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**A Generalized Pressure Drop Correlation for
Evaporation and Condensation of Alternative
Refrigerants in Smooth and Micro-fin Tubes**

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Abstract

This paper presents a pressure drop correlation for evaporation and condensation in smooth and micro-fin tubes. The correlation was developed from a database consisting of the following pure and mixed refrigerants: R125, R134a, R32, R410A (R32/R125 50/50 % mass), R22, R407C (R32/R125/R134a, 23/25/52 % mass) and R32/R134a (25/75 % mass). The new correlation was obtained by replacing the friction factor and the tube-diameter in the Bo Pierre correlation with a friction factor derived from pressure drop data for a micro-fin tube and the hydraulic diameter, respectively. The new correlation predicted the measured micro-fin data with an average residual of 10.8 %, and it also predicted the pressure drop in smooth tube with an average residual of 15.0 %. In addition, the correlation was used to predict¹ pressure drop data for refrigerant/lubricant mixtures by using a viscosity-mixing rule. As a result, the new correlation predicted the measured evaporation and condensation pressure drop data for mixtures of various lubricants with R12, R22, and R134a with an average residual of 19.0 %.

Keyword: alternative refrigerants, correlation, friction factor, heat transfer, hydraulic diameter, micro-fin tube, pressure drop, smooth tube, two-phase flow

¹ Certain trade names and company products are mentioned in the text or identified in an illustration in order to adequately specify the experimental procedure and equipment used. In no case does such an identification imply recommendation or endorsement by the National Institute of Standards and Technology, nor does it imply that the products are necessarily the best available for the purpose.

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NOMENCLATURE

English Symbols

A	area (mm^2) or force due to acceleration (N)
A_c	cross sectional flow area (mm^2)
A_w	cross sectional tube wall area per fin (mm^2)
C	constant
D	diameter (mm)
D_e	equivalent diameter of micro-fin tube (mm)
D_h	hydraulic diameter of micro-fin tube (mm)
D_o	outside diameter (mm)
D_r	maximum inside diameter of micro-fin tube (mm)
e	fin height (mm)
F	force due to pressure (N)
f	friction factor
G	mass flux ($\text{kg}/\text{m}^2\text{s}$)
g	acceleration due to gravity (m/s^2)
h	enthalpy (kJ/kg)
j	volumetric flux (m/s)
L	tube length (m)
m	mass flow rate (m/s)
N	number of micro fins
n	exponent in Chishom two-phase frictional multiplier
P	pressure (Pa)
ΔP	pressure drop (Pa)
p	fin pitch : (mm)
Q	volumetric flow rate (m^3/s)
r	radius (mm)
S_p	perimeter of one fin and channel taken perpendicular to the axis of the fin (mm)
T	temperature
t_w	tube wall thickness at root of fin (mm)
U, u	x -component velocity (m/s)
V, v	y -component velocity (m/s)
V_{fs}	volume of free space per unit length
W	molecular mass
w	mass fraction
x	mass vapor quality
z	length component

Greek symbols

α	fin angle (degree), or void fraction
β	helix angle (degree)
ϕ	two-phase frictional multiplier
λ	constant
μ	viscosity (N/ms)

ν specific volume (m^3/kg)
 π 3.141592
 ρ density (kg/m^3)
 τ wall shear stress (N/m^2)
 ω mass fraction
 ξ Yokozeki's factor
 Ψ mole fraction

Subscripts

B Blausius
 BP Bo Pierre
 C Collier and Thome
 c critical
 f friction or liquid
 fo total flow assumed liquid
 fg between liquid and vapor
 g vapor
 h hydraulic
 I component
 in inlet
 lo liquid phase only flowing
 m mixture
 o lubricant
 out outlet
 r reduced
 ref refrigerant
 to two-phase in Jung-Radermacher correlation
 tot total
 TP, tp two-phase
 w wetted

Nondimensional numbers

$$K_f = \frac{\Delta x h_{fg}}{L}; \quad \text{two-phase number}$$

$$\text{Re} = \frac{GD}{\mu}; \quad \text{Reynolds number}$$

$$X_{tt} = \left(\frac{1-x}{x} \right)^{0.9} \left(\frac{\mu_g}{\mu_f} \right)^{0.1} \left(\frac{v_f}{v_g} \right)^{0.5}; \quad \text{Lockhart-Martinelli parameter}$$

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INTRODUCTION

For approximately 50 years, automobile and residential air-conditioners have used smooth tubes and refrigerants R12, and R22 with a small fraction of lubricant in the refrigerant. Consequently, the smooth tube pressure drop has been studied extensively for R12 and R22. Today, due in part to government efficiency requirements and in part to competition, approximately 50 % of new evaporators and condensers in residential air-conditioning equipment employ enhanced micro-fin tubes rather than smooth tubes. Further changes in the air-conditioning industry have been imposed by the ozone crisis, which has led to the introduction of alternative refrigerants to replace R12 and R22. For these reasons, a correlation to predict the pressure drop for alternative refrigerants and refrigerant/lubricant mixtures in smooth and micro-fin tubes is required to design modern heat exchangers.

In the ten years since the identification of the ozone crisis, few publications on pressure drop are available for micro-fin tubes with alternative refrigerants. Most of the available pressure drop data for alternative refrigerants is for R134a. For example, Koops (1992) provides experimental data for the R134a condensation pressure drop in a micro-fin tube. His data showed that the pressure drop for R134a was greater than that for R12. Eckels and Pate (1991) and Fukushima and Kudou (1990) found that R134a/lubricant mixtures exhibited a greater evaporation and condensation pressure drop than pure R134a. Torikoshi and Kawabata (1992) confirmed the increase in evaporation pressure drop with the addition of lubricant; however, they found that lubricant had no significant effect on the condensation pressure drop.

The quest for the development of a model to predict two-phase pressure drop of refrigerant mixtures has been met with limited success. Signal et al. (1983) used the Martinelli-Nelson (1948) correlation to predict the pressure drop during forced convection boiling of pure R12 and four different mixtures of R13 and R12. Signal et al. (1983) developed a pressure drop model for pure fluids and a pressure drop model for mixtures where the maximum percent deviation between the model and the measured pressure drop was within ± 30 %. Jung and Radermacher (1989) measured the pressure drop during horizontal flow boiling of pure R22, R114, R12, and R152a and several mixtures of these refrigerants. They correlated their pressure drop

measurements to an average residual of 8.4% by applying a simple thermodynamic corresponding states principle.

Models to predict two-phase pressure drop of refrigerant/lubricant mixtures with similar limited success have been developed. Tichy et al. (1986) presented an experimental investigation of pressure drop in forced-convection condensation and evaporation of R12/lubricant mixtures. For condensation, Tichy et al. (1986) modified the Lockhart-Martinelli (1949) relation for frictional pressure drop and a homogeneous void fraction model. For evaporation, Tichy et al. (1986) modified the Dukler II (1964) frictional pressure-drop correlation and the homogeneous void fraction model. Overall, the evaporation and condensation models predicted 85 % of the data to within ± 25 %. Tichy et al. (1986) found that, because of a change in liquid properties as compared to the pure fluid, the presence of lubricant increased the pressure drop for condensation and evaporation. The effect of lubricant on the pressure drop was significantly more pronounced for evaporation than it was for condensation. Tichy et al. (1986) also argued that the lubricant encouraged additional wall wetting, which acted to increase the pressure drop.

Presently, the literature does not provide the heat exchanger designer with a satisfactory pressure drop correlation for evaporation and condensation within smooth and micro-fin tubes with alternative refrigerants with and without lubricants. This paper presents a pressure drop correlation for all of these conditions. In an effort to meet this need, the correlation was developed from a database consisting of the following pure and mixed refrigerants: R125, R134a, R32, R410A (R32/125 50/50 % mass), R22, R407C (R32/125/134a, 23/25/52 % mass) and R32/134a (25/75 % mass). Mixtures of R12, R22, and R134a with various lubricants were also correlated with the new pressure drop model.

EXPERIMENTS

Figure 1 shows a schematic of the experimental apparatus used to establish and measure heat transfer and pressure drop in a micro-fin tube. The local convective boiling heat-transfer coefficients were reported in Kaul et al. (1996). Kedzierski and Goncalves (1999) reported the local condensation heat-transfer coefficients and pressure drops. The condensation and

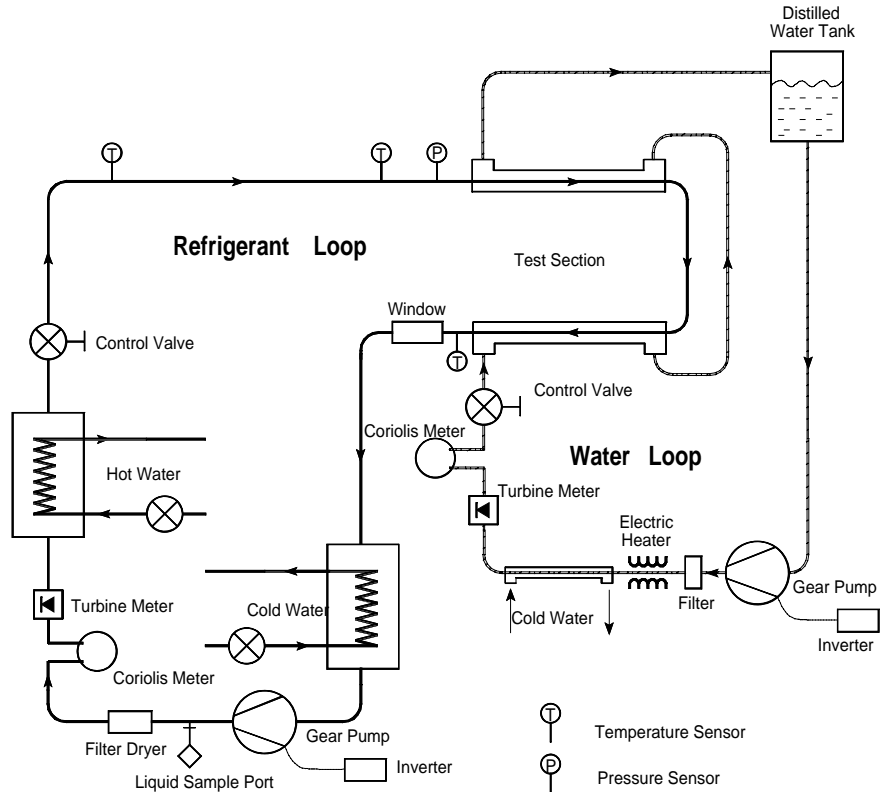


Figure 1. Schematic diagram of experimental apparatus

the evaporative pressure drops from these studies are given in Appendix A and Appendix B, respectively. The refrigerant flow rate, pressure, and single phase state were fixed at the inlet to the test section. The water flow rate and the inlet temperature were fixed to establish the overall refrigerant quality change in the test section. The differential pressure drop was measured over four elements of the test section. Only the two center test section elements were used to develop the pressure drop correlation. This was done to ensure that only saturated two-phase pressure drop data was analyzed. The test section consisted of a pair of 3.34 m long, horizontal tubes connected by a U-bend. A subcooler before the pump and an evaporator after the pump balanced the heat load of the refrigerant side and maintained a fixed test pressure. A magnetically coupled gear pump delivered the test refrigerant to the entrance of the test section as superheated vapor or subcooled liquid for condensation and evaporation tests, respectively. Another magnetically coupled gear pump was used to maintain the water flow rate. The temperature of the water loop was maintained with a water-chilled heat exchanger and variable electric heaters. The refrigerant

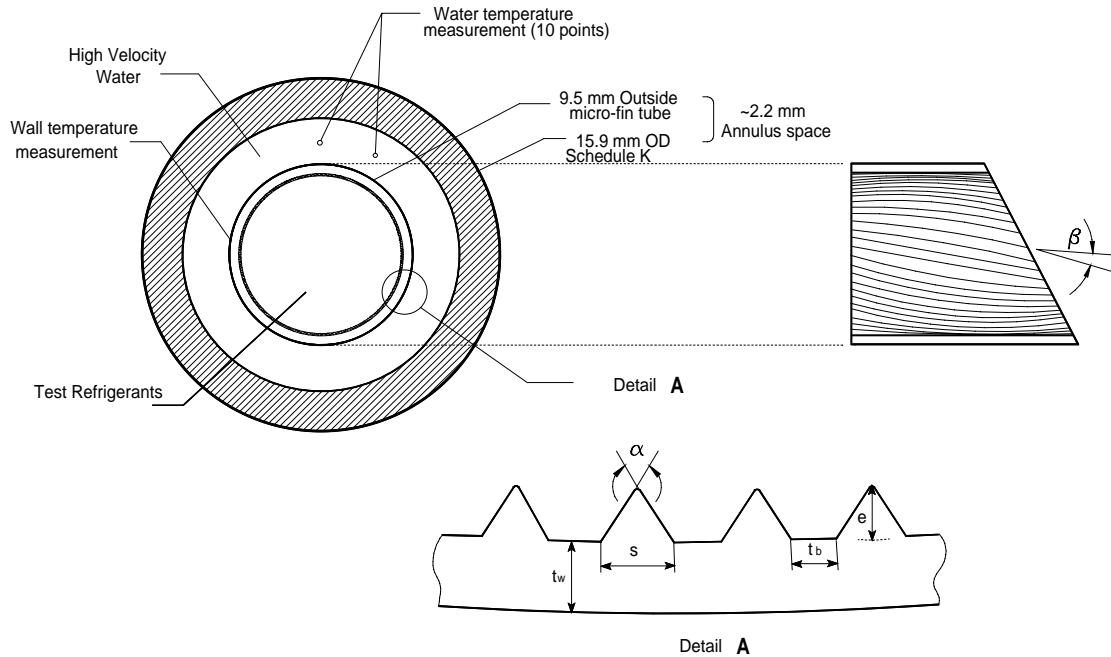


Figure 2. Cross-section of test section.

and water flow rates were controlled by varying the pump speeds with frequency inverters. Redundant flow rate measurements were made with Coriolis flowmeters and turbine flowmeters for both the refrigerant and water sides.

The standard uncertainty is the positive square root of the estimated variance. The individual standard uncertainties are combined to obtain the combined standard uncertainty by the law of propagation of uncertainty. The standard uncertainty becomes an expanded uncertainty when it is multiplied by a coverage factor to correspond to a particular confidence interval. All of the measurement uncertainties reported in this document are expanded uncertainties for a 95 % confidence interval.

Figure 2 shows a cross section of the test section. Table 1 gives the geometric parameters of the copper Turbo-A micro-fin tube that was used in this study. The test refrigerant flowed inside the micro-fin tube while distilled water flowed in the annulus that surrounded the micro-fin tube either in counterflow or in parallel flow to the refrigerant. The annulus gap was 2.2 mm, and the micro-fin tube wall thickness was 0.3 mm. The micro-fin tube had sixty 0.2 mm high fins with

Table 1. Geometric parameters of Turbo-A micro-fin tube.

Parameters	Dimension
D_o	9.52 mm
t_w	0.3 mm
D_r	8.92 mm
A_c	60.8 mm ²
e	0.2 mm
P	0.47 mm
β	18°
α	50°
N	60
S_p	0.707 mm
D_h	5.45 mm
Distance between pressure taps	1.587 m, 1.588 m

18 ° helix angle. For this geometry, the cross sectional flow area (A_c) was 60.8 mm² giving an equivalent smooth diameter (D_e) of 8.8 mm. The root diameter of the micro-fin tube was 8.91 mm. The inside-surface area per axial length of the tube was estimated to be 44.6 mm. The hydraulic diameter (D_h) of the micro-fin tube was estimated from Eq. (1) (see p. 13) to be 5.45 mm. The ratio of the inner surface area of the micro-fin tube to the surface area of a smooth tube of the same D_e is 1.6. The fins rifle down the axis of the tube at a helix angle of 18 ° with respect to the tube axis.

Figure 3 provides a detailed description of the test section. The annulus was constructed by connecting a series of tubes with 14 pairs of stainless steel flanges. This construction permitted the measurement of both the outer micro-fin wall temperature and the water temperature change as discussed in the following two paragraphs.

As shown in Figure 3, six refrigerant pressure taps along the test section allowed the measurement of the upstream absolute pressure and five pressure drops along the test section. Two sets of two water pressure taps were used to measure the water pressure drop along each tube. Differential pressure transducers with an expanded uncertainty of 1 % of the measurement were used to measure the pressure drops. Also, a sheathed thermocouple measured the refrigerant temperature at each end of the two refrigerant tubes with the junction of each located

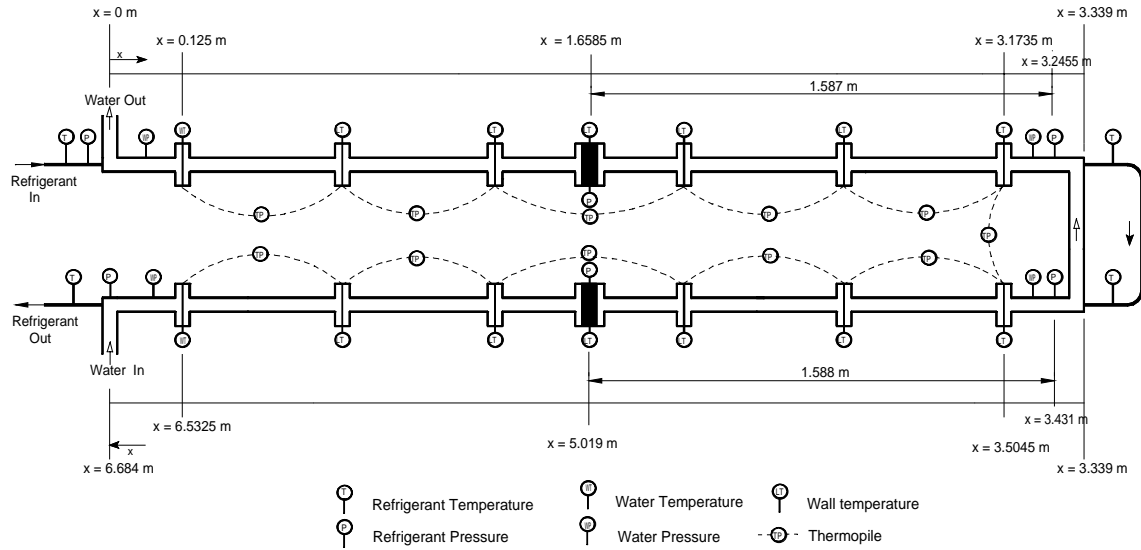


Figure 3. Detail schematic of test section.

at the center radially. Only the thermocouple at the inlet of the first tube was used in the calculations. The entire test section was wrapped with 5 cm of foam insulation to minimize heat transfer between the water and the ambient. The pressure drops used in this paper were measured between $x = 1.6585$ m and $x = 3.2456$ m, and between $x = 3.4310$ m and $x = 5.0190$ m, which the tube lengths are 1.5870 m, and 1.5880 m, respectively. The thermodynamic quality was calculated with an energy balance to an expanded uncertainty of ± 8 %.

Table 2 shows the test conditions. More than 800 pressure drop measurements were taken for various mass fluxes and various pressures. The mass flux was varied from $88 \text{ kg/m}^2\text{s}$ to $469 \text{ kg/m}^2\text{s}$ and from $306 \text{ kg/m}^2\text{s}$ to $367 \text{ kg/m}^2\text{s}$ for the condensation and the evaporation data, respectively. The expanded uncertainty of the mass flux measurement was ± 2 %. The absolute pressure was varied from 1.1 MPa to 2.0 MPa and from 0.36 MPa to 0.95 MPa for the condensation and for the evaporation data, respectively. The expanded uncertainty in the absolute pressure measurement was ± 1.5 % of the measurement. The inlet quality was varied from 100 % to 16.3 %, and the outlet quality was varied from 87.3 % to 6.4 % for condensation. The inlet quality was varied from 2.9 % to 48.5 %, and the outlet quality was varied from 9.2 % to 63.9 % for evaporation.

Table 2. Summary of test conditions.

		Mass Flux (kg/m ² s)	Pressure (MPa)	Quality at inlet (%)	Quality at outlet (%)
Condensation	R32	88 – 335	2.0	19.1–100	8.6–83.4
	R125	194–468	1.7	21.4–100	10.0–87.3
	R410A	138–468	1.9	16.3–100	6.4–86.0
	R134a	120–469	1.1	19.0–100	8.8–83.9
Evaporation	R32	312–364	0.95	2.9–38.4	9.2–51.6
	R125	316–367	0.78	3.7–47.9	12.9–60.5
	R410A	313–364	0.92	2.9–36.7	9.5–51.7
	R134a	306–364	0.36	3.4–16.3	36.2–50.4
	R22	311–370	0.59	3.6–41.7	11.7–59.1
	R407C	311–370	0.61	6.7–48.5	16.8–63.9
	R32/R134a	310–364	0.55	5.4–38.0	13.4–52.0

REFRIGERANT PROPERTY EVALUATION

All of the thermodynamic and transport properties for both pure and mixed refrigerants that were used in the data analysis and pressure drop predictions were calculated using property routines from REFPROP 4.01 (Gallagher, 1993). The thermodynamic mixture properties were calculated with the Extended Corresponding States (ECS). The high accuracy Modified Benedict-Webb-Rubin (MBWR) equation of state was selected for pure fluids, R32, R125, and R134a.

COMPARISON OF DATA TO EXISTING CORRELATIONS

A total of 831 data points from the NIST test apparatus were analyzed in the present study: 205 for condensation and 626 for evaporation. These measurements were compared to two homogeneous models and two separated models. The homogeneous model, also known as ‘the friction factor’ or ‘fog flow’ model, considers the two phases to flow as a single phase possessing mean fluid properties. The separated flow model considers the phases to be segregated into a liquid and a vapor stream. The above models were developed from smooth tube data. In the above correlations, the hydraulic diameter of the micro-fin tube was used in lieu of the smooth tube diameter.

In the present analysis, the hydraulic diameter (D_h) was used to correlate the pressure drop data. Kedzierski and Goncalves (1999) recommend that the hydraulic diameter for micro-fin tubes be calculated as:

$$D_h = \frac{4A_c \cos\beta}{NS_p} \quad (1)$$

where S_p is the perimeter of one fin and channel taken perpendicular to the axis of the fin, N is the number of fins, A_c is the cross-sectional flow area, $A_c = \frac{\pi D_o^2}{4} - NA_f$, and β is the helix angle of the fin. Figure 4 illustrates the various fin parameters that were used in the calculation of D_h .

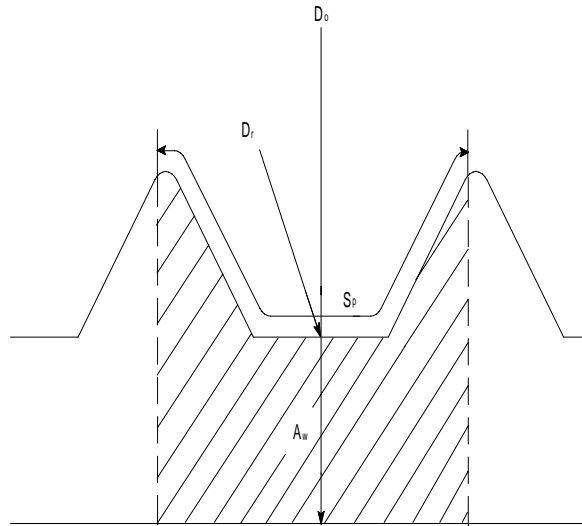


Figure 4. Detail cross section of micro-fin tube.

Homogenous Flow Models

In 1964, Bo Pierre published a paper on the prediction of the evaporation pressure drop for R12 and R12/lubricant mixtures in 12 mm and 18 mm diameter, horizontal, smooth tubes. Although many pressure drop correlations have been developed since 1964, the Bo Pierre (1964) correlation remains appealing because of its simplicity and validity:

$$\Delta P_{BP} = \left[f_{BP} + \frac{(x_{out} - x_{in})D}{\bar{x} L} \right] \frac{G^2 \bar{x} v_g L}{D} \quad (2)$$

where \bar{x} is the linearly averaged thermodynamic quality over the length (L). The specific volume of the vapor (v_g), the mass velocity (G), and the properties for the two-phase friction factor (f_{BP}) are evaluated at the linear-average refrigerant temperature. The two-phase friction factor for pure refrigerant, valid for $(Re/K_f) > 1$, is given as:

$$f_{BP} = 0.0185 \left(\frac{K_f}{Re} \right)^{0.25} \quad (3)$$

where Pierre's boiling number is defined as: $K_f = \frac{\Delta x h_{fg}}{Lg}$

Pierre's friction factor for the case where lubricant is present is given in the following equation which is valid for $(Re/K_f) > 2$:

$$f_{BP} = 0.053 \left(\frac{K_f}{Re} \right)^{0.25} \quad (4)$$

Figure 5 compares both condensation and evaporation pressure drop data to the predictions obtained from Eq. (2). Overall, the Bo Pierre correlation predicted the measured data with an average residual of 15.8 %. However, a few of the low pressure drop data were underpredicted by 50 % to 60 %. The ability of the Pierre (1964) pressure drop correlation to predict the condensation pressure drop data is adequate considering that it was developed with only evaporation pressure drop data.

The homogeneous pressure drop model as given by Collier and Thome (1994) is:

$$\Delta P_C = \left(\frac{2f_B G^2 v_f L}{D} \right) \cdot \left[1 + \bar{x} \left(\frac{v_{fg}}{v_f} \right) \right] \cdot \left[1 + \bar{x} \left(\frac{\mu_{fg}}{\mu_g} \right) \right]^{-1/4} + G^2 v_f \left(\frac{v_{fg}}{v_g} \right) (x_o - x_i) \quad (5)$$

In this model the two-phase frictional pressure drop is expressed in terms of the single phase pressure drop for the total flow considered as liquid. The two-phase friction factor is calculated from the Blasius (1913) equation:

$$f_B = \frac{0.079}{Re_{fo}^{0.25}} \quad (6)$$

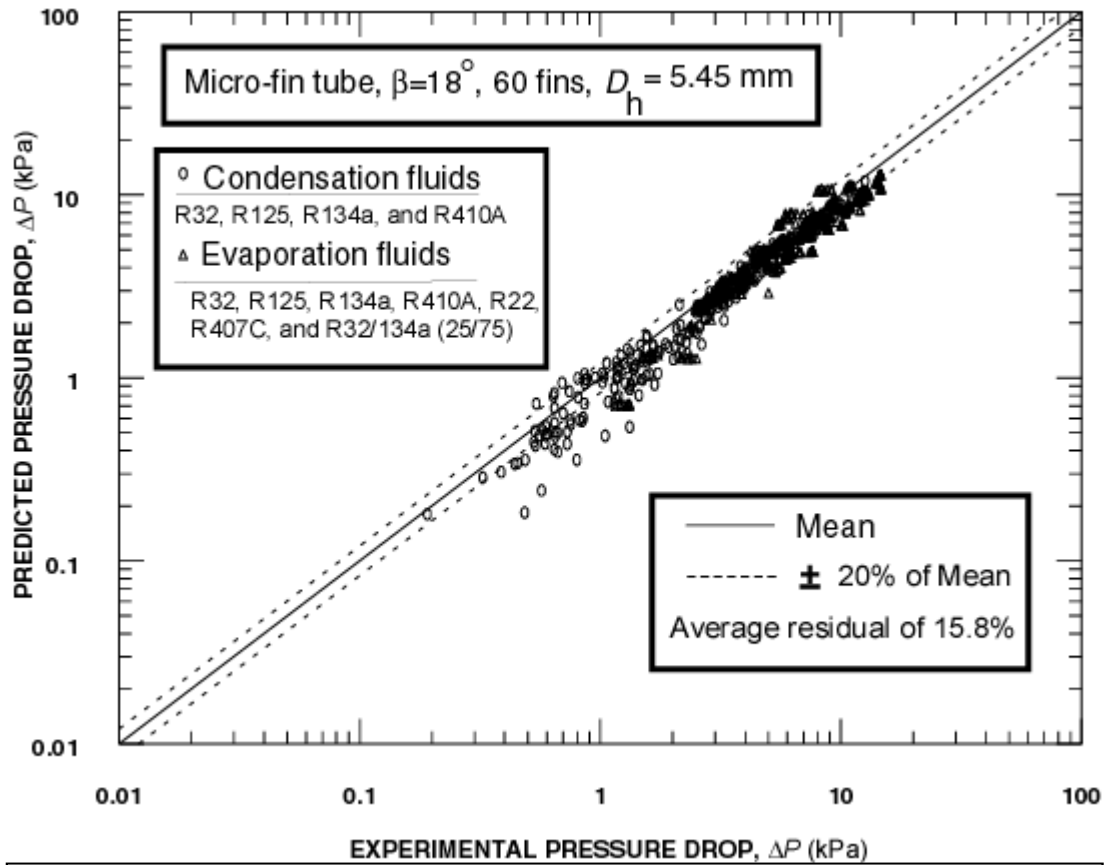


Figure 5 Prediction of NIST pressure drop measurements with Pierre (1964) correlation.

Figure 6 compares both condensation and evaporation pressure drop data to the predictions obtained from the homogeneous model given in Collier and Thome (1994). Overall, the homogeneous model underpredicted the measured data on average by 31.4% for all pressure drop ranges. The underprediction increased for the higher pressure drops.

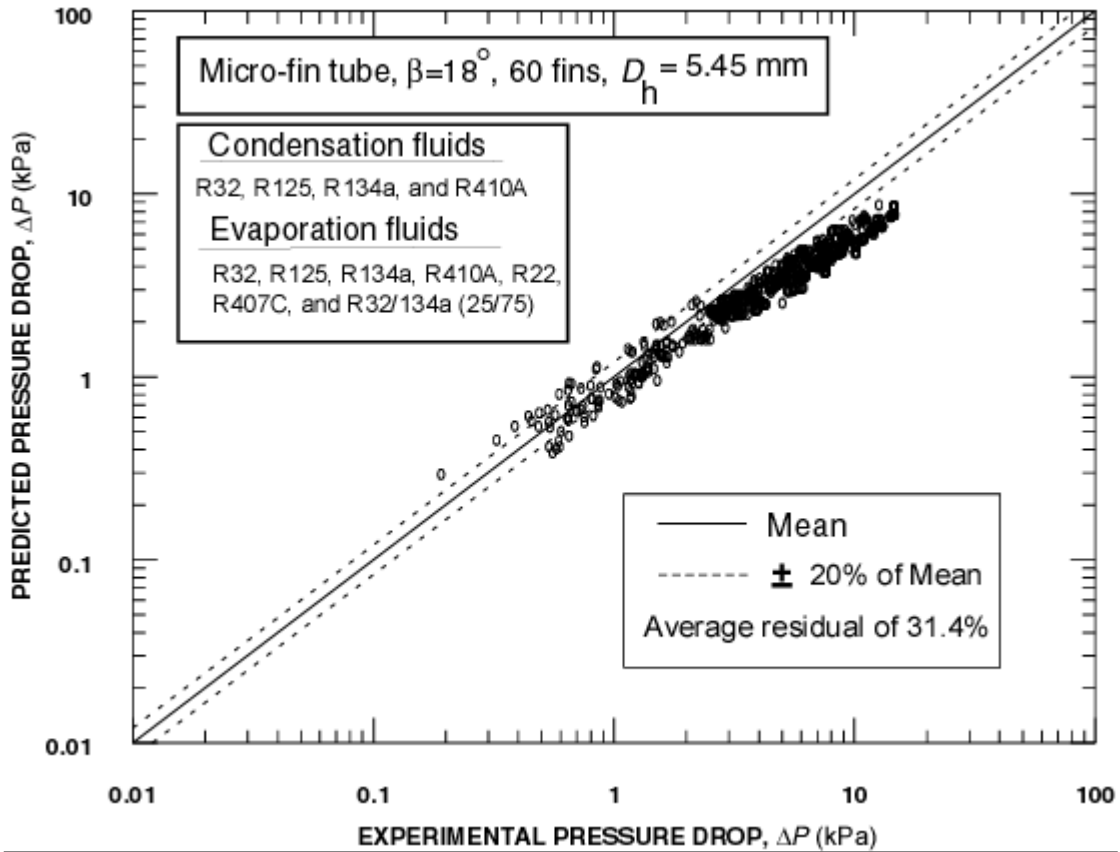


Figure 6 Predictions of NIST pressure drop measurements by homogenous model as given in Collier and Thome (1994).

Separated Flow Models

The total pressure gradient for horizontal homogeneous and separated flow is represented by the sum of the frictional and momentum components of the pressure gradient (Collier and Thome, 1994):

$$\Delta P_{tp} = \Delta P_F + \Delta P_A$$

$$= \left[\frac{2f_f G^2 (1-x)^2 v_f L}{D} \right] \phi_f^2 + G^2 (x_o - x_i) \left[\left\{ \frac{2xv_g}{\alpha} - \frac{2(1-x)v_f}{(1-\alpha)} \right\} + \left(\frac{d\alpha}{dx} \right)_p \left\{ \frac{(1-x)^2 v_f}{(1-\alpha)^2} - \frac{x^2 v_g}{\alpha^2} \right\} \right] \quad (7)$$

Pressure drop correlations based on the separated flow model has been continuously developed since Lockhart and Martinelli (1949) published their classic paper on two-phase gas-liquid flow.

Lockhart and Martinelli (1949) defined the friction factor as:

$$f_f = \frac{0.045}{\text{Re}_f^{0.2}} \quad (8)$$

The two-phase friction multipliers, ϕ_l^2 and ϕ_g^2 , can be represented as a function of the Lockhart-Martinelli parameter, X_{tt} :

$$X_{tt} = \left(\frac{1-x}{x} \right)^{0.9} \left(\frac{\mu_g}{\mu_f} \right)^{0.1} \left(\frac{v_f}{v_g} \right)^{0.5} \quad (9)$$

Chishom (1968) proposed a modification to the Lockhart-Martinelli correlation by allowing the two-phase frictional multiplier to vary with mass flux.

$$\phi_f^2 = 1 + \frac{C}{X_{tt}} + \frac{1}{X_{tt}^2} \quad (10)$$

where $C = \left[\lambda + (C_2 - \lambda) \left(\frac{v_{fg}}{v_g} \right)^{0.5} \right] \cdot \left[\left(\frac{v_g}{v_f} \right)^{0.5} + \left(\frac{v_f}{v_g} \right)^{0.5} \right]$ and $\lambda = 0.5 \cdot (2^{(2-n)} - 2)$. For rough tubes ($n = 0$ in Blasius equation) $\lambda=1$; for smooth tubes ($n = 0.25$) $\lambda=0.68$. At the critical pressure ($v_f = v_g$; $v_{fg} = 0$) C takes on a value of 2 for rough tubes and 1.36 for smooth tubes. For mass fluxes less than 2000 kg/m²s, C_2 and λ are 2000/ G and 0.75 (corresponding to $n=0.2$) for smooth tubes; and 1500/ G and 1 (corresponding to $n=0$) for rough tubes.

Butterworth (1975) reduced six void fraction models into one equation with variable constants:

$$\alpha = \frac{1}{1 + 0.28 \cdot \left(\frac{1-x}{x} \right)^{0.64} \left(\frac{\rho_g}{\rho_f} \right)^{0.36} \left(\frac{\mu_f}{\mu_g} \right)^{0.07}} \quad (11)$$

Figure 7 compares the measured evaporation and condensation pressure drop to the pressure drop predictions by the separated flow model given by Eq. 7. The frictional pressure drop was calculated by the Lockhart-Martinelli correlation using the two-phase frictional multiplier proposed by Chishom. The separated flow model overpredicted the measured data on average by 31.1 % for all pressure drop ranges. Specifically, overpredictions of over 100 % were evident

for the small pressure drop range. For the larger pressure drops, some data were overpredicted by more than 20 %.

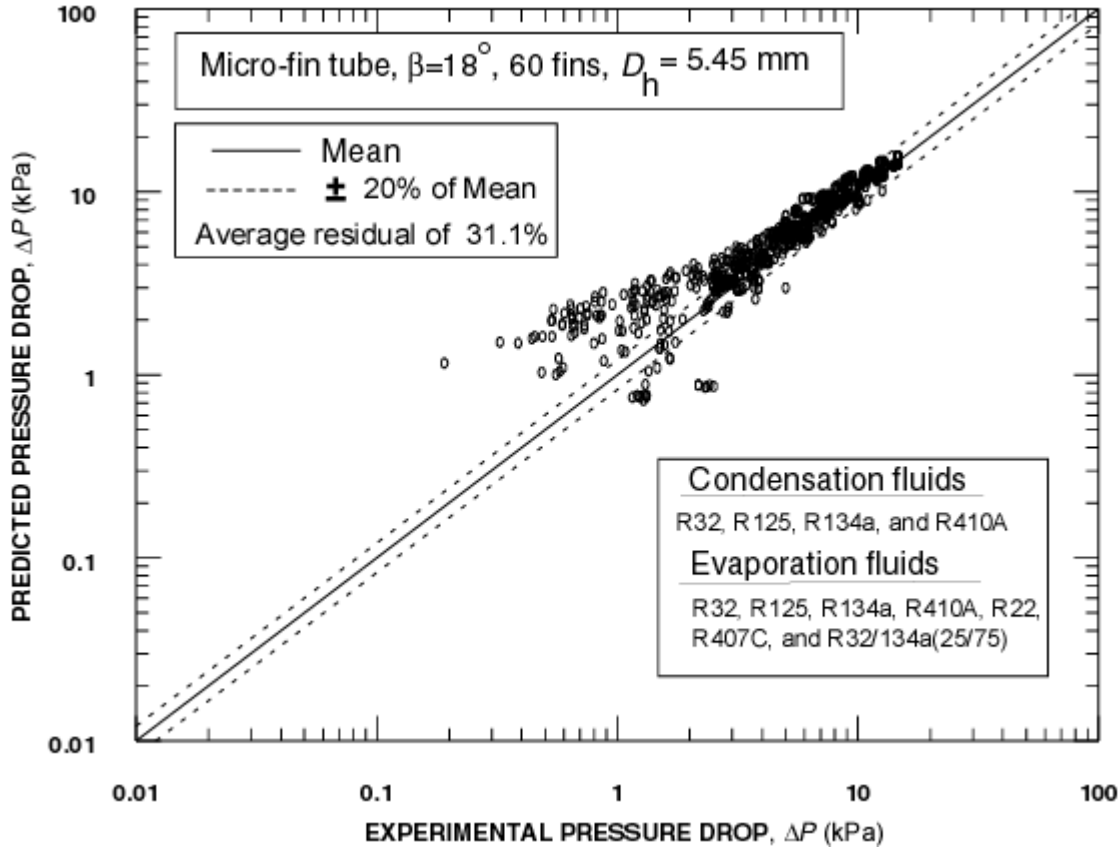


Figure 7. Prediction of NIST pressure drop measurements by separated flow model (Eq. 7)

Starting with the Martinelli-Nelson correlation (1948), Jung and Radermacher (1989) developed a new correlation from flow boiling pressure drop data for pure and mixed refrigerants with a wide absolute pressure range (0.2 MPa to 0.8 MPa). They used a regression analysis to remove the explicit dependence of the two-phase multiplier on X_{tt} :

$$\phi_{tp}^2 = 30.78x^{1.323} (1-x)^{0.477} P_r^{-0.7232} \quad (12)$$

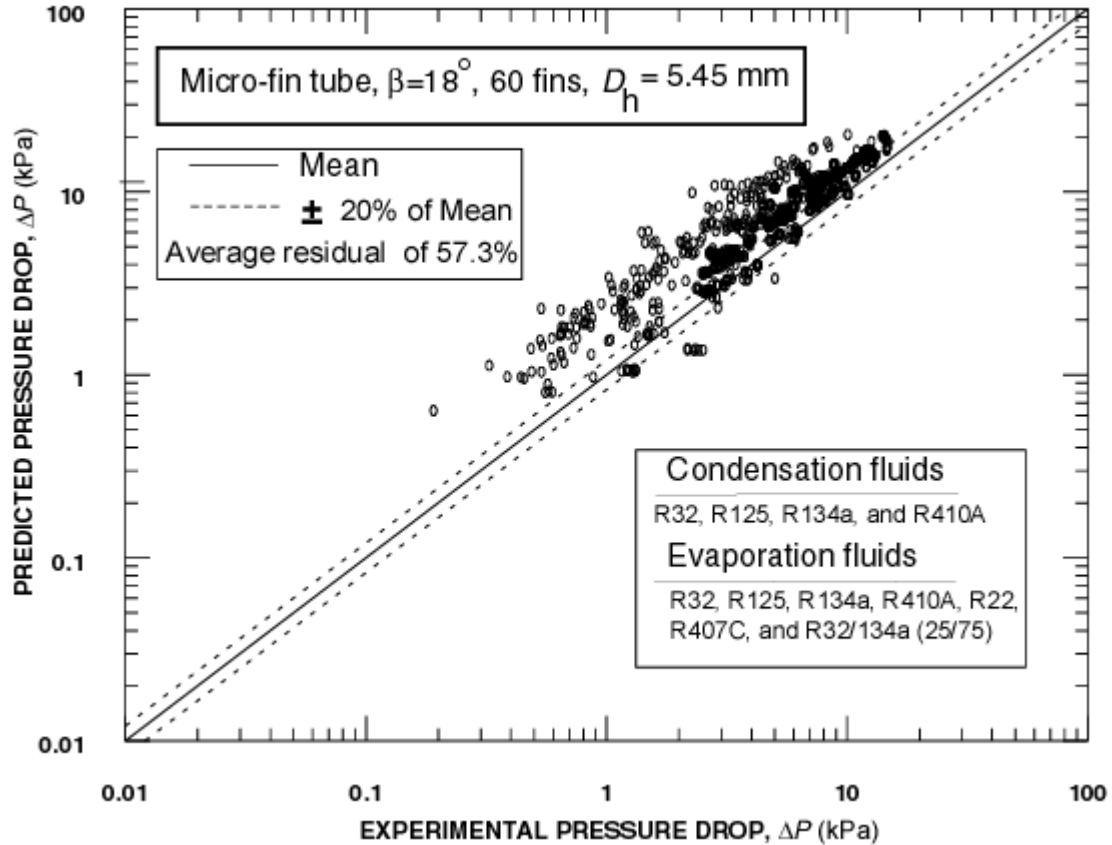


Figure 8 Predictions of NIST pressure drop measurements with Jung-Radermacher (1989) correlation

The Jung and Radermacher (1989) correlation for the two-phase pressure drop is:

$$\Delta P_p = \frac{2f_{fo} G^2 L v_f}{D} \left[\frac{1}{\Delta x} \int_{x_{in}}^{x_{out}} \phi_{tp}^2 dx \right] \quad (13)$$

The integral of Eq. (13) is evaluated numerically by subtracting the integral between 0 % to the inlet vapor quality, x_{in} , from the integral between 0 % and the outlet vapor quality, x_{out} . The friction factor is calculated by the following equation:

$$f_{fo} = 0.046 \text{Re}^{-0.2} \quad (14)$$

Figure 8 compares the predictions from the Jung-Radermacher (1989) pressure drop correlation to the NIST micro-fin pressure drop measurements. Averaged over all pressure ranges and refrigerants, the Jung-Radermacher correlation overpredicted the measured data by 57.3 %.

The Jung-Radermacher correlation was obtained from convective boiling data in a smooth tube. The hydraulic diameter concept can effectively be used to redistribute the wall shear from a circular to a noncircular tube for equivalent mixing at the wall. However, the micro-fins -

because of their size - are expected to increase a roughness by providing an additional mixing effect at the wall that cannot be accounted for by an extrapolation of a smooth tube pressure drop correlation with the hydraulic diameter concept. Consequently, it was surprising that the correlation overpredicted rather than underpredicted the pressure drop in micro-fin tube.

THE NEW CORRELATION FOR PRESSURE DROP

Pure Refrigerants

From among the four correlations presented in the above analysis, the predictions of the Pierre (1964) correlation were closest to the NIST micro-fin pressure drop data for convective evaporation and condensation. However, as shown in Figure 5, these predictions are not centered about the mean of the data. Consequently, a new two-phase friction factor (f_N) for Pierre (1964) pressure drop model was correlated to the NIST two-phase, micro-fin pressure drop data. The Pierre (1964) correlation was further modified by using the hydraulic diameter (D_h) and by including the specific volume of liquid in the calculation of the average specific volume of the two-phase fluid. (Pierre neglected the specific volume of liquid). The modified correlation becomes :

$$\Delta P_{tp} = \Delta P_{friction} + \Delta P_{accelation} = \left(\frac{f_N L (v_{out} + v_{in})}{D_h} + (v_{out} - v_{in}) \right) G^2 \quad (15)$$

The uncertainty of the fit was reduced when the liquid specific volume was included. The specific volume of the two-phase fluid (v) was obtained from a linear quality weighted sum of the vapor and liquid specific volumes at either the outlet or inlet of the segment L. The total mass velocity (G), and the properties for the two-phase friction factor (f_N) were evaluated at a linearly averaged refrigerant temperature. The new two-phase friction factor is:

$$f_N = 0.00506 \text{Re}_{fo}^{-0.0951} \text{K}_f^{0.1554} \quad (16)$$

The friction factor is based on the all liquid Reynolds number, $\text{Re}_{fo} = \frac{GD_h}{\mu_f}$, and the two-phase

number, $\text{K}_f = \frac{\Delta x h_{fg}}{L g}$. The procedure that was used to identify and possibly remove data that

had high influence and/or high leverage on the regression using the hat matrix and Cook's distance (Hamilton, 1992) is described by Kedzierski and Goncalves (1997). The friction factor

correlation that was obtained by Kedzierski and Goncalves (1999) for condensation alone was on average and consistently 5 % less than that given by Eq. (16) for Re_{fo} between 5000 and 25000.

Figure 9 shows improvement obtained with the modification of the Pierre (1964) pressure drop model. The NIST measured pressure drop data is predicted with an average residual of 10.8 % for all pressure drop ranges and refrigerants.

