

## Data sheet

# Thermostatic Expansion Valves

## TUA/TUAE and TCAE



The TUA/TUAE and TCAE is made of stainless steel and therefore is especially well-suited to refrigeration systems where aggressive environments exist. The TUA/TUAE and TCAE has been developed and designed especially for soldering into hermetic refrigeration systems. The valves are offered in rated capacities up to 4.8 TR R407C (TU) / 7.5 TR R407C (TC) and can be used in a wide range of applications:

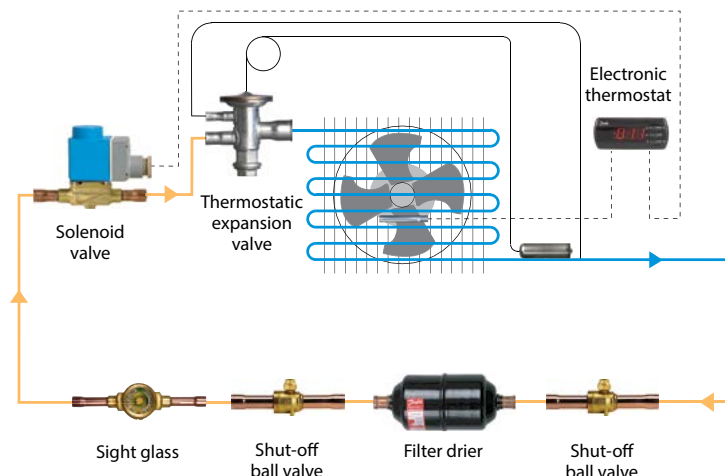
- Conventional refrigeration systems
- Heat pump systems
- Air conditioning systems
- Specialty refrigeration appliances
- Liquid chillers
- Ice machines
- Transport refrigeration

Danfoss also offers other stainless steel thermostatic expansion valves e.g. TUB/TUBE/TCBE with fixed orifice and TUC/TUCE/TCCE with fixed orifice and fixed superheat setting.

### Features

- *Interchangeable orifice assembly*
  - For easier stocking, capacity matching, and service
- *Bi-metal connections*
  - Fast and easy soldering without the need for a wet cloth.
- *Refrigerants*  
R22, R134a, R404A, R407A, R407C, R407F, R507, R410A (for other refrigerants, contact Danfoss)
- *Bi-flow function*
  - TU: orifice 1 - 8 and TC orifice 1 and 2.
- *Compact design*
  - Small dimensions and light weight for compact installation.
- *Stainless steel*
  - High body strength
  - High corrosion resistance
  - Highly vibration-resistant, flexible capillary tube
- *Laser-welded power element*  
insures diaphragm's structural integrity and lengthens life.
- *Precision-machined cone and orifice*  
accurately meters refrigerant under all operating conditions.
- *Stainless steel capillary tube*
  - Tolerates more bending for easier installation and longer life.
  - Greater resistance to vibration during operation
- *Stainless steel bulb*
  - Self-aligning for fast and easy installation; secures with a single strap or quick clip
  - More contact surface for better heat transfer
- *Removable strainer*
  - Removable strainer for easy servicing (TU orifice 1 - 4 = 100 mesh / All other TU and TC = 50 mesh).
- *Laser engraving*
  - Durable positive valve identification; no labels to peel off over time.
- *15% bleed orifices available, 30% bleed orifices available on request.*

Application example



Technical data

Danfoss offers the following standard range of thermostatic charges:

- Range N -40 – 50 °F
- Range N -40 – 50 °F, MOP 60 °F
- Range NM -40 – 25 °F, MOP 32 °F
- Range B<sup>1)</sup> -75 – -15 °F
- Range B<sup>1)</sup> -75 – -15 °F, MOP -4 °F
- Range F<sup>2)</sup> -40 – 50 °F MAH

<sup>1)</sup> TU valves for range B are not supplied for R134a.  
<sup>2)</sup> See page 24.

Connection sizes Inlet x outlet:  
 1/4 in. x 3/8 in.  
 1/4 in. x 1/2 in.  
 3/8 in. x 1/2 in.  
 1/2 in. x 5/8 in.  
 External equalization: 1/4 in.  
 Static superheat (SS) Valves without MOP

Maximum bulb temperature: 212 °F  
 Maximum valve body temperature: 250 °F  
 Short-lived peak: 300 °F

Maximum working pressure  
**TUA/TUAE**  
 MWP = 500 psig (R410A = 660 psig)  
**TCAE**  
 MWP = 660 psig

Maximum test pressure  
**TUA/TUAE**  
 $p^* = 540$  psig (R410A = 725 psig)  
**TCAE**  
 $p^* = 725$  psig

R134a, R22, R404A, R407A,  
 R407C, R407F, R410A: 9 °F  
 R507: 11 °F

Static superheat (SS) Valves F-Range  
 R134a, R22/R407C, R407A, R407F : 3 °F  
 R407C: 1.1 °F  
 R507: 5.4 °F

Static superheat (SS) Valves with MOP  
 R134a, R22, R404A, R407A,  
 R407C, R407F, R410A: 7 °F  
 R507: 9.5 °F

Capillary tube length: 59 inch.

Standard refrigerants  
 R22, R134a, R404A, R407A, R407C, R407F, R507  
 and R410A

Biflow operation  
 With flow in the opposite direction, the rated capacity is reduced by up to 15 %.  
 TUAE with orifice 0 and 9, TCAE with orifice 3, all TUA and valves with MOP charges cannot be used for biflow operation.

TU and TC valves are continually evaluated for use with newer refrigerants.  
 For further information, please contact Danfoss.

**MOP valves**

To avoid charge migration when using MOP valves, the bulb temperature must always be lower than the thermostatic element temperature.

*MOP-points*

Refrigerant	Range N	Range NM	Range B
	-40 – +50°F	-40 – +25°F	-75 – -15°F
	MOP point for evaporating temperature $t_e$ and evaporating pressure $p_e$		
	$t_e = +60^\circ\text{F}$	$t_e = +32^\circ\text{F}$	$t_e = -4^\circ\text{F}$
R22	$p_e = 100$ psig	$p_e = 60$ psig	$p_e = 20$ psig
R134a	$p_e = 55$ psig	$p_e = 30$ psig	
R404A / R507	$p_e = 120$ psig	$p_e = 75$ psig	$p_e = 30$ psig
R407C	$p_e = 95$ psig	$p_e = 50$ psig	$p_e = 20$ psig
R410A	$p_e = 165$ psig	$p_e = 100$ psig	$p_e = 45$ psig

**Identification**

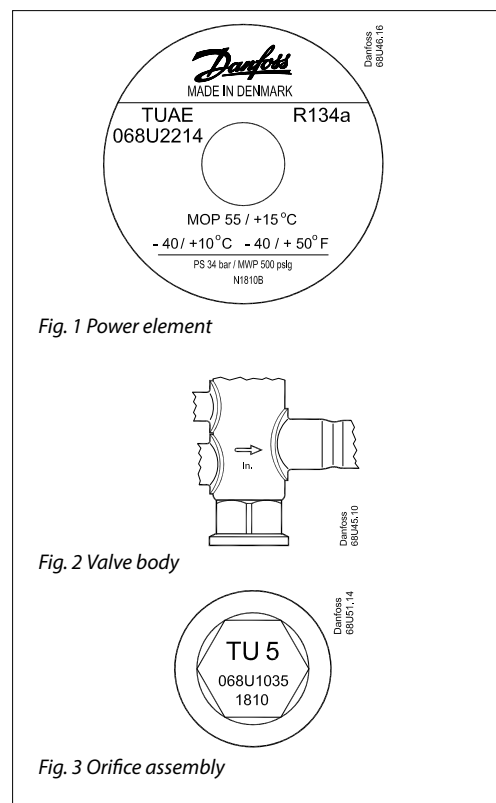
Main valve data is indicated on the valve element (fig. 1), on the valve body (fig. 2) and on the bottom of the orifice assembly (fig. 3).

*Example valve body*

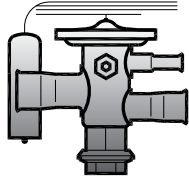
- TUAE = Type (E = external equalization)
- 068U2214** = Code number
- R134a = Refrigerant
- MOP 55 / +15°C** = **MOP-point in psig / °C**
- 40 / +10°C** = Evaporating temperature range in °C
- 40 / +50°F** = Evaporating temperature range in °F
- PS 34bar/
- MWP 500 psig** = Max. working pressure in bar/psig
- N1810B = Date marking (week **18**, year **2010**, weekday **B** = Tuesday)
- ⇒ = Normal flow direction
- in. = Connection in inches

*Example orifice assembly*

- TU = Valve type
- 5 = Orifice number
- 068U1035 = Code no., orifice assembly incl. filter and gasket
- 1810 = Date marking (Week **18**. Year **2010**)



