	26.56722069	1673.679199	0.010039274	29.14084013	26.56721942	2.57362071
C.3.323	26.56266403	1680.358643	0.010077224	29.18551384	26.5626634	2.622850441
C.3.324	26.56396484	1661.909912	0.009965542	28.9854624	26.56396484	2.421497559
C.3.325	26.55664063	1676.617554	0.010052834	29.1121489	26.55663999	2.555508911
C.3.326	26.53515625	1677.395996	0.010057135	29.08158208	26.53515625	2.546425832
C.3.327	26.50765038	1671.986816	0.010021	29.02314177	26.50764974	2.515492026
C.3.328	26.48697853	1670.175415	0.010007861	29.16168995	26.48697853	2.674711419
C.3.329	26.47086716	1673.002319	0.01002273	29.04681901	26.47086652	2.575952485
C.3.330	26.46370506	1669.312744	0.009999527	28.91483512	26.46370506	2.451130062
C.3.331	26.46728706	1684.388306	0.01009171	29.11997813	26.46728706	2.652691062
C.3.332	26.43880463	1687.678345	0.010108308	29.01879988	26.43880526	2.579994615
C.3.333	26.42854691	1679.508423	0.010057124	29.10489548	26.42854691	2.676348579
C.3.334	26.41438866	1676.313721	0.010039486	29.1496607	26.41438866	2.735272039
C.3.335	26.41275978	1689.778931	0.010119381	29.05828564	26.41276042	2.645525225

Point	T Valve in	Capacity - refrigerant	refrigerant mass flov	T sat	T valve inlet	T subcooling
C.3.336	26.40266991	1692.234985	0.010133488	29.35607808	26.40266991	2.953408177
C.3.337	26.40641213	1681.237915	0.010067663	29.06628688	26.40641149	2.659875393
C.3.338	26.40934372	1670.459839	0.010002492	29.01325816	26.40934308	2.603915078
C.3.339	26.40055084	1668.8125	0.009992326	28.98548818	26.40055211	2.584936068
C.3.340	26.36035156	1677.201294	0.010043157	28.9422284	26.3603522	2.581876197
C.3.341	26.31884766	1688.018188	0.010105771	29.0810304	26.31884829	2.762182105
C.3.342	26.29378319	1670.400391	0.009998586	28.99610503	26.29378319	2.702321839
C.3.343	26.27360153	1671.954956	0.010006878	29.00875503	26.27360153	2.735153502
C.3.344	26.26236916	1699.027344	0.010170783	29.08791026	26.26236788	2.825542373
C.3.345	26.2578125	1671.243042	0.010002696	29.16058847	26.2578125	2.902775968
C.3.346	26.24592781	1691.357544	0.010121583	29.20623821	26.24592845	2.960309768
C.3.347	26.24560738	1698.950439	0.010165876	29.19181368	26.2456061	2.946207572
C.3.348	26.24853516	1683.957397	0.01007534	29.2264433	26.24853452	2.977908781
C.3.349	26.24772072	1684.059204	0.010074274	29.09912394	26.24772199	2.851401954
C.3.350	26.23860741	1700.199341	0.010170677	29.1010612	26.23860868	2.862452525
C.3.351	26.21305275	1688.876099	0.010099169	29.06527465	26.21305339	2.852221264
C.3.352	26.18684959	1685.44519	0.010074982	29.01373049	26.18685023	2.826880262
C.3.353	26.16064453	1696.702271	0.010141134	28.970322	26.16064517	2.809676831
C.3.354	26.13899612	1694.208862	0.010124279	28.96570585	26.13899612	2.826709727
C.3.355	26.10123825	1692.650757	0.010110179	28.9336267	26.10123825	2.832388452
C.3.356	26.07145119	1700.295654	0.010156209	29.13142682	26.07145182	3.059975002
C.3.357	26.06656838	1700.259033	0.01015536	28.99619953	26.06656901	2.929630518
C.3.358	26.05745697	1704.03833	0.010175413	29.12335677	26.05745633	3.065900435
C.3.359	26.04996681	1698.321899	0.010140463	29.03517788	26.04996618	2.985211706
C.3.360	26.04394341	1711.73291	0.010220123	29.07287158	26.04394341	3.028928173
C.3.361	26.04117775	1693.630737	0.010110674	29.07061007	26.04117839	3.029431685
C.3.362	26.03548241	1702.305786	0.010162644	28.99052053	26.03548177	2.955038758
C.3.363	26.03141403	1705.106445	0.010178396	28.98797148	26.0314134	2.956558088
C.3.364	26.03076172	1710.235352	0.010209439	29.02048573	26.03076172	2.989724016
C.3.365	26.03841209	1701.896362	0.01016158	29.19091538	26.03841146	3.152503923
C.3.366	26.0390625	1700.400269	0.010152517	29.06083086	26.03906186	3.021768996
C.3.367	26.04394531	1708.935059	0.010203106	29.18590457	26.04394531	3.141959259
C.3.368	26.04736328	1704.209106	0.010175314	29.1472402	26.04736328	3.099876919
C.3.369	26.05062103	1707.598755	0.010195151	29.05629227	26.05062167	3.005670599
C.3.370	26.05452347	1703.799805	0.010171901	29.02442107	26.05452347	2.969897604
C.3.371	26.03027153	1700.471558	0.010151115	29.08629542	26.03027153	3.056023895
C.3.372	26.01106453	1705.052734	0.010179332	29.06508593	26.01106453	3.054021396
C.3.373	26.01009178	1699.407959	0.010146781	29.02915163	26.01009178	3.019059844
C.3.374	25.99592972	1706.679565	0.010190575	29.00914725	25.99593035	3.013216896
C.3.375	25.99821091	1699.287842	0.010149348	29.12888259	25.99820964	3.130672959
C.3.376	25.98616409	1715.3927	0.010245497	29.05770508	25.98616536	3.07153972
C.3.377	25.98144722	1697.209717	0.010136815	29.17778974	25.98144658	3.196343154
C.3.378	25.98079491	1715.794312	0.010247796	29.10040117	25.98079491	3.119606266
C.3.379	25.97184372	1697.289185	0.010135198	29.08303701	25.97184372	3.11119329
C.3.380	25.96809769	1710.195801	0.010210901	29.08240531	25.96809832	3.114306985
C.3.381	25.97363281	1709.558105	0.010206754	29.06803679	25.97363345	3.094403343
C.3.382	25.96158409	1700.680908	0.010152193	29.05489085	25.96158536	3.093305487
C.3.383	25.92415237	1706.68811	0.010183204	29.04973098	25.92415174	3.125579241
C.3.384	25.90120316	1710.986206	0.01020719	29.02479885	25.90120316	3.123595692
C.3.385	25.88736916	1707.471436	0.010187836	29.10694107	25.88737043	3.21957064
C.3.386	25.86621094	1725.16687	0.010290296	29.09472052	25.86621157	3.228508947
C.3.387	25.86214066	1714.645874	0.010225093	29.17678277	25.86214002	3.314642754
C.3.388	25.85253906	1712.427734	0.010211556	29.01623806	25.85253779	3.163700269
C.3.389	25.84424019	1704.541748	0.010162982	28.99978757	25.84423955	3.155548015
C.3.390	25.84586716	1723.132813	0.010277156	29.10832664	25.84586589	3.262460757
C.3.391	25.82845306	1711.281982	0.01020382	29.19223002	25.82845306	3.36377696
C.3.392	25.79899216	1718.247192	0.010241779	29.2326037	25.79899216	3.433611539
C.3.393	25.77994919	1728.935059	0.010304325	29.27837079	25.77994855	3.498422235
C.3.394	25.7752285	1722.505249	0.01026405	29.06415659	25.7752285	3.288928092
C.3.395	25.77083588	1719.231445	0.010243266	29.04175266	25.7708346	3.27091805
C.3.396	25.74463081	1707.388672	0.010168866	29.02155045	25.74462954	3.276920913
C.3.397	25.69124413	1734.276611	0.010326601	29.02821013	25.69124285	3.336967278
C.3.398	25.65559959	1725.7854	0.010273323	29.01452629	25.65560023	3.358926058
C.3.399	25.6225605	1734.196533	0.01031986	29.05860881	25.62255987	3.436048941
C.3.400	25.60921288	1737.08313	0.010337073	29.21734084	25.60921351	3.608127328
C.3.401	25.60530663	1738.845093	0.010347165	29.0907225	25.60530663	3.485415879
C.3.402	25.59212303	1725.928955	0.010269543	29.15729528	25.59212303	3.565172248

Point	T Valve in	Capacity - refrigerant	refrigerant mass flov	T sat	T valve inlet	T subcooling
C.3.403	25.59440041	1728.792603	0.010286875	29.12199734	25.59440041	3.527596939
C.3.404	25.59667969	1734.703003	0.010322822	29.18771845	25.59667969	3.591038763
C.3.405	25.60140038	1726.506104	0.010275512	29.09803241	25.60139974	3.496632673
C.3.406	25.60221291	1719.843018	0.010236981	29.08529792	25.60221354	3.483084375
C.3.407	25.59896088	1722.937012	0.010256627	29.12787457	25.59895961	3.528914968
C.3.408	25.59440231	1722.77771	0.010255864	29.14366346	25.59440168	3.549261784
C.3.409	25.57193756	1729.08606	0.010293431	29.06190896	25.57193883	3.489970128
C.3.410	25.56152344	1729.145386	0.01029347	28.93686686	25.56152344	3.375343422
C.3.411	25.54183006	1729.795898	0.01029533	28.96843089	25.54183006	3.426600832
C.3.412	25.50992966	1735.28894	0.010326339	29.04264238	25.50993029	3.532712089
C.3.413	25.48372269	1745.337646	0.010383015	29.01537646	25.48372332	3.531653134
C.3.414	25.46370506	1740.319946	0.010350569	29.14805942	25.46370506	3.684354353
C.3.415	25.44368553	1759.774902	0.010466126	29.22053574	25.4436849	3.776850842
C.3.416	25.43391991	1747.6427	0.010392907	29.21444216	25.43392054	3.780521612
C.3.417	25.42171097	1746.773926	0.010385931	29.16089666	25.4217116	3.739185053
C.3.418	25.41780663	1755.013428	0.01043418	29.0802243	25.41780663	3.662417674
C.3.419	25.40674019	1737.476563	0.010329042	29.15460691	25.40674019	3.747866719
C.3.420	25.38590431	1750.853638	0.010405995	29.12679799	25.38590495	3.740893045
C.3.421	25.36800194	1744.105957	0.010364274	29.02541988	25.3680013	3.657418578
C.3.422	25.34521484	1746.767578	0.010377592	29.04870695	25.34521548	3.703491468
C.3.423	25.33642578	1742.658203	0.010355021	29.14164518	25.33642451	3.80522067
C.3.424	25.29834175	1742.533569	0.010349735	29.10698106	25.29834175	3.808639313
C.3.425	25.27717972	1748.12561	0.010381682	29.12987917	25.27717972	3.852699455
C.3.426	25.25488091	1758.174194	0.010439081	29.05191341	25.25488154	3.79703187
C.3.427	25.24772072	1746.584839	0.010368832	28.9223475	25.24772008	3.674627414
C.3.428	25.23160744	1743.517456	0.010349417	28.98911714	25.23160807	3.757509067
C.3.429	25.21207809	1752.533936	0.010402489	29.06088519	25.21207873	3.848806464
C.3.430	25.19059181	1749.324829	0.010381971	29.0582313	25.19059118	3.867640128
C.3.431	25.1658535	1764.664917	0.010472715	29.0338445	25.16585286	3.867991639
C.3.432	25.17366409	1749.229126	0.010380697	29.05862025	25.17366536	3.884954881
C.3.433	25.16422463	1752.29834	0.010399031	29.06180029	25.16422526	3.897575033
C.3.434	25.16487694	1754.259399	0.010409904	29.15521195	25.1648763	3.990335645
C.3.435	25.16096687	1747.40271	0.0103682	29.14265576	25.16096687	3.981688885
C.3.436	25.17138481	1752.055176	0.010397965	29.02985273	25.17138545	3.858467279
C.3.437	25.17675591	1757.68689	0.01043175	29.12713496	25.17675718	3.950377786
C.3.438	25.17822075	1768.815674	0.010501584	29.1458672	25.17822011	3.967647086
C.3.439	25.18391991	1774.536011	0.01053553	29.13340272	25.18391991	3.949482812
C.3.440	25.17415428	1738.956177	0.010321221	29.18486926	25.17415301	4.01071625
C.3.441	25.16959572	1735.562012	0.01030056	29.14034053	25.16959635	3.970744175
C.3.442	25.13004684	1743.092407	0.010341754	29.00659636	25.13004684	3.876549512
C.3.443	25.12744141	1749.980103	0.010383482	29.05163024	25.12744141	3.924188838
C.3.444	25.11197853	1751.322266	0.010391593	28.89262946	25.11197853	3.780650925
C.3.445	25.08317184	1747.846924	0.010368632	29.09873248	25.08317184	4.015560637
C.3.446	25.06087112	1752.316162	0.010393552	29.05649247	25.06087176	3.995620707
C.3.447	25.03499413	1742.671631	0.010332195	29.15411031	25.03499476	4.11911555
C.3.448	25.02441406	1735.713257	0.010290454	29.12117482	25.02441343	4.096761389
C.3.449	25.01399612	1735.785767	0.010289866	29.04206449	25.0139974	4.028067095
C.3.450	25.00976753	1742.69458	0.01033112	29.10288981	25.0097669	4.093122916
C.3.451	25.00195313	1747.415161	0.010358583	29.03877438	25.00195313	4.036821255
C.3.452	24.99934769	1753.838135	0.010396701	29.06701316	24.99934832	4.067664837
C.3.453	24.99202347	1747.150635	0.010356329	29.0329403	24.99202347	4.040916835
C.3.454	24.98584175	1746.450562	0.010353058	29.08578381	24.98584112	4.099942696
C.3.455	24.98811913	1730.211548	0.010256105	29.08595816	24.98811849	4.097839671
C.3.456	24.98063088	1749.024658	0.010367926	29.00520776	24.98063215	4.024575618
C.3.457	24.97623634	1745.714355	0.010346963	29.02904574	24.97623698	4.052808766
C.3.458	24.98160744	1752.969971	0.01039281	29.05954969	24.98160871	4.07794098
C.3.459	24.98047066	1755.094971	0.01040593	29.12896541	24.98047066	4.148494748
C.3.460	24.96924019	1738.806641	0.010307782	29.12925953	24.96923955	4.160019974
C.3.461	24.96858788	1751.063477	0.010380602	29.05235675	24.96858851	4.083768239
C.3.462	24.97558403	1765.619995	0.010468178	29.04611816	24.97558339	4.070534766
C.3.463	24.97412109	1753.131958	0.010394787	29.06339024	24.97412173	4.089268507
C.3.464	24.96467972	1753.766724	0.0103969	29.01940668	24.96467972	4.05472696
C.3.465	24.93473434	1741.76709	0.010323616	28.96715006	24.93473498	4.032415078
C.3.466	24.92285347	1743.983276	0.010336431	28.98740438	24.92285283	4.064551541
C.3.467	24.91780663	1761.278809	0.010440003	29.03117477	24.91780663	4.113368146
C.3.468	24.91032028	1766.611938	0.010473094	29.14145676	24.91032028	4.231136482
C.3.469	24.90234566	1747.483887	0.010357361	29.16312812	24.90234502	4.260783094

Point	T Valve in	Capacity - refrigerant	refrigerant mass flov	T sat	T valve inlet	T subcooling
C.3.470	24.91829681	1747.827881	0.010362466	29.22718134	24.91829681	4.308884525
C.3.471	24.90950584	1757.803833	0.010420161	29.1379481	24.90950521	4.228442893
C.3.472	24.92871285	1758.538574	0.010424145	29.08704997	24.92871348	4.158336492
C.3.473	24.92431641	1748.286743	0.010364767	29.09551494	24.92431641	4.171198533
C.3.474	24.90901756	1754.357666	0.010400404	29.01506444	24.90901693	4.106047516
C.3.475	24.88671875	1766.137573	0.010468279	29.05550862	24.88671875	4.168789873
C.3.476	24.86702538	1753.969971	0.010393171	29.14562456	24.86702474	4.278599825
C.3.477	24.82356834	1747.697876	0.010352352	29.04299426	24.82356898	4.219425282
C.3.478	24.78759575	1758.029297	0.010409835	29.02908581	24.78759702	4.241488787
C.3.479	24.7734375	1763.928711	0.010445651	29.14914978	24.77343686	4.375712912
C.3.480	24.76383591	1768.621582	0.010473089	29.15250918	24.76383654	4.388672641
C.3.481	24.74967575	1764.727417	0.010448982	29.16689168	24.74967448	4.417217198
C.3.482	24.74609375	1750.028687	0.010360505	29.08418034	24.74609311	4.338087224
C.3.483	24.74316406	1760.849243	0.010426219	29.09896107	24.74316279	4.355798282
C.3.484	24.72965431	1777.725708	0.010524312	29.03748116	24.72965558	4.307825577
C.3.485	24.72688866	1786.364868	0.010576678	28.99092435	24.72688802	4.264036332
C.3.486	24.70361328	1761.533325	0.010426878	29.0567899	24.70361265	4.35317726
C.3.487	24.68522072	1771.219116	0.010482141	29.10449264	24.68522135	4.419271289
C.3.488	24.6669941	1763.296265	0.010434427	29.13275742	24.66699346	4.465763962
C.3.489	24.65755081	1778.922241	0.010527888	29.09209713	24.65755145	4.434545682
C.3.490	24.64518356	1785.06897	0.010562458	29.01913763	24.64518356	4.373954063
C.3.491	24.64550591	1780.262329	0.01053338	29.03858841	24.64550654	4.39308187
C.3.492	24.60579491	1783.662231	0.010549684	28.89859006	24.60579491	4.292795158
C.3.493	24.58496094	1782.692627	0.010544807	29.00117632	24.58495967	4.416216655
C.3.494	24.56559372	1781.343262	0.01053554	29.08423465	24.56559372	4.518640926
C.3.495	24.55387306	1780.922363	0.010532166	29.11888994	24.55387306	4.565016877
C.3.496	24.54296684	1790.921875	0.010590358	29.10788383	24.54296748	4.564916355
C.3.497	24.53548241	1793.527832	0.010605527	29.09048244	24.53548114	4.555001306
C.3.498	24.54052734	1786.248047	0.010564095	29.04201013	24.54052734	4.50148279
C.3.499	24.53320313	1790.536133	0.010587537	29.04145798	24.53320313	4.508254858
C.3.500	24.51530075	1795.841064	0.010616883	29.06111397	24.51529948	4.545814492
C.3.501	24.49528122	1784.186279	0.010547221	29.11237743	24.49528186	4.617095571
C.3.502	24.47151756	1789.751465	0.01057711	29.08991657	24.4715182	4.618398374
C.3.503	24.47200394	1795.404053	0.010611007	29.04625547	24.4720033	4.574252169
C.3.504	24.4729805	1794.876831	0.010609061	29.03819644	24.47297986	4.565216578
C.3.505	24.46858788	1792.783569	0.010595403	29.15105642	24.46858851	4.682467908
C.3.506	24.46582031	1801.726074	0.010650441	29.12327395	24.46581968	4.657454272
C.3.507	24.46989059	1782.287231	0.010534304	29.1765945	24.46988932	4.706705177
C.3.508	24.47167969	1790.54248	0.010584962	29.06879163	24.47167969	4.597111947
C.3.509	24.47672463	1802.507446	0.01065382	29.09608074	24.47672462	4.619356115
C.3.510	24.47949219	1794.259521	0.010605728	29.00166023	24.47949155	4.522168675
C.3.511	24.46109772	1782.960205	0.010536464	29.12297979	24.46109899	4.661880801
C.3.512	24.44189453	1782.562988	0.010534907	29.18112141	24.44189517	4.739226245
C.3.513	24.42822075	1784.43396	0.010543476	28.96154778	24.42822138	4.533326394
C.3.514	24.39990425	1799.950073	0.010634084	28.98481506	24.39990298	4.584912082
C.3.515	24.38590241	1787.932373	0.010559996	29.02450121	24.38590368	4.63859753
C.3.516	24.35530281	1785.181641	0.010541514	29.01629245	24.35530345	4.660989
C.3.517	24.33007813	1790.213867	0.010569276	29.12865415	24.33007812	4.798576025
C.3.518	24.31949997	1807.693481	0.010672498	29.11868715	24.31949933	4.799187817
C.3.519	24.30664253	1789.780396	0.010564923	29.08148775	24.30664317	4.774844585
C.3.520	24.30582619	1780.014648	0.010507689	29.07184805	24.30582746	4.766020593
C.3.521	24.29899216	1796.364014	0.010602213	29.08157065	24.29899152	4.782579127
C.3.522	24.29264259	1795.380371	0.010597889	29.15728101	24.29264323	4.864637781
C.3.523	24.29931641	1801.591797	0.010635167	29.1124317	24.29931641	4.813115295
C.3.524	24.283041	1800.455078	0.010628906	29.00573458	24.28304164	4.722692939
C.3.525	24.29720116	1799.08667	0.010620662	29.10655253	24.29720179	4.809350736
C.3.526	24.28450584	1798.511963	0.010617503	29.08514929	24.28450457	4.800644716
C.3.527	24.2781601	1792.145386	0.0105776	29.01142604	24.27815946	4.733266585
C.3.528	24.27783394	1799.956543	0.010625242	28.99010238	24.2778333	4.712269077
C.3.529	24.25439453	1796.840332	0.010605393	28.99863931	24.25439517	4.744244143
C.3.530	24.21988869	1794.276367	0.010587342	29.0002314	24.21988805	4.780343349
C.3.531	24.19921684	1793.408447	0.010579003	29.09622933	24.19921684	4.89701249
C.3.532	24.19384575	1802.62207	0.010634296	29.03071692	24.19384702	4.836869904
C.3.533	24.18619919	1803.575562	0.010639545	29.06229787	24.18619855	4.876099319
C.3.534	24.18880081	1795.850586	0.010592568	29.08510927	24.18880208	4.89630719
C.3.535	24.18815041	1793.970093	0.01058313	29.08004707	24.18814977	4.8918973
C.3.536	24.19010544	1797.162964	0.010600997	29.12701502	24.19010544	4.936909587

Point	T Valve in	Capacity - refrigerant	refrigerant mass flo	T sat	T valve inlet	T subcooling
C.3.537	24.18977928	1804.371338	0.01064378	29.01812724	24.18977865	4.82834859
C.3.538	24.20231056	1804.565186	0.010645602	29.0770598	24.20230993	4.874749871
C.3.539	24.20295906	1806.11377	0.010655958	29.00983434	24.2029597	4.806874639
C.3.540	24.21419334	1780.038086	0.010503408	29.01901455	24.21419398	4.804820569
C.3.541	24.20638084	1808.309448	0.01066983	29.07319464	24.20638021	4.866814434
C.3.542	24.18554497	1787.702881	0.0105452	29.00091862	24.18554497	4.815373649
C.3.543	24.16894531	1803.356689	0.010637037	28.99069523	24.16894531	4.821749921
C.3.544	24.14974022	1804.829102	0.010643302	29.01580583	24.14974022	4.86606561
C.3.545	24.14632225	1809.902344	0.010673284	29.0501486	24.14632161	4.903826981
C.3.546	24.13020706	1793.692017	0.010576276	29.06900608	24.13020643	4.938799651
C.3.547	24.13427734	1795.33728	0.010587329	28.96186015	24.13427671	4.827583441
C.3.548	24.12760353	1801.556274	0.010623139	29.07966974	24.12760353	4.95206621
C.3.549	24.12125588	1810.630493	0.010676094	29.09954112	24.12125651	4.978284608
C.3.550	24.12109375	1804.374512	0.010639685	29.02545995	24.12109375	4.904366196
C.3.551	24.11686134	1803.875244	0.010635172	28.96327582	24.11686134	4.846414473
C.3.552	24.11881638	1808.404175	0.010662546	28.99709012	24.11881638	4.878273745

Point	T sat gas	T evap exit	T superheat	capacity difference	HTF	dQ/dm_dot	dQ/dT_in	dQ/dT_out	U_Q
C.3.1	-1.113807554	6.116690063	7.230497618	1.709%		1946.74	907.8082	-907.8082	86.03161
C.3.2	-1.053313403	6.121271515	7.174584918	1.370%		1948.826	910.0233	-910.0233	86.24156
C.3.3	-1.010479643	6.120610237	7.13108988	1.967%		1943.33	904.7728	-904.7728	85.7439
C.3.4	-1.044848994	6.121108437	7.165957431	1.172%		1946.463	909.7899	-909.7899	86.21941
C.3.5	-1.014111802	6.114187622	7.128299424	0.108%		1915.099	911.2339	-911.2339	86.35578
C.3.6	-0.957706436	6.109578895	7.067285332	1.032%		1927.691	910.6828	-910.6828	86.30374
C.3.7	-0.983517767	6.111934852	7.09545262	0.220%		1931.73	908.2474	-908.2474	86.07301
C.3.8	-0.922892968	6.106570434	7.029463402	0.823%		1922.461	907.2599	-907.2599	85.97929
C.3.9	-0.99485539	6.102356529	7.097211919	-0.236%		1917.894	908.2259	-908.2259	86.07076
C.3.10	-0.991339826	6.093180275	7.084520101	0.784%		1942.844	912.1271	-912.1271	86.44085
C.3.11	-0.980711075	6.103940582	7.084651657	-0.605%		1904.595	909.8731	-909.8731	86.22667
C.3.12	-0.982129448	6.084283256	7.066412705	1.124%		1938.023	910.0734	-910.0734	86.24615
C.3.13	-0.970594516	6.066222382	7.036816897	0.516%		1925.501	912.9768	-912.9768	86.52112
C.3.14	-0.935626058	6.047174454	6.982800512	0.097%		1909.898	910.7098	-910.7098	86.30605
C.3.15	-0.945843157	6.029386521	6.975229678	0.640%		1920.462	910.3637	-910.3637	86.2734
C.3.16	-0.801555647	6.01377697	6.815332617	1.804%		1946.024	911.1902	-911.1902	86.35211
C.3.17	-0.857861351	5.999408913	6.857270263	0.816%		1925.175	910.0662	-910.0662	86.24528
C.3.18	-0.947088555	5.974714279	6.921802834	-0.848%		1908.326	912.9578	-912.9578	86.51906
C.3.19	-0.943749551	5.961263847	6.905013398	1.159%		1924.159	909.2565	-909.2565	86.16853
C.3.20	-0.923854918	5.952514458	6.876369376	3.378%		1972.691	912.1259	-912.1259	86.44119
C.3.21	-0.880090655	5.933468247	6.813558901	2.083%		1924.804	906.06	-906.06	85.86561
C.3.22	-0.891224464	5.929290771	6.820515235	1.966%		1933.96	908.4447	-908.4447	86.09174
C.3.23	-0.899306946	5.923882484	6.823189431	0.443%		1902.998	908.8768	-908.8768	86.13223
C.3.24	-0.907081942	5.928781509	6.835863451	2.088%		1952.12	909.8311	-909.8311	86.22341
C.3.25	-0.898628073	5.915503883	6.814131957	1.905%		1941.822	908.4651	-908.4651	86.0938
C.3.26	-0.853118526	5.911610222	6.764728748	2.977%		1946.413	906.2035	-906.2035	85.87954
C.3.27	-0.782788554	5.906232071	6.689020625	1.435%		1923.025	907.8917	-907.8917	86.03917
C.3.28	-0.910561458	5.901913834	6.812475291	1.159%		1927.021	909.3676	-909.3676	86.1791
C.3.29	-0.85664933	5.916963387	6.773612717	3.131%		1947.567	907.8754	-907.8754	86.038
C.3.30	-0.770228259	5.931917572	6.702145831	1.022%		1901.894	908.8839	-908.8839	86.13289
C.3.31	-0.876305178	5.939139557	6.815444735	0.621%		1911.776	909.6508	-909.6508	86.20571
C.3.32	-0.574937593	5.985538673	6.560476266	2.796%		1932.693	909.9077	-909.9077	86.23037
C.3.33	-0.654616354	6.012191582	6.666807935	1.929%		1921.041	907.1848	-907.1848	85.97215
C.3.34	-0.671538283	6.035153389	6.706691672	-0.492%		1871.47	906.5345	-906.5345	85.90979
C.3.35	-0.708505177	6.067689896	6.776195073	0.604%		1891.951	910.7061	-910.7061	86.30542
C.3.36	-0.758151324	6.092029381	6.850180705	1.048%		1912.322	910.6572	-910.6572	86.30109
C.3.37	-0.701144297	6.106920051	6.808064349	1.458%		1908.803	909.9681	-909.9681	86.23573
C.3.38	-0.659918057	6.134502029	6.794420086	2.264%		1905.357	903.7616	-903.7616	85.6475
C.3.39	-0.692489536	6.135856628	6.828346165	1.448%		1908.287	908.9088	-908.9088	86.13534
C.3.40	-0.682574743	6.139866447	6.82244119	1.965%		1901.678	908.0764	-908.0764	86.05636
C.3.41	-0.719834899	6.147489548	6.867324447	0.834%		1882.836	906.9484	-906.9484	85.94919
C.3.42	-0.710951206	6.143877792	6.854828998	1.630%		1907.379	907.6943	-907.6943	86.02023
C.3.43	-0.712468492	6.138380814	6.850849306	-0.063%		1876.976	911.254	-911.254	86.35713
C.3.44	-0.778930473	6.137134171	6.916064644	0.806%		1878.188	905.7322	-905.7322	85.83386
C.3.45	-0.724164106	6.131458855	6.855622961	1.475%		1904.817	904.9387	-904.9387	85.75905
C.3.46	-0.821685001	6.127951241	6.949636241	-1.585%		1870.729	909.1324	-909.1324	86.15597
C.3.47	-0.791577931	6.122855759	6.91443369	-1.706%		1880.943	912.2948	-912.2948	86.45582
C.3.48	-0.763386011	6.119939995	6.883326006	0.657%		1915.236	914.2889	-914.2889	86.6453
C.3.49	-0.842111571	6.117975998	6.960087568	0.425%		1898.219	906.04	-906.04	85.86332
C.3.50	-0.789269594	6.108682632	6.897952226	3.202%		1943.646	910.7826	-910.7826	86.31344
C.3.51	-0.746075839	6.095141601	6.84121744	0.697%		1887.635	910.5375	-910.5375	86.28938
C.3.52	-0.773495807	6.084862518	6.858358326	-0.204%		1873.774	909.9585	-909.9585	86.23431
C.3.53	-0.71114833	6.069932365	6.781080695	0.807%		1891.114	908.6153	-908.6153	86.10728
C.3.54	-0.718230638	6.070491218	6.788721856	2.023%		1918.609	907.6207	-907.6207	86.01343
C.3.55	-0.563940232	6.052673531	6.616613763	1.756%		1905.212	910.4012	-910.4012	86.27673
C.3.56	-0.637053497	6.043532181	6.680585678	2.388%		1902.211	907.3779	-907.3779	85.99017
C.3.57	-0.641821843	6.032731819	6.674553662	0.806%		1887.731	908.1484	-908.1484	86.06298
C.3.58	-0.61896988	6.014053535	6.633023415	3.617%		1942.337	910.0276	-910.0276	86.24188
C.3.59	-0.63851373	6.000083542	6.638597271	0.524%		1884.18	907.7774	-907.7774	86.02776
C.3.60	-0.538067257	5.98700943	6.525076687	1.652%		1895.555	906.3346	-906.3346	85.89121
C.3.61	-0.574238624	5.978123665	6.552362289	0.666%		1885.131	909.1372	-909.1372	86.15665
C.3.62	-0.613645007	5.95994873	6.573593738	1.829%		1907.462	907.7773	-907.7773	86.02811
C.3.63	-0.574098832	5.945293617	6.51939245	5.916%		1994.04	912.1418	-912.1418	86.44303
C.3.64	-0.537618635	5.932693481	6.470312116	2.980%		1921.74	910.5034	-910.5034	86.28666
C.3.65	-0.619306437	5.928901672	6.548208109	2.557%		1921.524	908.8994	-908.8994	86.13465
C.3.66	-0.566429036	5.928889847	6.495318883	1.981%		1917.789	910.1892	-910.1892	86.25683
C.3.67	-0.623848794	5.924412536	6.548261331	0.650%		1875.661	909.8255	-909.8255	86.22174