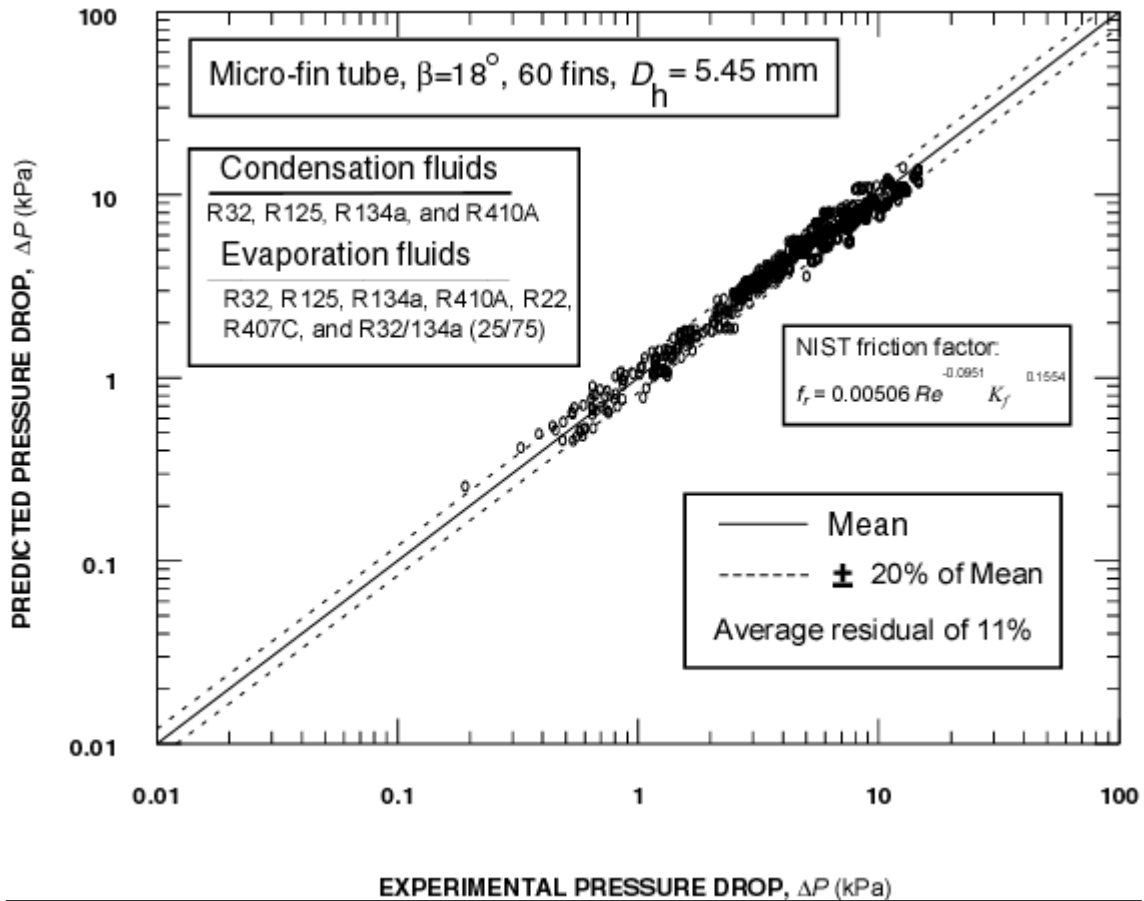


Figure 9 Predictions of NIST pressure drop measurements with NIST correlation.

The new correlation was verified with pressure drop data from Eckels et al. (1991 and 1993) and Pate et al. (1991), which are given in Appendix C and Appendix D, respectively. Table 3 shows geometric parameters of smooth and micro-fin tubes that were used by both researchers. Table 4 shows the test conditions for each data set. Pate et al. (1991) measured the pressure drop during condensation and evaporation of R12, R134a, and R22. Eckels et al. (1991 and 1993) measured the pressure drop during condensation of R22, R134a, R410A, R502, and R507. The hydraulic

diameters of the micro-fin tubes were calculate from Eq. (1) and used to correlate both condensation and evaporation data.

Figure 10 compares the predictions of the NIST correlation to the convective condensation pressure drop data of Eckels et al. (1991 and 1993) in smooth tube and three different micro-fin tubes. The smooth-tube and micro-fin-tube data are predicted to within 13.1 % and 17.6 %, respectively, for all ranges and refrigerants.

Table 3. Geometric tube parameters of Pate (1991) and Eckels (1991 and 1993).

Researcher	Pate et al.				Eckels et al.			
	Smooth		Micro-fin		Smooth		Micro-fin	
Tube type	(3/8 in)	(1/2 in)	(3/8 in)	(1/2 in)	(3/8 in)	(3/8 in)	(5/8 in)	(5/16 in)
D_o (mm)	9.52	12.70	Same	12.70	9.53	Same	15.90	7.94
t_w (mm)	0.760	0.800	as	0.406	0.760	as	0.508	0.305
D_r (mm)	8.01	11.10	NIST	11.98	8.01	NIST	14.68	7.33
A_c (mm ²)	50.3	96.8		108.5	50.3		170	40.6
e (mm)	-	-		0.254	-		0.305	0.203
P (mm)	-	-		0.622	-		0.778	0.460
β (degrees)	-	-		18	-		27	18
N	-	-		60	-		60	50
S_p (mm)	-	-		0.947	-		1.196	0.712
D_h (mm)	8.0	11.1		7.432	8.01		8.443	4.339
Distance between pressure taps (m)	3.97	3.97	3.97	3.97	3.81	3.78	3.78	3.78

Table 4. Summary of test conditions for of Pate (1991) and Eckels (1991 and 1993).

Conditions		Mass Flux (kg/m ² s)	Pressure (MPa)	Inlet quality (%)	Outlet quality (%)
Pate et al.	Cond.	125–400	1.5–1.6	80–88	5–15
	Evap.	125–400	0.5–0.6	5–20	80–88
Eckels et al	Cond.	120–620	0.9–2.5	48–91	2–46

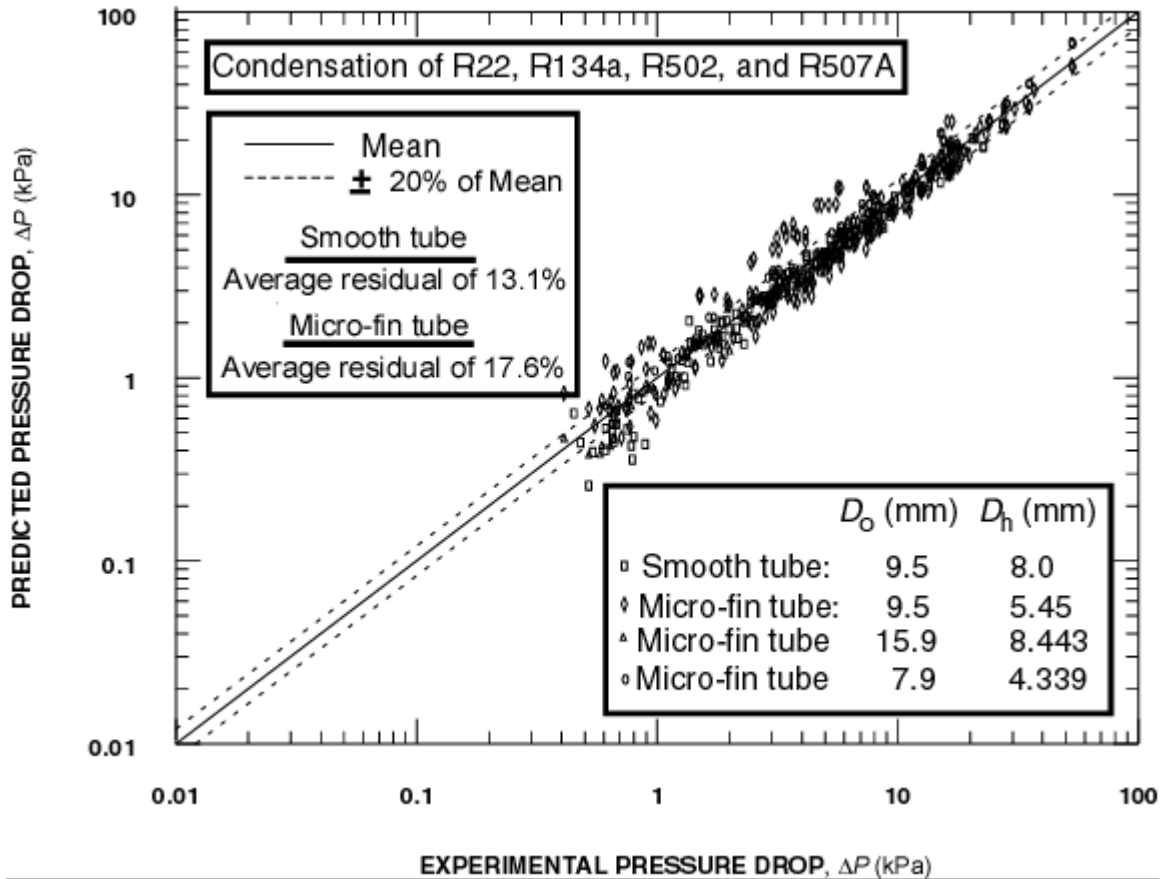


Figure 10 Predictions of Eckels et al. (1991 and 1993) pressure drop measurements with NIST correlation

Figure 11 compares the predictions of the NIST correlation to the convective boiling and condensation pressure drop data of Pate et al. (1991). The present correlation predicts the smooth-tube and micro-fin-pressure drop data of the Pate et al. (1991) to within 15.0 % and 16.1 %, respectively for all ranges and refrigerants.

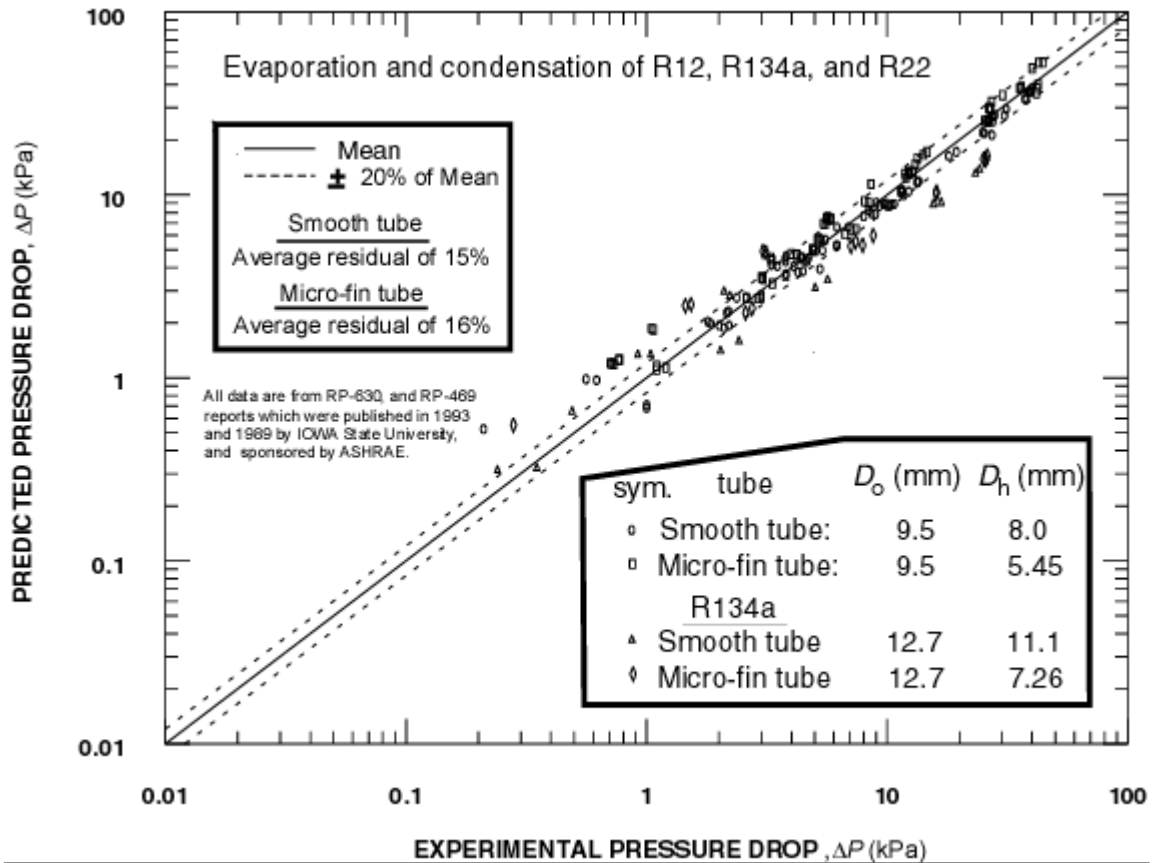


Figure 11 Predictions of Pate et al. (1991) pressure drop measurements with NIST correlation.

Refrigerant/Lubricant Mixtures

In practice, the refrigerant that circulates in refrigeration and air-conditioning equipment contains a small fraction of lubricant. For the present analysis, it was assumed that the lubricant alters the pressure drop solely through an increase in the viscosity of the liquid in the tube. As the vapor quality increases, the preferential evaporation of the refrigerant causes the local concentration of lubricant, and hence, the viscosity of the liquid to increase.

The pressure drop of an refrigerant/lubricant mixture was predicted using the pure refrigerant pressure drop correlation (Eq. (15)) with two modifications. These modifications accommodate the influence of the lubricant on the vapor quality and the liquid Reynolds number.

The vapor quality for the refrigerant/lubricant mixture and the mass fraction of the liquid refrigerant flow rate in the total refrigerant flow rate is calculated by Eqs. (17) and (18), respectively.

$$x = \frac{G_{ref,g}}{G_{tot}} = \frac{G_{ref,g}}{G_{ref,g} + G_{ref,f} + G_{oil}} \quad (17)$$

$$(1-x) = \frac{G_{ref,f}}{G_{tot}} = \frac{G_{ref,f} + G_{oil}}{G_{ref,g} + G_{ref,f} + G_{oil}} \quad (18)$$

The liquid Reynolds number for the refrigerant/lubricant mixture, Re_m , is calculated using the local viscosity of the liquid (refrigerant/lubricant mixture) on the tube wall:

$$Re_m = \frac{GD_h}{\mu_m} \quad (19)$$

The Yokozeki (1994) viscosity model was selected for use here because of its success in predicting measurements of refrigerant/lubricant mixture viscosities. For example, Michels et al. (1996) recently verified the Yokozeki mixing model with measured viscosities for several refrigerant/lubricant mixtures: R22/AB 150, R134a/POE-68, and R410A/PVE-68. The Yokozeki (1994) viscosity mixture model is given as:

$$\ln \mu_m = \sum_i \xi_i \ln \mu_i = \xi_{ref} \ln \mu_{ref} + \xi_{oil} \ln \mu_{oil} \quad (20)$$

$$\text{where } \xi_i = \frac{W_i^k \Psi_i}{\sum_j W_j^k \Psi_j}$$

Ψ_i and W_i are the mole fraction and molecular weight of component i, respectively. The exponent k is an empirical parameter, often modeled as a function of a low order polynomial in the temperature. Each refrigerant/lubricant mixture has a particular value of k. However, Yokozeki (1994) found that setting $k = 0.58$ gave accurate predictions for many refrigerant/lubricant mixtures. Consequently, the value of k was taken as 0.58 in the present pressure drop model.

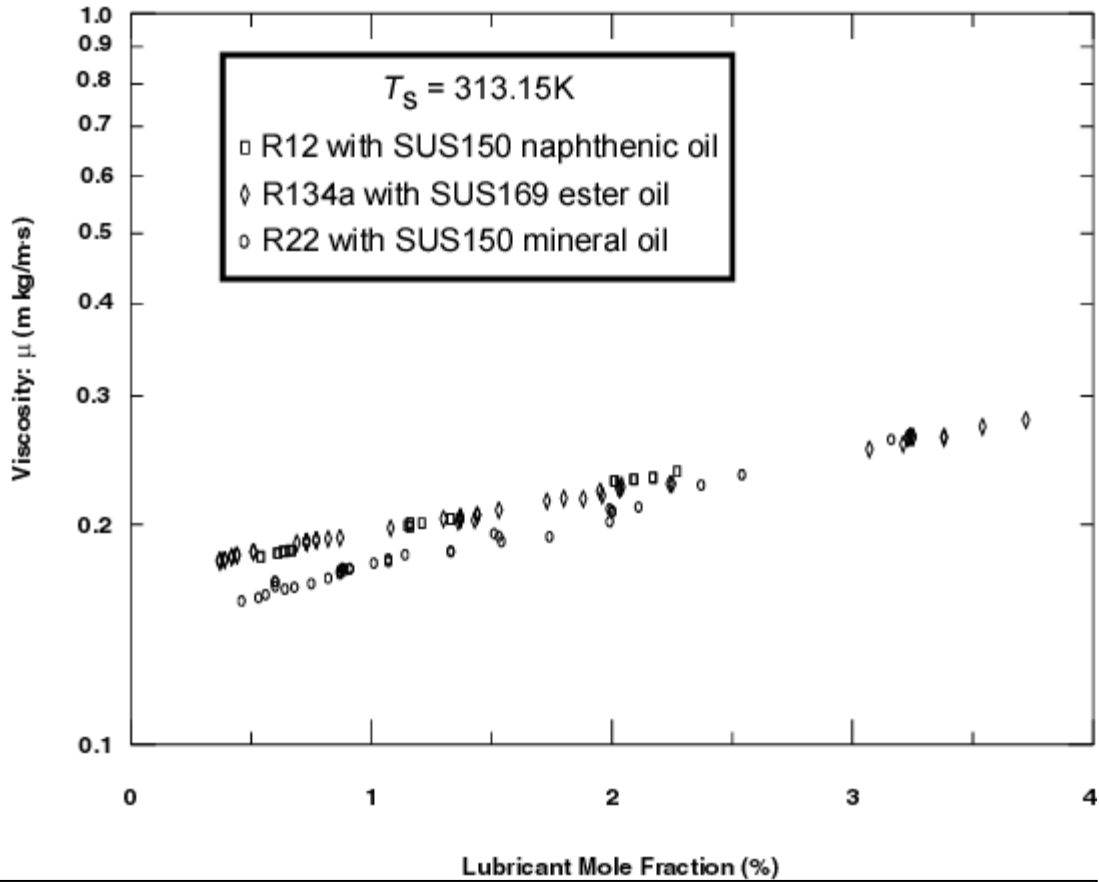


Figure 12 Lubricant viscosity as a function of mole fraction

Figure 12 shows viscosity of three refrigerant/lubricant mixtures that were calculated from the Yokozeki model. The viscosities of R12/naphthenic 150 SUS, R134a /169 SUS ester-m, and R22/mineral SUS150 are shown as a function of the lubricant mole fraction. The viscosity of the mixtures increase nearly linearly with respect to the lubricant mole fraction on a logarithmic viscosity scale.

If we consider only the liquid state of refrigerant and lubricant, the mass fraction of the lubricant in the refrigerant/lubricant mixture is:

$$w_{layer,oil} = \frac{m_{oil}}{m_{oil} + m_{ref,f}} \quad (21)$$

The lubricant mass fraction is linearly averaged over the length of the tube. Equation 20 requires the molar fraction of the mixture as input. The mass fraction can be converted to molar fraction by the following equation:

$$\Psi = \frac{w_{layer,oil} \left(\frac{m_{ref}}{m_{oil}} \right)}{1 - w_{layer,oil} + w_{layer,oil} \left(\frac{m_{ref}}{m_{oil}} \right)} \quad (22)$$

Figure 13 illustrates that, for fixed mass velocity, the Reynolds number is reduced by approximately 40 % of the pure refrigerant value for a lubricant mole fraction of 3 %. This magnitude of Reynolds number reduction results in approximately a 7 % increase in the friction factor. Consequently, the lubricant viscosity has a significant role in the prediction of the pressure drop.

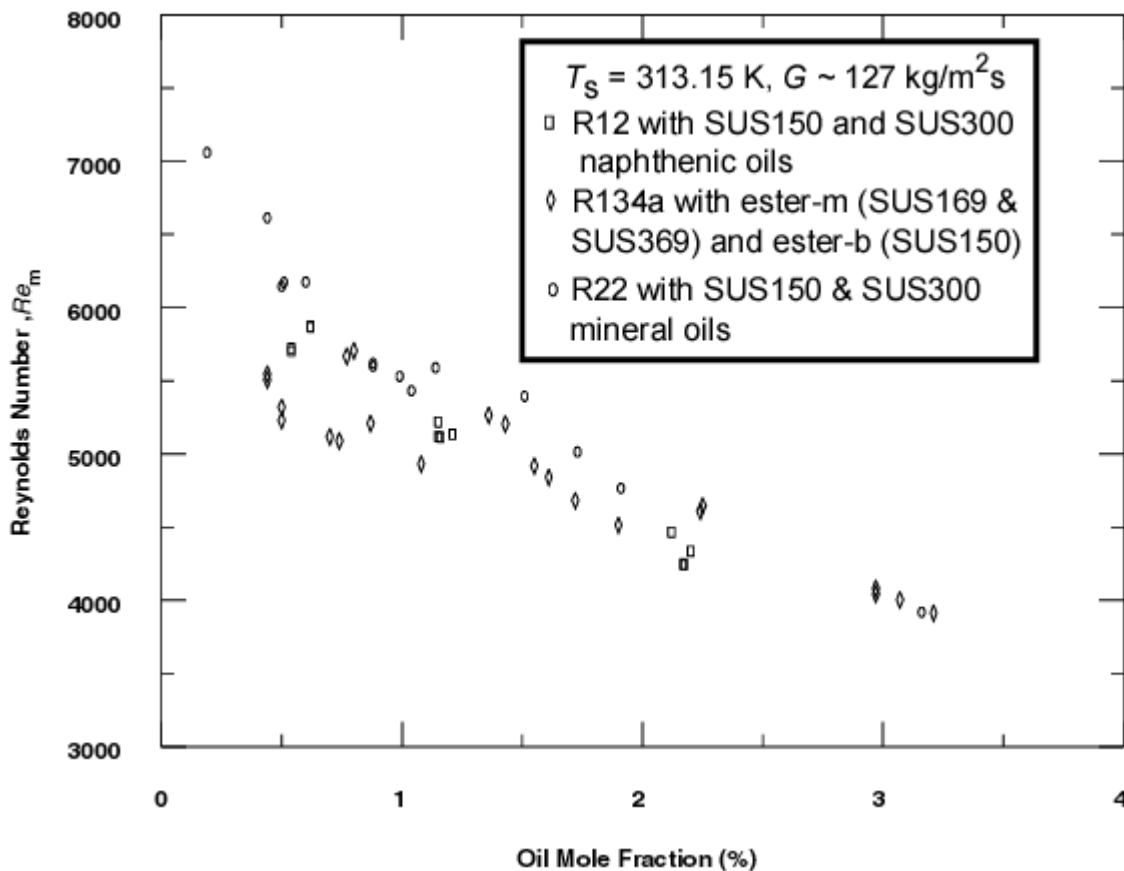


Figure 13 Reynolds Number for selected refrigerant/lubricant mixtures versus mole fraction

The NIST pressure drop model for refrigerant/lubricant mixtures was compared to the data of Pate et al. (1991) which is given in Appendix E. Pate et al. (1991) measured convective condensation and evaporation pressure drops in smooth and micro-fin tubes for 28 different refrigerant/lubricant mixtures. The refrigerants were R12, R134a, and R22. Six mixtures of R12 and naphthenic oil were tested at two viscosities: SUS150, and SUS300. Fifteen mixtures of R134a and ester lubricant were tested at three lubricant viscosities: SUS169, SUS369, and SUS150. Finally, seven mixtures of R22 and mineral lubricant were tested at two lubricant viscosities: SUS150, and SUS300. Table 5 summarizes the tubes that were tested and the various mass fraction of the mixtures.

Table 5. Refrigerant/lubricant mixture tests by Pate et al. (1991).

Refrigerant	Tube	Lubricant	Lubricant Concentration (%)				
R12	Smooth 9.525 mm (3/8 in)	150 SUS naphthenic	1.3	2.4	4.9		
		300 SUS naphthenic	1.2	2.4	4.8		
	Micro-fin 9.525 mm (3/8 in)	150 SUS naphthenic	1.3	2.4	4.9		
		300 SUS naphthenic	1.2	2.4	4.8		
R134a	Smooth 9.525 mm (3/8 in)	169 SUS ester-m	0.5	1.0	1.9	2.9	5.0
		369 SUS ester-m	0.6	1.1	2.4	5.0	
		150 SUS ester-b	1.1	2.4	5.0		
	Micro-fin 9.525 mm (3/8 in)	169 SUS ester-m	0.5	1.0	1.9	2.9	5.0
		369 SUS ester-m	0.6	1.1	2.4	5.0	
		150 SUS ester-b	1.1	2.4	5.0		
	Smooth 12.7 mm (1/2 in)	169 SUS ester-m	1.3	2.3	4.9		
Micro-fin 12.7 mm (1/2 in)	169 SUS ester-m	1.3	2.3	4.9			
R22	Smooth 9.525 mm (3/8 in)	150 SUS mineral	1.2	2.5	4.9		
		300 SUS mineral	0.6	1.3	2.6	5.0	
	Micro-fin 9.525 mm (3/8 in)	150 SUS mineral	1.3	2.4	5.1		
		300 SUS mineral	0.6	1.3	2.6	5.0	

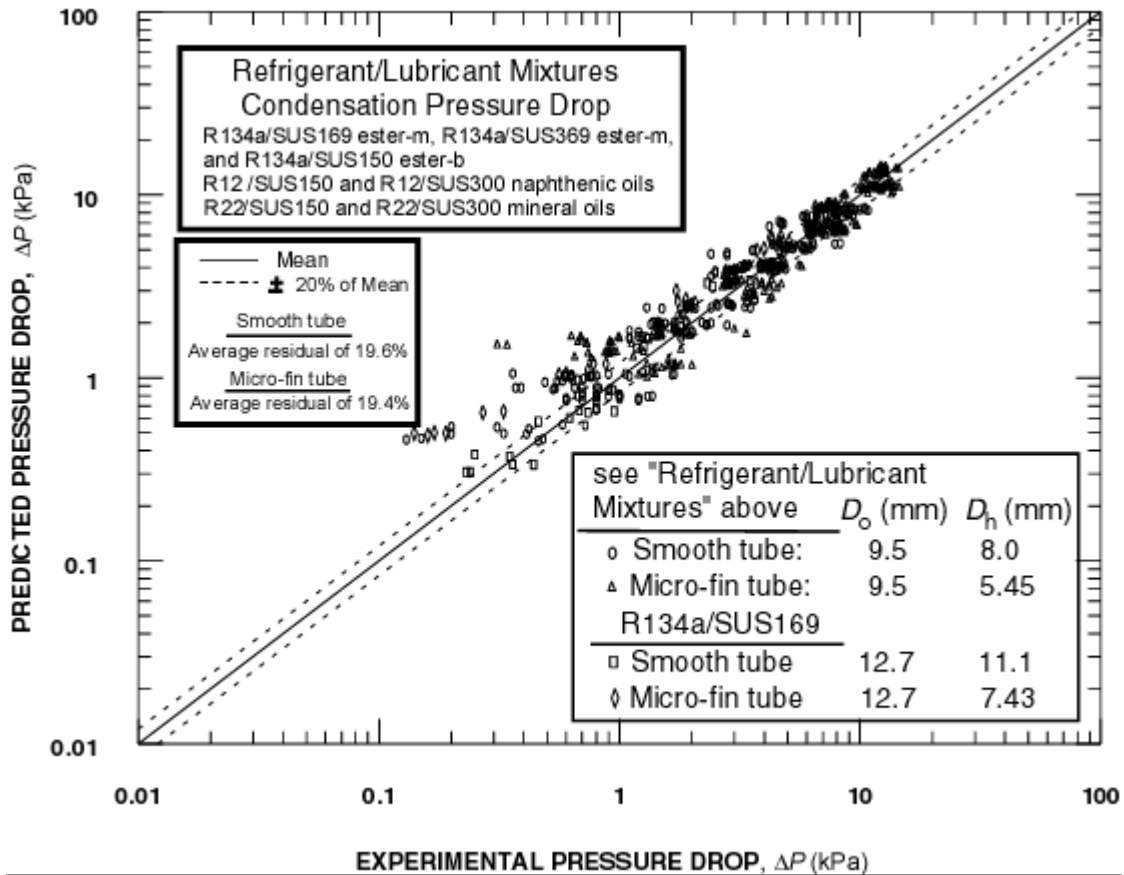


Figure 14 Predictions of Pate et al. (1991) condensation refrigerant/lubricant pressure drop measurements with NIST correlation

Figure 14 compares the condensation pressure drop of the refrigerant/lubricant mixtures measured by Pate et al. (1991) to the predicted pressure drop by the NIST correlation using a mixing viscosity rule. The figure shows that the present correlation predicts the measured data of the smooth and the micro-fin tubes to within 19.6 %, and 19.4 %, respectively. With the exception of the lowest pressure drops, the data scatter is centered about the mean of the predictions for both the smooth and micro-fin tubes and for all refrigerants.

Figure 15 compares the evaporation pressure drop of the refrigerant/lubricant mixtures measured by Pate et al. (1991) to the predicted pressure drop by the NIST correlation using a mixing viscosity rule. The figure shows that the present correlation predicts the measured data of the smooth and the micro-fin tubes to within 28.0 % and 14.9 %, respectively. The data scatter was

not centered about the mean for the evaporation data. The present pressure drop model tended to underpredict much of the data for all pressure drop ranges and refrigerants.

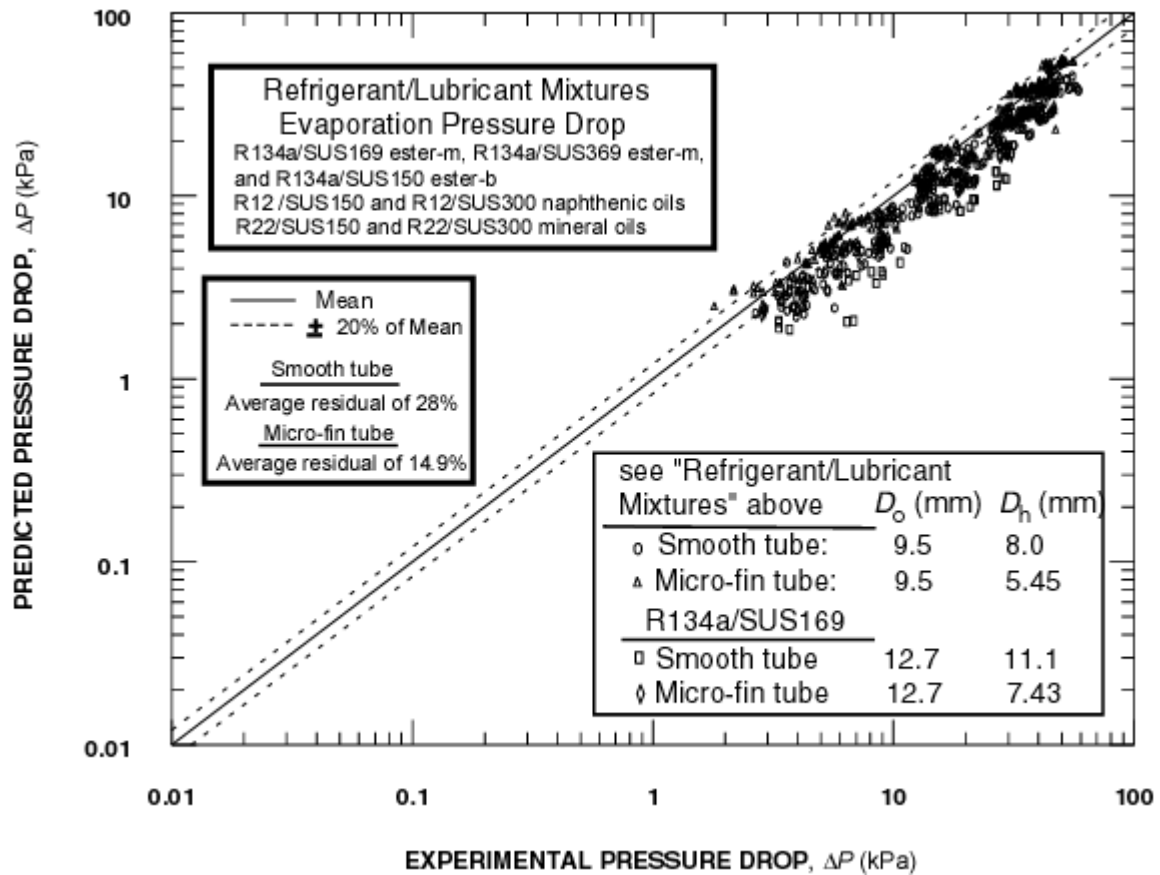


Figure 15 Predictions of Pate et al. (1991) evaporation refrigerant/lubricant pressure drop measurements with NIST correlation.

CONCLUSIONS

A pressure drop correlation for smooth and micro-fin tubes was developed based on the evaporation pressure drop correlation of Pierre (1964). The new correlation (Eq. (15)) is valid for both condensation and evaporation of pure refrigerants and refrigerant/lubricant mixtures. Two main modifications were made to the Pierre (1964) correlation to make it more general. First, the smooth tube diameter was replaced with the hydraulic diameter of the micro-fin tube. Second, the viscosity of the liquid in the Reynolds number was replaced by the refrigerant/lubricant viscosity.

The new correlation was developed from NIST lubricant-free refrigerant pressure drop data in a micro-fin tube. The resulting correlation reproduced the NIST measurements to within 10.8 %. The pressure drop correlation was also validated with other pressure drop data that were not included in the correlation development. The lubricant-free refrigerant pressure drop data of Pate et al. (1991) and of Eckels et al. (1991 and 1993) for several different micro-fin tube geometries was predicted to within 18 %. The new correlation predicted the evaporative pressure drop data of Pate et al. (1991) and of Eckels et al. (1991) for refrigerant/lubricant mixtures in smooth and micro-fin tubes to within 28 % and 15 %, respectively. The condensation pressure drop data of Pate et al. (1991) and of Eckels et al. (1991) for refrigerant/lubricant mixtures were predicted to within 19 % for both smooth and micro-fin tubes.

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APPENDIX A

Condensation pressure drop of NIST in micro-fin tube(file: nist_con.in)

ΔP (kPa)	mass flux(kg/m ² s)	z(m)	x_{in}	x_{out}	P_a (kPa)	P_c (kPa)	h_g (kJ/kg)	v_f (m ³ /kg)	v_g (m ³ /kg)	μ_c (x10 ⁻⁷ , N/ms ²)	μ_c
R32											
1.184	191.38	1.587	0.487	0.223	1729.6	5795	270.78	0.00104	0.02069	1160	130
0.454	191.38	1.588	0.203	0.106	1728.26	5795	270.83	0.00104	0.020705	1160	129
0.65	137.45	1.587	0.494	0.233	2042.22	5795	256.95	0.00108	0.01718	1067	134
0.753	157.35	1.587	0.506	0.244	2217.02	5795	249.44	0.00109	0.01563	1022	137
1.927	268.26	1.587	0.488	0.211	1995.53	5795	259.02	0.00107	0.01764	1080	133
0.729	268.26	1.588	0.191	0.086	1992.87	5795	259.11	0.00107	0.017665	1081	133
2.165	306.95	1.587	0.505	0.231	2285.62	5795	246.55	0.0011	0.01509	1006	137
1.324	306.95	1.588	0.211	0.108	2282.82	5795	246.66	0.0011	0.015115	1006	137
1.638	232.55	1.587	0.481	0.212	1835.54	5795	266.05	0.00105	0.019375	1126	131
0.666	232.55	1.588	0.192	0.09	1833.43	5795	266.12	0.00105	0.019395	1127	131
1.513	145.72	1.587	0.974	0.823	2117.78	5795	253.72	0.00108	0.016485	1047	135
0.805	145.72	1.588	0.798	0.509	2115.3	5795	253.81	0.00108	0.016505	1047	135
1.168	145.77	1.587	0.966	0.82	2112.15	5795	253.95	0.00108	0.016535	1048	135
1.166	145.77	1.588	0.795	0.513	2109.99	5795	254.05	0.00108	0.016555	1049	135
1.659	173.34	1.587	0.984	0.828	2292.67	5795	246.25	0.0011	0.015035	1004	138
1.063	173.34	1.588	0.802	0.505	2289.74	5795	246.36	0.0011	0.015055	1005	138
2.132	183.11	1.587	0.975	0.815	1677.22	5795	273.19	0.00104	0.02141	1178	129
1.563	165.22	1.587	0.971	0.821	1951.44	5795	260.94	0.00107	0.018095	1092	133
1.331	165.22	1.588	0.795	0.508	1948.81	5795	261.05	0.00107	0.01812	1093	133
0.595	88.37	1.587	0.962	0.808	2015.93	5795	258.1	0.00107	0.017435	1074	134
0.576	91.24	1.587	0.963	0.809	2176.61	5795	251.17	0.00109	0.015965	1032	136
0.556	91.99	1.587	0.961	0.805	2304.45	5795	245.72	0.0011	0.01494	1001	138
1.183	125.1	1.588	0.778	0.483	1564.89	5795	278.34	0.00103	0.023075	1217	127
5.207	335.11	1.587	0.9999	0.834	2136.18	5795	253.72	0.00108	0.01642	1037	135
4.373	335.11	1.588	0.807	0.51	2125.25	5795	253.49	0.00108	0.016435	1046	135
3.181	251.9	1.587	0.988	0.793	2180.81	5795	251.06	0.00109	0.015945	1031	136
2.854	242.1	1.587	0.987	0.826	2170.15	5795	251.51	0.00109	0.016035	1034	136
2.996	251.67	1.587	0.989	0.821	2275.03	5795	247.04	0.0011	0.01518	1008	137
2.498	251.67	1.588	0.794	0.497	2269.07	5795	247.28	0.0011	0.015225	1009	137
3.831	255.34	1.587	0.988	0.803	1852.6	5795	265.37	0.00106	0.0192	1122	131
3.269	255.34	1.588	0.774	0.462	1844.81	5795	265.7	0.00106	0.019285	1124	131
3.99	281.15	1.587	0.988	0.816	2111.22	5795	254.08	0.00108	0.016555	1049	135
3.39	281.15	1.588	0.789	0.489	2103.06	5795	254.42	0.00108	0.01663	1052	135
4.351	268.85	1.587	0.948	0.786	1837.02	5795	266.07	0.001055	0.019385	1126	131
3.779	268.85	1.588	0.76	0.476	1828.14	5795	266.46	0.00105	0.019485	1129	131
1.016	120.12	1.587	0.961	0.783	1850.27	5795	265.38	0.00106	0.0192	1122	131
0.638	120.12	1.588	0.754	0.455	1848.71	5795	265.44	0.00106	0.01922	1122	131
1.295	138.46	1.587	0.958	0.752	1782.28	5795	268.42	0.00105	0.02002	1142	130
0.872	138.46	1.588	0.719	0.393	1780.02	5795	268.52	0.00105	0.02004	1143	130
0.864	109.9	1.587	0.965	0.797	1805.15	5795	267.39	0.00105	0.019735	1135	131
0.542	109.9	1.588	0.77	0.475	1803.87	5795	267.44	0.00105	0.01975	1136	131
1.371	206.38	1.587	0.486	0.213	1768.19	5795	269.05	0.00105	0.020195	1147	130
0.441	206.38	1.588	0.193	0.089	1766.41	5795	269.11	0.00105	0.020215	1148	130
1.146	196.03	1.587	0.502	0.238	2068.98	5795	255.81	0.00108	0.016925	1060	134
0.387	196.03	1.588	0.218	0.114	2067.64	5795	255.85	0.00108	0.01694	1060	134
1.392	212.03	1.587	0.489	0.218	1831.64	5795	266.22	0.00105	0.01942	1127	131
0.488	212.03	1.588	0.198	0.096	1829.91	5795	266.28	0.00105	0.019435	1128	131
1.27	198.06	1.587	0.54	0.312	2221.95	5795	249.24	0.00109	0.015595	1021	137
0.53	198.06	1.588	0.295	0.206	2220.31	5795	249.3	0.00109	0.015605	1021	137
0.602	136.1	1.587	0.431	0.15	1620.17	5795	275.76	0.00103	0.02222	1197	128
0.537	122.41	1.587	0.475	0.213	1832.68	5795	266.15	0.00105	0.019405	1127	131
R125											
1.639	226.75	1.587	0.9999	0.873	1553.3	3629	106.94	0.00086	0.00979	1326	151
1.296	226.75	1.588	0.847	0.549	1550.25	3629	105.4	0.00086	0.009665	1358	150
1.022	226.76	1.588	0.868	0.581	1795.63	3629	98.39	0.00089	0.00811	1254	157
2.454	298.89	1.587	0.943	0.741	1728.21	3629	100.34	0.00088	0.0085	1282	155
1.562	298.89	1.588	0.711	0.421	1723.77	3629	100.45	0.00088	0.00852	1284	155
4.074	468.06	1.587	0.962	0.758	1979.86	3629	93.17	0.00091	0.007185	1189	164
2.811	468.06	1.588	0.727	0.412	1971.73	3629	93.39	0.00091	0.007215	1191	163
3.411	458.15	1.587	0.958	0.757	2192.28	3629	86.97	0.00094	0.00628	1120	171
2.271	458.15	1.588	0.727	0.418	2185.57	3629	87.15	0.00094	0.0063	1122	171
5.599	435.47	1.587	0.942	0.713	1439.96	3629	108.65	0.00085	0.01055	1413	146
3.659	435.47	1.588	0.68	0.348	1428.75	3629	108.95	0.00085	0.010635	1418	146
4.88	444.25	1.587	0.958	0.744	1641.42	3629	102.86	0.00087	0.00905	1318	152
3.256	444.25	1.588	0.713	0.395	1631.62	3629	103.12	0.00087	0.009115	1322	152
4.506	448.23	1.587	0.962	0.763	1767.23	3629	99.27	0.00089	0.00828	1267	156
3.09	448.23	1.588	0.734	0.43	1758.22	3629	99.51	0.00089	0.008325	1270	156
1.079	193.96	1.587	0.955	0.759	1908.77	3629	95.16	0.00091	0.007515	1212	161
0.535	193.96	1.588	0.729	0.427	1907.28	3629	95.19	0.00091	0.00752	1213	161
1.868	223.59	1.587	0.985	0.82	1392.92	3629	109.94	0.00084	0.01094	1436	145
1.397	223.59	1.588	0.793	0.472	1389.45	3629	110.04	0.00084	0.01096	1438	145
3.285	350.59	1.588	0.806	0.51	1450.03	3629	108.32	0.00085	0.010455	1407	147
3.696	358.1	1.587	0.994	0.806	1589.53	3629	104.32	0.00087	0.0094	1341	151
2.734	358.1	1.588	0.777	0.45	1582.23	3629	104.52	0.000865	0.009445	1344	151
2.281	296.49	1.587	0.962	0.821	1866.72	3629	96.38	0.0009	0.00773	1229	160
1.6	296.49	1.588	0.797	0.532	1862.61	3629	96.49	0.0009	0.00775	1230	159
2.34	331.97	1.587	0.9999	0.826	2047.1	3629	91.77	0.00092	0.006915	1157	166
1.492	331.97	1.588	0.797	0.473	2042.72	3629	91.31	0.00092	0.00689	1167	166
1.398	332.22	1.588	0.813	0.519	2211.48	3629	86.36	0.00095	0.0062	1114	172
1.048	278.39	1.587	0.556	0.289	2255.73	3629	85.03	0.00095	0.00603	1101	174
0.485	278.39	1.588	0.267	0.14	2254.51	3629	85.06	0.00095	0.00603	1101	174
0.799	334.65	1.588	0.224	0.111	1546.81	3629	105.49	0.00086	0.00969	1360	150
2.012	346.89	1.587	0.514	0.236	1408.99	3629	109.47	0.00084	0.01079	1427	145
1.682	341.31	1.587	0.532	0.275	1821	3629	97.68	0.00089	0.007965	1245	158
2.64	455.98	1.587	0.537	0.281	1818.86	3629	97.76	0.00089	0.007985	1246	158
3.268	458.62	1.587	0.527	0.261	1451.79	3629	108.26	0.00085	0.01044	1406	147
0.73	213.82	1.587	0.478	0.207	1394.82	3629	109.86	0.00084	0.010915	1435	145
1.446	394.7	1.587	0.509	0.232	2137.74	3629	88.53	0.00094	0.006485	1136	169
R410A											
2.041	324.03	1.587	0.53	0.269	2081.02	4950	182.03	0.00098	0.01224	1091	143

0.842	324.03	1.588	0.249	0.142	2078.15	4950	183.11	0.00098	0.01231	1091	143
6	443.02	1.587	0.646	0.466	1714.52	4950	194.14	0.00094	0.015215	1213	137
5.493	454.96	1.587	0.647	0.444	1845.7	4950	189.55	0.00095	0.01401	1167	139
3.987	370.41	1.587	0.614	0.401	1725.32	4950	193.96	0.00094	0.015115	1209	137
2.526	370.41	1.588	0.385	0.298	1718.31	4950	195.07	0.00094	0.015235	1209	137
0.589	137.62	1.587	0.508	0.258	1695.22	4950	195.64	0.00094	0.01544	1218	136
0.191	137.63	1.588	0.265	0.176	1847.28	4950	191.06	0.00096	0.01408	1163	139
0.82	173.07	1.587	0.556	0.322	2018.57	4950	183.96	0.00097	0.012655	1110	142
0.325	173.07	1.588	0.306	0.225	2017.8	4950	184.89	0.00097	0.012715	1109	142
3.262	264.23	1.587	0.9999	0.822	1669.72	4950	198.21	0.00093	0.015755	1220	136
2.847	264.23	1.588	0.793	0.492	1663.1	4950	195.43	0.00094	0.01568	1232	136
2.764	270.98	1.587	0.959	0.806	2078.14	4950	179.69	0.000975	0.01211	1094	144
2.156	270.98	1.588	0.782	0.523	2072.79	4950	181.04	0.00098	0.01222	1095	143
7.245	434.13	1.587	0.965	0.824	1850.3	4950	187.57	0.00095	0.013855	1167	139
6.19	434.13	1.588	0.801	0.559	1835.01	4950	189.25	0.00095	0.01406	1171	139
4.617	337.33	1.587	0.9999	0.831	1821.44	4950	195.55	0.00094	0.01455	1134	140
3.833	337.33	1.588	0.8	0.485	1811.9	4950	190.19	0.00095	0.01426	1178	138
6.938	457.24	1.587	0.995	0.849	2032.23	4950	181.16	0.00097	0.01244	1109	143
5.969	457.24	1.588	0.825	0.574	2017.35	4950	182.81	0.00097	0.01261	1112	142
5.165	468.01	1.588	0.817	0.526	2180.13	4950	177.33	0.00099	0.011525	1065	145
6.045	376.33	1.587	0.968	0.819	1738.62	4950	191.45	0.00094	0.01485	1206	137
5.212	376.33	1.588	0.795	0.545	1725.97	4950	193.1	0.00094	0.015055	1209	137
1.222	164.7	1.587	0.9999	0.828	1817.49	4950	192.77	0.00094	0.014305	1169	139
0.952	164.7	1.588	0.799	0.488	1815.41	4950	189.99	0.00095	0.01421	1177	138
1.039	166.75	1.587	0.9999	0.886	2202.67	4950	181.67	0.00098	0.01163	1028	146
0.646	166.75	1.588	0.833	0.528	2201.02	4950	176.46	0.00099	0.011365	1058	146
3.678	348.56	1.587	0.9999	0.838	2297.6	4950	176.75	0.00099	0.010945	1021	148
2.931	348.56	1.588	0.811	0.527	2290.22	4950	173.52	0.001	0.010855	1035	147
5.597	394.91	1.587	0.9999	0.842	1935.37	4950	191.55	0.00095	0.01358	1098	142
4.571	394.91	1.588	0.813	0.508	1923.55	4950	186.22	0.00096	0.013325	1141	140
5.295	402.26	1.587	0.9999	0.844	2104.08	4950	185.29	0.00097	0.0123	1055	144
4.227	402.26	1.588	0.815	0.514	2093.04	4950	180.34	0.00098	0.012085	1090	144
4.958	409	1.587	0.9999	0.838	2264.82	4950	178.45	0.000985	0.01119	1024	147
3.868	409	1.588	0.809	0.513	2254.57	4950	174.8	0.000995	0.011065	1045	147
1.378	256.03	1.587	0.464	0.183	1771.87	4950	193.27	0.00095	0.01472	1190	137
0.57	256.03	1.588	0.163	0.064	1770.37	4950	194.44	0.00095	0.01481	1190	137
2.098	319.87	1.587	0.513	0.253	1860.55	4950	189.8	0.00096	0.01392	1160	139
0.849	319.87	1.588	0.233	0.129	1857.61	4950	190.98	0.00096	0.014005	1160	139
2.572	374.66	1.587	0.511	0.254	1993.5	4950	185.18	0.00097	0.012865	1117	142