**Ordering**  
**TUA / TUAE, straightway**  
*Thermostatic element without orifice and with bulb strap*



**R22, R134a, R404A, R407A, R407C, R407F, R507, R410A**

Refrigerant	Type	Range	MOP	External equalization solder	Connections ODF x ODF [in.]	Code no.
R22/R407C <sup>1)</sup>	TUA	N (-40 – 50 °F)	–	–	1/4 x 1/2	<b>068U2234</b>
	TUA	N (-40 – 50 °F)	–	–	3/8 x 1/2	<b>068U2235</b>
	TUAE	N (-40 – 50 °F)	–	1/4 in.	1/4 x 1/2	<b>068U2236</b>
	TUAE	N (-40 – 50 °F)	–	1/4 in.	3/8 x 1/2	<b>068U2237</b>
	TUAE	N (-40 – 50 °F)	100 psig / 60 °F	1/4 in.	3/8 x 1/2	<b>068U2245</b>
	TUAE	F (-40 – 50 °F)	–	1/4 in.	1/4 x 1/2	<b>068U1254</b>
R134a	TUAE	F (-40 – 50 °F)	–	1/4 in.	3/8 x 1/2	<b>068U1255</b>
	TUA	N (-40 – 50 °F)	–	–	1/4 x 1/2	<b>068U2204</b>
	TUA	N (-40 – 50 °F)	–	–	3/8 x 1/2	<b>068U2205</b>
	TUAE	N (-40 – 50 °F)	–	1/4 in.	1/4 x 1/2	<b>068U2206</b>
	TUAE	N (-40 – 50 °F)	–	1/4 in.	3/8 x 1/2	<b>068U2207</b>
	TUA	N (-40 – 50 °F)	55 psig / 60 °F	–	1/4 x 1/2	<b>068U2212</b>
	TUA	N (-40 – 50 °F)	55 psig / 60 °F	–	3/8 x 1/2	<b>068U2213</b>
	TUAE	N (-40 – 50 °F)	55 psig / 60 °F	1/4 in.	1/4 x 1/2	<b>068U2214</b>
	TUAE	N (-40 – 50 °F)	55 psig / 60 °F	1/4 in.	3/8 x 1/2	<b>068U2215</b>
	TUAE	F (-40 – 50 °F)	–	1/4 in.	1/4 x 1/2	<b>068U1256</b>
R404A/R507	TUAE	F (-40 – 50 °F)	–	1/4 in.	3/8 x 1/2	<b>068U1257</b>
	TUA	N (-40 – 50 °F)	–	–	1/4 x 1/2	<b>068U2284</b>
	TUA	N (-40 – 50 °F)	–	–	3/8 x 1/2	<b>068U2285</b>
	TUAE	N (-40 – 50 °F)	–	1/4 in.	1/4 x 1/2	<b>068U2286</b>
	TUAE	N (-40 – 50 °F)	–	1/4 in.	3/8 x 1/2	<b>068U2287</b>
	TUA	N (-40 – 50 °F)	120 psig / 60 °F	–	1/4 x 1/2	<b>068U2292</b>
	TUA	N (-40 – 50 °F)	120 psig / 60 °F	–	3/8 x 1/2	<b>068U2293</b>
	TUAE	N (-40 – 50 °F)	120 psig / 60 °F	1/4 in.	3/8 x 1/2	<b>068U2295</b>
	TUA	B (-75 – -15 °F)	30 psig / -4°F	–	1/4 x 1/2	<b>068U2316</b>
	TUA	B (-75 – -15 °F)	30 psig / -4°F	–	3/8 x 1/2	<b>068U2317</b>
	TUAE	B (-75 – -15 °F)	30 psig / -4°F	1/4 in.	1/4 x 1/2	<b>068U2318</b>
	TUAE	B (-75 – -15 °F)	30 psig / -4°F	1/4 in.	3/8 x 1/2	<b>068U2319</b>
R407A	TUAE	F (-40 – 50 °F)	–	1/4 in.	1/4 x 1/2	<b>068U1252</b>
	TUAE	F (-40 – 50 °F)	–	1/4 in.	3/8 x 1/2	<b>068U1253</b>
R407C	TUAE	F (-40 – 50 °F)	–	1/4 in.	1/4 x 1/2	<b>068U1258</b>
	TUAE	F (-40 – 50 °F)	–	1/4 in.	3/8 x 1/2	<b>068U1259</b>
	TUA	N (-40 – 50 °F)	–	–	1/4 x 1/2	<b>068U2324</b>
	TUA	N (-40 – 50 °F)	–	–	3/8 x 1/2	<b>068U2325</b>
	TUAE	N (-40 – 50 °F)	–	1/4 in.	1/4 x 1/2	<b>068U2326</b>
	TUAE	N (-40 – 50 °F)	–	1/4 in.	3/8 x 1/2	<b>068U2327</b>
R407F	TUA	N (-40 – 50 °F)	95 psig / 60 °F	–	1/4 x 1/2	<b>068U2332</b>
	TUA	N (-40 – 50 °F)	95 psig / 60 °F	–	3/8 x 1/2	<b>068U2333</b>
	TUAE	N (-40 – 50 °F)	95 psig / 60 °F	1/4 in.	3/8 x 1/2	<b>068U2335</b>
	TUAE	F (-40 – 50 °F)	–	1/4 in.	1/4 x 1/2	<b>068U1250</b>
R410A	TUAE	F (-40 – 50 °F)	–	1/4 in.	3/8 x 1/2	<b>068U1251</b>
	TUA	N (-40 – 50 °F)	–	–	3/8 x 1/2	<b>068U2414</b>
	TUAE	N (-40 – 50 °F)	–	1/4 in.	3/8 x 1/2	<b>068U1714</b>

<sup>1)</sup> For R407C plants, please select valves from the dedicated R407C program  
 For range NM please contact Danfoss.  
 Capillary tube length 59 in.

**Ordering**  
**TUA / TUAE, orifice assembly**  
 with Inlet screen and gasket



Orifice assembly with filter and gasket for TUA and TUAE

Orifice no.	Bleed	Rated capacity in tons (TR) <sup>1)</sup>							Code no.
		R134a	R404A / R507	R407A	R407C	R407F	R410A	R22	
0	–	0.12	0.14	0.19	0.19	0.22	0.28	0.18	068U1030
1	–	0.17	0.21	0.28	0.27	0.32	0.38	0.26	068U1031
1	15%	0.17	0.21	0.28	0.27	0.32	0.38	0.26	068U1131
2	–	0.20	0.26	0.33	0.33	0.39	0.49	0.31	068U1032
2	15%	0.20	0.26	0.33	0.33	0.39	0.49	0.31	068U1132
3	–	0.27	0.33	0.43	0.42	0.50	0.61	0.40	068U1033
3	15%	0.27	0.33	0.43	0.42	0.50	0.61	0.40	068U1133
4	–	0.45	0.59	0.77	0.74	0.91	1.16	0.70	068U1034
4	15%	0.45	0.59	0.77	0.74	0.91	1.16	0.70	068U1134
5	–	0.60	0.79	1.02	0.98	1.21	1.52	0.93	068U1035
5	15%	0.60	0.79	1.02	0.98	1.21	1.52	0.93	068U1135
6	–	0.94	1.24	1.60	1.54	1.90	2.44	1.47	068U1036
6	15%	0.94	1.24	1.60	1.54	1.90	2.44	1.47	068U1136
7	–	1.25	1.64	2.11	2.03	2.50	3.20	1.94	068U1037
7	15%	1.25	1.64	2.11	2.03	2.50	3.20	1.94	068U1137
8	–	1.83	2.36	3.06	2.96	3.61	4.52	2.82	068U1038
8	15%	1.83	2.36	3.06	2.96	3.61	4.52	2.82	068U1138
9	–	2.54	3.35	4.23	4.11	4.99	6.64	3.95	068U1039
9	15%	2.54	3.35	4.23	4.11	4.99	6.64	3.95	068U1138

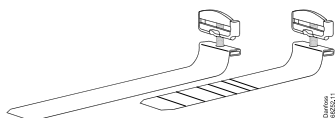
<sup>1)</sup> According to ARI 750-2007  
 Rated capacities for range N are based on:  
 Liquid temperature ahead of expansion valve  $t_l = 98\text{ °F}$   
 Evaporating temperature  $t_e = 40\text{ °F}$   
 Condensing temperature  $t_c = 100\text{ °F}$

**Spare parts**  
 TUA / TUAE and TCAE



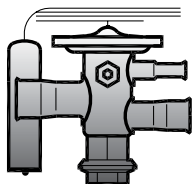
Description		Quantity/ pack	Code no.
Inlet screen TUA/TUAE 0 – 4	Industrial packing	24	068U1706
Inlet screen TUA/TUAE 5 – 9, TCAE 1 – 3	Industrial packing	24	068U0016
Gasket	Industrial packing	24	068U0015

**Note:** To secure tightness, the orifice gasket *must* be changed each time the orifice is disassembled.



Description		Quantity / pack	Code no.
Bulb strap max. 1 1/8 in. tube	Industrial packing	45	068U3505
Bulb strap max. 2 in. tube	Industrial packing	45	068U3506
Bulb strap max. 1 1/8 in. tube	Single packing	1	068U3507
Bulb strap max. 2 in. tube	Single packing	1	068U3508

**Ordering**  
**TCAE, straightway**  
 Thermostatic element without  
 orifice and with bulb strap



**R22, R134a, R404A, R507, R407C, R410A**

Refrigerant	Type	Range	MOP	Pressure equilisation	Connection Inlet x outlet	Code no.
					[in.]	
R22/ R407C <sup>1)</sup>	TCAE	N (-40 – 50 °F)	–	1/4 in.	3/8 x 5/8	068U4280
	TCAE	N (-40 – 50 °F)	–	1/4 in.	1/2 x 5/8	068U4281
	TCAE	N (-40 – 50 °F)	100 psig / 60 °F	1/4 in.	1/2 x 5/8	068U4283
R134a	TCAE	N (-40 – 50 °F)	–	1/4 in.	3/8 x 5/8	068U4292
	TCAE	N (-40 – 50 °F)	–	1/4 in.	1/2 x 5/8	068U4293
	TCAE	N (-40 – 50 °F)	55 psig / 60 °F	1/4 in.	1/2 x 5/8	068U4295
R404A R507	TCAE	N (-40 – 50 °F)	–	1/4 in.	3/8 x 5/8	068U4304
	TCAE	N (-40 – 50 °F)	–	1/4 in.	1/2 x 5/8	068U4305
	TCAE	N (-40 – 50 °F)	120 psig / 60 °F	1/4 in.	1/2 x 5/8	068U4307
	TCAE	NM (-40 – 23 °F)	75 psig / 32 °F	1/4 in.	1/2 x 5/8	068U4313
	TCAE	B (-75 – -15 °F)	–	1/4 in.	1/2 x 5/8	068U4317
	TCAE	B (-75 – -15 °F)	30 psig / -4 °F	1/4 in.	1/2 x 5/8	068U4319
R407C	TCAE	N (-40 – 50 °F)	–	1/4 in.	3/8 x 5/8	068U4324
	TCAE	N (-40 – 50 °F)	95 psig / 60 °F	1/4 in.	3/8 x 5/8	068U4326
	TCAE	N (-40 – 50 °F)	–	1/4 in.	1/2 x 5/8	068U4325
	TCAE	N (-40 – 50 °F)	95 psig / 60 °F	1/4 in.	1/2 x 5/8	068U4327
R410A	TCAE	N (-40 – 50 °F)	–	1/4 in.	3/8 x 5/8	068U4336
	TCAE	N (-40 – 50 °F)	–	1/4 in.	1/2 x 5/8	068U4337
	TCAE	N (-40 – 50 °F)	165 psig / 60 °F	1/4 in.	1/2 x 5/8	068U4339

<sup>1)</sup> For R407C plants, please select valves from the dedicated R407C program  
 Capillary tube length 59 in.