Point	T sat gas	T evap exit	T superheat	capacity difference	HTF	dQ/dm_dot	dQ/dT_in	dQ/dT_out	U_Q
C.3.68	-0.643562462	5.932984161	6.576546624	2.199%		1906.525	908.3597	-908.3597	86.08328
C.3.69	-0.653605609	5.936404228	6.590009837	0.821%		1890.067	910.3109	-910.3109	86.26795
C.3.70	-0.637923669	5.949510002	6.587433671	0.454%		1885.568	906.7864	-906.7864	85.93388
C.3.71	-0.532027718	5.954597282	6.486625	4.511%		1970.22	915.2595	-915.2595	86.73812
C.3.72	-0.603614078	5.952517319	6.556131397	1.192%		1892.411	911.4624	-911.4624	86.37711
C.3.73	-0.575862634	5.953308296	6.52917093	1.162%		1897.475	911.0936	-911.0936	86.34223
C.3.74	-0.577653301	5.95349083	6.53114413	1.284%		1904.169	909.0432	-909.0432	86.14802
C.3.75	-0.545644247	5.961997413	6.50764166	1.037%		1885.902	907.8528	-907.8528	86.03494
C.3.76	-0.477253272	5.98212223	6.459375503	2.985%		1912.835	907.748	-907.748	86.0254
C.3.77	-0.476639415	5.990052414	6.466691829	2.099%		1886.602	907.5193	-907.5193	86.00334
C.3.78	-0.454154041	6.003305817	6.457459857	0.553%		1871.821	908.5922	-908.5922	86.1048
C.3.79	-0.501487588	6.006146049	6.507633637	0.567%		1870.183	911.4825	-911.4825	86.37869
C.3.80	-0.498778176	6.015704346	6.514482521	-0.452%		1854.956	910.7203	-910.7203	86.30623
C.3.81	-0.502268106	6.04384861	6.546116716	1.979%		1884.288	909.3283	-909.3283	86.17474
C.3.82	-0.491796461	6.065149498	6.556945959	1.088%		1870.161	909.8688	-909.8688	86.22576
C.3.83	-0.577570012	6.08341999	6.660990002	0.554%		1874.072	911.3801	-911.3801	86.36903
C.3.84	-0.485904847	6.093666077	6.579570924	1.828%		1891.04	908.4176	-908.4176	86.08853
C.3.85	-0.52168614	6.108695793	6.630381933	-0.291%		1860.847	912.0759	-912.0759	86.43478
C.3.86	-0.501291719	6.108302116	6.609593836	0.415%		1861.159	906.6	-906.6	85.91585
C.3.87	-0.54942151	6.120432091	6.669853601	1.604%		1886.947	910.6367	-910.6367	86.29877
C.3.88	-0.532027718	6.125302315	6.657330032	1.867%		1888.567	908.2308	-908.2308	86.07079
C.3.89	-0.45867063	6.125417519	6.584088148	1.411%		1881.401	911.5178	-911.5178	86.38219
C.3.90	-0.404048005	6.141025543	6.545073549	4.091%		1905.381	903.9131	-903.9131	85.66187
C.3.91	-0.482081501	6.14836235	6.630443851	2.802%		1897.831	909.7669	-909.7669	86.2165
C.3.92	-0.457082047	6.143488884	6.600570931	1.052%		1863.492	908.9075	-908.9075	86.13456
C.3.93	-0.445119765	6.128742218	6.573861983	-0.396%		1859.06	910.9064	-910.9064	86.32393
C.3.94	-0.491209032	6.121783447	6.612992479	3.056%		1906.539	907.293	-907.293	85.98218
C.3.95	-0.522523562	6.120825577	6.643349138	-0.532%		1843.836	908.8649	-908.8649	86.13024
C.3.96	-0.580761917	6.098360634	6.679122551	0.915%		1875.552	910.6171	-910.6171	86.29675
C.3.97	-0.497380527	6.095055389	6.592435916	3.218%		1910.501	910.14	-910.14	86.25205
C.3.98	-0.457304325	6.094737434	6.55204176	1.322%		1880.519	909.4371	-909.4371	86.185
C.3.99	-0.481162066	6.100094032	6.581256099	6.861%		1998.857	911.5547	-911.5547	86.38746
C.3.100	-0.548636897	6.105592537	6.654229434	3.083%		1920.027	909.1044	-909.1044	86.15405
C.3.101	-0.543715663	6.11397686	6.657692523	3.094%		1914.837	909.8369	-909.8369	86.22339
C.3.102	-0.542232899	6.114967537	6.657200436	2.602%		1906.435	908.0405	-908.0405	86.05302
C.3.103	-0.586667612	6.11400032	6.700667932	0.095%		1860.381	908.9075	-908.9075	86.13451
C.3.104	-0.555770431	6.10598011	6.661750541	-1.415%		1848.951	912.6451	-912.6451	86.48856
C.3.105	-0.553755051	6.077256393	6.631011444	2.605%		1898.759	908.2205	-908.2205	86.06998
C.3.106	-0.573399882	6.047970772	6.621370654	0.933%		1861.521	905.068	-905.068	85.77068
C.3.107	-0.666768601	6.004312897	6.671081498	2.159%		1892.196	906.7702	-906.7702	85.93243
C.3.108	-0.651837625	5.956527519	6.608365144	0.674%		1884.844	909.411	-909.411	86.1826
C.3.109	-0.550539021	5.908163262	6.458702283	4.471%		1942.691	908.8933	-908.8933	86.13439
C.3.110	-0.555181856	5.893447495	6.44862935	2.959%		1904.91	909.1825	-909.1825	86.16123
C.3.111	-0.583954133	5.866091919	6.450046052	1.421%		1887.332	910.0018	-910.0018	86.23862
C.3.112	-0.611712423	5.853778267	6.46549069	0.299%		1863.071	903.6167	-903.6167	85.63317
C.3.113	-0.581713897	5.85211525	6.433829147	1.186%		1890.154	909.6409	-909.6409	86.20446
C.3.114	-0.594175478	5.854241752	6.44841723	2.175%		1897.422	911.5673	-911.5673	86.38713
C.3.115	-0.512772783	5.888856888	6.401629671	4.827%		1947.477	908.9618	-908.9618	86.14096
C.3.116	-0.436114632	5.902429581	6.338544213	-0.841%		1829.869	906.2119	-906.2119	85.87863
C.3.117	-0.51836042	5.921481705	6.439842125	-1.056%		1835.654	904.2476	-904.2476	85.69256
C.3.118	-0.50637578	5.949299621	6.455675401	0.901%		1860.882	908.6971	-908.6971	86.11459
C.3.119	-0.501122561	5.974377632	6.475500193	-1.223%		1827.331	904.9331	-904.9331	85.75741
C.3.120	-0.492828937	6.002658081	6.495487018	-1.420%		1817.914	907.5426	-907.5426	86.00456
C.3.121	-0.437032806	6.032909965	6.469942771	0.880%		1864.616	909.0929	-909.0929	86.15214
C.3.122	-0.465953605	6.050979042	6.516932647	-0.384%		1851.45	909.1105	-909.1105	86.15363
C.3.123	-0.395917917	6.061719131	6.457637048	-0.117%		1844.245	908.3127	-908.3127	86.07792
C.3.124	-0.516712532	6.079501343	6.596213875	3.238%		1907.036	911.7005	-911.7005	86.39989
C.3.125	-0.538905097	6.080372429	6.619277526	-0.158%		1844.207	910.5678	-910.5678	86.29163
C.3.126	-0.462159261	6.081163025	6.543322285	-0.304%		1846.999	909.1689	-909.1689	86.1591
C.3.127	-0.505761377	6.086144257	6.591905633	-0.376%		1844	912.3089	-912.3089	86.45662
C.3.128	-0.483561549	6.09268074	6.576242289	0.887%		1868.379	908.0971	-908.0971	86.05783
C.3.129	-0.486269705	6.095223808	6.581493513	-1.276%		1826.684	908.4774	-908.4774	86.09328
C.3.130	-0.438205736	6.095336533	6.533542268	0.871%		1857.718	908.6771	-908.6771	86.11264
C.3.131	-0.487079526	6.105093575	6.5921731	0.859%		1862.473	912.178	-912.178	86.44448
C.3.132	-0.476473349	6.104042435	6.580515783	-1.138%		1863.514	916.3759	-916.3759	86.84232
C.3.133	-0.494030566	6.095915985	6.589946551	-0.029%		1839.038	905.9027	-905.9027	85.84945
C.3.134	-0.570851069	6.099633026	6.670484095	-0.565%		1840.157	905.9983	-905.9983	85.85853

Point	T sat gas	T evap exit	T superheat	capacity difference	HTF	dQ/dm_do	dQ/dT_in	dQ/dT_out	U_Q
C.3.135	-0.44810326	6.108511353	6.556614613	3.443%		1916.374	912.646	-912.646	86.48963
C.3.136	-0.403879348	6.103134728	6.507014075	-2.342%		1822.775	913.5474	-913.5474	86.57368
C.3.137	-0.463496124	6.105878067	6.569374191	-0.240%		1852.342	908.633	-908.633	86.10838
C.3.138	-0.453706564	6.111748123	6.565454688	-0.524%		1842.142	906.5808	-906.5808	85.91376
C.3.139	-0.465980286	6.110375214	6.576355499	-2.058%		1826.403	910.7714	-910.7714	86.31066
C.3.140	-0.421483602	6.110280037	6.531763639	0.128%		1852.979	908.4341	-908.4341	86.08955
C.3.141	-0.481998454	6.112421608	6.594420062	-0.579%		1841.653	909.9097	-909.9097	86.22922
C.3.142	-0.436393044	6.101353836	6.53774688	-0.726%		1833.932	907.6311	-907.6311	86.01317
C.3.143	-0.481523905	6.081375694	6.562899599	1.715%		1868.463	908.8423	-908.8423	86.12846
C.3.144	-0.540693749	6.084294128	6.624987877	-1.555%		1846.722	911.0235	-911.0235	86.33485
C.3.145	-0.554090939	6.068561173	6.622652111	1.118%		1864.778	908.7712	-908.7712	86.12167
C.3.146	-0.594035601	6.046490669	6.64052627	1.882%		1876.928	911.671	-911.671	86.39665
C.3.147	-0.542960901	6.028527069	6.57148797	2.988%		1896.854	908.8476	-908.8476	86.12937
C.3.148	-0.615467517	6.005752563	6.621220081	1.257%		1864.874	908.5243	-908.5243	86.09827
C.3.149	-0.567746365	5.975647164	6.543393529	0.062%		1868.231	911.9538	-911.9538	86.42333
C.3.150	-0.595464158	5.97032814	6.565792299	1.181%		1880.26	906.6332	-906.6332	85.91928
C.3.151	-0.55137718	5.946777916	6.498155096	-1.197%		1840.66	910.3655	-910.3655	86.27241
C.3.152	-0.490010472	5.921968651	6.411979123	-1.876%		1824.707	909.3297	-909.3297	86.17402
C.3.153	-0.507186097	5.920892716	6.428078812	1.082%		1858.419	908.0275	-908.0275	86.05109
C.3.154	-0.59019666	5.910435677	6.500632337	-0.828%		1839.845	910.7442	-910.7442	86.30829
C.3.155	-0.38350478	5.889938545	6.273443325	0.042%		1846	912.9405	-912.9405	86.51651
C.3.156	-0.455297947	5.88902111	6.344319058	-0.537%		1856.119	912.5986	-912.5986	86.48426
C.3.157	-0.483700956	5.889632416	6.373333371	0.569%		1856.953	908.7808	-908.7808	86.12246
C.3.158	-0.423600419	5.893045998	6.316646416	1.260%		1862.703	908.6302	-908.6302	86.10828
C.3.159	-0.545953306	5.8959692	6.441922506	2.232%		1895.117	909.7537	-909.7537	86.21522
C.3.160	-0.515008317	5.919408607	6.434416925	1.069%		1878.541	909.5493	-909.5493	86.19561
C.3.161	-0.4869935	5.94824009	6.435233589	0.571%		1854.366	907.4444	-907.4444	85.99578
C.3.162	-0.514782679	5.976748276	6.491530955	2.188%		1891.23	911.0425	-911.0425	86.3373
C.3.163	-0.512493723	5.999686051	6.512179773	1.141%		1853.47	909.3721	-909.3721	86.17845
C.3.164	-0.41891992	6.028614616	6.447534537	1.831%		1869.174	907.3191	-907.3191	85.98412
C.3.165	-0.572448143	6.045435524	6.617883667	1.969%		1886.493	907.8649	-907.8649	86.0361
C.3.166	-0.45786151	6.070315552	6.528177062	2.530%		1874.866	906.4501	-906.4501	85.90184
C.3.167	-0.556778168	6.088002968	6.644781135	1.540%		1874.747	908.2546	-908.2546	86.07285
C.3.168	-0.271434579	6.094927597	6.366362176	2.382%		1865.497	909.7338	-909.7338	86.2129
C.3.169	-0.307728962	6.110578537	6.418307499	1.241%		1865.443	915.0372	-915.0372	86.71548
C.3.170	-0.382836491	6.115659714	6.498496205	-0.340%		1826.732	909.2063	-909.2063	86.16235
C.3.171	-0.375237877	6.119863892	6.495101769	2.515%		1884.953	907.7754	-907.7754	86.02759
C.3.172	-0.383782745	6.127359199	6.511141945	1.745%		1868.603	910.7543	-910.7543	86.30965
C.3.173	-0.404465215	6.130069351	6.534534566	2.688%		1877.138	905.4624	-905.4624	85.80828
C.3.174	-0.396417853	6.133610916	6.530028769	0.334%		1852.25	908.706	-908.706	86.1153
C.3.175	-0.398311172	6.135274506	6.533585678	2.747%		1879.277	908.8642	-908.8642	86.13069
C.3.176	-0.435388998	6.14180069	6.577189687	2.403%		1874.441	908.5771	-908.5771	86.1034
C.3.177	-0.40797472	6.129922676	6.537897396	0.914%		1857.91	909.8103	-909.8103	86.22004
C.3.178	-0.388011652	6.128542519	6.51655417	1.784%		1867.537	911.1513	-911.1513	86.34725
C.3.179	-0.400985672	6.132168961	6.533154633	0.943%		1858.618	910.2234	-910.2234	86.25919
C.3.180	-0.363249249	6.134488106	6.497737355	-0.069%		1839.815	911.3961	-911.3961	86.37006
C.3.181	-0.454933434	6.138681793	6.593615227	0.539%		1849.958	914.5677	-914.5677	86.67077
C.3.182	-0.4693007	6.141461563	6.610762263	0.226%		1846.683	909.9202	-909.9202	86.23029
C.3.183	-0.411537872	6.138985443	6.550523315	0.130%		1852.218	910.2558	-910.2558	86.26218
C.3.184	-0.449021769	6.13595562	6.584977388	1.319%		1864.144	909.4368	-909.4368	86.18473
C.3.185	-0.384338682	6.131954765	6.516293447	2.006%		1871.842	907.7985	-907.7985	86.02959
C.3.186	-0.425190342	6.11172905	6.536919391	2.242%		1871.43	910.6838	-910.6838	86.30301
C.3.187	-0.481942101	6.078462219	6.56040432	3.890%		1911.098	911.1005	-911.1005	86.34309
C.3.188	-0.51620779	6.044907761	6.561115551	2.905%		1908.441	911.1122	-911.1122	86.34416
C.3.189	-0.517048042	6.003212929	6.52026097	3.602%		1905.22	909.8599	-909.8599	86.22543
C.3.190	-0.561365395	5.971837425	6.533202821	3.733%		1913.647	908.4494	-908.4494	86.09189
C.3.191	-0.520343934	5.944227981	6.464571915	2.922%		1910.276	909.0284	-909.0284	86.14671
C.3.192	-0.469496378	5.923039245	6.392535623	3.804%		1889.831	903.3649	-903.3649	85.60969
C.3.193	-0.346763175	5.913734627	6.260497802	2.405%		1890.428	910.2118	-910.2118	86.25856
C.3.194	-0.464335026	5.892951965	6.357286992	0.374%		1846.133	910.2022	-910.2022	86.25701
C.3.195	-0.434553797	5.879160881	6.313714678	0.549%		1856.769	908.1318	-908.1318	86.06096
C.3.196	-0.468156305	5.865130615	6.33328692	2.364%		1875.456	910.0518	-910.0518	86.24318
C.3.197	-0.498974029	5.856711006	6.355685035	0.739%		1849.871	907.4977	-907.4977	86.00077
C.3.198	-0.443277066	5.860395241	6.303672307	0.703%		1848.19	911.5448	-911.5448	86.38427
C.3.199	-0.257736958	5.87114048	6.128877438	-0.882%		1816.755	908.6723	-908.6723	86.11161
C.3.200	-0.317392414	5.907909584	6.225301998	-0.020%		1828.737	910.0965	-910.0965	86.24674
C.3.201	-0.354603367	5.944802093	6.299405461	0.129%		1831.084	908.6421	-908.6421	86.10894

Point	T sat gas	T evap exit	T superheat	capacity difference	HTF	dQ/dm_dot	dQ/dT_in	dQ/dT_out	U_Q
C.3.202	-0.291603978	5.977263069	6.268867048	-1.002%		1819.574	908.5667	-908.5667	86.10164
C.3.203	-0.33386668	6.008684349	6.342551029	1.685%		1846.755	905.555	-905.555	85.81662
C.3.204	-0.401707588	6.039461517	6.441169105	0.794%		1845.87	911.0795	-911.0795	86.34014
C.3.205	-0.400234187	6.049132347	6.449366534	-0.065%		1824.545	907.2249	-907.2249	85.97455
C.3.206	-0.44364145	6.060639954	6.504281404	-1.662%		1809.055	907.2648	-907.2648	85.97811
C.3.207	-0.432072014	6.073050117	6.505122131	-1.399%		1806.729	907.0072	-907.0072	85.95366
C.3.208	-0.230247023	6.090160561	6.320407584	-0.983%		1803.893	906.1043	-906.1043	85.86806
C.3.209	-0.321781004	6.104623222	6.426404226	-1.336%		1809.274	908.9843	-908.9843	86.14106
C.3.210	-0.301068002	6.112988281	6.414056284	-0.846%		1804.276	905.4733	-905.4733	85.80828
C.3.211	-0.302064995	6.108993721	6.411058716	-0.004%		1823.669	906.2375	-906.2375	85.88096
C.3.212	-0.352101038	6.120319748	6.472420786	2.145%		1856.185	908.8913	-908.8913	86.13292
C.3.213	-0.36525296	6.140659523	6.505912483	1.155%		1851.136	907.1649	-907.1649	85.96924
C.3.214	-0.274290322	6.144438744	6.418729065	1.222%		1834.185	909.3171	-909.3171	86.17296
C.3.215	-0.320615182	6.150108719	6.4707239	1.064%		1842.509	910.5722	-910.5722	86.29201
C.3.216	-0.369313954	6.153234673	6.522548627	0.773%		1828.018	905.7837	-905.7837	85.83802
C.3.217	-0.331058887	6.1719944	6.503053287	1.963%		1852.591	906.9964	-906.9964	85.95329
C.3.218	-0.343844999	6.164385414	6.508230413	0.415%		1841.173	908.4571	-908.4571	86.09156
C.3.219	-0.344760593	6.171042824	6.515803417	1.335%		1843.186	905.0662	-905.0662	85.77024
C.3.220	-0.338786063	6.168787766	6.507573829	-0.409%		1816.796	912.0572	-912.0572	86.43238
C.3.221	-0.384838442	6.168588257	6.553426699	1.440%		1849.644	908.6307	-908.6307	86.10813
C.3.222	-0.396222611	6.165174103	6.561396714	2.902%		1875.31	907.2736	-907.2736	85.97989
C.3.223	-0.419310676	6.156271362	6.575582039	0.849%		1849.897	910.6202	-910.6202	86.29667
C.3.224	-0.459230801	6.119935799	6.5791666	1.462%		1852.098	910.1589	-910.1589	86.25298
C.3.225	-0.482164548	6.098756981	6.580921529	1.475%		1875.989	910.2109	-910.2109	86.25827
C.3.226	-0.383782745	6.071283531	6.455066276	3.977%		1889.752	906.2652	-906.2652	85.88454
C.3.227	-0.391046154	6.038752365	6.42979852	1.188%		1852.698	912.7028	-912.7028	86.49408
C.3.228	-0.445033849	6.01494236	6.459976209	3.048%		1905.67	912.5177	-912.5177	86.47731
C.3.229	-0.418168024	5.991116524	6.409284547	1.721%		1857.298	910.4357	-910.4357	86.27929
C.3.230	-0.422792164	5.959837914	6.382630077	-0.917%		1820.423	912.1616	-912.1616	86.44233
C.3.231	-0.431459001	5.943069458	6.374528458	1.921%		1870.755	909.2611	-909.2611	86.16818
C.3.232	-0.465840954	5.918343353	6.384184308	-0.557%		1844.244	909.7275	-909.7275	86.212
C.3.233	-0.390768128	5.893326759	6.284094887	-0.353%		1818.216	906.8852	-906.8852	85.94228
C.3.234	-0.349374395	5.88404808	6.233422475	1.924%		1865.033	909.1697	-909.1697	86.15944
C.3.235	-0.396920755	5.883065033	6.279985788	1.015%		1863.214	911.0022	-911.0022	86.33307
C.3.236	-0.4377022	5.872327804	6.310030004	-0.123%		1830.284	910.4986	-910.4986	86.28487
C.3.237	-0.423878724	5.863533211	6.287411934	0.682%		1843.789	908.9465	-908.9465	86.13798
C.3.238	-0.408335752	5.877598	6.285933752	1.039%		1834.977	908.5512	-908.5512	86.1004
C.3.239	-0.418780788	5.895978928	6.314759716	-0.579%		1836.155	912.777	-912.777	86.50087
C.3.240	-0.377520233	5.916203499	6.293723732	-0.372%		1820.697	908.6601	-908.6601	86.11051
C.3.241	-0.373931212	5.960820198	6.33475141	1.890%		1870.138	909.7956	-909.7956	86.21882
C.3.242	-0.362749818	5.977532577	6.340282395	-0.695%		1826.494	909.6572	-909.6572	86.20508
C.3.243	-0.391128971	6.000862503	6.391991474	0.288%		1824.128	909.3699	-909.3699	86.17782
C.3.244	-0.23606345	6.022277641	6.258341091	1.444%		1846.355	905.7269	-905.7269	85.8329
C.3.245	-0.257041769	6.031838989	6.288880759	-0.502%		1805.713	906.5443	-906.5443	85.90979
C.3.246	-0.27390129	6.045214844	6.319116133	-1.589%		1796.767	908.5285	-908.5285	86.0977
C.3.247	-0.322058446	6.060075569	6.382134016	-2.783%		1788.15	907.8618	-907.8618	86.0344
C.3.248	-0.240608988	6.064861298	6.305470285	-0.783%		1820.551	909.0953	-909.0953	86.15175
C.3.249	-0.325753966	6.084201622	6.409955589	-0.580%		1815.667	908.7049	-908.7049	86.11468
C.3.250	-0.355740853	6.082560921	6.438301774	-0.498%		1830.711	911.7678	-911.7678	86.40515
C.3.251	-0.415856198	6.091033173	6.506889371	1.412%		1859.971	909.4414	-909.4414	86.1851
C.3.252	-0.353211848	6.091804695	6.445016542	2.025%		1858.692	910.8571	-910.8571	86.31925
C.3.253	-0.244987313	6.11484623	6.359833543	2.130%		1851.248	908.7722	-908.7722	86.12156
C.3.254	-0.277535383	6.118792725	6.396328108	0.128%		1828.813	911.1494	-911.1494	86.34652
C.3.255	-0.321754441	6.125693321	6.447447762	0.921%		1833.972	911.7341	-911.7341	86.40201
C.3.256	-0.291713084	6.129143715	6.420856799	0.909%		1842.948	909.2558	-909.2558	86.16727
C.3.257	-0.289548738	6.13321991	6.422768648	-0.922%		1809.214	910.6079	-910.6079	86.29493
C.3.258	-0.291630517	6.146598053	6.43822857	-0.761%		1808.934	907.5983	-907.5983	86.00971
C.3.259	-0.314892922	6.151791	6.466683922	2.052%		1870.174	914.0634	-914.0634	86.62326
C.3.260	-0.371149546	6.163113212	6.534262759	2.068%		1850.73	910.4525	-910.4525	86.28079
C.3.261	-0.353657955	6.158511162	6.512169117	0.711%		1839.838	907.5369	-907.5369	86.00434
C.3.262	-0.416246918	6.144837952	6.56108487	2.769%		1893.468	909.9708	-909.9708	86.23576
C.3.263	-0.464139379	6.127160072	6.591299452	2.974%		1888.232	909.4626	-909.4626	86.18752
C.3.264	-0.268437644	6.109881973	6.378319617	4.835%		1903.058	908.4154	-908.4154	86.0885
C.3.265	-0.325086853	6.072690582	6.397777435	1.856%		1862.174	908.1361	-908.1361	86.06144
C.3.266	-0.40995157	6.04725914	6.45721071	2.708%		1885.01	905.8347	-905.8347	85.84368
C.3.267	-0.345983394	6.001656342	6.347639736	4.687%		1903.844	906.3791	-906.3791	85.89555
C.3.268	-0.433327689	5.962569809	6.395897498	2.778%		1888.551	908.7827	-908.7827	86.12311

Point	T sat gas	T evap exit	T superheat	capacity difference	HTF	dQ/dm_do	dQ/dT_in	dQ/dT_out	U_Q
C.3.269	-0.480687529	5.937569809	6.418257338	3.286%		1896.714	911.6838	-911.6838	86.39815
C.3.270	-0.482194208	5.910711479	6.392905687	3.109%		1901.739	910.267	-910.267	86.26397
C.3.271	-0.348875175	5.881824875	6.23070005	4.022%		1897.005	906.5844	-906.5844	85.9149
C.3.272	-0.324475836	5.867551041	6.192026877	4.085%		1898.172	911.378	-911.378	86.3692
C.3.273	-0.336146158	5.84039917	6.176545328	3.709%		1886.896	905.1585	-905.1585	85.77963
C.3.274	-0.402710603	5.832091331	6.234801935	2.531%		1866.45	909.3984	-909.3984	86.18113
C.3.275	-0.324224939	5.821167755	6.145392694	1.301%		1865.124	912.1216	-912.1216	86.43918
C.3.276	-0.251251072	5.843127823	6.094378895	1.795%		1857.596	910.3629	-910.3629	86.27241
C.3.277	-0.215016171	5.87065506	6.085671231	-0.367%		1816.146	912.1527	-912.1527	86.44143
C.3.278	-0.272819686	5.89324646	6.166066146	1.109%		1837.471	907.3275	-907.3275	85.98446
C.3.279	-0.333615711	5.91199379	6.2456095	1.101%		1854.682	911.1062	-911.1062	86.34281
C.3.280	-0.288272018	5.924863434	6.213135452	1.588%		1840.307	906.5614	-906.5614	85.9119
C.3.281	-0.16602002	5.932891655	6.098911675	2.661%		1866.016	908.0747	-908.0747	86.05568
C.3.282	-0.262921876	5.931611252	6.194533128	-0.046%		1814.271	909.7828	-909.7828	86.21682
C.3.283	-0.312254939	5.934464264	6.246719203	1.473%		1847.579	908.2527	-908.2527	86.07228
C.3.284	-0.274540837	5.937104225	6.211645062	1.383%		1837.642	909.6347	-909.6347	86.20311
C.3.285	-0.29124128	5.942077827	6.233319107	-0.517%		1811.015	909.1759	-909.1759	86.15926
C.3.286	-0.135792247	5.952055359	6.087847606	1.063%		1826.226	910.5876	-910.5876	86.29324
C.3.287	-0.226229699	5.955560493	6.181790193	0.633%		1820.689	907.5518	-907.5518	86.00548
C.3.288	-0.280533151	5.957200241	6.237733392	1.301%		1839.874	907.8536	-907.8536	86.03435
C.3.289	-0.240081979	5.949796295	6.189878275	3.028%		1866.471	909.0341	-909.0341	86.14661
C.3.290	-0.236092888	5.939836884	6.175929772	4.251%		1873.45	905.1384	-905.1384	85.77753
C.3.291	-0.254243492	5.940632057	6.194875549	3.434%		1872.768	906.6553	-906.6553	85.92126
C.3.292	-0.293405737	5.940520096	6.233925833	2.466%		1861.46	908.9336	-908.9336	86.13701
C.3.293	-0.250058304	5.927324104	6.177382408	0.372%		1827.819	909.0192	-909.0192	86.14464
C.3.294	-0.249310268	5.920767784	6.170078053	0.734%		1825.753	907.4939	-907.4939	86.00006
C.3.295	-0.129632665	5.933766746	6.063399411	-0.192%		1814.39	908.8759	-908.8759	86.13087
C.3.296	-0.11704419	5.926633072	6.043677262	1.595%		1846.007	912.7772	-912.7772	86.50103
C.3.297	-0.201342093	5.930438614	6.131780707	1.498%		1833.903	911.4063	-911.4063	86.37094
C.3.298	-0.206768099	5.939736748	6.146504846	3.118%		1860.636	905.3285	-905.3285	85.79535
C.3.299	-0.240997625	5.932821464	6.17381909	0.807%		1832.5	913.0151	-913.0151	86.52339
C.3.300	-0.234844741	5.925863647	6.160708388	2.009%		1847.828	909.6605	-909.6605	86.2057
C.3.301	-0.227727677	5.943230629	6.170958306	-0.167%		1808.825	910.4879	-910.4879	86.28355
C.3.302	-0.288799801	5.981650734	6.270450535	1.781%		1856.682	910.3599	-910.3599	86.2721
C.3.303	-0.090167215	6.00633049	6.096497705	2.828%		1857.984	913.646	-913.646	86.58354
C.3.304	-0.169697995	6.024695969	6.194393964	1.802%		1841.701	909.7355	-909.7355	86.21271
C.3.305	-0.142035176	6.032322502	6.174357678	1.291%		1834.014	907.5656	-907.5656	86.00697
C.3.306	-0.160271808	6.032625198	6.192897006	0.986%		1823.148	909.8907	-909.8907	86.22716
C.3.307	-0.248618204	6.024123764	6.272741968	3.438%		1867.981	907.5187	-907.5187	86.00302
C.3.308	-0.322309327	5.996265411	6.318574738	3.111%		1873.898	908.2864	-908.2864	86.07586
C.3.309	-0.306537088	5.97345047	6.279987558	1.974%		1861.654	909.4617	-909.4617	86.18706
C.3.310	-0.344872829	5.958965874	6.303838702	3.210%		1877.636	911.3969	-911.3969	86.37068
C.3.311	-0.190025364	5.950290108	6.140315472	2.613%		1859.319	909.4782	-909.4782	86.18859
C.3.312	-0.189002376	5.945202065	6.134204441	2.771%		1859.305	906.896	-906.896	85.94388
C.3.313	-0.258511697	5.94364357	6.202155267	0.936%		1848.157	909.3551	-909.3551	86.17676
C.3.314	-0.205659297	5.964164352	6.169823649	3.504%		1879.991	908.2521	-908.2521	86.07269
C.3.315	-0.206297515	5.956945419	6.163242935	0.722%		1823.07	908.9503	-908.9503	86.13804
C.3.316	-0.197275383	5.963300514	6.160575897	-1.076%		1805.335	911.2256	-911.2256	86.35341
C.3.317	-0.2292787	5.969633866	6.198912566	-1.464%		1794.343	906.8064	-906.8064	85.93447
C.3.318	-0.222989711	5.970583534	6.193573245	-1.181%		1805.004	909.8625	-909.8625	86.22423
C.3.319	-0.22235411	5.972655105	6.195009216	-0.171%		1822.699	912.3895	-912.3895	86.46396
C.3.320	-0.076299026	5.969739342	6.046038368	1.420%		1837.618	910.2	-910.2	86.25668
C.3.321	-0.119499311	5.975391579	6.09489089	1.277%		1836.556	905.4509	-905.4509	85.80661
C.3.322	-0.104706837	5.967366028	6.072072865	0.923%		1827.279	908.7063	-908.7063	86.11498
C.3.323	-0.118642785	5.994920349	6.113563134	1.361%		1829.916	909.5776	-909.5776	86.19759
C.3.324	-0.175283313	5.999145317	6.17442863	0.524%		1826.192	905.3817	-905.3817	85.7999
C.3.325	-0.17984688	6.00254612	6.182392999	0.899%		1816.488	905.1277	-905.1277	85.7757
C.3.326	-0.053588735	6.012782669	6.066371404	-0.336%		1805.539	911.2951	-911.2951	86.36001
C.3.327	-0.106859014	6.020134926	6.12699394	0.344%		1818.102	908.4632	-908.4632	86.09181
C.3.328	-0.140708418	6.01844101	6.159149427	-0.616%		1806.418	910.3439	-910.3439	86.26987
C.3.329	-0.139243762	6.030949402	6.170193164	3.223%		1857.869	902.054	-902.054	85.48499
C.3.330	-0.160271808	6.033201599	6.193473407	0.473%		1821.394	907.459	-907.459	85.99669
C.3.331	-0.038109073	6.042004967	6.08011404	0.936%		1819.066	910.2297	-910.2297	86.25923
C.3.332	-0.071805503	6.042284012	6.114089515	1.674%		1825.479	908.4113	-908.4113	86.08699
C.3.333	-0.125049678	6.05098896	6.176038638	0.630%		1817.69	909.6901	-909.6901	86.20808
C.3.334	0.019805257	6.044449043	6.024643786	-0.243%		1800.194	907.1266	-907.1266	85.96489
C.3.335	-0.005137104	6.047859573	6.052996677	1.295%		1813.558	907.0831	-907.0831	85.96096

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C.3.336	-0.00808083	6.041627312	6.049708141	1.414%		1817.218	909.1309	-909.1309	86.15507
C.3.337	-0.062709031	6.030193901	6.092902932	1.790%		1836.521	909.3475	-909.3475	86.17587
C.3.338	-0.194064714	6.006336212	6.200400926	1.545%		1843.657	909.3356	-909.3356	86.17485
C.3.339	-0.222271719	5.988777161	6.211048879	2.787%		1867.505	908.5995	-908.5995	86.10543
C.3.340	-0.096952547	5.949608803	6.046561349	3.410%		1872.805	909.9107	-909.9107	86.22977
C.3.341	-0.092843077	5.922527504	6.015370581	2.370%		1831.543	905.2829	-905.2829	85.79062
C.3.342	-0.101203254	5.910632706	6.011835959	-0.398%		1809.788	910.3186	-910.3186	86.26752
C.3.343	-0.08093087	5.902602959	5.983533829	-0.848%		1794.359	907.4608	-907.4608	85.99649
C.3.344	0.068314826	5.895791626	5.8274768	1.481%		1809.032	908.2188	-908.2188	86.06853
C.3.345	0.024037379	5.907689667	5.883652288	-1.176%		1792.59	909.1093	-909.1093	86.15268
C.3.346	0.061754765	5.927706527	5.865951763	1.067%		1809.152	907.9253	-907.9253	86.04072
C.3.347	0.062384868	5.948532677	5.886147809	-0.071%		1786.125	910.7375	-910.7375	86.30689
C.3.348	0.024092869	5.95684166	5.93274879	-1.422%		1775.194	909.2793	-909.2793	86.16855
C.3.349	-0.014574332	5.974698448	5.98927278	-0.717%		1796.688	913.9255	-913.9255	86.60915
C.3.350	0.001135337	5.967271614	5.966136277	0.138%		1785.872	909.3469	-909.3469	86.17511
C.3.351	-0.025886215	5.986912918	6.012799133	1.252%		1812.065	906.2975	-906.2975	85.88649
C.3.352	-0.086583134	5.993361855	6.079944989	0.471%		1811.187	911.1701	-911.1701	86.34824
C.3.353	0.006167621	5.999888611	5.99372099	-0.425%		1779.877	909.5053	-909.5053	86.19004
C.3.354	0.001299001	5.998930168	5.997631167	-0.117%		1784.222	907.5997	-907.5997	86.00951
C.3.355	-0.071831865	6.003129768	6.074961634	0.733%		1805.979	910.0218	-910.0218	86.23935
C.3.356	0.121027637	6.007125473	5.886097836	0.238%		1786.103	908.5874	-908.5874	86.10313
C.3.357	0.119245506	6.010077667	5.890832161	0.031%		1781.363	908.039	-908.039	86.0511
C.3.358	0.05763546	6.022636604	5.965001144	0.550%		1791.209	910.3108	-910.3108	86.26653
C.3.359	0.084477484	6.033682442	5.949204958	-1.113%		1765.411	909.135	-909.135	86.15474
C.3.360	0.096051496	6.03502388	5.938972384	0.577%		1775.888	906.3463	-906.3463	85.89061
C.3.361	0.047941965	6.04101162	5.993069655	0.608%		1795.306	906.285	-906.285	85.88507
C.3.362	0.104003164	6.045584107	5.941580943	-1.524%		1757.212	910.7121	-910.7121	86.30409
C.3.363	0.067956084	6.045589829	5.977633744	-0.434%		1770.977	909.479	-909.479	86.18741
C.3.364	0.108719639	6.049334526	5.940614887	2.438%		1817.214	909.2796	-909.2796	86.16917
C.3.365	0.217209036	6.060264969	5.843055933	1.152%		1806.688	911.4337	-911.4337	86.37315
C.3.366	0.193840242	6.056347275	5.862507033	-1.194%		1760.897	908.6371	-908.6371	86.1075
C.3.367	0.170262871	6.063952637	5.893689766	0.908%		1793.096	910.5524	-910.5524	86.28944
C.3.368	0.215678928	6.075872993	5.860194065	-0.134%		1773.82	907.7263	-907.7263	86.02136
C.3.369	0.111434437	6.056149292	5.944714855	-0.596%		1766.714	910.0925	-910.0925	86.24549
C.3.370	0.013428294	6.042684936	6.029256642	1.367%		1804.487	909.3975	-909.3975	86.18016
C.3.371	0.034619674	6.026268768	5.991649094	-0.372%		1770.546	906.2711	-906.2711	85.88341
C.3.372	0.102552252	5.999585915	5.897033662	-0.627%		1764.896	908.1491	-908.1491	86.06131
C.3.373	0.053652778	5.961427688	5.90777491	1.507%		1807.103	907.1844	-907.1844	85.97047
C.3.374	0.046567369	5.928878212	5.882310843	1.592%		1806.693	910.0803	-910.0803	86.2449
C.3.375	0.129165384	5.904479217	5.775313833	-0.244%		1785.388	912.192	-912.192	86.44472
C.3.376	0.141820733	5.889243126	5.747422393	2.033%		1795.203	904.8628	-904.8628	85.75029
C.3.377	0.172231208	5.892568779	5.720337571	-1.756%		1756.936	910.0733	-910.0733	86.24354
C.3.378	0.146912928	5.883860397	5.736947469	-0.234%		1765.243	910.5652	-910.5652	86.29028
C.3.379	0.131246809	5.902713394	5.771466585	-1.912%		1753.191	909.5302	-909.5302	86.19202
C.3.380	0.134725259	5.922828674	5.788103416	-0.235%		1767.025	908.4617	-908.4617	86.09096
C.3.381	0.125849387	5.935434151	5.809584764	0.466%		1776.21	906.4597	-906.4597	85.90137
C.3.382	0.102330822	5.937190819	5.834859996	-2.014%		1755.223	913.2924	-913.2924	86.54858
C.3.383	0.068973969	5.954791832	5.885817863	1.409%		1803.985	910.3656	-910.3656	86.27189
C.3.384	0.130781047	5.966795349	5.836014302	0.362%		1776.903	908.4933	-908.4933	86.09409
C.3.385	0.27088307	5.95797596	5.687092889	-0.759%		1758.054	907.0823	-907.0823	85.96012
C.3.386	0.26463597	5.978301048	5.713665079	0.670%		1769.048	909.1479	-909.1479	86.15602
C.3.387	0.178551181	5.989851379	5.811300198	1.840%		1800.132	908.6242	-908.6242	86.10682
C.3.388	0.220707402	5.992773819	5.772066417	0.419%		1780.294	910.4544	-910.4544	86.27998
C.3.389	0.174475607	5.993370628	5.818895022	0.005%		1773.801	906.7118	-906.7118	85.92522
C.3.390	0.386042196	6.001337624	5.615295427	2.333%		1792.308	904.5746	-904.5746	85.72295
C.3.391	0.355910602	6.012273979	5.656363377	-0.884%		1764.642	913.6255	-913.6255	86.58028
C.3.392	0.298831139	6.011614799	5.71278366	0.840%		1772.723	905.8093	-905.8093	85.83968
C.3.393	0.381177706	6.02734909	5.646171384	1.891%		1788.381	909.7106	-909.7106	86.2096
C.3.394	0.319621709	6.035964394	5.716342685	-0.278%		1757.375	910.3107	-910.3107	86.26604
C.3.395	0.267610376	6.035927391	5.768317015	1.046%		1784.885	910.6119	-910.6119	86.29497
C.3.396	0.234801597	6.053734398	5.818932801	1.945%		1811.606	909.5213	-909.5213	86.19199
C.3.397	0.403082433	6.06251049	5.659428057	2.494%		1787.827	906.5948	-906.5948	85.91433
C.3.398	0.421605544	6.05956974	5.637964196	0.023%		1759.263	910.267	-910.267	86.26194
C.3.399	0.425188895	6.07100544	5.645816545	1.834%		1779.163	908.2638	-908.2638	86.07237
C.3.400	0.506214429	6.074040413	5.567825984	2.157%		1781.566	908.013	-908.013	86.04863
C.3.401	0.492941933	6.070505524	5.57756359	0.426%		1750.606	908.9525	-908.9525	86.13724
C.3.402	0.488551126	6.061530495	5.572979369	-0.512%		1752.229	911.5717	-911.5717	86.38548