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1.141	374.66	1.588	0.235	0.132	1989.77	4067	186.36	0.00097	0.01295	1118	142
4.477	277.04	1.588	0.881	0.604	1027.45	4067	162.92	0.00087	0.01983	1770	131
4.382	310.29	1.588	0.868	0.576	1209.26	4067	156.08	0.000895	0.01665	1641	136
4.418	315.35	1.588	0.844	0.512	1207.27	4067	156.16	0.00089	0.016685	1642	136
6.299	388.94	1.588	0.896	0.614	1302.2	4067	152.76	0.00091	0.01537	1583	138
6.532	391.49	1.588	0.886	0.589	1265.27	4067	154.1	0.0009	0.01587	1606	137
7.004	350.96	1.587	0.97	0.793	986.91	4067	164.57	0.00087	0.02073	1803	130
6.269	350.96	1.588	0.766	0.479	970.82	4067	165.2	0.00087	0.021085	1815	130
7.365	348.86	1.587	0.964	0.781	942.11	4067	166.36	0.00086	0.021775	1841	129
6.553	348.86	1.588	0.754	0.459	925.24	4067	167.02	0.00086	0.022185	1855	128
9.801	469.51	1.587	0.9999	0.839	1285.79	4067	153.66	0.0009	0.015645	1591	137
8.279	469.51	1.588	0.814	0.528	1264.75	4067	154.16	0.0009	0.01589	1608	137
4.865	270.02	1.587	0.948	0.749	989.36	4067	164.41	0.00087	0.02064	1800	130
3.793	270.02	1.588	0.72	0.415	979.76	4067	164.77	0.00087	0.02084	1807	130
3.898	290.21	1.587	0.946	0.751	1373.11	4067	150.16	0.00091	0.01447	1541	140
2.751	290.21	1.588	0.722	0.422	1365.67	4067	150.4	0.00091	0.014545	1545	139
3.64	232.44	1.587	0.915	0.651	998.36	4067	164.02	0.00087	0.02042	1791	130
2.076	232.44	1.588	0.613	0.27	991.74	4067	164.25	0.00087	0.020555	1796	130
1.177	135.71	1.587	0.916	0.683	1131.19	4067	158.88	0.00089	0.01785	1692	134
0.646	135.71	1.588	0.648	0.299	1129.54	4067	158.94	0.000885	0.017875	1692	134
0.879	120.62	1.587	0.9999	0.931	1026.66	4067	164.79	0.00087	0.02004	1730	132
0.86	120.62	1.588	0.911	0.637	1025.3	4067	162.91	0.00087	0.01982	1769	131
0.694	113.3	1.588	0.901	0.615	1014.37	4067	163.32	0.00087	0.020045	1778	131
10.954	438.38	1.587	0.968	0.764	1037.43	4067	162.7	0.00087	0.01971	1765	132
8.421	438.38	1.588	0.733	0.417	1014.25	4067	163.56	0.00087	0.02017	1782	131
12.612	458.82	1.587	0.967	0.777	986.08	4067	164.75	0.00087	0.020835	1806	130
10.059	458.82	1.588	0.75	0.451	959.1	4067	165.77	0.000865	0.02143	1828	130
7.17	459.87	1.588	0.723	0.394	1182.24	4067	157.16	0.00089	0.0171	1660	135
7.276	465.08	1.588	0.762	0.461	1289.16	4067	153.26	0.0009	0.01555	1592	137
7.086	392.77	1.587	0.995	0.81	1301.66	4067	152.79	0.000905	0.015385	1584	138
5.564	392.77	1.588	0.781	0.478	1287.02	4067	153.29	0.0009	0.015565	1593	137
7.836	385.9	1.587	0.986	0.792	1135.83	4067	158.88	0.000885	0.01785	1692	134
6.421	385.9	1.588	0.763	0.454	1119.38	4067	159.48	0.00088	0.018125	1703	133
7.787	364.66	1.587	0.97	0.782	1039.37	4067	162.54	0.000875	0.01963	1762	132
6.475	364.66	1.588	0.753	0.452	1023.05	4067	163.15	0.00087	0.019955	1773	131
3.963	253.66	1.587	0.948	0.761	1063.84	4067	161.5	0.00088	0.0191	1741	132
3.13	253.66	1.588	0.732	0.438	1056.07	4067	161.79	0.00088	0.01924	1747	132
1.554	163.35	1.587	0.984	0.87	1089.99	4067	160.45	0.00088	0.01858	1721	133
1.467	163.35	1.588	0.848	0.568	1087.16	4067	160.55	0.00088	0.018635	1723	133
1.262	149.9	1.587	0.946	0.755	1265.69	4067	153.94	0.0009	0.01581	1603	137
0.743	149.9	1.588	0.724	0.398	1263.8	4067	154	0.0009	0.01583	1604	137
3.819	408.11	1.587	0.474	0.21	1069.74	4067	161.26	0.00088	0.01898	1736	132
1.559	408.11	1.588	0.192	0.104	1063.91	4067	161.45	0.00088	0.01907	1740	132
3.826	412.14	1.587	0.471	0.204	1075.96	4067	161.03	0.00088	0.018865	1732	132
1.498	412.14	1.588	0.186	0.096	1070.13	4067	161.21	0.00088	0.01895	1735	132
1.175	219.99	1.587	0.488	0.231	1203.88	4067	156.19	0.00089	0.01669	1642	136
0.646	163.28	1.587	0.472	0.202	1191.48	4067	156.63	0.00089	0.016875	1651	135
0.702	159.65	1.587	0.492	0.25	1141.44	4067	158.49	0.00089	0.017675	1684	134
1.659	263.95	1.587	0.468	0.188	1040.05	4067	162.35	0.00088	0.01953	1758	132
0.644	263.95	1.588	0.168	0.079	1038.07	4067	162.41	0.00088	0.019565	1759	132
1.595	233.13	1.587	0.501	0.246	1100.07	4067	160.06	0.00088	0.018395	1713	133
0.592	233.13	1.588	0.227	0.127	1098.09	4067	160.12	0.00088	0.018425	1714	133
4.029	411.39	1.587	0.506	0.22	1085.52	4067	160.67	0.00088	0.018695	1725	133
1.734	411.39	1.588	0.2	0.102	1079.25	4067	160.87	0.00088	0.018785	1729	132
3.603	403.22	1.587	0.502	0.239	1210.01	4067	156.02	0.000895	0.01662	1639	136
1.61	403.22	1.588	0.221	0.124	1204.39	4067	156.19	0.00089	0.016695	1642	136
4.37	460.74	1									

1.193	334.11	1.588	0.252	0.158	1366.04	4067	150.35	0.00091	0.01453	1544	139
3.189	346.82	1.587	0.501	0.231	1080.24	4067	160.85	0.00088	0.018775	1729	132
1.328	346.82	1.588	0.211	0.111	1075.41	4067	161	0.00088	0.01885	1731	132
0.808	162	1.587	0.48	0.209	934.12	4067	166.49	0.00086	0.02186	1843	129
0.859	160.47	1.587	0.491	0.236	1030	4067	162.72	0.00087	0.019725	1765	131
0.749	164.75	1.587	0.515	0.255	1320.61	4067	151.95	0.00091	0.015085	1570	138
1.762	268.43	1.587	0.496	0.235	1233.95	4067	155.1	0.0009	0.016255	1623	136
0.65	268.43	1.588	0.217	0.127	1231.78	4067	155.16	0.0009	0.01628	1625	136
1.739	268.28	1.587	0.496	0.234	1232.45	4067	155.15	0.0009	0.016275	1625	136
0.666	268.28	1.588	0.216	0.126	1230.25	4067	155.22	0.0009	0.016305	1626	136

APPENDIX B

Evaporation pressure drop of NIST in micro-fin tube(file: nist_eva.in)

ΔP (kPa)	mass flux(kg/m ² s)	z(m)	x_{in}	x_{out}	P_{in} (kPa)	P_e (kPa)	h_g (kJ/kg)	v_f (m ³ /kg)	v_g (m ³ /kg)	μ (x10 ⁻⁷ , N/ms ²)	μ (x10 ⁻⁷ , N/ms ²)
R32/R134a (25/75)											
2.594	324.326	1.587	0.0568	0.1422	563.083	5577.7	230.738	0.000826	0.051729	2237.85	114.58
7.9222	324.326	1.588	0.1569	0.3559	556.132	5469.2	226.351	0.000822	0.051382	2265.35	114.71
2.6137	325.018	1.587	0.0561	0.1413	564.55	5578.7	230.689	0.000826	0.051597	2235.55	114.62
8.0532	325.018	1.588	0.1559	0.3547	557.751	5470.3	226.303	0.000823	0.051239	2262.7	114.74
2.598	322.07	1.587	0.0572	0.1438	564.017	5576.9	230.656	0.000826	0.051628	2236.45	114.62
2.5556	324.6	1.587	0.0565	0.142	564.454	5577.9	230.676	0.000826	0.051604	2235.8	114.62
2.5276	325.209	1.587	0.0563	0.1415	565.406	5577.9	230.639	0.000826	0.051519	2234.35	114.64
7.978	325.209	1.588	0.1561	0.3549	558.528	5470.3	226.262	0.000823	0.051173	2261.7	114.76
2.6536	320.875	1.587	0.0588	0.1458	562.715	5575.7	230.665	0.000826	0.05174	2238.65	114.58
8.1566	320.875	1.588	0.1607	0.3632	555.861	5466.2	226.206	0.000822	0.051368	2266.2	114.71
2.7395	311.963	1.587	0.0606	0.1484	545.557	5573.7	231.483	0.000824	0.053365	2264.75	114.14
7.749	311.963	1.588	0.1632	0.3672	538.58	5463.2	226.964	0.00082	0.052986	2293.1	114.25
2.5918	315.108	1.587	0.0592	0.1455	546.796	5575.7	231.485	0.000824	0.053255	2262.55	114.17
7.7361	315.108	1.588	0.1601	0.3607	539.973	5466.3	227.033	0.00082	0.052888	2290.5	114.27
2.6801	314.096	1.587	0.0598	0.1464	546.572	5574.9	231.474	0.000824	0.053272	2263.05	114.15
7.8281	314.096	1.588	0.1609	0.3623	539.642	5465.2	227.016	0.00082	0.05291	2291.2	114.27
2.6514	312.248	1.587	0.0608	0.1485	546.308	5573.7	231.435	0.000824	0.053284	2263.55	114.15
7.9104	312.248	1.588	0.1632	0.367	539.443	5463.2	226.924	0.00082	0.052905	2291.8	114.27
2.5848	314.357	1.587	0.0601	0.1467	546.584	5574.7	231.465	0.000824	0.053269	2263.05	114.16
7.8073	314.357	1.588	0.1613	0.3629	539.538	5465.2	227.008	0.00082	0.052926	2291.55	114.27
2.5012	314.845	1.587	0.0597	0.1457	547.005	5575.7	231.461	0.000824	0.053228	2262.25	114.17
7.6661	314.845	1.588	0.1603	0.3608	540.186	5466.3	227.017	0.00082	0.052863	2290.2	114.29
2.4912	313.769	1.587	0.06	0.1466	547.05	5574.9	231.44	0.000824	0.053218	2262.2	114.18
7.7834	313.769	1.588	0.1612	0.3624	540.187	5465.2	226.982	0.00082	0.052856	2290.35	114.29
2.7084	315.278	1.587	0.0595	0.1453	547.261	5575.7	231.461	0.000824	0.053213	2261.95	114.18
7.8806	315.278	1.588	0.1599	0.3597	540.322	5466.2	227.035	0.00082	0.052863	2290	114.29
2.7321	314.436	1.587	0.0597	0.1457	547.576	5575.7	231.434	0.000824	0.053176	2261.4	114.18
8.1715	314.436	1.588	0.1603	0.3604	540.713	5466.2	227	0.00082	0.052823	2289.45	114.29
9.6668	311.373	1.587	0.1313	0.3543	551.52	5477.6	227.526	0.000822	0.052116	2271.1	114.49
12.929	311.373	1.588	0.3785	0.5204	532.987	5402.9	222.688	0.000817	0.052609	2320.05	114.36
6.9809	311.105	1.587	0.1313	0.3557	551.77	5476.9	227.495	0.000822	0.052089	2270.85	114.49
13.0252	311.105	1.588	0.3801	0.5236	533.176	5401.9	222.62	0.000817	0.052578	2319.85	114.37
7.1081	310.628	1.587	0.1312	0.3558	551.67	5476.9	227.505	0.000822	0.052108	2271.1	114.49
13.0887	310.628	1.588	0.3802	0.525	532.846	5400.9	222.624	0.000817	0.052616	2320.7	114.36
6.9467	311.283	1.587	0.1313	0.3559	551.235	5476.6	227.524	0.000822	0.052147	2271.75	114.49
12.8193	311.283	1.588	0.3803	0.5251	532.276	5400.9	222.647	0.000816	0.052668	2321.5	114.34
6.9522	311.453	1.587	0.1309	0.355	552.233	5477.6	227.491	0.000822	0.052054	2270.15	114.51
12.7987	311.453	1.588	0.3794	0.5235	533.402	5401.9	222.621	0.000817	0.052557	2319.45	114.38
7.0284	311.849	1.587	0.1314	0.3554	551.595	5476.9	227.51	0.000822	0.052115	2271.15	114.49
12.9963	311.849	1.588	0.3798	0.524	532.755	5400.9	222.646	0.000817	0.052629	2320.75	114.35
6.899	311.937	1.587	0.1307	0.3543	552.879	5477.6	227.465	0.000822	0.051983	2268.95	114.53
13.0589	311.937	1.588	0.3786	0.5225	534.492	5401.9	222.59	0.000817	0.052455	2317.6	114.4
7.0366	311.399	1.587	0.1321	0.3583	551.995	5475.6	227.436	0.000822	0.052058	2270.7	114.51
13.1721	311.399	1.588	0.383	0.5292	533.275	5398.9	222.517	0.000817	0.052551	2320.2	114.38
4.7348	313.927	1.587	0.0985	0.2498	547.771	5533.6	230.023	0.000823	0.052947	2268	114.25
10.6837	313.927	1.588	0.2687	0.436	534.677	5443.6	225.453	0.000818	0.053103	2307.55	114.23
4.9364	313.321	1.587	0.0991	0.2512	548.054	5532.9	229.978	0.000823	0.05291	2267.7	114.26
10.9715	313.321	1.588	0.2701	0.4377	535.207	5442.6	225.386	0.000818	0.053039	2306.85	114.24
4.7758	313.694	1.587	0.0979	0.2468	546.558	5534.9	230.139	0.000823	0.053074	2269.65	114.21
10.8586	313.694	1.588	0.2654	0.431	533.809	5445.6	225.611	0.000818	0.053223	2308.7	114.19
4.8489	314.688	1.587	0.0977	0.2465	547.302	5535.6	230.112	0.000823	0.053007	2268.5	114.24
10.8029	314.688	1.588	0.2651	0.4298	534.391	5446.6	225.604	0.000818	0.053168	2307.65	114.21
4.778	313.772	1.587	0.0976	0.2454	546.242	5535.9	230.18	0.000823	0.053108	2269.95	114.21
10.7748	313.772	1.588	0.2638	0.4281	533.634	5446.6	225.678	0.000818	0.053247	2308.65	114.18
5.2195	362.625	1.587	0.0813	0.2203	560.841	5549.6	230.124	0.000825	0.051928	2246.7	114.53
12.8808	362.625	1.588	0.2387	0.4114	546.165	5455.5	225.732	0.00082	0.052314	2289.35	114.44
5.1709	364.368	1.587	0.0797	0.2176	562.015	5550.9	230.129	0.000825	0.051828	2244.7	114.56
12.6081	364.368	1.588	0.2359	0.4068	547.534	5457.5	225.76	0.00082	0.052188	2286.55	114.47
5.3029	363.569	1.587	0.0807	0.2196	561.303	5549.9	230.125	0.000825	0.051893	2246.1	114.54
12.5892	363.569	1.588	0.238	0.4099	546.427	5456.6	225.743	0.00082	0.052279	2288.65	114.45
5.1491	363.733	1.587	0.0805	0.2192	561.493	5549.9	230.118	0.000825	0.051869	2245.6	114.55
12.6584	363.733	1.588	0.2376	0.4094	546.856	5456.5	225.734	0.00082	0.052241	2287.9	114.46
5.1537	364.105	1.587	0.0801	0.2174	561.374	5550.9	230.16	0.000825	0.051886	2245.65	114.54
12.6342	364.105	1.588	0.2356	0.4058	546.875	5458.6	225.811	0.00082	0.052256	2287.55	114.46
5.2878	363.983	1.587	0.0801	0.2174	560.873	5550.9	230.186	0.000825	0.051936	2246.45	114.53
12.8307	363.983	1.588	0.2356	0.4059	546.396	5457.5	225.836	0.00082	0.052311	2288.5	114.44
7.4301	363.724	1.587	0.1049	0.295	559.002	5511.1	228.775	0.000824	0.051869	2256.15	114.56
14.764	363.724	1.588	0.3168	0.444	538.545	5440	224.585	0.000818	0.052773	2308	114.32
7.4369	365.564	1.587	0.1038	0.2931	560.377	5512.1	228.753	0.000824	0.051755	2254.05	114.59
14.6352	365.564	1.588	0.3147	0.4411	539.803	5440.9	224.59	0.000818	0.052664	2305.75	114.35
7.4301	364.375	1.587	0.1048	0.295	559.909	5511.9	228.735	0.000824	0.051789	2254.9	114.58
14.6759	364.375	1.588	0.3168	0.4441	539.166	5439.9	224.556	0.000818	0.052715	2307.05	114.33
7.3661	364.381	1.587	0.1048	0.2948	559.972	5511.9	228.732	0.000824	0.051783	2254.7	114.59
14.5407	364.381	1.588	0.3166	0.4439	539.342	5439.9	224.547	0.000818	0.052691	2306.65	114.34
7.3757	364.701	1.587	0.1045	0.2944	560.302	5512.1	228.728	0.000824	0.051753	2254.15	114.59
14.5808	364.701	1.588	0.3162	0.4436	539.642	5439.9	224.545	0.000818	0.052666	2306.15	114.35
7.4229	365.468	1.587	0.1039	0.293	560.659	5512.9	228.736	0.000824	0.051722	2253.45	114.6
14.6727	365.468	1.588	0.3146	0.4414	540.334	5440.9	224.558	0.000818	0.052605	2304.75	114.37
3.3312	361.926	1.587	0.0548	0.1363	553.574	5594.2	232.212	0.000825	0.052902	2249.95	114.26
9.8927	361.926	1.588	0.1495	0.3449	545.029	5486.1	228.008	0.000821	0.052816	2281.4	114.29
3.1785	362.568	1.587	0.0535	0.1344	553.527	5595.2	232.262	0.000825	0.052906	2249.55	114.25
9.8488	362.568	1.588	0.1474	0.3407	545.459	5488.1	228.073	0.000821	0.052786	2280.2	114.31
3.1537	362.463	1.587	0.0537	0.134	552.088	5595.2	232.341	0.000825	0.05305	2251.85	114.21
9.7226	362.463	1.588	0.1471	0.3391	543.808	5489.2	228.185	0.000821	0.		

3.435	363.807	1.588	0.1639	0.4052	778.115	3629	129.1171	0.00077	0.02047	1897.9	127.46
3.1873	364.769	1.588	0.1598	0.3961	780.729	3629	129.0224	0.000771	0.020396	1894.95	127.54
3.4912	365.231	1.588	0.1592	0.3944	780.916	3629	129.0214	0.000771	0.020394	1894.9	127.54
1.3072	366.093	1.587	0.037	0.1292	790.464	3629	128.6855	0.000772	0.020136	1884.35	127.83
3.1363	366.093	1.588	0.1541	0.3852	786.184	3629	128.8331	0.000771	0.020249	1888.95	127.71
1.465	365.091	1.587	0.044	0.14	778.353	3629	129.1111	0.00077	0.020465	1897.75	127.46
3.5223	365.091	1.588	0.1664	0.4106	773.556	3629	129.2765	0.00077	0.020595	1903	127.32
3.4707	365.329	1.588	0.1646	0.4062	772.99	3629	129.2965	0.00077	0.02061	1903.65	127.31
3.7767	363.705	1.588	0.1746	0.438	775.16	3629	129.2257	0.00077	0.020554	1901.3	127.37
3.4085	364.865	1.588	0.1682	0.4188	778.084	3629	129.1201	0.00077	0.020473	1898.05	127.46
3.5226	367.327	1.588	0.1634	0.4058	781.091	3629	129.0154	0.000771	0.020391	1894.75	127.55
2.7033	363.683	1.587	0.108	0.3152	786.285	3629	128.9195	0.000771	0.020315	1891.7	127.62
2.7327	364.68	1.587	0.1068	0.3131	787.739	3629	128.8687	0.000771	0.020276	1890.15	127.67
5.8202	364.68	1.588	0.3331	0.5148	777.802	3629	129.1588	0.00077	0.020502	1899.2	127.43
2.6652	365.215	1.587	0.1066	0.3119	787.947	3629	128.8617	0.000771	0.020271	1889.95	127.68
5.9081	365.215	1.588	0.332	0.5138	778.036	3629	129.1518	0.00077	0.020496	1899	127.43
2.7271	364.991	1.587	0.1072	0.3134	787.459	3629	128.8796	0.000771	0.020284	1890.45	127.67
5.9523	364.991	1.588	0.3337	0.5169	777.486	3629	129.1718	0.00077	0.020512	1899.65	127.42
2.7051	365.29	1.587	0.1075	0.3149	788.266	3629	128.8527	0.000771	0.020263	1889.6	127.68
5.922	365.29	1.588	0.3351	0.5181	778.276	3629	129.1429	0.00077	0.020489	1898.7	127.44
2.7712	364.41	1.587	0.1091	0.3182	786.555	3629	128.9135	0.000771	0.02031	1891.55	127.63
6.2509	364.41	1.588	0.3388	0.5253	776.404	3629	129.2126	0.00077	0.020544	1900.95	127.38
2.6878	363.474	1.587	0.1096	0.3204	787.399	3629	128.8836	0.000771	0.020287	1890.55	127.66
6.1163	363.474	1.588	0.3412	0.5289	777.323	3629	129.1778	0.00077	0.020517	1899.85	127.41
2.6801	363.533	1.587	0.1092	0.3194	787.851	3629	128.8677	0.000771	0.020275	1890.1	127.67
6.0699	363.533	1.588	0.3401	0.5277	777.747	3629	129.1638	0.00077	0.020505	1899.35	127.43
2.6907	364.695	1.587	0.109	0.3187	787.861	3629	128.8677	0.000771	0.020276	1890.1	127.67
6.0272	364.695	1.588	0.3392	0.5253	777.718	3629	129.1638	0.00077	0.020506	1899.4	127.42
2.6917	364.364	1.587	0.1082	0.3175	788.299	3629	128.8547	0.000771	0.020265	1889.7	127.68
6.0155	364.364	1.588	0.338	0.5238	778.06	3629	129.1528	0.00077	0.020497	1899.05	127.43
4.4998	364.793	1.587	0.1745	0.4942	787.44	3629	128.9908	0.000771	0.02037	1893.9	127.57
4.463	365.152	1.587	0.1743	0.4931	788.2	3629	128.9689	0.000771	0.020353	1893.25	127.59
4.9041	316.351	1.588	0.5725	0.6699	773.78	3629	129.3013	0.00077	0.020615	1903.8	127.3
5	316.693	1.588	0.5718	0.6692	774.599	3629	129.2724	0.00077	0.020592	1902.9	127.33
5.0092	316.893	1.588	0.5706	0.6683	775.664	3629	129.2355	0.00077	0.020562	1901.7	127.36
5.002	313.461	1.588	0.5837	0.6882	772.791	3629	129.3352	0.00077	0.020641	1904.9	127.28
5.0464	313.362	1.588	0.5834	0.6876	773.121	3629	129.3222	0.00077	0.020631	1904.45	127.29
5.052	314.355	1.588	0.5806	0.683	773.87	3629	129.2953	0.00077	0.02061	1903.65	127.31
4.9856	313.739	1.588	0.5824	0.6856	773.703	3629	129.3013	0.00077	0.020615	1903.8	127.31
4.9584	314.544	1.588	0.5822	0.6847	774.026	3629	129.2913	0.00077	0.020607	1903.5	127.31
5.0067	363.184	1.588	0.4739	0.5955	776.707	3629	129.2801	0.00077	0.020598	1903.15	127.32
5.019	364.127	1.588	0.4724	0.593	778.433	3629	129.2173	0.00077	0.020548	1901.15	127.38
4.0549	362.19	1.587	0.1289	0.448	787.724	3629	128.8359	0.000771	0.020251	1889.1	127.69
6.8006	362.19	1.588	0.4797	0.6053	775.169	3629	129.3349	0.00077	0.02064	1904.85	127.28
4.1019	362.268	1.587	0.1272	0.4461	788.506	3629	128.806	0.000771	0.020228	1888.15	127.73
6.7592	362.268	1.588	0.4778	0.6025	776.123	3629	129.2981	0.00077	0.020611	1903.75	127.31
4.1323	362.501	1.587	0.1279	0.4468	788.556	3629	128.807	0.000771	0.020229	1888.2	127.73
6.7027	362.501	1.588	0.4784	0.6027	775.998	3629	129.305	0.00077	0.020617	1903.95	127.3
4.0428	363.25	1.587	0.1272	0.4456	788.4	3629	128.812	0.000771	0.020233	1888.3	127.71
6.6791	363.25	1.588	0.4772	0.601	775.763	3629	129.313	0.00077	0.020624	1904.2	127.29

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8.1034	362.133	1.588	0.1352	0.3841	358.152	4067	194.6257	0.000784	0.057855	2678.4	111.89
9.0908	361.78	1.588	0.1364	0.3871	358.591	4067	194.5908	0.000784	0.057765	2676.95	111.92
8.4732	363.265	1.588	0.1339	0.3786	359.088	4067	194.5688	0.000784	0.05771	2676.05	111.93
8.6217	363.389	1.588	0.1343	0.3775	359.345	4067	194.5479	0.000784	0.057662	2675.15	111.94
8.1164	363.217	1.588	0.1345	0.3812	359.687	4067	194.522	0.000784	0.057597	2674.15	111.96
9.172	364.325	1.588	0.1342	0.3829	358.869	4067	194.5838	0.000784	0.05775	2676.6	111.92
8.7997	364.693	1.588	0.1355	0.3851	360.474	4067	194.492	0.000784	0.057524	2672.9	111.97
7.963	365.52	1.588	0.1321	0.3743	360.701	4067	194.4581	0.000784	0.057443	2671.5	112
8.3401	361.051	1.588	0.1384	0.3871	354.692	4067	194.8491	0.000783	0.058418	2687.75	111.76
7.6158	361.047	1.588	0.0886	0.3096	358.496	4067	194.5451	0.000784	0.057657	2675.05	111.94
10.7649	362.901	1.588	0.1358	0.3769	355.605	4067	194.7883	0.000783	0.058262	2685.2	111.79
6.2974	315.328	1.588	0.1402	0.3681	355.735	4067	194.6987	0.000783	0.058037	2681.3	111.84
6.1956	315.909	1.588	0.1399	0.3669	356.427	4067	194.6528	0.000784	0.057922	2679.55	111.87
6.1615	316.349	1.588	0.1392	0.3679	356.093	4067	194.6778	0.000784	0.057985	2680.55	111.85
6.2447	317.198	1.588	0.1386	0.3649	357.468	4067	194.583	0.000784	0.057752	2676.6	111.91
5.8791	317.266	1.588	0.1378	0.3641	356.825	4067	194.6299	0.000784	0.057867	2678.55	111.89
5.9153	317.429	1.588	0.1381	0.3649	357.778	4067	194.5661	0.000784	0.05771	2675.95	111.92
6.9677	316.713	1.588	0.1391	0.3658	357.74	4067	194.57	0.000784	0.05772	2676.1	111.92
6.5576	317.938	1.588	0.1387	0.366	358.095	4067	194.5501	0.000784	0.057669	2675.25	111.93
9.0738	315.098	1.588	0.2361	0.3997	352.146	4067	194.9868	0.000783	0.058763	2693.45	111.67
9.1847	311.419	1.588	0.241	0.4093	351.808	4067	195.0087	0.000783	0.058818	2694.35	111.65
8.9015	316.832	1.588	0.2357	0.3995	352.971	4067	194.93	0.000783	0.05862	2691.1	111.71
8.939	312.2	1.588	0.2424	0.4107	352.547	4067	194.9649	0.000783	0.058706	2692.6	111.68
8.975	316.308	1.588	0.2374	0.4021	353.808	4067	194.8791	0.000783	0.058492	2688.95	111.74
3.2616	306.88	1.587	0.0494	0.1924	366.013	4067	193.9609	0.000785	0.056232	2651	112.29
8.8675	306.88	1.588	0.2108	0.3694	356.665	4067	194.7304	0.000783	0.058116	2682.75	111.82
8.9032	312.551	1.588	0.2432	0.4116	353.243	4067	194.916	0.000783	0.058586	2690.55	111.71
9.0857	317.046	1.588	0.2382	0.403	355.252	4067	194.7844	0.000783	0.058253	2685	111.79
8.7689	312.198	1.588	0.242	0.4108	354.134	4067	194.8572	0.000783	0.058437	2688.1	111.74
8.938	316.739	1.588	0.2378	0.4028	354.729	4067	194.8222	0.000783	0.058345	2686.55	111.77
9.2485	316.288	1.588	0.2476	0.427	358.884	4067	194.5649	0.000784	0.057703	2675.85	111.93
9.5538	313.804	1.588	0.2514	0.4354	359.042	4067	194.5609	0.000784	0.057692	2675.7	111.93
9.1923	320.47	1.588	0.2412	0.4173	360.747	4067	194.4462	0.000784	0.05741	2671	112
9.192	312.413	1.588	0.2497	0.4325	357.868	4067	194.6267	0.000784	0.057859	2678.5	111.89
9.2811	318.935	1.588	0.2406	0.4165	359.448	4067	194.53	0.000784	0.057619	2674.5	111.94
9.3793	314.314	1.588	0.2483	0.4305	358.963	4067	194.5668	0.000784	0.057708	2675.95	111.93
9.4903	309.753	1.588	0.2546	0.4435	357.139	4067	194.6786	0.000783	0.057988	2680.6	11

10.7127	362.879	1.588	0.1807	0.3418	362.263	4067	194.446	0.000784	0.057407	2671.05	111.99
10.8475	364.893	1.588	0.2196	0.3982	359.98	4067	194.5617	0.000784	0.057693	2675.75	111.93
11.1095	361.8	1.588	0.2238	0.4065	357.619	4067	194.7183	0.000783	0.058084	2682.3	111.83
10.7649	361.852	1.588	0.2234	0.4062	357.408	4067	194.7293	0.000783	0.058114	2682.8	111.82
10.8505	361.351	1.588	0.2249	0.408	357.164	4067	194.7432	0.000783	0.058146	2683.35	111.82
10.6628	362.459	1.588	0.221	0.4009	356.362	4067	194.7961	0.000783	0.05828	2685.55	111.79
11.2227	360.774	1.588	0.2239	0.4061	356.792	4067	194.7682	0.000783	0.058212	2684.45	111.81
10.9766	361.904	1.588	0.2247	0.406	357.036	4067	194.7632	0.000783	0.058195	2684.2	111.81
11.1615	362.414	1.588	0.2234	0.4048	357.753	4067	194.7113	0.000783	0.058067	2682.05	111.84
6.1132	363.365	1.587	0.0847	0.294	380.543	4067	193.6481	0.000786	0.055479	2638.6	112.48
14.7093	363.365	1.588	0.3087	0.4565	354.118	4067	195.0313	0.000783	0.058874	2695.4	111.64
6.0113	363.054	1.587	0.0852	0.2954	380.809	4067	193.6263	0.000786	0.055426	2637.7	112.5
14.6505	363.054	1.588	0.3101	0.4589	354.608	4067	194.9954	0.000783	0.058784	2694	111.66
5.9975	360.953	1.587	0.0864	0.2986	380.288	4067	193.6681	0.000786	0.055525	2639.4	112.46
14.4862	360.953	1.588	0.3137	0.4652	353.758	4067	195.0542	0.000782	0.058931	2696.4	111.63
6.0168	360.87	1.587	0.0867	0.2992	380.848	4067	193.6342	0.000786	0.055446	2638.05	112.49
14.5186	360.87	1.588	0.3143	0.4664	354.306	4067	195.0173	0.000783	0.058836	2694.85	111.65
6.0921	359.803	1.587	0.0566	0.2563	381.329	4067	193.1616	0.000787	0.054361	2618.85	112.78
14.617	359.803	1.588	0.2805	0.4223	362.495	4067	194.608	0.000784	0.057799	2677.9	111.9
6.0115	361.519	1.587	0.0867	0.2997	381.476	4067	193.5963	0.000786	0.055356	2636.5	112.51
14.6441	361.519	1.588	0.3148	0.4671	354.898	4067	194.9824	0.000783	0.058748	2693.35	111.67
6.0885	363.239	1.587	0.0856	0.2975	382.431	4067	193.5345	0.000787	0.055211	2633.95	112.55
14.4741	363.239	1.588	0.3124	0.4632	355.954	4067	194.9106	0.000783	0.058567	2690.35	111.71
5.9509	363.302	1.587	0.0859	0.2971	382.433	4067	193.5216	0.000787	0.055182	2633.45	112.56
14.6539	363.302	1.588	0.3121	0.4622	356.329	4067	194.8896	0.000783	0.058512	2689.45	111.73
5.9466	361.473	1.587	0.0864	0.2989	381.51	4067	193.5854	0.000786	0.055328	2636	112.52
14.6805	361.473	1.588	0.314	0.466	355.224	4067	194.9574	0.000783	0.058687	2692.35	111.69
5.999	363.657	1.587	0.0852	0.2969	382.659	4067	193.5284	0.000787	0.055197	2633.75	112.56
14.5425	363.657	1.588	0.3118	0.4616	355.899	4067	194.9176	0.000783	0.058582	2690.7	111.71

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4.0601	361.861	1.588	0.0898	0.2353	575.824	4990	198.8643	0.00079	0.040705	2102.75	119.43
3.9966	363.208	1.588	0.0891	0.2339	575.52	4990	198.8803	0.00079	0.040728	2103.1	119.42
4.3924	364.035	1.588	0.1221	0.2794	579.533	4990	198.7088	0.00079	0.040466	2098.9	119.52
4.3124	364.332	1.588	0.122	0.2794	579.793	4990	198.6948	0.00079	0.040445	2098.55	119.54
7.0973	360.729	1.588	0.236	0.3695	579.98	4990	198.7425	0.00079	0.04052	2099.7	119.51
7.1483	361.663	1.588	0.2353	0.3689	581.622	4990	198.6677	0.00079	0.040405	2097.9	119.56
7.3091	362.178	1.588	0.2352	0.3688	581.976	4990	198.6528	0.00079	0.040383	2097.5	119.56
7.9197	364.693	1.588	0.2448	0.3906	573.969	4990	199.0297	0.000789	0.040958	2106.8	119.32
7.9958	365	1.588	0.2443	0.39	574.018	4990	199.0327	0.000789	0.040963	2106.85	119.32
7.6224	365.718	1.588	0.2434	0.3887	573.98	4990	199.0277	0.000789	0.040956	2106.7	119.32
7.4519	366.239	1.588	0.2424	0.3862	573.854	4990	199.0206	0.000789	0.040937	2108	119.28
3.4404	367.358	1.587	0.0561	0.1906	586.694	4990	198.3846	0.000791	0.039797	2090.95	119.74
7.7211	367.858	1.588	0.2068	0.343	577.468	4990	198.901	0.00079	0.040761	2103.6	119.4
3.7581	361.031	1.587	0.0622	0.2155	593.619	4990	198.0843	0.000792	0.039535	2083.65	119.92
9.1305	361.031	1.588	0.2349	0.4153	583.445	4990	198.6635	0.00079	0.040398	2097.8	119.56
3.7574	361.804	1.587	0.0615	0.2144	594.492	4990	198.0445	0.000792	0.039476	2082.7	119.94
9.1302	361.804	1.588	0.2337	0.4133	584.421	4990	198.6176	0.00079	0.040328	2096.65	119.58
3.6755	362.089	1.587	0.0618	0.2145	594.501	4990	198.0395	0.000792	0.039469	2082.55	119.95
8.9592	362.089	1.588	0.2336	0.4134	584.725	4990	198.5957	0.00079	0.040294	2096.1	119.6
3.5842	363.58	1.587	0.0604	0.212	595.956	4990	197.9786	0.000792	0.039379	2081.1	119.99
8.9774	363.58	1.588	0.2312	0.4093	585.821	4990	198.5568	0.00079	0.040235	2095.15	119.62
3.6028	363.598	1.587	0.061	0.2131	595.664	4990	197.9926	0.000792	0.0394	2081.45	119.98
8.9375	363.598	1.588	0.2324	0.411	585.383	4990	198.5767	0.00079	0.040267	2095.65	119.61
3.6146	364.456	1.587	0.0604	0.2121	596.55	4990	197.9497	0.000792	0.039338	2080.4	120.01
8.8297	364.456	1.588	0.2312	0.4089	586.583	4990	198.5149	0.000791	0.040173	2094.15	119.65
5.7453	366.099	1.587	0.0923	0.3225	596.033	4990	198.0552	0.000792	0.039493	2083	119.94
12.2161	366.099	1.588	0.3474	0.5003	579.159	4990	198.9635	0.000789	0.040855	2105.25	119.36
5.798	367.033	1.587	0.0918	0.3211	596.36	4990	198.0403	0.000792	0.03947	2082.65	119.95
12.1783	367.033	1.588	0.346	0.498	579.639	4990	198.9385	0.00079	0.040816	2104.55	119.38
5.7508	366.813	1.587	0.0922	0.3216	596.006	4990	198.0592	0.000792	0.039497	2083.1	119.93
12.1587	366.813	1.588	0.3464	0.4986	579.009	4990	198.9714	0.000789	0.040866	2105.4	119.35
5.838	367.449	1.587	0.0915	0.3197	596.091	4990	198.0532	0.000792	0.039491	2083	119.94
12.0352	367.449	1.588	0.3443	0.4958	579.276	4990	198.9525	0.000789	0.040837	2104.9	119.37
5.7648	367.409	1.587	0.0918	0.32	595.531	4990	198.0791	0.000792	0.039529	2083.6	119.93
12.1569	367.409	1.588	0.3446	0.4961	578.509	4990	198.9933	0.000789	0.040901	2105.9	119.35
5.9534	368.411	1.587	0.0911	0.3187	596.033	4990	198.0581	0.000792	0.039497	2083.05	119.94
12.2778	368.411	1.588	0.3433	0.494	579.053	4990	198.9675	0.000789	0.04086	2105.3	119.36
5.7865	368.507	1.587	0.0913	0.3184	595.651	4990	198.0731	0.000792	0.039519	2083.4	119.93
12.6853	368.507	1.588	0.343	0.4937	578.696	4990	198.9923	0.000789	0.040899	2105.85	119.35
5.8214	369.334	1.587	0.0907	0.317	595.623	4990	198.0751	0.000792	0.039521	2083.5	119.93
12.354	369.334	1.588	0.3415	0.4915	578.657	4990	198.9874	0.000789	0.040891	2105.8	119.35
5.6551	369.452	1.587	0.091	0.3173	595.395	4990	198.0841	0.000792	0.039535	2083.7	119.92
12.3517	369.452	1.588	0.3419	0.4919	578.353	4990	199.0053	0.000789	0.040918	2106.25	119.33
5.7931	370.179	1.587	0.0905	0.3173	596.207	4990	198.0502	0.000792	0.039484	2082.85	119.94
12.3387	370.179	1.588	0.342	0.4917	579.202	4990	198.9664	0.000789	0.040859	2105.25	119.36
1.7432	311.501	1.587	0.038	0.1208	586.836	4990	198.3149	0.000791	0.039875	2089.25	119.77
5.1639	311.501	1.588	0.1356	0.3587	582.715	4990	198.576	0.00079	0.040267	2095.65	119.61
4.9303	311.83	1.588	0.1356	0.359	583.725	4990	198.5252	0.000791	0.040191	2094.4	119.64
1.5084	312.588	1.587	0.0376	0.1197	588.338	4990	198.2421	0.000791	0.039769	2087.5	119.82
4.6848	312.588	1.588	0.134	0.3564	584.505	4990	198.4883	0.000791	0.040136	2093.5	119.67
4.9028	314.177	1.588	0.132	0.3519	586.19	4990	198.4115	0.000791	0.040021	2091.65	119.71
1.5691	314.122	1.587	0.0373	0.1187	589.745	4990	198.1793	0.000791	0.039676	2086	119.86
5.0711	314.122	1.588	0.1331	0.3526	585.868	4990	198.4305	0.000791	0.040048	2092.1	119.7
1.5031	314.41	1.587	0.0361	0.1169	591.534	4990	198.0995	0.000792	0.039558	2084	119.91
4.8052	314.41	1.588	0.1313	0.349	587.632	4990	198.3506	0.000791	0.039929	2090.15	119.75
4.7907	315.492	1.588	0.1308	0.3482	587.325	4990	198.3616	0.000791	0.039945	2090.4	119.74
4.8995	315.703	1.588	0.1303	0.3466	588.492	4990	198.3138	0.000791	0.039874	2089.2	119.78
1.4918	316.167	1.587	0.0361	0.116	591.68	4990	198.				