**Ordering**  
**TCAE, orifice assembly**  
 with filter and gasket



Orifice assembly with filter and gasket for TCAE

Orifice no.	Bleed	Rated capacity in tons (TR) <sup>1)</sup>										Code no.
		R134a	R404A / R507	R407A	R407C	R407F	R410A	R290	R32	R22		
1	–	3.65	3.82	5.10	5.12	5.94	6.08	5.39	8.71	5.06	068U4100	
1	15%	3.65	3.82	5.10	5.12	5.94	6.08	5.39	8.71	5.06	068U4097	
2	–	4.19	4.43	5.89	5.89	6.91	7.04	6.25	10.10	5.88	068U4101	
2	15%	4.19	4.43	5.89	5.89	6.91	7.04	6.25	10.10	5.88	068U4098	
3	–	5.23	5.59	7.37	7.34	8.72	8.85	7.90	12.70	7.42	068U4102	
3	15%	5.23	5.59	7.37	7.34	8.72	8.85	7.90	12.70	7.42	068U4099	

<sup>1)</sup> According to ARI 750-2007  
 Rated capacities for range N are based on:  
 Liquid temperature ahead of expansion valve  $t_l = 98$  °F  
 Evaporating temperature  $t_e = 40$  °F  
 Condensing temperature  $t_c = 100$  °F

**Selection**

For optimum performance, it is important to select a TU/TC valve according to system conditions and application. Selecting an incorrect valve will result in operational difficulties or poor system performance. The following procedure will help you select the correct valve for your needs.

Example:  
 Refrigerant = R407C  
 Evaporator capacity:  
 $Q_e = 30,000$  Btu (2.5 TR)  
 Evaporating temperature:  $t_e = +10^\circ\text{F}$   
 Condensing temperature:  $t_c = +75^\circ\text{F}$   
 Liquid refrigerant temperature:  $t_l = +55^\circ\text{F}$   
 Pressure drop in Evaporator:  $dp_{\text{evap}} = 3$  psi  
 Pressure drop in Condenser:  $dp_{\text{cond}} = 3$  psi  
 Pressure drop in distributor: 15 psi  
 Pressure drop in other components in liquid line:  
 $dp_{\text{linecomp}} = 2$  psi

**Step 1**

Determine the pressure drop in the liquid line. Pressure drop in liquid line ( $dp_{\text{liquid}}$ ) = the sum of other pressure drops in the liquid line, evaporator, and distributor.

In this example, the total pressure drop in the liquid line will be:  
 $dp_{\text{liquid}} = dp_{\text{evap}} + dp_{\text{cond}} + dp_{\text{distrib}} + dp_{\text{linecomp}}$   
 $dp_{\text{liquid}}: 3 + 3 + 15 + 2 = 23$  psi

**Step 2**

Determine required valve capacity. Use the design evaporator capacity,  $Q_e$ , to select the required valve size at a given evaporating temperature. If necessary, correct the evaporator capacity for subcooling and pressure drop in liquid line (pdw). Subcooled liquid refrigerant entering the evaporator increases evaporator capacity, so that a smaller valve may be required. In this example, the subcooling is:  $\Delta t_{\text{sub}} = t_c - t_l = 75 - 55 = 20^\circ\text{F}$ . From the subcooling correction factor table, see below, we find the appropriate correction factor " $f_{\text{sub}}$ " equals 1.06 for  $\Delta t_{\text{sub}} = 20^\circ\text{F}$ . From the Distributer correction factor table, see below, we find the appropriate correction factor " $fp$ " equals 0.92 for pressure drop liquid = 25 psig and  $t_{\text{evap}} = +10^\circ\text{F}$ .

Now, determine the required valve capacity by multiplying the evaporator capacity by the correction factor for subcooling and pressure drop  
 Required valve capacity  
 $Q_e \times F_{\text{sub}} \times fp = 2.5 \times 1.06 \times 0.92 = 2.56$  TR

Subcooling correction factor ' $f_{\text{sub}}$ '  $\Delta t_{\text{sub}}$

Subcooling [°F]	2	7	10	20	30	40	50	60	70	80	90
Correction factor	0.95	0.98	1.00	1.06	1.12	1.19	1.25	1.31	1.37	1.43	1.49

Distributer correction factor ' $fp$ ' \*

Evaporating temperature [°F]	-40	-30	-20	-10	0	10	20	30	40	50
"Pressure drop [psi]"	0	1	1	1	1	1	1	1	1	1
	15	0.96	0.96	0.96	0.96	0.96	0.95	0.95	0.95	0.94
	25	0.93	0.93	0.93	0.93	0.93	0.92	0.92	0.91	0.90
	30	0.92	0.92	0.92	0.91	0.91	0.90	0.90	0.89	0.88

\*calculated at 90°F condensing temperature

Use the calculated valve capacity to select the corresponding orifice size from the capacity table for R407C as indicated below.

**Step 3**

Use the calculated valve capacity (2.56 TR) to select the corresponding orifice size from the capacity table for R407C as indicated below. Note that the expansion valve capacity must be equal to or slightly more than the corrected evaporator capacity. In this sizing example, orifice 9 will be suitable.

**Capacities (TR)**

**R407C**

Range N: -40 °F – 50 °F.  $\Delta t_{sub} = 10\text{ °F}$ , OSH = 7 °F

Type	Orifice no.	Cond. temp. [°F]	Evaporating temperature [°F]									
			-40	-30	-20	-10	0	10	20	30	40	50
			Capacity in TR									
TU	0	75	0.071	0.082	0.094	0.107	0.121	0.136	0.150	0.162	0.171	0.174
	1		0.102	0.118	0.135	0.155	0.175	0.196	0.216	0.233	0.246	0.249
	2		0.114	0.131	0.152	0.174	0.199	0.225	0.251	0.275	0.295	0.305
	3		0.155	0.179	0.205	0.235	0.267	0.300	0.332	0.360	0.381	0.389
	4		0.243	0.282	0.326	0.377	0.433	0.493	0.556	0.617	0.670	0.705
	5		0.328	0.379	0.439	0.507	0.581	0.662	0.744	0.824	0.891	0.934
	6		0.505	0.585	0.677	0.782	0.900	1.030	1.160	1.290	1.400	1.480
	7		0.669	0.774	0.896	1.040	1.190	1.360	1.530	1.700	1.850	1.950
	8		0.991	1.150	1.330	1.540	1.770	2.010	2.260	2.500	2.690	2.800
	9		1.310	1.520	1.760	2.040	2.360	2.710	3.080	3.440	3.770	4.010
TC	1		2.480	2.800	3.130	3.470	3.800	4.110	4.370	4.550	4.630	4.540
	2		2.680	3.040	3.430	3.830	4.230	4.620	4.960	5.210	5.330	5.260
	3		3.110	3.550	4.030	4.540	5.070	5.590	6.080	6.470	6.690	6.670

**Step 4**

Select a thermostatic charge. Danfoss offers a universal wide range thermostatic charge, Range N, suited for most applications in the normal temperature range. Ranges NM and B are available for special low temperature applications.

**Step 5**

Determine if external equalization is required.

**Note!** External equalization is always required if a distributor is used or if there is an appreciable difference in pressure (>8 psi) from the valve outlet to the bulb location. Finally, determine connection sizes, then find the valve's code number from the tables on page 4 - 6.



Capacities

Capacities (TR)

-40 – 50 °F.  $\Delta t_{sub} = 10$  °F, OSH = 7 °F

**R22**

Type	Orifice no.	Cond. temp. [°F]	Evaporating temperature [°F]									
			-40	-30	-20	-10	0	10	20	30	40	50
			Capacity in TR									
TU	0	75	0.066	0.077	0.089	0.102	0.115	0.128	0.139	0.147	0.150	0.145
	1		0.098	0.114	0.131	0.150	0.170	0.188	0.204	0.216	0.220	0.211
	2		0.108	0.126	0.147	0.169	0.193	0.216	0.238	0.255	0.264	0.260
	3		0.147	0.172	0.199	0.228	0.259	0.288	0.314	0.334	0.341	0.330
	4		0.231	0.271	0.316	0.366	0.420	0.475	0.529	0.575	0.604	0.604
	5		0.311	0.365	0.426	0.493	0.564	0.637	0.707	0.766	0.803	0.799
	6		0.481	0.563	0.657	0.761	0.874	0.990	1.100	1.200	1.270	1.270
	7		0.637	0.746	0.871	1.010	1.160	1.310	1.460	1.590	1.670	1.670
	8		0.949	1.110	1.300	1.500	1.720	1.950	2.160	2.330	2.420	2.390
TC	1	75	1.260	1.480	1.720	2.000	2.310	2.630	2.950	3.230	3.430	3.460
	2		2.620	2.970	3.330	3.660	3.970	4.220	4.390	4.440	4.330	4.000
	3		2.840	3.240	3.660	4.070	4.460	4.790	5.030	5.130	5.030	4.660
			3.300	3.800	4.330	4.880	5.410	5.880	6.250	6.440	6.370	5.960