Point	T sat gas	T evap exit	T superheat	capacity difference	HTF	dQ/dm_dot	dQ/dT_in	dQ/dT_out	U_Q
C.3.403	0.414625253	6.036616135	5.621990882	0.185%		1755.58	908.4963	-908.4963	86.09408
C.3.404	0.388217117	6.017886162	5.629669044	1.603%		1781.632	912.026	-912.026	86.42893
C.3.405	0.381339482	5.996466637	5.615127154	2.269%		1790.482	906.0828	-906.0828	85.86585
C.3.406	0.357677014	5.969624138	5.611947124	0.507%		1771.143	908.9447	-908.9447	86.13679
C.3.407	0.326211369	5.93182354	5.605612171	1.494%		1793.748	913.0836	-913.0836	86.52933
C.3.408	0.244030937	5.895172691	5.651141754	2.288%		1806.161	911.9305	-911.9305	86.42023
C.3.409	0.297495992	5.874682617	5.577186625	3.201%		1794.904	901.0871	-901.0871	85.39249
C.3.410	0.296134724	5.862783432	5.566648708	-0.219%		1753.225	911.2887	-911.2887	86.35868
C.3.411	0.301530229	5.868997764	5.567467535	3.111%		1809.092	909.4133	-909.4133	86.18172
C.3.412	0.418347875	5.884151459	5.465803583	2.637%		1795.336	909.764	-909.764	86.21477
C.3.413	0.448341388	5.907216263	5.458874875	0.338%		1738.788	907.1393	-907.1393	85.96526
C.3.414	0.445167107	5.920785522	5.475618415	1.088%		1757.83	907.5432	-907.5432	86.00379
C.3.415	0.620037162	5.946006584	5.325969422	3.378%		1782.846	909.1612	-909.1612	86.15746
C.3.416	0.629482575	5.952247047	5.322764472	-0.102%		1729.861	907.625	-907.625	86.01117
C.3.417	0.573771504	5.947387695	5.373616191	-0.300%		1728.47	908.2463	-908.2463	86.07002
C.3.418	0.580528454	5.95644207	5.375913616	2.088%		1762.191	908.1898	-908.1898	86.06513
C.3.419	0.546137643	5.943456268	5.397318626	-1.922%		1713.266	909.9595	-909.9595	86.23218
C.3.420	0.509627392	5.944337845	5.434710453	0.649%		1749.419	912.6986	-912.6986	86.49223
C.3.421	0.520240986	5.94765358	5.427412593	1.432%		1763.996	909.5327	-909.5327	86.19241
C.3.422	0.476924879	5.942077065	5.465152186	-1.431%		1718.186	913.0311	-913.0311	86.52332
C.3.423	0.609699714	5.936119461	5.326419748	2.637%		1785.539	908.6224	-908.6224	86.10644
C.3.424	0.559147253	5.940529442	5.381382189	0.957%		1757.792	909.8728	-909.8728	86.22456
C.3.425	0.561066501	5.929478836	5.368412335	-0.463%		1732.753	912.7095	-912.7095	86.49304
C.3.426	0.512686094	5.918737602	5.406051508	-0.812%		1710.71	909.4357	-909.4357	86.1825
C.3.427	0.45178633	5.913842583	5.462056252	0.826%		1749.281	908.8108	-908.8108	86.12381
C.3.428	0.479825347	5.918339348	5.438514001	0.204%		1748.211	912.3346	-912.3346	86.45772
C.3.429	0.534695721	5.911872482	5.377176762	2.236%		1769.584	909.3611	-909.3611	86.17623
C.3.430	0.598951503	5.923727226	5.324775723	3.526%		1790.142	906.1263	-906.1263	85.86997
C.3.431	0.669525059	5.910925675	5.241400615	2.687%		1767.08	910.1619	-910.1619	86.25208
C.3.432	0.593765507	5.90721302	5.313447513	-0.061%		1734.479	910.556	-910.556	86.28899
C.3.433	0.638627177	5.903780365	5.265153188	0.395%		1735.005	908.276	-908.276	86.07293
C.3.434	0.589686734	5.903311348	5.313624614	1.375%		1751.129	908.7133	-908.7133	86.11459
C.3.435	0.523407999	5.89441719	5.371009191	1.886%		1764.553	907.359	-907.359	85.98643
C.3.436	0.557742222	5.882985115	5.325242893	1.528%		1757.768	909.6044	-909.6044	86.19913
C.3.437	0.566122666	5.8879673	5.321844634	3.613%		1784.184	906.6062	-906.6062	85.91536
C.3.438	0.775156686	5.888752365	5.113595679	5.463%		1814.289	909.9326	-909.9326	86.23101
C.3.439	0.745004038	5.88874836	5.143744322	3.736%		1770.206	906.9884	-906.9884	85.95138
C.3.440	0.595197693	5.881321716	5.286124023	0.078%		1747.105	910.5403	-910.5403	86.28767
C.3.441	0.621413712	5.891576195	5.270162482	-2.092%		1717.629	912.8396	-912.8396	86.50516
C.3.442	0.569150245	5.873992538	5.304842293	0.263%		1750.89	912.9991	-912.9991	86.52074
C.3.443	0.595117332	5.862278366	5.267161034	2.984%		1782.973	907.9505	-907.9505	86.04274
C.3.444	0.691375191	5.864707565	5.173332374	2.747%		1774.818	906.6988	-906.6988	85.92401
C.3.445	0.671331905	5.85396595	5.182634045	1.483%		1757.388	907.677	-907.677	86.01647
C.3.446	0.694874781	5.853866577	5.158991796	2.800%		1781.623	910.2078	-910.2078	86.25664
C.3.447	0.580663406	5.851258278	5.270594871	0.964%		1754.948	908.487	-908.487	86.0932
C.3.448	0.590605292	5.845953941	5.255348649	-1.235%		1725.911	909.6717	-909.6717	86.20507
C.3.449	0.589281986	5.847126579	5.257844593	0.284%		1750.189	908.6664	-908.6664	86.11013
C.3.450	0.615072496	5.84295826	5.227885763	1.065%		1758.931	909.6495	-909.6495	86.20341
C.3.451	0.606297165	5.836867714	5.230570549	-0.355%		1727.234	908.5359	-908.5359	86.09746
C.3.452	0.624734402	5.837693024	5.212958622	2.397%		1767.589	907.6099	-907.6099	86.01025
C.3.453	0.600004674	5.831119537	5.231114863	1.629%		1767.6	911.2628	-911.2628	86.35642
C.3.454	0.627811044	5.813840294	5.186029249	0.717%		1748.201	909.2519	-909.2519	86.16559
C.3.455	0.577501926	5.814242744	5.236740818	-0.137%		1751.656	910.3495	-910.3495	86.26965
C.3.456	0.626351611	5.811894226	5.185542616	2.810%		1778.822	907.0085	-907.0085	85.95341
C.3.457	0.574529684	5.812756347	5.238226663	0.250%		1741.933	909.9003	-909.9003	86.22695
C.3.458	0.687091046	5.805633927	5.11854288	3.497%		1788.581	907.6009	-907.6009	86.00968
C.3.459	0.719344289	5.804646682	5.085302394	2.868%		1767.434	903.8083	-903.8083	85.64998
C.3.460	0.66615736	5.798199844	5.132042485	-0.643%		1731.341	908.8555	-908.8555	86.1278
C.3.461	0.655078163	5.790587425	5.135509263	1.619%		1762.159	910.6326	-910.6326	86.29662
C.3.462	0.680842688	5.787075234	5.106232545	2.112%		1754.992	909.8902	-909.8902	86.22617
C.3.463	0.688224382	5.775236511	5.08701213	1.689%		1757.552	908.6828	-908.6828	86.11178
C.3.464	0.616500883	5.766948509	5.150447626	2.991%		1778.979	907.9088	-907.9088	86.03873
C.3.465	0.664081012	5.772327614	5.108246602	2.263%		1780.067	909.0346	-909.0346	86.14543
C.3.466	0.65569982	5.756102943	5.100403124	-0.017%		1736.964	908.8703	-908.8703	86.12928
C.3.467	0.720473649	5.749278641	5.028804991	-0.522%		1714.075	910.3912	-910.3912	86.27309
C.3.468	0.800019794	5.735868263	4.935848469	3.022%		1767.382	908.319	-908.319	86.07745
C.3.469	0.744786909	5.747792435	5.003005526	0.600%		1740.907	907.1439	-907.1439	85.96573

Point	T sat gas	T evap exit	T superheat	capacity difference	HTF	dQ/dm_dot	dQ/dT_in	dQ/dT_out	U_Q
C.3.470	0.833877318	5.746527863	4.912650545	0.318%		1732.733	905.6308	-905.6308	85.82223
C.3.471	0.784797162	5.742633057	4.957835895	1.970%		1755.081	907.2517	-907.2517	85.97614
C.3.472	0.681274931	5.747672653	5.066397722	0.894%		1739.508	909.4435	-909.4435	86.18363
C.3.473	0.762286881	5.740966606	4.978679725	1.542%		1765.948	911.8873	-911.8873	86.41558
C.3.474	0.811802774	5.738157463	4.926354688	2.739%		1781.748	912.0032	-912.0032	86.42678
C.3.475	0.826904567	5.741952133	4.915047566	2.900%		1763.144	907.0442	-907.0442	85.95659
C.3.476	0.756212791	5.741558647	4.985345856	2.756%		1776.873	909.1447	-909.1447	86.15582
C.3.477	0.73002448	5.728757477	4.998732997	1.612%		1759.381	907.5567	-907.5567	86.0051
C.3.478	0.720284949	5.734313965	5.014029016	3.156%		1778.326	908.2623	-908.2623	86.07222
C.3.479	0.846639276	5.735706329	4.889067053	3.833%		1782.564	907.09	-907.09	85.96119
C.3.480	0.875921698	5.735781288	4.859859591	2.408%		1751.125	906.7138	-906.7138	85.92511
C.3.481	0.853419891	5.724390984	4.870971092	1.720%		1750.593	910.8423	-910.8423	86.31634
C.3.482	0.787887335	5.723862266	4.935974931	1.245%		1754.637	909.7246	-909.7246	86.21048
C.3.483	0.872708914	5.716243553	4.84353464	1.336%		1743.457	908.6738	-908.6738	86.11075
C.3.484	0.80809895	5.706368637	4.898269687	0.688%		1719.568	910.7577	-910.7577	86.3079
C.3.485	0.898061131	5.708812141	4.810751011	4.533%		1772.792	906.9634	-906.9634	85.94906
C.3.486	0.873992357	5.713515282	4.839522924	0.750%		1734.335	909.6441	-909.6441	86.20257
C.3.487	0.818106012	5.702961922	4.88485591	0.706%		1721.554	908.3359	-908.3359	86.07843
C.3.488	0.852642513	5.699250412	4.846607899	1.629%		1748.075	909.6608	-909.6608	86.20435
C.3.489	0.928286308	5.690263367	4.761977059	2.077%		1740.562	909.6082	-909.6082	86.19926
C.3.490	0.899292398	5.693032074	4.793739676	0.407%		1710.53	912.3083	-912.3083	86.45473
C.3.491	0.866493031	5.694478226	4.827985194	1.269%		1721.581	907.8236	-907.8236	86.02988
C.3.492	0.82966877	5.686079407	4.856410637	1.121%		1719.059	909.573	-909.573	86.19563
C.3.493	0.968393752	5.681387329	4.712993577	1.372%		1731.249	913.2069	-913.2069	86.54016
C.3.494	0.983318574	5.677760506	4.694441932	1.392%		1731.964	912.7074	-912.7074	86.49283
C.3.495	1.01391857	5.684438324	4.670519754	2.663%		1749.116	909.6322	-909.6322	86.20165
C.3.496	1.003143512	5.680028915	4.676885403	1.738%		1725.334	910.9062	-910.9062	86.32205
C.3.497	1.040387709	5.684135437	4.643747728	2.927%		1741.175	909.4644	-909.4644	86.18564
C.3.498	1.091028695	5.679749679	4.588720984	3.055%		1751.855	910.1154	-910.1154	86.24747
C.3.499	1.034605695	5.683835602	4.649229906	2.156%		1729.694	909.1009	-909.1009	86.15104
C.3.500	0.991457551	5.676784706	4.685327155	1.239%		1715.206	912.6428	-912.6428	86.48649
C.3.501	1.049605105	5.676597405	4.6269923	3.248%		1758.43	910.669	-910.669	86.30002
C.3.502	0.969247836	5.665749168	4.696501332	3.630%		1754.669	907.9633	-907.9633	86.04357
C.3.503	0.975120835	5.65961895	4.684498115	2.671%		1735.713	909.9484	-909.9484	86.23143
C.3.504	1.046355533	5.663323212	4.616967679	4.403%		1766.594	909.3905	-909.3905	86.17898
C.3.505	1.013972408	5.668792915	4.654820508	3.155%		1740.4	906.5504	-906.5504	85.90948
C.3.506	1.146903111	5.668396378	4.521493267	1.527%		1713.494	912.0693	-912.0693	86.43212
C.3.507	1.055067509	5.667411804	4.612344295	0.945%		1715.629	908.6977	-908.6977	86.11264
C.3.508	1.139756775	5.66431675	4.524559975	1.650%		1721.512	909.503	-909.503	86.18903
C.3.509	1.003463811	5.661746979	4.658283168	1.528%		1716.155	913.8808	-913.8808	86.60382
C.3.510	0.999248655	5.653044319	4.653795664	2.446%		1728.801	907.8587	-907.8587	86.03331
C.3.511	0.983690119	5.662636947	4.678946829	1.618%		1730.424	910.6664	-910.6664	86.2994
C.3.512	1.092784165	5.652450562	4.559666397	2.864%		1756.057	912.2263	-912.2263	86.44757
C.3.513	1.038043313	5.656884766	4.618841453	1.107%		1719.181	910.1899	-910.1899	86.2541
C.3.514	1.10536369	5.651589394	4.546225703	2.404%		1730.954	912.2727	-912.2727	86.45163
C.3.515	1.001516459	5.650610542	4.649094083	2.727%		1737.144	906.4031	-906.4031	85.89548
C.3.516	1.032527093	5.650907326	4.618380233	1.028%		1712.654	907.8546	-907.8546	86.0327
C.3.517	1.062495482	5.654631424	4.592135942	3.451%		1744.864	904.811	-904.811	85.74471
C.3.518	1.123044858	5.656592178	4.53354732	3.381%		1730.859	906.9761	-906.9761	85.94969
C.3.519	1.050697659	5.64475956	4.594061901	1.140%		1709.351	907.4003	-907.4003	85.98961
C.3.520	1.063001938	5.639956093	4.576954155	1.310%		1725.14	909.2328	-909.2328	86.16347
C.3.521	0.98918905	5.64055233	4.65136328	2.465%		1729.114	908.9453	-908.9453	86.13628
C.3.522	1.091746725	5.63693943	4.545192705	1.599%		1714.279	908.6416	-908.6416	86.1073
C.3.523	1.067395608	5.628953552	4.561557945	1.188%		1706.815	911.6361	-911.6361	86.39098
C.3.524	1.165408033	5.626123619	4.460715586	2.134%		1720.648	909.6496	-909.6496	86.20291
C.3.525	1.069152345	5.621024704	4.551872359	2.619%		1720.82	904.5356	-904.5356	85.71828
C.3.526	1.136860541	5.618100929	4.481240389	0.733%		1704.713	913.1362	-913.1362	86.53311
C.3.527	1.040200843	5.617893791	4.577692949	3.062%		1743.238	908.6394	-908.6394	86.10749
C.3.528	1.117274598	5.614855957	4.497581359	4.016%		1755.647	910.0384	-910.0384	86.24023
C.3.529	1.144696154	5.611561966	4.466865812	2.493%		1732.569	910.7643	-910.7643	86.30871
C.3.530	1.138215536	5.605495453	4.467279917	1.520%		1720.604	912.1879	-912.1879	86.44346
C.3.531	1.080677709	5.610940552	4.530262842	3.033%		1745.075	910.5253	-910.5253	86.28623
C.3.532	1.137763877	5.603834343	4.466070466	3.247%		1734.727	907.747	-907.747	86.0228
C.3.533	1.150221732	5.602156067	4.451934335	2.470%		1724.844	910.3311	-910.3311	86.26755
C.3.534	1.075168667	5.607245636	4.532076969	2.272%		1727.469	909.6531	-909.6531	86.20333
C.3.535	1.166124433	5.606070518	4.439946085	1.708%		1715.397	907.5327	-907.5327	86.00224
C.3.536	1.095124645	5.603553391	4.508428746	1.379%		1714.308	911.6149	-911.6149	86.38907

Point	T sat gas	T evap exit	T superheat	capacity difference	HTF	dQ/dm_do	dQ/dT_in	dQ/dT_out	U_Q
C.3.537	1.123256669	5.607355118	4.484098449	2.451%		1726.354	911.7075	-911.7075	86.39801
C.3.538	1.089564319	5.604820061	4.515255742	1.540%		1710.025	911.5921	-911.5921	86.38685
C.3.539	1.152239266	5.604418755	4.452179488	3.414%		1735.283	908.2188	-908.2188	86.06752
C.3.540	1.162753829	5.602757263	4.440003434	1.133%		1719.685	908.0223	-908.0223	86.04869
C.3.541	1.18565582	5.604613876	4.418958056	2.422%		1716.879	908.9389	-908.9389	86.13551
C.3.542	1.11148072	5.601209641	4.489728921	1.741%		1725.127	909.1823	-909.1823	86.15869
C.3.543	1.14307612	5.593375015	4.450298895	4.411%		1760.988	910.7827	-910.7827	86.31083
C.3.544	1.160364581	5.610865784	4.450501203	3.750%		1748.177	911.1435	-911.1435	86.34485
C.3.545	1.155957976	5.602762795	4.446804818	2.883%		1728.434	911.5412	-911.5412	86.38228
C.3.546	1.109034045	5.586639023	4.477604978	2.247%		1725.03	907.523	-907.523	86.00144
C.3.547	1.174325256	5.590138245	4.415812988	3.669%		1751.917	909.0832	-909.0832	86.14966
C.3.548	1.185999708	5.598639679	4.412639971	2.883%		1726.919	906.5378	-906.5378	85.90811
C.3.549	1.161134688	5.590057946	4.428923257	1.847%		1704.882	909.0969	-909.0969	86.15032
C.3.550	1.186873503	5.589557839	4.402684336	2.884%		1727.705	908.3879	-908.3879	86.08344
C.3.551	1.138774455	5.594934464	4.456160008	1.746%		1711.982	910.3959	-910.3959	86.27352
C.3.552	1.166973376	5.59534359	4.428370214	2.082%		1704.516	905.5899	-905.5899	85.81798

Point	U_Q (%)	refrigerant	dh_vap/dT	dh_vap/dP	U_h_vap	dh_liq/dT	U_h_liq	drho/dT	drho/dP	U_rho
C.3.1	5.532%		0.692567	-0.026048	0.046435	1.483405	0.099388	-0.064438	0.051902	-0.004317
C.3.2	5.538%		0.692686	-0.026061	0.046443	1.483319	0.099382	-0.064634	0.051923	-0.004331
C.3.3	5.522%		0.692883	-0.026072	0.046456	1.483318	0.099382	-0.064778	0.051939	-0.00434
C.3.4	5.531%		0.692726	-0.026063	0.046446	1.48324	0.099377	-0.064663	0.051926	-0.004332
C.3.5	5.442%		0.693053	-0.026074	0.046467	1.483226	0.099376	-0.064771	0.05194	-0.00434
C.3.6	5.478%		0.69342	-0.02609	0.046492	1.483217	0.099376	-0.064963	0.051962	-0.004353
C.3.7	5.489%		0.693245	-0.026082	0.04648	1.483221	0.099376	-0.064875	0.051952	-0.004347
C.3.8	5.463%		0.693652	-0.0261	0.046508	1.48321	0.099375	-0.065082	0.051976	-0.004361
C.3.9	5.450%		0.693472	-0.026084	0.046495	1.483233	0.099377	-0.064846	0.051951	-0.004345
C.3.10	5.521%		0.69375	-0.026088	0.046514	1.48326	0.099378	-0.064865	0.051955	-0.004346
C.3.11	5.412%		0.693486	-0.026086	0.046496	1.483168	0.099372	-0.064891	0.051956	-0.004348
C.3.12	5.507%		0.694044	-0.026094	0.046534	1.483023	0.099363	-0.064904	0.051961	-0.004349
C.3.13	5.472%		0.694611	-0.026105	0.046572	1.482942	0.099357	-0.064958	0.051972	-0.004352
C.3.14	5.428%		0.695305	-0.026121	0.046618	1.482858	0.099352	-0.065092	0.051991	-0.004361
C.3.15	5.458%		0.695773	-0.026126	0.04665	1.482908	0.099355	-0.065073	0.051993	-0.00436
C.3.16	5.531%		0.696829	-0.026169	0.04672	1.482889	0.099354	-0.065573	0.052052	-0.004393
C.3.17	5.471%		0.697006	-0.026161	0.046732	1.482792	0.099347	-0.065395	0.052036	-0.004381
C.3.18	5.423%		0.697343	-0.026149	0.046755	1.48268	0.09934	-0.065117	0.052011	-0.004363
C.3.19	5.469%		0.697744	-0.026155	0.046782	1.48255	0.099331	-0.06514	0.052016	-0.004364
C.3.20	5.607%		0.69808	-0.026164	0.046804	1.48239	0.09932	-0.065214	0.052027	-0.004369
C.3.21	5.470%		0.698814	-0.026183	0.046853	1.482383	0.09932	-0.065379	0.052049	-0.00438
C.3.22	5.496%		0.698888	-0.026182	0.046858	1.482343	0.099317	-0.065345	0.052047	-0.004378
C.3.23	5.409%		0.69901	-0.026182	0.046867	1.482326	0.099316	-0.065322	0.052045	-0.004377
C.3.24	5.548%		0.698836	-0.026178	0.046855	1.482367	0.099319	-0.065292	0.052041	-0.004375
C.3.25	5.519%		0.699255	-0.026186	0.046883	1.482288	0.099313	-0.065332	0.052048	-0.004377
C.3.26	5.532%		0.699559	-0.026199	0.046903	1.482327	0.099316	-0.065489	0.052067	-0.004388
C.3.27	5.466%		0.700012	-0.026219	0.046934	1.482309	0.099315	-0.065731	0.052095	-0.004404
C.3.28	5.477%		0.699597	-0.026188	0.046906	1.482281	0.099313	-0.065304	0.052048	-0.004375
C.3.29	5.535%		0.69939	-0.026196	0.046892	1.4823	0.099314	-0.065472	0.052064	-0.004387
C.3.30	5.405%		0.699323	-0.026211	0.046888	1.482263	0.099312	-0.065751	0.052091	-0.004405
C.3.31	5.433%		0.698666	-0.026181	0.046844	1.482216	0.099308	-0.065386	0.052049	-0.004381
C.3.32	5.492%		0.698606	-0.026238	0.04684	1.481981	0.099293	-0.066369	0.052147	-0.004447
C.3.33	5.459%		0.697497	-0.026206	0.046765	1.481894	0.099287	-0.066073	0.052108	-0.004427
C.3.34	5.318%		0.696764	-0.026192	0.046716	1.481747	0.099277	-0.065995	0.052094	-0.004422
C.3.35	5.376%		0.695671	-0.026169	0.046643	1.48167	0.099272	-0.06584	0.052069	-0.004411
C.3.36	5.434%		0.694761	-0.026147	0.046582	1.481639	0.09927	-0.06565	0.052043	-0.004399
C.3.37	5.424%		0.694574	-0.026155	0.046569	1.48155	0.099264	-0.06583	0.052059	-0.004411
C.3.38	5.414%		0.693957	-0.026153	0.046528	1.481437	0.099256	-0.065946	0.052065	-0.004418
C.3.39	5.422%		0.69378	-0.026145	0.046516	1.481417	0.099255	-0.065834	0.052053	-0.004411
C.3.40	5.403%		0.693707	-0.026145	0.046511	1.481391	0.099253	-0.065864	0.052055	-0.004413
C.3.41	5.350%		0.693331	-0.026133	0.046486	1.481314	0.099248	-0.065731	0.052039	-0.004404
C.3.42	5.420%		0.693472	-0.026137	0.046496	1.481303	0.099247	-0.065764	0.052043	-0.004406
C.3.43	5.333%		0.693623	-0.026139	0.046506	1.481292	0.099247	-0.065764	0.052044	-0.004406
C.3.44	5.337%		0.693379	-0.026122	0.046489	1.481263	0.099245	-0.06554	0.05202	-0.004391
C.3.45	5.413%		0.693772	-0.026139	0.046516	1.481193	0.09924	-0.06573	0.052042	-0.004404
C.3.46	5.316%		0.693462	-0.026116	0.046495	1.481055	0.099231	-0.065404	0.052007	-0.004382
C.3.47	5.345%		0.693735	-0.026125	0.046513	1.480892	0.09922	-0.06551	0.05202	-0.004389
C.3.48	5.442%		0.693937	-0.026134	0.046527	1.480472	0.099192	-0.065608	0.052031	-0.004396
C.3.49	5.394%		0.693663	-0.026115	0.046508	1.480118	0.099168	-0.065344	0.052003	-0.004378
C.3.50	5.523%		0.694152	-0.026132	0.046541	1.479817	0.099148	-0.06553	0.052025	-0.004391
C.3.51	5.364%		0.694723	-0.026148	0.046579	1.479598	0.099133	-0.065688	0.052046	-0.004401
C.3.52	5.325%		0.694902	-0.026146	0.046591	1.479445	0.099123	-0.065605	0.052039	-0.004396
C.3.53	5.374%		0.695595	-0.026168	0.046638	1.479393	0.099119	-0.065829	0.052068	-0.004411
C.3.54	5.452%		0.695549	-0.026166	0.046635	1.479348	0.099116	-0.065804	0.052065	-0.004409
C.3.55	5.414%		0.696717	-0.026212	0.046713	1.479305	0.099113	-0.066346	0.052129	-0.004445
C.3.56	5.406%		0.696669	-0.026197	0.04671	1.479273	0.099111	-0.066105	0.052104	-0.004429
C.3.57	5.365%		0.69696	-0.026201	0.046729	1.479278	0.099112	-0.066098	0.052106	-0.004429
C.3.58	5.520%		0.697595	-0.026214	0.046772	1.479324	0.099115	-0.066193	0.052121	-0.004435
C.3.59	5.355%		0.697915	-0.026215	0.046793	1.479289	0.099112	-0.066139	0.052118	-0.004431
C.3.60	5.387%		0.698721	-0.026246	0.046847	1.479238	0.099109	-0.066494	0.052161	-0.004455
C.3.61	5.358%		0.698823	-0.026241	0.046854	1.479288	0.099112	-0.066378	0.05215	-0.004447
C.3.62	5.421%		0.699179	-0.026239	0.046878	1.479305	0.099113	-0.066259	0.052141	-0.004439
C.3.63	5.667%		0.699772	-0.026255	0.046918	1.479283	0.099112	-0.066408	0.052161	-0.004449
C.3.64	5.462%		0.700292	-0.026269	0.046953	1.479268	0.099111	-0.066545	0.052179	-0.004458
C.3.65	5.461%		0.700052	-0.02625	0.046936	1.479253	0.09911	-0.066268	0.052149	-0.00444
C.3.66	5.451%		0.700279	-0.026264	0.046952	1.479266	0.099111	-0.066449	0.052169	-0.004452
C.3.67	5.331%		0.700163	-0.026251	0.046944	1.479243	0.099109	-0.066256	0.052149	-0.004439

Point	U_Q (%)	refrigerant	dh_vap/dT	dh_vap/dP	U_h_vap	dh_liq/dT	U_h_liq	drho/dT	drho/dP	U_rho
C.3.68	5.419%		0.699831	-0.026242	0.046922	1.479227	0.099108	-0.066181	0.052139	-0.004434
C.3.69	5.372%		0.699689	-0.026238	0.046912	1.479105	0.0991	-0.066144	0.052134	-0.004432
C.3.70	5.359%		0.699377	-0.026237	0.046891	1.478976	0.099091	-0.066186	0.052135	-0.004434
C.3.71	5.599%		0.699683	-0.026261	0.046912	1.478906	0.099087	-0.066544	0.052174	-0.004458
C.3.72	5.378%		0.699437	-0.026244	0.046895	1.478794	0.099079	-0.0663	0.052147	-0.004442
C.3.73	5.393%		0.699533	-0.026251	0.046902	1.478767	0.099077	-0.066395	0.052158	-0.004448
C.3.74	5.412%		0.69952	-0.02625	0.046901	1.478767	0.099077	-0.066389	0.052157	-0.004448
C.3.75	5.360%		0.699411	-0.026255	0.046894	1.478651	0.09907	-0.066491	0.052166	-0.004455
C.3.76	5.436%		0.699123	-0.026264	0.046874	1.478579	0.099065	-0.066708	0.052186	-0.004469
C.3.77	5.362%		0.698897	-0.026261	0.046859	1.478623	0.099068	-0.066703	0.052183	-0.004469
C.3.78	5.320%		0.698611	-0.026261	0.04684	1.478627	0.099068	-0.066768	0.052187	-0.004473
C.3.79	5.315%		0.698326	-0.026247	0.046821	1.478613	0.099067	-0.066603	0.052168	-0.004462
C.3.80	5.271%		0.698061	-0.026244	0.046803	1.478609	0.099067	-0.066603	0.052166	-0.004462
C.3.81	5.355%		0.697235	-0.026231	0.046748	1.478595	0.099066	-0.066566	0.052155	-0.00446
C.3.82	5.314%		0.696666	-0.026225	0.04671	1.478476	0.099058	-0.066583	0.052152	-0.004461
C.3.83	5.325%		0.695774	-0.026196	0.04665	1.478229	0.099041	-0.066272	0.052114	-0.00444
C.3.84	5.374%		0.695871	-0.026214	0.046656	1.478098	0.099033	-0.066577	0.052145	-0.004461
C.3.85	5.288%		0.695286	-0.026199	0.046617	1.478018	0.099027	-0.066441	0.052126	-0.004452
C.3.86	5.289%		0.695384	-0.026204	0.046624	1.477961	0.099023	-0.066511	0.052134	-0.004456
C.3.87	5.362%		0.69483	-0.026187	0.046587	1.477917	0.09902	-0.066335	0.052112	-0.004444
C.3.88	5.366%		0.694764	-0.026189	0.046582	1.477902	0.099019	-0.06639	0.052117	-0.004448
C.3.89	5.346%		0.695074	-0.026208	0.046603	1.477896	0.099019	-0.066642	0.052145	-0.004465
C.3.90	5.414%		0.69486	-0.026215	0.046589	1.477846	0.099016	-0.066816	0.05216	-0.004477
C.3.91	5.393%		0.694315	-0.026192	0.046552	1.477862	0.099017	-0.066541	0.052128	-0.004458
C.3.92	5.295%		0.694562	-0.026201	0.046569	1.477851	0.099016	-0.066631	0.052139	-0.004464
C.3.93	5.283%		0.695037	-0.02621	0.046601	1.477875	0.099018	-0.066686	0.052149	-0.004468
C.3.94	5.418%		0.69504	-0.026201	0.046601	1.477811	0.099013	-0.066534	0.052134	-0.004458
C.3.95	5.239%		0.694933	-0.026194	0.046594	1.477819	0.099014	-0.066427	0.052122	-0.004451
C.3.96	5.330%		0.695331	-0.026188	0.04662	1.477782	0.099011	-0.066248	0.052107	-0.004439
C.3.97	5.429%		0.695782	-0.026211	0.04665	1.477812	0.099013	-0.066537	0.05214	-0.004458
C.3.98	5.344%		0.695962	-0.026221	0.046663	1.477773	0.099011	-0.066675	0.052155	-0.004467
C.3.99	5.680%		0.695706	-0.026213	0.046645	1.477753	0.099009	-0.066588	0.052145	-0.004461
C.3.100	5.456%		0.69526	-0.026193	0.046615	1.477575	0.098998	-0.066351	0.052117	-0.004446
C.3.101	5.441%		0.69504	-0.026191	0.046601	1.477216	0.098973	-0.066361	0.052116	-0.004446
C.3.102	5.417%		0.695018	-0.026191	0.046599	1.477051	0.098962	-0.066365	0.052116	-0.004446
C.3.103	5.286%		0.694856	-0.02618	0.046588	1.47693	0.098954	-0.066214	0.0521	-0.004436
C.3.104	5.254%		0.695218	-0.026191	0.046613	1.476905	0.098953	-0.066326	0.052114	-0.004444
C.3.105	5.396%		0.696053	-0.026204	0.046669	1.476916	0.098953	-0.066359	0.052125	-0.004446
C.3.106	5.290%		0.696812	-0.026212	0.046719	1.47688	0.098951	-0.066318	0.052127	-0.004443
C.3.107	5.378%		0.697673	-0.026206	0.046777	1.476905	0.098953	-0.066038	0.052106	-0.004425
C.3.108	5.357%		0.699115	-0.02623	0.046874	1.476876	0.098951	-0.066132	0.052128	-0.004431
C.3.109	5.522%		0.700947	-0.026276	0.046996	1.476878	0.098951	-0.066522	0.052182	-0.004457
C.3.110	5.414%		0.701353	-0.026282	0.047024	1.476932	0.098954	-0.06652	0.052186	-0.004457
C.3.111	5.365%		0.702022	-0.026286	0.047068	1.47696	0.098956	-0.066446	0.052184	-0.004452
C.3.112	5.296%		0.70226	-0.026284	0.047084	1.476907	0.098953	-0.066361	0.052177	-0.004446
C.3.113	5.373%		0.702437	-0.026292	0.047096	1.476874	0.098951	-0.066466	0.052189	-0.004453
C.3.114	5.393%		0.702322	-0.026288	0.047089	1.476916	0.098953	-0.066421	0.052184	-0.00445
C.3.115	5.535%		0.701668	-0.026294	0.047045	1.476924	0.098954	-0.06667	0.052203	-0.004467
C.3.116	5.201%		0.701605	-0.026308	0.047041	1.47691	0.098953	-0.066922	0.052228	-0.004484
C.3.117	5.217%		0.700699	-0.026279	0.04698	1.476832	0.098948	-0.066621	0.05219	-0.004464
C.3.118	5.289%		0.699946	-0.02627	0.046929	1.476849	0.098949	-0.066637	0.052185	-0.004465
C.3.119	5.193%		0.699244	-0.026261	0.046882	1.476786	0.098945	-0.066633	0.052179	-0.004464
C.3.120	5.166%		0.698463	-0.026251	0.04683	1.476899	0.098952	-0.066636	0.052173	-0.004465
C.3.121	5.299%		0.69783	-0.026252	0.046788	1.476771	0.098944	-0.066801	0.052184	-0.004476
C.3.122	5.261%		0.697185	-0.026237	0.046744	1.476779	0.098944	-0.066685	0.052167	-0.004468
C.3.123	5.241%		0.697177	-0.026251	0.046744	1.476696	0.098939	-0.066917	0.05219	-0.004483
C.3.124	5.419%		0.696147	-0.026213	0.046675	1.476732	0.098941	-0.066484	0.052138	-0.004454
C.3.125	5.241%		0.696027	-0.026207	0.046667	1.476681	0.098938	-0.066407	0.052129	-0.004449
C.3.126	5.249%		0.696332	-0.026226	0.046687	1.476656	0.098936	-0.06667	0.052158	-0.004467
C.3.127	5.240%		0.696002	-0.026213	0.046665	1.476621	0.098934	-0.066516	0.05214	-0.004457
C.3.128	5.309%		0.695909	-0.026215	0.046659	1.476624	0.098934	-0.066586	0.052146	-0.004461
C.3.129	5.191%		0.695824	-0.026214	0.046653	1.476613	0.098933	-0.066575	0.052144	-0.00446
C.3.130	5.279%		0.696027	-0.026226	0.046667	1.47659	0.098932	-0.06674	0.052163	-0.004472
C.3.131	5.292%		0.695537	-0.026209	0.046634	1.476561	0.09893	-0.066563	0.052141	-0.00446
C.3.132	5.295%		0.695613	-0.026212	0.046639	1.476517	0.098927	-0.0666	0.052145	-0.004462
C.3.133	5.226%		0.695771	-0.026211	0.04665	1.476515	0.098927	-0.066547	0.052141	-0.004459
C.3.134	5.229%		0.695336	-0.02619	0.046621	1.476529	0.098927	-0.066281	0.052111	-0.004441