3.2752	315.08	1.587	0.0798	0.2484	595.353	4990	197.9926	0.000792	0.0394	2081.4	119.98
7.6067	315.08	1.588	0.2691	0.452	586.425	4990	198.4881	0.000791	0.040135	2093.5	119.67
5.4092	311.786	1.587	0.1226	0.3901	595.631	4990	198.0572	0.000792	0.039497	2083.1	119.94
10.8818	311.786	1.588	0.4178	0.5905	580.313	4990	198.8718	0.00079	0.040713	2102.95	119.42
5.5471	311.708	1.587	0.123	0.3919	596.057	4990	198.0423	0.000792	0.039473	2082.7	119.95
10.7509	311.708	1.588	0.4196	0.5943	580.708	4990	198.8538	0.00079	0.040685	2102.5	119.43
5.4847	311.519	1.587	0.1234	0.3929	596.677	4990	198.0084	0.000792	0.039424	2081.85	119.97
11.0305	311.519	1.588	0.4204	0.5968	581.533	4990	198.811	0.00079	0.040621	2101.45	119.46
5.3816	314.767	1.587	0.1207	0.3779	592.348	4990	198.2048	0.000791	0.039711	2086.6	119.85
10.5376	314.767	1.588	0.4046	0.5558	577.168	4990	199.0055	0.000789	0.040921	2106.25	119.33
5.4011	315.174	1.587	0.1203	0.3769	592.63	4990	198.1909	0.000791	0.03969	2086.25	119.86
10.5061	315.174	1.588	0.4036	0.5538	577.629	4990	198.9825	0.000789	0.040885	2105.65	119.35
5.4078	315.896	1.587	0.1199	0.3757	592.252	4990	198.2058	0.000791	0.039713	2086.6	119.85
10.4416	315.896	1.588	0.4021	0.5513	577.368	4990	198.9905	0.000789	0.040896	2105.85	119.35
5.4812	316.099	1.587	0.1193	0.3741	593.081	4990	198.169	0.000792	0.039661	2085.8	119.87
10.4234	316.099	1.588	0.4006	0.5488	578.045	4990	198.9596	0.000789	0.040849	2105.1	119.37
5.2833	316.191	1.587	0.1194	0.3739	593.018	4990	198.169	0.000792	0.039661	2085.8	119.87
10.404	316.191	1.588	0.4004	0.5482	578.086	4990	198.9586	0.000789	0.040847	2105.1	119.37
5.2388	316.673	1.587	0.1194	0.3742	592.927	4990	198.176	0.000792	0.039671	2085.95	119.87
10.4047	316.673	1.588	0.4007	0.5483	577.731	4990	198.9795	0.000789	0.04088	2105.65	119.36
5.3545	317.017	1.587	0.1189	0.3731	593.099	4990	198.163	0.000792	0.039651	2085.6	119.87
10.4215	317.017	1.588	0.3994	0.5461	578.436	4990	198.9366	0.000789	0.040812	2104.5	119.38

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2.8686	361.599	1.587	0.0428	0.1566	948.308	5795	309.6065	0.000963	0.039048	1508.05	117.26
7.2135	361.599	1.588	0.1725	0.3324	940.643	5795	310.1671	0.000962	0.03947	1514.25	117.09
2.7545	361.632	1.587	0.0424	0.1575	951.972	5795	309.4098	0.000963	0.038901	1505.9	117.32
7.2833	361.632	1.588	0.1736	0.3344	943.921	5795	309.9844	0.000962	0.039332	1512.25	117.13
2.8634	362.105	1.587	0.0423	0.157	954.932	5795	309.2372	0.000963	0.038774	1504.05	117.38
7.5479	362.105	1.588	0.1731	0.3332	946.987	5795	309.8197	0.000962	0.039207	1510.45	117.19
7.2316	361.615	1.588	0.2531	0.3948	944.5	5795	310.0402	0.000962	0.039372	1512.9	117.12
7.6306	361.915	1.588	0.2518	0.3936	945.017	5795	310.0102	0.000962	0.03935	1512.5	117.13
7.4453	362.006	1.588	0.2501	0.395	944.552	5795	310.0372	0.000962	0.039371	1512.85	117.12
7.4474	363.012	1.588	0.2509	0.3922	946.116	5795	309.9494	0.000962	0.039304	1511.9	117.15
7.1896	363.689	1.588	0.2511	0.3925	944.613	5795	310.0372	0.000962	0.03937	1512.85	117.12
7.1581	363.04	1.588	0.2519	0.3936	946.365	5795	309.9384	0.000962	0.039296	1511.75	117.15
7.0014	363.09	1.588	0.2515	0.3932	944.415	5795	310.0471	0.000962	0.039378	1512.95	117.12
7.2075	363.178	1.588	0.2518	0.3936	943.313	5795	310.112	0.000962	0.039427	1513.65	117.1
2.7338	315.611	1.587	0.0657	0.2087	947.881	5795	309.7519	0.000962	0.039156	1509.65	117.21
7.1944	315.611	1.588	0.2296	0.4158	938.335	5795	310.245	0.000961	0.039528	1515.1	117.06
2.9089	315.529	1.587	0.0651	0.209	950.812	5795	309.5862	0.000963	0.039032	1507.85	117.26
7.4841	315.529	1.588	0.23	0.4154	941.311	5795	310.0744	0.000962	0.039399	1513.2	117.11
3.0496	314.29	1.587	0.0662	0.2107	949.561	5795	309.659	0.000963	0.039087	1508.65	117.24
7.5855	314.29	1.588	0.2319	0.4194	939.953	5795	310.1512	0.000962	0.039457	1514.1	117.09
3.0309	313.325	1.587	0.067	0.2121	948.689	5795	309.703	0.000963	0.03912	1509.15	117.23
7.5124	313.325	1.588	0.2333	0.4215	939.236	5795	310.1981	0.000962	0.039492	1514.6	117.08
3.0631	313.269	1.587	0.0668	0.2118	949.374	5795	309.6621	0.000963	0.039089	1508.7	117.24
7.5557	313.269	1.588	0.233	0.4211	939.992	5795	310.1542	0.000962	0.039459	1514.1	117.09
2.8875	312.207	1.587	0.0673	0.2133	949.007	5795	309.685	0.000963	0.039106	1508.95	117.24
7.4325	312.207	1.588	0.2347	0.4233	939.565	5795	310.1742	0.000962	0.039475	1514.35	117.08
2.9041	314.211	1.587	0.0656	0.2098	950.959	5795	309.5732	0.000963	0.039023	1507.7	117.27
7.4008	314.211	1.588	0.2309	0.418	941.59	5795	310.0624	0.000962	0.039389	1513.05	117.12
2.8655	312.858	1.587	0.067	0.2123	949.971	5795	309.6351	0.000963	0.039069	1508.4	117.25
7.5147	312.858	1.588	0.2336	0.4224	940.355	5795	310.1353	0.000962	0.039445	1513.9	117.1
3.1211	315.148	1.587	0.0653	0.2094	952.206	5795	309.5024	0.000963	0.03897	1506.9	117.29
7.4547	315.148	1.588	0.2304	0.4167	942.916	5795	309.9815	0.000962	0.039329	1512.2	117.14
2.9035	315.783	1.587	0.0641	0.1723	951.171	5795	309.4318	0.000963	0.038917	1506.15	117.32
4.2901	314.693	1.587	0.0722	0.2678	955.879	5795	309.2291	0.000963	0.038768	1503.95	117.38
4.2007	311.373	1.587	0.074	0.2717	954.025	5795	309.3369	0.000963	0.038846	1505.15	117.35
4.2843	314.481	1.587	0.0723	0.2687	957.3	5795	309.1512	0.000964	0.038711	1503.1	117.39
4.227	313.558	1.587	0.0737	0.2717	955.56	5795	309.251	0.000963	0.038784	1504.2	117.36
4.1771	314.636	1.587	0.0724	0.2687	958.301	5795	309.0914	0.000964	0.038666	1502.4	117.42
4.2287	315.835	1.587	0.0712	0.2661	958.758	5795	309.0714	0.000964	0.03865	1502.25	117.43
4.2258	315.653	1.587	0.0716	0.2627	954.369	5795	309.3149	0.000963	0.03883	1504.85	117.35
9.6508	314.88	1.588	0.3814	0.5118	941.806	5795	310.2297	0.000961	0.039516	1514.95	117.07
5.8797	314.891	1.587	0.0967	0.3546	955.875	5795	309.2928	0.000963	0.038814	1504.65	117.36
6.0324	314.908	1.587	0.0962	0.3548	957.444	5795	309.203	0.000964	0.038749	1503.7	117.38
6.042	314.967	1.587	0.096	0.3558	959	5795	309.1212	0.000964	0.038688	1502.75	117.41
6.131	315.507	1.587	0.0958	0.3552	958.403	5795	309.1471	0.000964	0.038707	1503.05	117.4
5.7073	315.916	1.587	0.0959	0.3553	960.126	5795	309.0533	0.000964	0.038638	1502.05	117.43
5.9027	314.131	1.587	0.0965	0.3576	959.974	5795	309.0643	0.000964	0.038646	1502.1	117.43
5.7764	362.622	1.587	0.0832	0.3132	958.038	5795	309.2039	0.000964	0.038749	1503.65	117.39
11.9418	362.622	1.588	0.3384	0.4635	940.925	5795	310.3403	0.000961	0.039599	1516.15	117.03
6.0019	363.258	1.587	0.0828	0.3125	959.344	5795	309.1301	0.000964	0.038694	1502.85	117.41
12.0798	363.258	1.588	0.3378	0.4623	942.285	5795	310.2615	0.000961	0.03954	1515.3	117.06
2.3499	367.068	1.587	0.0264	0.0917	951.44	5795	309.4506	0.000963	0.038931	1506.35	117.31
6.1462	367.068	1.588	0.1099	0.2758	945.829	5795	309.782	0.000962	0.03918	1510	117.21
2.1718	367.473	1.587	0.0269	0.0914	948.04	5795	309.6433	0.000963	0.039075	1508.45	117.24
6.2799	367.473	1.588	0.1095	0.2748	942.361	5795	309.9816	0.000962	0.039328	1512.2	117.15
2.1698	361.68	1.587	0.0266	0.0926	953.09	5795	309.3548	0.000963	0.03886	1505.3	117.33
6.2774	361.68	1.588	0.1111	0.2799	947.589	5795	309.6822	0.000963	0.039105	1508.95	117.24
2.4167	361.428	1.587	0.0266	0.0927	953.94	5795	309.301	0.000963	0.038821	1504.7	117.35
6.2662	361.428	1.588	0.1112	0.2802	948.608	5795	309.6264	0.000963	0.039063	1508.3	117.26
2.3152	363.239	1.587	0.0263	0.0917	952.405	5795	309.3918	0.000963	0.038887	1505.7	117.32
6.2143	363.239	1.588	0.11	0.2774	946.957	5795	309.7162	0.000963	0.03913	1509.3	117.23
2.5148	363.33	1.587	0.0265	0.0918	951.78	5795	309.4237	0.000963	0.038911	1506.05	117.32
6.3006	363.33	1.588	0.1102	0.2776	946.432	5795	309.7501	0.000962	0.039155	1509.7	117.22
6.4773	362.117	1.588	0.1216	0.3864	940.534	5795	310.1641	0.000962	0.039466	1514.2	117.09
3.7253	362.276	1.587	0.0607	0.1925	950.222	5795					

12.062	360.433	1.588	0.3832	0.5152	937.327	5795	310.4373	0.000961	0.039672	1517.2	117
11.9249	359.701	1.588	0.3836	0.5156	934.157	5795	310.617	0.000961	0.039813	1519.15	116.94
11.8862	360.598	1.588	0.3802	0.5116	934.133	5795	310.6121	0.000961	0.039808	1519.15	116.95
11.7984	361.778	1.588	0.3774	0.5082	932.707	5795	310.6969	0.000961	0.039872	1520.1	116.92
11.8126	359.305	1.588	0.3809	0.5126	930.337	5795	310.8336	0.00096	0.039978	1521.55	116.88
11.8719	360.857	1.588	0.3784	0.5091	931.48	5795	310.7697	0.00096	0.039927	1520.85	116.9

R410A

1.211	316.815	1.587	0.0299	0.0949	914.352	4950	210.852	0.000854	0.028664	1643.45	121.84
3.291	316.815	1.588	0.1064	0.3086	911.63	4950	210.014	0.000853	0.028672	1647.9	121.82
1.314	317.068	1.587	0.0298	0.095	914.611	4950	210.844	0.000854	0.028658	1643.3	121.85
3.457	317.068	1.588	0.1065	0.309	911.741	4950	210.015	0.000853	0.028673	1647.9	121.82
1.243	317.144	1.587	0.0297	0.0941	917.507	4950	210.722	0.000854	0.028564	1640.95	121.9
3.341	317.144	1.588	0.1056	0.3062	914.854	4950	209.889	0.000853	0.02857	1645.35	121.88
1.21	316.404	1.587	0.0302	0.0936	913.522	4950	210.891	0.000854	0.02869	1644.05	121.82
3.25	316.404	1.588	0.1049	0.3027	910.759	4950	210.077	0.000853	0.028703	1648.5	121.8
1.155	316.597	1.587	0.0297	0.0931	914.084	4950	210.87	0.000854	0.028673	1643.65	121.83
3.272	316.597	1.588	0.1044	0.3019	911.322	4950	210.06	0.000853	0.028687	1648.1	121.82
1.324	315.899	1.587	0.0299	0.0939	915.763	4950	210.798	0.000854	0.028621	1642.35	121.87
3.37	315.899	1.588	0.1052	0.304	913.068	4950	209.977	0.000853	0.028632	1646.8	121.85
1.326	314.508	1.587	0.03	0.0951	916.754	4950	210.752	0.000854	0.028588	1641.55	121.89
3.068	314.508	1.588	0.1065	0.3091	914.045	4950	209.906	0.000853	0.028591	1645.9	121.88
1.289	314.96	1.587	0.0301	0.0954	916.185	4950	210.773	0.000854	0.028606	1642.05	121.88
3.453	314.96	1.588	0.1071	0.31	913.427	4950	209.935	0.000853	0.028617	1646.55	121.86
1.285	315.688	1.587	0.0287	0.0936	919.921	4950	210.627	0.000855	0.028489	1639.1	121.96
3.224	315.688	1.588	0.1053	0.3062	917.178	4950	209.794	0.000853	0.028497	1643.55	121.93
3.604	316.075	1.588	0.1065	0.3085	916.03	4950	209.835	0.000853	0.028536	1644.55	121.91
2.352	315.633	1.587	0.0632	0.2186	927.222	4950	209.813	0.000855	0.028229	1635	122.12
5.228	315.633	1.588	0.2371	0.4009	921.133	4950	208.895	0.000853	0.028326	1642.7	122.04
5.276	315.613	1.588	0.237	0.401	922.122	4950	208.854	0.000853	0.028296	1641.9	122.07
2.404	317.266	1.587	0.0614	0.2163	932.364	4950	209.613	0.000855	0.028072	1631.05	122.23
5.369	317.266	1.588	0.2347	0.3971	926.3	4950	208.703	0.000853	0.028169	1638.65	122.15
5.281	313.376	1.588	0.2436	0.419	920.537	4950	208.835	0.000853	0.028337	1643.3	122.04
5.507	313.293	1.588	0.2443	0.4203	922.231	4950	208.761	0.000853	0.028286	1642.1	122.07
5.507	313.491	1.588	0.2421	0.4156	925.731	4950	208.633	0.000853	0.028176	1639.2	122.14
5.538	314.009	1.588	0.2437	0.4187	923.454	4950	208.717	0.000853	0.028248	1641.1	122.1
5.545	313.491	1.588	0.2444	0.4208	924.887	4950	208.646	0.000853	0.028202	1640	122.13
2.391	314.314	1.587	0.0653	0.2254	931.698	4950	209.596	0.000855	0.028089	1631.65	122.21
5.647	314.314	1.588	0.2449	0.4212	925.444	4950	208.625	0.000853	0.028189	1639.7	122.13
7.614	315.372	1.588	0.3805	0.5192	914.647	4950	208.311	0.000851	0.02848	1650.45	121.93
7.529	314.978	1.588	0.3795	0.5171	917.786	4950	208.189	0.000852	0.028381	1647.9	122
3.815	315.034	1.587	0.1036	0.356	927.403	4950	209.231	0.000854	0.028191	1636.8	122.14
7.602	315.034	1.588	0.3821	0.5208	916.807	4950	208.206	0.000851	0.028408	1648.75	121.98
3.981	315.272	1.587	0.1055	0.3556	927.58	4950	209.231	0.000854	0.028189	1636.7	122.14
7.639	315.272	1.588	0.3817	0.5209	916.676	4950	208.215	0.000851	0.028414	1648.85	121.97
3.905	314.963	1.587	0.1057	0.3546	925.946	4950	209.301	0.000854	0.028239	1637.95	122.11
7.656	314.963	1.588	0.3806	0.5197	915.228	4950	208.285	0.000851	0.028462	1650.05	121.94
3.875	315.176	1.587	0.105	0.3485	924.422	4950	209.389	0.000854	0.028289	1639.05	122.07
7.41	315.176	1.588	0.3739	0.5109	913.811	4950	208.396	0.000851	0.028509	1650.95	121.91
3.901	315.252	1.587	0.1056	0.35	922.952	4950	209.441	0.000854	0.028333	1640.2	122.04
7.631	315.252	1.588	0.3755	0.5133	912.439	4950	208.439	0.000851	0.028551	1652.05	121.88
3.931	314.704	1.587	0.1055	0.3507	923.017	4950	209.438	0.000854	0.028331	1640.15	122.04
7.636	314.704	1.588	0.3764	0.5145	912.395	4950	208.436	0.000851	0.028554	1652.1	121.88
3.912	314.751	1.587	0.104	0.3489	922.019	4950	209.491	0.000854	0.028364	1640.9	122.02
7.541	314.751	1.588	0.3745	0.5125	911.44	4950	208.488	0.000851	0.028585	1652.8	121.86
4.604	363.095	1.588	0.1544	0.393	916.366	4950	209.393	0.000853	0.028499	1645.65	121.93
4.752	362.794	1.588	0.156	0.3994	920.023	4950	209.212	0.000853	0.028382	1642.85	122.01
4.478	364.031	1.588	0.1553	0.3974	920.931	4950	209.186	0.000853	0.028356	1642.15	122.02
4.775	364.025	1.588	0.1546	0.3958	922.28	4950	209.13	0.000853	0.02831	1641	122.06
4.396	364.943	1.588	0.1547	0.3959	920.629	4950	209.203	0.000853	0.028365	1642.35	122.02
1.647	364.427	1.587	0.0381	0.126	926.437	4950	210.28	0.000855	0.028321	1635.65	122.07
4.791	364.427	1.588	0.1539	0.3955	920.763	4950	209.2	0.000853	0.02836	1642.2	122.02
4.829	365.082	1.588	0.1549	0.3952	920.893	4950	209.193	0.000853	0.028356	1642.15	122.02
1.658	365.102	1.587	0.0373	0.1269	928.433	4950	210.19	0.000855	0.028255	1633.95	122.11
4.823	365.102	1.588	0.1533	0.3939	923.071	4950	209.113	0.000853	0.02829	1640.45	122.07
4.209	364.638	1.588	0.1529	0.3906	921.234	4950	209.2	0.000853	0.028347	1641.8	122.04
3.016	362.566	1.587	0.0806	0.2388	931.271	4950	209.636	0.000855	0.028179	1634.35	122.15
6.76	362.566	1.588	0.2598	0.4537	920.93	4950	208.652	0.000853	0.028315	1643.5	122.05
2.81	362.955	1.587	0.0804	0.2374	931.351	4950	209.634	0.000855	0.028175	1634.2	122.16
6.736	362.955	1.588	0.2583	0.4507	921.226	4950	208.654	0.000853	0.028306	1643.25	122.05
2.893	362.768	1.587	0.0764	0.237	929.5	4950	209.729	0.000855	0.028235	1635.65	122.12
6.551	362.768	1.588	0.2577	0.4489	919.293	4950	208.741	0.000852	0.028366	1644.7	122.01
2.747	362.701	1.587	0.0806	0.2379	930.77	4950	209.66	0.000855	0.028195	1634.75	122.15
6.517	362.701	1.588	0.2589	0.4509	920.455	4950	208.684	0.000853	0.02833	1643.85	122.04
2.845	363.467	1.587	0.0805	0.2407	933.597	4950	209.538	0.000855	0.028111	1632.65	122.2
6.577	363.467	1.588	0.2619	0.457	922.974	4950	208.547	0.000853	0.028249	1642	122.09
3.071	362.366	1.587	0.0836	0.2466	929.746	4950	209.669	0.000855	0.028227	1635.7	122.12
6.829	362.366	1.588	0.2686	0.4722	919.074	4950	208.635	0.000852	0.028363	1645.2	122.01
2.937	362.076	1.587	0.0837	0.2473	930.329	4950	209.642	0.000855	0.028209	1635.25	122.13
7.027	362.076	1.588	0.2695	0.4749	919.653	4950	208.598	0.000852	0.028344	1644.7	122.03
2.797	362.333	1.587	0.0833	0.2457	930.487	4950	209.648	0.000855	0.02821	1635.2	122.13
6.952	362.333	1.588	0.2675	0.47	919.475	4950	208.632	0.000852	0.028353	1644.9	122.02
3.02	362.507	1.587	0.0827	0.2435	930.217	4950	209.665	0.000855	0.028215	1635.3	122.13
6.978	362.507	1.588	0.2649	0.4645	919.482	4950	208.661	0.000852	0.028358	1644.8	122.02
6.83	362.49	1.588	0.3677	0.5167	917.653	4950	208.215	0.000852	0.028372	1647.55	122
4.228	362.825	1.587	0.1242	0.3553	929.182	4950	209.299	0.000854	0.02828	1639.25	122.08
8.709	362.825	1.588	0.3715	0.5232	912.192	4950	208.409	0.000851	0.028543	1651.9	121.89
4.397	362.844	1.587	0.1239	0.3544	929.125	4950	209.304	0.000854	0.028281	1639.2	122.08
8.869	362.844	1.588	0.3706	0.5221	912.237	4950	208.414	0.000851	0.028542	1651.9	121.89
4.633	363.158	1.587	0.1236	0.3534	928.376	4950	209.339	0.000854	0.0283		

8.3161	360.801	1.588	0.1853	0.4032	601.794	4820	205.582	0.00081	0.041532	2186.5	117.44
2.9405	359.708	1.587	0.0699	0.1714	606.481	4820	207.676	0.000812	0.041533	2164.8	117.36
8.2421	359.708	1.588	0.1887	0.4088	598.471	4820	205.682	0.00081	0.041757	2191.7	117.37
2.9926	360.789	1.587	0.0684	0.1687	607.706	4820	207.646	0.000812	0.041452	2162.85	117.4
8.5339	360.789	1.588	0.1857	0.404	600.009	4820	205.662	0.00081	0.04166	2189.25	117.4
2.8954	360.898	1.587	0.0686	0.1685	608.012	4820	207.632	0.000812	0.041432	2162.5	117.4
8.1417	360.898	1.588	0.1855	0.4024	600.157	4820	205.663	0.00081	0.041648	2188.9	117.4
2.913	360.261	1.587	0.0696	0.1702	606.678	4820	207.674	0.000812	0.041519	2164.4	117.38
8.2084	360.261	1.588	0.1874	0.4058	598.879	4820	205.688	0.00081	0.04173	2190.9	117.38
5.2041	360.332	1.587	0.1067	0.2852	619.543	4820	206.076	0.000813	0.040561	2154.15	117.78
11.8274	360.332	1.588	0.3085	0.5148	605.461	4820	203.96	0.00081	0.041117	2191.75	117.66
5.0839	361.046	1.587	0.1057	0.2833	621.172	4820	206.016	0.000813	0.040454	2151.75	117.82
11.7708	361.046	1.588	0.3065	0.5115	607.214	4820	203.911	0.00081	0.041002	2189.1	117.71
5.1222	360.679	1.587	0.1069	0.2845	619.219	4820	206.091	0.000813	0.04058	2154.55	117.77
11.9556	360.679	1.588	0.3078	0.5134	605.188	4820	203.987	0.00081	0.041142	2192.15	117.65
5.0599	361.349	1.587	0.1058	0.2832	620.505	4820	206.047	0.000813	0.040496	2152.65	117.81
11.964	361.349	1.588	0.3064	0.512	606.638	4820	203.939	0.00081	0.041046	2190.05	117.69
4.9784	361.508	1.587	0.1066	0.285	620.526	4820	206.029	0.000813	0.040492	2152.75	117.81
11.944	361.508	1.588	0.3084	0.5155	606.383	4820	203.918	0.00081	0.041059	2190.65	117.68
5.178	360.777	1.587	0.1082	0.2882	619.161	4820	206.064	0.000813	0.040583	2154.9	117.77
11.9062	360.777	1.588	0.3119	0.5221	604.77	4820	203.93	0.00081	0.041158	2193.25	117.65
5.1189	361.739	1.587	0.1066	0.2859	621.28	4820	205.99	0.000813	0.040445	2151.8	117.83
12.0315	361.739	1.588	0.3094	0.5186	607.146	4820	203.859	0.00081	0.041004	2189.7	117.71
5.248	361.913	1.587	0.1074	0.2876	620.486	4820	206.012	0.000813	0.040497	2153	117.81
12.1954	361.913	1.588	0.3113	0.5214	606.144	4820	203.877	0.00081	0.041067	2191.25	117.68
4.9676	363.056	1.587	0.1052	0.2816	622.469	4820	205.969	0.000813	0.040367	2149.85	117.86
11.8023	363.056	1.588	0.3046	0.5095	608.625	4820	203.87	0.00081	0.040911	2186.9	117.74
5.0879	362.08	1.587	0.1065	0.2835	619.495	4820	206.089	0.000813	0.040562	2154.1	117.78
11.817	362.08	1.588	0.3067	0.5134	605.465	4820	203.979	0.00081	0.041118	2191.65	117.66
7.6111	367.814	1.587	0.1368	0.3902	637.146	4820	204.43	0.000815	0.039365	2136.8	118.31
14.1305	367.814	1.588	0.4186	0.5939	617.08	4820	202.312	0.000811	0.040199	2182.85	118.07
7.5369	367.247	1.587	0.1389	0.3934	635.577	4820	204.464	0.000814	0.039454	2139	118.26
14.0593	367.247	1.588	0.422	0.5994	615.452	4820	202.331	0.000811	0.040291	2185.3	118.03
7.4392	368.159	1.587	0.1373	0.391	637.193	4820	204.418	0.000815	0.039359	2136.8	118.31
13.9373	368.159	1.588	0.4194	0.596	616.859	4820	202.303	0.000811	0.040207	2183.15	118.07
7.5446	368.502	1.587	0.1371	0.3917	637.959	4820	204.38	0.000815	0.039312	2135.8	118.32
14.2496	368.502	1.588	0.4203	0.5991	617.683	4820	202.247	0.000811	0.040154	2182.25	118.09
7.5718	369.609	1.587	0.1371	0.3905	637.735	4820	204.4	0.000815	0.039329	2136.1	118.32
14.3588	369.609	1.588	0.4191	0.5964	617.324	4820	202.29	0.000811	0.040187	2182.75	118.07
7.4404	370.338	1.587	0.136	0.3886	638.962	4820	204.362	0.000815	0.039254	2134.3	118.35
14.0908	370.338	1.588	0.417	0.5938	618.617	4820	202.255	0.000811	0.040102	2180.65	118.1
7.6922	369.918	1.587	0.137	0.3908	638.754	4820	204.356	0.000815	0.039269	2134.8	118.34
14.277	369.918	1.588	0.4194	0.5979	618.25	4820	202.237	0.000811	0.040124	2181.5	118.1
7.3894	370.579	1.587	0.1349	0.3863	639.958	4820	204.336	0.000815	0.039194	2132.8	118.37
14.034	370.579	1.588	0.4145	0.5888	619.859	4820	202.242	0.000811	0.040028	2178.7	118.13
7.4043	370.386	1.587	0.1353	0.3876	640.499	4820	204.301	0.000815	0.039158	2132.1	118.39
14.169	370.386	1.588	0.416	0.5935	620.369	4820	202.184	0.000812	0.03999	2178.15	118.15
7.5304	370.775	1.587	0.1357	0.3877	639.305	4820	204.354	0.000815	0.039236	2133.85	118.36
14.0573	370.775	1.588	0.4161	0.5919	619.032	4820	202.252	0.000811	0.040076	2179.95	118.12
2.578	313.63	1.587	0.0805	0.1925	604.949	4820	207.503	0.000811	0.041571	2167.6	117.36
7.5413	313.63	1.588	0.2101	0.447	598.14	4820	205.272	0.00081	0.041655	2193.15	117.42
2.4754	313.195	1.587	0.0811	0.1935	604.244	4820	207.525	0.000811	0.041616	2168.65	117.34
7.5637	313.195	1.588	0.211	0.449	597.339	4820	205.293	0.000809	0.041711	2194.5	117.4
2.6323	312.995	1.587	0.0817	0.1945	603.32	4820	207.561	0.000811	0.041682	2170.1	117.32
7.5014	312.995	1.588	0.2121	0.4511	596.261	4820	205.321	0.000809	0.04178	2196.1	117.37
2.5555	313.238	1.587	0.0817	0.1947	603.342	4820	207.555	0.000811	0.041675	2170	117.32
8.0231	313.238	1.588	0.2125	0.4513	596.517	4820	205.312	0.000809	0.041772	2196	117.38
2.5116	313.674	1.587	0.0807	0.1929	604.701	4820	207.51	0.000811	0.041586	2168	117.35
7.4179	313.674	1.588	0.2104	0.4481	597.87	4820	205.276	0.00081	0.041672	2193.6	117.42
2.5175	313.815	1.587	0.0794	0.19	607.253	4820	207.419	0.000812	0.041416	2164.2	117.41
7.023	313.815	1.588	0.2072	0.4411	600.555	4820	205.209	0.00081	0.041486	2189.15	117.48
2.5593	313.378	1.587	0.0812	0.1934	605.752	4820	207.455	0.000811	0.041514	2166.55	117.38
7.3375	313.378	1.588	0.2109	0.4485	598.933	4820	205.219	0.00081	0.041595	2192	117.44
2.6877	313.939	1.587	0.0814	0.1941	605.008	4820	207.487	0.000811	0.041567	2167.7	117.36
7.6322	313.939	1.588	0.2118	0.4504	597.97	4820	205.249	0.00081	0.041664	2193.6	117.42
2.6365	313.452	1.587	0.0815	0.1944	605.013	4820	207.482	0.000811	0.041565	2167.65	117.36
7.4905	313.452	1.588	0.212	0.4514	598.149	4820	205.232	0.00081	0.041648	2193.35	117.43
2.5851	314.592	1.587	0.0819	0.1947	605.508	4820	207.452	0.000811	0.041528	2166.95	117.37
7.7431	314.592	1.588	0.2123	0.4519	598.642	4820	205.208	0.00081	0.04162	2192.8	117.43
4.6782	310.186	1.587	0.1282	0.3215	601.102	4820	206.518	0.00081	0.041698	2181.4	117.35
10.0932	310.186	1.588	0.3444	0.5377	588.298	4820	204.327	0.000808	0.042166	2217.15	117.28
4.7446	310.345	1.587	0.1285	0.3222	601.199	4820	206.507	0.00081	0.041691	2181.35	117.36
10.1028	310.345	1.588	0.3452	0.539	588.39	4820	204.31	0.000808	0.042158	2217.05	117.28
4.8375	310.421	1.587	0.1289	0.3223	601.168	4820	206.5	0.00081	0.041696	2181.55	117.36
10.2021	310.421	1.588	0.3465	0.5415	588.216	4820	204.299	0.000808	0.04217	2217.55	117.28
4.6925	311.778	1.587	0.1269	0.3199	603.663	4820	206.415	0.000811	0.041521	2177.55	117.42
10.0064	311.778	1.588	0.3427	0.5354	591.178	4820	204.214	0.000808	0.041958	2212.55	117.35
4.7047	311.534	1.587	0.1274	0.3205	604.988	4820	206.345	0.000811	0.04143	2175.8	117.46
10.0558	311.534	1.588	0.3434	0.5357	592.269	4820	204.159	0.000808	0.041882	2211.1	117.38
4.6883	312.433	1.587	0.1268	0.3189	605.293	4820	206.347	0.000811	0.041413	2175.35	117.46
10.2603	312.433	1.588	0.3416	0.5343	592.628	4820	204.169	0.000808	0.041871	2210.7	117.39
4.7056	311.739	1.587	0.1274	0.3192	603.325	4820	206.435	0.000811	0.041552	2178.2	117.41
10.1551	311.739	1.588	0.342	0.5343	590.536	4820	204.266	0.000808	0.04202	2213.75	117.33
4.7591	311.76	1.587	0.1278	0.3204	603.195	4820	206.43	0.000811	0.041556	2178.45	117.41
10.1543	311.76	1.588	0.3434	0.5365	590.414	4820	204.244	0.000808	0.042018	2213.95	117.33
4.7597	311.943	1.587	0.1277	0.3202	603.511	4820	206.418	0.000811	0.041537	2178	117.42
10.1154	311.943	1.588	0.343	0.5361	590.65	4820	204.238	0.000808	0.042004	2213.6	117.33
4.6783	311.604	1.587	0.128	0.3202	603.594	4820	206.41	0.000811	0.041527	2177.8</	

APPENDIX C

Condensation pressure drop of Kansas State University (file: kan_all.in)

ΔP (kPa)	mass flux(kg/m ² s)	z(m)	x_{in}	x_{out}	P_1 (kPa)	P_2 (kPa)	h_g (kJ/kg)	v_1 (m ³ /kg)	v_2 (m ³ /kg)	μ (x10 ⁻⁷ , N/ms)	μ_w
Smooth 3/8 inch											
R22											
0.68	121	3.81	0.89	0.08	1542	4990	163.7	0.00089	0.01478	1459	138
0.66	122	3.81	0.89	0.05	1544	4990	163.7	0.00089	0.01474	1458	138
0.8	120	3.81	0.91	0.28	1535	4990	164	0.00089	0.01483	1462	137.9
0.84	131	3.81	0.75	0.22	1550	4990	163.4	0.00089	0.01468	1456	138.1
0.65	120	3.81	0.67	0.08	1513	4990	164.7	0.00088	0.01506	1472	137.5
0.65	127	3.81	0.86	0.09	1927	4990	151.8	0.00092	0.0115	1301	144.3
0.67	123	3.81	0.92	0.13	1990	4990	150	0.00093	0.01108	1277	145.3
0.68	119	3.81	0.83	0.27	1955	4990	151.1	0.00093	0.01131	1290	144.8
0.78	120	3.81	0.68	0.13	1942	4990	151.4	0.00093	0.0114	1295	144.6
2.45	254	3.81	0.87	0.06	1530	4990	164.1	0.00089	0.01489	1464	137.8
2.52	255	3.81	0.88	0.08	1524	4990	164.3	0.00089	0.01496	1467	137.7
3.92	251	3.81	0.85	0.4	1515	4990	164.6	0.00088	0.01505	1471	137.5
3.05	259	3.81	0.73	0.25	1526	4990	164.2	0.00089	0.01493	1466	137.7
1.59	242	3.81	0.55	0.07	1514	4990	164.6	0.00088	0.01506	1472	137.5
1.94	250	3.81	0.89	0.1	1955	4990	151.1	0.00093	0.01131	1290	144.8
2.54	247	3.81	0.88	0.41	1918	4990	152.1	0.00092	0.01157	1304	144.2
2.34	249	3.81	0.76	0.26	1922	4990	152	0.00092	0.01154	1303	144.2
1.47	249	3.81	0.6	0.13	1939	4990	151.5	0.00093	0.01142	1296	144.5
7.4	415	3.81	0.88	0.08	1547	4990	163.6	0.00089	0.01471	1457	138.1
7.42	416	3.81	0.87	0.08	1541	4990	163.8	0.00089	0.01478	1460	138
9.26	397	3.81	0.88	0.35	1545	4990	163.6	0.00089	0.01473	1458	138
8.72	400	3.81	0.74	0.26	1526	4990	164.2	0.00089	0.01493	1466	137.7
5.15	400	3.81	0.57	0.08	1536	4990	164	0.00089	0.01483	1462	137.9
5.29	400	3.81	0.91	0.13	1950	4990	151.1	0.00093	0.01135	1292	144.7
6.64	385	3.81	0.91	0.37	1954	4990	151	0.00093	0.01132	1291	144.7
5.25	391	3.81	0.73	0.19	1961	4990	150.9	0.00093	0.01127	1288	144.9
3.19	395	3.81	0.51	0.08	1930	4990	151.7	0.00092	0.01148	1300	144.4
16.08	615	3.81	0.89	0.13	1514	4990	164.6	0.00088	0.01506	1472	137.5
16.78	617	3.81	0.88	0.13	1511	4990	164.7	0.00088	0.0151	1473	137.3
22.58	593	3.81	0.87	0.39	1493	4990	165.3	0.00088	0.01529	1481	137.2
16.47	590	3.81	0.72	0.23	1559	4990	163.2	0.00089	0.01459	1451	138.3
9.25	595	3.81	0.48	0.08	1543	4990	163.7	0.00089	0.01475	1459	138
R134a											
3.46	253	3.81	0.85	0.04	993	4067	164.1	0.00087	0.02049	1725	128
3.46	254	3.81	0.84	0.03	972	4067	165	0.00087	0.02096	1744	127.6
5.52	252	3.81	0.88	0.42	1029	4067	162.7	0.00087	0.01974	1694	128.7
5	253	3.81	0.76	0.31	1030	4067	162.7	0.00087	0.01972	1693	128.8
2.98	248	3.81	0.57	0.14	1016	4067	163.2	0.00087	0.02	1705	128.5
1.8	247	3.81	0.55	0.09	1307	4067	152.4	0.00091	0.01525	1489	134.1
3.24	254	3.81	0.8	0.29	1318	4067	152.1	0.00091	0.01511	1482	134.3
3.67	253	3.81	0.9	0.39	1296	4067	152.8	0.0009	0.01539	1496	133.8
2.79	252	3.81	0.85	0.12	1290	4067	153	0.0009	0.01574	1500	133.7
8.17	404	3.81	0.86	0.03	1008	4067	163.6	0.00087	0.02017	1712	128.3
8.35	404	3.81	0.86	0.02	1003	4067	163.8	0.00087	0.02028	1717	128.2
12.4	393	3.81	0.88	0.33	1023	4067	163	0.00087	0.01986	1699	128.6
10.91	397	3.81	0.77	0.22	1024	4067	162.9	0.00087	0.01984	1699	128.6
5.78	403	3.81	0.46	0.06	1013	4067	163.4	0.00087	0.02007	1708	128.4
6.08	402	3.81	0.88	0.06	1316	4067	152.1	0.00091	0.01514	1483	134.2
9.7	403	3.81	0.87	0.36	1326	4067	151.7	0.00091	0.01501	1477	134.4
6.23	391	3.81	0.75	0.19	1319	4067	152	0.00091	0.0151	1481	134.3
4.04	400	3.81	0.49	0.06	1300	4067	152.7	0.00091	0.01534	1494	133.9
21.08	609	3.81	0.91	0.13	1006	4067	163.6	0.00087	0.02021	1714	128.3
20.34	608	3.81	0.91	0.13	1004	4067	163.7	0.00087	0.02026	1716	128.2
27.26	592	3.81	0.89	0.39	1015	4067	163.3	0.00087	0.02002	1706	128.5
22.78	594	3.81	0.73	0.25	1015	4067	163.3	0.00087	0.02002	1706	128.5
15.04	596	3.81	0.52	0.12	1015	4067	163.3	0.00087	0.02002	1706	128.5
15.44	609	3.81	0.86	0.12	1301	4067	152.7	0.00091	0.01533	1493	133.9
19.07	591	3.81	0.87	0.35	1316	4067	152.1	0.00091	0.01514	1483	134.2
17.77	600	3.81	0.77	0.26	1304	4067	152.5	0.00091	0.01529	1491	134
9.32	592	3.81	0.52	0.06	1302	4067	152.6	0.00091	0.01531	1492	134
R410A											
0.61	126	3.81	0.85	0.18	2422	4950	166.6	0.00101	0.01005	1000	142.6
0.75	128	3.81	0.85	0.14	2426	4950	166.5	0.00102	0.01003	999	142.7
0.45	127	3.81	0.85	0.44	2453	4950	165.5	0.00102	0.00989	992	143.1
0.65	126	3.81	0.75	0.18	2469	4950	165	0.00102	0.00981	988	143.3
0.61	132	3.81	0.61	0.09	2407	4950	167.1	0.00101	0.01012	1003	142.4
0.48	131	3.81	0.87	0.1	2840	4950	152.3	0.00106	0.00821	909	148.9
0.8	129	3.81	0.87	0.23	2866	4950	151.4	0.00106	0.00811	904	149.3
0.54	130	3.81	0.71	0.18	2913	4950	149.8	0.00107	0.00794	895	150
0.52	126	3.81	0.49	0.08	2901	4950	150.2	0.00107	0.00798	897	149.8
1.85	266	3.81	0.85	0.11	2401	4950	167.3	0.00101	0.01015	1005	142.3
1.36	267	3.81	0.85	0.11	2402	4950	167.2	0.00101	0.01015	1004	142.3
2.12	249	3.81	0.85	0.38	2436	4950	166.1	0.00102	0.00998	996	142.8
1.73	243	3.81	0.78	0.27	2442	4950	165.9	0.00102	0.00995	995	142.9
1.15	242	3.81	0.51	0.1	2420	4950	166.7	0.00101	0.01006	1000	142.6
1.37	260	3.81	0.86	0.09	2886	4950	150.7	0.00107	0.00804	900	149.6
1.49	253	3.81	0.84	0.34	2859	4950	151.7	0.00106	0.00814	905	149.2
1.9	242	3.81	0.72	0.23	2877	4950	151	0.00106	0.00807	902	149.5
1.2	256	3.81	0.5	0.09	2882	4950	150.9	0.00106	0.00805	901	149.5
4.15	405	3.81	0.86	0.14	2413	4950	166.9	0.00101	0.01009	1002	142.5
4.18	405	3.81	0.86	0.14	2408	4950	167	0.00101	0.01012	1003	142.4
5.23	400	3.81	0.86	0.41	2412	4950	166.9	0.00101	0.0101	1002	142.5
4.57	403	3.81	0.76	0.28	2470	4950	165	0.00102	0.00981	988	143.3
2.97	400	3.81	0.5	0.09	2406	4950	167.1	0.00101	0.01013	1003	142.4
3	404	3.81	0.85	0.1	2822	4950	152.9	0.00106	0.00828	912	148.6
4.2	398	3.81	0.84	0.37	2812	4950	153	0.00106	0.00828	913	148.6
3.1	398	3.81	0.75	0.25	2831	4950	153.2	0.00106	0.00825	911	148.7
2.31	395	3.81	0.48	0.05	2805	4950	153.5	0.00106	0.00835	916	148.3
8.1	605	3.81	0.85	0.13	2455	4950	165.5	0.00102	0.00988	992	143.1

8.02	606	3.81	0.85	0.12	2465	4950	165.1	0.00102	0.00983	989	143.2
13.6	599	3.81	0.85	0.48	2416	4950	166.8	0.00101	0.01008	1001	142.5
9.7	599	3.81	0.75	0.25	2418	4950	166.7	0.00101	0.01007	1001	142.5
5.76	600	3.81	0.48	0.12	2431	4950	166.2	0.00102	0.01	997	142.7

R502

1.86	251	3.81	0.86	0.11	1653	4080	108.7	0.00089	0.00992	1314	141.9
1.55	251	3.81	0.86	0.12	1653	4080	108.7	0.00089	0.00992	1314	141.9
1.87	249	3.81	0.86	0.32	1676	4080	108.2	0.00089	0.00977	1300	142.3
1.76	249	3.81	0.75	0.24	1671	4080	108.2	0.00089	0.0098	1303	142.2
1.3	255	3.81	0.48	0.06	1664	4080	108.5	0.00089	0.00985	1307	142.1
1.27	252	3.81	0.89	0.04	2060	4080	97.1	0.00094	0.00762	1082	150.2
2.16	253	3.81	0.87	0.37	2074	4080	96.7	0.00095	0.00755	1075	150.5
1.31	255	3.81	0.74	0.22	2059	4080	97.2	0.00094	0.00762	1083	150.2
1.31	250	3.81	0.54	0.11	2061	4080	97.1	0.00094	0.00761	1082	150.2
4.51	404	3.81	0.85	0.15	1672	4080	108.2	0.00089	0.00979	1302	142.2
5.17	403	3.81	0.85	0.17	1689	4080	107.7	0.00089	0.00968	1291	142.6
5.66	405	3.81	0.89	0.37	1701	4080	107.4	0.0009	0.0096	1284	142.8
4.76	396	3.81	0.72	0.22	1680	4080	108	0.00089	0.00974	1297	142.4
3.04	401	3.81	0.52	0.07	1646	4080	109	0.00089	0.00997	1319	141.7
3.03	403	3.81	0.87	0.08	2087	4080	96.3	0.00095	0.00749	1069	150.8
5.17	400	3.81	0.87	0.46	2078	4080	96.6	0.00095	0.00753	1073	150.6
3.76	398	3.81	0.78	0.22	2084	4080	96.4	0.00095	0.00751	1070	150.7
2.14	402	3.81	0.48	0.04	2038	4080	97.8	0.00094	0.00772	1093	149.7
8.55	602	3.81	0.88	0.06	1639	4080	109.2	0.00089	0.01002	1324	141.6
8.25	603	3.81	0.89	0.06	1638	4080	109.2	0.00089	0.01003	1324	141.6
13.48	600	3.81	0.86	0.37	1657	4080	108.7	0.00089	0.0099	1312	141.9
11.18	605	3.81	0.77	0.28	1674	4080	108.1	0.00089	0.00978	1301	142.3
6.24	606	3.81	0.46	0.11	1650	4080	108.8	0.00089	0.00995	1316	141.8
5.79	605	3.81	0.91	0.07	2096	4080	96	0.00095	0.00745	1064	151
9.07	599	3.81	0.86	0.39	2077	4080	96.6	0.00095	0.00754	1074	150.6
6.58	603	3.81	0.73	0.16	2084	4080	96.4	0.00095	0.00751	1070	150.7
5.02	596	3.81	0.57	0.07	2070	4080	96.8	0.00094	0.00757	1077	150.4

R507a

0.89	131	3.81	0.823	0.075	1899	3790	115.2	0.00104	0.00915	1092	140.1
0.66	132	3.81	0.814	0.091	1888	3790	115.6	0.00104	0.00922	1096	139.9
0.79	133	3.81	0.905	0.09	2456	3790	95.7	0.00113	0.00646	916	152.4
1.42	248	3.81	0.878	0.045	1889	3790	115.6	0.00104	0.00921	1095	139.9
1.56	247	3.81	0.882	0.065	1878	3790	116	0.00104	0.00928	1098	139.7
2.46	246	3.81	0.88	0.409	1858	3790	116.6	0.00103	0.00941	1104	139.3
2.3	245	3.81	0.788	0.194	1917	3790	114.6	0.00104	0.00904	1087	140.4
1.13	248	3.81	0.571	0.03	1910	3790	114.8	0.00104	0.00908	1089	140.3
1.34	256	3.81	0.879	0.087	2427	3790	96.8	0.00113	0.00658	927	151.7
1.81	255	3.81	0.845	0.328	2379	3790	98.5	0.00112	0.00677	945	150.5
1.67	255	3.81	0.718	0.252	2394	3790	98	0.00112	0.00671	940	150.8
1.03	253	3.81	0.87	0.031	2441	3790	96.3	0.00113	0.00652	921	152
3.93	400	3.81	0.874	0.106	1880	3790	115.9	0.00104	0.00927	1098	139.7
3.64	399	3.81	0.866	0.125	1863	3790	116.4	0.00103	0.00937	1103	139.4
5.51	395	3.81	0.843	0.389	1874	3790	116	0.00104	0.00931	1100	139.6
4.36	392	3.81	0.757	0.318	1866	3790	116.3	0.00103	0.00936	1102	139.4
2.42	398	3.81	0.483	0.088	1910	3790	114.8	0.00104	0.00908	1089	140.3
2.74	396	3.81	0.858	0.062	2392	3790	98.1	0.00112	0.00672	940	150.8
3.43	397	3.81	0.879	0.185	2369	3790	99	0.00112	0.00681	949	150.2
2.81	391	3.81	0.765	0.139	2378	3790	98.6	0.00112	0.00677	946	150.5
1.99	400	3.81	0.528	0.016	2387	3790	98.3	0.00112	0.00674	942	150.7
8.24	608	3.81	0.844	0.16	1904	3790	115	0.00104	0.00912	1091	140.2
8.32	606	3.81	0.849	0.157	1903	3790	115	0.00104	0.00913	1091	140.2
10.84	598	3.81	0.839	0.368	1849	3790	116.9	0.00103	0.00946	1107	139.1
7.94	593	3.81	0.703	0.167	1917	3790	114.6	0.00104	0.00904	1087	140.4
4.76	604	3.81	0.423	0.046	1926	3790	114.3	0.00104	0.00899	1085	140.6
5.96	601	3.81	0.867	0.096	2376	3790	98.6	0.00112	0.00678	946	150.4
7.87	595	3.81	0.894	0.394	2369	3790	99	0.00112	0.00681	949	150.2
6.7	593	3.81	0.761	0.266	2381	3790	98.5	0.00112	0.00676	944	150.5
4.62	589	3.81	0.522	0.087	2357	3790	99.4	0.00111	0.00686	954	150