Type	Orifice no.	Cond. temp. [°F]	Evaporating temperature [°F]									
			-40	-30	-20	-10	0	10	20	30	40	50
			Capacity in TR									
TU	0	95	0.069	0.081	0.094	0.108	0.124	0.140	0.156	0.170	0.182	0.188
	1		0.101	0.119	0.138	0.159	0.182	0.205	0.229	0.249	0.266	0.275
	2		0.112	0.132	0.154	0.179	0.207	0.236	0.266	0.295	0.319	0.337
	3		0.153	0.179	0.209	0.242	0.278	0.315	0.351	0.385	0.413	0.430
	4		0.241	0.284	0.333	0.389	0.451	0.518	0.589	0.661	0.727	0.782
	5		0.325	0.382	0.448	0.523	0.606	0.695	0.789	0.882	0.968	1.040
	6		0.506	0.594	0.695	0.810	0.939	1.080	1.230	1.380	1.520	1.640
	7		0.669	0.784	0.919	1.070	1.240	1.430	1.620	1.820	2.010	2.160
	8		0.988	1.160	1.360	1.580	1.840	2.110	2.390	2.670	2.920	3.100
TC	1	95	1.340	1.560	1.820	2.120	2.470	2.840	3.250	3.670	4.080	4.440
	2		2.710	3.100	3.500	3.890	4.280	4.630	4.940	5.150	5.260	5.210
	3		2.920	3.360	3.820	4.300	4.770	5.230	5.630	5.930	6.100	6.080
			3.340	3.870	4.440	5.060	5.690	6.320	6.900	7.380	7.690	7.750

Subcooling correction factor  $f_{sub} \Delta t_{sub}$

Subcooling [°F]	2	7	10	20	30	40	50	60	70	80	90
Correction factor	0.96	0.98	1.00	1.05	1.10	1.15	1.20	1.25	1.30	1.35	1.40

Distributor correction factor  $f_p^*$

Evaporating temperature [°F]	-40	-30	-20	-10	0	10	20	30	40	50	
Pressure drop [psi]	0	1	1	1	1	1	1	1	1	1	
	15	0.95	0.95	0.95	0.95	0.95	0.94	0.94	0.93	0.92	0.91
	25	0.92	0.92	0.92	0.91	0.91	0.90	0.89	0.88	0.87	0.84
	30	0.91	0.90	0.90	0.90	0.89	0.88	0.87	0.86	0.84	0.80

\*calculated at 90°F condensing temperature

Capacities

Capacities (TR)

-40 – 50 °F.  $\Delta t_{sub} = 10$  °F, OSH = 7 °F

**R22**

Type	Orifice no.	Cond. temp. [°F]	Evaporating temperature [°F]									
			-40	-30	-20	-10	0	10	20	30	40	50
			Capacity in TR									
TU	0	115	0.070	0.082	0.096	0.111	0.128	0.146	0.164	0.183	0.199	0.213
	1		0.103	0.121	0.141	0.163	0.188	0.214	0.241	0.267	0.292	0.312
	2		0.114	0.134	0.157	0.184	0.213	0.246	0.280	0.316	0.350	0.382
	3		0.156	0.183	0.213	0.248	0.286	0.328	0.371	0.414	0.454	0.487
	4		0.246	0.290	0.341	0.400	0.466	0.540	0.620	0.706	0.795	0.882
	5		0.331	0.390	0.458	0.537	0.625	0.724	0.831	0.944	1.060	1.170
	6		0.521	0.610	0.714	0.834	0.970	1.120	1.290	1.470	1.660	1.850
	7		0.686	0.804	0.942	1.100	1.280	1.480	1.700	1.940	2.190	2.430
	8		1.010	1.180	1.380	1.620	1.880	2.180	2.500	2.840	3.180	3.500
9	1.380	1.600	1.870	2.170	2.530	2.930	3.380	3.870	4.390	4.920		
TC	1		2.740	3.150	3.570	4.000	4.440	4.860	5.240	5.580	5.820	5.960
	2		2.930	3.380	3.860	4.380	4.900	5.430	5.940	6.380	6.730	6.940
	3		3.300	3.830	4.410	5.050	5.730	6.450	7.160	7.820	8.390	8.790

Type	Orifice no.	Cond. temp. [°F]	Evaporating temperature [°F]									
			-40	-30	-20	-10	0	10	20	30	40	50
			Capacity in TR									
TU	0	135	0.070	0.082	0.096	0.111	0.128	0.147	0.167	0.187	0.206	0.225
	1		0.103	0.120	0.141	0.163	0.188	0.215	0.244	0.274	0.302	0.328
	2		0.114	0.134	0.157	0.184	0.214	0.248	0.284	0.323	0.362	0.401
	3		0.156	0.183	0.213	0.248	0.287	0.330	0.376	0.423	0.470	0.513
	4		0.247	0.291	0.342	0.401	0.468	0.544	0.629	0.721	0.821	0.925
	5		0.332	0.391	0.459	0.538	0.628	0.730	0.842	0.965	1.100	1.230
	6		0.527	0.615	0.719	0.839	0.977	1.130	1.310	1.500	1.710	1.930
	7		0.693	0.809	0.946	1.110	1.290	1.490	1.720	1.980	2.250	2.540
	8		1.010	1.180	1.380	1.610	1.880	2.180	2.520	2.890	3.280	3.670
9	1.400	1.620	1.880	2.180	2.530	2.930	3.380	3.890	4.450	5.070		
TC	1		2.720	3.130	3.560	4.010	4.460	4.910	5.350	5.740	6.080	6.320
	2		2.880	3.330	3.820	4.340	4.880	5.440	6.000	6.530	6.990	7.350
	3		3.200	3.710	4.280	4.910	5.590	6.320	7.080	7.840	8.560	9.160

Subcooling correction factor ' $f_{sub}$ '  $\Delta t_{sub}$

Subcooling [°F]	2	7	10	20	30	40	50	60	70	80	90
Correction factor	0.96	0.98	1.00	1.05	1.10	1.15	1.20	1.25	1.30	1.35	1.40

Distributor correction factor ' $f_p$ ' \*

Evaporating temperature [°F]	-40	-30	-20	-10	0	10	20	30	40	50	
Pressure drop [psi]	0	1	1	1	1	1	1	1	1	1	
	15	0.95	0.95	0.95	0.95	0.95	0.94	0.94	0.93	0.92	0.91
	25	0.92	0.92	0.92	0.91	0.91	0.90	0.89	0.88	0.87	0.84
	30	0.91	0.90	0.90	0.90	0.89	0.88	0.87	0.86	0.84	0.80

\*calculated at 90°F condensing temperature

Capacities

Capacities (TR)

-40 – 50 °F.  $\Delta t_{sub} = 10$  °F, OSH = 7 °F

R134a

Type	Orifice no.	Cond. temp. [°F]	Evaporating temperature [°F]									
			-40	-30	-20	-10	0	10	20	30	40	50
			Capacity in TR									
TU	0	75	0.039	0.046	0.053	0.061	0.070	0.080	0.089	0.097	0.101	0.101
	1		0.057	0.067	0.078	0.090	0.104	0.117	0.131	0.142	0.149	0.148
	2		0.063	0.074	0.086	0.101	0.116	0.133	0.149	0.164	0.175	0.177
	3		0.087	0.101	0.118	0.137	0.157	0.179	0.200	0.218	0.229	0.229
	4		0.135	0.158	0.185	0.216	0.251	0.288	0.327	0.363	0.391	0.402
	5		0.182	0.213	0.249	0.291	0.338	0.388	0.438	0.486	0.522	0.534
	6		0.281	0.328	0.384	0.449	0.521	0.600	0.681	0.757	0.817	0.842
	7		0.374	0.436	0.510	0.596	0.692	0.796	0.902	1.000	1.080	1.110
	8		0.560	0.654	0.765	0.893	1.040	1.190	1.340	1.490	1.590	1.620
TC	1	75	1.710	1.950	2.190	2.440	2.670	2.880	3.050	3.160	3.150	2.990
	2		1.860	2.120	2.410	2.690	2.980	3.240	3.460	3.610	3.620	3.460
	3		2.180	2.500	2.850	3.220	3.590	3.950	4.260	4.480	4.550	4.380

Type	Orifice no.	Cond. temp. [°F]	Evaporating temperature [°F]									
			-40	-30	-20	-10	0	10	20	30	40	50
			Capacity in TR									
TU	0	95	0.040	0.047	0.055	0.064	0.075	0.087	0.099	0.111	0.122	0.130
	1		0.059	0.069	0.081	0.095	0.110	0.127	0.145	0.163	0.178	0.190
	2		0.065	0.076	0.090	0.106	0.124	0.144	0.165	0.188	0.209	0.227
	3		0.089	0.104	0.123	0.144	0.167	0.194	0.221	0.249	0.275	0.295
	4		0.140	0.164	0.193	0.228	0.268	0.313	0.362	0.414	0.467	0.515
	5		0.188	0.221	0.260	0.307	0.360	0.420	0.486	0.555	0.624	0.685
	6		0.294	0.344	0.404	0.475	0.558	0.652	0.755	0.864	0.975	1.080
	7		0.390	0.456	0.535	0.630	0.739	0.863	0.999	1.140	1.290	1.420
	8		0.580	0.678	0.797	0.938	1.100	1.280	1.480	1.690	1.900	2.070
TC	1	95	1.760	2.010	2.280	2.570	2.850	3.130	3.400	3.620	3.780	3.840
	2		1.890	2.180	2.490	2.820	3.160	3.500	3.830	4.120	4.340	4.430
	3		2.190	2.540	2.910	3.320	3.760	4.210	4.660	5.080	5.400	5.580

Subcooling correction factor ' $f_{sub}$ '  $\Delta t_{sub}$

Subcooling [F]	2	7	10	20	30	40	50	60	70	80	90
Correction factor	0.95	0.98	1.00	1.06	1.12	1.18	1.24	1.30	1.36	1.42	1.48

Distributor correction factor ' $f_p$ ' \*

Evaporating temperature [°F]	-40	-30	-20	-10	0	10	20	30	40	50	
Pressure drop [psi]	0	1	1	1	1	1	1	1	1	1	
	15	0.93	0.93	0.93	0.92	0.92	0.92	0.91	0.90	0.89	0.86
	25	0.88	0.88	0.87	0.87	0.86	0.85	0.84	0.82	0.80	0.76
	30	0.86	0.85	0.85	0.84	0.83	0.82	0.81	0.79	0.75	0.70