Point	U_Q (%)	refrigerant	dh_vap/dT	dh_vap/dP	U_h_vap	dh_liq/dT	U_h_liq	drho/dT	drho/dP	U_rho
C.3.135	5.446%		0.695606	-0.026218	0.046639	1.476607	0.098933	-0.066694	0.052154	-0.004468
C.3.136	5.180%		0.69595	-0.026231	0.046662	1.476525	0.098927	-0.066851	0.052173	-0.004479
C.3.137	5.264%		0.695615	-0.026215	0.046639	1.476525	0.098927	-0.066643	0.052149	-0.004465
C.3.138	5.235%		0.695488	-0.026215	0.046631	1.476477	0.098924	-0.066672	0.052151	-0.004467
C.3.139	5.190%		0.695475	-0.026212	0.04663	1.476475	0.098924	-0.066631	0.052147	-0.004464
C.3.140	5.265%		0.695669	-0.026224	0.046643	1.476471	0.098924	-0.066784	0.052164	-0.004475
C.3.141	5.233%		0.695348	-0.026207	0.046621	1.476508	0.098926	-0.066574	0.05214	-0.00446
C.3.142	5.211%		0.695862	-0.026224	0.046656	1.476481	0.098924	-0.066741	0.052161	-0.004472
C.3.143	5.310%		0.696243	-0.026221	0.046681	1.476499	0.098925	-0.066603	0.052151	-0.004462
C.3.144	5.248%		0.695906	-0.026204	0.046659	1.47655	0.098929	-0.066398	0.052127	-0.004449
C.3.145	5.299%		0.696302	-0.026208	0.046685	1.476493	0.098925	-0.066366	0.052127	-0.004447
C.3.146	5.334%		0.696767	-0.026207	0.046716	1.476453	0.098922	-0.066249	0.05212	-0.004439
C.3.147	5.391%		0.697503	-0.026227	0.046766	1.476348	0.098915	-0.06644	0.052145	-0.004451
C.3.148	5.300%		0.69785	-0.026219	0.046789	1.47621	0.098906	-0.066212	0.052125	-0.004436
C.3.149	5.310%		0.698922	-0.026244	0.046861	1.476219	0.098907	-0.066403	0.052153	-0.004449
C.3.150	5.344%		0.698957	-0.026239	0.046863	1.476217	0.098907	-0.066312	0.052144	-0.004443
C.3.151	5.231%		0.699826	-0.02626	0.046921	1.47623	0.098907	-0.066485	0.052169	-0.004454
C.3.152	5.186%		0.700807	-0.026286	0.046987	1.476172	0.098904	-0.066718	0.052201	-0.00447
C.3.153	5.282%		0.700764	-0.026282	0.046984	1.476191	0.098905	-0.06666	0.052195	-0.004466
C.3.154	5.229%		0.700711	-0.026265	0.046981	1.476211	0.098906	-0.066384	0.052166	-0.004448
C.3.155	5.247%		0.702194	-0.026327	0.04708	1.476206	0.098906	-0.067116	0.052252	-0.004497
C.3.156	5.276%		0.701911	-0.026309	0.047061	1.476231	0.098907	-0.066868	0.052225	-0.00448
C.3.157	5.278%		0.701771	-0.026301	0.047052	1.476172	0.098904	-0.066769	0.052214	-0.004474
C.3.158	5.294%		0.701931	-0.026315	0.047062	1.47615	0.098902	-0.066974	0.052236	-0.004487
C.3.159	5.386%		0.701319	-0.026283	0.047021	1.476213	0.098906	-0.066549	0.052188	-0.004459
C.3.160	5.339%		0.700774	-0.026281	0.046985	1.476179	0.098904	-0.066634	0.052192	-0.004465
C.3.161	5.270%		0.70006	-0.026276	0.046937	1.476075	0.098897	-0.066705	0.052193	-0.004469
C.3.162	5.375%		0.699117	-0.026256	0.046874	1.475933	0.098888	-0.066583	0.052173	-0.004461
C.3.163	5.267%		0.698465	-0.026247	0.04683	1.475745	0.098875	-0.066571	0.052166	-0.00446
C.3.164	5.312%		0.698032	-0.026259	0.046801	1.475605	0.098866	-0.066867	0.052192	-0.00448
C.3.165	5.361%		0.696889	-0.026213	0.046725	1.475612	0.098866	-0.066324	0.052128	-0.004444
C.3.166	5.328%		0.696663	-0.026231	0.046709	1.475486	0.098858	-0.066695	0.052163	-0.004469
C.3.167	5.327%		0.695731	-0.026199	0.046647	1.475418	0.098853	-0.066339	0.05212	-0.004445
C.3.168	5.301%		0.696757	-0.026268	0.046716	1.475378	0.09885	-0.067318	0.052227	-0.00451
C.3.169	5.301%		0.69615	-0.026253	0.046675	1.475368	0.09885	-0.067178	0.052207	-0.004501
C.3.170	5.191%		0.69568	-0.026231	0.046644	1.475324	0.098847	-0.066913	0.052177	-0.004483
C.3.171	5.356%		0.695592	-0.026231	0.046638	1.475294	0.098845	-0.066935	0.052178	-0.004485
C.3.172	5.310%		0.69534	-0.026226	0.046621	1.475286	0.098844	-0.066899	0.052173	-0.004482
C.3.173	5.334%		0.695173	-0.02622	0.04661	1.475268	0.098843	-0.066825	0.052164	-0.004477
C.3.174	5.263%		0.695106	-0.02622	0.046605	1.475176	0.098837	-0.06685	0.052166	-0.004479
C.3.175	5.340%		0.69505	-0.026219	0.046601	1.475229	0.09884	-0.066842	0.052164	-0.004478
C.3.176	5.326%		0.694703	-0.026207	0.046578	1.475158	0.098836	-0.066708	0.052148	-0.004469
C.3.177	5.279%		0.695162	-0.026219	0.046609	1.475171	0.098836	-0.066813	0.052163	-0.004476
C.3.178	5.307%		0.695287	-0.026224	0.046617	1.475218	0.09884	-0.066883	0.052171	-0.004481
C.3.179	5.281%		0.695127	-0.02622	0.046607	1.475128	0.098834	-0.066835	0.052164	-0.004478
C.3.180	5.228%		0.695223	-0.026228	0.046613	1.475217	0.09884	-0.066963	0.052178	-0.004487
C.3.181	5.257%		0.694709	-0.026203	0.046579	1.475144	0.098835	-0.066643	0.052142	-0.004465
C.3.182	5.247%		0.694568	-0.026198	0.046569	1.475145	0.098835	-0.066591	0.052135	-0.004462
C.3.183	5.263%		0.694886	-0.026214	0.04659	1.475004	0.098825	-0.066792	0.052158	-0.004475
C.3.184	5.297%		0.694813	-0.026206	0.046586	1.474924	0.09882	-0.066666	0.052145	-0.004467
C.3.185	5.319%		0.695205	-0.026224	0.046612	1.474825	0.098813	-0.066893	0.052171	-0.004482
C.3.186	5.318%		0.695611	-0.026222	0.046639	1.474883	0.098817	-0.06677	0.052162	-0.004474
C.3.187	5.431%		0.696325	-0.026222	0.046687	1.474858	0.098815	-0.066605	0.052152	-0.004463
C.3.188	5.424%		0.697145	-0.026227	0.046742	1.474932	0.09882	-0.066517	0.05215	-0.004457
C.3.189	5.415%		0.698343	-0.026245	0.046822	1.474849	0.098815	-0.066552	0.052163	-0.004459
C.3.190	5.439%		0.699059	-0.026247	0.04687	1.474859	0.098816	-0.066428	0.052157	-0.004451
C.3.191	5.429%		0.700033	-0.026269	0.046935	1.474944	0.098821	-0.066594	0.052182	-0.004462
C.3.192	5.371%		0.700864	-0.026291	0.046991	1.474997	0.098825	-0.066788	0.052208	-0.004475
C.3.193	5.373%		0.701664	-0.026326	0.047045	1.474966	0.098823	-0.067222	0.052259	-0.004504
C.3.194	5.247%		0.701758	-0.026305	0.047051	1.474941	0.098821	-0.066833	0.05222	-0.004478
C.3.195	5.278%		0.702286	-0.026318	0.047086	1.474901	0.098818	-0.066949	0.052236	-0.004486
C.3.196	5.331%		0.702548	-0.026316	0.047104	1.474957	0.098822	-0.066845	0.052228	-0.004479
C.3.197	5.258%		0.702659	-0.026311	0.047111	1.474957	0.098822	-0.066746	0.052219	-0.004472
C.3.198	5.253%		0.702793	-0.026324	0.04712	1.474954	0.098822	-0.066936	0.052239	-0.004485
C.3.199	5.164%		0.703286	-0.026367	0.047153	1.474886	0.098817	-0.067571	0.052307	-0.004527
C.3.200	5.198%		0.70196	-0.026336	0.047064	1.47493	0.09882	-0.067329	0.052272	-0.004511
C.3.201	5.204%		0.700731	-0.026311	0.046982	1.474927	0.09882	-0.067166	0.052245	-0.0045

Point	U_Q (%)	refrigerant	dh_vap/dT	dh_vap/dP	U_h_vap	dh_liq/dT	U_h_liq	drho/dT	drho/dP	U_rho
C.3.202	5.171%		0.700065	-0.026313	0.046937	1.474906	0.098819	-0.067356	0.052258	-0.004513
C.3.203	5.248%		0.698974	-0.026289	0.046864	1.474879	0.098817	-0.06718	0.052232	-0.004501
C.3.204	5.245%		0.697793	-0.026259	0.046785	1.474827	0.098813	-0.066917	0.052195	-0.004483
C.3.205	5.185%		0.697521	-0.026255	0.046767	1.474725	0.098807	-0.066913	0.052193	-0.004483
C.3.206	5.141%		0.697003	-0.026239	0.046732	1.474508	0.098792	-0.066753	0.052172	-0.004472
C.3.207	5.134%		0.696695	-0.026237	0.046712	1.47436	0.098782	-0.066781	0.052172	-0.004474
C.3.208	5.126%		0.697073	-0.026281	0.046737	1.474275	0.098776	-0.067466	0.052244	-0.00452
C.3.209	5.141%		0.69626	-0.026251	0.046683	1.47419	0.098771	-0.067134	0.052204	-0.004498
C.3.210	5.127%		0.696109	-0.026253	0.046672	1.474167	0.098769	-0.067199	0.052209	-0.004502
C.3.211	5.182%		0.69622	-0.026255	0.04668	1.474134	0.098767	-0.067199	0.05221	-0.004502
C.3.212	5.275%		0.695678	-0.026237	0.046644	1.474135	0.098767	-0.067015	0.052187	-0.00449
C.3.213	5.260%		0.695037	-0.026225	0.046601	1.474041	0.098761	-0.066951	0.052175	-0.004486
C.3.214	5.212%		0.69532	-0.026247	0.04662	1.474042	0.098761	-0.067263	0.052209	-0.004507
C.3.215	5.235%		0.694957	-0.026232	0.046595	1.474097	0.098764	-0.067097	0.052189	-0.004495
C.3.216	5.194%		0.694658	-0.026219	0.046575	1.474068	0.098763	-0.066925	0.052169	-0.004484
C.3.217	5.264%		0.694284	-0.026221	0.04655	1.474033	0.09876	-0.067041	0.052178	-0.004492
C.3.218	5.232%		0.694447	-0.026221	0.046561	1.474016	0.098759	-0.067003	0.052175	-0.004489
C.3.219	5.237%		0.694252	-0.026217	0.046548	1.473987	0.098757	-0.066994	0.052173	-0.004489
C.3.220	5.162%		0.694343	-0.02622	0.046554	1.474037	0.09876	-0.067017	0.052176	-0.00449
C.3.221	5.256%		0.694151	-0.026208	0.046541	1.473988	0.098757	-0.066858	0.052158	-0.004479
C.3.222	5.329%		0.6942	-0.026207	0.046545	1.473899	0.098751	-0.066822	0.052155	-0.004477
C.3.223	5.257%		0.694356	-0.026205	0.046555	1.473771	0.098743	-0.06675	0.052149	-0.004472
C.3.224	5.263%		0.695229	-0.02621	0.046613	1.473717	0.098739	-0.066645	0.052146	-0.004465
C.3.225	5.331%		0.69574	-0.026213	0.046648	1.47369	0.098737	-0.066586	0.052145	-0.004461
C.3.226	5.370%		0.696953	-0.02625	0.046729	1.473658	0.098735	-0.06695	0.052191	-0.004486
C.3.227	5.265%		0.69786	-0.026262	0.04679	1.473674	0.098736	-0.066954	0.0522	-0.004486
C.3.228	5.416%		0.698314	-0.026258	0.04682	1.473663	0.098735	-0.066789	0.052187	-0.004475
C.3.229	5.279%		0.699117	-0.026275	0.046874	1.473689	0.098737	-0.066904	0.052205	-0.004483
C.3.230	5.174%		0.700001	-0.026287	0.046933	1.473678	0.098736	-0.066916	0.052214	-0.004483
C.3.231	5.317%		0.700449	-0.026292	0.046963	1.473769	0.098743	-0.066901	0.052216	-0.004482
C.3.232	5.242%		0.701016	-0.026294	0.047001	1.473745	0.098741	-0.066805	0.052211	-0.004476
C.3.233	5.168%		0.702065	-0.026324	0.047071	1.473834	0.098747	-0.067088	0.052248	-0.004495
C.3.234	5.301%		0.702513	-0.026338	0.047101	1.473829	0.098747	-0.06724	0.052268	-0.004505
C.3.235	5.296%		0.702336	-0.026326	0.04709	1.473834	0.098747	-0.067076	0.05225	-0.004494
C.3.236	5.202%		0.702471	-0.026321	0.047099	1.473868	0.098749	-0.066944	0.052238	-0.004485
C.3.237	5.241%		0.702785	-0.026328	0.04712	1.473874	0.09875	-0.067	0.052246	-0.004489
C.3.238	5.216%		0.702445	-0.026326	0.047097	1.473841	0.098747	-0.067041	0.052247	-0.004492
C.3.239	5.219%		0.701867	-0.026315	0.047058	1.473859	0.098749	-0.066988	0.052237	-0.004488
C.3.240	5.175%		0.701459	-0.026317	0.047031	1.473833	0.098747	-0.067113	0.052246	-0.004497
C.3.241	5.315%		0.700184	-0.026299	0.046945	1.473755	0.098742	-0.067084	0.052232	-0.004495
C.3.242	5.191%		0.699749	-0.026295	0.046916	1.473756	0.098742	-0.067108	0.052231	-0.004496
C.3.243	5.184%		0.698952	-0.026278	0.046863	1.473738	0.09874	-0.066988	0.052212	-0.004488
C.3.244	5.247%		0.699005	-0.026308	0.046867	1.473668	0.098736	-0.067508	0.052265	-0.004523
C.3.245	5.132%		0.698638	-0.026299	0.046842	1.473716	0.098739	-0.067426	0.052253	-0.004518
C.3.246	5.106%		0.698179	-0.026289	0.046811	1.473707	0.098738	-0.067355	0.052242	-0.004513
C.3.247	5.082%		0.697542	-0.02627	0.046768	1.473619	0.098732	-0.067174	0.052219	-0.004501
C.3.248	5.173%		0.697757	-0.026289	0.046783	1.47361	0.098732	-0.067453	0.052249	-0.004519
C.3.249	5.160%		0.696831	-0.026259	0.046721	1.473613	0.098732	-0.067139	0.052209	-0.004498
C.3.250	5.202%		0.696749	-0.026252	0.046715	1.473585	0.09873	-0.067037	0.052198	-0.004491
C.3.251	5.285%		0.696247	-0.026233	0.046682	1.473524	0.098726	-0.066821	0.052173	-0.004477
C.3.252	5.282%		0.696494	-0.026249	0.046698	1.473371	0.098716	-0.067037	0.052196	-0.004491
C.3.253	5.261%		0.696298	-0.026267	0.046685	1.47321	0.098705	-0.067392	0.05223	-0.004515
C.3.254	5.197%		0.696044	-0.026257	0.046668	1.473061	0.098695	-0.067275	0.052216	-0.004507
C.3.255	5.211%		0.695654	-0.026243	0.046642	1.472993	0.098691	-0.067115	0.052197	-0.004497
C.3.256	5.237%		0.695685	-0.026249	0.046644	1.473001	0.098691	-0.067216	0.052207	-0.004504
C.3.257	5.141%		0.695577	-0.026248	0.046637	1.472908	0.098685	-0.06722	0.052207	-0.004504
C.3.258	5.140%		0.695183	-0.026241	0.04661	1.472913	0.098685	-0.067201	0.052201	-0.004502
C.3.259	5.314%		0.694934	-0.026233	0.046594	1.472899	0.098684	-0.067115	0.052191	-0.004497
C.3.260	5.259%		0.694367	-0.026214	0.046556	1.47297	0.098689	-0.06691	0.052165	-0.004483
C.3.261	5.228%		0.694574	-0.02622	0.04657	1.472905	0.098685	-0.066975	0.052174	-0.004487
C.3.262	5.380%		0.694698	-0.02621	0.046578	1.472785	0.098677	-0.066771	0.052154	-0.004474
C.3.263	5.366%		0.695001	-0.026206	0.046598	1.472661	0.098668	-0.066622	0.052142	-0.004464
C.3.264	5.408%		0.696339	-0.026263	0.046688	1.472563	0.098662	-0.067315	0.052223	-0.00451
C.3.265	5.292%		0.697166	-0.026264	0.046743	1.472507	0.098658	-0.067152	0.052213	-0.004499
C.3.266	5.357%		0.697533	-0.026253	0.046768	1.472445	0.098654	-0.066881	0.052189	-0.004481
C.3.267	5.411%		0.699124	-0.026289	0.046874	1.472514	0.098658	-0.067144	0.052229	-0.004499
C.3.268	5.368%		0.699877	-0.026283	0.046925	1.472479	0.098656	-0.066877	0.052209	-0.004481

Point	U_Q (%)	refrigerant	dh_vap/dT	dh_vap/dP	U_h_vap	dh_liq/dT	U_h_liq	drho/dT	drho/dP	U_rho
C.3.269	5.391%		0.700396	-0.026282	0.04696	1.472503	0.098658	-0.066736	0.052199	-0.004471
C.3.270	5.405%		0.701167	-0.026293	0.047011	1.472546	0.098661	-0.066755	0.052208	-0.004473
C.3.271	5.392%		0.70258	-0.026339	0.047106	1.472555	0.098661	-0.067244	0.052268	-0.004505
C.3.272	5.395%		0.7031	-0.026352	0.047141	1.472602	0.098664	-0.067342	0.052283	-0.004512
C.3.273	5.363%		0.703837	-0.02636	0.04719	1.47255	0.098661	-0.067326	0.052287	-0.004511
C.3.274	5.305%		0.70379	-0.026347	0.047187	1.472567	0.098662	-0.067102	0.052264	-0.004496
C.3.275	5.302%		0.704448	-0.026372	0.047231	1.472502	0.098658	-0.067385	0.052298	-0.004515
C.3.276	5.280%		0.704128	-0.026381	0.04721	1.472508	0.098658	-0.06762	0.052319	-0.004531
C.3.277	5.162%		0.703487	-0.026379	0.047167	1.472564	0.098662	-0.067721	0.052324	-0.004537
C.3.278	5.222%		0.702579	-0.026354	0.047106	1.472539	0.09866	-0.067498	0.052294	-0.004522
C.3.279	5.271%		0.701771	-0.02633	0.047052	1.472577	0.098663	-0.067269	0.052264	-0.004507
C.3.280	5.230%		0.701596	-0.026337	0.04704	1.472487	0.098657	-0.067415	0.052277	-0.004517
C.3.281	5.303%		0.701896	-0.026365	0.04706	1.47241	0.098651	-0.067836	0.052322	-0.004545
C.3.282	5.156%		0.70151	-0.02634	0.047034	1.472214	0.098638	-0.067498	0.052285	-0.004522
C.3.283	5.251%		0.701213	-0.026326	0.047014	1.472078	0.098629	-0.067323	0.052265	-0.004511
C.3.284	5.223%		0.701301	-0.026335	0.04702	1.471979	0.098623	-0.067452	0.052279	-0.004519
C.3.285	5.147%		0.701084	-0.026328	0.047006	1.471905	0.098618	-0.067389	0.05227	-0.004515
C.3.286	5.190%		0.701473	-0.026364	0.047032	1.471699	0.098604	-0.067925	0.052327	-0.004551
C.3.287	5.175%		0.700977	-0.026339	0.046999	1.471595	0.098597	-0.067604	0.052291	-0.004529
C.3.288	5.229%		0.700693	-0.026325	0.04698	1.47151	0.098591	-0.067413	0.052269	-0.004517
C.3.289	5.305%		0.701083	-0.026338	0.047006	1.471406	0.098584	-0.067561	0.052288	-0.004527
C.3.290	5.325%		0.701389	-0.026344	0.047026	1.471328	0.098579	-0.067584	0.052292	-0.004528
C.3.291	5.323%		0.701287	-0.026339	0.047019	1.471233	0.098573	-0.06752	0.052285	-0.004524
C.3.292	5.291%		0.70112	-0.026329	0.047008	1.47122	0.098572	-0.067383	0.05227	-0.004515
C.3.293	5.195%		0.70169	-0.026345	0.047046	1.471305	0.098577	-0.067547	0.052291	-0.004526
C.3.294	5.189%		0.701884	-0.026348	0.047059	1.471217	0.098572	-0.067555	0.052294	-0.004526
C.3.295	5.157%		0.70203	-0.026374	0.047069	1.471253	0.098574	-0.067963	0.052336	-0.004554
C.3.296	5.247%		0.702292	-0.02638	0.047087	1.471168	0.098568	-0.068014	0.052343	-0.004557
C.3.297	5.212%		0.701813	-0.026357	0.047055	1.471288	0.098576	-0.067714	0.052309	-0.004537
C.3.298	5.288%		0.70152	-0.026351	0.047035	1.471252	0.098574	-0.067687	0.052304	-0.004535
C.3.299	5.208%		0.701571	-0.026345	0.047038	1.47131	0.098578	-0.067573	0.052293	-0.004527
C.3.300	5.252%		0.701799	-0.02635	0.047054	1.471336	0.098579	-0.067601	0.052298	-0.004529
C.3.301	5.141%		0.701327	-0.026344	0.047022	1.471317	0.098578	-0.06761	0.052295	-0.00453
C.3.302	5.276%		0.69995	-0.026312	0.04693	1.471208	0.098571	-0.067361	0.052258	-0.004513
C.3.303	5.280%		0.700102	-0.026353	0.04694	1.471013	0.098558	-0.068035	0.052327	-0.004558
C.3.304	5.234%		0.699224	-0.026325	0.046881	1.471058	0.098561	-0.067738	0.05229	-0.004538
C.3.305	5.212%		0.699125	-0.026328	0.046875	1.471028	0.098559	-0.067828	0.052298	-0.004544
C.3.306	5.181%		0.699036	-0.026324	0.046869	1.470931	0.098552	-0.067764	0.05229	-0.00454
C.3.307	5.309%		0.698897	-0.026304	0.046859	1.470957	0.098554	-0.067463	0.052259	-0.00452
C.3.308	5.326%		0.699383	-0.026297	0.046892	1.470967	0.098555	-0.067231	0.05224	-0.004505
C.3.309	5.291%		0.70011	-0.026311	0.04694	1.470965	0.098555	-0.067307	0.052254	-0.00451
C.3.310	5.336%		0.700363	-0.026307	0.046957	1.470743	0.09854	-0.067187	0.052244	-0.004502
C.3.311	5.284%		0.701287	-0.026351	0.047019	1.470599	0.09853	-0.067736	0.052307	-0.004538
C.3.312	5.284%		0.701439	-0.026353	0.04703	1.470429	0.098519	-0.067744	0.052309	-0.004539
C.3.313	5.253%		0.701181	-0.026336	0.047012	1.470379	0.098515	-0.067502	0.052283	-0.004523
C.3.314	5.343%		0.700817	-0.026341	0.046988	1.470316	0.098511	-0.067668	0.052296	-0.004534
C.3.315	5.181%		0.701023	-0.026344	0.047002	1.470248	0.098507	-0.067672	0.052298	-0.004534
C.3.316	5.131%		0.700879	-0.026344	0.046992	1.470308	0.098511	-0.067698	0.0523	-0.004536
C.3.317	5.100%		0.700556	-0.026333	0.04697	1.470231	0.098505	-0.06758	0.052285	-0.004528
C.3.318	5.130%		0.700556	-0.026334	0.04697	1.470232	0.098506	-0.067601	0.052287	-0.004529
C.3.319	5.180%		0.700499	-0.026333	0.046967	1.470205	0.098504	-0.067602	0.052287	-0.004529
C.3.320	5.223%		0.701222	-0.026372	0.047015	1.47017	0.098501	-0.068118	0.052344	-0.004564
C.3.321	5.220%		0.700869	-0.026359	0.046991	1.47019	0.098503	-0.06796	0.052326	-0.004553
C.3.322	5.193%		0.701166	-0.026366	0.047011	1.470142	0.0985	-0.06802	0.052334	-0.004557
C.3.323	5.201%		0.700308	-0.02635	0.046954	1.470106	0.098497	-0.067945	0.052319	-0.004552
C.3.324	5.190%		0.699938	-0.026334	0.046929	1.470148	0.0985	-0.067742	0.052296	-0.004539
C.3.325	5.162%		0.69982	-0.026331	0.046921	1.470081	0.098495	-0.067723	0.052293	-0.004537
C.3.326	5.131%		0.700076	-0.02636	0.046938	1.469951	0.098487	-0.068158	0.052339	-0.004567
C.3.327	5.167%		0.69963	-0.026343	0.046908	1.469788	0.098476	-0.067963	0.052315	-0.004554
C.3.328	5.134%		0.699531	-0.026335	0.046902	1.469635	0.098466	-0.067846	0.052303	-0.004546
C.3.329	5.280%		0.699176	-0.02633	0.046878	1.469553	0.09846	-0.067839	0.052299	-0.004545
C.3.330	5.176%		0.69902	-0.026323	0.046868	1.46953	0.098459	-0.067764	0.05229	-0.00454
C.3.331	5.170%		0.6993	-0.026351	0.046886	1.469519	0.098458	-0.068185	0.052335	-0.004568
C.3.332	5.188%		0.699144	-0.026342	0.046876	1.469357	0.098447	-0.068066	0.052322	-0.00456
C.3.333	5.165%		0.69866	-0.026325	0.046843	1.469279	0.098442	-0.067871	0.052298	-0.004547
C.3.334	5.116%		0.699483	-0.026365	0.046899	1.469182	0.098435	-0.068388	0.052357	-0.004582
C.3.335	5.154%		0.699275	-0.026357	0.046885	1.469187	0.098436	-0.068297	0.052346	-0.004576

Point	U_Q (%)	refrigerant	dh_vap/dT	dh_vap/dP	U_h_vap	dh_liq/dT	U_h_liq	drho/dT	drho/dP	U_rho
C.3.336	5.164%		0.699442	-0.026359	0.046896	1.469075	0.098428	-0.068292	0.052347	-0.004576
C.3.337	5.219%		0.699533	-0.02635	0.046902	1.469146	0.098433	-0.06811	0.052329	-0.004563
C.3.338	5.240%		0.699648	-0.026326	0.04691	1.469173	0.098435	-0.06767	0.052286	-0.004534
C.3.339	5.308%		0.700033	-0.026326	0.046935	1.469123	0.098431	-0.067587	0.052281	-0.004528
C.3.340	5.323%		0.701714	-0.026375	0.047048	1.468878	0.098415	-0.068064	0.052343	-0.00456
C.3.341	5.206%		0.702517	-0.026388	0.047102	1.468596	0.098396	-0.068103	0.052354	-0.004563
C.3.342	5.144%		0.702825	-0.026391	0.047122	1.468453	0.098386	-0.068085	0.052355	-0.004562
C.3.343	5.100%		0.703147	-0.0264	0.047144	1.468325	0.098378	-0.068164	0.052365	-0.004567
C.3.344	5.142%		0.704003	-0.026442	0.047201	1.468242	0.098372	-0.0687	0.052426	-0.004603
C.3.345	5.095%		0.703462	-0.026425	0.047165	1.468202	0.09837	-0.068531	0.052405	-0.004592
C.3.346	5.142%		0.703048	-0.026426	0.047137	1.46812	0.098364	-0.068647	0.052413	-0.004599
C.3.347	5.076%		0.702447	-0.026418	0.047097	1.46812	0.098364	-0.068629	0.052406	-0.004598
C.3.348	5.045%		0.702037	-0.026404	0.04707	1.468133	0.098365	-0.068485	0.052388	-0.004589
C.3.349	5.106%		0.701349	-0.026386	0.047024	1.468149	0.098366	-0.068331	0.052367	-0.004578
C.3.350	5.076%		0.701634	-0.026393	0.047043	1.468091	0.098362	-0.068394	0.052375	-0.004582
C.3.351	5.150%		0.700946	-0.026378	0.046997	1.467938	0.098352	-0.06828	0.052358	-0.004575
C.3.352	5.147%		0.700493	-0.026359	0.046966	1.467783	0.098341	-0.06806	0.052332	-0.00456
C.3.353	5.058%		0.700712	-0.026381	0.046981	1.467627	0.098331	-0.068381	0.052366	-0.004582
C.3.354	5.071%		0.700718	-0.02638	0.046981	1.467493	0.098322	-0.068365	0.052365	-0.00458
C.3.355	5.133%		0.700275	-0.026359	0.046952	1.467263	0.098307	-0.068103	0.052335	-0.004563
C.3.356	5.076%		0.701009	-0.026408	0.047001	1.467045	0.098292	-0.068783	0.052409	-0.004608
C.3.357	5.063%		0.700916	-0.026406	0.046995	1.467037	0.098291	-0.068774	0.052407	-0.004608
C.3.358	5.090%		0.70028	-0.026384	0.046952	1.466959	0.098286	-0.068543	0.052379	-0.004592
C.3.359	5.017%		0.70008	-0.026387	0.046939	1.466927	0.098284	-0.068628	0.052386	-0.004598
C.3.360	5.047%		0.700092	-0.026389	0.046939	1.466883	0.098281	-0.068668	0.05239	-0.004601
C.3.361	5.102%		0.699707	-0.026374	0.046914	1.466866	0.09828	-0.068491	0.052369	-0.004589
C.3.362	4.994%		0.699822	-0.026387	0.046921	1.466844	0.098279	-0.068686	0.052389	-0.004602
C.3.363	5.033%		0.699663	-0.026377	0.046911	1.466819	0.098277	-0.068558	0.052375	-0.004593
C.3.364	5.164%		0.699734	-0.026386	0.046916	1.46681	0.098276	-0.0687	0.05239	-0.004603
C.3.365	5.134%		0.699899	-0.02641	0.046927	1.466829	0.098278	-0.069077	0.052429	-0.004628
C.3.366	5.004%		0.699909	-0.026406	0.046927	1.466855	0.098279	-0.068997	0.052421	-0.004623
C.3.367	5.096%		0.699584	-0.026396	0.046905	1.466865	0.09828	-0.068906	0.052409	-0.004617
C.3.368	5.041%		0.699441	-0.026403	0.046896	1.466892	0.098282	-0.069057	0.052423	-0.004627
C.3.369	5.021%		0.699549	-0.026384	0.046903	1.466928	0.098284	-0.068703	0.052389	-0.004603
C.3.370	5.128%		0.699506	-0.026364	0.0469	1.466957	0.098286	-0.068367	0.052355	-0.004581
C.3.371	5.032%		0.700074	-0.026377	0.046938	1.466796	0.098275	-0.068458	0.052369	-0.004587
C.3.372	5.016%		0.701146	-0.026406	0.04701	1.46668	0.098268	-0.068724	0.052404	-0.004605
C.3.373	5.136%		0.702035	-0.02641	0.04707	1.46668	0.098268	-0.068586	0.052398	-0.004595
C.3.374	5.135%		0.702947	-0.026422	0.047131	1.466595	0.098262	-0.068591	0.052406	-0.004596
C.3.375	5.075%		0.704021	-0.026454	0.047203	1.46659	0.098262	-0.068909	0.052447	-0.004617
C.3.376	5.103%		0.70452	-0.026464	0.047236	1.466527	0.098257	-0.068969	0.052457	-0.004621
C.3.377	4.994%		0.704559	-0.026471	0.047239	1.466477	0.098254	-0.069075	0.052468	-0.004628
C.3.378	5.017%		0.704699	-0.026468	0.047248	1.466486	0.098255	-0.068992	0.052461	-0.004622
C.3.379	4.983%		0.704082	-0.026455	0.047207	1.466433	0.098251	-0.068918	0.052449	-0.004618
C.3.380	5.022%		0.703513	-0.026448	0.047169	1.46641	0.098249	-0.068912	0.052443	-0.004617
C.3.381	5.048%		0.703108	-0.02644	0.047142	1.466447	0.098252	-0.068868	0.052435	-0.004614
C.3.382	4.989%		0.702953	-0.026433	0.047131	1.466374	0.098247	-0.068782	0.052425	-0.004608
C.3.383	5.127%		0.702295	-0.026417	0.047087	1.466143	0.098232	-0.068647	0.052406	-0.004599
C.3.384	5.050%		0.70222	-0.026428	0.047082	1.466005	0.098222	-0.068856	0.052427	-0.004613
C.3.385	4.996%		0.7031	-0.026468	0.047141	1.465905	0.098216	-0.069367	0.052485	-0.004648
C.3.386	5.028%		0.702483	-0.026458	0.0471	1.465776	0.098207	-0.069325	0.052476	-0.004645
C.3.387	5.116%		0.701765	-0.02643	0.047052	1.465737	0.098204	-0.069005	0.052438	-0.004623
C.3.388	5.060%		0.701867	-0.02644	0.047058	1.465704	0.098202	-0.069154	0.052453	-0.004633
C.3.389	5.041%		0.701644	-0.026428	0.047044	1.465656	0.098199	-0.068987	0.052435	-0.004622
C.3.390	5.094%		0.702358	-0.02648	0.047091	1.465648	0.098198	-0.069742	0.052516	-0.004673
C.3.391	5.015%		0.701906	-0.026468	0.047061	1.465526	0.09819	-0.069623	0.0525	-0.004665
C.3.392	5.038%		0.70167	-0.026453	0.047045	1.465337	0.098178	-0.069417	0.052478	-0.004651
C.3.393	5.082%		0.701583	-0.026468	0.04704	1.465211	0.098169	-0.0697	0.052505	-0.00467
C.3.394	4.994%		0.701058	-0.026448	0.047004	1.465218	0.09817	-0.069469	0.052478	-0.004654
C.3.395	5.072%		0.700827	-0.026434	0.046989	1.465194	0.098168	-0.069281	0.052457	-0.004642
C.3.396	5.148%		0.700166	-0.026418	0.046945	1.465035	0.098157	-0.069147	0.052438	-0.004633
C.3.397	5.081%		0.700664	-0.026458	0.046978	1.464704	0.098135	-0.069745	0.052502	-0.004673
C.3.398	5.000%		0.700832	-0.026465	0.046989	1.464486	0.098121	-0.069815	0.05251	-0.004678
C.3.399	5.056%		0.700517	-0.026461	0.046968	1.464275	0.098106	-0.069817	0.052508	-0.004678
C.3.400	5.063%		0.700794	-0.026481	0.046987	1.464167	0.098099	-0.070109	0.052539	-0.004697
C.3.401	4.975%		0.700836	-0.026479	0.04699	1.464163	0.098099	-0.070064	0.052535	-0.004694
C.3.402	4.980%		0.701076	-0.026482	0.047006	1.464071	0.098093	-0.070057	0.052536	-0.004694