Micro-fin 3/8 inch

R22

1.06	130	3.78	0.89	0.12	1502	4990	165.1	0.00088	0.01519	1477	137.3
1.34	130	3.78	0.89	0.15	1503	4990	165	0.00088	0.01518	1477	137.3
1.42	129	3.78	0.88	0.38	1519	4990	164.5	0.00089	0.01501	1469	137.6
1.27	128	3.78	0.85	0.26	1528	4990	164.2	0.00089	0.01491	1465	137.7
1.19	128	3.78	0.61	0.08	1510	4990	164.8	0.00088	0.01511	1474	137.4
0.9	127	3.78	0.87	0.06	1928	4990	151.8	0.00092	0.0115	1300	144.3
0.9	125	3.78	0.87	0.4	1939	4990	151.5	0.00093	0.01142	1296	144.5
1.12	121	3.78	0.85	0.26	1910	4990	152.4	0.00092	0.01162	1307	144
0.99	130	3.78	0.48	0.12	1978	4990	150.3	0.00093	0.01116	1282	145.1
5.05	262	3.78	0.88	0.08	1523	4990	164.3	0.00089	0.01497	1468	137.7
4.88	263	3.78	0.88	0.07	1514	4990	164.6	0.00088	0.01506	1472	137.5
6.04	261	3.78	0.88	0.3	1527	4990	164.3	0.00089	0.01492	1466	137.7
4.87	239	3.78	0.74	0.25	1543	4990	163.7	0.00089	0.01475	1459	138
3.79	245	3.78	0.57	0.14	1537	4990	163.9	0.00089	0.01482	1461	137.9
3.22	246	3.78	0.91	0.09	1911	4990	152.3	0.00092	0.01161	1307	144
4.24	244	3.78	0.92	0.37	1944	4990	151.3	0.00093	0.01139	1294	144.6
4.18	243	3.78	0.74	0.3	1924	4990	151.9	0.00092	0.01152	1302	144.3
2.59	252	3.78	0.46	0.11	1927	4990	151.8	0.00092	0.0115	1301	144.3
11.33	402	3.78	0.88	0.2	1600	4990	161.9	0.00089	0.01418	1433	138.9
11.44	403	3.78	0.89	0.2	1609	4990	161.6	0.00089	0.01409	1430	139.1
13.94	386	3.78	0.89	0.45	1548	4990	163.5	0.00089	0.0147	1456	138.1
13.41	393	3.78	0.74	0.28	1521	4990	164.4	0.00089	0.01499	1469	137.6
7.96	397	3.78	0.5	0.07	1497	4990	165.1	0.00088	0.01525	1479	137.2
9.37	404	3.78	0.86	0.19	1957	4990	151	0.00093	0.0113	1289	144.8
11.42	403	3.78	0.87	0.39	1956	4990	151	0.00093	0.01131	1290	144.8
9.62	402	3.78	0.72	0.26	1967	4990	150.7	0.00093	0.01123	1286	145
7.38	399	3.78	0.47	0.15	1962	4990	150.8	0.00093	0.01127	1288	144.9
24.17	618	3.78	0.88	0.14	1523	4990	164.3	0.00089	0.01497	1468	137.7
23.92	618	3.78	0.88	0.14	1525	4990	164.3	0.00089	0.01494	1467	137.7
30.61	608	3.78	0.88	0.39	1538	4990	163.9	0.00089	0.01481	1461	137.9
27.22	604	3.78	0.74	0.3	1529	4990	164.2	0.00089	0.0149	1465	137.8
18.14	596	3.78	0.51	0.14	1516	4990	164.6	0.00088	0.01504	1471	137.5
17.76	607	3.78	0.85	0.15	1911	4990	152.3	0.00092	0.01161	1307	144
20.98	587	3.78	0.89	0.4	1935	4990	151.6	0.00093	0.01145	1298	144.4
18.78	603	3.78	0.72	0.27	1933	4990	151.6	0.00092	0.01146	1299	144.4
12.51	595	3.78	0.46	0.11	1917	4990	152.2	0.00092	0.01157	1305	144.1
0.68	121	3.78	0.89	0.08	1542	4990	163.7	0.00089	0.01476	1459	138
0.66	122	3.78	0.89	0.05	1544	4990	163.7	0.00089	0.01474	1458	138

2.45	254	3.78	0.87	0.06	1530	4990	164.1	0.00089	0.01489	1464	137.8
2.52	255	3.78	0.88	0.08	1524	4990	164.3	0.00089	0.01496	1467	137.7
7.4	415	3.78	0.88	0.08	1547	4990	163.6	0.00089	0.01471	1457	138.1
7.42	416	3.78	0.87	0.08	1541	4990	163.8	0.00089	0.01478	1460	138
16.08	615	3.78	0.89	0.13	1514	4990	164.6	0.00088	0.01506	1472	137.5
16.78	617	3.78	0.88	0.13	1511	4990	164.7	0.00088	0.0151	1473	137.5
1.06	130	3.78	0.89	0.12	1502	4990	165.1	0.00088	0.01519	1477	137.3
1.34	130	3.78	0.89	0.15	1503	4990	165	0.00088	0.01518	1477	137.3
5.05	262	3.78	0.88	0.08	1523	4990	164.3	0.00089	0.01479	1468	137.7
4.88	263	3.78	0.88	0.07	1514	4990	164.6	0.00088	0.01506	1472	137.5
11.33	402	3.78	0.88	0.2	1600	4990	161.9	0.00089	0.01418	1433	138.9
11.44	403	3.78	0.89	0.2	1609	4990	161.6	0.00089	0.01409	1430	139.1
24.17	618	3.78	0.88	0.14	1523	4990	164.3	0.00089	0.01479	1468	137.7
23.92	618	3.78	0.88	0.14	1525	4990	164.3	0.00089	0.01494	1467	137.7
0.61	126	3.78	0.91	0.1	1529	4990	164.2	0.00089	0.0149	1465	137.8
0.78	126	3.78	0.91	0.1	1534	4990	164	0.00089	0.01485	1463	137.8
3.2	268	3.78	0.88	0.1	1529	4990	164.2	0.00089	0.0149	1465	137.8
3.02	268	3.78	0.89	0.1	1530	4990	164.1	0.00089	0.01489	1464	137.8
5.54	398	3.78	0.75	0.09	1539	4990	163.9	0.00089	0.0148	1460	137.9
5.16	398	3.78	0.75	0.08	1536	4990	164	0.00089	0.01483	1462	137.9
1.44	125	3.78	0.84	0.11	1534	4990	164	0.00089	0.01485	1463	137.8
1.44	125	3.78	0.84	0.13	1538	4990	163.9	0.00089	0.01481	1461	137.9
5.32	252	3.78	0.89	0.15	1537	4990	164.1	0.00089	0.01482	1461	137.9
5.82	251	3.78	0.89	0.17	1530	4990	164.1	0.00089	0.01489	1464	137.8
12.52	407	3.78	0.89	0.09	1554	4990	163.4	0.00089	0.01464	1454	138.2
12.73	406	3.78	0.9	0.09	1554	4990	163.4	0.00089	0.01464	1454	138.2
28.42	610	3.78	0.85	0.12	1504	4990	165	0.00088	0.01517	1476	137.3
28.25	611	3.78	0.85	0.11	1499	4990	165.1	0.00088	0.01523	1479	137.3

R134a

6.07	251	3.78	0.86	0.08	1029	4067	162.7	0.00087	0.01974	1694	128.7
5.93	251	3.78	0.86	0.08	1030	4067	162.7	0.00087	0.01972	1693	128.8
7.62	249	3.78	0.85	0.3	992	4067	164.2	0.00087	0.02051	1726	128
6.69	244	3.78	0.75	0.21	1007	4067	163.6	0.00087	0.02019	1713	128.3
5.19	247	3.78	0.54	0.09	1006	4067	163.6	0.00087	0.02021	1714	128.3
4.58	252	3.78	0.88	0.05	1319	4067	152	0.00091	0.0151	1481	134.3
5.47	249	3.78	0.9	0.3	1297	4067	152.8	0.00091	0.01538	1496	133.9
5.22	250	3.78	0.72	0.25	1298	4067	152.7	0.00091	0.01537	1495	133.9
3.71	254	3.78	0.5	0.07	1294	4067	152.9	0.0009	0.01542	1498	133.8
14.19	398	3.78	0.88	0.11	1014	4067	163.4	0.00087	0.02004	1707	128.4
14.87	398	3.78	0.87	0.1	1010	4067	163.5	0.00087	0.02013	1711	128.4
18.06	401	3.78	0.87	0.33	994	4067	164.1	0.00087	0.02047	1724	128.9
16.16	397	3.78	0.74	0.21	1008	4067	163.6	0.00087	0.02017	1712	128.3
11.22	395	3.78	0.51	0.09	1015	4067	163.3	0.00087	0.02002	1706	128.5
10.94	404	3.78	0.9	0.09	1328	4067	151.7	0.00091	0.01498	1475	134.4
13.41	395	3.78	0.89	0.31	1291	4067	153	0.0009	0.01546	1499	133.8
12.6	399	3.78	0.74	0.24	1300	4067	152.7	0.00091	0.01534	1494	133.9
8.59	400	3.78	0.54	0.08	1300	4067	152.7	0.00091	0.01534	1494	133.9
27.6	613	3.78	0.86	0.08	1011	4067	163.4	0.00087	0.02011	1710	128.4
36.97	589	3.78	0.88	0.35	1000	4067	163.8	0.00087	0.02034	1719	128.2
34.06	597	3.78	0.77	0.27	1001	4067	163.9	0.00087	0.02032	1718	128.2
19.78	603	3.78	0.46	0.06	989	4067	164.5	0.00087	0.02073	1735	127.8
22.06	610	3.78	0.88	0.08	1298	4067	152.7	0.00091	0.01537	1495	133.9
27.67	585	3.78	0.88	0.34	1281	4067	153.5	0.0009	0.01559	1506	133.6
23.34	590	3.78	0.75	0.19	1299	4067	152.7	0.00091	0.01535	1494	133.9
16.92	595	3.78	0.58	0.04	1301	4067	152.7	0.00091	0.01533	1493	133.9
0.92	124	3.78	0.88	0.09	1009	4067	163.5	0.00087	0.02015	1711	128.3
0.96	124	3.78	0.88	0.09	1010	4067	163.5	0.00087	0.02013	1711	128.4
0.86	125	3.78	0.86	0.05	1006	4067	163.6	0.00087	0.02021	1714	128.3
3.35	259	3.78	0.92	0.1	1010	4067	163.5	0.00087	0.02013	1711	128.4
3.38	259	3.78	0.91	0.1	1007	4067	163.6	0.00087	0.02019	1713	128.6
3.83	252	3.78	0.87	0.08	1001	4067	163.9	0.00087	0.02032	1718	128.2
3.15	252	3.78	0.87	0.08	1002	4067	163.8	0.00087	0.02032	1717	128.2
5.63	348	3.78	0.89	0.1	1022	4067	163	0.00087	0.01988	1700	128.6
5.77	351	3.78	0.87	0.1	1020	4067	163.1	0.00087	0.01992	1702	128.6
4.81	322	3.78	0.87	0.05	1017	4067	163.2	0.00087	0.01998	1705	128.5
4.61	323	3.78	0.88	0.04	1020	4067	163.1	0.00087	0.01992	1702	128.6
1.64	128	3.78	0.91	0.04	1013	4067	163.4	0.00087	0.02007	1708	128.4
1.72	128	3.78	0.9	0.05	1014	4067	163.4	0.00087	0.02004	1707	128.4
6.26	241	3.78	0.89	0.08	1017	4067	163.2	0.00087	0.01998	1705	128.5
6.55	241	3.78	0.89	0.07	1017	4067	163.2	0.00087	0.01998	1705	128.5
7.52	254	3.78	0.86	0.1	1001	4067	163.9	0.00087	0.02032	1718	128.2
7.55	253	3.78	0.86	0.1	1001	4067	163.9	0.00087	0.02032	1718	128.2
15.97	388	3.78	0.87	0.08	1007	4067	163.6	0.00087	0.02019	1713	128.6
16.49	387	3.78	0.87	0.08	1004	4067	163.7	0.00087	0.02026	1716	128.2
17.59	396	3.78	0.87	0.11	995	4067	164.1	0.00087	0.02045	1724	128.1
16.61	398	3.78	0.9	0.08	1017	4067	163.2	0.00087	0.01998	1705	128.5
35.35	593	3.78	0.89	0.1	1010	4067	163.5	0.00087	0.02013	1711	128.4
35.04	592	3.78	0.89	0.1	1010	4067	163.5	0.00087	0.02013	1711	128.4
52.89	791	3.78	0.88	0.09	1012	4067	163.4	0.00087	0.02009	1709	128.4
53.46	791	3.78	0.87	0.08	1013	4067	163.4	0.00087	0.02007	1708	128.4

R410A

0.74	122	3.78	0.81	0.07	2460	4950	165.3	0.00102	0.00986	990	143.2
0.75	120	3.78	0.84	0.06	2465	4950	165.1	0.00102	0.00983	989	143.2
1.07	124	3.78	0.8	0.25	2458	4950	165.4	0.00102	0.00987	991	143.1
0.77	124	3.78	0.76	0.18	2426	4950	166.5	0.00102	0.01003	999	142.7
0.77	125	3.78	0.59	0.04	2410	4950	167	0.00101	0.01011	1002	142.4
0.69	129	3.78	0.84	0.15	2871	4950	151.2	0.00106	0.0081	903	149.4
0.66	122	3.78	0.81	0.19	2910	4950	149.9	0.00107	0.00795	895	150
0.94	123	3.78	0.81	0.19	2859	4950	151.6	0.00106	0.00814	905	149.2
0.71	122	3.78	0.64	0.05	2829	4950	152.7	0.00106	0.00825	911	148.7
2.43	253	3.78	0.85	0.1	2470	4950	165	0.00102	0.00981	988	143.3
2.58	253	3.78	0.86	0.09	2466	4950	165.1	0.00102	0.00983	989	143.2
3.23	256	3.78	0.83	0.24	2443	4950	165.8	0.00102	0.00994	994	142.9
3.12	254	3.78	0.75	0.22	2399	4950	167.3	0.00101	0.01017	1005	142.3
2.39	256	3.78	0.54	0.09	2418	4950	166.7	0.00101	0.01007	1001	142.5
1.95	250	3.78	0.86	0.05	2879	4950	151	0.00164	0.00807	901	149.5
3.5	253	3.78	0.86	0.46	2872	4950	151.2	0.00106	0.00809	903	149.4
2.65	245	3.78	0.69	0.18	2867	4950	151.3	0.00106	0.00811	904	149.3
1.68	243	3.78	0.52	0.04	2805	4950	153.5	0.00106	0.00835	916	148.3
6.83	403	3.78	0.84	0.09	2408	4950	167	0.00101	0.01012	1003	142.4
6.55	403	3.78	0.85	0.1	2415	4950	166.8	0.00101	0.01008	1001	142.5
7.14	399	3.78	0.85	0.32	2471	4950	164.8	0.00102	0.0098	988	143.3
7.33	402	3.78	0.73	0.18	2439	4950	166	0.00102	0.00996	996	142.9
5.32	404	3.78	0.49	0.09	2429	4950	166.4	0.00102	0.01001	998	142.7

4.39	402	3.78	0.48	0.08	2824	4950	152.8	0.00106	0.00827	912	148.6
12.52	610	3.78	0.85	0.1	2454	4950	165.5	0.00102	0.00989	992	143.1
12.67	609	3.78	0.85	0.1	2461	4950	165.3	0.00102	0.00985	990	143.2
16.62	603	3.78	0.86	0.37	2395	4950	167.4	0.00101	0.01019	1006	142.2
14.19	595	3.78	0.75	0.23	2421	4950	166.6	0.00101	0.01005	1000	142.6
9.83	606	3.78	0.49	0.04	2403	4950	167.2	0.00101	0.01014	1004	142.3
0.59	125	3.78	0.86	0.06	2448	4950	165.7	0.00102	0.00992	993	143
0.64	125	3.78	0.86	0.06	2452	4950	165.5	0.00102	0.0099	992	143
1.73	250	3.78	0.88	0.08	2470	4950	165	0.00102	0.00981	988	143.3
1.5	250	3.78	0.88	0.08	2471	4950	164.9	0.00102	0.0098	988	143.3
3.44	400	3.78	0.68	0.1	2391	4950	167.6	0.00101	0.01021	1007	142.2
3.84	400	3.78	0.68	0.11	2402	4950	167.2	0.00101	0.01015	1004	142.3
0.76	127	3.78	0.82	0.1	2452	4950	165.5	0.00102	0.0099	992	143
0.98	127	3.78	0.84	0.16	2455	4950	165.5	0.00102	0.00988	992	143.1
3.19	250	3.78	0.89	0.08	2446	4950	165.7	0.00102	0.00993	994	143
2.89	250	3.78	0.83	0.05	2464	4950	165.2	0.00102	0.00984	990	143.2
7.6	406	3.78	0.85	0.03	2451	4950	165.6	0.00102	0.0099	993	143
7.11	405	3.78	0.85	0.04	2464	4950	165.2	0.00102	0.00984	990	143.2
15.67	597	3.78	0.88	0.06	2438	4950	166	0.00102	0.00997	996	142.8
15.42	597	3.78	0.88	0.06	2429	4950	166.4	0.00102	0.01001	998	142.7

R502

2.86	248	3.78	0.86	0.04	1641	4080	109.1	0.00089	0.01001	1322	141.6
2.86	248	3.78	0.86	0.04	1641	4080	109.1	0.00089	0.01001	1322	141.6
4.36	256	3.78	0.88	0.4	1693	4080	107.6	0.00089	0.00965	1289	142.7
4.39	245	3.78	0.77	0.32	1688	4080	107.8	0.00089	0.00969	1292	142.6
1.8	248	3.78	0.5	0.06	1663	4080	108.5	0.00089	0.00986	1308	142.1
2.26	254	3.78	0.88	0.09	2117	4080	95.5	0.00095	0.00736	1054	151.4
4.11	257	3.78	0.85	0.6	2083	4080	96.4	0.00095	0.00751	1071	150.7
3.03	264	3.78	0.76	0.18	2038	4080	97.8	0.00094	0.00772	1093	149.7
2.07	264	3.78	0.55	0.13	2091	4080	96.2	0.00095	0.00747	1067	150.9
7.56	402	3.78	0.83	0.12	1657	4080	108.7	0.00089	0.0099	1312	141.9
7.29	402	3.78	0.84	0.09	1644	4080	109	0.00089	0.00999	1320	141.7
9.34	395	3.78	0.85	0.44	1650	4080	108.8	0.00089	0.00995	1316	141.8
8.38	399	3.78	0.71	0.26	1664	4080	108.5	0.00089	0.00985	1307	142.1
5.83	401	3.78	0.48	0.11	1673	4080	108.2	0.00089	0.00979	1302	142.3
5.46	404	3.78	0.86	0.05	2058	4080	97.2	0.00094	0.00763	1083	150.2
6.38	395	3.78	0.89	0.36	2077	4080	96.6	0.00095	0.00754	1074	150.6
5.76	397	3.78	0.67	0.27	2075	4080	96.7	0.00095	0.00755	1075	150.5
4.45	405	3.78	0.49	0.07	2045	4080	97.6	0.00094	0.00769	1090	149.9
14.05	613	3.78	0.86	0.07	1671	4080	108.2	0.00089	0.0098	1303	142.2
14.05	613	3.78	0.86	0.07	1671	4080	108.2	0.00089	0.0098	1303	142.2
17.65	589	3.78	0.9	0.37	1667	4080	108.4	0.00089	0.00983	1305	142.1
16.67	595	3.78	0.73	0.26	1640	4080	109.2	0.00089	0.01002	1323	141.6
10.67	603	3.78	0.49	0.08	1674	4080	108.1	0.00089	0.00978	1301	142.3
11	606	3.78	0.86	0.05	2035	4080	97.8	0.00094	0.00773	1095	149.7
14.87	610	3.78	0.84	0.42	2073	4080	96.7	0.00095	0.00756	1076	150.5
12.26	596	3.78	0.75	0.32	2115	4080	95.6	0.00095	0.00737	1055	151.4
8.37	604	3.78	0.46	0.1	2116	4080	95.5	0.00095	0.00736	1055	151.4
0.58	126	3.78	0.84	0.05	1681	4080	108	0.00089	0.00973	1296	142.4
0.52	126	3.78	0.85	0.03	1667	4080	108.4	0.00089	0.00983	1305	142.1
2	253	3.78	0.84	0.06	1711	4080	107.1	0.0009	0.00953	1278	143
1.95	251	3.78	0.87	0.1	1694	4080	107.6	0.00089	0.00965	1288	142.7
3.67	394	3.78	0.85	0.09	1663	4080	108.5	0.00089	0.00986	1308	142.1
4.14	395	3.78	0.76	0.05	1627	4080	109.5	0.00089	0.01011	1331	141.3
1.22	150	3.78	0.84	0.03	1636	4080	109.3	0.00089	0.01004	1326	141.5
1.11	149	3.78	0.86	0.04	1630	4080	109.4	0.00089	0.01009	1329	141.4
3.08	249	3.78	0.92	0.07	1714	4080	107	0.0009	0.00951	1276	143.1
3.03	248	3.78	0.94	0.16	1730	4080	106.6	0.0009	0.00941	1266	143.4
7.8	393	3.78	0.86	0.05	1672	4080	108.2	0.00089	0.00979	1302	142.2
7.57	392	3.78	0.86	0.05	1671	4080	108.2	0.00089	0.0098	1303	142.2
16.72	599	3.78	0.85	0.07	1647	4080	108.9	0.00089	0.00997	1318	141.7
16.45	598	3.78	0.85	0.08	1651	4080	108.8	0.00089	0.00994	1316	141.8

R507a

0.63	128	3.78	0.886	0.005	1923	3790	114.4	0.00104	0.00901	1086	140.6
0.55	129	3.78	0.861	0.058	2434	3790	100.2	0.00111	0.00696	963	149.4
2.93	258	3.78	0.843	0.097	1927	3790	114.3	0.00104	0.00898	1085	140.6
2.71	258	3.78	0.844	0.111	1934	3790	114	0.00104	0.00894	1083	140.8
4.11	248	3.78	0.856	0.48	1916	3790	114.7	0.00104	0.00905	1088	140.4
3.82	250	3.78	0.759	0.237	1905	3790	115	0.00104	0.00912	1091	140.2
2.57	252	3.78	0.566	0.018	1890	3790	115.1	0.00104	0.00921	1095	139.9
2.46	256	3.78	0.858	0.073	2394	3790	98	0.00112	0.00671	939	150.9
2.26	255	3.78	0.873	0.303	2364	3790	99.1	0.00111	0.00683	951	150.1
2.81	255	3.78	0.773	0.284	2346	3790	99.8	0.00111	0.00691	958	149.7
1.86	253	3.78	0.5	0.015	2355	3790	99.4	0.00111	0.00687	954	149.9
6	397	3.78	0.875	0.029	1928	3790	114.2	0.00104	0.00898	1084	140.7
6	397	3.78	0.875	0.029	1928	3790	114.2	0.00104	0.00898	1084	140.7
7.93	405	3.78	0.86	0.261	1880	3790	115.9	0.00104	0.00927	1098	139.7
6.86	390	3.78	0.739	0.226	1870	3790	116.1	0.00104	0.00933	1101	139.5
4.39	401	3.78	0.425	0.032	1890	3790	115.5	0.00104	0.00921	1095	139.9
4.91	396	3.78	0.854	0.059	2356	3790	99.4	0.00111	0.00686	954	149.9
5.77	396	3.78	0.844	0.38	2363	3790	99.2	0.00111	0.00684	951	150.1
5.51	396	3.78	0.797	0.209	2399	3790	97.9	0.00112	0.00669	937	151
3.97	397	3.78	0.59	0.066	2366	3790	99.1	0.00111	0.00682	950	150.2
11.93	608	3.78	0.843	0.024	1896	3790	115.3	0.00104	0.00917	1093	140
11.78	607	3.78	0.838	0.035	1897	3790	115.3	0.00104	0.00916	1093	140
16.62	601	3.78	0.845	0.394	1906	3790	114.9	0.00104	0.00911	1090	140.2
13.6	595	3.78	0.684	0.281	1894	3790	115.4	0.00104	0.00918	1094	140
8.42	598	3.78	0.45	0.054	1901	3790	115.1	0.00104	0.00914	1092	140.1
8.54	608	3.78	0.851	0.044	2408	3790	97.5	0.00112	0.00665	934	151.2
10.46	593	3.78	0.88	0.391	2416	3790	97.3	0.00112	0.00662	931	151.4
10.56	598	3.78	0.742	0.291	2385	3790	98.3	0.00112	0.00675	943	150.6
6.65	592	3.78	0.421	0.04	2384	3790	98.2	0.00112	0.00675	943	150.6
0.66	127	3.78	0.884	0.068	1670	3790	122.9	0.00101	0.01072	1163	135.6
0.41	127	3.78	0.883	0.069	1670	3790	122.9	0.00101	0.01072	1163	135.6
1.5	242	3.78	0.87	0.082	1670	3790	122.9	0.00101	0.01072	1163	135.6
1.51	243	3.78	0.871	0.078	1670	3790	122.9	0.00101	0.01072	1163	135.6
3.67	394	3.78	0.85	0.09	1663	3790	123.2	0.00101	0.01077	1165	135.5
4.14	395	3.78	0.76	0.05	1627	3790	124.4	0.001	0.01106	1177	134.8
1.11	135	3.78	0.843	0.121	1670	3790	122.9	0.00101	0.01072	1163	135.6
0.77	135	3.78	0.836	0.121	1670	3790	122.9	0.00101	0.01072	1163	135.6
3.5	246	3.78	0.855	0.076	1670	3790	122.9	0.00101	0.01072	1163	135.6
3.5	246	3.78	0.855	0.076	1670	3790	122.9	0.00101	0.01072	1163	135.6
7.92	401	3.78	0.869	0.118	1670	3790	122.9	0.00101	0.01072	1163	135.6
7.85	401	3.78	0.867	0.118	1670	3790	122.9	0.00101	0.01072		

Micro-fin 5/8 inch

R22

0.61	126	3.78	0.91	0.1	1529	4990	164.2	0.00089	0.0149	1465	137.8
0.78	126	3.78	0.91	0.1	1534	4990	164	0.00089	0.01485	1463	137.8
3.2	268	3.78	0.88	0.1	1529	4990	164.2	0.00089	0.0149	1465	137.8
3.02	268	3.78	0.89	0.1	1530	4990	164.2	0.00089	0.01489	1464	137.8
5.54	398	3.78	0.75	0.09	1539	4990	163.9	0.00089	0.0148	1460	137.9
5.16	398	3.78	0.75	0.08	1536	4990	164	0.00089	0.01483	1462	137.9

R134a

0.92	124	3.78	0.88	0.09	1009	4067	163.5	0.00087	0.02015	1711	128.3
0.96	124	3.78	0.88	0.09	1010	4067	163.5	0.00087	0.02013	1711	128.4
0.86	125	3.78	0.86	0.05	1006	4067	163.6	0.00087	0.02021	1714	128.3
3.35	259	3.78	0.92	0.1	1010	4067	163.5	0.00087	0.02013	1711	128.4
3.38	259	3.78	0.91	0.1	1007	4067	163.6	0.00087	0.02019	1713	128.3
3.83	252	3.78	0.87	0.08	1001	4067	163.9	0.00087	0.02032	1718	128.2
3.15	252	3.78	0.87	0.08	1002	4067	163.8	0.00087	0.0203	1717	128.2
5.63	348	3.78	0.89	0.1	1022	4067	163	0.00087	0.01988	1700	128.6
5.77	351	3.78	0.87	0.1	1020	4067	163.1	0.00087	0.01992	1702	128.6
4.81	322	3.78	0.87	0.05	1017	4067	163.2	0.00087	0.01998	1705	128.5
4.61	323	3.78	0.88	0.04	1020	4067	163.1	0.00087	0.01992	1702	128.6

R410A

0.59	125	3.78	0.86	0.06	2448	4950	165.7	0.00102	0.00991	993.3	143
0.64	125	3.78	0.86	0.06	2452	4950	165.5	0.00102	0.00989	992.4	143
1.73	250	3.78	0.88	0.08	2470	4950	165	0.00102	0.00981	988.2	143.3
1.5	250	3.78	0.88	0.08	2471	4950	164.9	0.00102	0.0098	987.9	143.3
3.44	400	3.78	0.68	0.1	2391	4950	167.6	0.00101	0.01021	1007	142.2
3.84	400	3.78	0.68	0.11	2402	4950	167.2	0.00101	0.01015	1004	142.3

R502

0.58	126	3.78	0.84	0.05	1681	4080	108	0.00089	0.00973	1296	142.4
0.52	126	3.78	0.85	0.03	1667	4080	108.4	0.00089	0.00983	1305	142.1
2	253	3.78	0.84	0.06	1711	4080	107.1	0.0009	0.00953	1278	143
1.95	251	3.78	0.87	0.1	1694	4080	107.6	0.00089	0.00965	1288	142.7
3.67	394	3.78	0.85	0.09	1663	4080	108.5	0.00089	0.00986	1308	142.1
4.14	395	3.78	0.76	0.05	1627	4080	109.5	0.00089	0.01011	1331	141.3

R507a

0.66124	127.46	3.78	0.88442	0.0677	1670	3790	122.9	0.00101	0.01072	1163	135.6
0.40981	127.43	3.78	0.88302	0.0692	1670	3790	122.9	0.00101	0.01072	1163	135.6
1.5023	242.35	3.78	0.86959	0.082	1670	3790	122.9	0.00101	0.01072	1163	135.6
1.5144	242.56	3.78	0.87124	0.0782	1670	3790	122.9	0.00101	0.01072	1163	135.6
3.67	394	3.78	0.85	0.09	1663	3790	123.2	0.00101	0.01077	1165	135.5
4.14	395	3.78	0.76	0.05	1627	3790	124.4	0.001	0.01106	1177	134.8

Micro-fin 5/16 inch

R22

1.44	125	3.78	0.84	0.11	1534	4990	164	0.00089	0.01485	1463	137.8
1.44	125	3.78	0.84	0.13	1538	4990	163.9	0.00089	0.01481	1461	137.9
5.32	252	3.78	0.89	0.15	1537	4990	163.9	0.00089	0.01482	1461	137.9
5.82	251	3.78	0.89	0.17	1530	4990	164.2	0.00089	0.01489	1464	137.8
12.52	407	3.78	0.89	0.09	1554	4990	163.4	0.00089	0.01464	1454	138.2
12.73	406	3.78	0.9	0.09	1554	4990	163.4	0.00089	0.01464	1454	138.2
28.42	610	3.78	0.85	0.12	1504	4990	165	0.00088	0.01517	1476	137.3
28.25	611	3.78	0.85	0.11	1499	4990	165.1	0.00088	0.01523	1479	137.3

R134a

1.64	128	3.78	0.91	0.04	1013	4067	163.4	0.00087	0.02007	1708	128.4
1.72	128	3.78	0.9	0.05	1014	4067	163.4	0.00087	0.02004	1707	128.4
6.26	241	3.78	0.89	0.08	1017	4067	163.2	0.00087	0.01998	1705	128.5
6.55	241	3.78	0.89	0.07	1017	4067	163.2	0.00087	0.01998	1705	128.5
7.52	254	3.78	0.86	0.1	1001	4067	163.9	0.00087	0.02032	1718	128.2
7.55	253	3.78	0.86	0.1	1001	4067	163.9	0.00087	0.02032	1718	128.2
15.97	388	3.78	0.87	0.08	1007	4067	163.6	0.00087	0.02019	1713	128.3
16.49	387	3.78	0.87	0.08	1004	4067	163.7	0.00087	0.02026	1716	128.2
17.59	396	3.78	0.87	0.11	995	4067	164.1	0.00087	0.02045	1724	128.1
16.61	398	3.78	0.9	0.08	1017	4067	163.2	0.00087	0.01998	1705	128.5
35.35	593	3.78	0.89	0.1	1010	4067	163.5	0.00087	0.02013	1711	128.4
35.04	592	3.78	0.89	0.1	1010	4067	163.5	0.00087	0.02013	1711	128.4
52.89	791	3.78	0.88	0.09	1012	4067	163.4	0.00087	0.02009	1709	128.4
53.46	791	3.78	0.87	0.08	1013	4067	163.4	0.00087	0.02007	1708	128.4

R410A

0.76	127	3.78	0.82	0.1	2452	4950	165.5	0.00102	0.00989	992.4	143
0.98	127	3.78	0.84	0.16	2455	4950	165.5	0.00102	0.00988	991.7	143.1
3.19	250	3.78	0.89	0.08	2446	4950	165.7	0.00102	0.00993	993.8	143
2.89	250	3.78	0.83	0.05	2464	4950	165.2	0.00102	0.00984	989.6	143.2
7.6	406	3.78	0.85	0.03	2451	4950	165.6	0.00102	0.0099	992.6	143
7.11	405	3.78	0.85	0.04	2464	4950	165.2	0.00102	0.00984	989.6	143.2
15.67	597	3.78	0.88	0.06	2438	4950	166	0.00102	0.00997	995.7	142.8
15.42	597	3.78	0.88	0.06	2429	4950	166.4	0.00102	0.01001	997.9	142.7

R502

1.22	150	3.78	0.84	0.03	1636	4080	109.3	0.00089	0.01004	1326	141.5
1.11	149	3.78	0.86	0.04	1630	4080	109.4	0.00089	0.01009	1329	141.4
3.08	249	3.78	0.92	0.07	1714	4080	107	0.0009	0.00951	1276	143.1
3.03	248	3.78	0.94	0.16	1730	4080	106.6	0.0009	0.00941	1266	143.4
7.8	393	3.78	0.86	0.05	1672	4080	108.2	0.00089	0.00979	1302	142.2
7.57	392	3.78	0.86	0.05	1671	4080	108.2	0.00089	0.0098	1303	142.2
16.72	599	3.78	0.85	0.07	1647	4080	108.9	0.00089	0.00997	1318	141.7
16.45	598	3.78	0.85	0.08	1651	4080	108.8	0.00089	0.00994	1316	141.8

R507

1.1132	134.51	3.78	0.84307	0.12052	1670	3790	122.9	0.00101	0.01072	1163	135.6
0.76528	134.63	3.78	0.83554	0.12114	1670	3790	122.9	0.00101	0.01072	1163	135.6
1.951	246.46	3.78	0.85469	0.07589	1670	3790	122.9	0.00101	0.01072	1163	135.6
3.4951	246.46	3.78	0.85469	0.07589	1670	3790	122.9	0.00101	0.01072	1163	135.6
7.9245	401.37	3.78	0.86897	0.11843	1670	3790	122.9	0.00101	0.01072	1163	135.6
7.8512	401.14	3.78	0.86676	0.11771	1670	3790	122.9	0.00101	0.01072	1163	135.6
15.272	599.58	3.78	0.89876	0.10928	1670	3790	122.9	0.00101	0.01072	1163	135.6

14.994 600.39 3.78 0.89244 0.10595 1670 3790 122.9 0.00101 0.01072 1163 135.6

APPENDIX D

Pressure drop without oil of Iowa State University (file: iow_all.in)

ΔP (kPa)	mass flux(kg/m ² s)	z(m)	x _{in}	x _{out}	P(kPa)	P _c (kPa)	h _{fg} (kJ/kg)	v _f (m ³ /kg)	v _g	μ _f (x10 ⁻⁷ , N/ms ²)	μ _g
Smooth 3/8 inch											
R134a											
2.19	86	3.97	0.05	0.85	310	4067	197.4	0.00078	0.06561	2820	109.9
2.15	86	3.97	0.05	0.84	311	4067	197.4	0.00078	0.0654	2816	109
4.66	121	3.97	0.05	0.82	306	4067	197.7	0.00078	0.06644	2833	109.7
4.55	121	3.97	0.05	0.82	306	4067	197.7	0.00078	0.06644	2833	109.7
5.39	125	3.97	0.07	0.85	299	4067	198.3	0.00077	0.06794	2857	109.4
13.34	200	3.97	0.11	0.82	305	4067	197.8	0.00078	0.06665	2836	109.7
13.35	200	3.97	0.11	0.82	307	4067	197.7	0.00078	0.06623	2830	109.8
13.48	201	3.97	0.11	0.82	305	4067	197.8	0.00078	0.06665	2836	109.7
27.4	310	3.97	0.07	0.82	303	4067	198	0.00078	0.06707	2843	109.6
28.06	308	3.97	0.07	0.83	299	4067	198.3	0.00077	0.06794	2857	109.4
27.42	307	3.97	0.07	0.83	304	4067	197.9	0.00078	0.06686	2840	109.7
39.24	372	3.97	0.1	0.8	310	4067	197.4	0.00078	0.06561	2820	109.9
38.72	362	3.97	0.11	0.83	310	4067	197.4	0.00078	0.06561	2820	109.9
0.18	87	3.97	0.85	0.15	1008	4067	163.6	0.00087	0.02017	1712	128
0.21	87	3.97	0.85	0.15	1008	4067	163.6	0.00087	0.02017	1712	128
0.56	121	3.97	0.85	0.15	1003	4067	163.8	0.00087	0.02028	1717	128
0.62	121	3.97	0.85	0.14	1002	4067	163.8	0.00087	0.0203	1717	128
2.37	206	3.97	0.86	0.15	992	4067	164.2	0.00087	0.02051	1726	128
2.59	206	3.97	0.86	0.15	990	4067	164.3	0.00087	0.02056	1728	128
5.3	305	3.97	0.83	0.16	975	4067	164.8	0.00087	0.02089	1741	128
5.53	305	3.97	0.82	0.16	976	4067	164.8	0.00087	0.02087	1740	128
8.94	368	3.97	0.84	0.14	996	4067	164	0.00087	0.02043	1723	128
8.63	373	3.97	0.82	0.14	993	4067	164.1	0.00087	0.02049	1725	128
6.16	128	3.97	0.1	0.85	301	4067	198.1	0.00077	0.0675	2850	109.5
6.18	130	3.97	0.1	0.84	301	4067	198.1	0.00077	0.0675	2850	109.5
12.29	191	3.97	0.08	0.81	306	4067	197.7	0.00078	0.06644	2833	109.7
11.74	188	3.97	0.08	0.8	307	4067	197.7	0.00078	0.06623	2830	109.8
27.45	294	3.97	0.09	0.84	304	4067	197.9	0.00078	0.06686	2840	109.7
26.44	290	3.97	0.1	0.87	298	4067	198.3	0.00077	0.06816	2860	109.4
39.57	365	3.97	0.11	0.81	307	4067	197.7	0.00078	0.06623	2830	109.8
40.01	360	3.97	0.12	0.85	302	4067	198	0.00077	0.06728	2847	109.6
R12											
5.26	132	3.97	0.09	0.8	321	4120	151.6	0.00072	0.05357	2436	114
4.26	133	3.97	0.09	0.79	334	4120	150.9	0.00072	0.05158	2403	115
4.47	133	3.97	0.09	0.79	330	4120	151.2	0.00072	0.05217	2413	114.5
10.43	197	3.97	0.09	0.8	306	4120	152.3	0.00072	0.05608	2476	114
10.2	197	3.97	0.1	0.78	305	4120	152.3	0.00072	0.05626	2479	113
10.69	199	3.97	0.1	0.78	304	4120	152.4	0.00072	0.05643	2482	113
27.29	305	3.97	0.1	0.81	302	4120	152.5	0.00072	0.05679	2487	113
24.89	314	3.97	0.09	0.8	304	4120	152.4	0.00072	0.05643	2482	113
25.33	307	3.97	0.1	0.82	303	4120	152.5	0.00072	0.05661	2484	113
37.35	391	3.97	0.1	0.83	316	4120	151.8	0.00072	0.05438	2449	114
37.77	386	3.97	0.11	0.84	316	4120	151.8	0.00072	0.05438	2449	114
0.5	134	3.97	0.83	0.1	982	4120	128	0.0008	0.01776	1629	134
0.2	134	3.97	0.83	0.08	943	4120	129.2	0.0008	0.01852	1655	133
0.33	134	3.97	0.84	0.08	943	4120	129.2	0.0008	0.01852	1655	133
1.85	211	3.97	0.8	0.05	958	4120	128.7	0.0008	0.01822	1645	133
1.8	211	3.97	0.81	0.06	962	4120	128.7	0.0008	0.01814	1642	133
3.79	305	3.97	0.83	0.09	962	4120	128.7	0.0008	0.01814	1642	133
3.76	305	3.97	0.84	0.1	957	4120	128.8	0.0008	0.01824	1645	133
3.3	307	3.97	0.82	0.07	974	4120	128.3	0.0008	0.01791	1634	134
6.17	374	3.97	0.8	0.13	934	4120	129.5	0.0008	0.0187	1661	133
6.89	373	3.97	0.81	0.13	940	4120	129.3	0.0008	0.01858	1657	133
R22											
3.5	125	3.97	0.2	0.88	450	4990	204.8	0.00077	0.05154	2260	115.2
4.4	128	3.97	0.2	0.92	440	4990	205.3	0.00077	0.05268	2274	114.9
3.8	131	3.97	0.2	0.91	450	4990	204.8	0.00077	0.05154	2260	115.2
8.4	202	3.97	0.18	0.75	470	4990	203.8	0.00078	0.04941	2231	115.8
9.3	203	3.97	0.18	0.8	480	4990	203.3	0.00078	0.04841	2218	116.1
9	208	3.97	0.18	0.76	460	4990	204.3	0.00077	0.05046	2245	115.5
19.4	302	3.97	0.17	0.74	480	4990	203.3	0.00078	0.04841	2218	116.1
18	303	3.97	0.15	0.72	490	4990	202.8	0.00078	0.04745	2204	116.4
31.2	387	3.97	0.23	0.77	480	4990	203.3	0.00078	0.04841	2218	116.1
30.7	390	3.97	0.22	0.73	500	4990	202.3	0.00078	0.04653	2191	116.7
1	127	3.97	0.88	0.04	1600	4990	161.9	0.00089	0.01418	1433	138.9
1	130	3.97	0.86	0.05	1600	4990	161.9	0.00089	0.01418	1433	138.9
2.1	198	3.97	0.91	0.14	1570	4990	162.9	0.00089	0.01448	1447	138.4
2	201	3.97	0.9	0.15	1570	4990	162.9	0.00089	0.01448	1447	138.4
2.2	201	3.97	0.9	0.15	1570	4990	162.9	0.00089	0.01448	1447	138.4
3.8	302	3.97	0.93	0.09	1690	4990	159.1	0.0009	0.01334	1395	140.4
4.7	303	3.97	0.91	0.17	1510	4990	164.8	0.00088	0.01511	1474	137.4
4.1	303	3.97	0.91	0.11	1560	4990	163.2	0.00089	0.01458	1451	138.3
9.7	409	3.97	0.93	0.23	1460	4990	166.4	0.00088	0.01567	1497	136.6
8	410	3.97	0.92	0.19	1610	4990	161.6	0.00089	0.01408	1429	139.1

9.9	411	3.97	0.94	0.23	1470	4990	166	0.00088	0.01555	1492	136.8
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Micro-fin 3/8 inch

R134a

3.33	85	3.97	0.08	0.84	310	4067	197.4	0.00078	0.0656	2820	110
3.78	91	3.97	0.08	0.81	308	4067	197.6	0.00078	0.066	2830	110
5.55	129	3.97	0.05	0.82	307	4067	197.7	0.00078	0.0662	2830	110
5.43	130	3.97	0.05	0.81	310	4067	197.4	0.00078	0.0656	2820	110
13.38	198	3.97	0.07	0.81	308	4067	197.6	0.00078	0.066	2830	110
14.19	197	3.97	0.07	0.84	304	4067	197.9	0.00078	0.0669	2840	110
14.66	200	3.97	0.1	0.83	304	4067	197.9	0.00078	0.0669	2840	110
27.22	289	3.97	0.08	0.81	314	4067	197.2	0.00078	0.0648	2810	110
30.19	299	3.97	0.08	0.82	313	4067	197.3	0.00078	0.065	2810	110
40.06	367	3.97	0.07	0.82	329	4067	196.2	0.00078	0.0619	2760	111
42.74	373	3.97	0.09	0.83	324	4067	196.6	0.00078	0.0629	2780	111
44.47	375	3.97	0.09	0.81	317	4067	197	0.00078	0.0642	2800	110
1.05	129	3.97	0.86	0.15	987	4067	164.4	0.00087	0.0206	1730	128
1.07	129	3.97	0.86	0.14	985	4067	164.5	0.00087	0.0206	1730	128
3.28	203	3.97	0.88	0.17	996	4067	164	0.00087	0.0204	1720	128
3.31	202	3.97	0.89	0.15	1011	4067	163.4	0.00087	0.0201	1710	128
8.07	300	3.97	0.87	0.14	983	4067	164.6	0.00087	0.0207	1730	128
8.34	299	3.97	0.87	0.14	987	4067	164.4	0.00087	0.0206	1730	128
12.4	363	3.97	0.84	0.15	978	4067	164.5	0.00087	0.0208	1740	128
11.85	361	3.97	0.86	0.15	984	4067	164.5	0.00087	0.0206	1730	128