\*calculated at 90°F condensing temperature

Capacities

Capacities (TR)

-40 °F – 50 °F.  $\Delta t_{sub} = 10$  °F, OSH = 7 °F

R134a

Type	Orifice no.	Cond. temp. [°F]	Evaporating temperature [°F]									
			-40	-30	-20	-10	0	10	20	30	40	50
TU	0	115	0.040	0.047	0.055	0.065	0.076	0.089	0.103	0.118	0.132	0.146
	1		0.059	0.069	0.082	0.096	0.112	0.131	0.151	0.173	0.194	0.214
	2		0.065	0.076	0.090	0.107	0.126	0.148	0.173	0.199	0.227	0.255
	3		0.089	0.105	0.123	0.145	0.171	0.199	0.231	0.265	0.299	0.332
	4		0.140	0.165	0.195	0.231	0.273	0.322	0.378	0.439	0.506	0.576
	5		0.189	0.222	0.262	0.311	0.367	0.433	0.507	0.589	0.677	0.768
	6		0.299	0.349	0.410	0.484	0.571	0.672	0.787	0.916	1.060	1.200
	7		0.395	0.461	0.543	0.640	0.755	0.889	1.040	1.210	1.390	1.590
	8		0.584	0.682	0.802	0.946	1.120	1.310	1.540	1.780	2.050	2.320
TC	9	0.855	0.979	1.130	1.320	1.540	1.800	2.100	2.440	2.810	3.210	
	1	1.740	2.010	2.300	2.600	2.920	3.250	3.570	3.880	4.150	4.350	
	2	1.870	2.160	2.490	2.840	3.210	3.600	4.000	4.390	4.750	5.020	
	3	2.140	2.490	2.870	3.290	3.760	4.270	4.800	5.340	5.840	6.260	

Type	Orifice no.	Cond. temp. [°F]	Evaporating temperature [°F]									
			-40	-30	-20	-10	0	10	20	30	40	50
TU	0	135	0.039	0.046	0.054	0.064	0.075	0.088	0.103	0.118	0.135	0.152
	1		0.057	0.068	0.080	0.094	0.110	0.129	0.151	0.174	0.198	0.222
	2		0.063	0.075	0.088	0.105	0.124	0.146	0.172	0.201	0.232	0.264
	3		0.087	0.102	0.121	0.142	0.168	0.197	0.230	0.267	0.305	0.345
	4		0.138	0.162	0.192	0.227	0.270	0.320	0.377	0.442	0.515	0.596
	5		0.186	0.218	0.258	0.306	0.362	0.429	0.506	0.593	0.690	0.795
	6		0.297	0.346	0.406	0.479	0.566	0.668	0.786	0.921	1.070	1.240
	7		0.392	0.456	0.536	0.632	0.747	0.882	1.040	1.220	1.420	1.640
	8		0.576	0.670	0.787	0.928	1.100	1.300	1.530	1.790	2.080	2.390
TC	9	0.856	0.975	1.120	1.310	1.520	1.780	2.080	2.430	2.830	3.280	
	1	1.680	1.950	2.240	2.550	2.880	3.230	3.580	3.940	4.270	4.560	
	2	1.800	2.090	2.410	2.760	3.140	3.550	3.980	4.430	4.860	5.240	
	3	2.030	2.360	2.730	3.150	3.610	4.120	4.690	5.280	5.890	6.460	

Subcooling correction factor ' $f_{sub}$ '  $\Delta t_{sub}$

Subcooling [°F]	2	7	10	20	30	40	50	60	70	80	90
Correction factor	0.95	0.98	1.00	1.06	1.12	1.18	1.24	1.30	1.36	1.42	1.48

Distributor correction factor ' $f_p$ ' \*

Evaporating temperature [°F]	-40	-30	-20	-10	0	10	20	30	40	50	
Pressure drop [psi]	0	1	1	1	1	1	1	1	1	1	
	15	0.93	0.93	0.93	0.92	0.92	0.92	0.91	0.90	0.89	0.86
	25	0.88	0.88	0.87	0.87	0.86	0.85	0.84	0.82	0.80	0.76
	30	0.86	0.85	0.85	0.84	0.83	0.82	0.81	0.79	0.75	0.70

\*calculated at 90°F condensing temperature

Capacities

Capacities (TR)

-40 °F – 50 °F.  $\Delta t_{sub} = 10$  °F, OSH = 7 °F

**R404A**

Type	Orifice no.	Cond. temp. [°F]	Evaporating temperature [°F]									
			-40	-30	-20	-10	0	10	20	30	40	50
			Capacity in TR									
TU	0	75	0.050	0.060	0.071	0.083	0.095	0.107	0.117	0.125	0.127	0.123
	1		0.075	0.089	0.105	0.122	0.140	0.157	0.172	0.182	0.185	0.178
	2		0.082	0.099	0.118	0.138	0.160	0.182	0.202	0.219	0.227	0.223
	3		0.112	0.135	0.159	0.186	0.214	0.241	0.265	0.283	0.289	0.281
	4		0.177	0.213	0.254	0.300	0.350	0.403	0.454	0.497	0.526	0.528
	5		0.238	0.286	0.341	0.403	0.469	0.539	0.606	0.662	0.697	0.696
	6		0.367	0.442	0.528	0.624	0.730	0.840	0.948	1.040	1.100	1.110
	7		0.485	0.584	0.697	0.825	0.964	1.110	1.250	1.370	1.450	1.460
	8		0.719	0.866	1.030	1.220	1.430	1.640	1.840	2.000	2.090	2.070
9	0.952	1.150	1.380	1.640	1.930	2.240	2.540	2.810	2.990	3.030		
TC	1		1.830	2.130	2.420	2.710	2.980	3.210	3.380	3.440	3.380	3.150
	2		1.980	2.310	2.660	3.010	3.350	3.640	3.870	3.970	3.920	3.670
	3		2.290	2.700	3.140	3.600	4.050	4.460	4.800	4.990	4.980	4.710

Type	Orifice no.	Cond. temp. [°F]	Evaporating temperature [°F]									
			-40	-30	-20	-10	0	10	20	30	40	50
			Capacity in TR									
TU	0	95	0.047	0.058	0.069	0.082	0.095	0.109	0.123	0.136	0.147	0.153
	1		0.070	0.085	0.101	0.120	0.140	0.161	0.182	0.200	0.215	0.222
	2		0.078	0.094	0.114	0.136	0.160	0.187	0.214	0.240	0.263	0.278
	3		0.106	0.128	0.154	0.182	0.214	0.247	0.281	0.311	0.335	0.349
	4		0.168	0.204	0.246	0.295	0.351	0.412	0.479	0.545	0.607	0.655
	5		0.225	0.274	0.330	0.396	0.470	0.552	0.640	0.727	0.805	0.865
	6		0.350	0.425	0.512	0.614	0.731	0.860	0.999	1.140	1.270	1.380
	7		0.462	0.560	0.675	0.810	0.964	1.140	1.320	1.510	1.680	1.810
	8		0.680	0.825	0.995	1.190	1.420	1.670	1.930	2.190	2.420	2.570
9	0.909	1.100	1.330	1.600	1.920	2.270	2.650	3.040	3.420	3.730		
TC	1		1.720	2.020	2.340	2.670	3.000	3.310	3.580	3.800	3.920	3.910
	2		1.840	2.180	2.550	2.940	3.330	3.720	4.080	4.370	4.540	4.560
	3		2.110	2.510	2.960	3.450	3.970	4.490	5.000	5.430	5.720	5.810

Subcooling correction factor  $f_{sub} \Delta t_{sub}$

Subcooling [°F]	2	7	10	20	30	40	50	60	70	80	90
Correction factor	0.93	0.97	1.00	1.08	1.17	1.25	1.33	1.41	1.49	1.57	1.65

Distributor correction factor  $f_{p}^*$

Evaporating temperature [°F]	-40	-30	-20	-10	0	10	20	30	40	50
Pressure drop [psi]	0	1	1	1	1	1	1	1	1	1
	15	0.96	0.96	0.96	0.96	0.96	0.95	0.95	0.94	0.93
	25	0.94	0.93	0.93	0.93	0.92	0.92	0.91	0.90	0.89
	30	0.92	0.92	0.92	0.91	0.91	0.90	0.89	0.88	0.86

\*calculated at 90°F condensing temperature

Capacities

Capacities (TR)

-40 °F – 50 °F.  $\Delta t_{sub} = 10$  °F, OSH = 7 °F

**R404A**

Type	Orifice no.	Cond. temp. [°F]	Evaporating temperature [°F]									
			-40	-30	-20	-10	0	10	20	30	40	50
			Capacity in TR									
TU	0	115	0.042	0.052	0.063	0.075	0.089	0.104	0.119	0.135	0.150	0.162
	1		0.063	0.076	0.092	0.110	0.130	0.152	0.175	0.198	0.219	0.236
	2		0.070	0.085	0.103	0.124	0.149	0.176	0.206	0.237	0.267	0.294
	3		0.095	0.116	0.140	0.168	0.199	0.234	0.271	0.308	0.343	0.371
	4		0.150	0.184	0.224	0.271	0.326	0.389	0.460	0.537	0.615	0.690
	5		0.202	0.247	0.300	0.364	0.437	0.522	0.616	0.717	0.819	0.914
	6		0.315	0.384	0.466	0.564	0.678	0.810	0.958	1.120	1.280	1.450
	7		0.416	0.506	0.614	0.743	0.894	1.070	1.270	1.480	1.700	1.910
	8		0.609	0.743	0.902	1.090	1.310	1.570	1.860	2.160	2.460	2.730
TC	1		0.821	0.994	1.200	1.460	1.750	2.100	2.500	2.940	3.410	3.870
	2		1.530	1.820	2.130	2.460	2.800	3.150	3.490	3.800	4.040	4.200
	3		1.630	1.950	2.300	2.680	3.090	3.510	3.940	4.340	4.670	4.890
			1.830	2.200	2.620	3.090	3.600	4.160	4.730	5.290	5.790	6.160