Point	U_Q (%)	refrigerant	dh_vap/dT	dh_vap/dP	U_h_vap	dh_liq/dT	U_h_liq	drho/dT	drho/dP	U_rho
C.3.403	4.989%		0.701465	-0.026473	0.047032	1.464091	0.098094	-0.069812	0.052515	-0.004677
C.3.404	5.064%		0.701889	-0.026474	0.04706	1.464094	0.098094	-0.069734	0.052511	-0.004672
C.3.405	5.089%		0.702479	-0.026481	0.047099	1.464138	0.098097	-0.06973	0.052516	-0.004672
C.3.406	5.034%		0.703151	-0.026486	0.047145	1.464145	0.098098	-0.06967	0.052515	-0.004668
C.3.407	5.098%		0.704107	-0.026494	0.047209	1.464118	0.098096	-0.069592	0.052516	-0.004663
C.3.408	5.134%		0.704804	-0.026488	0.047255	1.464087	0.098094	-0.06933	0.052496	-0.004645
C.3.409	5.102%		0.705639	-0.026512	0.047311	1.463962	0.098085	-0.069543	0.052524	-0.004659
C.3.410	4.983%		0.705979	-0.026516	0.047334	1.463919	0.098083	-0.069549	0.052528	-0.00466
C.3.411	5.142%		0.705823	-0.026515	0.047323	1.463792	0.098074	-0.069563	0.052528	-0.004661
C.3.412	5.103%		0.705907	-0.02654	0.047329	1.463584	0.09806	-0.069972	0.052569	-0.004688
C.3.413	4.942%		0.705372	-0.026538	0.047293	1.463427	0.09805	-0.070059	0.052573	-0.004694
C.3.414	4.996%		0.704963	-0.026531	0.047266	1.463282	0.09804	-0.070034	0.052567	-0.004692
C.3.415	5.067%		0.705023	-0.026567	0.04727	1.463147	0.098031	-0.07065	0.052629	-0.004734
C.3.416	4.917%		0.704884	-0.026567	0.047261	1.463088	0.098027	-0.070679	0.052631	-0.004735
C.3.417	4.913%		0.704772	-0.026554	0.047253	1.463021	0.098022	-0.070479	0.05261	-0.004722
C.3.418	5.009%		0.70454	-0.026552	0.047238	1.463011	0.098022	-0.070495	0.052609	-0.004723
C.3.419	4.869%		0.704761	-0.026548	0.047252	1.46293	0.098016	-0.070381	0.0526	-0.004716
C.3.420	4.972%		0.70457	-0.026538	0.04724	1.462807	0.098008	-0.070247	0.052585	-0.004707
C.3.421	5.014%		0.704521	-0.02654	0.047236	1.462714	0.098002	-0.070283	0.052588	-0.004709
C.3.422	4.883%		0.704488	-0.02653	0.047234	1.46257	0.097992	-0.07013	0.052573	-0.004699
C.3.423	5.075%		0.705263	-0.026569	0.047286	1.462501	0.097988	-0.070622	0.052628	-0.004732
C.3.424	4.996%		0.704905	-0.026553	0.047262	1.462273	0.097972	-0.070432	0.052606	-0.004719
C.3.425	4.925%		0.705235	-0.026558	0.047284	1.462139	0.097963	-0.07045	0.052611	-0.00472
C.3.426	4.862%		0.705328	-0.02655	0.04729	1.462015	0.097955	-0.070283	0.052595	-0.004709
C.3.427	4.972%		0.705195	-0.026536	0.047281	1.461993	0.097954	-0.070065	0.052572	-0.004694
C.3.428	4.969%		0.705191	-0.026541	0.047281	1.461883	0.097946	-0.070163	0.052582	-0.004701
C.3.429	5.030%		0.705627	-0.026559	0.047311	1.461752	0.097937	-0.07037	0.052606	-0.004715
C.3.430	5.088%		0.705574	-0.026571	0.047307	1.461621	0.097929	-0.070594	0.052628	-0.00473
C.3.431	5.023%		0.706269	-0.026596	0.047354	1.461473	0.097919	-0.070867	0.052661	-0.004748
C.3.432	4.930%		0.706031	-0.026577	0.047338	1.461517	0.097922	-0.070591	0.052632	-0.00473
C.3.433	4.931%		0.706336	-0.026591	0.047358	1.461459	0.097918	-0.07076	0.052651	-0.004741
C.3.434	4.977%		0.706126	-0.026578	0.047344	1.461447	0.097917	-0.07058	0.052631	-0.004729
C.3.435	5.015%		0.706084	-0.026564	0.047341	1.461425	0.097916	-0.070346	0.052608	-0.004713
C.3.436	4.996%		0.706573	-0.026578	0.047374	1.461508	0.097921	-0.070483	0.052626	-0.004722
C.3.437	5.071%		0.706466	-0.026578	0.047367	1.461525	0.097922	-0.070509	0.052627	-0.004724
C.3.438	5.157%		0.707399	-0.026634	0.047429	1.461531	0.097923	-0.07128	0.052712	-0.004776
C.3.439	5.032%		0.707261	-0.026626	0.04742	1.461567	0.097925	-0.071168	0.052699	-0.004768
C.3.440	4.966%		0.706792	-0.026589	0.047389	1.461499	0.09792	-0.070622	0.052641	-0.004732
C.3.441	4.882%		0.706613	-0.026591	0.047377	1.461479	0.097919	-0.070708	0.052648	-0.004737
C.3.442	4.977%		0.706887	-0.026585	0.047395	1.461259	0.097904	-0.070533	0.052633	-0.004726
C.3.443	5.068%		0.707346	-0.026597	0.047426	1.461235	0.097903	-0.07064	0.052648	-0.004733
C.3.444	5.045%		0.707716	-0.026622	0.04745	1.461167	0.097898	-0.070993	0.052686	-0.004757
C.3.445	4.995%		0.707937	-0.026621	0.047465	1.460957	0.097884	-0.070929	0.052682	-0.004752
C.3.446	5.064%		0.708048	-0.026628	0.047473	1.460828	0.097875	-0.071017	0.052691	-0.004758
C.3.447	4.988%		0.707602	-0.026598	0.047443	1.460654	0.097864	-0.070598	0.052646	-0.00473
C.3.448	4.906%		0.707802	-0.026603	0.047456	1.460595	0.09786	-0.070639	0.052652	-0.004733
C.3.449	4.975%		0.707762	-0.026602	0.047454	1.460544	0.097856	-0.070633	0.052651	-0.004732
C.3.450	5.000%		0.708001	-0.026611	0.04747	1.460508	0.097854	-0.070732	0.052663	-0.004739
C.3.451	4.910%		0.708139	-0.026611	0.047479	1.460471	0.097852	-0.070706	0.052661	-0.004737
C.3.452	5.025%		0.708199	-0.026616	0.047483	1.460451	0.09785	-0.070773	0.052668	-0.004742
C.3.453	5.025%		0.708278	-0.026612	0.047488	1.460412	0.097848	-0.070689	0.052661	-0.004736
C.3.454	4.969%		0.708909	-0.026627	0.04753	1.460365	0.097844	-0.070808	0.052678	-0.004744
C.3.455	4.979%		0.708668	-0.026613	0.047514	1.460379	0.097845	-0.070622	0.052657	-0.004732
C.3.456	5.056%		0.708959	-0.026627	0.047534	1.460347	0.097843	-0.070804	0.052678	-0.004744
C.3.457	4.952%		0.708697	-0.026613	0.047516	1.460316	0.097841	-0.070613	0.052657	-0.004731
C.3.458	5.084%		0.709421	-0.026647	0.047565	1.460344	0.097843	-0.071035	0.052705	-0.004759
C.3.459	5.024%		0.709598	-0.026656	0.047577	1.460325	0.097842	-0.071156	0.052718	-0.004767
C.3.460	4.922%		0.709542	-0.026644	0.047573	1.460257	0.097837	-0.070965	0.052699	-0.004755
C.3.461	5.009%		0.709714	-0.026645	0.047584	1.460266	0.097838	-0.070931	0.052697	-0.004752
C.3.462	4.989%		0.709934	-0.026653	0.047599	1.460309	0.097841	-0.07103	0.052709	-0.004759
C.3.463	4.996%		0.710315	-0.02666	0.047625	1.460298	0.09784	-0.071069	0.052716	-0.004762
C.3.464	5.057%		0.710228	-0.026644	0.047619	1.460247	0.097837	-0.070812	0.052689	-0.004744
C.3.465	5.060%		0.710289	-0.026655	0.047623	1.460073	0.097825	-0.070983	0.052707	-0.004756
C.3.466	4.938%		0.710725	-0.02666	0.047652	1.459998	0.09782	-0.070967	0.052709	-0.004755
C.3.467	4.873%		0.711223	-0.026681	0.047685	1.45996	0.097817	-0.071214	0.052738	-0.004771
C.3.468	5.024%		0.711983	-0.026708	0.047736	1.459896	0.097813	-0.071524	0.052775	-0.004792
C.3.469	4.949%		0.711378	-0.026688	0.047696	1.459844	0.09781	-0.071306	0.052748	-0.004778

Point	U_Q (%)	refrigerant	dh_vap/dT	dh_vap/dP	U_h_vap	dh_liq/dT	U_h_liq	drho/dT	drho/dP	U_rho
C.3.470	4.926%		0.711827	-0.026713	0.047726	1.459931	0.097815	-0.07164	0.052785	-0.0048
C.3.471	4.989%		0.711714	-0.026701	0.047718	1.459892	0.097813	-0.07146	0.052767	-0.004788
C.3.472	4.945%		0.711089	-0.026671	0.047676	1.460017	0.097821	-0.07107	0.052723	-0.004762
C.3.473	5.020%		0.711659	-0.026696	0.047715	1.459989	0.097819	-0.071378	0.052758	-0.004782
C.3.474	5.065%		0.71197	-0.026711	0.047736	1.459909	0.097814	-0.071566	0.052779	-0.004795
C.3.475	5.012%		0.711929	-0.026713	0.047733	1.459766	0.097804	-0.071618	0.052784	-0.004798
C.3.476	5.051%		0.711614	-0.026694	0.047712	1.459632	0.097795	-0.071355	0.052755	-0.004781
C.3.477	5.002%		0.711868	-0.026692	0.047729	1.459384	0.097779	-0.07127	0.052749	-0.004775
C.3.478	5.056%		0.71166	-0.026687	0.047715	1.459168	0.097764	-0.071228	0.052743	-0.004772
C.3.479	5.068%		0.712204	-0.026721	0.047751	1.459062	0.097757	-0.071698	0.052794	-0.004804
C.3.480	4.978%		0.712337	-0.026729	0.04776	1.459004	0.097753	-0.071808	0.052806	-0.004811
C.3.481	4.977%		0.712567	-0.026728	0.047776	1.458915	0.097747	-0.071735	0.052801	-0.004806
C.3.482	4.988%		0.712279	-0.02671	0.047756	1.458907	0.097747	-0.07149	0.052774	-0.00479
C.3.483	4.957%		0.712896	-0.026737	0.047798	1.458887	0.097745	-0.071815	0.052812	-0.004812
C.3.484	4.889%		0.712885	-0.026724	0.047797	1.458815	0.097741	-0.071583	0.052789	-0.004796
C.3.485	5.040%		0.713232	-0.026747	0.04782	1.458806	0.09774	-0.071918	0.052825	-0.004819
C.3.486	4.931%		0.712982	-0.026739	0.047803	1.458654	0.09773	-0.071823	0.052813	-0.004812
C.3.487	4.894%		0.713032	-0.026728	0.047807	1.458534	0.097722	-0.071624	0.052794	-0.004799
C.3.488	4.970%		0.713301	-0.026739	0.047825	1.458419	0.097714	-0.071757	0.05281	-0.004808
C.3.489	4.948%		0.713917	-0.026764	0.047866	1.458369	0.097711	-0.07205	0.052844	-0.004827
C.3.490	4.863%		0.713701	-0.026755	0.047852	1.458306	0.097706	-0.071938	0.052831	-0.00482
C.3.491	4.895%		0.713505	-0.026745	0.047838	1.458305	0.097706	-0.071814	0.052817	-0.004812
C.3.492	4.887%		0.713581	-0.026739	0.047843	1.458087	0.097692	-0.071684	0.052805	-0.004803
C.3.493	4.922%		0.714365	-0.026779	0.047896	1.457944	0.097682	-0.07221	0.052864	-0.004838
C.3.494	4.924%		0.714542	-0.026785	0.047908	1.457813	0.097673	-0.07227	0.052871	-0.004842
C.3.495	4.973%		0.714489	-0.02679	0.047904	1.457737	0.097668	-0.072379	0.052881	-0.004849
C.3.496	4.905%		0.714568	-0.026789	0.04791	1.457673	0.097664	-0.072343	0.052878	-0.004847
C.3.497	4.950%		0.714622	-0.026798	0.047913	1.45763	0.097661	-0.07248	0.052893	-0.004856
C.3.498	4.981%		0.714989	-0.026814	0.047938	1.457669	0.097664	-0.072677	0.052915	-0.004869
C.3.499	4.917%		0.714604	-0.026796	0.047912	1.457624	0.097661	-0.072458	0.05289	-0.004855
C.3.500	4.876%		0.714609	-0.026788	0.047912	1.457513	0.097653	-0.072302	0.052875	-0.004844
C.3.501	4.999%		0.714887	-0.026804	0.047931	1.457384	0.097645	-0.072522	0.052899	-0.004859
C.3.502	4.989%		0.714829	-0.026786	0.047927	1.457244	0.097635	-0.072229	0.052869	-0.004839
C.3.503	4.935%		0.715037	-0.026791	0.047941	1.457254	0.097636	-0.072257	0.052874	-0.004841
C.3.504	5.023%		0.715262	-0.026809	0.047956	1.457261	0.097636	-0.072523	0.052902	-0.004859
C.3.505	4.948%		0.714949	-0.026797	0.047935	1.457216	0.097633	-0.072395	0.052887	-0.00485
C.3.506	4.872%		0.715587	-0.026835	0.047978	1.457204	0.097633	-0.072901	0.052942	-0.004884
C.3.507	4.878%		0.715183	-0.026809	0.047951	1.45722	0.097634	-0.072552	0.052904	-0.004861
C.3.508	4.894%		0.715673	-0.026835	0.047984	1.457248	0.097636	-0.072878	0.052941	-0.004883
C.3.509	4.879%		0.715107	-0.026798	0.047946	1.457274	0.097637	-0.072363	0.052885	-0.004848
C.3.510	4.915%		0.715343	-0.0268	0.047962	1.457306	0.09764	-0.072355	0.052886	-0.004848
C.3.511	4.920%		0.714988	-0.026792	0.047938	1.457176	0.097631	-0.072287	0.052877	-0.004843
C.3.512	4.993%		0.715801	-0.026827	0.047992	1.45705	0.097622	-0.072711	0.052925	-0.004872
C.3.513	4.888%		0.715412	-0.026809	0.047966	1.457003	0.097619	-0.072498	0.052901	-0.004857
C.3.514	4.921%		0.715885	-0.026831	0.047998	1.456829	0.097608	-0.07276	0.052931	-0.004875
C.3.515	4.939%		0.715426	-0.026802	0.047967	1.456738	0.097601	-0.072366	0.052888	-0.004849
C.3.516	4.869%		0.715562	-0.02681	0.047976	1.456555	0.097589	-0.072484	0.052901	-0.004856
C.3.517	4.961%		0.715594	-0.026817	0.047978	1.456385	0.097578	-0.072594	0.052912	-0.004864
C.3.518	4.921%		0.715821	-0.026833	0.047994	1.456322	0.097574	-0.072822	0.052937	-0.004879
C.3.519	4.860%		0.715829	-0.026818	0.047994	1.456251	0.097569	-0.072559	0.052911	-0.004861
C.3.520	4.905%		0.716028	-0.026824	0.048008	1.456248	0.097569	-0.07261	0.052917	-0.004865
C.3.521	4.916%		0.715664	-0.026803	0.047983	1.456205	0.097566	-0.07233	0.052887	-0.004846
C.3.522	4.874%		0.716252	-0.026833	0.048023	1.456154	0.097562	-0.072723	0.052931	-0.004872
C.3.523	4.853%		0.716373	-0.02683	0.048031	1.456202	0.097566	-0.072638	0.052923	-0.004867
C.3.524	4.892%		0.716919	-0.026859	0.048067	1.456121	0.09756	-0.073015	0.052965	-0.004892
C.3.525	4.893%		0.716615	-0.026834	0.048047	1.45619	0.097565	-0.072653	0.052927	-0.004868
C.3.526	4.847%		0.717021	-0.026854	0.048074	1.456117	0.09756	-0.072914	0.052956	-0.004885
C.3.527	4.956%		0.716571	-0.026827	0.048044	1.456091	0.097558	-0.072546	0.052916	-0.004861
C.3.528	4.992%		0.717024	-0.02685	0.048074	1.456093	0.097558	-0.072842	0.052949	-0.00488
C.3.529	4.926%		0.71725	-0.026859	0.048089	1.45595	0.097549	-0.07295	0.052962	-0.004888
C.3.530	4.892%		0.717399	-0.02686	0.048099	1.455742	0.097535	-0.072932	0.052961	-0.004886
C.3.531	4.962%		0.716966	-0.026842	0.04807	1.455603	0.097525	-0.072707	0.052935	-0.004871
C.3.532	4.932%		0.717446	-0.026861	0.048103	1.455581	0.097524	-0.072932	0.052961	-0.004886
C.3.533	4.904%		0.717554	-0.026865	0.04811	1.45553	0.097521	-0.072981	0.052967	-0.00489
C.3.534	4.912%		0.717049	-0.026842	0.048076	1.455542	0.097521	-0.07269	0.052934	-0.00487
C.3.535	4.877%		0.717514	-0.026868	0.048107	1.455539	0.097521	-0.073038	0.052973	-0.004894
C.3.536	4.874%		0.717252	-0.026849	0.04809	1.455543	0.097521	-0.072769	0.052944	-0.004876

Point	U_Q (%)	refrigerant	dh_vap/dT	dh_vap/dP	U_h_vap	dh_liq/dT	U_h_liq	drho/dT	drho/dP	U_rho
C.3.537	4.909%		0.717273	-0.026855	0.048091	1.455559	0.097522	-0.072873	0.052954	-0.004882
C.3.538	4.862%		0.717189	-0.026847	0.048085	1.455624	0.097527	-0.072747	0.052941	-0.004874
C.3.539	4.934%		0.717497	-0.026865	0.048106	1.455639	0.097528	-0.072986	0.052967	-0.00489
C.3.540	4.889%		0.717596	-0.026869	0.048113	1.455705	0.097532	-0.073028	0.052972	-0.004893
C.3.541	4.882%		0.71765	-0.026874	0.048116	1.455649	0.097529	-0.073114	0.052981	-0.004899
C.3.542	4.905%		0.717399	-0.026855	0.048099	1.455536	0.097521	-0.072834	0.052951	-0.00488
C.3.543	5.007%		0.717779	-0.026867	0.048125	1.455438	0.097514	-0.072963	0.052967	-0.004888
C.3.544	4.970%		0.717345	-0.026864	0.048096	1.455319	0.097506	-0.073011	0.052968	-0.004892
C.3.545	4.914%		0.717563	-0.026867	0.04811	1.455293	0.097505	-0.073002	0.052969	-0.004891
C.3.546	4.905%		0.717817	-0.026861	0.048127	1.455193	0.097498	-0.072839	0.052955	-0.00488
C.3.547	4.981%		0.718023	-0.026877	0.048141	1.455235	0.097501	-0.073085	0.052982	-0.004897
C.3.548	4.910%		0.717827	-0.026877	0.048128	1.455175	0.097497	-0.073121	0.052983	-0.004899
C.3.549	4.848%		0.717963	-0.026874	0.048137	1.455134	0.097494	-0.073035	0.052976	-0.004893
C.3.550	4.912%		0.7181	-0.026881	0.048146	1.455145	0.097495	-0.073134	0.052987	-0.0049
C.3.551	4.868%		0.717713	-0.026865	0.04812	1.45513	0.097494	-0.072944	0.052965	-0.004887
C.3.552	4.846%		0.717834	-0.026873	0.048129	1.455136	0.097494	-0.073052	0.052977	-0.004894

Point	rho	U_Q	U (%)
C.3.1	13.34584	51.28209	3.241%
C.3.2	13.37727	51.40399	3.255%
C.3.3	13.39982	51.48885	3.251%
C.3.4	13.38173	51.42365	3.260%
C.3.5	13.39833	51.48548	3.241%
C.3.6	13.42832	51.598	3.241%
C.3.7	13.41457	51.54661	3.280%
C.3.8	13.44687	51.66773	3.256%
C.3.9	13.40923	51.52506	3.270%
C.3.10	13.41167	51.53217	3.266%
C.3.11	13.41657	51.55545	3.255%
C.3.12	13.4171	51.5597	3.255%
C.3.13	13.42435	51.58733	3.246%
C.3.14	13.44402	51.66222	3.246%
C.3.15	13.43979	51.64231	3.246%
C.3.16	13.51713	51.9316	3.266%
C.3.17	13.48823	51.82458	3.261%
C.3.18	13.44269	51.65406	3.265%
C.3.19	13.44533	51.66667	3.241%
C.3.20	13.4564	51.71303	3.241%
C.3.21	13.48078	51.80229	3.232%
C.3.22	13.47516	51.78204	3.241%
C.3.23	13.47124	51.76686	3.236%
C.3.24	13.46681	51.75012	3.260%
C.3.25	13.47215	51.77059	3.256%
C.3.26	13.49649	51.86068	3.241%
C.3.27	13.53415	52.00218	3.256%
C.3.28	13.46673	51.74886	3.251%
C.3.29	13.49427	51.85392	3.232%
C.3.30	13.53913	52.02601	3.232%
C.3.31	13.48241	51.81548	3.246%
C.3.32	13.63971	52.42085	3.246%
C.3.33	13.59538	52.26164	3.255%
C.3.34	13.58484	52.22988	3.249%
C.3.35	13.56301	52.15509	3.229%
C.3.36	13.53503	52.05416	3.243%
C.3.37	13.56435	52.17005	3.233%
C.3.38	13.58448	52.25357	3.228%
C.3.39	13.56705	52.18885	3.238%
C.3.40	13.57206	52.209	3.214%
C.3.41	13.55174	52.1363	3.218%
C.3.42	13.5567	52.15504	3.233%
C.3.43	13.55625	52.15288	3.223%
C.3.44	13.52104	52.02145	3.208%
C.3.45	13.55049	52.13448	3.242%
C.3.46	13.49898	51.94551	3.256%
C.3.47	13.51527	52.01184	3.270%
C.3.48	13.53041	52.08398	3.250%
C.3.49	13.48882	51.9395	3.249%
C.3.50	13.51742	52.05715	3.224%
C.3.51	13.54123	52.15303	3.219%
C.3.52	13.52735	52.10479	3.224%
C.3.53	13.56146	52.2332	3.234%
C.3.54	13.55766	52.22072	3.243%
C.3.55	13.64114	52.53462	3.239%
C.3.56	13.60268	52.38929	3.215%
C.3.57	13.60085	52.38073	3.239%
C.3.58	13.61428	52.42721	3.234%
C.3.59	13.60477	52.39072	3.244%
C.3.60	13.65935	52.59627	3.244%
C.3.61	13.64058	52.52247	3.244%
C.3.62	13.62071	52.44472	3.244%
C.3.63	13.64283	52.52634	3.240%
C.3.64	13.66321	52.6024	3.230%
C.3.65	13.61974	52.43811	3.240%
C.3.66	13.64803	52.54462	3.255%
C.3.67	13.61761	52.43044	3.221%

Point	rho	U_Q	U (%)
C.3.68	13.60652	52.39038	3.225%
C.3.69	13.60093	52.3743	3.234%
C.3.70	13.60843	52.40915	3.253%
C.3.71	13.66475	52.62449	3.244%
C.3.72	13.62656	52.48406	3.229%
C.3.73	13.64136	52.5411	3.243%
C.3.74	13.64038	52.53747	3.258%
C.3.75	13.65696	52.60546	3.243%
C.3.76	13.6923	52.74365	3.233%
C.3.77	13.6921	52.74272	3.219%
C.3.78	13.7033	52.78609	3.243%
C.3.79	13.67769	52.69099	3.224%
C.3.80	13.67851	52.69564	3.233%
C.3.81	13.67476	52.68604	3.209%
C.3.82	13.67896	52.70916	3.213%
C.3.83	13.63181	52.54281	3.222%
C.3.84	13.68022	52.73161	3.231%
C.3.85	13.66004	52.66016	3.231%
C.3.86	13.671	52.70373	3.231%
C.3.87	13.64441	52.60636	3.216%
C.3.88	13.6534	52.64157	3.221%
C.3.89	13.69272	52.79074	3.221%
C.3.90	13.72104	52.90099	3.207%
C.3.91	13.67863	52.74166	3.206%
C.3.92	13.69237	52.79283	3.211%
C.3.93	13.69978	52.81821	3.245%
C.3.94	13.67551	52.72793	3.221%
C.3.95	13.65879	52.66436	3.221%
C.3.96	13.62911	52.55073	3.216%
C.3.97	13.67398	52.71882	3.211%
C.3.98	13.6955	52.80205	3.231%
C.3.99	13.68234	52.75327	3.230%
C.3.100	13.64582	52.62349	3.230%
C.3.101	13.64789	52.64503	3.219%
C.3.102	13.64862	52.65434	3.228%
C.3.103	13.62492	52.56876	3.223%
C.3.104	13.64197	52.63302	3.243%
C.3.105	13.64496	52.64059	3.214%
C.3.106	13.63639	52.605	3.214%
C.3.107	13.58942	52.42093	3.210%
C.3.108	13.60054	52.45732	3.239%
C.3.109	13.65792	52.66704	3.225%
C.3.110	13.65641	52.65773	3.211%
C.3.111	13.64282	52.6018	3.226%
C.3.112	13.62878	52.54916	3.240%
C.3.113	13.64495	52.61076	3.240%
C.3.114	13.63813	52.58407	3.211%
C.3.115	13.67945	52.74435	3.226%
C.3.116	13.71974	52.89871	3.230%
C.3.117	13.67428	52.73186	3.244%
C.3.118	13.67886	52.75258	3.211%
C.3.119	13.68	52.76248	3.234%
C.3.120	13.68257	52.77231	3.215%
C.3.121	13.71052	52.88669	3.224%
C.3.122	13.69378	52.82555	3.238%
C.3.123	13.73072	52.96932	3.229%
C.3.124	13.66465	52.721	3.200%
C.3.125	13.6527	52.6776	3.204%
C.3.126	13.6938	52.83391	3.228%
C.3.127	13.67007	52.74609	3.209%
C.3.128	13.68155	52.79024	3.228%
C.3.129	13.67992	52.78527	3.223%
C.3.130	13.70572	52.88338	3.214%
C.3.131	13.67883	52.7844	3.204%
C.3.132	13.68459	52.80733	3.257%
C.3.133	13.67571	52.7726	3.213%
C.3.134	13.63433	52.61668	3.223%

Point	rho	U_Q	U (%)
C.3.135	13.69953	52.86099	3.214%
C.3.136	13.72366	52.95448	3.242%
C.3.137	13.69144	52.83294	3.237%
C.3.138	13.6963	52.85389	3.237%
C.3.139	13.6898	52.82937	3.242%
C.3.140	13.71372	52.91976	3.233%
C.3.141	13.68107	52.7955	3.223%
C.3.142	13.7063	52.89016	3.228%
C.3.143	13.68339	52.80063	3.199%
C.3.144	13.65148	52.67873	3.252%
C.3.145	13.64536	52.65597	3.204%
C.3.146	13.62546	52.57884	3.185%
C.3.147	13.65397	52.68826	3.199%
C.3.148	13.6167	52.54961	3.194%
C.3.149	13.64422	52.64895	3.233%
C.3.150	13.62974	52.59384	3.233%
C.3.151	13.6549	52.6849	3.233%
C.3.152	13.68946	52.8139	3.238%
C.3.153	13.68031	52.77866	3.205%
C.3.154	13.63653	52.61095	3.214%
C.3.155	13.74892	53.0327	3.215%
C.3.156	13.71032	52.88619	3.243%
C.3.157	13.69501	52.82986	3.219%
C.3.158	13.7271	52.95228	3.215%
C.3.159	13.66118	52.70162	3.219%
C.3.160	13.67622	52.76336	3.233%
C.3.161	13.68933	52.82055	3.218%
C.3.162	13.67252	52.7663	3.213%
C.3.163	13.67222	52.77507	3.189%
C.3.164	13.72055	52.9668	3.212%
C.3.165	13.63707	52.65379	3.216%
C.3.166	13.69683	52.8877	3.197%
C.3.167	13.64263	52.68734	3.211%
C.3.168	13.79566	53.26828	3.197%
C.3.169	13.775	53.19252	3.211%
C.3.170	13.73415	53.03989	3.206%
C.3.171	13.73796	53.0565	3.220%
C.3.172	13.73286	53.03826	3.206%
C.3.173	13.72155	52.99689	3.206%
C.3.174	13.72564	53.01647	3.229%
C.3.175	13.72451	53.00988	3.196%
C.3.176	13.70414	52.93683	3.196%
C.3.177	13.71967	52.99291	3.215%
C.3.178	13.7305	53.03201	3.201%
C.3.179	13.72328	53.00918	3.215%
C.3.180	13.74344	53.08218	3.215%
C.3.181	13.69385	52.89859	3.191%
C.3.182	13.68595	52.86898	3.210%
C.3.183	13.71715	52.99141	3.229%
C.3.184	13.6972	52.91846	3.210%
C.3.185	13.73225	53.05388	3.214%
C.3.186	13.71163	52.97114	3.191%
C.3.187	13.68336	52.86118	3.196%
C.3.188	13.66722	52.79218	3.220%
C.3.189	13.66954	52.79898	3.196%
C.3.190	13.64788	52.71223	3.206%
C.3.191	13.6717	52.79577	3.230%
C.3.192	13.70041	52.89903	3.193%
C.3.193	13.76715	53.15091	3.231%
C.3.194	13.7052	52.91532	3.207%
C.3.195	13.72214	52.97821	3.231%
C.3.196	13.705	52.91014	3.193%
C.3.197	13.689	52.84809	3.207%
C.3.198	13.7187	52.96053	3.198%
C.3.199	13.81817	53.34061	3.227%
C.3.200	13.7834	53.21214	3.207%
C.3.201	13.76083	53.13212	3.207%

Point	rho	U_Q	U (%)
C.3.202	13.79268	53.25794	3.231%
C.3.203	13.76773	53.16916	3.197%
C.3.204	13.72909	53.02992	3.196%
C.3.205	13.72924	53.03539	3.201%
C.3.206	13.70512	52.95343	3.219%
C.3.207	13.71051	52.98099	3.209%
C.3.208	13.81828	53.39384	3.219%
C.3.209	13.76781	53.20815	3.218%
C.3.210	13.77843	53.24995	3.209%
C.3.211	13.77816	53.2502	3.213%
C.3.212	13.7504	53.14645	3.185%
C.3.213	13.74195	53.12047	3.213%
C.3.214	13.79079	53.30591	3.185%
C.3.215	13.76538	53.2084	3.194%
C.3.216	13.73892	53.1098	3.189%
C.3.217	13.75828	53.18736	3.193%
C.3.218	13.7519	53.16229	3.217%
C.3.219	13.75096	53.16115	3.203%
C.3.220	13.75433	53.17196	3.189%
C.3.221	13.72953	53.08045	3.193%
C.3.222	13.72364	53.06068	3.193%
C.3.223	13.71181	53.0196	3.202%
C.3.224	13.69279	52.94488	3.183%
C.3.225	13.68189	52.90154	3.221%
C.3.226	13.73661	53.10612	3.189%
C.3.227	13.73488	53.09451	3.194%
C.3.228	13.70742	52.98701	3.217%
C.3.229	13.72346	53.04361	3.189%
C.3.230	13.72307	53.03885	3.204%
C.3.231	13.71953	53.01947	3.209%
C.3.232	13.70269	52.95346	3.238%
C.3.233	13.74477	53.10634	3.205%
C.3.234	13.76773	53.19137	3.210%
C.3.235	13.74215	53.09399	3.224%
C.3.236	13.7209	53.0115	3.200%
C.3.237	13.72893	53.03991	3.205%
C.3.238	13.73636	53.0712	3.181%
C.3.239	13.7295	53.04758	3.219%
C.3.240	13.75038	53.12971	3.205%
C.3.241	13.74932	53.1348	3.214%
C.3.242	13.75423	53.15578	3.223%
C.3.243	13.73737	53.096	3.185%
C.3.244	13.81971	53.41232	3.218%
C.3.245	13.8077	53.36669	3.204%
C.3.246	13.79768	53.33039	3.213%
C.3.247	13.77065	53.23349	3.232%
C.3.248	13.81437	53.40052	3.232%
C.3.249	13.76703	53.22408	3.207%
C.3.250	13.75097	53.16423	3.217%
C.3.251	13.71803	53.04285	3.207%
C.3.252	13.75171	53.17672	3.188%
C.3.253	13.80863	53.40096	3.192%
C.3.254	13.79076	53.33933	3.206%
C.3.255	13.76641	53.24993	3.182%
C.3.256	13.7824	53.31097	3.211%
C.3.257	13.78329	53.31814	3.206%
C.3.258	13.78127	53.31204	3.210%
C.3.259	13.76836	53.265	3.201%
C.3.260	13.73727	53.14678	3.172%
C.3.261	13.747	53.18462	3.210%
C.3.262	13.71422	53.06355	3.219%
C.3.263	13.68967	52.97297	3.200%
C.3.264	13.79628	53.3779	3.191%
C.3.265	13.76817	53.26789	3.215%
C.3.266	13.72413	53.10035	3.224%
C.3.267	13.76166	53.23404	3.196%
C.3.268	13.71722	53.06155	3.215%