R12

4.9	124	3.97	0.09	0.82	327	4125	151.3	0.00072	0.05263	2420	114
4.95	125	3.97	0.09	0.79	325	4125	151.4	0.00072	0.05294	2430	114
5.15	131	3.97	0.09	0.81	317	4125	151.7	0.00072	0.05422	2450	114
12.3	203	3.97	0.09	0.83	321	4125	151.6	0.00072	0.05357	2440	114
12.85	202	3.97	0.1	0.84	324	4125	151.4	0.00072	0.0531	2430	114
26.62	308	3.97	0.08	0.81	310	4125	152.2	0.00072	0.05539	2470	114
26.71	304	3.97	0.07	0.83	310	4125	152.2	0.00072	0.05539	2470	114
35.55	358	3.97	0.11	0.82	334	4125	150.9	0.00072	0.05158	2400	115
36.15	361	3.97	0.11	0.82	334	4125	150.9	0.00072	0.05158	2400	115
4.9	124	3.97	0.09	0.82	327	4125	151.3	0.00072	0.05263	2420	114
4.95	125	3.97	0.09	0.79	325	4125	151.4	0.00072	0.05294	2430	114
5.15	131	3.97	0.09	0.81	317	4125	151.7	0.00072	0.05422	2450	114
12.3	203	3.97	0.09	0.83	321	4125	151.6	0.00072	0.05357	2440	114
12.85	202	3.97	0.1	0.84	324	4125	151.4	0.00072	0.0531	2430	114
26.62	308	3.97	0.08	0.81	310	4125	152.2	0.00072	0.05539	2470	114
26.71	304	3.97	0.07	0.83	310	4125	152.2	0.00072	0.05539	2470	114
35.55	358	3.97	0.11	0.82	334	4125	150.9	0.00072	0.05158	2400	115
36.15	361	3.97	0.11	0.82	334	4125	150.9	0.00072	0.05158	2400	115
0.71	117	3.97	0.84	0.09	959	4125	128.7	0.0008	0.0182	1640	133
0.73	115	3.97	0.86	0.09	958	4125	128.7	0.0008	0.01822	1650	133
0.77	126	3.97	0.77	0.08	953	4125	129	0.00079	0.01832	1650	133
3	205	3.97	0.87	0.08	960	4125	128.8	0.0008	0.01818	1640	133
3.05	205	3.97	0.85	0.08	955	4125	128.9	0.0008	0.01828	1650	133
5.65	299	3.97	0.86	0.1	932	4125	129.6	0.0008	0.01875	1660	133
5.57	301	3.97	0.84	0.09	929	4125	129.6	0.00079	0.01881	1660	133
5.79	302	3.97	0.83	0.09	927	4125	129.7	0.00079	0.01885	1670	133
8.59	367	3.97	0.84	0.14	921	4125	129.9	0.00079	0.01897	1670	132
0.71	117	3.97	0.84	0.09	959	4125	128.7	0.0008	0.0182	1640	133
0.73	115	3.97	0.86	0.09	958	4125	128.7	0.0008	0.01822	1650	133
0.77	126	3.97	0.77	0.08	953	4125	129	0.00079	0.01832	1650	133
3	205	3.97	0.87	0.08	960	4125	128.8	0.0008	0.01818	1640	133
3.05	205	3.97	0.85	0.08	955	4125	128.9	0.0008	0.01828	1650	133
5.65	299	3.97	0.86	0.1	932	4125	129.6	0.0008	0.01875	1660	133
5.57	301	3.97	0.84	0.09	929	4125	129.6	0.00079	0.01881	1660	133
5.79	302	3.97	0.83	0.09	927	4125	129.7	0.00079	0.01885	1670	133
8.59	367	3.97	0.84	0.14	921	4125	129.9	0.00079	0.01897	1670	132

R22

4.2	118	3.97	0.22	0.86	500	4990	202.3	0.00078	0.04653	2190	117
4.4	119	3.97	0.21	0.82	510	4990	201.6	0.00078	0.04564	2180	117
4.2	123	3.97	0.21	0.81	510	4990	201.6	0.00078	0.04564	2180	117
4	125	3.97	0.2	0.8	510	4990	201.6	0.00078	0.04564	2180	117
13.1	203	3.97	0.19	0.9	470	4990	203.8	0.00078	0.04941	2230	116
12	204	3.97	0.15	0.82	500	4990	202.3	0.00078	0.04653	2190	117
26.2	301	3.97	0.16	0.86	550	4990	200	0.00079	0.0424	2130	118
26.4	306	3.97	0.17	0.85	550	4990	200	0.00079	0.0424	2130	118
25.4	306	3.97	0.16	0.83	540	4990	200.4	0.00079	0.04316	2140	118
26.2	316	3.97	0.16	0.8	550	4990	200	0.00079	0.0424	2130	118
41.7	381	3.97	0.18	0.78	550	4990	200	0.00079	0.0424	2130	118
42.5	394	3.97	0.18	0.81	550	4990	200	0.00079	0.0424	2130	118
41.9	396	3.97	0.17	0.76	540	4990	200.4	0.00079	0.04316	2140	118
1.1	121	3.97	0.9	0.05	1560	4990	163.2	0.00089	0.01458	1450	138
1.2	122	3.97	0.9	0.06	1560	4990	163.2	0.00089	0.01458	1450	138
1.1	126	3.97	0.87	0.05	1550	4990	163.5	0.00089	0.01468	1460	138
2.6	190	3.97	0.9	0.09	1550	4990	163.5	0.00089	0.01468	1460	138
2.9	190	3.97	0.89	0.1	1550	4990	163.5	0.00089	0.01468	1460	138
3	193	3.97	0.92	0.06	1530	4990	164.2	0.00089	0.01489	1460	138
3	193	3.97	0.9	0.07	1550	4990	163.5	0.00089	0.01468	1460	138
6.7	284	3.97	0.9	0.15	1560	4990	163.2	0.00089	0.01458	1450	138
7.1	292	3.97	0.93	0.09	1520	4990	164.4	0.00089	0.015	1470	138
7.4	293	3.97	0.9	0.15	1560	4990	163.2	0.00089	0.01458	1450	138

11.5	380	3.97	0.89	0.13	1520	4990	163.2	0.00089	0.01458	1450	138
11.5	382	3.97	0.88	0.13	1530	4990	164.2	0.00089	0.01489	1460	138
11.4	383	3.97	0.89	0.13	1520	4990	163.2	0.00089	0.01458	1450	138

Smooth 1/2 inch

R134a

2.42	82	3.97	0.09	0.83	305	4067	197.8	0.00078	0.06665	2836	109.7
2.03	82	3.97	0.09	0.76	314	4067	197.2	0.00078	0.0648	2807	110.1
5.02	121	3.97	0.11	0.79	316	4067	197	0.00078	0.0644	2800	110.1
5.66	120	3.97	0.12	0.86	309	4067	197.6	0.00078	0.06581	2823	109.9
15.57	199	3.97	0.09	0.87	315	4067	197.1	0.00078	0.0646	2803	110.1
16.75	205	3.97	0.08	0.84	314	4067	197.2	0.00078	0.0648	2810	110
23.3	246	3.97	0.06	0.87	319	4067	196.9	0.00078	0.06382	2791	110.3
24.19	267	3.97	0.04	0.79	318	4067	196.9	0.00078	0.06401	2794	110.2
0.24	83	3.97	0.87	0.16	1024	4067	162.9	0.00087	0.01984	1699	128.6
0.35	86	3.97	0.82	0.16	1014	4067	163.4	0.00087	0.02004	1707	128.4
0.32	124	3.97	0.86	0.16	1025	4067	162.9	0.00087	0.01982	1698	128.7
0.49	125	3.97	0.84	0.15	1012	4067	163.4	0.00087	0.02009	1709	128.4
1.04	191	3.97	0.82	0.12	1020	4067	163.1	0.00087	0.01992	1702	128.6
0.92	192	3.97	0.81	0.12	1021	4067	163.1	0.00087	0.0199	1701	128.6
2.22	279	3.97	0.82	0.14	1025	4067	162.9	0.00087	0.01982	1698	128.7
2.1	281	3.97	0.82	0.15	996	4067	164	0.00087	0.02043	1723	128.1

Micro-fin 1/2 inch

R134a

2.75	85	3.97	0.08	0.84	320	4067	196.8	0.00078	0.06363	2787	110.3
2.58	85	3.97	0.08	0.81	325	4067	196.4	0.00078	0.06268	2772	110.5
7.41	129	3.97	0.11	0.84	312	4067	197.3	0.00078	0.0652	2813	110
7.06	128	3.97	0.11	0.82	318	4067	196.9	0.00078	0.06401	2794	110.2
8.75	131	3.97	0.12	0.87	310	4067	197.4	0.00078	0.06561	2820	109.9
7.92	133	3.97	0.1	0.79	323	4067	196.6	0.00078	0.06305	2778	110.4
16.01	184	3.97	0.09	0.78	309	4067	197.6	0.00078	0.06581	2823	109.9
16.05	184	3.97	0.08	0.79	304	4067	197.9	0.00078	0.06686	2840	109.7
25.17	245	3.97	0.09	0.81	361	4067	194.1	0.00078	0.05661	2666	111.8
25.75	227	3.97	0.11	0.89	351	4067	194.8	0.00078	0.05817	2694	111.5
26.04	259	3.97	0.08	0.75	354	4067	194.6	0.00078	0.0577	2685	111.6
0.21	89	3.97	0.82	0.09	1052	4067	161.9	0.00088	0.01928	1675	129.2
0.28	89	3.97	0.82	0.11	1044	4067	162.1	0.00088	0.01944	1682	129
0.13	88	3.97	0.83	0.12	1038	4067	162.3	0.00087	0.01955	1687	128.9
0.49	122	3.97	0.82	0.13	1060	4067	161.6	0.00088	0.01912	1669	129.4
0.32	116	3.97	0.89	0.14	1046	4067	162.1	0.00088	0.0194	1680	129.1
0.47	121	3.97	0.84	0.16	1028	4067	162.8	0.00087	0.01976	1695	128.7
1.53	195	3.97	0.8	0.17	1052	4067	161.9	0.00088	0.01928	1675	129.2
1.45	196	3.97	0.8	0.16	1065	4067	161.4	0.00088	0.01903	1665	129.5
3.13	286	3.97	0.8	0.07	997	4067	164	0.00087	0.02041	1722	128.1
3.05	284	3.97	0.84	0.07	1019	4067	163.1	0.00087	0.01994	1703	128.5

APPENDIX E

Pressure drop with oil of Iowa State University (file: iow_allo.in)

ΔP (kPa)	G (kg/m ² s)	Oil (%)	W_{in} (kg/kmole)	x_{in}	x_{out}	P(kPa)	W_{out} (kg/kmole)	h_g (kJ/kg)	v_r (m ³ /kg)	v_g	μ_r (x10 ⁻³ , N/ms ²)	μ_g	T_c (°C)	ρ_{in} (kg/m ³)	μ_{out} (N/ms ²)
Smooth 3/8 inch, condensation															
R12 with SUS150 naphthenic oil															
0.67	129	1.3	800	0.78	0.08	948	120.91	125.9	0.0007954	0.018	1654	132.9	39.3	952.8	0.0357684
0.8	129	1.3	800	0.78	0.08	940	120.91	126.1	0.0007945	0.01816	1660	132.7	39.2	952.9	0.0358667
1.89	208	1.3	800	0.83	0.06	941	120.91	126.2	0.0007946	0.01814	1659	132.7	39.2	952.9	0.0358667
1.45	208	1.3	800	0.82	0.06	938	120.91	126.2	0.0007942	0.0182	1661	132.7	39.1	952.9	0.0360483
3.41	293	1.3	800	0.83	0.1	947	120.91	125.9	0.0007952	0.01802	1655	132.9	39.5	952.7	0.0353979
3.2	294	1.3	800	0.82	0.1	944	120.91	126	0.0007949	0.01808	1657	132.8	39.4	952.8	0.0355869
6.24	367	1.3	800	0.81	0.09	942	120.91	126.1	0.0007947	0.01812	1658	132.8	39.3	952.8	0.0357684
6.12	367	1.3	800	0.81	0.09	942	120.91	126.1	0.0007947	0.01812	1658	132.8	39.3	952.8	0.0357684
0.37	130	2.4	800	0.82	0.09	937	120.91	126.2	0.0007941	0.01822	1662	132.6	39	953	0.0362375
0.39	129	2.4	800	0.83	0.09	935	120.91	126.3	0.0007939	0.01827	1663	132.6	39	953	0.0362375
1.47	198	2.4	800	0.85	0.09	950	120.91	125.9	0.0007956	0.01796	1653	132.9	39.6	952.6	0.0352089
1.45	197	2.4	800	0.85	0.09	950	120.91	125.9	0.0007956	0.01796	1653	132.9	39.6	952.6	0.0352089
4.74	297	2.4	800	0.82	0.11	920	120.91	126.8	0.0007922	0.01858	1673	132.2	38.3	953.4	0.0374496
4.6	297	2.4	800	0.82	0.11	922	120.91	126.7	0.0007925	0.01853	1672	132.3	38.4	953.4	0.0372678
6.89	368	2.4	800	0.82	0.1	942	120.91	126.1	0.0007947	0.01812	1658	132.8	39.2	952.9	0.0358667
6.43	367	2.4	800	0.82	0.1	944	120.91	126	0.0007949	0.01808	1657	132.8	39.3	952.8	0.0357684
1.31	123	4.9	800	0.81	0.09	944	120.91	126	0.0007949	0.01808	1657	132.8	39.3	952.8	0.0357684
1.37	123	4.9	800	0.81	0.09	940	120.91	126.1	0.0007945	0.01816	1660	132.7	39.1	952.9	0.0360483
1.45	197	4.9	800	0.8	0.08	928	120.91	126.5	0.0007931	0.01841	1668	132.4	38.7	953.2	0.036707
1.48	197	4.9	800	0.8	0.08	925	120.91	126.5	0.0007928	0.01847	1670	132.4	38.6	953.2	0.0368888
4.05	303	4.9	800	0.79	0.07	918	120.91	126.8	0.000792	0.01862	1675	132.2	38.3	953.4	0.0374496
4.07	303	4.9	800	0.79	0.07	916	120.91	126.8	0.0007918	0.01866	1676	132.1	38.2	953.5	0.0376393
6.07	363	4.9	800	0.82	0.11	932	120.91	126.3	0.0007936	0.01833	1665	132.5	38.8	953.1	0.0366085
6.06	371	4.9	800	0.79	0.1	926	120.91	126.6	0.0007929	0.01845	1669	132.4	38.6	953.2	0.0368888
R12 with SUS300 naphthenic oil															
0.82	134	1.2	800	0.83	0.07	966	120.91	125.4	0.0007973	0.01765	1643	133.3	40.2	953.8	0.0531285
0.7	134	1.2	800	0.83	0.07	963	120.91	125.4	0.0007977	0.01771	1645	133.3	40.2	953.8	0.0531285
1.8	201	1.2	800	0.82	0.09	967	120.91	125.3	0.0007975	0.01763	1642	133.3	40.3	953.7	0.0529354
1.69	200	1.2	800	0.83	0.09	965	120.91	125.4	0.0007972	0.01767	1643	133.3	40.2	953.8	0.0531285
4.3	308	1.2	800	0.79	0.09	937	120.91	126.2	0.0007941	0.01822	1662	132.6	39.1	954.4	0.055928
4.82	304	1.2	800	0.8	0.09	933	120.91	126.3	0.0007937	0.01831	1664	132.6	38.9	954.6	0.0564982
6.71	372	1.2	800	0.8	0.11	937	120.91	126.2	0.0007941	0.01822	1662	132.6	39.1	954.4	0.055928
6.94	372	1.2	800	0.8	0.12	936	120.91	126.3	0.000794	0.01824	1662	132.6	39	954.5	0.056213
0.53	129	2.4	800	0.82	0.09	943	120.91	126.1	0.0007948	0.0181	1658	132.8	39.3	954.3	0.0554609
0.54	129	2.4	800	0.82	0.1	943	120.91	126.1	0.0007948	0.0181	1658	132.8	39.3	954.3	0.0554609
1.69	203	2.4	800	0.81	0.09	936	120.91	126.3	0.000794	0.01824	1662	132.6	39	954.5	0.056213
1.55	201	2.4	800	0.83	0.08	946	120.91	125.9	0.0007951	0.01804	1656	132.9	39.4	954.3	0.0551877
3.86	296	2.4	800	0.82	0.08	934	120.91	126.4	0.0007938	0.01829	1664	132.6	38.9	954.6	0.0564982
3.95	300	2.4	800	0.81	0.08	930	120.91	126.4	0.0007934	0.01837	1666	132.5	38.7	954.7	0.0569658
6.3	369	2.4	800	0.79	0.09	931	120.91	126.4	0.0007935	0.01835	1666	132.5	38.8	954.6	0.0567716
6.15	371	2.4	800	0.79	0.1	930	120.91	126.4	0.0007934	0.01837	1666	132.5	38.7	954.7	0.0569658
6.65	368	2.4	800	0.84	0.13	929	120.91	126.5	0.0007932	0.01839	1667	132.5	38.7	954.7	0.0569658
0.94	131	4.8	800	0.81	0.07	955	120.91	125.6	0.0007961	0.01787	1650	133.1	39.8	954	0.0541519
0.91	130	4.8	800	0.82	0.06	937	120.91	126.2	0.0007941	0.01822	1662	132.6	39.1	954.4	0.055928
0.65	131	4.8	800	0.82	0.06	936	120.91	126.3	0.000794	0.01824	1662	132.6	39	954.5	0.056213
1.38	199	4.8	800	0.82	0.08	922	120.91	126.7	0.0007925	0.01853	1671	132.3	38.4	954.9	0.0578103
1.43	200	4.8	800	0.81	0.08	921	120.91	126.7	0.0007924	0.01855	1673	132.3	38.4	954.9	0.0578103
1.35	197	4.8	800	0.83	0.07	930	120.91	126.4	0.0007934	0.01837	1666	132.5	38.7	954.7	0.0569658
4.25	296	4.8	800	0.82	0.08	934	120.91	126.4	0.0007938	0.01829	1664	132.6	38.9	954	0.0538789
4.3	300	4.8	800	0.82	0.07	933	120.91	126.3	0.0007937	0.01831	1664	132.5	38.9	954.6	0.0564982
3.82	296	4.8	800	0.8	0.07	928	120.91	126.5	0.0007931	0.01841	1668	132.4	38.7	954.7	0.0569658
6.21	368	4.8	800	0.8	0.09	910	120.91	127	0.0007911	0.01879	1680	132	37.9	955.2	0.0592152
6.39	366	4.8	800	0.81	0.1	907	120.91	127.1	0.0007908	0.01885	1682	131.9	37.8	955.2	0.0593977
R134a with SUS169 ester-m oil															
0.48	81	0.5	500	0.89	0.11	1005	102.03	163.7	0.0008709	0.02023	1715	128.3	39.6	952.8	0.0377656
0.46	80	0.5	500	0.89	0.11	1007	102.03	163.6	0.0008711	0.02019	1713	128.3	39.7	952.8	0.0375841
1.69	126	0.5	500	0.87	0.12	1008	102.03	163.6	0.0008712	0.02017	1712	128.3	39.7	952.8	0.0375841
1.65	125	0.5	500	0.87	0.13	1009	102.03	163.5	0.0008713	0.02015	1711	128.3	39.8	952.7	0.0373947
2.95	200	0.5	500	0.86	0.12	1012	102.03	163.4	0.0008717	0.02009	1709	128.4	39.9	952.7	0.0372131
2.85	201	0.5	500	0.86	0.13	1013	102.03	163.4	0.0008718	0.02007	1708	128.4	39.9	952.7	0.0372131
5.78	301	0.5	500	0.85	0.1	1024	102.03	162.9	0.0008731	0.01984	1699	128.6	40.3	952.4	0.0365548
5.96	300	0.5	500	0.85	0.1	1026	102.03	162.9	0.0008734	0.0198	1697	128.7	40.3	952.4	0.0365548
8.46	374	0.5	500	0.84	0.11	1030	102.03	162.8	0.0008738	0.01972	1693	128.8	40.5	952.3	0.0361843
9.36	374	0.5	500	0.84	0.12	1020	102.03	163.1	0.0008726	0.01992	1702	128.6	40.1	952.5	0.0369253
0.15	83	1	500	0.85	0.11	1002	102.03	163.8	0.0008705	0.0203	1717	128.2	39.5	952.9	0.0379552
0.13	83	1	500	0.84	0.11	1006	102.03	163.6	0.000871	0.02021	1714	128.3	39.6	952.8	0.0377656
0.59	122	1	500	0.9	0.11	1008	102.03	163.6	0.0008712	0.02017	1712	128.3	39.7	952.8	0.0375841
0.62	125	1	500	0.87	0.1	1012	102.03	163.4	0.0008717	0.02009	1709	128.4	39.9	952.7	0.0372131
1.91	204	1	500	0.85	0.09	1003	102.03	163.8	0.0008706	0.02028	1717	128.2	39.5	952.9	0.0379552
1.88	203	1	500	0.86	0.09	1005	102.03	163.7	0.0008709	0.02023	1715	128.3	39.6	952.8	0.0377656
4.61	299	1	500	0.84	0.08	999	102.03	163.9	0.0008702	0.02036	1720	128.1	39.3	953	0.0383264
4.82	300	1	500	0.83	0.07	1000	102.03	163.8	0.0008703	0.02034	1719	128.2	39.4	953	0.0381448
8.1	380	1	500	0.84	0.09	1001	102.03	163.9	0.0008704	0.02032	1718	128.2	39.4	953	0.0381448
7.86	380	1	500	0.84	0.09	1005	102.03	163.7	0.0008709	0.02023	1715	128.3	39.6	952.8	0.0377656
1.25	133	1.9	500	0.84	0.1	1037	102.03	162.4	0.0008747	0.01957	1688	128.9	40.7	952.2	0.0359047
1.															

2.53	203	2.9	500	0.83	0.14	1028	102.03	162.8	0.0008736	0.01976	1695	128.7	40.4	952.4	0.0363733
5.79	300	2.9	500	0.84	0.08	1001	102.03	163.9	0.0008704	0.02032	1718	128.2	39.4	953	0.0381448
6.22	300	2.9	500	0.84	0.08	1004	102.03	163.7	0.0008708	0.02026	1716	128.2	39.6	952.8	0.0377656
8.96	374	2.9	500	0.84	0.12	999	102.03	163.9	0.0008702	0.02036	1720	128.1	39.4	953	0.0381448
8.88	374	2.9	500	0.83	0.11	1001	102.03	163.9	0.0008704	0.02032	1718	128.2	39.4	953	0.0381448
0.72	86	5	500	0.86	0.14	996	102.03	164	0.0008698	0.02043	1723	128.1	39.2	953.1	0.0385161
0.58	87	5	500	0.85	0.14	995	102.03	164.1	0.0008697	0.02045	1724	128.1	39.2	953.1	0.0385161
2.92	127	5	500	0.82	0.08	1017	102.03	163.2	0.0008723	0.01998	1705	128.5	40	952.6	0.0370238
2.91	126	5	500	0.83	0.1	1020	102.03	163.1	0.0008726	0.01992	1702	128.6	40.1	952.5	0.0369253
3.66	201	5	500	0.83	0.15	990	102.03	164.3	0.0008691	0.02056	1728	128	39	953.2	0.0387968
3.64	201	5	500	0.83	0.15	990	102.03	164.3	0.0008691	0.02056	1728	128	39	953.2	0.0387968
3.38	201	5	500	0.83	0.12	990	102.03	164.3	0.0008691	0.02056	1728	128	39	953.2	0.0387968
7.86	296	5	500	0.84	0.14	1013	102.03	163.4	0.0008718	0.02007	1708	128.4	39.9	952.7	0.0372131
8.27	300	5	500	0.84	0.13	1021	102.03	163.1	0.0008728	0.01999	1701	128.6	40.2	952.5	0.0367439
10.45	375	5	500	0.83	0.13	983	102.03	164.6	0.0008683	0.02071	1734	127.8	38.7	953.4	0.0393585
10.47	372	5	500	0.83	0.13	982	102.03	164.5	0.0008681	0.02073	1735	127.8	38.7	953.4	0.0393585

R134a with SUS369 ester-m oil

0.1	88	0.6	500	0.86	0.15	1021	102.03	163.1	0.0008728	0.01999	1701	128.6	40.2	954.5	0.0654148
0.2	88	0.6	500	0.86	0.15	1021	102.03	163.1	0.0008728	0.01999	1701	128.6	40.1	954.5	0.0656882
0.71	121	0.6	500	0.86	0.14	1001	102.03	163.9	0.0008704	0.02032	1718	128.2	39.4	955	0.0679459
0.74	123	0.6	500	0.86	0.14	1003	102.03	163.8	0.0008706	0.02028	1717	128.2	39.5	954.9	0.0675669
2.41	199	0.6	500	0.79	0.15	981	102.03	164.6	0.000868	0.02076	1736	127.8	38.6	955.4	0.0704673
2.83	199	0.6	500	0.84	0.15	989	102.03	164.3	0.000869	0.02058	1729	127.9	38.9	955.3	0.06954
2.56	200	0.6	500	0.82	0.14	992	102.03	164.2	0.0008693	0.02051	1726	128	39.1	955.1	0.0688723
4.96	296	0.6	500	0.84	0.13	1006	102.03	163.6	0.000871	0.02021	1714	128.3	39.6	954.8	0.0672792
5.26	298	0.6	500	0.83	0.12	1009	102.03	163.5	0.0008713	0.02015	1711	128.3	39.8	954.7	0.0666271
8.98	374	0.6	500	0.83	0.13	1003	102.03	163.8	0.0008706	0.02028	1717	128.2	39.5	954.9	0.0675669
9.58	375	0.6	500	0.83	0.15	990	102.03	164.3	0.0008691	0.02056	1728	128	39	955.2	0.0691605
0.05	89	1.1	500	0.86	0.13	1021	102.03	163.1	0.0008728	0.01999	1701	128.6	40.2	954.5	0.0654148
0.06	89	1.1	500	0.86	0.13	1021	102.03	163.1	0.0008728	0.01999	1701	128.6	40.1	954.5	0.0656882
0.55	122	1.1	500	0.82	0.13	1000	102.03	163.8	0.0008703	0.02034	1719	128.2	39.4	955	0.0679459
0.49	122	1.1	500	0.81	0.13	1003	102.03	163.8	0.0008706	0.02028	1717	128.2	39.5	954.9	0.0675669
2.92	203	1.1	500	0.83	0.1	974	102.03	164.9	0.0008672	0.02091	1742	127.6	38.3	955.6	0.0715013
2.8	202	1.1	500	0.84	0.11	971	102.03	165	0.0008668	0.02098	1745	127.6	38.3	955.6	0.0715013
6.4	301	1.1	500	0.83	0.12	993	102.03	164.1	0.0008694	0.02049	1725	128	39.1	955.1	0.0688723
5.8	302	1.1	500	0.82	0.12	994	102.03	164.1	0.0008696	0.02047	1724	128	39.2	955.1	0.0685986
9	369	1.1	500	0.82	0.13	989	102.03	164.3	0.000869	0.02058	1729	127.9	39	955.2	0.0691605
8.72	367	1.1	500	0.83	0.14	994	102.03	164.1	0.0008696	0.02047	1724	128	39.2	955.1	0.0685986
0.41	87	2.4	500	0.83	0.1	1018	102.03	163.1	0.0008724	0.01996	1704	128.5	40.1	954.5	0.0656882
0.33	87	2.4	500	0.83	0.1	1013	102.03	163.4	0.0008718	0.02007	1708	128.4	39.9	954.7	0.0663537
0.2	86	2.4	500	0.83	0.11	1006	102.03	163.6	0.000871	0.02021	1714	128.3	39.7	954.8	0.0670058
0.9	132	2.4	500	0.82	0.08	1010	102.03	163.5	0.0008715	0.02013	1711	128.4	39.8	954.7	0.0666271
0.8	131	2.4	500	0.83	0.07	1012	102.03	163.4	0.0008717	0.02009	1709	128.4	39.9	954.7	0.0663537
1.5	209	2.4	500	0.83	0.09	1073	102.03	161.1	0.0008789	0.01888	1658	129.6	41.9	953.5	0.0604593
1.3	208	2.4	500	0.84	0.09	1065	102.03	161.4	0.000878	0.01903	1665	129.5	41.7	953.6	0.0610176
3.58	303	2.4	500	0.83	0.09	1041	102.03	162.3	0.0008751	0.0195	1684	129	40.9	954.1	0.0633573
3.58	299	2.4	500	0.85	0.09	1035	102.03	162.5	0.0008744	0.01961	1698	128.9	40.7	954.2	0.0639169
7.84	384	2.4	500	0.83	0.11	1023	102.03	163	0.000873	0.01986	1699	128.6	40.2	954.5	0.0654148
7.69	384	2.4	500	0.83	0.12	1016	102.03	163.2	0.0008722	0.02	1705	128.5	40.1	954.5	0.0656882
0.31	88	5	500	0.81	0.14	1000	102.03	163.8	0.0008703	0.02034	1719	128.2	39.4	955	0.0679459
0.42	87	5	500	0.81	0.14	1003	102.03	163.8	0.0008706	0.02028	1717	128.2	39.5	954.9	0.0675669
0.59	126	5	500	0.84	0.1	1011	102.03	163.4	0.0008716	0.02011	1710	128.4	39.8	954.7	0.0666271
0.36	126	5	500	0.85	0.1	1007	102.03	163.6	0.0008711	0.02019	1713	128.3	39.7	954.8	0.0670058
1.77	194	5	500	0.81	0.08	1003	102.03	163.8	0.0008706	0.02028	1717	128.2	39.5	954.9	0.0675669
1.82	194	5	500	0.82	0.08	1005	102.03	163.7	0.0008709	0.02023	1715	128.3	39.6	954.8	0.0672792
4.32	301	5	500	0.8	0.13	993	102.03	164.1	0.0008694	0.02049	1725	128	39.1	955.1	0.0688723
4.59	301	5	500	0.8	0.14	989	102.03	164.3	0.000869	0.02058	1729	127.9	39	955.2	0.0691605
9.24	380	5	500	0.83	0.12	1002	102.03	163.8	0.0008705	0.0203	1717	128.2	39.5	954.9	0.0675669
8.64	380	5	500	0.83	0.11	1004	102.03	163.7	0.0008708	0.02026	1716	128.2	39.6	954.8	0.0672792

R134a with SUS150 ester-b oil

0.63	132	1.1	500	0.84	0.1	1064	102.03	161.3	0.0008778	0.01905	1665	129.4	41.1	951.7	0.0328781
0.63	132	1.1	500	0.83	0.1	1040	102.03	162.3	0.000875	0.01952	1685	129	40.8	951.9	0.033345
1.94	202	1.1	500	0.84	0.13	1016	102.03	163.2	0.0008722	0.02	1705	128.5	40	952.4	0.0345592
2.07	204	1.1	500	0.82	0.11	1022	102.03	163	0.0008729	0.01988	1700	128.6	40.2	952.3	0.0342799
5.15	300	1.1	500	0.82	0.13	1013	102.03	163.6	0.0008718	0.02007	1708	128.4	39.9	952.5	0.0347479
5.32	301	1.1	500	0.83	0.14	1011	102.03	163.4	0.0008716	0.02011	1710	128.4	39.8	952.5	0.0349294
7.96	380	1.1	500	0.88	0.11	1037	102.03	162.4	0.0008747	0.01957	1688	128.9	40.7	952	0.0334426
7.94	382	1.1	500	0.87	0.1	1037	102.03	162.4	0.0008747	0.01957	1688	128.9	40.7	952	0.0334426
0.58	121	2.4	500	0.86	0.14	1049	102.03	162	0.0008761	0.01934	1678	129.1	41.1	951.7	0.0328781
0.67	123	2.4	500	0.84	0.14	1042	102.03	162.2	0.0008752	0.01948	1683	129	40.9	951.9	0.0331638
1.97	208	2.4	500	0.83	0.08	1027	102.03	162.8	0.0008735	0.01978	1696	128.7	40.4	952.2	0.03391
1.94	206	2.4	500	0.84	0.09	1021	102.03	163.1	0.0008728	0.01999	1701	128.6	40.2	952.3	0.0342799
5.02	310	2.4	500	0.83	0.1	1042	102.03	162.2	0.0008752	0.01948	1683	129	40.9	951.9	0.0331638
4.5	308	2.4	500	0.83	0.11	1038	102.03	162.3	0.0008748	0.01955	1687	128.9	40.8	951.9	0.033345
7.21	371	2.4	500	0.82	0.12	1014	102.03	163.4	0.0008719	0.02004	1707	128.4	39.9	952.5	0.0347479
7.18	371	2.4	500	0.83	0.13	1008	102.03	163.6	0.0008712	0.02017	1712	128.3	39.7	952.6	0.0350274
0.76	127	5	500	0.81	0.1	1002	102.03	163.8	0.0008705	0.0203	1717	128.3	39.5	952.7	0.0353979
0.77	128	5	500	0.81	0.1										

2.5	297	2.4	800	0.87	0.11	1570	86.47	162.9	0.0008898	0.01448	1447	138.4	40.9	951.9	0.0331638
2.5	303	2.4	800	0.83	0.1	1570	86.47	162.9	0.0008898	0.01448	1447	138.4	40.9	951.9	0.0331638
4.8	400	2.4	800	0.87	0.13	1550	86.47	163.5	0.0008879	0.01468	1456	138.1	40.4	952.2	0.03391
4.7	400	2.4	800	0.87	0.13	1550	86.47	163.5	0.0008879	0.01468	1456	138.1	40.4	952.2	0.03391
4.7	407	2.4	800	0.86	0.12	1550	86.47	163.5	0.0008879	0.01468	1456	138.1	40.4	952.2	0.03391
0.8	128	4.9	800	0.93	0.1	1530	86.47	164.2	0.000886	0.01489	1464	137.8	39.9	952.5	0.0347479
0.6	131	4.9	800	0.8	0.11	1550	86.47	163.5	0.0008879	0.01468	1456	138.1	40.4	952.2	0.03391
0.9	131	4.9	800	0.8	0.14	1580	86.47	162.5	0.0008908	0.01438	1442	138.6	41.2	951.7	0.032697
1.1	194	4.9	800	0.8	0.17	1630	86.47	161	0.0008956	0.01389	1420	139.4	42.5	950.9	0.0307432
1.2	196	4.9	800	0.86	0.19	1680	86.47	159.5	0.0009003	0.01343	1399	140.3	43.8	950.1	0.0289763
1.1	201	4.9	800	0.83	0.2	1690	86.47	159.1	0.0009013	0.01334	1395	140.4	44	950	0.0286995
2.8	294	4.9	800	0.93	0.24	1550	86.47	163.5	0.0008879	0.01468	1456	138.1	40.4	952.2	0.03391
2.4	300	4.9	800	0.9	0.22	1540	86.47	163.8	0.000887	0.01479	1460	137.9	40.2	952.3	0.0342799
2.8	302	4.9	800	0.89	0.21	1550	86.47	163.5	0.0008879	0.01468	1456	138.1	40.4	952.2	0.03391
4.2	382	4.9	800	0.86	0.18	1570	86.47	162.9	0.0008898	0.01448	1447	138.4	40.9	951.9	0.0331638
4.7	291	4.9	800	0.87	0.21	1610	86.47	161.6	0.0008936	0.01408	1429	139.1	42	951.2	0.0314864
4.7	393	4.9	800	0.86	0.2	1600	86.47	161.9	0.0008927	0.01418	1433	138.9	41.7	951.4	0.0319522
4.6	394	4.9	800	0.86	0.2	1590	86.47	162.3	0.0008917	0.01428	1438	138.8	41.5	951.5	0.0322305

R22 with SUS300 mineral oil

1	127	0.6	800	0.9	0.14	1650	86.47	160.4	0.0008975	0.0137	1412	139.8	43	952.1	0.0465938
0.8	131	0.6	800	0.8	0.05	1620	86.47	161.3	0.0008946	0.01399	1425	139.3	42.2	952.6	0.0483669
1.1	132	0.6	800	0.92	0.27	1550	86.47	163.5	0.0008879	0.01468	1456	138.1	40.4	953.7	0.0526626
2.8	201	0.6	800	0.87	0.16	1550	86.47	163.5	0.0008879	0.01468	1456	138.1	40.4	953.7	0.0526626
2.3	201	0.6	800	0.87	0.16	1550	86.47	163.5	0.0008879	0.01468	1456	138.1	40.4	953.7	0.0526626
2.3	201	0.6	800	0.87	0.17	1550	86.47	163.5	0.0008879	0.01468	1456	138.1	40.4	953.7	0.0526626
4.9	294	0.6	800	0.86	0.17	1560	86.47	163.2	0.0008889	0.01458	1451	138.3	40.7	953.5	0.0519132
4.4	295	0.6	800	0.85	0.15	1560	86.47	163.2	0.0008889	0.01458	1451	138.3	40.7	953.5	0.0519132
4.8	297	0.6	800	0.86	0.18	1550	86.47	163.5	0.0008879	0.01468	1456	138.1	40.4	953.7	0.0526626
7.8	396	0.6	800	0.85	0.15	1590	86.47	162.3	0.0008917	0.01428	1438	138.8	41.5	953	0.0500423
7.7	397	0.6	800	0.85	0.15	1590	86.47	162.3	0.0008917	0.01428	1438	138.8	41.5	953	0.0500423
7.8	399	0.6	800	0.84	0.14	1590	86.47	162.3	0.0008917	0.01428	1438	138.8	41.5	953	0.0500423
0.8	126	1.3	800	0.84	0.1	1510	86.47	164.8	0.0008841	0.01511	1474	137.4	39.4	954.3	0.051877
0.8	127	1.3	800	0.84	0.13	1500	86.47	165	0.0008832	0.01522	1478	137.3	39.1	954.4	0.055928
0.8	127	1.3	800	0.84	0.13	1500	86.47	165	0.0008832	0.01522	1478	137.3	39.1	954.4	0.055928
1.9	202	1.3	800	0.84	0.1	1550	86.47	163.5	0.0008879	0.01468	1456	138.1	40.4	953.7	0.0526626
1.8	202	1.3	800	0.84	0.09	1550	86.47	163.5	0.0008879	0.01468	1456	138.1	40.4	953.7	0.0526626
1.7	205	1.3	800	0.82	0.11	1550	86.47	163.5	0.0008879	0.01468	1456	138.1	40.4	953.7	0.0526626
4.6	296	1.3	800	0.89	0.13	1540	86.47	163.8	0.000887	0.01479	1460	137.9	40.2	953.8	0.0531285
4.2	298	1.3	800	0.83	0.12	1520	86.47	164.4	0.0008851	0.015	1469	137.6	39.6	954.1	0.0546184
4.4	299	1.3	800	0.84	0.11	1520	86.47	164.4	0.0008851	0.015	1469	137.6	39.6	954.1	0.0546184
7.1	397	1.3	800	0.86	0.13	1560	86.47	163.2	0.0008899	0.01458	1451	138.3	40.7	953.5	0.0519132
6.6	399	1.3	800	0.86	0.12	1570	86.47	162.9	0.0008898	0.01448	1447	138.4	40.9	953.4	0.0514478
7	402	1.3	800	0.84	0.11	1570	86.47	162.9	0.0008898	0.01448	1447	138.4	40.9	953.4	0.0514478
1.2	124	2.6	800	0.85	0.14	1520	86.47	164.4	0.0008851	0.015	1469	137.6	39.6	954.1	0.0546184
1	125	2.6	800	0.84	0.15	1520	86.47	164.4	0.0008851	0.015	1469	137.6	39.6	954.1	0.0546184
1.2	127	2.6	800	0.82	0.1	1510	86.47	164.8	0.0008841	0.01511	1474	137.4	39.4	954.3	0.051877
2.2	200	2.6	800	0.86	0.16	1500	86.47	165	0.0008832	0.01522	1478	137.3	39.1	954.4	0.055928
1.9	202	2.6	800	0.84	0.16	1500	86.47	165	0.0008832	0.01522	1478	137.3	39.1	954.4	0.055928
2.4	204	2.6	800	0.84	0.14	1500	86.47	165	0.0008832	0.01522	1478	137.3	39.1	954.4	0.055928
4.2	295	2.6	800	0.85	0.13	1510	86.47	164.8	0.0008841	0.01511	1474	137.4	39.4	954.3	0.051877
4.6	300	2.6	800	0.83	0.12	1510	86.47	164.8	0.0008841	0.01511	1474	137.4	39.4	954.3	0.051877
4.3	301	2.6	800	0.86	0.15	1520	86.47	164.4	0.0008851	0.015	1469	137.6	39.6	954.1	0.0546184
7.3	392	2.6	800	0.84	0.11	1500	86.47	165	0.0008832	0.01522	1478	137.3	39.1	954.4	0.055928
7.5	396	2.6	800	0.86	0.12	1510	86.47	164.8	0.0008841	0.01511	1474	137.4	39.4	954.3	0.051877
7.4	398	2.6	800	0.86	0.13	1500	86.47	165	0.0008832	0.01522	1478	137.3	39.1	954.4	0.055928
0.7	127	5	800	0.85	0.14	1570	86.47	162.9	0.0008898	0.01448	1447	138.4	40.9	953.4	0.0514478
0.8	130	5	800	0.83	0.1	1550	86.47	163.5	0.0008879	0.01468	1456	138.1	40.4	953.7	0.0526626
1	130	5	800	0.82	0.13	1560	86.47	163.2	0.0008889	0.01458	1451	138.3	40.7	953.5	0.0519132
2	201	5	800	0.85	0.09	1570	86.47	162.9	0.0008898	0.01448	1447	138.4	40.9	953.4	0.0514478
2	201	5	800	0.86	0.08	1570	86.47	162.9	0.0008898	0.01448	1447	138.4	40.9	953.4	0.0514478
1.8	203	5	800	0.8	0.06	1560	86.47	163.2	0.0008889	0.01458	1451	138.3	40.7	953.5	0.0519132
4.1	293	5	800	0.88	0.13	1560	86.47	163.2	0.0008889	0.01458	1451	138.3	40.7	953.5	0.0519132
3.9	296	5	800	0.87	0.12	1570	86.47	162.9	0.0008898	0.01448	1447	138.4	40.9	953.4	0.0514478
4.5	301	5	800	0.82	0.12	1550	86.47	163.5	0.0008879	0.01468	1456	138.1	40.4	953.7	0.0526626
7.2	398	5	800	0.88	0.12	1580	86.47	162.5	0.0008908	0.01438	1442	138.6	41.2	953.2	0.0506993
8	403	5	800	0.87	0.13	1570	86.47	162.9	0.0008898	0.01448	1447	138.4	40.9	953.4	0.0514478
7.6	403	5	800	0.86	0.12	1580	86.47	162.5	0.0008908	0.01438	1442	138.6	41.2	953.2	0.0506993

Smooth 3/8 inch, evaporation

R12 with SUS150 naphthenic oil

5.24	130	1.3	800	0.08	0.83	322	120.91	148.4	0.000717	0.0527	2439	114.1	1.2	975.7	0.2115323
6	131	1.3	800	0.08	0.84	321	120.91	148.4	0.0007169	0.05286	2441	114.1	1.2	975.7	0.2115323
12.96	196	1.3	800	0.13	0.85	305	120.91	149.3	0.0007143	0.05552	2484	113.4	-0.5	976.7	0.2289463
13.1	199	1.3	800	0.12	0.84	308	120.91	149.1	0.0007148	0.055	2476	113.5	0	976.4	0.2236575
27.18	301	1.3	800	0.13	0.86	324	120.91	148.3	0.0007174	0.05239	2434	114.2	1.4	975.6	0.2095853
26.81	302	1.3	800	0.13	0.85	323	120.91	148.4	0.0007172	0.05254	2436	114.2	1.4	975.6	0.2095853
35.21	361	1.3	800	0.12	0.84	329	120.91	148.1	0.0007181	0.05162	2421	114.4	1.9	975.3	0.2047004
35.3	363	1.3	800	0.12	0.84	330	120.91	148	0.0007183	0.05147	2419	114.5	2	975.2	0.2037074
35.93	361	1.3	800	0.12	0.85	326	120.91	148.2	0.0007177	0.05208	2429	114.3	1.6	975.4	0.2075966
5.73	126	2.4	800	0.13	0.83	321	120.91	148.4	0.0007169</						

25.05	304	1.2	800	0.1	0.82	325	120.91	148.3	0.0007175	0.05223	2431	114.3	1.6	976.9	0.3219922
34.91	371	1.2	800	0.09	0.81	317	120.91	148.6	0.0007163	0.0535	2452	113.9	0.8	977.4	0.3342633
34.31	373	1.2	800	0.09	0.8	319	120.91	148.5	0.0007166	0.05318	2447	114	0.9	977.4	0.3327348
5.86	129	2.4	800	0.1	0.81	324	120.91	148.3	0.0007174	0.05239	2434	114.2	1.4	977.1	0.3250837
5.96	128	2.4	800	0.1	0.81	326	120.91	148.2	0.0007177	0.05208	2429	114.3	1.6	976.9	0.3219922
14.15	205	2.4	800	0.09	0.83	327	120.91	148.1	0.0007178	0.05192	2426	114.3	1.8	976.8	0.3189684
15.38	206	2.4	800	0.09	0.83	327	120.91	148.1	0.0007178	0.05192	2426	114.3	1.8	976.8	0.3189684
27.34	303	2.4	800	0.11	0.8	316	120.91	148.7	0.0007161	0.05366	2455	113.9	0.7	977.5	0.3358605
28.39	303	2.4	800	0.11	0.8	313	120.91	148.9	0.0007156	0.05416	2463	113.7	0.4	977.7	0.3405862
41.11	375	2.4	800	0.1	0.8	305	120.91	149.3	0.0007143	0.05552	2484	113.4	-0.4	978.1	0.3534931
42.22	371	2.4	800	0.11	0.83	303	120.91	149.3	0.000714	0.05587	2490	113.3	-0.6	978.3	0.3568917
6.45	127	4.8	800	0.12	0.82	330	120.91	148	0.0007183	0.05147	2419	114.5	2	976.7	0.3160413
18.26	195	4.8	800	0.12	0.79	304	120.91	149.3	0.0007142	0.05569	2487	113.3	-0.5	978.2	0.3551921
16.88	197	4.8	800	0.11	0.78	316	120.91	148.7	0.0007161	0.05366	2455	113.9	0.7	977.5	0.3358605
37.31	299	4.8	800	0.14	0.85	312	120.91	148.8	0.0007155	0.05432	2465	113.7	0.3	977.7	0.3421157
36.46	297	4.8	800	0.14	0.85	314	120.91	148.8	0.0007158	0.05399	2460	113.8	0.5	977.6	0.3389874
36.71	295	4.8	800	0.14	0.86	314	120.91	148.8	0.0007158	0.05399	2460	113.8	0.4	977.7	0.3405862
44.7	359	4.8	800	0.13	0.82	327	120.91	148.1	0.0007178	0.05192	2426	114.3	1.7	976.9	0.3205607
45.35	360	4.8	800	0.13	0.82	326	120.91	148.2	0.0007177	0.05208	2429	114.3	1.6	976.9	0.3219922