Type	Orifice no.	Cond. temp. [°F]	Evaporating temperature [°F]									
			-40	-30	-20	-10	0	10	20	30	40	50
			Capacity in TR									
TU	0	135	0.035	0.044	0.054	0.065	0.078	0.092	0.106	0.122	0.137	0.150
	1		0.053	0.065	0.078	0.094	0.112	0.132	0.154	0.177	0.199	0.219
	2		0.058	0.072	0.088	0.106	0.128	0.153	0.181	0.211	0.242	0.272
	3		0.080	0.098	0.119	0.143	0.172	0.203	0.238	0.275	0.311	0.344
	4		0.126	0.155	0.190	0.231	0.280	0.338	0.404	0.477	0.556	0.636
	5		0.169	0.208	0.255	0.311	0.377	0.453	0.541	0.638	0.742	0.845
	6		0.267	0.325	0.396	0.481	0.583	0.701	0.838	0.990	1.160	1.330
	7		0.353	0.430	0.523	0.634	0.768	0.925	1.110	1.310	1.530	1.750
	8		0.515	0.629	0.765	0.928	1.120	1.350	1.620	1.910	2.220	2.530
TC	1		0.700	0.842	1.020	1.230	1.480	1.790	2.150	2.550	3.010	3.490
	2		1.270	1.540	1.820	2.120	2.430	2.760	3.090	3.420	3.710	3.950
	3		1.350	1.630	1.940	2.280	2.650	3.040	3.450	3.860	4.250	4.580
			1.500	1.810	2.170	2.570	3.020	3.510	4.050	4.620	5.180	5.680

Subcooling correction factor  $f_{sub} \Delta t_{sub}$

Subcooling [°F]	2	7	10	20	30	40	50	60	70	80	90
Correction factor	0.93	0.97	1.00	1.08	1.17	1.25	1.33	1.41	1.49	1.57	1.65

Distributor correction factor  $f_p$  \*

Evaporating temperature [°F]	-40	-30	-20	-10	0	10	20	30	40	50
Pressure drop [psi]	0	1	1	1	1	1	1	1	1	1
	15	0.96	0.96	0.96	0.96	0.96	0.95	0.95	0.94	0.93
	25	0.94	0.93	0.93	0.93	0.92	0.92	0.91	0.90	0.89
	30	0.92	0.92	0.92	0.91	0.91	0.90	0.89	0.88	0.86

\*calculated at 90°F condensing temperature

Capacities

Capacities (TR)

R407A

-40 °F – 50 °F.  $\Delta t_{sub} = 10$  °F, OSH = 7 °F

Type	Orifice no.	Cond. temp. [°F]	Evaporating temperature [°F]									
			-40	-30	-20	-10	0	10	20	30	40	50
			Capacity in TR									
TU	0	75	0.073	0.084	0.095	0.108	0.123	0.137	0.151	0.164	0.172	0.174
	1		0.108	0.123	0.140	0.160	0.180	0.201	0.222	0.239	0.251	0.253
	2		0.120	0.137	0.157	0.180	0.205	0.232	0.260	0.285	0.305	0.314
	3		0.163	0.187	0.213	0.243	0.275	0.308	0.342	0.371	0.392	0.397
	4		0.257	0.295	0.339	0.390	0.447	0.510	0.577	0.644	0.702	0.738
	5		0.346	0.397	0.456	0.524	0.600	0.683	0.771	0.858	0.932	0.975
	6		0.534	0.613	0.704	0.808	0.926	1.060	1.200	1.340	1.470	1.550
	7		0.707	0.811	0.931	1.070	1.220	1.400	1.580	1.770	1.930	2.040
	8		1.050	1.200	1.380	1.580	1.810	2.060	2.330	2.580	2.800	2.920
TC	1	75	1.400	1.610	1.840	2.110	2.410	2.750	3.130	3.520	3.900	4.190
	2		2.580	2.890	3.220	3.560	3.890	4.190	4.440	4.590	4.630	4.490
	3		2.790	3.150	3.530	3.930	4.330	4.710	5.040	5.280	5.370	5.250
			3.240	3.670	4.150	4.660	5.190	5.710	6.190	6.560	6.770	6.710

Type	Orifice no.	Cond. temp. [°F]	Evaporating temperature [°F]									
			-40	-30	-20	-10	0	10	20	30	40	50
			Capacity in TR									
TU	0	95	0.073	0.084	0.096	0.110	0.126	0.143	0.160	0.177	0.192	0.203
	1		0.108	0.124	0.142	0.162	0.185	0.210	0.235	0.259	0.281	0.296
	2		0.120	0.138	0.159	0.183	0.211	0.241	0.274	0.308	0.340	0.367
	3		0.163	0.187	0.215	0.247	0.283	0.321	0.362	0.402	0.438	0.465
	4		0.257	0.297	0.343	0.397	0.459	0.530	0.609	0.694	0.780	0.860
	5		0.346	0.400	0.461	0.533	0.616	0.710	0.814	0.926	1.040	1.140
	6		0.538	0.620	0.715	0.826	0.953	1.100	1.260	1.440	1.630	1.800
	7		0.711	0.819	0.945	1.090	1.260	1.450	1.670	1.900	2.150	2.370
	8		1.050	1.210	1.390	1.610	1.860	2.140	2.450	2.780	3.110	3.410
TC	1	95	1.410	1.620	1.870	2.150	2.480	2.850	3.280	3.770	4.290	4.820
	2		2.570	2.900	3.260	3.630	4.010	4.390	4.730	5.010	5.200	5.290
	3		2.770	3.140	3.550	3.990	4.450	4.910	5.350	5.730	6.010	6.160
			3.170	3.620	4.120	4.670	5.260	5.870	6.480	7.040	7.500	7.810

Subcooling correction factor  $f_{sub} \Delta t_{sub}$

Subcooling [°F]	2	7	10	20	30	40	50	60	70	80	90
Correction factor	0.95	0.98	1.00	1.07	1.13	1.20	1.26	1.33	1.39	1.46	1.52

Distributor correction factor  $f_p$  \*

Evaporating temperature [°F]	-40	-30	-20	-10	0	10	20	30	40	50	
Pressure drop [psi]	0	1	1	1	1	1	1	1	1	1	
	15	0.96	0.96	0.96	0.96	0.96	0.96	0.95	0.95	0.94	0.93
	25	0.94	0.94	0.93	0.93	0.93	0.92	0.92	0.91	0.90	0.89
	30	0.92	0.92	0.92	0.92	0.91	0.91	0.90	0.89	0.88	0.86

\*calculated at 90°F condensing temperature

Capacities

Capacities (TR)

R407A

-40 °F – 50 °F,  $\Delta t_{sub} = 10 °F$ , OSH = 7 °F

Type	Orifice no.	Cond. temp. [°F]	Evaporating temperature [°F]									
			-40	-30	-20	-10	0	10	20	30	40	50
			Capacity in TR									
TU	0	115	0.070	0.081	0.094	0.108	0.124	0.142	0.161	0.180	0.199	0.215
	1		0.104	0.120	0.138	0.159	0.182	0.208	0.236	0.264	0.291	0.314
	2		0.115	0.133	0.154	0.179	0.207	0.240	0.275	0.314	0.352	0.389
	3		0.157	0.181	0.209	0.242	0.278	0.319	0.364	0.409	0.454	0.493
	4		0.249	0.288	0.335	0.389	0.453	0.526	0.610	0.705	0.806	0.908
	5		0.335	0.388	0.450	0.522	0.607	0.705	0.817	0.941	1.070	1.200
	6		0.524	0.605	0.700	0.812	0.942	1.090	1.270	1.460	1.680	1.900
	7		0.690	0.798	0.924	1.070	1.240	1.440	1.670	1.930	2.210	2.500
	8		1.010	1.170	1.350	1.570	1.830	2.120	2.450	2.820	3.210	3.600
TC	1	115	1.370	1.580	1.830	2.110	2.440	2.830	3.280	3.800	4.390	5.020
	2		2.470	2.800	3.170	3.560	3.970	4.380	4.780	5.140	5.440	5.650
	3		2.640	3.010	3.420	3.880	4.370	4.870	5.380	5.850	6.260	6.560
			2.980	3.420	3.920	4.470	5.090	5.750	6.420	7.090	7.700	8.210

Type	Orifice no.	Cond. temp. [°F]	Evaporating temperature [°F]									
			-40	-30	-20	-10	0	10	20	30	40	50
			Capacity in TR									
TU	0	135	0.065	0.076	0.088	0.101	0.117	0.135	0.155	0.175	0.195	0.214
	1		0.096	0.111	0.129	0.149	0.172	0.198	0.227	0.256	0.286	0.313
	2		0.107	0.124	0.144	0.168	0.196	0.228	0.264	0.304	0.346	0.387
	3		0.146	0.169	0.196	0.227	0.263	0.304	0.349	0.397	0.446	0.492
	4		0.233	0.270	0.314	0.367	0.429	0.502	0.586	0.682	0.788	0.901
	5		0.312	0.363	0.422	0.493	0.575	0.672	0.785	0.912	1.050	1.200
	6		0.493	0.570	0.662	0.770	0.897	1.050	1.220	1.420	1.640	1.880
	7		0.648	0.750	0.871	1.010	1.180	1.380	1.610	1.870	2.170	2.480
	8		0.939	1.090	1.270	1.480	1.730	2.010	2.350	2.730	3.140	3.560
TC	1	135	1.290	1.490	1.720	2.000	2.320	2.700	3.140	3.660	4.250	4.920
	2		2.270	2.590	2.950	3.340	3.760	4.190	4.610	5.020	5.380	5.660
	3		2.400	2.760	3.160	3.610	4.100	4.620	5.150	5.660	6.140	6.540
			2.670	3.080	3.550	4.080	4.680	5.330	6.030	6.740	7.420	8.050

Subcooling correction factor  $f_{sub} \Delta t_{sub}$

Subcooling [°F]	2	7	10	20	30	40	50	60	70	80	90
Correction factor	0.95	0.98	1.00	1.07	1.13	1.20	1.26	1.33	1.39	1.46	1.52