Point	rho	U_Q	U (%)
C.3.269	13.69343	52.96716	3.196%
C.3.270	13.69441	52.96571	3.216%
C.3.271	13.76815	53.23981	3.207%
C.3.272	13.78229	53.29002	3.193%
C.3.273	13.77781	53.27118	3.207%
C.3.274	13.74245	53.13566	3.188%
C.3.275	13.78555	53.2995	3.226%
C.3.276	13.82358	53.44607	3.212%
C.3.277	13.84137	53.51489	3.207%
C.3.278	13.80851	53.39439	3.207%
C.3.279	13.77436	53.26723	3.216%
C.3.280	13.79801	53.36153	3.197%
C.3.281	13.86377	53.61395	3.216%
C.3.282	13.81128	53.42231	3.197%
C.3.283	13.78439	53.32642	3.205%
C.3.284	13.80462	53.40786	3.191%
C.3.285	13.79524	53.3751	3.205%
C.3.286	13.87891	53.70056	3.196%
C.3.287	13.82954	53.51915	3.200%
C.3.288	13.80002	53.41017	3.204%
C.3.289	13.82242	53.49807	3.195%
C.3.290	13.82526	53.51037	3.180%
C.3.291	13.81537	53.47591	3.199%
C.3.292	13.79418	53.39679	3.199%
C.3.293	13.81854	53.48414	3.213%
C.3.294	13.81938	53.48929	3.204%
C.3.295	13.8835	53.733	3.223%
C.3.296	13.89084	53.76209	3.209%
C.3.297	13.84475	53.584	3.185%
C.3.298	13.84117	53.57304	3.199%
C.3.299	13.82308	53.50143	3.195%
C.3.300	13.82688	53.51394	3.195%
C.3.301	13.82957	53.52785	3.194%
C.3.302	13.7939	53.40185	3.208%
C.3.303	13.90006	53.81422	3.189%
C.3.304	13.85555	53.64676	3.198%
C.3.305	13.87006	53.7034	3.212%
C.3.306	13.86013	53.66973	3.193%
C.3.307	13.81278	53.48871	3.188%
C.3.308	13.7748	53.34086	3.198%
C.3.309	13.78486	53.37591	3.212%
C.3.310	13.76513	53.30762	3.188%
C.3.311	13.84955	53.63179	3.202%
C.3.312	13.85045	53.64062	3.207%
C.3.313	13.81285	53.49947	3.230%
C.3.314	13.84012	53.60741	3.211%
C.3.315	13.84026	53.61051	3.201%
C.3.316	13.84473	53.62578	3.221%
C.3.317	13.82694	53.56203	3.225%
C.3.318	13.83029	53.57469	3.225%
C.3.319	13.83049	53.57691	3.215%
C.3.320	13.91011	53.87946	3.216%
C.3.321	13.88619	53.78867	3.230%
C.3.322	13.89479	53.8218	3.216%
C.3.323	13.88533	53.79079	3.201%
C.3.324	13.85424	53.67318	3.230%
C.3.325	13.85153	53.6651	3.201%
C.3.326	13.91956	53.92965	3.215%
C.3.327	13.89003	53.82516	3.219%
C.3.328	13.87173	53.76036	3.219%
C.3.329	13.87167	53.76571	3.214%
C.3.330	13.86009	53.72377	3.218%
C.3.331	13.92602	53.9743	3.204%
C.3.332	13.90762	53.91129	3.194%
C.3.333	13.87803	53.80261	3.203%
C.3.334	13.9575	54.10666	3.228%
C.3.335	13.94363	54.0549	3.199%

Point	rho	U_Q	U (%)
C.3.336	13.94245	54.05191	3.194%
C.3.337	13.9134	53.93925	3.208%
C.3.338	13.84356	53.67017	3.213%
C.3.339	13.82945	53.61626	3.213%
C.3.340	13.90022	53.88904	3.213%
C.3.341	13.90431	53.91063	3.194%
C.3.342	13.90056	53.90072	3.227%
C.3.343	13.91216	53.94843	3.227%
C.3.344	13.99426	54.2618	3.194%
C.3.345	13.96918	54.16932	3.241%
C.3.346	13.98847	54.24816	3.207%
C.3.347	13.98739	54.24702	3.193%
C.3.348	13.96584	54.16566	3.217%
C.3.349	13.94347	54.08339	3.211%
C.3.350	13.95257	54.11907	3.183%
C.3.351	13.93645	54.06667	3.201%
C.3.352	13.9029	53.9463	3.201%
C.3.353	13.95309	54.14409	3.191%
C.3.354	13.95049	54.13924	3.196%
C.3.355	13.91027	53.99595	3.190%
C.3.356	14.01554	54.40359	3.200%
C.3.357	14.01436	54.40069	3.200%
C.3.358	13.9797	54.27288	3.185%
C.3.359	13.99366	54.32924	3.199%
C.3.360	13.99991	54.35463	3.175%
C.3.361	13.97313	54.25433	3.203%
C.3.362	14.00355	54.37195	3.194%
C.3.363	13.98378	54.29778	3.184%
C.3.364	14.00588	54.38245	3.180%
C.3.365	14.0648	54.60603	3.209%
C.3.366	14.05219	54.55746	3.209%
C.3.367	14.03869	54.50603	3.189%
C.3.368	14.06288	54.59877	3.204%
C.3.369	14.00691	54.38255	3.185%
C.3.370	13.95413	54.17916	3.180%
C.3.371	13.96685	54.23099	3.189%
C.3.372	14.00592	54.38036	3.189%
C.3.373	13.98172	54.28333	3.194%
C.3.374	13.98007	54.27591	3.180%
C.3.375	14.02708	54.45064	3.204%
C.3.376	14.03509	54.48184	3.176%
C.3.377	14.0516	54.54614	3.214%
C.3.378	14.03826	54.49443	3.176%
C.3.379	14.02835	54.4615	3.209%
C.3.380	14.02887	54.46719	3.185%
C.3.381	14.02313	54.44578	3.185%
C.3.382	14.01008	54.39932	3.199%
C.3.383	13.99057	54.33649	3.184%
C.3.384	14.02368	54.46949	3.184%
C.3.385	14.1015	54.76741	3.208%
C.3.386	14.09664	54.75684	3.174%
C.3.387	14.04836	54.57586	3.183%
C.3.388	14.07139	54.66614	3.192%
C.3.389	14.04588	54.57119	3.202%
C.3.390	14.16225	55.01439	3.193%
C.3.391	14.14477	54.95367	3.211%
C.3.392	14.11322	54.84065	3.192%
C.3.393	14.15773	55.0167	3.182%
C.3.394	14.12303	54.88707	3.186%
C.3.395	14.09428	54.77876	3.186%
C.3.396	14.07495	54.71393	3.205%
C.3.397	14.16743	55.07988	3.176%
C.3.398	14.17792	55.12794	3.194%
C.3.399	14.17912	55.14202	3.180%
C.3.400	14.22398	55.31638	3.184%
C.3.401	14.21683	55.28965	3.180%
C.3.402	14.21502	55.28464	3.203%

Point	rho	U_Q	U (%)
C.3.403	14.17565	55.13076	3.189%
C.3.404	14.1623	55.07675	3.175%
C.3.405	14.15998	55.06379	3.189%
C.3.406	14.14872	55.01701	3.199%
C.3.407	14.13392	54.95615	3.190%
C.3.408	14.09102	54.78884	3.180%
C.3.409	14.122	54.90927	3.176%
C.3.410	14.12207	54.91039	3.176%
C.3.411	14.12463	54.92569	3.175%
C.3.412	14.18837	55.17808	3.180%
C.3.413	14.20344	55.24498	3.165%
C.3.414	14.20073	55.24134	3.174%
C.3.415	14.29657	55.61457	3.160%
C.3.416	14.30142	55.63628	3.184%
C.3.417	14.27058	55.52117	3.178%
C.3.418	14.27372	55.53535	3.164%
C.3.419	14.25542	55.46649	3.192%
C.3.420	14.23498	55.39381	3.164%
C.3.421	14.24067	55.42027	3.178%
C.3.422	14.21691	55.33448	3.168%
C.3.423	14.29148	55.61974	3.192%
C.3.424	14.26289	55.52069	3.186%
C.3.425	14.26474	55.53128	3.177%
C.3.426	14.23849	55.4351	3.153%
C.3.427	14.2049	55.30817	3.167%
C.3.428	14.22019	55.37096	3.176%
C.3.429	14.25125	55.49309	3.166%
C.3.430	14.28634	55.63363	3.180%
C.3.431	14.32679	55.79198	3.162%
C.3.432	14.2846	55.62876	3.180%
C.3.433	14.30997	55.72724	3.180%
C.3.434	14.28259	55.62267	3.171%
C.3.435	14.24618	55.48358	3.175%
C.3.436	14.26616	55.55563	3.171%
C.3.437	14.27049	55.57154	3.162%
C.3.438	14.38778	56.01816	3.167%
C.3.439	14.37079	55.95208	3.153%
C.3.440	14.28723	55.63499	3.199%
C.3.441	14.30119	55.69073	3.209%
C.3.442	14.27317	55.59105	3.189%
C.3.443	14.28853	55.64855	3.180%
C.3.444	14.34234	55.85773	3.189%
C.3.445	14.33185	55.82315	3.194%
C.3.446	14.34508	55.87897	3.189%
C.3.447	14.28122	55.64139	3.193%
C.3.448	14.28716	55.66584	3.207%
C.3.449	14.28633	55.66539	3.207%
C.3.450	14.30107	55.722	3.197%
C.3.451	14.29659	55.70593	3.188%
C.3.452	14.30686	55.74585	3.179%
C.3.453	14.29347	55.69563	3.188%
C.3.454	14.31027	55.75874	3.193%
C.3.455	14.28206	55.65069	3.216%
C.3.456	14.30959	55.75714	3.188%
C.3.457	14.2805	55.64741	3.188%
C.3.458	14.34413	55.8877	3.188%
C.3.459	14.36234	55.95723	3.188%
C.3.460	14.3329	55.8468	3.212%
C.3.461	14.32722	55.82423	3.188%
C.3.462	14.34194	55.87816	3.165%
C.3.463	14.34693	55.89586	3.188%
C.3.464	14.30725	55.74571	3.179%
C.3.465	14.33357	55.85405	3.207%
C.3.466	14.33001	55.84106	3.202%
C.3.467	14.36691	55.98201	3.178%
C.3.468	14.41272	56.15653	3.179%
C.3.469	14.38071	56.03813	3.207%

Point	rho	U_Q	U (%)
C.3.470	14.43109	56.22611	3.217%
C.3.471	14.40364	56.12309	3.193%
C.3.472	14.34498	55.89551	3.179%
C.3.473	14.39106	56.07131	3.207%
C.3.474	14.41921	56.18194	3.202%
C.3.475	14.42747	56.21939	3.183%
C.3.476	14.3876	56.07206	3.197%
C.3.477	14.37375	56.028	3.206%
C.3.478	14.36787	56.01507	3.186%
C.3.479	14.43908	56.29029	3.191%
C.3.480	14.45565	56.35584	3.186%
C.3.481	14.44373	56.31219	3.191%
C.3.482	14.40673	56.17185	3.210%
C.3.483	14.45523	56.35649	3.201%
C.3.484	14.41939	56.22167	3.163%
C.3.485	14.47013	56.41624	3.158%
C.3.486	14.45615	56.36926	3.200%
C.3.487	14.42529	56.25447	3.176%
C.3.488	14.44509	56.33391	3.195%
C.3.489	14.48861	56.50097	3.176%
C.3.490	14.47196	56.44087	3.162%
C.3.491	14.45327	56.36969	3.166%
C.3.492	14.43304	56.30094	3.156%
C.3.493	14.51204	56.6068	3.175%
C.3.494	14.52079	56.64438	3.180%
C.3.495	14.53772	56.71282	3.184%
C.3.496	14.53191	56.69266	3.166%
C.3.497	14.55283	56.77493	3.166%
C.3.498	14.58204	56.88456	3.185%
C.3.499	14.54955	56.76295	3.170%
C.3.500	14.52549	56.67447	3.156%
C.3.501	14.55863	56.80582	3.184%
C.3.502	14.51365	56.63838	3.165%
C.3.503	14.51744	56.65183	3.155%
C.3.504	14.55774	56.80598	3.165%
C.3.505	14.53889	56.73585	3.165%
C.3.506	14.61482	57.02633	3.165%
C.3.507	14.56241	56.82513	3.188%
C.3.508	14.61103	57.00984	3.184%
C.3.509	14.53341	56.71196	3.146%
C.3.510	14.53164	56.70329	3.160%
C.3.511	14.52209	56.67269	3.179%
C.3.512	14.58503	56.91618	3.193%
C.3.513	14.55347	56.7997	3.183%
C.3.514	14.59228	56.95406	3.164%
C.3.515	14.53311	56.73139	3.173%
C.3.516	14.55075	56.8063	3.182%
C.3.517	14.56758	56.87723	3.177%
C.3.518	14.60203	57.01169	3.154%
C.3.519	14.56156	56.85857	3.177%
C.3.520	14.56893	56.88623	3.196%
C.3.521	14.52682	56.72711	3.158%
C.3.522	14.58557	56.95254	3.172%
C.3.523	14.57224	56.89886	3.158%
C.3.524	14.62851	57.11736	3.172%
C.3.525	14.57382	56.90427	3.163%
C.3.526	14.61274	57.05562	3.172%
C.3.527	14.55752	56.84625	3.172%
C.3.528	14.60177	57.0149	3.168%
C.3.529	14.61771	57.08103	3.177%
C.3.530	14.61444	57.07613	3.181%
C.3.531	14.58113	56.95473	3.176%
C.3.532	14.6143	57.08174	3.167%
C.3.533	14.62156	57.11109	3.167%
C.3.534	14.57826	56.94575	3.171%
C.3.535	14.63038	57.1449	3.185%
C.3.536	14.58993	56.98948	3.171%

Point	rho	U_Q	U (%)
C.3.537	14.60574	57.05054	3.162%
C.3.538	14.58666	56.97419	3.157%
C.3.539	14.62255	57.11111	3.162%
C.3.540	14.62869	57.13159	3.210%
C.3.541	14.64169	57.18341	3.162%
C.3.542	14.59945	57.02667	3.190%
C.3.543	14.6181	57.10088	3.166%
C.3.544	14.62673	57.14108	3.166%
C.3.545	14.6248	57.13335	3.157%
C.3.546	14.59911	57.03681	3.180%
C.3.547	14.63625	57.17824	3.185%
C.3.548	14.64232	57.2043	3.175%
C.3.549	14.62869	57.15253	3.156%
C.3.550	14.64349	57.20905	3.171%
C.3.551	14.61553	57.10402	3.166%
C.3.552	14.63165	57.16522	3.161%

C.4 System Response Data

time	HX2 T ref in	HX2 T HTF out	HX2 T ref out	HX2 T HTF in	Turbine for ref HX2	Total HTF m dot
0	3.834598971	7.323909855	9.282613945	9.19424839	0.000755024	0.269748658
43	3.763530874	7.280112266	9.287797928	9.230601883	0.00075066	0.270377576
86	3.74153347	7.340890026	9.307323265	9.230888557	0.00075066	0.268749923
129	3.683479404	7.316840935	9.301856422	9.244699288	0.000752842	0.270552427
172	3.769935274	7.325636482	9.305554199	9.232971763	0.000746296	0.269467294
215	3.735929823	7.317586422	9.321291733	9.241885376	0.000748478	0.269566178
258	3.714905405	7.312807751	9.314265442	9.244355965	0.00075066	0.269142628
301	3.757632971	7.312979984	9.31065197	9.235825348	0.000751751	0.26991266
344	3.785541773	7.318666649	9.324398041	9.266499519	0.000746296	0.269436598
387	3.772892952	7.298040581	9.330084229	9.253515053	0.000751751	0.269448429
430	3.819742775	7.291175175	9.321982384	9.2299263	0.000749569	0.269437909
473	3.851767445	7.304179096	9.319359779	9.229914284	0.000746296	0.269325435
516	3.810279703	7.303689289	9.320036888	9.238060188	0.00075066	0.269555748
559	3.854437017	7.308769893	9.314058304	9.230116844	0.000748478	0.268552989
602	3.817586231	7.313364601	9.31287899	9.247432136	0.00075066	0.269067198
645	3.855707025	7.297711086	9.3182724	9.243172836	0.000749569	0.269091159
688	3.88897624	7.267345333	9.309166527	9.257328224	0.00075066	0.269625485
731	3.889296198	7.284542179	9.311411858	9.22914505	0.000748478	0.268456072
774	3.892821979	7.286632061	9.310260582	9.23569603	0.000746296	0.268990666
817	3.935576344	7.284824181	9.311111832	9.235015869	0.000749569	0.269157708
860	3.923368168	7.267916679	9.301465797	9.206046295	0.000748478	0.27004084
903	3.93399353	7.284030056	9.30398922	9.219396591	0.000743022	0.269769669
946	3.924784374	7.279953384	9.302077103	9.226563072	0.000746296	0.268366724
989	3.95392971	7.262705136	9.297139359	9.203983498	0.000746296	0.268904001
1032	3.958074474	7.260875797	9.290431595	9.220478439	0.00075066	0.269331425
1075	3.919169474	7.251566506	9.28977375	9.205566978	0.000746296	0.269165665
1118	3.84546423	7.261057567	9.285735512	9.206461525	0.000745205	0.269919395
1161	3.809795713	7.276606369	9.289661026	9.214176941	0.000752842	0.269141793
1204	3.713432455	7.263530731	9.284557533	9.217263794	0.000747387	0.268352866
1247	3.617168713	7.294919109	9.287390709	9.205072212	0.000743022	0.269924074
1290	3.525746584	7.321447945	9.284959602	9.230692673	0.000749569	0.269394755
1333	3.478512859	7.331357956	9.299013329	9.221294975	0.000743022	0.269312471
1376	3.420258045	7.331922817	9.297167397	9.223057747	0.000737567	0.269837111
1419	3.368987131	7.323138333	9.299318504	9.224709892	0.000748478	0.269257337
1462	3.384682274	7.32734642	9.299333382	9.221734619	0.000745205	0.270066351
1505	3.410340452	7.297415733	9.284955597	9.20435009	0.000746296	0.270231694
1548	3.38361578	7.294438267	9.291888809	9.197988129	0.000749569	0.269691557
1591	3.390218067	7.304235363	9.286320495	9.210652733	0.000746296	0.269477218
1634	3.417403126	7.280539131	9.275285149	9.208669281	0.000746296	0.269096494
1677	3.588187838	7.286349773	9.270789146	9.211909485	0.000744114	0.269269466
1720	3.827492952	7.25413351	9.276625633	9.196822357	0.000756115	0.270233095
1763	3.986660719	7.266605854	9.27627964	9.206429863	0.00075066	0.270362556
1806	4.090287113	7.243582916	9.267372322	9.193580055	0.000743022	0.27009654
1849	4.128643799	7.262532425	9.263551903	9.19109993	0.00075066	0.268145114
1892	4.166061592	7.243255615	9.261209297	9.1696558	0.000751751	0.269810915
1935	4.165584564	7.216879177	9.246572876	9.17446537	0.00075066	0.269033402
1978	4.203712273	7.217244339	9.248884392	9.166897774	0.000756115	0.268546343
2021	4.234231281	7.206058788	9.244982719	9.165242767	0.000748478	0.269151241
2064	4.20229435	7.215148735	9.239315605	9.158782768	0.000748478	0.26900813
2107	4.234919929	7.226282883	9.236514473	9.1428545	0.00074084	0.269873053
2150	4.250464058	7.206873035	9.230533791	9.152768326	0.000749569	0.27058509
2193	4.248468208	7.207248592	9.226931	9.177723312	0.000747387	0.269409597
2236	4.269295883	7.248714924	9.232693863	9.151774597	0.000741931	0.269599974
2279	4.309287167	7.2316535	9.236511612	9.152583504	0.00075066	0.269272923
2322	4.294165611	7.194683075	9.230550384	9.164635849	0.000744114	0.26923573
2365	4.322254181	7.209762192	9.227527428	9.150299072	0.000741931	0.270016134
2408	4.343669033	7.227393436	9.238361168	9.162187958	0.000748478	0.270174086
2451	4.342715454	7.223670864	9.234057045	9.168773651	0.000744114	0.269791156
2494	4.360801983	7.21545763	9.235220909	9.167016411	0.000749569	0.268625766
2537	4.284242439	7.229975319	9.236306	9.168314934	0.000745205	0.26924935
2580	4.130491829	7.246793461	9.231234932	9.179803085	0.000746296	0.26859805
2623	3.995704937	7.243277073	9.244898414	9.166156196	0.000747387	0.270218313
2666	3.859238768	7.279459381	9.249295044	9.187849808	0.000743022	0.269530565
2709	3.761157942	7.303345966	9.253506661	9.208289719	0.000736476	0.269179791
2752	3.652041388	7.318001747	9.264641762	9.221669769	0.00074084	0.269231141
2795	3.62561636	7.364360046	9.273032761	9.217362404	0.000747387	0.269537538
2838	3.567331695	7.33192234	9.286904335	9.226467895	0.000746296	0.270145446

time	HX2 T ref in	HX2 T HTF out	HX2 T ref out	HX2 T HTF in	Turbine for ref HX2	Total HTF m dot
2881	3.533172035	7.321845245	9.286522675	9.218817329	0.00074084	0.270222247
2924	3.51692524	7.37292099	9.299412155	9.229603767	0.000739749	0.269214094
2967	3.513572502	7.359001446	9.294644356	9.2178442	0.000739749	0.269899696
3010	3.50358057	7.337412834	9.279743957	9.199547386	0.000743022	0.269624174
3053	3.517117071	7.323977089	9.269723702	9.194734001	0.000739749	0.269349456
3096	3.55071249	7.336631679	9.274403382	9.202288628	0.000741931	0.270055771
3139	3.514097309	7.326906681	9.27704525	9.222354698	0.000744114	0.269843251
3182	3.570463514	7.327208996	9.284660911	9.214209938	0.000744114	0.270280033
3225	3.567834568	7.376319313	9.305459976	9.249565888	0.000739749	0.269389331
3268	3.568448591	7.365368175	9.309849548	9.272782898	0.000746296	0.269723535
3311	3.997363138	7.361539078	9.31981411	9.26344204	0.00075066	0.269260764
3354	4.24516716	7.355395794	9.334967041	9.264831925	0.000748478	0.269987583
3397	4.367281532	7.330919647	9.343279457	9.280534935	0.000747387	0.269042253
3440	4.443797398	7.321832466	9.344241524	9.274667168	0.00075066	0.269474924
3483	4.495982456	7.329349232	9.344253731	9.261865234	0.000752842	0.268888414
3526	4.528290653	7.303243447	9.342682838	9.272675896	0.000744114	0.268733919
3569	4.568345165	7.298620987	9.332995987	9.271598053	0.000746296	0.270269424
3612	4.599036694	7.310064316	9.330373001	9.242285156	0.000741931	0.26939714
3655	4.590276909	7.317006493	9.333783913	9.255405426	0.000749569	0.268207639
3698	4.568494129	7.315444279	9.333972359	9.254100227	0.000751751	0.270231843
3741	4.58411026	7.304946613	9.324989891	9.239157677	0.000755024	0.269602031
3784	4.593466091	7.296972084	9.323043442	9.240350914	0.000746296	0.269414127
3827	4.576529885	7.289224148	9.309564972	9.255159569	0.000749569	0.27033475
3870	4.573578835	7.29824295	9.30810318	9.225316238	0.00075066	0.268686473
3913	4.569092369	7.293233871	9.306248474	9.222549248	0.000751751	0.269806087
3956	4.578593826	7.282771206	9.30615387	9.242018509	0.000749569	0.269481003
3999	4.610133362	7.272031403	9.299334717	9.213802528	0.000746296	0.268620759
4042	4.585684109	7.283836937	9.306612015	9.234235001	0.000746296	0.269695491
4085	4.575838757	7.295211983	9.29597187	9.225316811	0.000744114	0.269212186
4128	4.592533112	7.292311573	9.295229149	9.222653961	0.000748478	0.269649208
4171	4.632539082	7.286019135	9.288071251	9.228066444	0.00075066	0.269951969
4214	4.567375183	7.26906519	9.279953575	9.216851044	0.000748478	0.269595116
4257	4.541257477	7.217080498	9.271960449	9.197668266	0.000752842	0.26907295
4300	4.543143654	7.259766579	9.268043327	9.182363319	0.000745205	0.268693298
4343	4.420933247	7.240013218	9.25124836	9.170962143	0.000745205	0.269565433
4386	4.247423744	7.249399948	9.235512352	9.159225845	0.000744114	0.269469678
4429	4.141862583	7.229751682	9.223252106	9.148453713	0.000744114	0.269691885
4472	3.982217789	7.256092262	9.221265602	9.157586289	0.000744114	0.269982755
4515	3.829853583	7.250666237	9.220188332	9.159628105	0.000749569	0.270067424
4558	3.744300032	7.277479839	9.226361084	9.162981033	0.000737567	0.268879473
4601	3.725437069	7.296591568	9.246459007	9.173307419	0.000738658	0.270455539
4644	3.64927516	7.309699631	9.25557003	9.196070289	0.000743022	0.269244194
4687	3.631611586	7.31185646	9.262783432	9.210235596	0.000738658	0.270237505
4730	3.603307295	7.331816291	9.278217888	9.218133736	0.000737567	0.269849092
4773	3.592968464	7.351071739	9.288175201	9.218330955	0.000745205	0.269559443
4816	3.590063572	7.326015186	9.282812309	9.221644974	0.000739749	0.269595712
4859	3.575784302	7.354803085	9.305276489	9.221256447	0.000738658	0.269204885
4902	3.59201231	7.354597378	9.307203865	9.246318817	0.000745205	0.26938352
4945	3.621453285	7.34918108	9.308386802	9.250346565	0.000737567	0.26961112
4988	3.595614004	7.386629868	9.321765137	9.23661499	0.000746296	0.269585699
5031	3.652611923	7.377879333	9.32970047	9.255474091	0.000743022	0.269985378
5074	3.640417528	7.376348781	9.329589271	9.256567001	0.00074084	0.269520879
5117	3.670220709	7.382300663	9.330578804	9.246251679	0.000741931	0.269590855
5160	4.062117386	7.354672241	9.335353851	9.26243	0.000743022	0.269169688
5203	4.303678989	7.315651035	9.333985901	9.268919754	0.000749569	0.269060642
5246	4.408534336	7.291259861	9.316424179	9.242690087	0.000748478	0.269443572
5289	4.498334789	7.279247761	9.310658264	9.241711235	0.000749569	0.269852132
5332	4.548732948	7.252850246	9.308888626	9.247446251	0.000747387	0.269220144
5375	4.568989086	7.237891388	9.291110611	9.235426712	0.00075066	0.269751042
5418	4.60013628	7.247549534	9.296473122	9.22540493	0.000756115	0.270008355
5461	4.619660664	7.240332318	9.28515892	9.225190354	0.000745205	0.268976063
5504	4.605813694	7.23473196	9.27432251	9.194939423	0.000745205	0.270393252
5547	4.587134552	7.24607439	9.259743309	9.175658226	0.000751751	0.270075887
5590	4.575552368	7.255358696	9.251848411	9.178429222	0.000741931	0.269229919
5633	4.566018486	7.232415581	9.23914051	9.182427597	0.000743022	0.270576298
5676	4.581568718	7.211127472	9.22907753	9.159029198	0.000749569	0.268623382
5719	4.590995693	7.223946571	9.223970795	9.145576286	0.000747387	0.269651502

time	HX2 T ref in	HX2 T HTF out	HX2 T ref out	HX2 T HTF in	Turbine for ref HX2	Total HTF m dot
5762	4.573679733	7.202013111	9.208968163	9.144319725	0.000746296	0.268940449
5805	4.563376522	7.182483959	9.204460526	9.116293335	0.000744114	0.268969655
5848	4.56346674	7.193478203	9.192058754	9.115082359	0.000748478	0.269611955

time	ref micromotion	P comp disch	P EV2 in	P valve inlet	P EV2 out	Voltage	T oil
0	0.012855672	718.0843506	300.7272644	717.078186	292.3131714	24.0551357	25.47882652
43	0.012849156	718.0446167	299.4107971	717.3702393	291.2146301	24.0550804	25.49680519
86	0.012848416	719.4750366	300.1374817	718.4827881	291.518219	24.0552006	25.5016613
129	0.012864801	719.7023926	299.3474731	718.0251465	291.1101074	24.0556602	25.48027992
172	0.012863724	719.2271118	299.5217285	718.1309204	291.2982178	24.055275	25.47833824
215	0.01284896	719.6783447	299.5528259	718.5394287	290.9067688	24.0550499	25.45160675
258	0.01286456	720.0681152	300.710144	718.6308594	291.6747437	24.0550804	25.45306969
301	0.012867549	719.24823	299.8174744	718.3186646	291.2723694	24.0550957	25.46084213
344	0.01286474	720.2002563	300.2589722	718.9714966	291.315155	24.055685	25.46666908
387	0.012870072	720.3161011	299.7632751	718.5656128	291.8103027	24.0551796	25.4491787
430	0.01287884	720.3286743	300.5513	718.5632935	292.8132019	24.05509	25.44820786
473	0.012868715	720.793335	299.9586487	719.2926636	291.7749634	24.0550747	25.47299004
516	0.012872144	720.0741577	300.0915527	718.782959	292.1669922	24.0550842	25.4807663
559	0.012868845	720.1630859	300.5940857	718.642334	291.813446	24.0552292	25.4807663
602	0.01287718	720.5686035	300.5313416	719.0307617	291.944397	24.0552597	25.49388886
645	0.012860358	720.5734253	300.4069824	718.9470825	291.9978333	24.0554352	25.48950958
688	0.012871799	720.6334839	301.9624634	719.4823608	293.5004578	24.0553207	25.48902702
731	0.012876796	721.3184204	301.1656189	719.8569946	292.3516541	24.0555248	25.49145508
774	0.01287713	721.2371826	301.9282227	719.713501	293.0475464	24.0552158	25.48514175
817	0.012878762	721.1625366	300.7109985	719.7991943	293.1133118	24.0554047	25.48465347
860	0.012881385	721.6635742	302.0214844	720.2077026	292.9751587	24.0551701	26.66796112
903	0.012880906	721.473938	301.5945435	720.3465576	293.0300293	24.0554047	33.1972847
946	0.012871319	721.355835	301.6650085	720.4638672	293.0443726	24.0552006	37.91593552
989	0.012877233	721.7338867	301.7251587	720.9554443	293.4743347	24.0551758	39.96667481
1032	0.012867127	722.2423706	301.7388611	721.5496826	293.0501404	24.0552807	41.13685989
1075	0.012853399	722.3058472	301.4117432	721.5905151	292.3105774	24.0552406	41.91973496
1118	0.012851769	723.3447876	300.4084167	722.5552979	291.6164246	24.05513	42.44554138
1161	0.012821027	724.5793457	299.5579529	724.130127	291.1813354	24.0551605	43.84121704
1204	0.012795054	725.6814575	297.8915405	725.1437988	289.1419067	24.0547447	44.71788025
1247	0.012795211	726.3723755	297.1602783	726.3828735	288.4299622	24.0545902	45.20772934
1290	0.012792342	726.2382202	296.1960144	726.5404053	287.9988709	24.0542946	45.51144409
1333	0.012809036	727.1104126	296.2650452	727.5089111	287.190979	24.0545101	45.73887253
1376	0.012806912	728.2142944	295.9604492	728.1068726	287.7969666	24.0541496	45.89632416
1419	0.012805863	728.5202637	295.4576416	728.4406738	286.9968262	24.0542049	45.99206162
1462	0.01280243	728.9472046	295.2080994	728.8724365	286.4864807	24.0541744	46.07516098
1505	0.012818584	729.6304321	295.3792114	729.0966797	287.2435303	24.0542393	46.16651917
1548	0.012810668	729.744812	295.4493713	729.2433472	287.3311157	24.0542107	46.2131691
1591	0.012814024	729.8394775	296.1098938	729.6268311	287.835144	24.0543041	46.2481575
1634	0.01285291	730.2798462	296.0662537	729.7515869	287.7998352	24.0541191	45.87981033
1677	0.012923982	728.0001221	299.7818298	727.4103394	291.8800659	24.0541401	36.6621666
1720	0.012913732	727.4650269	302.6957092	725.902771	294.0783081	24.054285	32.36775589
1763	0.012907734	726.7918701	302.7989502	725.2357788	294.342804	24.0543709	29.87382126
1806	0.01291295	726.6351318	304.3050842	725.0888672	294.9597168	24.0539494	28.28279877
1849	0.012910605	725.5870972	303.456604	724.2681274	295.0860901	24.0535545	27.19085503
1892	0.012913421	725.7575073	304.8489685	724.2120361	295.5751953	24.0547295	26.4419899
1935	0.012912954	725.5479126	303.7757568	724.124939	296.412384	24.0544453	25.90597916
1978	0.012905258	725.6954346	304.966156	724.15802	296.2719421	24.0546608	25.50992203
2021	0.012909687	725.5476074	304.5817261	723.9208374	296.0714722	24.0544395	25.21251488
2064	0.012908618	725.8599243	304.7591248	724.2713013	295.6392212	24.0545692	24.99383545
2107	0.012904225	725.7918091	305.0006714	724.3241577	295.9580383	24.0548859	24.82618141
2150	0.012899408	725.8275757	305.0043945	724.4639282	296.3506165	24.0547504	24.69789124
2193	0.012902321	725.4729614	305.0397644	724.1269531	297.2383728	24.0546341	24.60701561
2236	0.012900198	725.5272827	305.2077332	724.2390747	296.4356384	24.0548744	24.50107193
2279	0.012912536	726.213623	306.2201843	724.7910767	297.5852966	24.0547791	24.45247841
2322	0.012917659	726.2442627	305.6452332	724.7594604	296.1648254	24.05476	24.39659119
2365	0.012911826	726.0678101	306.0062866	724.6430054	297.0324402	24.0547295	24.34945679
2408	0.012909642	726.1816406	306.0541992	724.8330078	296.4517212	24.0547047	26.62374115
2451	0.012913	726.3311768	305.8873596	725.1190796	296.803833	24.0547791	37.03878021
2494	0.012880611	727.1813354	305.4207764	726.3920288	297.1407166	24.0545559	42.18846893
2537	0.012841555	729.1039429	304.0609436	728.303833	295.4953613	24.0544491	44.57209015
2580	0.012830061	730.6582031	302.4327393	730.4179688	293.649231	24.0546608	46.0080986
2623	0.012815389	732.3131104	300.9408875	732.1782227	292.3123169	24.054575	46.93579102
2666	0.012797274	732.8933105	299.4541321	733.4011841	290.8570862	24.0545292	47.57530594
2709	0.012809098	734.6443481	298.2816772	735.0479126	290.4153748	24.0541554	48.05203629
2752	0.012807451	735.522522	297.9251709	736.3036499	289.7481995	24.054245	48.34846878
2795	0.012816411	736.7064819	297.4702759	737.432312	288.7475891	24.0538101	48.5778389
2838	0.012803596	737.6873169	297.1440125	738.1501465	288.7803345	24.0539551	48.71925736