R134a with SUS169 ester-m oil

3.41	90	0.5	500	0.09	0.81	308	102.03	197.6	0.0007758	0.06602	2826	109.8	1.5	975.7	0.2235274
3.86	89	0.5	500	0.09	0.81	306	102.03	197.7	0.0007754	0.06644	2833	109.7	1.3	975.8	0.2255728
3.81	89	0.5	500	0.09	0.82	305	102.03	197.8	0.0007752	0.06665	2836	109.7	1.2	975.9	0.2266666
6.56	133	0.5	500	0.1	0.81	305	102.03	197.8	0.0007752	0.06665	2836	109.7	1.1	975.9	0.2277143
6.55	132	0.5	500	0.1	0.8	305	102.03	197.8	0.0007752	0.06665	2836	109.7	1.2	975.9	0.2266666
13.2	201	0.5	500	0.06	0.79	307	102.03	197.6	0.0007756	0.06623	2830	109.8	1.3	975.8	0.2255728
12.95	201	0.5	500	0.06	0.79	309	102.03	197.6	0.000776	0.06581	2823	109.9	1.5	975.7	0.2235274
26.01	296	0.5	500	0.06	0.8	304	102.03	197.9	0.0007751	0.06686	2840	109.7	1.1	975.9	0.2277143
25.51	297	0.5	500	0.06	0.79	312	102.03	197.3	0.0007765	0.0652	2813	110	1.7	975.6	0.2214828
37.95	370	0.5	500	0.08	0.81	323	102.03	196.6	0.0007784	0.06305	2778	110.4	2.7	975	0.2113239
36.94	374	0.5	500	0.08	0.8	321	102.03	196.7	0.0007781	0.06343	2784	110.3	2.5	975.1	0.213364
3.39	88	1	500	0.11	0.86	300	102.03	198.2	0.0007743	0.06772	2853	109.5	0.7	976.2	0.2320473
3.44	88	1	500	0.11	0.86	299	102.03	198.3	0.0007742	0.06794	2857	109.4	0.6	976.2	0.2330956
6.01	126	1	500	0.09	0.79	308	102.03	197.6	0.0007758	0.06602	2826	109.8	1.4	975.8	0.2246206
5.64	127	1	500	0.09	0.8	309	102.03	197.6	0.000776	0.06581	2823	109.9	1.5	975.7	0.2235274
14.55	200	1	500	0.08	0.81	307	102.03	197.6	0.0007756	0.06623	2830	109.8	1.3	975.8	0.2255728
14.04	202	1	500	0.09	0.81	308	102.03	197.6	0.0007758	0.06602	2826	109.8	1.4	975.8	0.2246206
30.63	299	1	500	0.1	0.82	301	102.03	198.1	0.0007745	0.0675	2850	109.5	0.8	976.1	0.2309517
30.49	302	1	500	0.1	0.81	301	102.03	198.1	0.0007745	0.0675	2850	109.5	0.8	976.1	0.2309517
43.34	390	1	500	0.1	0.79	313	102.03	197.3	0.0007767	0.065	2810	110	1.9	975.5	0.219439
43.22	383	1	500	0.1	0.81	311	102.03	197.4	0.0007763	0.0654	2816	109.9	1.7	975.6	0.2214828
4.24	87	1.9	500	0.08	0.79	309	102.03	197.6	0.000776	0.06581	2823	109.9	1.5	975.7	0.2235274
3.94	87	1.9	500	0.08	0.78	315	102.03	197.1	0.000777	0.0646	2803	110.1	2	975.4	0.2183475
8.79	129	1.9	500	0.09	0.88	305	102.03	197.8	0.0007752	0.06665	2836	109.7	1.1	975.9	0.2277143
8.55	131	1.9	500	0.09	0.85	313	102.03	197.3	0.0007767	0.065	2810	110	1.9	975.5	0.219439
8.76	131	1.9	500	0.09	0.86	312	102.03	197.3	0.0007765	0.0652	2813	110	1.8	975.5	0.2203906
16.79	203	1.9	500	0.12	0.81	301	102.03	198.1	0.0007745	0.0675	2850	109.5	0.8	976.1	0.2309517
16.64	197	1.9	500	0.13	0.81	294	102.03	198.6	0.0007732	0.06905	2874	109.2	0.2	976.5	0.2375298
33.62	298	1.9	500	0.12	0.79	302	102.03	198	0.0007747	0.06728	2847	109.6	0.9	976.1	0.2299037
34.3	299	1.9	500	0.12	0.82	299	102.03	198.3	0.0007742	0.06794	2857	109.4	0.6	976.2	0.2330956
44.7	381	1.9	500	0.1	0.78	309	102.03	197.6	0.000776	0.06581	2823	109.9	1.5	975.7	0.2235274
46.67	386	1.9	500	0.11	0.78	305	102.03	197.8	0.0007752	0.06665	2836	109.7	1.2	975.9	0.2266666
3.85	91	2.9	500	0.1	0.8	316	102.03	197	0.0007772	0.0644	2800	110.1	2.1	975.3	0.2173515
8.39	126	2.9	500	0.09	0.85	306	102.03	197.7	0.0007754	0.06644	2833	109.7	1.3	975.8	0.2255728
9.28	129	2.9	500	0.09	0.87	297	102.03	198.3	0.0007738	0.06838	2864	109.4	0.5	976.3	0.2341918
9.39	128	2.9	500	0.08	0.87	300	102.03	198.2	0.0007743	0.06772	2853	109.5	0.7	976.2	0.2320473
19.06	202	2.9	500	0.1	0.83	292	102.03	198.8	0.0007729	0.06951	2881	109.2	0.2	976.5	0.2375298
19.36	203	2.9	500	0.1	0.83	290	102.03	198.9	0.0007725	0.06997	2888	109.1	0	976.6	0.2397721
36.3	303	2.9	500	0.12	0.83	298	102.03	198.3	0.000774	0.06816	2860	109.4	0.5	976.3	0.2341918
39.12	303	2.9	500	0.12	0.85	294	102.03	198.6	0.0007732	0.06905	2874	109.2	0.2	976.5	0.2375298
55.34	393	2.9	500	0.13	0.84	309	102.03	197.6	0.000776	0.06581	2823	109.9	1.5	975.7	0.2235274
52.46	398	2.9	500	0.12	0.8	311	102.03	197.4	0.0007763	0.0654	2816	109.9	1.7	975.6	0.2214828
52.37	388	2.9	500	0.13	0.82	310	102.03	197.4	0.0007761	0.06561	2820	109.9	1.6	975.6	0.2224346
3.58	93	5	500	0.13	0.84	313	102.03	197.3	0.0007767	0.065	2810	110	1.9	975.5	0.219439
5.32	93	5	500	0.13	0.86	307	102.03	197.6	0.0007756	0.06623	2830	109.8	1.4	975.8	0.2246206
8.9	122	5	500	0.1	0.83	306	102.03	197.7	0.0007754	0.06644	2833	109.7	1.2	975.9	0.2266666
8.69	122	5	500	0.1	0.83	314	102.03	197.2	0.0007768	0.0648	2807	110.1	1.9	975.5	0.219439
19.56	199	5	500	0.11	0.8	303	102.03	198	0.0007749	0.06707	2843	109.6	1	976	0.2288087
18.47	200	5	500	0.11	0.8	304	102.03	197.9	0.0007751	0.06686	2840	109.7	1.1	975.9	0.2277143
19.95	199	5	500	0.11	0.8	306	102.03	197.7	0.0007754	0.06644	2833	109.7	1.2	975.9	0.2266666
40.94	297	5	500	0.14	0.84	297	102.03	198.3	0.0007738	0.06838	2864	109.4	0.4	976.4	0.2352885
41.13	297	5	500	0.13	0.85	295	102.03	198.5	0.0007734	0.06882	2871	109.3	0.3	976.4	0.2363372
39.56	307	5	500	0.11	0.8	304	102.03	197.9	0.0007751	0.06686	2840	109.7	1	976	0.2288087
49.35	366	5	500	0.13	0.83	332	102.03	196	0.00078	0.0614	2750	110.8	3.5	974.5	0.203605
46.42	361	5	500	0.13	0.84	334	102.03	195.9	0.0007803	0.06104	2744	110.8	3.6	974.4	0.2026138

R134a with SUS369 ester-m oil

3.97	87	0.6	500	0.09	0.81	305	102.03	197.8	0.0007752	0.06665	2836	109.7	1.2	977.9	0.4039363
4.2	88	0.6	500	0.1	0.82	302	102.03	198	0.0007747	0.06728	2847	109.6			

35.09	313	2.4	500	0.1	0.8	295	102.03	198.5	0.0007734	0.06882	2871	109.3	0.3	978.4	0.4211973
44.1	383	2.4	500	0.1	0.8	330	102.03	196.2	0.0007797	0.06176	2756	110.7	3.2	976.7	0.3679358
45.29	363	2.4	500	0.11	0.84	326	102.03	196.4	0.0007779	0.06249	2768	110.5	2.9	976.9	0.3731444
47.55	365	2.4	500	0.11	0.85	324	102.03	196.6	0.0007786	0.06287	2775	110.5	2.8	976.9	0.3748623
5.69	88	5	500	0.12	0.82	320	102.03	196.8	0.0007779	0.06363	2787	110.3	2.5	977.1	0.3801712
11.43	130	5	500	0.1	0.8	309	102.03	197.6	0.0007776	0.06581	2823	109.9	1.5	977.7	0.3983224
11.06	132	5	500	0.09	0.8	310	102.03	197.4	0.0007761	0.06561	2820	109.9	1.5	977.7	0.3983224
21.55	194	5	500	0.13	0.79	294	102.03	198.6	0.0007732	0.06905	2874	109.2	0.2	978.5	0.4231983
21.96	200	5	500	0.12	0.79	292	102.03	198.8	0.0007729	0.06951	2881	109.2	0.2	978.5	0.4231983
42.19	300	5	500	0.11	0.81	308	102.03	197.6	0.0007758	0.06602	2826	109.8	1.4	977.8	0.4002205
42.76	305	5	500	0.11	0.8	303	102.03	198	0.0007749	0.06707	2843	109.6	1	978	0.4076535
43.14	301	5	500	0.11	0.81	302	102.03	198	0.0007747	0.06728	2847	109.6	0.9	978.1	0.4096502
58.7	359	5	500	0.14	0.84	319	102.03	196.9	0.0007777	0.06382	2791	110.3	2.4	977.2	0.381968
58.39	354	5	500	0.14	0.87	323	102.03	196.6	0.0007784	0.06305	2778	110.4	2.7	977	0.3766571
57.45	375	5	500	0.13	0.82	324	102.03	196.6	0.0007786	0.06287	2775	110.5	2.8	976.9	0.3748623

R134a with SUS150 ester-b oil

5.26	116	1.1	500	0.13	0.89	306	102.03	197.7	0.0007754	0.06644	2833	109.7	1.2	975.7	0.2115323
5.32	119	1.1	500	0.13	0.88	304	102.03	197.9	0.0007751	0.06686	2840	109.7	1.1	975.7	0.2124843
12.92	198	1.1	500	0.07	0.8	308	102.03	197.6	0.0007758	0.06602	2826	109.8	1.4	975.6	0.2095853
12.88	198	1.1	500	0.07	0.82	301	102.03	198.1	0.0007745	0.0675	2850	109.5	0.8	975.9	0.2154285
25.68	289	1.1	500	0.09	0.81	304	102.03	197.9	0.0007751	0.06686	2840	109.7	1.1	975.7	0.2124843
26.44	285	1.1	500	0.09	0.83	296	102.03	198.5	0.0007736	0.0686	2867	109.3	0.4	976.2	0.2195635
42.74	358	1.1	500	0.15	0.84	308	102.03	197.6	0.0007758	0.06602	2826	109.8	1.5	975.5	0.2085908
42.42	364	1.1	500	0.14	0.82	311	102.03	197.4	0.0007763	0.0654	2816	109.9	1.6	975.4	0.2075966
7.39	128	2.4	500	0.1	0.81	306	102.03	197.7	0.0007754	0.06644	2833	109.7	1.3	975.6	0.2105371
8.34	127	2.4	500	0.11	0.87	294	102.03	198.6	0.0007732	0.06905	2874	109.2	0.2	976.3	0.2216101
14.59	193	2.4	500	0.1	0.81	310	102.03	197.4	0.0007761	0.06561	2820	109.9	1.6	975.4	0.2075966
14.04	194	2.4	500	0.08	0.79	303	102.03	198	0.0007749	0.06707	2843	109.6	1	975.8	0.21348
34.66	305	2.4	500	0.12	0.81	297	102.03	198.3	0.0007738	0.06838	2864	109.4	0.4	976.2	0.2195635
35.15	304	2.4	500	0.12	0.83	291	102.03	198.8	0.0007727	0.06974	2885	109.1	0	976.4	0.2236575
36.57	301	2.4	500	0.12	0.85	285	102.03	199.3	0.0007716	0.07115	2906	108.9	-0.7	976.8	0.2310923
43.83	353	2.4	500	0.13	0.82	313	102.03	197.3	0.0007767	0.065	2810	110	1.9	975.3	0.2047004
44.53	366	2.4	500	0.14	0.79	316	102.03	197	0.0007772	0.0644	2800	110.1	2.2	975.1	0.2018591
45.15	359	2.4	500	0.12	0.81	304	102.03	197.9	0.0007751	0.06686	2840	109.7	1.1	975.7	0.2124843
9	132	5	500	0.09	0.81	302	102.03	198.8	0.0007747	0.06728	2847	109.6	0.9	975.9	0.2144762
9.7	122	5	500	0.11	0.87	301	102.03	198.1	0.0007745	0.0675	2850	109.5	0.8	975.9	0.2154285
21.7	192	5	500	0.12	0.84	293	102.03	198.6	0.0007731	0.06928	2878	109.2	0.2	976.3	0.2216101
21.48	194	5	500	0.12	0.82	295	102.03	198.5	0.0007734	0.06882	2871	109.3	0.3	976.2	0.2205164
20.49	196	5	500	0.12	0.8	301	102.03	198.1	0.0007745	0.0675	2850	109.5	0.8	975.9	0.2154285
40.05	289	5	500	0.13	0.85	305	102.03	197.8	0.0007752	0.06665	2836	109.7	1.1	975.7	0.2124843
40.71	285	5	500	0.13	0.86	306	102.03	197.7	0.0007754	0.06644	2833	109.7	1.3	975.6	0.2105371
56.34	361	5	500	0.13	0.87	318	102.03	196.9	0.0007776	0.06401	2794	110.2	2.3	975	0.2008671
54.54	368	5	500	0.12	0.84	319	102.03	196.9	0.0007777	0.06382	2791	110.3	2.4	975	0.2000115
53.43	368	5	500	0.12	0.84	325	102.03	196.4	0.0007788	0.06268	2772	110.5	2.9	974.7	0.1954232

R22 with SUS150 mineral oil

3.7	125	1.3	800	0.13	0.81	490	86.47	202.8	0.0007786	0.04745	2204	116.4	-0.5	976.7	0.2289463
3.3	125	1.3	800	0.11	0.74	520	86.47	201.4	0.0007823	0.04478	2166	117.3	1.3	975.6	0.2105371
3.7	127	1.3	800	0.11	0.73	510	86.47	201.9	0.0007811	0.04564	2178	117	0.7	976	0.2165205
9.9	205	1.3	800	0.12	0.78	490	86.47	202.8	0.0007786	0.04745	2204	116.4	-0.5	976.7	0.2289463
9.4	206	1.3	800	0.12	0.77	500	86.47	202.3	0.0007798	0.04653	2191	116.7	0.1	976.3	0.2226586
9.7	208	1.3	800	0.12	0.78	500	86.47	202.3	0.0007798	0.04653	2191	116.7	0.1	976.3	0.2226586
19.4	283	1.3	800	0.16	0.75	480	86.47	203.3	0.0007773	0.04841	2218	116.1	-1.1	977	0.2343369
19.5	287	1.3	800	0.16	0.74	480	86.47	203.3	0.0007773	0.04841	2218	116.1	-1.1	977	0.2343369
30	388	1.3	800	0.15	0.69	500	86.47	202.3	0.0007798	0.04653	2191	116.7	0.1	976.3	0.2226586
30.8	393	1.3	800	0.15	0.69	490	86.47	202.8	0.0007786	0.04745	2204	116.4	-0.5	976.7	0.2289463
30.8	397	1.3	800	0.15	0.64	480	86.47	203.3	0.0007773	0.04841	2218	116.1	-1.1	977	0.2343369
3.7	117	2.4	800	0.18	0.79	480	86.47	203.3	0.0007773	0.04841	2218	116.1	-1.1	977	0.2343369
4.6	118	2.4	800	0.17	0.81	480	86.47	203.3	0.0007773	0.04841	2218	116.1	-1.1	977	0.2343369
4.1	119	2.4	800	0.18	0.75	470	86.47	203.8	0.0007756	0.04941	2231	115.8	-1.7	977.3	0.2397339
8.7	186	2.4	800	0.14	0.76	480	86.47	203.3	0.0007773	0.04841	2218	116.1	-1.1	977	0.2343369
8.6	193	2.4	800	0.16	0.72	490	86.47	202.8	0.0007786	0.04745	2204	116.4	-0.5	976.7	0.2289463
9.3	194	2.4	800	0.16	0.72	490	86.47	202.8	0.0007786	0.04745	2204	116.4	-0.5	976.7	0.2289463
9.8	198	2.4	800	0.16	0.75	490	86.47	202.8	0.0007786	0.04745	2204	116.4	-0.5	976.7	0.2289463
10.5	200	2.4	800	0.15	0.73	490	86.47	202.8	0.0007786	0.04745	2204	116.4	-0.5	976.7	0.2289463
20	292	2.4	800	0.15	0.78	530	86.47	200.9	0.0007836	0.04396	2153	117.5	1.9	975.3	0.2047004
20	293	2.4	800	0.15	0.74	520	86.47	201.4	0.0007823	0.04478	2166	117.3	1.3	975.6	0.2105371
24.5	294	2.4	800	0.14	0.81	520	86.47	201.4	0.0007823	0.04478	2166	117.3	1.3	975.6	0.2105371
21	298	2.4	800	0.13	0.78	520	86.47	201.4	0.0007823	0.04478	2166	117.3	1.3	975.6	0.2105371
19.8	300	2.4	800	0.13	0.75	520	86.47	201.4	0.0007823	0.04478	2166	117.3	1.3	975.6	0.2105371
32.5	388	2.4	800	0.12	0.81	560	86.47	199.5	0.0007872	0.04166	2118	118.4	3.7	974.2	0.1881997
30.2	398	2.4	800	0.11	0.75	560	86.47	199.5	0.0007872	0.04166	2118	118.4	3.7	974.2	0.1881997
4.2	119	4.9	800	0.23	0.78	550	86.47	200	0.000786	0.0424	2130	118.1	3.1	974.5	0.1935387
4.3	122	4.9	800	0.21	0.78	560	86.47	199.5	0.0007872	0.04166	2118	118.4	3.7	974.2	0.1881997
4.4	130	4.9	800	0.19	0.76	550	86.47	200	0.000786	0.0424	2130	118.1	3.1	974.5	0.1935387
14	197	4.9	800	0.16	0.85	520	86.47	201.4	0.0007823	0.04478	2166	117.3	1.3	975.6	0.2105371
14.4	198	4.9	800	0.16	0.88	520	86.47	201.4	0.0007823	0.04478	2166	117.3	1.3	975.6	0.2105371
11.9	200	4.9	800	0.15	0.81	540	86.47	200.4	0.0007848	0.04316	2141	117.8	2.5	974.9	0.19902
21.4	281	4.9	800	0.15	0.85	520	86.47	201.4	0.0007823	0.04478	2166	117.3	1.3	975.6	0.2105371

5.1	122	2.6	800	0.15	0.78	470	86.47	203.8	0.000776	0.04941	2231	115.8	-1.7	979	0.3749421
4	124	2.6	800	0.15	0.78	490	86.47	202.8	0.0007786	0.04745	2204	116.4	-0.5	978.2	0.3551921
4.4	137	2.6	800	0.14	0.71	490	86.47	202.8	0.0007786	0.04745	2204	116.4	-0.5	978.2	0.3551921
10.2	194	2.6	800	0.16	0.77	540	86.47	200.4	0.0007848	0.04316	2141	117.8	2.5	976.4	0.3087923
8.9	197	2.6	800	0.15	0.75	530	86.47	200.9	0.0007836	0.04396	2153	117.5	1.9	976.8	0.3175372
10.9	198	2.6	800	0.17	0.76	500	86.47	202.3	0.0007798	0.04653	2191	116.7	0.1	977.8	0.3453407
10.9	203	2.6	800	0.16	0.82	510	86.47	201.9	0.0007811	0.04564	2178	117	0.7	977.5	0.3358605
21.1	296	2.6	800	0.18	0.81	550	86.47	200	0.000786	0.0424	2130	118.1	3.1	976	0.300252
21.7	297	2.6	800	0.18	0.81	560	86.47	199.5	0.0007872	0.04166	2118	118.4	3.7	975.7	0.2919755
36.9	389	2.6	800	0.17	0.81	530	86.47	200.9	0.0007836	0.04396	2153	117.5	1.9	976.8	0.3175372
38.1	390	2.6	800	0.22	0.84	560	86.47	199.5	0.0007872	0.04166	2118	118.4	3.7	975.7	0.2919755
37.4	396	2.6	800	0.19	0.8	540	86.47	200.4	0.0007848	0.04316	2141	117.8	2.5	976.4	0.3087923
35.8	398	2.6	800	0.16	0.78	520	86.47	201.4	0.0007823	0.04478	2166	117.3	1.3	977.1	0.3265157
5.3	126	5	800	0.16	0.76	530	86.47	200.9	0.0007836	0.04396	2153	117.5	1.9	976.8	0.3175372
4.7	130	5	800	0.15	0.71	520	86.47	201.4	0.0007823	0.04478	2166	117.3	1.3	977.1	0.3265157
6.2	136	5	800	0.15	0.84	510	86.47	201.9	0.0007811	0.04564	2178	117	0.7	977.5	0.3358605
6.3	144	5	800	0.11	0.84	470	86.47	203.8	0.000776	0.04941	2231	115.8	-1.7	979	0.3749421
14.1	211	5	800	0.1	0.8	530	86.47	200.9	0.0007836	0.04396	2153	117.5	1.9	976.8	0.3175372
16.2	217	5	800	0.14	0.84	530	86.47	200.9	0.0007836	0.04396	2153	117.5	1.9	976.8	0.3175372
16.4	218	5	800	0.13	0.82	520	86.47	201.4	0.0007823	0.04478	2166	117.3	1.3	977.1	0.3265157
23.1	278	5	800	0.2	0.83	560	86.47	199.5	0.0007872	0.04166	2118	118.4	3.7	975.7	0.2919755
23.7	278	5	800	0.19	0.81	530	86.47	200.9	0.0007836	0.04396	2153	117.5	1.9	976.8	0.3175372
23.2	287	5	800	0.19	0.77	550	86.47	200	0.000786	0.0424	2130	118.1	3.1	976	0.300252
25.2	302	5	800	0.17	0.76	520	86.47	201.4	0.0007823	0.04478	2166	117.3	1.3	977.1	0.3265157
33.9	360	5	800	0.21	0.81	570	86.47	199	0.0007884	0.04094	2107	118.6	4.2	975.4	0.2852313
32.8	372	5	800	0.19	0.75	560	86.47	199.5	0.0007872	0.04166	2118	118.4	3.7	975.7	0.2919755
34.8	378	5	800	0.18	0.71	540	86.47	200.4	0.0007848	0.04316	2141	117.8	2.5	976.4	0.3087923

Micro-fin 3/8 inch, condensation R12 with SUS150 naphthenic oil

0.76	122	1.3	800	0.81	0.11	949	120.91	125.9	0.0007955	0.01798	1654	132.9	39.6	952.6	0.0352089
0.65	123	1.3	800	0.81	0.12	953	120.91	125.7	0.0007959	0.0179	1651	133	39.7	952.6	0.0350274
1.26	129	1.3	800	0.79	0.11	944	120.91	126	0.0007949	0.01808	1657	132.8	39.4	952.8	0.0355869
1.14	120	1.3	800	0.87	0.1	959	120.91	125.6	0.0007966	0.01779	1647	133.2	39.6	952.6	0.0352089
2.97	207	1.3	800	0.8	0.06	952	120.91	125.8	0.0007958	0.01792	1652	133	39.7	952.6	0.0350274
3.03	205	1.3	800	0.85	0.08	958	120.91	125.6	0.0007965	0.01781	1648	133.1	39.2	952.9	0.0358667
6.38	302	1.3	800	0.81	0.08	943	120.91	126.1	0.0007948	0.0181	1658	132.8	39.3	952.8	0.0357684
6.08	295	1.3	800	0.83	0.07	949	120.91	125.9	0.0007955	0.01798	1654	132.9	39.6	952.6	0.0352089
8.54	366	1.3	800	0.81	0.08	938	120.91	126.2	0.0007942	0.0182	1661	132.7	39.1	952.9	0.0360483
8.7	365	1.3	800	0.82	0.08	940	120.91	126.1	0.0007945	0.01816	1660	132.7	39.2	952.9	0.0358667
0.74	130	2.4	800	0.8	0.06	939	120.91	126.1	0.0007944	0.01818	1660	132.7	39.2	952.9	0.0358667
0.91	131	2.4	800	0.79	0.07	943	120.91	126.1	0.0007948	0.0181	1658	132.8	39.3	952.8	0.0357684
2.76	203	2.4	800	0.82	0.07	944	120.91	126	0.0007949	0.01808	1657	132.8	39.4	952.8	0.0355869
2.77	205	2.4	800	0.81	0.07	946	120.91	125.9	0.0007951	0.01804	1656	132.9	39.4	952.8	0.0355869
6.08	299	2.4	800	0.83	0.07	947	120.91	125.9	0.0007952	0.01802	1655	132.9	39.5	952.7	0.0353979
5.99	299	2.4	800	0.84	0.07	946	120.91	125.9	0.0007951	0.01804	1656	132.9	39.4	952.8	0.0355869
10.08	382	2.4	800	0.82	0.08	928	120.91	126.5	0.0007931	0.01841	1668	132.4	38.7	953.2	0.036707
10.57	381	2.4	800	0.83	0.09	926	120.91	126.6	0.0007929	0.01845	1669	132.4	38.6	953.2	0.0368888
1.12	134	4.9	800	0.81	0.08	930	120.91	126.4	0.0007934	0.01837	1666	132.5	38.8	953.1	0.0366085
0.93	134	4.9	800	0.82	0.08	932	120.91	126.3	0.0007936	0.01833	1665	132.5	38.9	953.1	0.0364268
2.78	204	4.9	800	0.81	0.07	948	120.91	125.9	0.0007954	0.018	1654	132.9	39.5	952.7	0.0353979
2.74	199	4.9	800	0.83	0.07	949	120.91	125.9	0.0007955	0.01798	1654	132.9	39.5	952.7	0.0353979
2.72	199	4.9	800	0.83	0.07	949	120.91	125.9	0.0007955	0.01798	1654	132.9	39.6	952.6	0.0352089
6.04	296	4.9	800	0.81	0.07	938	120.91	126.2	0.0007942	0.0182	1661	132.7	39.1	952.9	0.0362375
6.13	297	4.9	800	0.81	0.07	938	120.91	126.2	0.0007942	0.0182	1661	132.7	39.1	952.9	0.0360483
10.93	368	4.9	800	0.81	0.11	889	120.91	127.6	0.0007888	0.01925	1695	131.5	37	954.2	0.0397887
11.44	368	4.9	800	0.81	0.11	890	120.91	127.7	0.0007889	0.01923	1694	131.5	37.1	954.1	0.0395983

R12 with SUS300 naphthenic oil

0.87	131	1.2	800	0.8	0.07	950	120.91	125.9	0.0007956	0.01796	1653	132.9	39.6	954.1	0.0546184
0.89	130	1.2	800	0.8	0.08	951	120.91	125.8	0.0007957	0.01794	1652	133	39.6	954.1	0.0546184
2.81	203	1.2	800	0.82	0.1	956	120.91	125.6	0.0007962	0.01785	1649	133.1	39.8	954	0.0541519
2.93	203	1.2	800	0.82	0.1	957	120.91	125.7	0.0007964	0.01783	1649	133.1	39.9	954	0.0538789
2.67	201	1.2	800	0.79	0.1	958	120.91	125.6	0.0007965	0.01781	1648	133.1	39.9	954	0.0538789
2.85	201	1.2	800	0.8	0.11	959	120.91	125.6	0.0007966	0.01779	1647	133.2	40	953.9	0.0536856
6.53	303	1.2	800	0.83	0.11	936	120.91	126.3	0.000794	0.01824	1662	132.6	39	954.5	0.056213
6.72	303	1.2	800	0.83	0.11	936	120.91	126.3	0.000794	0.01824	1662	132.6	39	954.5	0.056213
10.26	375	1.2	800	0.81	0.09	930	120.91	126.4	0.0007934	0.01837	1666	132.5	38.8	954.6	0.0567716
11.15	381	1.2	800	0.81	0.1	927	120.91	126.6	0.000793	0.01843	1668	132.4	38.7	954.7	0.0569658
10.41	373	1.2	800	0.81	0.12	939	120.91	126.1	0.0007944	0.01818	1660	132.7	39.1	954.4	0.055928
10.99	375	1.2	800	0.8	0.12	937	120.91	126.2	0.0007941	0.01822	1662	132.6	39.1	954.4	0.055928
0.9	125	2.4	800	0.84	0.07	937	120.91	126.2	0.0007941	0.01822	1662	132.6	39.1	954.4	0.055928
0.91	127	2.4	800	0.83	0.07	939	120.91	126.1	0.0007944	0.01818	1660	132.7	39.1	954.4	0.055928
2.81	197	2.4	800	0.83	0.08	951	120.91	125.8	0.0007957	0.01794	1652	133	39.6	954.1	0.0546184
2.88	198	2.4	800	0.83	0.08	950	120.91	125.9	0.0007956	0.01796	1653	132.9	39.6	954.1	0.0546184
6.19	297	2.4	800	0.82	0.07	937	120.91	126.2	0.0007941	0.01822	1662	132.6	39.1	954.4	0.055928
6.26	297	2.4	800	0.81	0.08	944	120.91	126	0.0007949	0.01808	1657	132.8	39.3	954.3	0.0554609
6.45	296	2.4	800	0.81	0.09	951	120.91	125.8	0.0007957	0.01794	1652	133	39.7	954.1	0.0544363
13.76	367	2.4	800	0.83	0.07	946	120.91	125.9	0.0007951	0.01804	1656	132.9	39.4	954.3	0.0551877
9.79	382	2.4	800	0.81	0.07	943	120.91	126.1	0.0007948	0.0181	1658	132.8	39.3	954.3	0.0554609
0.94	126	4.8	800	0.82	0.08	938	120.91	126.2	0.0007942						

7.5	304	1	500	0.83	0.17	1017	102.03	163.2	0.0008723	0.01998	1705	128.5	40	952.6	0.0370238
7.43	307	1	500	0.83	0.14	1019	102.03	163.1	0.0008725	0.01994	1703	128.5	40.1	952.5	0.0369253
12.17	377	1	500	0.88	0.15	1003	102.03	163.8	0.0008706	0.02028	1717	128.2	39.5	952.9	0.0379552
12.75	377	1	500	0.87	0.15	999	102.03	163.9	0.0008702	0.02036	1720	128.1	39.4	953	0.0381448
12.62	378	1	500	0.87	0.13	1009	102.03	163.5	0.0008713	0.02015	1711	128.3	39.8	952.7	0.0373947
1.86	125	1.9	500	0.86	0.15	995	102.03	164.1	0.0008697	0.02045	1724	128.1	39.2	953.1	0.0385161
1.69	125	1.9	500	0.87	0.17	995	102.03	164.1	0.0008697	0.02045	1724	128.1	39.2	953.1	0.0385161
4.25	200	1.9	500	0.85	0.15	1002	102.03	163.8	0.0008705	0.0203	1717	128.2	39.5	952.9	0.0379552
4.3	202	1.9	500	0.84	0.14	1004	102.03	163.7	0.0008708	0.02026	1716	128.2	39.5	952.9	0.0379552
8.03	305	1.9	500	0.8	0.11	989	102.03	164.3	0.000869	0.02058	1729	127.9	38.9	953.3	0.0389867
7.83	303	1.9	500	0.81	0.11	993	102.03	164.1	0.0008694	0.02049	1725	128	39.1	953.1	0.038607
12.76	367	1.9	500	0.84	0.13	983	102.03	164.6	0.0008683	0.02071	1734	127.8	38.7	953.4	0.0393585
12.52	367	1.9	500	0.84	0.12	983	102.03	164.6	0.0008683	0.02071	1734	127.8	38.7	953.4	0.0393585
1.97	126	2.9	500	0.82	0.14	992	102.03	164.2	0.0008693	0.02051	1726	128	39.1	953.1	0.038607
1.94	127	2.9	500	0.81	0.13	991	102.03	164.2	0.0008692	0.02053	1727	128	39	953.2	0.0387968
4.3	195	2.9	500	0.83	0.14	994	102.03	164.1	0.0008696	0.02047	1724	128	39.2	953.1	0.0385161
4.56	196	2.9	500	0.84	0.14	995	102.03	164.1	0.0008697	0.02045	1724	128.1	39.2	953.1	0.0385161
6.89	299	2.9	500	0.83	0.13	1012	102.03	163.4	0.0008717	0.02009	1709	128.4	40.1	952.5	0.0369253
7.54	300	2.9	500	0.83	0.13	1017	102.03	163.2	0.0008723	0.01998	1705	128.5	40	952.6	0.0370238
12.38	378	2.9	500	0.84	0.11	988	102.03	164.3	0.0008689	0.0206	1730	127.9	38.9	953.3	0.0389867
12.01	376	2.9	500	0.85	0.12	986	102.03	164.5	0.0008686	0.02064	1731	127.9	38.6	953.4	0.0395403
3.37	128	5	500	0.85	0.1	1026	102.03	162.9	0.0008734	0.0198	1697	128.7	40.4	952.4	0.0363733
3	130	5	500	0.84	0.13	1014	102.03	163.4	0.0008719	0.0204	1707	128.4	39.5	952.7	0.0372131
5.71	201	5	500	0.84	0.1	1019	102.03	163.1	0.0008725	0.01994	1703	128.5	40.1	952.5	0.0369253
5.56	202	5	500	0.84	0.1	1012	102.03	163.4	0.0008717	0.02009	1709	128.4	40.1	952.5	0.0369253
8.73	297	5	500	0.84	0.09	970	102.03	165	0.0008667	0.021	1746	127.5	38.2	953.7	0.0402928
7.34	298	5	500	0.84	0.1	966	102.03	165.2	0.0008662	0.02109	1749	127.5	38	953.8	0.0406651
14.08	366	5	500	0.87	0.13	997	102.03	164	0.0008699	0.02041	1722	128.1	39.3	953	0.0383264
14.47	367	5	500	0.87	0.13	1000	102.03	163.8	0.0008703	0.02034	1719	128.2	39.4	953	0.0381448

R134a with SUS369 ester-m oil

0.63	123	0.6	500	0.88	0.13	1009	102.03	163.5	0.0008713	0.02015	1711	128.3	39.7	954.8	0.0670058
0.69	124	0.6	500	0.88	0.12	1012	102.03	163.4	0.0008717	0.02009	1709	128.4	39.9	954.7	0.0663537
3.23	193	0.6	500	0.87	0.11	991	102.03	164.2	0.0008692	0.02053	1727	128	39	955.2	0.0691605
2.96	193	0.6	500	0.86	0.1	992	102.03	164.2	0.0008693	0.02051	1726	128	39.1	955.1	0.0688723
6.5	294	0.6	500	0.84	0.1	987	102.03	164.4	0.0008687	0.02062	1731	127.9	38.9	955.3	0.06954
6.95	296	0.6	500	0.84	0.1	997	102.03	164	0.0008699	0.02041	1722	128.1	39.3	955	0.0682195
12.81	370	0.6	500	0.81	0.15	988	102.03	164.3	0.0008689	0.0206	1730	127.9	38.9	955.3	0.06954
12.8	371	0.6	500	0.81	0.15	988	102.03	164.3	0.0008689	0.0206	1730	127.9	38.9	955.3	0.06954
0.69	122	1.1	500	0.87	0.11	1001	102.03	163.9	0.0008704	0.02032	1718	128.2	39.4	955	0.0679459
0.67	122	1.1	500	0.85	0.1	1003	102.03	163.8	0.0008706	0.02028	1717	128.2	39.5	954.9	0.0675669
2.78	196	1.1	500	0.84	0.12	1002	102.03	163.8	0.0008705	0.0203	1707	128.2	39.5	954.9	0.0675669
3.06	195	1.1	500	0.85	0.12	1004	102.03	163.7	0.0008708	0.02026	1716	128.2	39.5	954.9	0.0675669
7.42	300	1.1	500	0.84	0.14	1001	102.03	163.9	0.0008704	0.02032	1718	128.4	39.4	955	0.0679459
6.5	299	1.1	500	0.84	0.14	1004	102.03	163.7	0.0008708	0.02026	1716	128.2	39.6	954.8	0.0672792
11.82	371	1.1	500	0.82	0.15	978	102.03	164.8	0.0008677	0.02082	1739	127.7	38.5	955.5	0.0708473
11.98	367	1.1	500	0.83	0.15	986	102.03	164.4	0.0008686	0.02064	1731	127.9	38.8	955.3	0.0698138
11.43	364	1.1	500	0.84	0.15	987	102.03	164.4	0.0008687	0.02062	1731	127.9	38.9	955.3	0.06954
1	128	2.4	500	0.84	0.09	1035	102.03	162.5	0.0008744	0.01961	1698	128.9	40.2	954.5	0.0654148
0.99	129	2.4	500	0.84	0.09	1033	102.03	162.6	0.0008742	0.01966	1691	128.8	40.6	954.2	0.0641901
3.08	203	2.4	500	0.83	0.1	1027	102.03	162.8	0.0008735	0.01978	1696	128.7	40.4	954.4	0.0648546
2.95	198	2.4	500	0.84	0.11	1028	102.03	162.8	0.0008736	0.01976	1695	128.7	40.4	954.4	0.0648546
2.88	198	2.4	500	0.84	0.11	1027	102.03	162.8	0.0008735	0.01978	1696	128.7	40.4	954.4	0.0648546
2.75	198	2.4	500	0.84	0.11	1025	102.03	162.9	0.0008732	0.01982	1698	128.7	40.3	954.4	0.0651279
6.68	299	2.4	500	0.82	0.12	1007	102.03	163.6	0.0008711	0.02019	1713	128.3	39.7	954.8	0.0670058
6.91	300	2.4	500	0.82	0.13	1007	102.03	163.6	0.0008711	0.02019	1713	128.3	39.7	954.8	0.0670058
10.83	374	2.4	500	0.84	0.12	1023	102.03	163	0.000873	0.01986	1699	128.6	40.2	954.5	0.0654148
10.97	374	2.4	500	0.84	0.13	1022	102.03	163	0.0008729	0.01988	1700	128.6	40.2	954.5	0.0654148
0.31	118	5	500	0.83	0.12	1009	102.03	163.5	0.0008713	0.02015	1711	128.3	39.7	954.8	0.0670058
0.34	119	5	500	0.82	0.11	1008	102.03	163.6	0.0008712	0.02017	1712	128.3	39.7	954.8	0.0670058
3.32	203	5	500	0.83	0.1	1014	102.03	163.4	0.0008719	0.02004	1707	128.4	39.9	954.7	0.0663537
3.28	204	5	500	0.83	0.1	1014	102.03	163.4	0.0008719	0.02004	1707	128.4	40	954.6	0.0660664
7.88	303	5	500	0.83	0.13	1011	102.03	163.4	0.0008716	0.02011	1710	128.4	39.8	954.7	0.0666271
7.33	304	5	500	0.83	0.12	1015	102.03	163.3	0.0008721	0.02002	1706	128.5	40	954.6	0.0660664
12.05	368	5	500	0.83	0.13	1002	102.03	163.8	0.0008705	0.0203	1717	128.2	39.5	954.9	0.0675669
12.4	368	5	500	0.84	0.14	1005	102.03	163.7	0.0008709	0.02023	1715	128.3	39.6	954.8	0.0672792
12.55	366	5	500	0.84	0.14	1008	102.03	163.6	0.0008712	0.02017	1712	128.3	39.7	954.8	0.0670058

R134a with SUS150 ester-b oil

0.73	125	1.1	500	0.81	0.09	1012	102.03	163.4	0.0008717	0.02009	1709	128.4	40.2	952.3	0.0342799
0.73	125	1.1	500	0.82	0.1	1020	102.03	163.1	0.0008726	0.01992	1702	128.6	40.1	952.3	0.0343706
2.71	200	1.1	500	0.8	0.08	1018	102.03	163.1	0.0008724	0.01996	1704	128.5	40.1	952.3	0.0343706
2.99	206	1.1	500	0.78	0.09	1014	102.03	163.4	0.0008719	0.02004	1707	128.4	40	952.4	0.0345592
7.48	302	1.1	500	0.85	0.11	1022	102.03	163	0.0008729	0.01988	1700	128.6	40.2	952.3	0.0342799
7.01	297	1.1	500	0.86	0.11	1020	102.03	163.1	0.0008726	0.01992	1702	128.5	40.1	952.3	0.0343706
10.31	371	1.1	500	0.86	0.1	1042	102.03	162.2	0.0008752	0.01948	1683	129	40.9	951.9	0.0331638
10.54	370	1.1	500	0.86	0.1	1032	102.03	162.7	0.0008741	0.01968	1692	128.8	40.5	952.1	0.0338122
1.39	131	2.4	500	0.84	0.11	1016	102.03	163.2	0.0008722	0.02	1705	128.5	40	952.4	0.0345592
1.45	130	2.4	500	0.85	0.12	1017	102.03	163.2	0.0008723	0.01998	1705	128.5	40.1	952.3	0.0343706
3.39	204														

3.3	202	2.4	800	0.81	0.09	1570	86.47	162.9	0.0008898	0.01448	1447	138.4	40.9	951.9	0.0331638
3.4	203	2.4	800	0.81	0.09	1560	86.47	163.2	0.0008889	0.01458	1451	138.3	40.7	952	0.0334426
7.9	298	2.4	800	0.85	0.14	1560	86.47	163.2	0.0008889	0.01458	1451	138.3	40.7	952	0.0334426
8.3	299	2.4	800	0.84	0.14	1560	86.47	163.2	0.0008889	0.01458	1451	138.3	40.7	952	0.0334426
12.2	399	2.4	800	0.85	0.13	1590	86.47	162.3	0.0008917	0.01428	1438	138.8	41.5	951.5	0.0322305
12.1	399	2.4	800	0.85	0.12	1610	86.47	161.6	0.0008936	0.01408	1429	139.1	41.2	951.2	0.0314864
12.3	401	2.4	800	0.84	0.12	1600	86.47	161.6	0.0008936	0.01408	1429	139.1	41.7	951.4	0.0319522
1.7	122	5.1	800	0.82	0.14	1540	86.47	163.8	0.000887	0.01479	1460	137.9	40.2	952.3	0.0342799
1.6	124	5.1	800	0.88	0.12	1570	86.47	162.9	0.0008898	0.01448	1447	138.4	40.9	951.9	0.0331638
1.7	126	5.1	800	0.81	0.09	1560	86.47	163.2	0.0008889	0.01458	1451	138.3	40.7	952	0.0334426
4.2	200	5.1	800	0.8	0.08	1580	86.47	162.5	0.0008908	0.01438	1442	138.6	41.2	951.7	0.032697
4.3	201	5.1	800	0.81	0.09	1590	86.47	162.3	0.0008917	0.01428	1438	138.8	41.5	951.5	0.0322305
4	202	5.1	800	0.85	0.11	1600	86.47	161.6	0.0008936	0.01408	1429	139.1	41.7	951.4	0.0319522
7.8	295	5.1	800	0.83	0.11	1520	86.47	164.4	0.0008851	0.015	1469	137.6	39.6	952.6	0.0352089
8.6	298	5.1	800	0.82	0.09	1510	86.47	164.8	0.0008841	0.01511	1474	137.4	39.4	952.8	0.0355869
8.1	301	5.1	800	0.9	0.14	1530	86.47	164.2	0.000886	0.01489	1464	137.8	39.9	952.5	0.0347479
7.9	304	5.1	800	0.84	0.1	1520	86.47	164.4	0.0008851	0.015	1469	137.6	39.6	952.6	0.0352089
13.5	403	5.1	800	0.86	0.11	1520	86.47	164.4	0.0008851	0.015	1469	137.6	39.6	952.6	0.0352089
12.6	405	5.1	800	0.86	0.09	1560	86.47	163.2	0.0008889	0.01458	1451	138.3	40.7	952	0.0334426
13.1	413	5.1	800	0.84	0.1	1560	86.47	163.2	0.0008889	0.01458	1451	138.3	40.7	952	0.0334426

R22 with SUS300 mineral oil

1.4	120	0.6	800	0.88	0.05	1590	86.47	162.3	0.0008917	0.01428	1438	138.8	41.5	953	0.0500423
1.3	120	0.6	800	0.87	0.06	1650	86.47	160.4	0.0008975	0.0137	1412	139.8	43	952.1	0.0465938
1.2	125	0.6	800	0.84	0.04	1630	86.47	161	0.0008956	0.01389	1420	139.4	42.5	952.4	0.0477117
3.6	193	0.6	800	0.86	0.12	1540	86.47	163.8	0.000887	0.01479	1460	137.9	40.2	953.8	0.0531285
3.4	194	0.6	800	0.86	0.09	1540	86.47	163.8	0.000887	0.01479	1460	137.9	40.2	953.8	0.0531285
3.6	198	0.6	800	0.88	0.1	1550	86.47	163.5	0.0008879	0.01468	1456	138.1	40.4	953.7	0.0526626
8	297	0.6	800	0.87	0.14	1600	86.47	161.6	0.0008936	0.01408	1429	139.1	41.7	952.9	0.0495778
7.9	298	0.6	800	0.87	0.14	1600	86.47	161.6	0.0008936	0.01408	1429	139.1	41.7	952.9	0.0495778
7.7	298	0.6	800	0.87	0.13	1610	86.47	161.6	0.0008936	0.01408	1429	139.1	42	952.7	0.0488309
11.8	399	0.6	800	0.88	0.13	1610	86.47	161.6	0.0008936	0.01408	1429	139.1	42	952.7	0.0488309
12.4	400	0.6	800	0.88	0.14	1600	86.47	161.6	0.0008936	0.01408	1429	139.1	41.7	952.9	0.0495778
11.5	403	0.6	800	0.87	0.15	1590	86.47	162.3	0.0008917	0.01428	1438	138.8	41.5	953	0.0500423
1.7	128	1.3	800	0.87	0.06	1630	86.47	161	0.0008956	0.01389	1420	139.4	42.5	952.4	0.0477117
1.6	128	1.3	800	0.87	0.04	1600	86.47	161.6	0.0008936	0.01408	1429	139.1	41.7	952.9	0.0495778
1.7	131	1.3	800	0.85	0.04	1590	86.47	162.3	0.0008917	0.01428	1438	138.8	41.5	953	0.0500423
3.9	200	1.3	800	0.91	0.16	1590	86.47	162.3	0.0008917	0.01428	1438	138.8	41.5	953	0.0500423
3.9	203	1.3	800	0.89	0.17	1580	86.47	162.5	0.0008908	0.01438	1442	138.6	41.2	953.2	0.0506993
3.7	204	1.3	800	0.89	0.18	1560	86.47	163.2	0.0008889	0.01458	1451	138.3	40.7	953.5	0.0519132
8.3	296	1.3	800	0.91	0.16	1550	86.47	163.5	0.0008879	0.01468	1456	138.1	40.4	953.7	0.0526626
8.1	300	1.3	800	0.89	0.15	1550	86.47	163.5	0.0008879	0.01468	1456	138.1	40.4	953.7	0.0526626
8.2	300	1.3	800	0.9	0.14	1550	86.47	163.5	0.0008879	0.01468	1456	138.1	40.4	953.7	0.0526626
13.2	398	1.3	800	0.85	0.15	1520	86.47	164.4	0.0008851	0.015	1469	137.6	39.6	954.1	0.0546184
12.8	399	1.3	800	0.85	0.14	1530	86.47	164.2	0.000886	0.01489	1464	137.8	39.9	954	0.0538789
13.1	404	1.3	800	0.85	0.14	1520	86.47	164.4	0.0008851	0.015	1469	137.6	39.6	954.1	0.0546184
1.6	128	2.6	800	0.84	0.07	1590	86.47	162.3	0.0008917	0.01428	1438	138.8	41.5	953	0.0500423
1.8	129	2.6	800	0.88	0.17	1540	86.47	163.8	0.000887	0.01479	1460	137.9	40.2	953.8	0.0531285
4.2	198	2.6	800	0.89	0.13	1500	86.47	165	0.0008832	0.01522	1478	137.3	39.1	954.4	0.055928
3.9	199	2.6	800	0.9	0.13	1500	86.47	165	0.0008832	0.01522	1478	137.3	39.1	954.4	0.055928
4.3	203	2.6	800	0.89	0.15	1510	86.47	164.8	0.0008841	0.01511	1474	137.4	39.4	954.3	0.0551877
8.6	293	2.6	800	0.86	0.11	1540	86.47	163.8	0.000887	0.01479	1460	137.9	40.2	953.8	0.0531285
8.3	294	2.6	800	0.87	0.12	1540	86.47	163.8	0.000887	0.01479	1460	137.9	40.2	953.8	0.0531285
8.7	297	2.6	800	0.88	0.1	1540	86.47	163.8	0.000887	0.01479	1460	137.9	40.2	953.8	0.0531285
13.7	395	2.6	800	0.85	0.13	1550	86.47	163.5	0.0008879	0.01468	1456	138.1	40.4	953.7	0.0526626
13.5	399	2.6	800	0.86	0.12	1580	86.47	162.5	0.0008908	0.01438	1442	138.6	41.2	953.2	0.0506993
13.9	400	2.6	800	0.86	0.13	1570	86.47	162.9	0.0008898	0.01448	1447	138.4	40.9	953.4	0.0514478
1.8	120	5	800	0.85	0.12	1530	86.47	164.2	0.000886	0.01489	1464	137.8	39.9	954	0.0538789
2	124	5	800	0.82	0.1	1550	86.47	163.5	0.0008879	0.01468	1456	138.1	40.4	953.7	0.0526626
4.5	208	5	800	0.84	0.09	1580	86.47	162.5	0.0008908	0.01438	1442	138.6	41.2	953.2	0.0506993
4.2	208	5	800	0.84	0.09	1560	86.47	163.2	0.0008889	0.01458	1451	138.3	40.7	953.5	0.0519132
4.7	211	5	800	0.83	0.11	1560	86.47	163.2	0.0008889	0.01458	1451	138.3	40.7	953.5	0.0519132
9.7	294	5	800	0.84	0.17	1500	86.47	165	0.0008832	0.01522	1478	137.3	39.1	954.4	0.055928
9.3	297	5	800	0.88	0.15	1520	86.47	164.4	0.0008851	0.015	1469	137.6	39.6	954.1	0.0546184
9.6	301	5	800	0.85	0.13	1520	86.47	164.4	0.0008851	0.015	1469	137.6	39.6	954.1	0.0546184
13.5	394	5	800	0.83	0.06	1550	86.47	163.5	0.0008879	0.01468	1456	138.1	40.4	953.7	0.0526626
13.7	398	5	800	0.85	0.06	1570	86.47	162.9	0.0008898	0.01448	1447	138.4	40.9	953.4	0.0514478
14.5	401	5	800	0.85	0.1	1570	86.47	162.9	0.0008898	0.01448	1447	138.4	40.9	953.4	0.0514478

Micro-fin 3/8 inch, evaporation R12 with SUS150 naphthenic oil

4.59	126	1.3	800	0.11	0.82	341	120.91	147.5	0.0007198	0.05001	2394	114.9	3	974.6	0.1944333
5.67	126	1.3	800	0.1	0.84	310	120.91	149	0.0007151	0.05466	2471	113.6	0.2	976.3	0.2216101
5.49	126	1.3	800	0.09	0.83	310	120.91	149	0.0007151	0.05466	2471	113.6	0.1	976.3	0.2226586
13.9	202	1.3	800	0.11	0.82	310	120.91	149	0.0007151	0.05466	2471	113.6	0.1	976.3	0.2226586
12.27	207	1.3	800	0.09	0.78	335	120.91	147.8	0.0007191	0.05073	2406	114.7	2.5	974.9	0.19902
13.12	205	1.3	800	0.07	0.84	325	120.91	148.3	0.0007175	0.05223	2431	114.3	1.6	975.4	0.2075966
28.46	309	1.3	800	0.09	0.81	316	120.91	148.7	0.0007161	0.05336	2455	113.9	0.6	976	0.2174731
27.43	309	1.3	800	0.07	0.81	311	120.91	148.9	0.0007153	0.05449	2468	113.6	0.2	976.3	0.2216101
40.26	376	1.3	800	0.09	0.8	327	120.91	148.1	0.0007178	0.05192	2426	114.3	1.8	975.3	0.2056516
40.36	382	1.3	800	0.09	0.8	326	120.91	148.2	0.0007177	0.					