Distributor correction factor  $f_p$  \*

Evaporating temperature [°F]	-40	-30	-20	-10	0	10	20	30	40	50
Pressure drop [psi]	0	1	1	1	1	1	1	1	1	1
	15	0.96	0.96	0.96	0.96	0.96	0.96	0.95	0.95	0.94
	25	0.94	0.94	0.93	0.93	0.93	0.92	0.92	0.91	0.90
	30	0.92	0.92	0.92	0.92	0.91	0.91	0.90	0.89	0.88

\*calculated at 90°F condensing temperature



Capacities

Capacities (TR)

R407C

-40 °F – 50 °F.  $\Delta t_{sub} = 10$  °F, OSH = 7 °F

Type	Orifice no.	Cond. temp. [°F]	Evaporating temperature [°F]									
			-40	-30	-20	-10	0	10	20	30	40	50
			Capacity in TR									
TU	0	75	0.071	0.082	0.094	0.107	0.121	0.136	0.150	0.162	0.171	0.174
	1		0.102	0.118	0.135	0.155	0.175	0.196	0.216	0.233	0.246	0.249
	2		0.114	0.131	0.152	0.174	0.199	0.225	0.251	0.275	0.295	0.305
	3		0.155	0.179	0.205	0.235	0.267	0.300	0.332	0.360	0.381	0.389
	4		0.243	0.282	0.326	0.377	0.433	0.493	0.556	0.617	0.670	0.705
	5		0.328	0.379	0.439	0.507	0.581	0.662	0.744	0.824	0.891	0.934
	6		0.505	0.585	0.677	0.782	0.900	1.030	1.160	1.290	1.400	1.480
	7		0.669	0.774	0.896	1.040	1.190	1.360	1.530	1.700	1.850	1.950
	8		0.991	1.150	1.330	1.540	1.770	2.010	2.260	2.500	2.690	2.800
9	1.310	1.520	1.760	2.040	2.360	2.710	3.080	3.440	3.770	4.010		
TC	1		2.480	2.800	3.130	3.470	3.800	4.110	4.370	4.550	4.630	4.540
	2		2.680	3.040	3.430	3.830	4.230	4.620	4.960	5.210	5.330	5.260
	3		3.110	3.550	4.030	4.540	5.070	5.590	6.080	6.470	6.690	6.670

Type	Orifice no.	Cond. temp. [°F]	Evaporating temperature [°F]									
			-40	-30	-20	-10	0	10	20	30	40	50
			Capacity in TR									
TU	0	95	0.071	0.082	0.095	0.110	0.126	0.143	0.161	0.178	0.193	0.205
	1		0.101	0.118	0.136	0.157	0.180	0.204	0.230	0.255	0.277	0.294
	2		0.113	0.131	0.152	0.177	0.204	0.234	0.267	0.300	0.332	0.359
	3		0.153	0.178	0.206	0.238	0.274	0.313	0.353	0.393	0.430	0.460
	4		0.242	0.282	0.328	0.382	0.444	0.513	0.589	0.670	0.751	0.829
	5		0.326	0.379	0.441	0.514	0.596	0.688	0.789	0.895	1.000	1.100
	6		0.506	0.587	0.683	0.795	0.923	1.070	1.230	1.400	1.570	1.740
	7		0.668	0.775	0.902	1.050	1.220	1.410	1.620	1.840	2.070	2.290
	8		0.982	1.140	1.330	1.550	1.800	2.080	2.390	2.700	3.020	3.300
9	1.320	1.520	1.770	2.070	2.410	2.790	3.220	3.690	4.180	4.660		
TC	1		2.460	2.790	3.150	3.530	3.910	4.300	4.670	4.990	5.240	5.370
	2		2.630	3.010	3.420	3.860	4.330	4.800	5.260	5.690	6.020	6.220
	3		3.010	3.460	3.960	4.500	5.100	5.730	6.360	6.970	7.480	7.830

Subcooling correction factor  $f_{sub} \Delta t_{sub}$

Subcooling [°F]	2	7	10	20	30	40	50	60	70	80	90
Correction factor	0.95	0.98	1.00	1.06	1.12	1.19	1.25	1.31	1.37	1.43	1.49

Distributor correction factor  $f_p$  \*

Evaporating temperature [°F]	-40	-30	-20	-10	0	10	20	30	40	50
Pressure drop [psi]	0	1	1	1	1	1	1	1	1	1
	15	0.96	0.96	0.96	0.96	0.96	0.95	0.95	0.95	0.94
	25	0.93	0.93	0.93	0.93	0.93	0.92	0.92	0.91	0.90
	30	0.92	0.92	0.92	0.91	0.91	0.90	0.90	0.89	0.88

\*calculated at 90°F condensing temperature

Capacities

Capacities (TR)

R407C

-40 °F – 50 °F.  $\Delta t_{sub} = 10$  °F, OSH = 7 °F

Type	Orifice no.	Cond. temp. [°F]	Evaporating temperature [°F]									
			-40	-30	-20	-10	0	10	20	30	40	50
			Capacity in TR									
TU	0	115	0.069	0.080	0.093	0.108	0.124	0.143	0.162	0.182	0.202	0.220
	1		0.097	0.113	0.131	0.152	0.176	0.202	0.230	0.259	0.287	0.313
	2		0.108	0.126	0.147	0.172	0.200	0.231	0.266	0.304	0.343	0.381
	3		0.147	0.171	0.199	0.232	0.268	0.309	0.353	0.400	0.446	0.489
	4		0.233	0.271	0.317	0.371	0.434	0.507	0.588	0.677	0.773	0.874
	5		0.313	0.365	0.426	0.499	0.583	0.679	0.787	0.906	1.030	1.160
	6		0.489	0.568	0.662	0.774	0.904	1.050	1.220	1.410	1.610	1.820
	7		0.644	0.748	0.872	1.020	1.190	1.390	1.610	1.860	2.130	2.410
	8		0.942	1.090	1.280	1.490	1.750	2.040	2.360	2.720	3.100	3.480
9	1.280	1.480	1.710	2.000	2.330	2.720	3.170	3.670	4.230	4.830		
TC	1		2.350	2.690	3.050	3.440	3.860	4.280	4.710	5.130	5.490	5.780
	2		2.500	2.870	3.280	3.730	4.220	4.740	5.270	5.800	6.280	6.670
	3		2.810	3.240	3.730	4.270	4.870	5.540	6.250	6.970	7.680	8.280

Type	Orifice no.	Cond. temp. [°F]	Evaporating temperature [°F]									
			-40	-30	-20	-10	0	10	20	30	40	50
			Capacity in TR									
TU	0	135	0.065	0.075	0.088	0.102	0.118	0.136	0.156	0.177	0.198	0.219
	1		0.091	0.105	0.123	0.142	0.165	0.190	0.218	0.248	0.278	0.307
	2		0.101	0.117	0.137	0.160	0.187	0.218	0.253	0.291	0.332	0.373
	3		0.137	0.160	0.186	0.217	0.252	0.292	0.336	0.383	0.432	0.480
	4		0.217	0.253	0.296	0.348	0.408	0.478	0.558	0.648	0.747	0.855
	5		0.292	0.340	0.398	0.467	0.548	0.642	0.748	0.868	0.999	1.140
	6		0.459	0.532	0.621	0.726	0.850	0.994	1.160	1.340	1.550	1.780
	7		0.604	0.700	0.817	0.956	1.120	1.310	1.530	1.770	2.050	2.350
	8		0.879	1.020	1.190	1.390	1.630	1.910	2.230	2.590	2.980	3.400
9	1.210	1.390	1.600	1.860	2.180	2.540	2.970	3.460	4.010	4.630		
TC	1		2.160	2.490	2.840	3.220	3.630	4.060	4.500	4.940	5.370	5.730
	2		2.280	2.630	3.020	3.450	3.920	4.430	4.980	5.540	6.080	6.580
	3		2.530	2.920	3.370	3.870	4.430	5.070	5.760	6.510	7.280	8.020

Subcooling correction factor ' $f_{sub}$ '  $\Delta t_{sub}$

Subcooling [°F]	2	7	10	20	30	40	50	60	70	80	90
Correction factor	0.95	0.98	1.00	1.06	1.12	1.19	1.25	1.31	1.37	1.43	1.49

Distributor correction factor ' $f_p$ ' \*

Evaporating temperature [°F]	-40	-30	-20	-10	0	10	20	30	40	50
Pressure drop [psi]	0	1	1	1	1	1	1	1	1	1
	15	0.96	0.96	0.96	0.96	0.96	0.95	0.95	0.95	0.94
	25	0.93	0.93	0.93	0.93	0.93	0.92	0.92	0.91	0.90
	30	0.92	0.92	0.92	0.91	0.91	0.90	0.90	0.89	0.88

\*calculated at 90°F condensing temperature

Capacities

Capacities (TR)

-40 °F – 50 °F.  $\Delta t_{sub} = 10$  °F, OSH = 7 °F

R407F

Type	Orifice no.	Cond. temp. [°F]	Evaporating temperature [°F]									
			-40	-30	-20	-10	0	10	20	30	40	50
			Capacity in TR									
TU	0	75	0.086	0.098	0.112	0.127	0.143	0.160	0.177	0.191	0.200	0.201
	1		0.126	0.144	0.164	0.187	0.210	0.235	0.259	0.279	0.292	0.292
	2		0.140	0.161	0.185	0.211	0.241	0.272	0.305	0.335	0.358	0.367
	3		0.191	0.218	0.250	0.284	0.322	0.361	0.399	0.433	0.456	0.461
	4		0.301	0.346	0.398	0.458	0.525	0.600	0.680	0.760	0.830	0.872
	5		0.405	0.466	0.535	0.615	0.704	0.803	0.908	1.010	1.100	1.150
	6		0.627	0.720	0.826	0.948	1.090	1.240	1.410	1.580	1.740	1.840
	7		0.829	0.952	1.090	1.250	1.440	1.640	1.860	2.090	2.290	2.410
	8		1.230	1.410	1.620	1.850	2.120	2.420	2.730	3.040	3.290	3.430
TC	1	75	1.640	1.880	2.160	2.470	2.820	3.220	3.660	4.140	4.600	4.960
	2		3.110	3.480	3.860	4.250	4.620	4.950	5.220	5.370	5.380	5.190
	3		3.370	3.790	4.240	4.710	5.170	5.600	5.960	6.210	6.270	6.100
TC	1	75	3.900	4.420	4.980	5.580	6.200	6.800	7.340	7.760	7.970	7.860
	2		3.110	3.480	3.860	4.250	4.620	4.950	5.220	5.370	5.380	5.190
	3		3.370	3.790	4.240	4.710	5.170	5.600	5.960	6.210	6.270	6.100