time	ref micromotion	P comp disch	P EV2 in	P valve inlet	P EV2 out	Voltage	T oil
2881	0.012813322	737.4748535	296.9532166	738.109314	288.7659607	24.0539207	48.82081604
2924	0.012815778	737.8326416	297.1987915	738.4781494	288.4440308	24.0536156	48.89614487
2967	0.012813221	738.041687	296.6928406	738.6293945	288.9179077	24.0536308	48.95785904
3010	0.012817209	738.6373291	296.4119263	738.6963501	288.5525818	24.0535851	49.02783585
3053	0.012810805	738.4591675	297.3208313	738.9570923	288.6956177	24.0532646	49.09392929
3096	0.012806307	738.4477539	296.6802979	738.8754272	288.3150635	24.0534248	49.16049957
3139	0.012814415	739.2367554	298.0458069	739.300354	288.9945984	24.0534649	49.19597626
3182	0.012811589	739.4194946	298.0866089	739.5113525	288.9285278	24.0534859	49.23825455
3225	0.012816252	739.4326172	297.4563293	739.5792236	288.9494934	24.0535259	49.246521
3268	0.012986043	736.8068237	300.738678	736.583374	292.3657227	24.0534801	42.58161163
3311	0.012965806	733.8527832	305.0500183	732.9963989	295.4539795	24.0534096	35.62950516
3354	0.012959621	731.5727539	305.6135864	730.8883057	296.6467285	24.053545	31.97218704
3397	0.012950623	731.6931152	306.6668091	730.4053345	298.0106506	24.0538406	29.73435211
3440	0.012946535	730.6467285	307.0495605	729.4661255	298.5893555	24.0537491	28.2526722
3483	0.012953539	729.795105	307.6681519	728.9176025	299.0451355	24.0535641	27.22195053
3526	0.01293845	730.1185913	308.1869202	728.7160645	298.6249695	24.0539742	26.4910717
3569	0.012946145	729.6721802	308.5385742	728.442688	299.1083069	24.0540047	25.93270683
3612	0.012934104	729.4050903	308.4244995	728.1005859	299.1677551	24.0541306	25.54345703
3655	0.012933597	728.8717041	308.3013	727.894165	299.471344	24.0540047	25.25236511
3698	0.012943164	728.5880737	308.7159729	727.6934814	300.4762573	24.0540504	25.03951645
3741	0.012939058	728.1082153	308.0896606	727.3174438	299.4578552	24.0543251	24.83687019
3784	0.012926437	728.1279297	308.2354126	727.2096558	298.9322815	24.0541344	24.71441078
3827	0.012946975	728.3358154	308.0682678	727.5701904	299.7229309	24.0541058	24.60603905
3870	0.0129311	727.979248	308.2265625	727.3994141	299.7260742	24.0540791	24.55695915
3913	0.012939426	728.296936	309.45578	727.6851807	299.9992065	24.053896	24.4845562
3956	0.012941031	728.0449829	308.1190491	727.3309937	299.2530823	24.0538006	24.45102692
3999	0.012937235	728.4647827	309.2524109	727.5089111	299.558075	24.0537205	24.41846085
4042	0.012928456	727.9005737	307.7283325	727.3234863	298.9724731	24.0538502	24.39853668
4085	0.012923968	727.9829102	307.8943176	727.3048096	299.3667908	24.0538158	24.38541985
4128	0.012927314	728.1165161	308.7986755	727.807312	300.0606689	24.0532341	24.36889458
4171	0.012938839	727.6786499	308.2297058	727.5560913	299.773468	24.0534248	24.35188484
4214	0.012932505	727.3340454	308.6834412	727.3240967	299.615509	24.053196	33.34647369
4257	0.012916897	727.8588257	308.1763611	727.8242798	299.8869324	24.0533543	41.69230652
4300	0.012868455	728.8394165	306.7218628	728.9816895	297.7200012	24.0530758	44.98078156
4343	0.01283872	730.8243408	304.8674927	731.2424927	296.0967407	24.0530643	46.77105331
4386	0.012826236	732.7266235	303.1103821	733.3566284	294.3827515	24.0530949	47.93735123
4429	0.012816942	733.6617432	301.7559814	734.6543579	293.5504456	24.0529804	48.71537018
4472	0.012814529	735.1447754	300.141449	736.2576294	291.5500793	24.0532055	49.36508942
4515	0.012797093	736.6152344	299.4943542	738.0112915	290.7367249	24.0531693	49.93901062
4558	0.012803074	737.6784668	299.0791016	739.2374268	289.8705444	24.0531006	50.33700943
4601	0.012805473	737.9049683	297.878418	739.6629028	289.7246399	24.0529995	50.55422592
4644	0.012813109	738.4291382	297.8190918	739.9359741	289.4035645	24.0530396	50.69176102
4687	0.012813033	739.3048096	297.480835	740.317749	289.3753967	24.05299	51.20201492
4730	0.012804905	739.138916	297.1197815	740.7529907	289.2318115	24.0533104	51.44110489
4773	0.012817167	739.0250854	297.2886047	740.850769	288.7065125	24.0535908	51.57668304
4816	0.012813673	739.5701904	297.9947815	741.2779541	289.0046387	24.0534496	51.67096329
4859	0.012821153	739.5464478	297.0387878	741.4685669	288.7050781	24.0536251	51.74045563
4902	0.012815204	739.4066162	297.9827881	740.9502563	289.9093018	24.05369	51.77641296
4945	0.012815628	739.9785156	298.3934937	741.401001	289.4196472	24.0537949	51.82014847
4988	0.012829904	740.0237427	297.9354553	741.3360596	289.1976318	24.0536251	51.84007263
5031	0.012831717	739.5478516	298.0826111	740.9128418	289.6830139	24.0538692	51.82743835
5074	0.012823645	739.3568115	298.2893677	740.9654541	289.9851379	24.0539341	51.86290741
5117	0.013001813	737.0991211	301.4408264	737.6832886	293.3261414	24.0537949	44.83694077
5160	0.012973461	733.2611084	304.7149048	733.6745605	295.9450989	24.0538502	37.03051758
5203	0.012967033	730.9750366	307.1185608	730.8411255	298.5709839	24.05373	32.92563248
5246	0.012955391	730.9498901	307.1636353	730.8348389	298.8900452	24.0538845	30.39768601
5289	0.012947393	729.7305298	307.7243347	729.4893799	298.9164734	24.0538349	28.72744751
5332	0.012937063	728.7696533	308.2160034	728.3788452	299.4747925	24.0536842	27.59419632
5375	0.012940424	728.8989258	307.7268982	728.4711304	299.5896606	24.0535908	26.80014229
5418	0.012942133	728.8519897	308.267334	728.2000122	299.7981873	24.05369	26.21310616
5461	0.012935519	727.8897095	308.8522949	727.5307617	300.2398987	24.0535793	25.78157425
5504	0.012931134	727.9451904	308.246521	727.4235229	299.6640625	24.0535603	25.47104836
5547	0.012930987	727.7702026	307.9613342	727.242981	299.1281433	24.0533848	25.23876
5590	0.012928924	727.6300659	307.8943176	726.8425293	299.2599487	24.0531845	25.04340363
5633	0.012924369	727.7727661	308.0737	727.0696411	299.3897705	24.0531502	24.89664459
5676	0.012929794	727.552002	307.9313965	726.9917603	299.2651367	24.0533142	24.74162674
5719	0.012926438	727.5491333	307.7189026	726.9615479	299.0371094	24.0531559	24.65317917

time	ref micromotion	P comp disch	P EV2 in	P valve inlet	P EV2 out	Voltage	T oil
5762	0.012932627	727.491333	309.2156372	726.7134399	300.1956482	24.0530491	24.58854866
5805	0.012918087	726.9963379	308.1960449	726.2393799	299.2823486	24.0532646	24.51468086
5848	0.012932528	726.9786377	307.3601379	726.1675415	298.9868469	24.0529957	24.47386169

time	HTF mass flow	T HTF in	CP HTF	T HTF out	Capacity - HTF	T ref out	h refrigerant out
0	0.269748658	9.194248199	3334.172607	7.32390976	1682.161133	5.93261385	403.9114685
43	0.270377576	9.230602264	3334.15918	7.280112267	1758.331177	5.937797546	403.9450989
86	0.268749923	9.230888367	3334.269287	7.340889931	1693.598755	5.957323551	403.9544373
129	0.270552427	9.244699478	3334.250732	7.316840649	1739.101196	5.951856613	403.9603577
172	0.269467294	9.232972145	3334.245605	7.325636387	1713.68396	5.955554008	403.9586792
215	0.269566178	9.241885185	3334.24707	7.317586422	1729.560181	5.971291542	403.9829712
258	0.269142628	9.244356155	3334.24292	7.31280756	1733.346191	5.964265347	403.9564819
301	0.26991266	9.235825539	3334.227783	7.312980175	1730.465454	5.960652351	403.9638672
344	0.269436598	9.266499519	3334.293457	7.318666458	1749.89563	5.974398136	403.9749756
387	0.269448429	9.253515244	3334.23291	7.29804039	1756.805664	5.980084419	403.9669495
430	0.269437909	9.229926109	3334.177734	7.291175365	1741.684692	5.971982479	403.9332886
473	0.269325435	9.229914665	3334.201172	7.304179192	1729.281738	5.969359875	403.9583435
516	0.269555748	9.238059998	3334.215088	7.303689003	1738.529297	5.970036983	403.9486084
559	0.268552989	9.230116844	3334.209961	7.308769703	1720.397217	5.964058399	403.9526367
602	0.269067198	9.247432709	3334.249512	7.313364506	1735.124023	5.962878704	403.9481201
645	0.269091159	9.243172646	3334.213623	7.297710896	1745.482788	5.968272209	403.9515076
688	0.269625485	9.257328033	3334.184326	7.267345428	1788.956909	5.959166527	403.903717
731	0.268456072	9.22914505	3334.164551	7.284542084	1740.568726	5.961411953	403.9360657
774	0.268990666	9.235695839	3334.180176	7.286632061	1748.043945	5.960260868	403.9166565
817	0.269157708	9.235015869	3334.175537	7.284824371	1750.13916	5.961111546	403.9156799
860	0.27004084	9.206046104	3334.092773	7.267916679	1744.977905	5.951466084	403.9107666
903	0.269769669	9.219396591	3334.145996	7.284029961	1740.768066	5.953989506	403.9115601
946	0.268366724	9.226563454	3334.151611	7.27995348	1741.77832	5.952076912	403.9094543
989	0.268904001	9.203983307	3334.07959	7.262705326	1740.447876	5.947139263	403.8937073
1032	0.269331425	9.220479012	3334.106201	7.260875702	1759.683228	5.940431595	403.8989563
1075	0.269165665	9.205566406	3334.062256	7.25156641	1753.549438	5.93977356	403.9179077
1118	0.269919395	9.206461906	3334.081055	7.261057377	1750.733887	5.935735703	403.9326477
1161	0.269141793	9.214177132	3334.123047	7.276606083	1738.682739	5.939661026	403.9476318
1204	0.268352866	9.217264175	3334.10498	7.263530731	1748.03772	5.934557438	403.9968567
1247	0.269924074	9.205072403	3334.139648	7.294919014	1719.070068	5.937390804	404.0181274
1290	0.269394755	9.230692863	3334.233887	7.321447849	1714.931641	5.934959412	404.0273132
1333	0.269312471	9.221294403	3334.234863	7.331357956	1697.070679	5.94901371	404.0610046
1376	0.269837111	9.223057747	3334.239014	7.331923008	1701.456665	5.947167397	404.043457
1419	0.269257337	9.224709511	3334.226074	7.323138237	1707.164063	5.949318886	404.0664063
1462	0.270066351	9.221734047	3334.228271	7.327346325	1705.826294	5.949333668	404.0798035
1505	0.270231694	9.204350471	3334.142822	7.297415733	1718.130859	5.934955597	404.0471802
1548	0.269691557	9.19798851	3334.125977	7.294438362	1711.644531	5.941888809	404.0510254
1591	0.269477218	9.210652351	3334.166504	7.304235458	1712.881714	5.936320782	404.0328064
1634	0.269096494	9.208669662	3334.120361	7.280539036	1729.918457	5.925285339	404.0239563
1677	0.269269466	9.211909294	3334.136719	7.286349773	1728.731323	5.920788765	403.9124146
1720	0.270233095	9.196822166	3334.05127	7.254133701	1750.306396	5.926625729	403.8594666
1763	0.270362556	9.206429482	3334.091064	7.266605854	1748.583252	5.926279545	403.8521729
1806	0.27009654	9.193579674	3334.026367	7.243582726	1755.98999	5.917372227	403.8279114
1849	0.268145114	9.191100121	3334.056152	7.262532234	1724.160156	5.913551807	403.821167
1892	0.269810915	9.1696558	3333.982666	7.243255615	1732.883301	5.911209583	403.8060913
1935	0.269033402	9.174465179	3333.943604	7.216879368	1755.841431	5.896573067	403.770874
1978	0.268546343	9.166897774	3333.930664	7.217244148	1745.553711	5.898884296	403.7766418
2021	0.269151241	9.165243149	3333.907471	7.206058979	1758.025391	5.894982815	403.7785034
2064	0.26900813	9.158782959	3333.912109	7.215148926	1743.147339	5.889315605	403.7849121
2107	0.269873053	9.142854691	3333.903564	7.226283073	1724.398193	5.886514187	403.7739563
2150	0.27058509	9.152768135	3333.886475	7.20687294	1755.392212	5.880533695	403.7582092
2193	0.269409597	9.177722931	3333.932129	7.207248688	1769.86731	5.87693119	403.7314148
2236	0.269599974	9.151774406	3333.960205	7.248714924	1710.537842	5.882693768	403.7578735
2279	0.269272923	9.152583122	3333.930908	7.23165369	1724.490356	5.886511803	403.7307434
2322	0.26923573	9.164635658	3333.885742	7.194683075	1768.231934	5.880550385	403.7631531
2365	0.270016134	9.150299072	3333.887207	7.209762096	1746.877808	5.877527714	403.7374268
2408	0.270174086	9.162187576	3333.94043	7.227393627	1742.755249	5.888360977	403.7625122
2451	0.269791156	9.168773651	3333.945557	7.223670959	1749.559814	5.884057045	403.7493286
2494	0.268625766	9.167016029	3333.927734	7.215457439	1747.774658	5.885221004	403.7414246
2537	0.26924935	9.168314934	3333.956055	7.229975224	1739.980713	5.886305809	403.7860413
2580	0.26859805	9.179802895	3334.007324	7.24679327	1731.025146	5.881235123	403.8304443
2623	0.270218313	9.166155815	3333.976318	7.243277073	1732.324585	5.894898415	403.8779602
2666	0.269530565	9.187849998	3334.080811	7.279459476	1714.949585	5.899294853	403.9203186
2709	0.269179791	9.2082901	3334.160645	7.303346157	1709.665405	5.903506279	403.93573
2752	0.269231141	9.221670151	3334.211426	7.318001747	1708.872559	5.914641857	403.9631958
2795	0.269537538	9.217362404	3334.287354	7.364360332	1665.321899	5.923032761	403.9970093
2838	0.270145446	9.226468086	3334.245117	7.331922531	1706.476196	5.93690443	404.0084534

time	HTF mass flow	T HTF in	CP HTF	T HTF out	Capacity - HTF	T ref out	h refrigerant out
2881	0.270222247	9.218816757	3334.213135	7.321845531	1709.130981	5.936522484	404.0085144
2924	0.269214094	9.229603767	3334.324707	7.37292099	1666.646118	5.949412346	404.0284119
2967	0.269899696	9.217844009	3334.278564	7.359001637	1672.811279	5.944644451	404.0117188
3010	0.269624174	9.199547768	3334.206543	7.337412834	1674.026855	5.929744244	404.0081177
3053	0.269349456	9.19473362	3334.173584	7.323976994	1680.047729	5.919723988	403.9954529
3096	0.270055771	9.202288628	3334.209961	7.336631775	1679.879761	5.924403191	404.009613
3139	0.269843251	9.222354889	3334.22876	7.326906681	1705.370972	5.927045345	403.9940796
3182	0.270280033	9.214209557	3334.2146	7.327208996	1700.511475	5.934660912	404.0025635
3225	0.269389331	9.249566078	3334.366943	7.376319408	1682.630371	5.955460072	404.0204773
3268	0.269723535	9.272783279	3334.38916	7.365367889	1715.458618	5.959849358	403.9342957
3311	0.269260764	9.263442039	3334.365234	7.361538887	1707.554688	5.969813824	403.8615112
3354	0.269987583	9.264831543	3334.356689	7.355395794	1718.941162	5.984967232	403.8434143
3397	0.269042253	9.280534744	3334.34082	7.330919743	1748.95813	5.993279457	403.8146362
3440	0.269474924	9.274666786	3334.313965	7.32183218	1754.649414	5.994241714	403.8001404
3483	0.268888414	9.261864662	3334.304443	7.329349041	1732.608398	5.994253635	403.7880554
3526	0.268733919	9.272675514	3334.276855	7.303243637	1764.67688	5.992682934	403.7977905
3569	0.270269424	9.271597862	3334.266602	7.298621178	1777.948975	5.982995987	403.7763367
3612	0.26939714	9.242284775	3334.234131	7.310064316	1735.584839	5.980372906	403.7723999
3655	0.268207639	9.255405426	3334.270508	7.317006588	1733.464966	5.983783722	403.767395
3698	0.270231843	9.254099846	3334.265381	7.315444469	1746.776855	5.983972549	403.7408142
3741	0.269602031	9.239157677	3334.219238	7.304946423	1738.686157	5.974989891	403.7598877
3784	0.269414127	9.240350723	3334.207031	7.296972275	1745.703125	5.973043442	403.7721252
3827	0.27033475	9.255159378	3334.219971	7.289224148	1772.006592	5.959565163	403.7390747
3870	0.268686473	9.225316048	3334.182373	7.298243046	1726.368164	5.95810318	403.7377014
3913	0.269806087	9.222549438	3334.168213	7.293233871	1735.571289	5.95624876	403.7287598
3956	0.269481003	9.2420187	3334.18457	7.282771111	1760.382446	5.95615387	403.7485352
3999	0.268620759	9.213802338	3334.114258	7.272031307	1739.073975	5.949334621	403.7343445
4042	0.269695491	9.23423481	3334.172363	7.283836842	1753.819824	5.95661211	403.7564087
4085	0.269212186	9.225317001	3334.176758	7.295211792	1732.464233	5.945971966	403.7364197
4128	0.269649208	9.222653389	3334.166748	7.292311668	1735.484619	5.945229053	403.7173157
4171	0.269951969	9.228066444	3334.165283	7.286019325	1747.967896	5.938071251	403.7185669
4214	0.269595116	9.216851234	3334.114258	7.26906538	1750.788574	5.929953575	403.7155151
4257	0.26907295	9.197668076	3333.98584	7.217080593	1776.756348	5.921960354	403.7011719
4300	0.268693298	9.18236351	3334.0354	7.259766579	1722.325439	5.918043613	403.7552795
4343	0.269565433	9.170962334	3333.979004	7.240013123	1735.392944	5.901248455	403.7834167
4386	0.269469678	9.159225464	3333.974854	7.249400139	1715.797241	5.885512352	403.8148193
4429	0.269691885	9.148453712	3333.919922	7.229751587	1725.164673	5.873251915	403.8259583
4472	0.269982755	9.157586098	3333.983887	7.256092548	1711.569214	5.871265411	403.8771057
4515	0.270067424	9.159627914	3333.977783	7.250666142	1718.826904	5.870188236	403.897644
4558	0.268879473	9.162981033	3334.032227	7.277479649	1690.262817	5.87636137	403.9259644
4601	0.270455539	9.173307419	3334.085449	7.296591759	1692.275757	5.896459103	403.9476624
4644	0.269244194	9.196070671	3334.150146	7.309699535	1693.395996	5.90557003	403.9642334
4687	0.270237505	9.210235596	3334.179688	7.31185627	1710.478271	5.912783623	403.9713745
4730	0.269849092	9.218133926	3334.22998	7.331816196	1697.193115	5.928217888	403.9888611
4773	0.269559443	9.218331337	3334.265137	7.351071835	1678.260132	5.938175201	404.0115356
4816	0.269595712	9.221645355	3334.22583	7.326014996	1703.968262	5.932812214	403.9989319
4859	0.269204885	9.221256256	3334.2771	7.354803085	1675.335205	5.955276489	404.0267639
4902	0.26938352	9.246318817	3334.322021	7.354597092	1699.165894	5.957203865	403.9967651
4945	0.26961112	9.250346184	3334.319336	7.349181175	1709.090088	5.958386898	404.0107117
4988	0.269585699	9.236615181	3334.362305	7.386630058	1662.944824	5.971765041	404.0284119
5031	0.269985378	9.255474091	3334.380371	7.377879143	1690.274536	5.979700565	404.0227051
5074	0.269520879	9.256567001	3334.379639	7.376348495	1689.723999	5.979589462	404.0146484
5117	0.269590855	9.246251106	3334.371826	7.382300854	1675.535522	5.980578899	403.9273682
5160	0.269169688	9.262430191	3334.351074	7.354672432	1712.224609	5.98535347	403.8623352
5203	0.269060642	9.268919945	3334.29248	7.31565094	1752.329956	5.983985901	403.7914734
5246	0.269443572	9.242690086	3334.200928	7.291259766	1753.124023	5.966424465	403.767334
5289	0.269852132	9.241711617	3334.17749	7.279247761	1765.696899	5.960658073	403.7615051
5332	0.269220144	9.24744606	3334.140381	7.252850056	1790.384888	5.958888531	403.7450867
5375	0.269751042	9.235426903	3334.091553	7.237891197	1796.532593	5.941110611	403.7261658
5418	0.270008355	9.225404739	3334.09082	7.247549534	1780.529663	5.946473122	403.7254028
5461	0.268976063	9.225190163	3334.077637	7.240332127	1779.994873	5.93515873	403.7035522
5504	0.270393252	9.194939613	3334.012695	7.234732151	1767.116333	5.924322605	403.709198
5547	0.270075887	9.175658226	3333.998535	7.2460742	1737.460083	5.909743309	403.7104492
5590	0.269229919	9.17842865	3334.020264	7.255358696	1726.182495	5.901848793	403.6998901
5633	0.270576298	9.182427406	3333.986084	7.232415676	1759.101318	5.889140606	403.6851196
5676	0.268623382	9.159029007	3333.905273	7.211127281	1744.472534	5.879077911	403.6794434
5719	0.269651502	9.145576477	3333.904297	7.223946571	1727.530029	5.873970509	403.6809692

time	HTF mass flow	T HTF in	CP HTF	T HTF out	Capacity - HTF	T ref out	h refrigerant out
5762	0.268940449	9.144319534	3333.862305	7.202013016	1741.492432	5.858968258	403.6367188
5805	0.268969655	9.116292953	3333.776611	7.18248415	1734.017212	5.854460716	403.6570129
5848	0.269611955	9.115082741	3333.794189	7.193478107	1727.196899	5.842058659	403.6538391

time	h refrigerant in	T refrigerant inlet	T Valve in	Capacity - refrigerant	refrigerant mass flow	T sat
0	232.7595062	0.484598994	23.48111916	1777.052979	0.010382894	27.50670116
43	232.750061	0.413530886	23.47460938	1759.943115	0.010280341	27.52083601
86	232.7371368	0.391533524	23.4656601	1762.008301	0.010291065	27.57464375
129	232.7368774	0.333479375	23.46549416	1764.543823	0.010305502	27.55251741
172	232.7198792	0.419935286	23.45377731	1750.557739	0.010222904	27.55763233
215	232.7147064	0.385929793	23.45019531	1753.275879	0.010237015	27.57738154
258	232.7088013	0.364905447	23.44612694	1763.294189	0.010296748	27.58180063
301	232.6912994	0.407632977	23.43408394	1763.48877	0.010296388	27.56670976
344	232.6814117	0.435541779	23.42724419	1751.071533	0.010222635	27.59826099
387	232.6880035	0.422892988	23.43180084	1766.941284	0.010316161	27.57864713
430	232.6783295	0.469742715	23.42513084	1768.235474	0.010325165	27.57853502
473	232.679306	0.501767457	23.42578125	1753.977905	0.010240469	27.61377539
516	232.6679535	0.460279703	23.41797066	1766.830322	0.01031541	27.58915111
559	232.6688843	0.504437029	23.41862106	1759.452026	0.010272148	27.5823552
602	232.6575623	0.467586249	23.41080856	1765.525146	0.010307195	27.60112424
645	232.6644135	0.505707085	23.41552925	1763.229736	0.010294002	27.59708143
688	232.6535797	0.538976252	23.408041	1775.401489	0.010367299	27.62293663
731	232.6597443	0.53929621	23.41227531	1762.936035	0.010292934	27.64102413
774	232.6354065	0.542821944	23.39550591	1762.4198	0.010289624	27.63409699
817	232.6398926	0.585576415	23.39859963	1770.519165	0.010337242	27.63823394
860	232.6408691	0.573368192	23.39925194	1767.053711	0.010317364	27.65795036
903	232.6396942	0.583993495	23.39843941	1754.531494	0.010244133	27.66465029
946	232.6463165	0.574784398	23.40299416	1762.281494	0.010289905	27.6703099
989	232.6361847	0.603929639	23.395998	1765.085205	0.010306614	27.6940189
1032	232.6399994	0.608074427	23.39860153	1772.680176	0.010350876	27.72266379
1075	232.6466217	0.569169462	23.40315819	1757.656616	0.010262412	27.72463148
1118	232.6518707	0.495464206	23.40673828	1750.674316	0.010221078	27.77110024
1161	232.6392059	0.459795743	23.39794922	1765.992554	0.010308849	27.84685598
1204	232.6536713	0.363432467	23.40787888	1740.216919	0.010156324	27.8955549
1247	232.6693268	0.26716873	23.41862106	1725.449829	0.010069811	27.95501583
1290	232.6624908	0.175746605	23.41390228	1738.002441	0.01014212	27.96257023
1333	232.6549835	0.12851283	23.40869141	1717.862305	0.010022181	28.00898865
1376	232.6670685	0.070258051	23.41699219	1708.885498	0.009971534	28.0376253
1419	232.6670837	0.018987121	23.4169941	1729.131714	0.010088324	28.05360376
1462	232.6642761	0.034682255	23.41504097	1718.401489	0.010024771	28.07426358
1505	232.6687775	0.060340453	23.41813278	1725.610229	0.010069007	28.08499009
1548	232.6600342	0.03361579	23.41210747	1733.824219	0.010116193	28.09200453
1591	232.6706848	0.040218107	23.41943169	1729.303955	0.010091517	28.11033997
1634	232.6629028	0.067403108	23.4140625	1729.152466	0.010090697	28.11630338
1677	232.6771851	0.238187835	23.42399216	1749.493164	0.010216899	28.00426637
1720	232.6761475	0.477492929	23.42334175	1791.724487	0.010466699	27.9319853
1763	232.6617126	0.636660755	23.413414	1780.620117	0.010401398	27.89997137
1806	232.6576843	0.740287125	23.41064262	1766.401367	0.01031956	27.89291713
1849	232.6710968	0.778643847	23.41991997	1785.214966	0.0104307	27.85348871
1892	232.6717987	0.816061616	23.42041206	1790.89978	0.010464879	27.8507929
1935	232.6611633	0.815584481	23.41308785	1793.699463	0.010482746	27.84660661
1978	232.6555023	0.85371238	23.4091816	1805.901123	0.010553349	27.84819668
2021	232.6616364	0.884231329	23.413414	1786.327637	0.010439226	27.83679515
2064	232.6538544	0.852294326	23.408041	1783.676758	0.010422871	27.85364124
2107	232.6444092	0.884919882	23.40152931	1767.562744	0.010328799	27.85618143
2150	232.6363831	0.900464058	23.39599609	1790.949463	0.010465932	27.86289793
2193	232.643219	0.898468316	23.40071487	1791.258057	0.010469792	27.84670343
2236	232.637558	0.919295847	23.39681053	1773.222534	0.01036243	27.85209242
2279	232.6257782	0.959287226	23.38867188	1801.490845	0.010528571	27.87861497
2322	232.6297913	0.944165707	23.39143944	1776.817261	0.010382647	27.87709627
2365	232.6359253	0.972254217	23.39566803	1776.970581	0.010385475	27.87150188
2408	232.6335754	0.993669033	23.39404297	1789.015869	0.010454199	27.88062908
2451	232.6241455	0.992715478	23.38753128	1780.889282	0.010406939	27.89436792
2494	232.6348419	1.010802031	23.3948555	1795.9646	0.010496176	27.9554549
2537	232.6446381	0.934242427	23.40152931	1775.065796	0.010371924	28.04705408
2580	232.6390839	0.780491829	23.39762116	1766.105957	0.01031656	28.14814432
2623	232.6453247	0.645705044	23.40185738	1760.216675	0.01027968	28.23215071
2666	232.6586151	0.509238839	23.41097069	1740.702148	0.01016399	28.29042853
2709	232.662262	0.411157966	23.41341209	1722.594238	0.010057567	28.36878784
2752	232.6642151	0.302041352	23.41471481	1728.631592	0.010091313	28.42845537
2795	232.6529388	0.275616378	23.40690231	1737.736572	0.010141796	28.48202099
2838	232.6492004	0.217331678	23.40429688	1735.453491	0.010127573	28.51605757

time	h refrigerant in	T refrigerant inlet	T Valve in	Capacity - refrigerant	refrigerant mass flow	T sat
2881	232.6499023	0.183172077	23.40478516	1722.670654	0.010053015	28.51412212
2924	232.6515808	0.166925192	23.40592384	1718.123291	0.010025411	28.53160191
2967	232.655365	0.163572565	23.40852928	1721.030151	0.010043574	28.53876783
3010	232.6615143	0.153580561	23.41276169	1726.289063	0.010074838	28.54193981
3053	232.6567993	0.167117104	23.40950584	1719.614014	0.010036347	28.55429029
3096	232.6683655	0.200712532	23.41748238	1722.199219	0.010051282	28.55042244
3139	232.6594238	0.164097279	23.41129684	1731.609497	0.010106592	28.57054452
3182	232.6568298	0.220463485	23.40950584	1731.227905	0.010103712	28.58053303
3225	232.6653442	0.217834562	23.41536522	1721.134644	0.010044254	28.58374554
3268	232.6495819	0.218448639	23.40462112	1757.987793	0.010263541	28.44173653
3311	232.6531677	0.647363126	23.40722656	1787.772217	0.010442086	28.27114717
3354	232.6402893	0.895167291	23.3984375	1790.248779	0.01045687	28.17060513
3397	232.6313019	1.017281532	23.39225388	1796.339478	0.010493658	28.14754082
3440	232.635025	1.093797445	23.39485741	1807.834229	0.010561932	28.10265704
3483	232.6286163	1.145982385	23.39046288	1816.053955	0.010610306	28.07642426
3526	232.6392212	1.178290606	23.39778709	1792.246704	0.010471265	28.06678221
3569	232.6335449	1.218345165	23.39388084	1800.599976	0.01052104	28.05370016
3612	232.6422577	1.249036789	23.39990425	1790.349365	0.010461917	28.03732432
3655	232.6318665	1.240276933	23.39274025	1810.81311	0.010581165	28.02744059
3698	232.6320801	1.218494177	23.39290428	1822.46167	0.010650897	28.01782963
3741	232.6289978	1.234110236	23.39078713	1823.930176	0.010658099	27.99981559
3784	232.6240234	1.243466139	23.38736916	1799.583618	0.010514774	27.99465077
3827	232.6134186	1.226529956	23.38004494	1812.582642	0.010592115	28.01192413
3870	232.5992432	1.223578811	23.37027931	1815.390381	0.01060773	28.00374294
3913	232.6176758	1.219092488	23.38297653	1819.565674	0.010633827	28.01743206
3956	232.6042023	1.228593707	23.37369919	1809.703735	0.010574138	28.00046481
3999	232.6167297	1.260133386	23.38232422	1803.586182	0.010540038	28.00898865
4042	232.6186066	1.235684037	23.38362503	1799.881836	0.01051715	28.00010511
4085	232.6370239	1.22583878	23.39632034	1796.895142	0.010502053	27.99921023
4128	232.6351624	1.242533207	23.39501762	1811.838379	0.010590458	28.02328134
4171	232.6452942	1.282539129	23.40201759	1815.187256	0.010610585	28.01124875
4214	232.6481171	1.217375159	23.40397072	1808.876465	0.010574058	28.00013435
4257	232.6547699	1.191257477	23.40852928	1821.072388	0.010646657	28.02409393
4300	232.6442108	1.193143725	23.40120506	1789.076294	0.010455643	28.07948992
4343	232.6542511	1.070933223	23.408041	1778.755859	0.01039423	28.18751228
4386	232.6685333	0.897423685	23.41780281	1765.240967	0.010314222	28.28830657
4429	232.6506653	0.791862607	23.40543556	1760.19751	0.010283011	28.35007232
4472	232.661377	0.632217824	23.4127636	1747.550171	0.010206715	28.42626998
4515	232.6628876	0.47985363	23.41373634	1755.213867	0.010250336	28.50947557
4558	232.6570587	0.394300044	23.40966797	1721.796875	0.010053177	28.56756519
4601	232.6506958	0.375437051	23.40527153	1723.516113	0.010061568	28.587706
4644	232.6509552	0.29927513	23.40543747	1731.696289	0.01010836	28.60062789
4687	232.6403503	0.281611592	23.39811134	1721.461792	0.010047577	28.61868779
4730	232.6472168	0.253307283	23.40283203	1717.970459	0.010026579	28.63926854
4773	232.6380157	0.24296844	23.39648628	1732.567749	0.010109891	28.64389083
4816	232.6399231	0.240063623	23.39778709	1721.716187	0.010047422	28.66407993
4859	232.6342621	0.225784317	23.39388084	1717.388916	0.010020211	28.67308566
4902	232.6344757	0.242012337	23.39404297	1740.159302	0.010154856	28.64859345
4945	232.6319122	0.271453321	23.39225388	1719.312134	0.010032234	28.66989363
4988	232.6224518	0.245614022	23.38574219	1738.37085	0.010141834	28.66682538
5031	232.6403809	0.302611887	23.39810944	1733.605713	0.01011543	28.64682497
5074	232.6356506	0.290417552	23.39485741	1730.445557	0.010097187	28.64931178
5117	232.6191864	0.320220709	23.38362694	1754.035645	0.010239065	28.49392398
5160	232.6267548	0.712117374	23.38899422	1772.944214	0.010353831	28.30344603
5203	232.6351013	0.953678966	23.39485741	1805.081909	0.010546389	28.16835253
5246	232.6301422	1.058534384	23.39143753	1804.509521	0.010544227	28.16805237
5289	232.6194305	1.148334742	23.38411522	1807.415894	0.01056091	28.10376885
5332	232.6333008	1.198732972	23.39371681	1805.529541	0.010551755	28.05064454
5375	232.6413422	1.218989134	23.39925003	1814.06665	0.010603317	28.0550614
5418	232.6557312	1.250136256	23.40917969	1828.431519	0.010688228	28.04208426
5461	232.6606598	1.269660711	23.41259766	1804.766235	0.010551542	28.01003539
5504	232.6575775	1.255813718	23.41048241	1801.167603	0.010529965	28.00489798
5547	232.6530762	1.237134457	23.40739059	1813.626465	0.010602445	27.99624765
5590	232.6558838	1.225552201	23.40934181	1790.72644	0.01046939	27.9770552
5633	232.6665344	1.216018438	23.41666603	1794.053101	0.010490399	27.98794093
5676	232.65802	1.231568694	23.41080856	1809.153564	0.010578521	27.98420829
5719	232.656601	1.240995765	23.40983009	1802.459351	0.010539197	27.98276021

time	h refrigerant in	T refrigerant inlet	T Valve in	Capacity - refrigerant	refrigerant mass flow	T sat
5762	232.6547089	1.223679781	23.40852928	1807.136597	0.010569162	27.9708667
5805	232.6714478	1.213376522	23.42008591	1795.935669	0.010503434	27.94813359
5848	232.6631775	1.213466644	23.41439056	1804.680176	0.010554262	27.94468771