40.08	373	1.2	800	0.12	0.8	333	120.91	147.9	0.0007188	0.05102	2411	114.6	2.3	976.5	0.3116209
5.57	130	2.4	800	0.09	0.81	331	120.91	148	0.0007185	0.05132	2416	114.5	2.1	976.6	0.3145459
5.56	129	2.4	800	0.09	0.82	332	120.91	147.9	0.0007186	0.05117	2414	114.6	2.2	976.6	0.3131153
13.51	203	2.4	800	0.1	0.8	335	120.91	147.8	0.0007191	0.05073	2406	114.7	2.4	976.5	0.3101905
14.18	201	2.4	800	0.11	0.84	326	120.91	148.1	0.0007177	0.05208	2429	114.3	1.9	976.8	0.3175372
12.48	211	2.4	800	0.09	0.75	336	120.91	147.8	0.0007192	0.05058	2404	114.7	2.6	976.3	0.3072993
13.73	205	2.4	800	0.1	0.82	331	120.91	148	0.0007185	0.05132	2416	114.5	2	976.7	0.3160413
29.92	307	2.4	800	0.08	0.82	312	120.91	148.8	0.0007155	0.05432	2465	113.7	0.3	977.7	0.3421157
29.42	302	2.4	800	0.08	0.84	312	120.91	148.8	0.0007155	0.05432	2465	113.7	0.3	977.7	0.3421157
45.16	371	2.4	800	0.12	0.83	317	120.91	148.6	0.0007163	0.0535	2452	113.9	0.8	977.4	0.3342633
44.58	382	2.4	800	0.12	0.8	317	120.91	148.6	0.0007163	0.0535	2452	113.9	0.8	977.4	0.3342633
6.84	132	4.8	800	0.07	0.8	344	120.91	147.3	0.0007202	0.04972	2389	115	3.2	976	0.2988231
7.15	131	4.8	800	0.07	0.81	341	120.91	147.5	0.0007198	0.05001	2394	114.9	3	976.1	0.3016474
17.45	204	4.8	800	0.12	0.82	338	120.91	147.6	0.0007195	0.0503	2399	114.8	2.7	976.3	0.3058696
18.55	204	4.8	800	0.12	0.83	336	120.91	147.8	0.0007192	0.05058	2404	114.7	2.6	976.3	0.3072993
33.78	298	4.8	800	0.11	0.82	317	120.91	148.6	0.0007163	0.0535	2452	113.9	0.8	977.4	0.3342633
34.05	298	4.8	800	0.11	0.82	316	120.91	148.7	0.0007161	0.05336	2455	113.9	0.6	977.5	0.3373893
32.78	295	4.8	800	0.11	0.83	318	120.91	148.6	0.0007164	0.05334	2449	113.9	0.9	977.4	0.3327348
41.09	348	4.8	800	0.1	0.8	334	120.91	147.8	0.0007189	0.05088	2409	114.6	2.4	976.5	0.3101905
39.98	351	4.8	800	0.09	0.79	338	120.91	147.6	0.0007195	0.0503	2399	114.8	2.7	976.3	0.3058696

R134a with SUS169 ester-m oil

1.8	80	0.5	500	0.1	0.73	321	102.03	196.7	0.0007781	0.06343	2784	110.3	2.5	975.1	0.213364
2.16	79	0.5	500	0.11	0.87	312	102.03	197.3	0.0007765	0.0652	2813	110	1.8	975.5	0.2203906
2.17	80	0.5	500	0.11	0.87	313	102.03	197.3	0.0007767	0.065	2810	110	1.8	975.5	0.2203906
5.93	117	0.5	500	0.11	0.81	307	102.03	197.6	0.0007756	0.06623	2830	109.8	1.3	975.8	0.2255728
5.84	116	0.5	500	0.11	0.82	309	102.03	197.6	0.0007776	0.06581	2823	109.9	1.4	975.8	0.2246206
5.5	117	0.5	500	0.1	0.74	316	102.03	197	0.0007772	0.0644	2800	110.1	2.1	975.3	0.2173515
15.18	194	0.5	500	0.05	0.89	307	102.03	197.6	0.0007756	0.06623	2830	109.8	1.3	975.8	0.2255728
15.81	205	0.5	500	0.08	0.84	304	102.03	197.9	0.0007751	0.06686	2840	109.7	1	976	0.2288087
15.17	204	0.5	500	0.08	0.84	306	102.03	197.7	0.0007754	0.06644	2833	109.7	1.3	975.8	0.2255728
31.67	288	0.5	500	0.13	0.87	310	102.03	197.4	0.0007761	0.06561	2820	109.9	1.6	975.6	0.2224346
32.87	306	0.5	500	0.11	0.8	310	102.03	197.4	0.0007761	0.06561	2820	109.9	1.5	975.7	0.2235274
43.1	385	0.5	500	0.08	0.77	318	102.03	196.9	0.0007776	0.06401	2794	110.2	2.2	975.3	0.2163052
44.78	359	0.5	500	0.1	0.85	314	102.03	197.2	0.0007768	0.0648	2807	110	1.9	975.5	0.219439
6.07	85	1	500	0.07	0.85	319	102.03	196.9	0.0007777	0.06382	2791	110.3	2.3	975.2	0.2153098
6.15	84	1	500	0.07	0.83	309	102.03	197.6	0.0007776	0.06581	2823	109.9	1.5	975.7	0.2235274
9.58	125	1	500	0.1	0.88	299	102.03	198.3	0.0007742	0.06794	2857	109.4	0.6	976.2	0.2330956
9.68	126	1	500	0.1	0.87	301	102.03	198.1	0.0007745	0.0675	2850	109.5	0.8	976.1	0.2309517
16.74	195	1	500	0.1	0.81	311	102.03	197.4	0.0007763	0.0654	2816	109.9	1.7	975.6	0.2214828
17.24	200	1	500	0.09	0.78	308	102.03	197.6	0.0007758	0.06602	2826	109.8	1.4	975.8	0.2246206
37.03	300	1	500	0.09	0.87	318	102.03	196.9	0.0007776	0.06401	2794	110.2	2.3	975.2	0.2153098
37.41	305	1	500	0.09	0.87	314	102.03	197.2	0.0007768	0.0648	2807	110	2	975.4	0.2183475
50.23	367	1	500	0.1	0.83	318	102.03	196.9	0.0007776	0.06401	2794	110.2	2.3	975.2	0.2153098
49.48	367	1	500	0.11	0.83	317	102.03	197	0.0007774	0.06421	2797	110.2	2.2	975.3	0.2163052
3.49	78	1.9	500	0.08	0.87	312	102.03	197.3	0.0007765	0.0652	2813	110	1.8	975.5	0.2203906
3.22	79	1.9	500	0.08	0.86	312	102.03	197.3	0.0007765	0.0652	2813	110	1.7	975.6	0.2214828
6.7	130	1.9	500	0.08	0.79	319	102.03	196.9	0.0007777	0.06382	2791	110.3	2.4	975.2	0.2143588
7.81	131	1.9	500	0.09	0.82	302	102.03	198	0.0007747	0.06728	2847	109.6	0.9	976.1	0.2290037
16.39	206	1.9	500	0.08	0.8	303	102.03	198	0.0007749	0.06707	2843	109.6	1	976	0.2288087
16.52	206	1.9	500	0.08	0.8	304	102.03	197.9	0.0007751	0.06686	2840	109.7	1.1	975.9	0.2277143
16.78	205	1.9	500	0.08	0.82	301	102.03	198.1	0.0007745	0.0675	2850	109.5	0.8	976.1	0.2309517
35.11	315	1.9	500	0.09	0.82	318	102.03	196.9	0.0007776	0.06401	2794	110.2	2.3	975.2	0.2153098
37.39	297	1.9	500	0.11	0.87	309	102.03	197.6	0.0007776	0.06581	2823	109.9	1.5	976.1	0.2309517
49.71	371	1.9	500	0.1	0.83	322	102.03	196.7	0.0007783	0.06324	2781	110.4	2.6	975	0.2122746
49.99	383	1.9	500	0.1	0.8	320	102.03	196.8	0.0007779	0.06363	2787	110.3	2.5	975.1	0.213364
50.19	387	1.9	500	0.09	0.8	320	102.03	196.8	0.0007779	0.06363	2787	110.3	2.5	975.1	0.213364
2.62	81	2.9	500	0.07	0.82	315	102.03	197.1	0.0007777	0.0646	2803	110.1	2	975.4	0.2183475
2.86	81	2.9	500	0.07	0.83	314	102.03	197.2	0.0007768	0.0648	2807	110.1	2	975.4	0.2183475
7.36	127	2.9	500	0.09	0.83	301	102.03	198.1	0.0007745	0.0675	2850	109.5	0.8	976.1	0.2309517
7.14	125	2.9	500	0.08	0.85	305	102.03	197.8	0.0007752	0.06665	2836	109.7	1.2	975.9	0.2266666
6.71	124	2.9	500	0.08	0.83	306	102.03	197.7	0.0007754	0.06644	2833	109.7	1.3	975.8	0.2255728
16.59	199	2.9	500	0.09	0.83	301	102.03	198.1	0.0007745	0.0675	2850	109.5	0.8	976.1	0.2309517
15.88	199	2.9	500	0.08	0.81	302	102.03	198	0.0007747	0.06728	2847	109.6	0.9	976.1	0.2299037
16.75	201	2.9	500	0.08	0.81	301	102.03	198.1	0.0007745	0.0675	2850	109.5	0.8	976.1	0.2309517
35.26	308	2.9	500	0.09	0.82	315	102.03	197.1	0.0007777	0.0646	2803	110.1	2	975.4	0.2183475
33.76	309	2.9	500	0.08	0.81	316	102.03	197	0.0007772	0.0644	2800	110.1	2.1	975.3	0.2173515
34.79	310	2.9	500	0.08	0.81	317	102.03	197	0.0007774	0.06421	2797	110.2	2.2	975.3	0.2163052
44.24	376	2.9	500	0.08	0.77	326	102.03	196.4	0.0007779	0.06249	2768	110.5	2.9	974.9	0.2093797
46.04	361	2.9	500	0.08	0.81	332	102.03	196	0.00078	0.0614	2750	110.8	3.4	974.6	0.2045966
3.99	82	5	500	0.09	0.81	316	102.03	197	0.0007772	0.0644	2800	110.1	2.1	975.3	0.2173515
4.07	81	5	500	0.09	0.83	317	102.03	197	0.0007774	0.06421	2797	110.2	2.2	975.3	0.2163052
8.12	123	5	500	0.07	0.82	317	102.03	197	0.0007774	0.06421	2797	110.2	2.2	975.3	0.2163052
10.31	123	5	500	0.07	0.82	318	102.03	196.9	0.0007776	0.06401	2794	110.2	2.3	975.2	0.2153098
9	125	5	500	0.07	0.84	311	102.03	197.4	0.0007763	0.0654	2816	109.9	1.6	975.6	0.2224346
20.1	198	5	500	0.09	0.82	309	102.03	197.6	0.0007776	0.06581	2823	109.9	1.5	975.7	0.2235274
21.09	202	5	500	0.09	0.8	310	102.03	197.4	0.0007761	0.06561	2820	109.9	1.6	975.6	0.2224346
37.86	289	5	500	0.1	0.84	332	102.03	196	0.00078	0.0614	2750	110.8	3.4	974.6	0.2045966
36.11	286	5	500	0.11	0.85	331	102.03								

6.4	126	2.4	500	0.1	0.82	303	102.03	198	0.0007749	0.06707	2843	109.6	1	978	0.4076535
15.57	197	2.4	500	0.09	0.83	314	102.03	197.2	0.0007768	0.0648	2807	110.1	1.9	977.5	0.3909931
15.31	197	2.4	500	0.09	0.82	316	102.03	197	0.0007772	0.0644	2800	110.1	2.1	977.3	0.3872993
15.89	198	2.4	500	0.1	0.83	318	102.03	196.9	0.0007776	0.06401	2794	110.2	2.3	977.2	0.3836868
33.08	298	2.4	500	0.1	0.82	318	102.03	196.9	0.0007776	0.06401	2794	110.2	2.2	977.3	0.3854845
33.84	300	2.4	500	0.09	0.83	314	102.03	197.2	0.0007768	0.0648	2807	110.1	1.9	977.5	0.3909931
48.57	361	2.4	500	0.12	0.84	328	102.03	196.3	0.0007793	0.06212	2762	110.6	3.1	976.7	0.3696529
46.87	358	2.4	500	0.12	0.82	334	102.03	195.9	0.0007803	0.06104	2744	110.8	3.6	976.4	0.3611316
4.05	88	5	500	0.11	0.79	313	102.03	197.3	0.0007767	0.065	2810	110	1.8	977.5	0.3927131
4.23	88	5	500	0.11	0.79	312	102.03	197.3	0.0007765	0.0652	2813	110	1.8	977.5	0.3927131
3.84	89	5	500	0.1	0.79	313	102.03	197.3	0.0007767	0.065	2810	110	1.8	977.5	0.3927131
9.03	131	5	500	0.1	0.79	311	102.03	197.4	0.0007763	0.0654	2816	109.9	1.6	977.6	0.396425
7.9	129	5	500	0.11	0.8	309	102.03	197.6	0.0007776	0.06581	2823	109.9	1.5	977.7	0.3983224
8.6	129	5	500	0.11	0.81	308	102.03	197.6	0.0007758	0.06602	2826	109.8	1.4	977.8	0.4002205
17.51	198	5	500	0.1	0.81	316	102.03	197	0.0007772	0.0644	2800	110.1	2.1	977.3	0.3872993
18.5	200	5	500	0.1	0.82	314	102.03	197.2	0.0007768	0.0648	2807	110.1	2	977.4	0.3890981
17.25	200	5	500	0.1	0.82	312	102.03	197.3	0.0007765	0.0652	2813	110	1.7	977.6	0.3946093
42.36	312	5	500	0.11	0.82	304	102.03	197.9	0.0007751	0.06686	2840	109.7	1.1	977.9	0.4057532
42.46	309	5	500	0.11	0.82	305	102.03	197.8	0.0007752	0.06665	2836	109.7	1.2	977.9	0.4039363
39.46	291	5	500	0.13	0.86	314	102.03	197.2	0.0007768	0.0648	2807	110.1	1.9	977.5	0.3909931
52	375	5	500	0.13	0.8	331	102.03	196.1	0.0007798	0.06158	2753	110.7	3.4	976.6	0.3645223
51.58	379	5	500	0.12	0.78	328	102.03	196.3	0.0007793	0.06194	2759	110.6	3.1	976.7	0.3696529

R134a with SUS150 ester-b oil

5.68	128	1.1	500	0.12	0.84	304	102.03	197.9	0.0007751	0.06686	2840	109.7	1.1	975.7	0.2124843
6.31	125	1.1	500	0.14	0.89	296	102.03	198.5	0.0007736	0.0686	2867	109.3	0.4	976.2	0.2195635
14.45	202	1.1	500	0.09	0.82	304	102.03	197.9	0.0007751	0.06686	2840	109.7	1	975.8	0.21348
32.3	308	1.1	500	0.08	0.82	302	102.03	198	0.0007747	0.06728	2847	109.6	0.9	975.9	0.2144762
32.53	301	1.1	500	0.09	0.85	302	102.03	198	0.0007747	0.06728	2847	109.6	0.9	975.9	0.2144762
43.13	354	1.1	500	0.1	0.86	324	102.03	196.6	0.0007786	0.06287	2775	110.5	2.8	974.7	0.1962783
41.68	358	1.1	500	0.09	0.86	322	102.03	196.8	0.0007779	0.06363	2787	110.3	2.6	974.8	0.198124
6.27	117	2.4	500	0.11	0.89	303	102.03	198	0.0007749	0.06707	2843	109.6	1	975.8	0.21348
6.56	118	2.4	500	0.11	0.87	305	102.03	197.8	0.0007752	0.06665	2836	109.7	1.1	975.7	0.2124843
18.29	207	2.4	500	0.08	0.85	303	102.03	198	0.0007749	0.06707	2843	109.6	1	975.8	0.21348
18.23	209	2.4	500	0.08	0.84	303	102.03	198	0.0007749	0.06707	2843	109.6	1	975.8	0.21348
33.81	286	2.4	500	0.1	0.85	299	102.03	198.3	0.0007742	0.06794	2857	109.4	0.7	976	0.2165205
33.32	298	2.4	500	0.09	0.81	302	102.03	198	0.0007747	0.06728	2847	109.6	0.9	975.9	0.2144762
48.51	357	2.4	500	0.13	0.81	309	102.03	197.6	0.0007776	0.06581	2823	109.9	1.5	975.5	0.2085908
51.15	377	2.4	500	0.12	0.78	309	102.03	197.6	0.0007776	0.06581	2823	109.9	1.5	975.5	0.2085908
7.75	125	5	500	0.09	0.84	302	102.03	198	0.0007747	0.06728	2847	109.6	0.9	975.9	0.2144762
8.84	127	5	500	0.1	0.85	301	102.03	198.1	0.0007745	0.0675	2850	109.5	0.8	975.9	0.2154285
22.82	221	5	500	0.11	0.85	310	102.03	197.4	0.0007761	0.06561	2820	109.9	1.6	975.4	0.2075966
22.27	222	5	500	0.11	0.84	312	102.03	197.3	0.0007765	0.0652	2813	110	1.8	975.3	0.2056516
34.95	289	5	500	0.11	0.83	312	102.03	197.3	0.0007765	0.0652	2813	110	1.7	975.4	0.2066452
36.45	288	5	500	0.11	0.84	310	102.03	197.4	0.0007761	0.06561	2820	109.9	1.6	975.4	0.2075966
45.05	347	5	500	0.1	0.81	320	102.03	196.8	0.0007779	0.06363	2787	110.3	2.5	974.9	0.19902
44.86	346	5	500	0.11	0.81	324	102.03	196.6	0.0007786	0.06287	2775	110.5	2.8	974.7	0.1962783

R22 with SUS150 mineral oil

4.3	122	1.3	800	0.16	0.81	560	86.47	199.5	0.0007872	0.04166	2118	118.4	3.7	974.2	0.1881997
4.4	122	1.3	800	0.16	0.82	560	86.47	199.5	0.0007872	0.04166	2118	118.4	3.7	974.2	0.1881997
4	123	1.3	800	0.18	0.85	560	86.47	199.5	0.0007872	0.04166	2118	118.4	3.7	974.2	0.1881997
4.3	126	1.3	800	0.16	0.79	560	86.47	199.5	0.0007872	0.04166	2118	118.4	3.7	974.2	0.1881997
14.4	202	1.3	800	0.19	0.85	490	86.47	202.8	0.0007786	0.04745	2204	116.4	-0.5	976.7	0.22289463
12.8	204	1.3	800	0.17	0.79	500	86.47	202.3	0.0007798	0.04653	2191	116.7	0.1	976.3	0.2226586
12.8	210	1.3	800	0.15	0.75	520	86.47	201.4	0.0007823	0.04478	2166	117.3	1.3	975.6	0.2105371
16.6	213	1.3	800	0.16	0.83	480	86.47	203.3	0.0007773	0.04841	2218	116.1	-1.1	978.6	0.3650592
27	297	1.3	800	0.15	0.87	540	86.47	200.4	0.0007848	0.04316	2141	117.8	2.5	974.9	0.19902
27.6	303	1.3	800	0.14	0.84	550	86.47	200	0.000786	0.0424	2130	118.1	3.1	974.5	0.1935387
25.5	304	1.3	800	0.12	0.74	550	86.47	200	0.000786	0.0424	2130	118.1	3.1	974.5	0.1935387
42.1	392	1.3	800	0.18	0.78	550	86.47	200	0.000786	0.0424	2130	118.1	3.1	974.5	0.1935387
41.6	392	1.3	800	0.18	0.77	560	86.47	199.5	0.0007872	0.04166	2118	118.4	3.7	974.2	0.1881997
5.2	124	2.4	800	0.19	0.84	480	86.47	203.3	0.0007773	0.04841	2218	116.1	-1.1	978.6	0.3650592
5	124	2.4	800	0.19	0.82	480	86.47	203.3	0.0007773	0.04841	2218	116.1	-1.1	978.6	0.3650592
5.2	127	2.4	800	0.19	0.83	480	86.47	203.3	0.0007773	0.04841	2218	116.1	-1.1	978.6	0.3650592
5.1	128	2.4	800	0.18	0.79	480	86.47	203.3	0.0007773	0.04841	2218	116.1	-1.1	978.6	0.3650592
15	199	2.4	800	0.2	0.83	500	86.47	202.3	0.0007798	0.04653	2191	116.7	0.1	976.3	0.2226586
13.8	203	2.4	800	0.17	0.7	490	86.47	202.8	0.0007786	0.04745	2204	116.4	-0.5	976.7	0.22289463
15.5	203	2.4	800	0.19	0.82	490	86.47	202.8	0.0007786	0.04745	2204	116.4	-0.5	976.7	0.22289463
13.7	207	2.4	800	0.16	0.68	490	86.47	202.8	0.0007786	0.04745	2204	116.4	-0.5	976.7	0.22289463
29.5	296	2.4	800	0.16	0.84	500	86.47	202.3	0.0007798	0.04653	2191	116.7	0.1	976.3	0.2226586
29.9	303	2.4	800	0.15	0.8	500	86.47	202.3	0.0007798	0.04653	2191	116.7	0.1	976.3	0.2226586
30	304	2.4	800	0.15	0.8	500	86.47	202.3	0.0007798	0.04653	2191	116.7	0.1	976.3	0.2226586
45.6	376	2.4	800	0.22	0.9	590	86.47	198.2	0.0007908	0.03958	2085	119.2	5.3	973.2	0.1746486
42.1	394	2.4	800	0.19	0.79	590	86.47	198.2	0.0007908	0.03958	2085	119.2	5.3	973.2	0.1746486
47.1	396	2.4	800	0.2	0.86	580	86.47	198.8	0.0007896	0.04025	2095	118.9	4.8	973.5	0.1787366
42.9	399	2.4	800	0.17	0.76	580	86.47	198.8	0.0007896	0.04025	2095	118.9	4.8	973.5	0.1787366
42.6	405	2.4	800	0.19	0.77	600	86.47	197.6	0.000792	0.03893	2074	119.4	5.9	972.9	0.1699029
5.1	123	5.1	800	0.2	0.8	510	86.47	201.9	0.0007811	0.04564	2178	117	0.7	976	0.2165205
4.9	125	5.1	800	0.19	0.81	510	86.47	201.9	0.0007811	0.04564	2178	117	0.7	976	0.2165205
5.3	126	5.1	800	0.19											

6.1	125	1.3	800	0.08	0.77	450	86.47	204.8	0.0007734	0.05154	2260	115.2	-3.1	979.9	0.3980046
5.6	126	1.3	800	0.1	0.77	490	86.47	202.8	0.0007786	0.04745	2204	116.4	-0.5	978.2	0.3551921
5.9	130	1.3	800	0.07	0.78	470	86.47	203.8	0.0007776	0.04941	2231	115.8	-1.7	979	0.3749421
5.1	131	1.3	800	0.06	0.75	450	86.47	204.8	0.0007734	0.05154	2260	115.2	-3.1	979.9	0.3980046
13.5	195	1.3	800	0.13	0.82	510	86.47	201.9	0.0007811	0.04564	2178	117	0.7	977.5	0.3358605
13.7	199	1.3	800	0.13	0.8	500	86.47	202.3	0.0007798	0.04653	2191	116.7	0.1	977.8	0.3453407
12.3	199	1.3	800	0.12	0.81	490	86.47	202.8	0.0007786	0.04745	2204	116.4	-0.5	978.2	0.3551921
13.5	204	1.3	800	0.11	0.76	490	86.47	202.8	0.0007786	0.04745	2204	116.4	-0.5	978.2	0.3551921
30.9	295	1.3	800	0.15	0.84	490	86.47	202.8	0.0007786	0.04745	2204	116.4	-0.5	978.2	0.3551921
28.4	296	1.3	800	0.12	0.78	510	86.47	201.9	0.0007811	0.04564	2178	117	0.7	977.5	0.3358605
30.7	301	1.3	800	0.15	0.8	500	86.47	202.3	0.0007798	0.04653	2191	116.7	0.1	977.8	0.3453407
31.1	303	1.3	800	0.12	0.78	500	86.47	202.3	0.0007798	0.04653	2191	116.7	0.1	977.8	0.3453407
47.2	291	1.3	800	0.17	0.85	570	86.47	199	0.0007884	0.04094	2107	118.6	4.2	975.4	0.2852313
48.5	406	1.3	800	0.16	0.83	560	86.47	199.5	0.0007872	0.04166	2118	118.4	3.7	975.7	0.2919755
49.2	406	1.3	800	0.16	0.85	550	86.47	200	0.000786	0.0424	2130	118.1	3.1	976	0.300252
4.4	118	2.6	800	0.14	0.8	510	86.47	201.9	0.0007811	0.04564	2178	117	0.7	977.5	0.3358605
4.7	125	2.6	800	0.13	0.77	520	86.47	201.4	0.0007823	0.04478	2166	117.3	1.3	977.1	0.3265157
13.2	187	2.6	800	0.13	0.82	530	86.47	200.9	0.0007836	0.04396	2153	117.5	1.9	976.8	0.3175372
12.9	189	2.6	800	0.13	0.82	560	86.47	199.5	0.0007872	0.04166	2118	118.4	3.7	975.7	0.2919755
12.6	200	2.6	800	0.11	0.76	550	86.47	200	0.000786	0.0424	2130	118.1	3.1	976	0.300252
13.5	205	2.6	800	0.11	0.77	540	86.47	200.4	0.0007848	0.04316	2141	117.8	2.5	976.4	0.3087923
27.8	270	2.6	800	0.19	0.78	560	86.47	199.5	0.0007872	0.04166	2118	118.4	3.7	975.7	0.2919755
28.9	271	2.6	800	0.18	0.8	580	86.47	198.8	0.0007896	0.04025	2095	118.9	4.8	975	0.2727973
29.3	279	2.6	800	0.18	0.74	550	86.47	200	0.000786	0.0424	2130	118.1	3.1	976	0.300252
30.1	283	2.6	800	0.17	0.79	610	86.47	197.2	0.0007931	0.0383	2063	119.7	6.4	974.1	0.2574286
45.2	373	2.6	800	0.22	0.7	600	86.47	197.6	0.000792	0.03893	2074	119.4	5.9	974.4	0.2634739
41.9	382	2.6	800	0.22	0.62	620	86.47	196.8	0.0007943	0.03769	2053	119.9	6.9	973.8	0.2514856
46.5	383	2.6	800	0.21	0.65	580	86.47	198.8	0.0007896	0.04025	2095	118.9	4.8	975	0.2727973
7	125	5	800	0.11	0.83	510	86.47	201.9	0.0007811	0.04564	2178	117	0.7	977.5	0.3358605
7.1	132	5	800	0.1	0.83	510	86.47	201.9	0.0007811	0.04564	2178	117	0.7	977.5	0.3358605
12.8	184	5	800	0.1	0.81	590	86.47	198.2	0.0007908	0.03958	2085	119.2	5.3	974.7	0.2709514
13.7	200	5	800	0.09	0.78	580	86.47	198.8	0.0007896	0.04025	2095	118.9	4.8	975	0.2727973
13.7	201	5	800	0.09	0.77	560	86.47	199.5	0.0007872	0.04166	2118	118.4	3.7	975.7	0.2919755
17.2	228	5	800	0.11	0.79	630	86.47	196.4	0.0007954	0.0371	2043	120.2	7.4	973.5	0.2456444
30.3	270	5	800	0.2	0.82	600	86.47	197.6	0.000792	0.03893	2074	119.4	5.9	974.4	0.2634739
29.8	273	5	800	0.19	0.76	600	86.47	197.6	0.000792	0.03893	2074	119.4	5.9	974.4	0.2634739
29.3	278	5	800	0.18	0.7	600	86.47	197.6	0.000792	0.03893	2074	119.4	5.9	974.4	0.2634739
26.7	283	5	800	0.18	0.72	590	86.47	198.2	0.0007908	0.03958	2085	119.2	5.3	974.7	0.2709514
46.5	367	5	800	0.27	0.77	630	86.47	196.4	0.0007954	0.0371	2043	120.2	7.4	973.5	0.2456444
46.3	372	5	800	0.15	0.69	580	86.47	198.8	0.0007896	0.04025	2095	118.9	4.8	975	0.2727973
44.7	384	5	800	0.15	0.66	610	86.47	197.2	0.0007931	0.0383	2063	119.7	6.4	974.1	0.2574286

Smooth 1/2 inch, evaporation R134a with SUS169 ester-m oil

3.34	91	1.3	500	0.12	0.85	306	102.03	197.7	0.0007754	0.06644	2833	109.7	1.2	975.9	0.2266712
3.33	89	1.3	500	0.12	0.89	302	102.03	198	0.0007749	0.06707	2843	109.6	0.9	976.1	0.2298669
6.49	128	1.3	500	0.11	0.78	314	102.03	197.2	0.000778	0.0648	2807	110.1	2	975.4	0.2183649
7	124	1.3	500	0.12	0.84	304	102.03	197.9	0.0007751	0.06686	2840	109.7	1.1	975.9	0.2277315
14.76	192	1.3	500	0.08	0.84	311	102.03	197.4	0.0007763	0.0654	2816	109.9	1.7	975.6	0.2277315
15.57	193	1.3	500	0.08	0.84	305	102.03	197.8	0.0007752	0.06665	2836	109.7	1.2	975.9	0.2266712
26.73	265	1.3	500	0.12	0.81	339	102.03	195.5	0.0007812	0.06017	2729	111	3.9	974.3	0.1998365
26.73	268	1.3	500	0.11	0.79	338	102.03	195.7	0.000781	0.06034	2732	111	3.9	974.3	0.1998365
3.69	88	2.3	500	0.13	0.84	313	102.03	197.3	0.0007767	0.065	2810	110	1.8	975.5	0.2204125
3.34	89	2.3	500	0.13	0.84	313	102.03	197.3	0.0007767	0.065	2810	110	1.9	975.5	0.2193863
8.09	126	2.3	500	0.1	0.85	303	102.03	198	0.0007749	0.06707	2843	109.6	1	976	0.2287967
8.47	126	2.3	500	0.09	0.78	317	102.03	197	0.0007774	0.06421	2797	110.2	2.2	975.3	0.2163363
18.96	187	2.3	500	0.09	0.85	300	102.03	198.2	0.0007743	0.06772	2853	109.5	0.7	976.2	0.2320224
18.96	187	2.3	500	0.09	0.85	301	102.03	198.1	0.0007745	0.0675	2850	109.5	0.8	976.1	0.2309421
26.77	242	2.3	500	0.15	0.83	354	102.03	194.6	0.0007837	0.0577	2685	111.6	5.3	973.4	0.1871976
26.74	240	2.3	500	0.15	0.84	353	102.03	194.7	0.0007836	0.05785	2688	111.5	5.1	973.5	0.188953
6.83	89	4.9	500	0.12	0.84	291	102.03	198.8	0.0007727	0.06974	2885	109.1	0.1	976.5	0.2386107
6.39	88	4.9	500	0.11	0.85	291	102.03	198.8	0.0007727	0.06974	2885	109.1	0	976.6	0.2397269
9.05	131	4.9	500	0.13	0.81	329	102.03	196.2	0.0007795	0.06194	2759	110.6	3.2	974.7	0.2064724
10.65	136	4.9	500	0.12	0.82	308	102.03	197.6	0.0007758	0.06602	2826	109.8	1.4	975.8	0.2245665
8.93	136	4.9	500	0.11	0.77	319	102.03	196.9	0.0007777	0.06382	2791	110.3	2.4	975.2	0.2143265
20.74	203	4.9	500	0.09	0.82	325	102.03	196.4	0.0007788	0.06268	2772	110.5	2.8	974.9	0.2103628
21.76	205	4.9	500	0.1	0.83	310	102.03	197.4	0.0007761	0.06561	2820	109.9	1.6	975.6	0.2224793
21.35	205	4.9	500	0.1	0.83	309	102.03	197.6	0.000776	0.06581	2823	109.9	1.5	975.7	0.22352
28.79	239	4.9	500	0.12	0.81	311	102.03	197.4	0.0007763	0.0654	2816	109.9	1.6	975.6	0.2224793
29.41	236	4.9	500	0.13	0.82	312	102.03	197.3	0.0007765	0.0652	2813	110	1.7	975.6	0.2214455

Smooth 1/2 inch, condensation R134a with SUS169 ester-m oil

0.23	89	1.3	500	0.82	0.08	1026	102.03	162.9	0.0008734	0.0198	1697	128.7	40.3	952.4	0.036545
0.24	88	1.3	500	0.82	0.09	1024	102.03	162.9	0.0008731	0.01984	1699	128.6	40.3	952.4	0.036545
0.46	122	1.3	500	0.84	0.12	1062	102.03	161.5	0.0008776	0.01909	1667	129.4	41.5	951.7	0.0345541
0.62	123	1.3	500	0.83	0.14	1048	102.03	162	0.000876	0.01936	1678	129.1	41.1	951.9	0.0352054
1.32	213	1.3	500	0.82	0.1	1010	102.03	163.5	0.0008715	0.02013	1711	128.4	39.8	952.7	0.0374081
1.24	212	1.3	500	0.83	0.11	1000	102.03	163.8	0.0008703	0.02034	1719	128.2	39.4	953	0.0381131
2.44	300	1.3	500	0.8	0.12	1000	102.03	163.8	0.0008703	0.02034	1719	128.2	39.4	953	0.0381131
2.32	299	1.3	500	0.8	0.14	988	102.03	164.4	0.0008687	0.02062	1731	127.9	38.9	953.3	0.0390132
0.36	92	2.3	500	0.82	0.09	1017	102.03	163.2	0.0008723	0.01998	1705	128.5	40.1	952.5	

29.28	258	1.3	500	0.11	0.78	342	102.03	195.3	0.0007817	0.05966	2720	111.1	4.2	974.1	0.1970583
29.82	260	1.3	500	0.1	0.76	343	102.03	195.3	0.0007819	0.05949	2717	111.2	4.4	974	0.1952276
4.27	91	2.3	500	0.14	0.83	317	102.03	197	0.0007774	0.06421	2797	110.2	2.2	975.3	0.2163363
3.96	91	2.3	500	0.14	0.82	319	102.03	196.9	0.0007777	0.06382	2791	110.3	2.3	975.2	0.215329
9.14	131	2.3	500	0.08	0.85	313	102.03	197.3	0.0007767	0.065	2810	110	1.8	975.5	0.2204125
9.11	132	2.3	500	0.08	0.86	313	102.03	197.3	0.0007767	0.065	2810	110	1.8	975.5	0.2204125
18.84	186	2.3	500	0.1	0.84	319	102.03	196.9	0.0007777	0.06382	2791	110.3	2.3	975.2	0.215329
19.35	185	2.3	500	0.1	0.87	317	102.03	197	0.0007774	0.06421	2797	110.2	2.2	975.3	0.2163363
27.61	242	2.3	500	0.15	0.83	352	102.03	194.7	0.0007834	0.05801	2691	111.5	5	973.6	0.1898369
27.95	244	2.3	500	0.14	0.82	351	102.03	194.8	0.0007832	0.05817	2694	111.5	5	973.6	0.1898369
2.86	84	4.9	500	0.09	0.86	322	102.03	196.7	0.0007783	0.06324	2781	110.4	2.6	975	0.2123354
2.84	84	4.9	500	0.09	0.81	325	102.03	196.4	0.0007788	0.06268	2772	110.5	2.9	974.9	0.2093834
8.96	125	4.9	500	0.1	0.86	320	102.03	196.8	0.0007779	0.06363	2787	110.3	2.4	975.2	0.2143265
9.43	126	4.9	500	0.11	0.89	313	102.03	197.3	0.0007767	0.065	2810	110	1.8	975.5	0.2204125
18.44	197	4.9	500	0.1	0.79	337	102.03	195.7	0.0007809	0.06052	2735	111	3.8	974.3	0.2007713
18.47	196	4.9	500	0.11	0.8	343	102.03	195.3	0.0007819	0.05949	2717	111.2	4.3	974	0.1961408
30.93	238	4.9	500	0.11	0.89	362	102.03	194.1	0.0007851	0.05646	2663	111.9	5.9	973.1	0.1820286
30.9	236	4.9	500	0.11	0.89	358	102.03	194.3	0.0007844	0.05707	2674	111.7	5.6	973.2	0.184595

Micro-fin 1/2 inch, condensation R134a with SUS169 ester-m oil

0.17	85	1.3	500	0.85	0.09	1049	102.03	162	0.0008761	0.01934	1678	129.1	41.2	951.9	0.0350415
0.19	85	1.3	500	0.85	0.09	1057	102.03	161.6	0.000877	0.01918	1671	129.3	41.4	951.8	0.0347158
0.56	127	1.3	500	0.82	0.09	1041	102.03	162.3	0.0008751	0.0195	1684	129	40.8	952.1	0.0357019
0.6	127	1.3	500	0.82	0.1	1041	102.03	162.3	0.0008751	0.0195	1684	129	40.9	952.1	0.0355357
1.75	198	1.3	500	0.85	0.12	1028	102.03	162.8	0.0008736	0.01976	1695	128.7	40.4	952.4	0.0363748
1.89	199	1.3	500	0.85	0.13	1024	102.03	162.9	0.0008731	0.01984	1699	128.6	40.3	952.4	0.036545
4.68	302	1.3	500	0.81	0.15	994	102.03	164.1	0.0008696	0.02047	1724	128	39.1	953.1	0.0386506
4.31	304	1.3	500	0.8	0.13	1004	102.03	163.7	0.0008708	0.02026	1716	128.2	39.6	952.8	0.037759
4.23	306	1.3	500	0.79	0.14	1001	102.03	163.9	0.0008704	0.02032	1718	128.2	39.4	953	0.0381131
0.16	84	2.3	500	0.84	0.1	1068	102.03	161.2	0.0008783	0.01897	1662	129.5	41.8	951.5	0.0340736
0.14	84	2.3	500	0.84	0.11	1055	102.03	161.7	0.0008786	0.01922	1673	129.3	41.3	951.8	0.0348783
0.63	122	2.3	500	0.83	0.12	1056	102.03	161.7	0.0008769	0.0192	1672	129.3	41.4	951.8	0.0347158
0.74	127	2.3	500	0.82	0.11	1020	102.03	163.1	0.0008726	0.01992	1702	128.6	40.1	952.5	0.0368878
1.99	203	2.3	500	0.81	0.07	1018	102.03	163.1	0.0008724	0.01996	1704	128.5	40	952.6	0.0370604
2.06	201	2.3	500	0.82	0.09	1015	102.03	163.3	0.0008721	0.02002	1706	128.5	40	952.6	0.0370604
4.62	298	2.3	500	0.81	0.13	1028	102.03	162.8	0.0008736	0.01976	1695	128.7	40.4	952.4	0.0363748
4.79	305	2.3	500	0.78	0.1	1002	102.03	163.8	0.0008705	0.0203	1717	128.2	39.5	952.9	0.0379356
5.06	307	2.3	500	0.79	0.1	1017	102.03	163.2	0.0008723	0.01998	1705	128.5	40	952.6	0.0370604
0.27	94	4.9	500	0.85	0.07	1000	102.03	163.8	0.0008703	0.02034	1719	128.2	39.4	953	0.0381131
0.33	93	4.9	500	0.86	0.08	993	102.03	164.1	0.0008694	0.02049	1725	128	39.1	953.1	0.0386506
0.88	127	4.9	500	0.87	0.08	997	102.03	164	0.0008699	0.02041	1722	128.1	39.3	953	0.0382915
0.78	127	4.9	500	0.87	0.08	993	102.03	164.1	0.0008694	0.02049	1725	128	39.1	953.1	0.0386506
1.72	206	4.9	500	0.85	0.09	974	102.03	164.8	0.0008673	0.02089	1741	127.7	38.3	953.6	0.0401213
3.99	289	4.9	500	0.78	0.08	974	102.03	164.8	0.0008673	0.02089	1741	127.7	38.4	953.6	0.0399345
3.73	290	4.9	500	0.81	0.06	1013	102.03	163.4	0.0008718	0.02007	1708	128.4	39.9	952.7	0.0372338