time	T valve inlet	T subcooling	% diff capacity	HTF	dQ/dm_dot	dQ/dT_in	dQ/dT_out	U_Q	U_Q (%)
0	23.48111979	4.025581364	5.340%		1782.657373	899.3885864	-899.3885864	85.23135	5.067%
43	23.47461001	4.046226001	0.092%		1709.395683	901.481877	-901.481877	85.42874	4.859%
86	23.4656601	4.10898365	3.882%		1764.165104	896.0846142	-896.0846142	84.918	5.014%
129	23.46549479	4.087022621	1.442%		1729.509797	902.0896279	-902.0896279	85.4866	4.916%
172	23.45377668	4.103855653	2.106%		1748.11676	898.4701408	-898.4701408	85.14385	4.968%
215	23.45019531	4.127186227	1.353%		1732.707589	898.8002393	-898.8002393	85.17492	4.925%
258	23.4461263	4.135674325	1.698%		1726.201934	897.3869019	-897.3869019	85.0409	4.906%
301	23.4340833	4.132626459	1.873%		1734.00724	899.95029	-899.95029	85.28393	4.928%
344	23.42724482	4.171016164	0.067%		1711.796316	898.3806858	-898.3806858	85.13489	4.865%
387	23.43180148	4.146845649	0.574%		1705.07583	898.4038196	-898.4038196	85.13699	4.846%
430	23.42513021	4.153404816	1.502%		1719.755747	898.353877	-898.353877	85.13245	4.888%
473	23.42578125	4.187994135	1.408%		1731.391055	897.985181	-897.985181	85.09767	4.921%
516	23.41796939	4.171181728	1.602%		1723.668881	898.756842	-898.756842	85.17069	4.899%
559	23.41862106	4.163734133	2.220%		1735.350104	895.412051	-895.412051	84.85388	4.932%
602	23.41080856	4.190315677	1.722%		1723.956532	897.1371736	-897.1371736	85.01721	4.900%
645	23.41552798	4.181553449	1.007%		1713.841777	897.2074082	-897.2074082	85.02373	4.871%
688	23.40804164	4.214894997	-0.764%		1675.484156	898.981066	-898.981066	85.19131	4.762%
731	23.41227468	4.22874945	1.269%		1714.573416	895.0767187	-895.0767187	84.82183	4.873%
774	23.39550718	4.238589808	0.816%		1710.657298	896.863346	-896.863346	84.99108	4.862%
817	23.39859962	4.239634319	1.151%		1709.665713	897.4190456	-897.4190456	85.04373	4.859%
860	23.39925194	4.258698421	1.249%		1720.263224	900.3412132	-900.3412132	85.32079	4.890%
903	23.39844004	4.266210244	0.784%		1722.746452	899.4514618	-899.4514618	85.23651	4.896%
946	23.40299543	4.267314472	1.163%		1712.798997	894.7753453	-894.7753453	84.79324	4.868%
989	23.395998	4.298020897	1.396%		1717.46634	896.5473414	-896.5473414	84.96123	4.882%
1032	23.39860153	4.324062261	0.733%		1701.418947	897.9795743	-897.9795743	85.09674	4.836%
1075	23.40315819	4.321473289	0.234%		1706.275467	897.4150842	-897.4150842	85.04331	4.850%
1118	23.40673828	4.364361963	-0.003%		1713.824043	899.9331412	-899.9331412	85.28204	4.871%
1161	23.39794985	4.448906128	1.546%		1720.7746	897.3518549	-897.3518549	85.03751	4.891%
1204	23.40787888	4.48767602	-0.449%		1706.530126	894.7166271	-894.7166271	84.7876	4.850%
1247	23.4186217	4.536394134	0.370%		1745.482676	899.9645572	-899.9645572	85.28543	4.961%
1290	23.41390165	4.548668585	1.327%		1746.362495	898.225121	-898.225121	85.12061	4.963%
1333	23.40869141	4.600297247	1.210%		1764.204753	897.9510299	-897.9510299	85.09487	5.014%
1376	23.41699219	4.620633108	0.435%		1763.089083	899.7014228	-899.7014228	85.26073	5.011%
1419	23.41699346	4.636610305	1.270%		1753.405786	897.7648337	-897.7648337	85.07708	4.984%
1462	23.41504224	4.65922134	0.732%		1760.055892	900.4628627	-900.4628627	85.33285	5.002%
1505	23.41813342	4.666856674	0.433%		1748.430482	900.9910629	-900.9910629	85.38275	4.970%
1548	23.41210874	4.67989579	1.279%		1751.530413	899.1856259	-899.1856259	85.2117	4.978%
1591	23.41943169	4.690908279	0.950%		1748.917834	898.4819138	-898.4819138	85.14498	4.971%
1634	23.41406186	4.702241516	-0.044%		1729.198383	897.2000998	-897.2000998	85.02324	4.915%
1677	23.42399152	4.580274846	1.187%		1731.515792	897.7812138	-897.7812138	85.07834	4.921%
1720	23.42334175	4.508643551	2.312%		1716.204801	900.9709935	-900.9709935	85.38042	4.878%
1763	23.413414	4.48655737	1.799%		1718.7599	901.4133821	-901.4133821	85.42238	4.885%
1806	23.41064326	4.482273866	0.589%		1709.759787	900.508986	-900.508986	85.33655	4.860%
1849	23.41991997	4.43356874	3.420%		1728.773031	894.0108671	-894.0108671	84.72101	4.914%
1892	23.42041206	4.430380834	3.240%		1730.680204	899.5449137	-899.5449137	85.24547	4.919%
1935	23.41308848	4.433518134	2.111%		1703.089379	896.9421897	-896.9421897	84.99846	4.841%
1978	23.40918159	4.439015087	3.342%		1710.011778	895.3148876	-895.3148876	84.84434	4.861%
2021	23.41341337	4.423381781	1.584%		1701.681507	897.3253331	-897.3253331	85.03475	4.837%
2064	23.40804164	4.445599605	2.272%		1715.298278	896.8494621	-896.8494621	84.98983	4.876%
2107	23.40152995	4.454651486	2.442%		1739.51421	899.7307333	-899.7307333	85.2632	4.945%
2150	23.39599673	4.466901197	1.985%		1713.291899	902.0999718	-902.0999718	85.48737	4.870%
2193	23.40071551	4.445987918	1.194%		1691.944029	898.1933113	-898.1933113	85.11688	4.809%
2236	23.39681053	4.455281889	3.535%		1751.894902	898.8355846	-898.8355846	85.17853	4.980%
2279	23.38867188	4.489943093	4.274%		1735.582189	897.7373207	-897.7373207	85.07424	4.933%
2322	23.39144007	4.485656195	0.483%		1692.368522	897.6011615	-897.6011615	85.06077	4.810%
2365	23.39566867	4.475833217	1.693%		1718.023026	900.2033348	-900.2033348	85.3077	4.883%
2408	23.3940436	4.486585472	2.586%		1723.150122	900.7443084	-900.7443084	85.35903	4.898%
2451	23.38753192	4.506836001	1.759%		1714.020329	899.4690258	-899.4690258	85.23806	4.872%
2494	23.39485486	4.560600041	2.683%		1708.341093	895.5788914	-895.5788914	84.86933	4.856%
2537	23.40152995	4.645524135	1.977%		1720.006064	897.6655007	-897.6655007	85.06722	4.889%
2580	23.39762179	4.750522526	1.986%		1724.775335	895.507866	-895.507866	84.86282	4.902%
2623	23.40185674	4.830293969	1.585%		1733.846366	900.9014563	-900.9014563	85.37406	4.928%
2666	23.41097005	4.87945848	1.479%		1747.064226	898.6366846	-898.6366846	85.15962	4.966%
2709	23.41341146	4.955376379	0.751%		1750.267065	897.4886655	-897.4886655	85.05087	4.975%
2752	23.41471481	5.013740555	1.143%		1751.466494	897.6735465	-897.6735465	85.0684	4.978%
2795	23.40690168	5.075119308	4.167%		1799.397531	898.7156043	-898.7156043	85.16781	5.114%
2838	23.40429688	5.111760692	1.670%		1759.918155	900.7311343	-900.7311343	85.35827	5.002%

time	T valve inlet	T subcooling	% diff capacity	HTF	dQ/dm_dot	dQ/dT_in	dQ/dT_out	U_Q	U_Q (%)
2881	23.40478516	5.109336965	0.786%		1757.650875	900.9785653	-900.9785653	85.38169	4.996%
2924	23.40592321	5.125678705	2.996%		1795.850507	897.6472051	-897.6472051	85.06651	5.104%
2967	23.40852865	5.130239189	2.802%		1793.739273	899.9207709	-899.9207709	85.28194	5.098%
3010	23.41276169	5.129178124	3.027%		1790.528969	898.9826851	-898.9826851	85.193	5.089%
3053	23.40950521	5.144785077	2.301%		1782.259401	898.0578411	-898.0578411	85.10524	5.066%
3096	23.41748174	5.132940695	2.457%		1787.150705	900.4226417	-900.4226417	85.32941	5.079%
3139	23.41129684	5.159247678	1.515%		1759.071414	899.7191281	-899.7191281	85.26236	5.000%
3182	23.40950521	5.171027817	1.774%		1766.938849	901.171632	-901.171632	85.40011	5.022%
3225	23.41536522	5.168380322	2.237%		1779.993525	898.2428802	-898.2428802	85.12274	5.059%
3268	23.40462176	5.037114774	2.419%		1748.11904	899.3632313	-899.3632313	85.22848	4.968%
3311	23.40722656	4.863920604	4.487%		1753.172989	897.8137305	-897.8137305	85.08171	4.983%
3354	23.39843686	4.772168267	3.983%		1746.252363	900.2349034	-900.2349034	85.31106	4.963%
3397	23.39225324	4.755287585	2.638%		1710.256034	897.0785666	-897.0785666	85.01147	4.861%
3440	23.39485677	4.707800266	2.942%		1707.422613	898.5140023	-898.5140023	85.14747	4.853%
3483	23.39046351	4.685960747	4.595%		1725.369983	896.5558336	-896.5558336	84.96214	4.904%
3526	23.39778646	4.668995756	1.538%		1693.014566	896.0332864	-896.0332864	84.91219	4.812%
3569	23.39387957	4.659820589	1.258%		1689.967565	901.1503139	-901.1503139	85.39707	4.803%
3612	23.39990298	4.637421336	3.059%		1725.597157	898.2331389	-898.2331389	85.12109	4.904%
3655	23.39274025	4.634700344	4.271%		1720.115821	894.2768207	-894.2768207	84.7461	4.889%
3698	23.39290492	4.624924714	4.153%		1719.885556	901.0246789	-901.0246789	85.38555	4.888%
3741	23.39078649	4.609029101	4.674%		1723.813379	898.9122784	-898.9122784	85.18542	4.899%
3784	23.38736788	4.607282883	2.994%		1715.675624	898.2824766	-898.2824766	85.12563	4.876%
3827	23.38004494	4.631879195	2.239%		1695.996857	901.3555222	-901.3555222	85.41659	4.820%
3870	23.37027995	4.633462991	4.904%		1730.179588	895.8497022	-895.8497022	84.89528	4.918%
3913	23.38297653	4.634455524	4.616%		1728.161152	899.5788789	-899.5788789	85.24865	4.912%
3956	23.37369792	4.626766891	2.725%		1701.767857	898.4994022	-898.4994022	85.14601	4.837%
3999	23.38232485	4.626663799	3.577%		1717.048099	895.6123025	-895.6123025	84.87261	4.880%
4042	23.38362503	4.616480077	2.559%		1709.483099	899.2112526	-899.2112526	85.21357	4.859%
4085	23.39632034	4.602889885	3.586%		1727.458556	897.6010135	-897.6010135	85.06121	4.910%
4128	23.3950189	4.628262445	4.214%		1727.241717	899.055423	-899.055423	85.19904	4.909%
4171	23.40201632	4.609232432	3.703%		1716.830272	900.0644832	-900.0644832	85.29452	4.880%
4214	23.40396945	4.596164904	3.211%		1711.745802	898.8609201	-898.8609201	85.1804	4.865%
4257	23.40852801	4.615565918	2.434%		1683.331773	897.0854052	-897.0854052	85.01177	4.785%
4300	23.40120443	4.678285489	3.731%		1734.13124	895.8329674	-895.8329674	84.89375	4.929%
4343	23.40804164	4.779470646	2.438%		1726.601086	898.7254938	-898.7254938	85.16776	4.908%
4386	23.41780345	4.870503121	2.801%		1745.696221	898.4051302	-898.4051302	85.13766	4.962%
4429	23.40543556	4.944636754	1.990%		1737.591197	899.1311482	-899.1311482	85.20635	4.939%
4472	23.4127636	5.013506386	2.059%		1753.35009	900.1181549	-900.1181549	85.3001	4.984%
4515	23.41373634	5.09573923	2.073%		1746.487453	900.3987916	-900.3987916	85.3266	4.964%
4558	23.40966797	5.157897221	1.831%		1768.247032	896.452828	-896.452828	84.95295	5.026%
4601	23.40527217	5.18243383	1.813%		1776.553327	901.7218772	-901.7218772	85.45239	5.050%
4644	23.40543683	5.195191055	2.212%		1767.494255	897.7005689	-897.7005689	85.07118	5.024%
4687	23.39811134	5.220576446	0.638%		1756.32954	901.0204	-901.0204	85.38564	4.992%
4730	23.4028314	5.236437141	1.209%		1767.58662	899.7389327	-899.7389327	85.26435	5.024%
4773	23.39648628	5.247404548	3.135%		1785.646362	898.7826531	-898.7826531	85.17397	5.075%
4816	23.39778646	5.266293475	1.031%		1758.90084	898.8929866	-898.8929866	85.18407	4.999%
4859	23.39388021	5.279205454	2.449%		1786.424193	897.6036832	-897.6036832	85.06226	5.077%
4902	23.3940436	5.254549844	2.356%		1762.585891	898.211403	-898.211403	85.11952	5.009%
4945	23.39225324	5.277640387	0.595%		1753.829531	898.9695706	-898.9695706	85.19125	4.985%
4988	23.38574155	5.281083826	4.339%		1802.372497	898.8963926	-898.8963926	85.18498	5.123%
5031	23.39811007	5.248714901	2.499%		1775.878431	900.2339449	-900.2339449	85.31137	5.047%
5074	23.39485614	5.254455648	2.353%		1773.400075	898.6849311	-898.6849311	85.16454	5.040%
5117	23.38362694	5.110297038	4.475%		1788.87383	898.9161515	-898.9161515	85.18667	5.084%
5160	23.38899485	4.914451172	3.425%		1747.785356	897.5062383	-897.5062383	85.0525	4.967%
5203	23.39485614	4.773496395	2.922%		1707.03189	897.1268754	-897.1268754	85.01601	4.852%
5246	23.3914388	4.776613567	2.848%		1708.593381	898.3790077	-898.3790077	85.13469	4.856%
5289	23.38411522	4.719653628	2.308%		1698.975235	899.7349042	-899.7349042	85.26305	4.829%
5332	23.39371681	4.656927728	0.839%		1671.586815	897.6177535	-897.6177535	85.06207	4.751%
5375	23.39925003	4.655811368	0.967%		1669.102356	899.3746705	-899.3746705	85.22853	4.744%
5418	23.40918032	4.632903935	2.620%		1685.710264	900.2323778	-900.2323778	85.31002	4.791%
5461	23.41259829	4.597437096	1.373%		1679.756222	896.7870765	-896.7870765	84.98346	4.774%
5504	23.41048177	4.594416211	1.891%		1700.846854	901.4945349	-901.4945349	85.42983	4.834%
5547	23.40739059	4.588857056	4.200%		1727.832782	900.4326116	-900.4326116	85.32955	4.911%
5590	23.40934181	4.567713391	3.604%		1733.69682	897.6180055	-897.6180055	85.0629	4.928%
5633	23.4166673	4.57127363	1.948%		1709.726169	902.0976122	-902.0976122	85.4871	4.860%
5676	23.41080793	4.573400365	3.575%		1711.53669	895.5649098	-895.5649098	84.86805	4.865%
5719	23.40982946	4.572930749	4.157%		1734.935685	898.9923012	-898.9923012	85.19316	4.932%

time	T valve inlet	T subcooling	% diff capacity	HTF	dQ/dm_dot	dQ/dT_in	dQ/dT_out	U_Q	U_Q (%)
5762	23.40852992	4.562336786	3.632%		1716.444997	896.6104251	-896.6104251	84.96719	4.879%
5805	23.42008527	4.528048322	3.448%		1723.943239	896.684745	-896.684745	84.97434	4.900%
5848	23.41438993	4.530297785	4.293%		1734.901202	898.830769	-898.830769	85.17785	4.932%

time	refrigerant	dh_vap/dT	dh_vap/dP	U_h_vap	dh_liq/dT	U_h_liq	drho/dT	drho/dP	U_rho	rho
0		0.894195	-0.029211	0.059943	1.451567	0.097255	-0.074481	0.05453	-0.00499	14.40024
43		0.89363	-0.029176	0.059905	1.451526	0.097252	-0.074067	0.054482	-0.004962	14.34037
86		0.893786	-0.029186	0.059916	1.451465	0.097248	-0.074181	0.054495	-0.00497	14.35691
129		0.893576	-0.029173	0.059901	1.451467	0.097248	-0.074027	0.054477	-0.00496	14.33467
172		0.893673	-0.029179	0.059908	1.451397	0.097244	-0.074098	0.054486	-0.004965	14.34492
215		0.893472	-0.029166	0.059894	1.451373	0.097242	-0.073951	0.054469	-0.004955	14.3236
258		0.893866	-0.029191	0.059921	1.451348	0.09724	-0.07424	0.054502	-0.004974	14.36544
301		0.893659	-0.029178	0.059907	1.451279	0.097236	-0.074088	0.054484	-0.004964	14.34351
344		0.893681	-0.029179	0.059909	1.451233	0.097233	-0.074105	0.054486	-0.004965	14.34584
387		0.893936	-0.029195	0.059926	1.451263	0.097235	-0.074291	0.054508	-0.004978	14.37283
430		0.894452	-0.029227	0.05996	1.451224	0.097232	-0.07467	0.054551	-0.005003	14.42752
473		0.893918	-0.029194	0.059924	1.451222	0.097232	-0.074278	0.054506	-0.004977	14.3709
516		0.894119	-0.029206	0.059938	1.45118	0.097229	-0.074426	0.054523	-0.004987	14.39227
559		0.893938	-0.029195	0.059926	1.451185	0.097229	-0.074292	0.054508	-0.004978	14.373
602		0.894005	-0.029199	0.05993	1.451136	0.097226	-0.074342	0.054514	-0.004981	14.38014
645		0.894032	-0.029201	0.059932	1.451164	0.097228	-0.074362	0.054516	-0.004982	14.38305
688		0.894807	-0.029249	0.059984	1.451116	0.097225	-0.07493	0.054581	-0.00502	14.46502
731		0.894215	-0.029212	0.059944	1.451138	0.097226	-0.074496	0.054531	-0.004991	14.40234
774		0.894573	-0.029234	0.059968	1.45104	0.09722	-0.074759	0.054562	-0.005009	14.4403
817		0.894607	-0.029236	0.059971	1.451058	0.097221	-0.074784	0.054565	-0.005011	14.44389
860		0.894536	-0.029232	0.059966	1.451059	0.097221	-0.074731	0.054559	-0.005007	14.43635
903		0.894564	-0.029234	0.059968	1.451053	0.097221	-0.074752	0.054561	-0.005008	14.43935
946		0.894572	-0.029234	0.059968	1.451079	0.097222	-0.074758	0.054562	-0.005009	14.44013
989		0.894793	-0.029248	0.059983	1.451034	0.097219	-0.074921	0.05458	-0.00502	14.46359
1032		0.894575	-0.029234	0.059968	1.451045	0.09722	-0.07476	0.054562	-0.005009	14.44044
1075		0.894193	-0.029211	0.059943	1.451072	0.097222	-0.07448	0.05453	-0.00499	14.4001
1118		0.893836	-0.029189	0.059919	1.451086	0.097223	-0.074218	0.054499	-0.004973	14.36226
1161		0.893613	-0.029175	0.059904	1.451022	0.097218	-0.074054	0.05448	-0.004962	14.33855
1204		0.892568	-0.029111	0.059834	1.451073	0.097222	-0.073288	0.054392	-0.00491	14.22753
1247		0.892204	-0.029088	0.059809	1.451128	0.097226	-0.073022	0.054361	-0.004892	14.18882
1290		0.891985	-0.029075	0.059795	1.451099	0.097224	-0.072861	0.054343	-0.004882	14.16539
1333		0.891573	-0.029049	0.059767	1.451061	0.097221	-0.07256	0.054308	-0.004862	14.1215
1376		0.891882	-0.029068	0.059788	1.451105	0.097224	-0.072786	0.054334	-0.004877	14.15442
1419		0.891475	-0.029043	0.05976	1.451103	0.097224	-0.072488	0.0543	-0.004857	14.11096
1462		0.891215	-0.029027	0.059743	1.451088	0.097223	-0.072298	0.054278	-0.004844	14.08325
1505		0.8916	-0.029051	0.059769	1.451105	0.097224	-0.07258	0.05431	-0.004863	14.12436
1548		0.891645	-0.029054	0.059772	1.451068	0.097222	-0.072612	0.054314	-0.004865	14.12911
1591		0.891901	-0.029069	0.059789	1.451108	0.097224	-0.0728	0.054336	-0.004878	14.15649
1634		0.891883	-0.029068	0.059788	1.451076	0.097222	-0.072787	0.054334	-0.004877	14.15458
1677		0.893972	-0.029197	0.059928	1.451152	0.097227	-0.074318	0.054511	-0.004979	14.37663
1720		0.895106	-0.029267	0.060004	1.451159	0.097228	-0.07515	0.054607	-0.005035	14.49656
1763		0.895242	-0.029276	0.060013	1.451105	0.097224	-0.07525	0.054618	-0.005042	14.51101
1806		0.895562	-0.029295	0.060035	1.45109	0.097223	-0.075485	0.054645	-0.005057	14.54471
1849		0.895627	-0.029299	0.060039	1.451151	0.097227	-0.075533	0.054651	-0.005061	14.55162
1892		0.895881	-0.029315	0.060056	1.451154	0.097227	-0.075719	0.054672	-0.005073	14.57835
1935		0.896316	-0.029342	0.060085	1.451112	0.097224	-0.076039	0.054709	-0.005095	14.62414
1978		0.896243	-0.029337	0.06008	1.451088	0.097223	-0.075985	0.054703	-0.005091	14.61646
2021		0.896139	-0.029331	0.060073	1.451115	0.097225	-0.075909	0.054694	-0.005086	14.60549
2064		0.895914	-0.029317	0.060058	1.451081	0.097222	-0.075744	0.054675	-0.005075	14.58185
2107		0.89608	-0.029327	0.060069	1.451042	0.09722	-0.075865	0.054689	-0.005083	14.59929
2150		0.896284	-0.02934	0.060083	1.451008	0.097218	-0.076015	0.054706	-0.005093	14.62076
2193		0.896746	-0.029368	0.060114	1.451038	0.09722	-0.076355	0.054745	-0.005116	14.66934
2236		0.896328	-0.029342	0.060086	1.451014	0.097218	-0.076048	0.05471	-0.005095	14.62541
2279		0.896927	-0.029379	0.060126	1.450962	0.097214	-0.076488	0.05476	-0.005125	14.68834
2322		0.896187	-0.029334	0.060077	1.450979	0.097216	-0.075944	0.054698	-0.005088	14.6106
2365		0.896639	-0.029362	0.060107	1.451005	0.097217	-0.076276	0.054736	-0.005111	14.65807
2408		0.896336	-0.029343	0.060087	1.450994	0.097217	-0.076054	0.054711	-0.005096	14.62629
2451		0.89652	-0.029354	0.060099	1.450953	0.097214	-0.076189	0.054726	-0.005105	14.64556
2494		0.896695	-0.029365	0.060111	1.450987	0.097216	-0.076318	0.054741	-0.005113	14.664
2537		0.89584	-0.029312	0.060053	1.451012	0.097218	-0.075689	0.054669	-0.005071	14.57399
2580		0.894884	-0.029253	0.059989	1.450973	0.097215	-0.074987	0.054588	-0.005024	14.47314
2623		0.894194	-0.029211	0.059943	1.450985	0.097216	-0.074481	0.05453	-0.00499	14.4002
2666		0.893446	-0.029165	0.059893	1.45103	0.097219	-0.073932	0.054466	-0.004953	14.32089
2709		0.89322	-0.029151	0.059878	1.451032	0.097219	-0.073766	0.054447	-0.004942	14.29684
2752		0.892878	-0.02913	0.059855	1.451031	0.097219	-0.073516	0.054418	-0.004926	14.26052
2795		0.892367	-0.029098	0.05982	1.450976	0.097215	-0.073141	0.054375	-0.0049	14.20609
2838		0.892383	-0.029099	0.059821	1.450955	0.097214	-0.073153	0.054376	-0.004901	14.20787

time	refrigerant	dh_vap/dT	dh_vap/dP	U_h_vap	dh_liq/dT	U_h_liq	drho/dT	drho/dP	U_rho	rho
2881		0.892376	-0.029099	0.059821	1.450958	0.097214	-0.073148	0.054376	-0.004901	14.20709
2924		0.892212	-0.029089	0.05981	1.450962	0.097214	-0.073028	0.054362	-0.004893	14.18959
2967		0.892454	-0.029104	0.059826	1.450977	0.097215	-0.073205	0.054382	-0.004905	14.21535
3010		0.892267	-0.029092	0.059814	1.451001	0.097217	-0.073068	0.054367	-0.004896	14.19549
3053		0.89234	-0.029097	0.059819	1.45098	0.097216	-0.073122	0.054373	-0.004899	14.20326
3096		0.892146	-0.029085	0.059806	1.451028	0.097219	-0.072979	0.054356	-0.00489	14.18258
3139		0.892493	-0.029106	0.059829	1.450988	0.097216	-0.073233	0.054386	-0.004907	14.21952
3182		0.892459	-0.029104	0.059827	1.450976	0.097215	-0.073209	0.054383	-0.004905	14.21593
3225		0.89247	-0.029105	0.059827	1.45101	0.097218	-0.073216	0.054384	-0.004906	14.21707
3268		0.894222	-0.029213	0.059945	1.450969	0.097215	-0.074501	0.054532	-0.004992	14.40311
3311		0.895818	-0.029311	0.060052	1.451011	0.097218	-0.075673	0.054667	-0.00507	14.57173
3354		0.896438	-0.029349	0.060094	1.450975	0.097215	-0.076129	0.054719	-0.005101	14.63696
3397		0.897149	-0.029393	0.060141	1.450942	0.097213	-0.076651	0.054779	-0.005136	14.71164
3440		0.897451	-0.029412	0.060162	1.450964	0.097215	-0.076874	0.054805	-0.005151	14.74334
3483		0.89769	-0.029426	0.060178	1.450942	0.097213	-0.077049	0.054825	-0.005162	14.76833
3526		0.89747	-0.029413	0.060163	1.450987	0.097216	-0.076887	0.054806	-0.005151	14.7453
3569		0.897723	-0.029428	0.06018	1.450966	0.097215	-0.077073	0.054827	-0.005164	14.77179
3612		0.897754	-0.02943	0.060182	1.451004	0.097217	-0.077096	0.05483	-0.005165	14.77505
3655		0.897913	-0.02944	0.060192	1.450963	0.097215	-0.077213	0.054843	-0.005173	14.7917
3698		0.89844	-0.029472	0.060228	1.450966	0.097215	-0.077602	0.054888	-0.005199	14.84683
3741		0.897906	-0.02944	0.060192	1.450956	0.097214	-0.077208	0.054843	-0.005173	14.79096
3784		0.89763	-0.029423	0.060174	1.450936	0.097213	-0.077006	0.05482	-0.005159	14.76214
3827		0.898045	-0.029448	0.060201	1.45089	0.09721	-0.07731	0.054855	-0.00518	14.8055
3870		0.898046	-0.029448	0.060201	1.450834	0.097206	-0.077312	0.054855	-0.00518	14.80567
3913		0.898189	-0.029457	0.060211	1.450907	0.097211	-0.077417	0.054867	-0.005187	14.82065
3956		0.897798	-0.029433	0.060185	1.450855	0.097207	-0.077129	0.054834	-0.005168	14.77973
3999		0.897958	-0.029443	0.060196	1.450904	0.097211	-0.077247	0.054847	-0.005176	14.79645
4042		0.897652	-0.029424	0.060175	1.450914	0.097211	-0.077021	0.054821	-0.00516	14.76434
4085		0.897858	-0.029437	0.060189	1.450989	0.097216	-0.077173	0.054839	-0.005171	14.78596
4128		0.898222	-0.029459	0.060213	1.450977	0.097215	-0.077441	0.05487	-0.005189	14.82403
4171		0.898071	-0.02945	0.060203	1.451021	0.097218	-0.07733	0.054857	-0.005181	14.80827
4214		0.897988	-0.029445	0.060198	1.451034	0.097219	-0.077269	0.05485	-0.005177	14.7996
4257		0.898131	-0.029453	0.060207	1.451057	0.097221	-0.077374	0.054862	-0.005184	14.81449
4300		0.896997	-0.029384	0.060131	1.451005	0.097217	-0.07654	0.054766	-0.005128	14.69572
4343		0.896152	-0.029332	0.060074	1.451029	0.097219	-0.075918	0.054695	-0.005087	14.60687
4386		0.895263	-0.029277	0.060015	1.451071	0.097222	-0.075265	0.05462	-0.005043	14.51319
4429		0.894833	-0.02925	0.059986	1.450988	0.097216	-0.074949	0.054584	-0.005022	14.46775
4472		0.893802	-0.029187	0.059917	1.451019	0.097218	-0.074193	0.054497	-0.004971	14.35865
4515		0.893384	-0.029161	0.059889	1.451012	0.097218	-0.073887	0.054461	-0.00495	14.31434
4558		0.892941	-0.029134	0.059859	1.450979	0.097216	-0.073562	0.054424	-0.004929	14.26718
4601		0.892866	-0.029129	0.059854	1.45095	0.097214	-0.073507	0.054417	-0.004925	14.25924
4644		0.892702	-0.029119	0.059843	1.450948	0.097214	-0.073386	0.054403	-0.004917	14.24177
4687		0.892687	-0.029118	0.059842	1.450902	0.09721	-0.073376	0.054402	-0.004916	14.24024
4730		0.892614	-0.029113	0.059837	1.450927	0.097212	-0.073322	0.054396	-0.004913	14.23243
4773		0.892346	-0.029097	0.059819	1.450889	0.09721	-0.073126	0.054373	-0.004899	14.20386
4816		0.892498	-0.029106	0.059829	1.450893	0.09721	-0.073237	0.054386	-0.004907	14.22007
4859		0.892345	-0.029097	0.059819	1.450869	0.097208	-0.073125	0.054373	-0.004899	14.20378
4902		0.89296	-0.029135	0.05986	1.450873	0.097209	-0.073576	0.054425	-0.00493	14.26929
4945		0.89271	-0.029119	0.059843	1.450859	0.097208	-0.073393	0.054404	-0.004917	14.24264
4988		0.892596	-0.029112	0.059836	1.450821	0.097205	-0.073309	0.054395	-0.004912	14.23057
5031		0.892845	-0.029128	0.059852	1.450898	0.09721	-0.073491	0.054416	-0.004924	14.25697
5074		0.892999	-0.029137	0.059863	1.450878	0.097209	-0.073605	0.054429	-0.004932	14.27342
5117		0.894717	-0.029243	0.059978	1.450836	0.097206	-0.074864	0.054574	-0.005016	14.4555
5160		0.896073	-0.029327	0.060069	1.450898	0.09721	-0.07586	0.054688	-0.005083	14.59858
5203		0.897442	-0.029411	0.060161	1.450954	0.097214	-0.076867	0.054804	-0.00515	14.74234
5246		0.897608	-0.029421	0.060172	1.450934	0.097213	-0.076989	0.054818	-0.005158	14.75982
5289		0.897622	-0.029422	0.060173	1.4509	0.09721	-0.077	0.054819	-0.005159	14.76127
5332		0.897915	-0.02944	0.060193	1.450965	0.097215	-0.077215	0.054844	-0.005173	14.79189
5375		0.897975	-0.029444	0.060197	1.450997	0.097217	-0.077259	0.054849	-0.005176	14.79819
5418		0.898084	-0.029451	0.060204	1.451058	0.097221	-0.07734	0.054858	-0.005182	14.80963
5461		0.898316	-0.029465	0.06022	1.451083	0.097223	-0.07751	0.054877	-0.005193	14.83386
5504		0.898014	-0.029446	0.060199	1.451072	0.097222	-0.077288	0.054852	-0.005178	14.80227
5547		0.897733	-0.029429	0.06018	1.451055	0.097221	-0.077081	0.054828	-0.005164	14.77288
5590		0.897802	-0.029433	0.060185	1.451069	0.097222	-0.077132	0.054834	-0.005168	14.78011
5633		0.89787	-0.029437	0.06019	1.451111	0.097224	-0.077182	0.05484	-0.005171	14.78722
5676		0.897805	-0.029433	0.060185	1.451077	0.097222	-0.077134	0.054834	-0.005168	14.78039
5719		0.897685	-0.029426	0.060177	1.451071	0.097222	-0.077046	0.054824	-0.005162	14.76789

time	refrigerant	dh_vap/dT	dh_vap/dP	U_h_vap	dh_liq/dT	U_h_liq	drho/dT	drho/dP	U_rho	rho
5762		0.898293	-0.029463	0.060218	1.451065	0.097221	-0.077493	0.054876	-0.005192	14.83143
5805		0.897814	-0.029434	0.060186	1.451137	0.097226	-0.077141	0.054835	-0.005168	14.78133
5848		0.897659	-0.029424	0.060175	1.451104	0.097224	-0.077027	0.054822	-0.005161	14.76513

time	U_Q	U (%)
0	56.51739	3.180%
43	56.28947	3.198%
86	56.35806	3.199%
129	56.27179	3.189%
172	56.31454	3.217%
215	56.23566	3.207%
258	56.39655	3.198%
301	56.31456	3.193%
344	56.32717	3.217%
387	56.43071	3.194%
430	56.64146	3.203%
473	56.42316	3.217%
516	56.50734	3.198%
559	56.43217	3.207%
602	56.46132	3.198%
645	56.47219	3.203%
688	56.78788	3.199%
731	56.54615	3.207%
774	56.696	3.217%
817	56.70919	3.203%
860	56.67862	3.208%
903	56.6907	3.231%
946	56.69232	3.217%
989	56.78351	3.217%
1032	56.69287	3.198%
1075	56.53653	3.217%
1118	56.38952	3.221%
1161	56.30098	3.188%
1204	55.87073	3.211%
1247	55.71962	3.229%
1290	55.6302	3.201%
1333	55.46451	3.229%
1376	55.58899	3.253%
1419	55.42202	3.205%
1462	55.31581	3.219%
1505	55.47125	3.215%
1548	55.49197	3.201%
1591	55.59483	3.215%
1634	55.58712	3.215%
1677	56.43843	3.226%
1720	56.90063	3.176%
1763	56.95852	3.199%
1806	57.08743	3.232%
1849	57.11118	3.199%
1892	57.21347	3.195%
1935	57.38903	3.199%
1978	57.3608	3.176%
2021	57.31705	3.209%
2064	57.22666	3.208%
2107	57.29483	3.241%
2150	57.37781	3.204%
2193	57.56281	3.214%
2236	57.39581	3.237%
2279	57.64017	3.200%
2322	57.33985	3.227%
2365	57.52081	3.237%
2408	57.4007	3.209%
2451	57.47569	3.227%
2494	57.54492	3.204%
2537	57.19753	3.222%
2580	56.81001	3.217%
2623	56.53052	3.212%
2666	56.22396	3.230%
2709	56.13145	3.259%
2752	55.99304	3.239%
2795	55.78666	3.210%
2838	55.79613	3.215%

time	U_Q	U (%)
2881	55.79295	3.239%
2924	55.72718	3.243%
2967	55.82503	3.244%
3010	55.74544	3.229%
3053	55.77468	3.243%
3096	55.69386	3.234%
3139	55.83788	3.225%
3182	55.82557	3.225%
3225	55.83158	3.244%
3268	56.55055	3.217%
3311	57.19983	3.200%
3354	57.45503	3.209%
3397	57.74481	3.215%
3440	57.86619	3.201%
3483	57.96328	3.192%
3526	57.87274	3.229%
3569	57.97406	3.220%
3612	57.98471	3.239%
3655	58.05096	3.206%
3698	58.26278	3.197%
3741	58.04727	3.183%
3784	57.93708	3.219%
3827	58.10344	3.206%
3870	58.10629	3.201%
3913	58.16044	3.196%
3956	58.00547	3.205%
3999	58.06658	3.220%
4042	57.94399	3.219%
4085	58.02233	3.229%
4128	58.16876	3.210%
4171	58.10542	3.201%
4214	58.07042	3.210%
4257	58.12528	3.192%
4300	57.67015	3.223%
4343	57.32454	3.223%
4386	56.95973	3.227%
4429	56.78618	3.226%
4472	56.36462	3.225%
4515	56.1938	3.202%
4558	56.01426	3.253%
4601	55.98767	3.248%
4644	55.92174	3.229%
4687	55.91862	3.248%
4730	55.88968	3.253%
4773	55.78268	3.220%
4816	55.84399	3.244%
4859	55.78547	3.248%
4902	56.03781	3.220%
4945	55.93587	3.253%
4988	55.89287	3.215%
5031	55.99272	3.230%
5074	56.05676	3.239%
5117	56.76015	3.236%
5160	57.3098	3.232%
5203	57.86076	3.205%
5246	57.92615	3.210%
5289	57.93266	3.205%
5332	58.04767	3.215%
5375	58.06782	3.201%
5418	58.11013	3.178%
5461	58.20067	3.225%
5504	58.0782	3.224%
5547	57.96386	3.196%
5590	57.98995	3.238%
5633	58.01357	3.234%
5676	57.98723	3.205%
5719	57.93868	3.214%

time	U_Q	U (%)
5762	58.18078	3.220%
5805	57.98486	3.229%
5848	57.92216	3.210%

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