Type	Orifice no.	Cond. temp. [°F]	Evaporating temperature [°F]									
			-40	-30	-20	-10	0	10	20	30	40	50
			Capacity in TR									
TU	0	95	0.086	0.099	0.114	0.130	0.148	0.168	0.188	0.207	0.224	0.236
	1		0.127	0.146	0.167	0.191	0.218	0.246	0.275	0.303	0.327	0.343
	2		0.141	0.163	0.188	0.216	0.249	0.285	0.324	0.363	0.401	0.431
	3		0.192	0.221	0.254	0.292	0.333	0.378	0.425	0.471	0.512	0.541
	4		0.305	0.352	0.406	0.470	0.543	0.627	0.721	0.823	0.926	1.020
	5		0.410	0.473	0.546	0.631	0.729	0.840	0.965	1.100	1.230	1.350
	6		0.637	0.734	0.846	0.976	1.130	1.300	1.500	1.710	1.930	2.140
	7		0.841	0.969	1.120	1.290	1.490	1.720	1.980	2.260	2.550	2.810
	8		1.240	1.430	1.640	1.900	2.190	2.520	2.890	3.290	3.680	4.010
TC	1	95	1.670	1.920	2.200	2.530	2.910	3.360	3.870	4.450	5.080	5.710
	2		3.130	3.520	3.940	4.370	4.810	5.230	5.600	5.890	6.080	6.130
	3		3.370	3.820	4.300	4.820	5.350	5.880	6.370	6.780	7.070	7.180
TC	1	95	3.850	4.390	4.980	5.630	6.330	7.040	7.750	8.380	8.890	9.190
	2		3.130	3.520	3.940	4.370	4.810	5.230	5.600	5.890	6.080	6.130
	3		3.370	3.820	4.300	4.820	5.350	5.880	6.370	6.780	7.070	7.180

Subcooling correction factor  $f_{sub} \Delta t_{sub}$

Subcooling [°F]	2	7	10	20	30	40	50	60	70	80	90
Correction factor	0.95	0.98	1.00	1.06	1.12	1.18	1.25	1.31	1.37	1.43	1.49

Distributor correction factor  $f_p^*$

Evaporating temperature [°F]	-40	-30	-20	-10	0	10	20	30	40	50
Pressure drop [psi]	0	1	1	1	1	1	1	1	1	1
	15	0.96	0.96	0.96	0.96	0.96	0.96	0.95	0.95	0.94
	25	0.94	0.94	0.94	0.94	0.93	0.93	0.92	0.92	0.89
	30	0.93	0.93	0.92	0.92	0.92	0.91	0.91	0.90	0.89

\*calculated at 90°F condensing temperature

Capacities

Capacities (TR)

R407F

-40 °F – 50 °F.  $\Delta t_{sub} = 10$  °F, OSH = 7 °F

Type	Orifice no.	Cond. temp. [°F]	Evaporating temperature [°F]									
			-40	-30	-20	-10	0	10	20	30	40	50
			Capacity in TR									
TU	0	115	0.084	0.097	0.112	0.129	0.148	0.168	0.190	0.213	0.234	0.251
	1		0.124	0.143	0.165	0.189	0.217	0.247	0.279	0.311	0.341	0.366
	2		0.138	0.160	0.185	0.214	0.247	0.286	0.328	0.373	0.418	0.459
	3		0.188	0.217	0.250	0.288	0.332	0.380	0.431	0.484	0.534	0.577
	4		0.299	0.346	0.401	0.465	0.541	0.629	0.730	0.842	0.963	1.080
	5		0.401	0.464	0.538	0.625	0.726	0.843	0.976	1.120	1.280	1.430
	6		0.628	0.725	0.838	0.970	1.130	1.310	1.510	1.750	2.000	2.260
	7		0.827	0.955	1.100	1.280	1.480	1.720	2.000	2.310	2.640	2.980
	8		1.210	1.400	1.620	1.880	2.180	2.530	2.920	3.360	3.820	4.260
9	1.640	1.890	2.180	2.510	2.900	3.360	3.900	4.520	5.230	5.990		
TC	1		3.040	3.440	3.870	4.330	4.810	5.280	5.720	6.100	6.400	6.590
	2		3.250	3.700	4.200	4.740	5.310	5.900	6.470	6.980	7.410	7.700
	3		3.650	4.190	4.790	5.450	6.180	6.960	7.750	8.520	9.200	9.740

Type	Orifice no.	Cond. temp. [°F]	Evaporating temperature [°F]									
			-40	-30	-20	-10	0	10	20	30	40	50
			Capacity in TR									
TU	0	135	0.079	0.092	0.106	0.123	0.142	0.163	0.185	0.209	0.232	0.253
	1		0.117	0.135	0.156	0.181	0.208	0.239	0.272	0.306	0.339	0.368
	2		0.130	0.151	0.176	0.204	0.238	0.276	0.319	0.366	0.414	0.461
	3		0.177	0.205	0.238	0.276	0.319	0.367	0.420	0.476	0.531	0.581
	4		0.284	0.329	0.383	0.446	0.520	0.608	0.710	0.826	0.953	1.080
	5		0.381	0.442	0.514	0.598	0.698	0.816	0.951	1.100	1.270	1.440
	6		0.600	0.695	0.805	0.935	1.090	1.270	1.480	1.710	1.980	2.260
	7		0.788	0.913	1.060	1.230	1.430	1.670	1.950	2.270	2.620	2.980
	8		1.140	1.320	1.540	1.790	2.090	2.440	2.840	3.290	3.790	4.280
9	1.560	1.810	2.090	2.420	2.800	3.250	3.790	4.420	5.140	5.940		
TC	1		2.850	3.240	3.670	4.140	4.630	5.120	5.600	6.030	6.400	6.680
	2		3.010	3.450	3.940	4.480	5.060	5.670	6.280	6.860	7.370	7.770
	3		3.320	3.830	4.400	5.050	5.770	6.560	7.380	8.210	8.990	9.670

Subcooling correction factor  $f_{sub} \Delta t_{sub}$

Subcooling [°F]	2	7	10	20	30	40	50	60	70	80	90
Correction factor	0.95	0.98	1.00	1.06	1.12	1.18	1.25	1.31	1.37	1.43	1.49

Distributor correction factor  $f_p$  \*

Evaporating temperature [°F]	-40	-30	-20	-10	0	10	20	30	40	50
Pressure drop [psi]	0	1	1	1	1	1	1	1	1	1
	15	0.96	0.96	0.96	0.96	0.96	0.96	0.95	0.95	0.94
	25	0.94	0.94	0.94	0.94	0.93	0.93	0.92	0.92	0.91
	30	0.93	0.93	0.92	0.92	0.92	0.91	0.91	0.90	0.89

\*calculated at 90°F condensing temperature

Capacities

Capacities (TR)

R410A

-40 °F – 50 °F.  $\Delta t_{sub} = 10$  °F, OSH = 7 °F

Type	Orifice no.	Cond. temp. [°F]	Evaporating temperature [°F]									
			-40	-30	-20	-10	0	10	20	30	40	50
			Capacity in TR									
TU	0	75	0.118	0.139	0.161	0.184	0.206	0.226	0.241	0.247	0.242	0.223
	1		0.157	0.185	0.214	0.244	0.273	0.301	0.323	0.336	0.334	0.311
	2		0.175	0.206	0.241	0.279	0.318	0.356	0.390	0.414	0.421	0.400
	3		0.239	0.281	0.326	0.373	0.421	0.465	0.503	0.526	0.526	0.493
	4		0.375	0.444	0.522	0.608	0.702	0.799	0.892	0.967	1.000	0.972
	5		0.504	0.597	0.701	0.816	0.940	1.070	1.190	1.280	1.320	1.270
	6		0.778	0.920	1.080	1.260	1.460	1.670	1.870	2.030	2.110	2.050
	7		1.030	1.220	1.430	1.670	1.930	2.200	2.460	2.670	2.770	2.670
	8		1.520	1.800	2.120	2.470	2.850	3.230	3.580	3.830	3.910	3.720
9	2.010	2.380	2.810	3.300	3.840	4.430	5.010	5.500	5.760	5.610		
TC	1		3.170	3.610	4.050	4.460	4.840	5.160	5.370	5.440	5.310	4.890
	2		3.420	3.920	4.440	4.940	5.420	5.830	6.130	6.260	6.150	5.700
	3		3.960	4.580	5.230	5.880	6.530	7.110	7.580	7.830	7.780	7.280

Type	Orifice no.	Cond. temp. [°F]	Evaporating temperature [°F]									
			-40	-30	-20	-10	0	10	20	30	40	50
			Capacity in TR									
TU	0	95	0.117	0.139	0.162	0.187	0.213	0.239	0.263	0.281	0.291	0.288
	1		0.157	0.185	0.216	0.249	0.283	0.318	0.350	0.377	0.395	0.398
	2		0.175	0.207	0.244	0.285	0.329	0.376	0.424	0.467	0.500	0.514
	3		0.238	0.282	0.330	0.381	0.436	0.492	0.546	0.592	0.624	0.632
	4		0.376	0.447	0.529	0.622	0.727	0.844	0.968	1.090	1.190	1.250
	5		0.506	0.601	0.710	0.835	0.974	1.130	1.290	1.450	1.570	1.640
	6		0.784	0.930	1.100	1.290	1.510	1.760	2.020	2.290	2.520	2.650
	7		1.030	1.230	1.450	1.710	2.000	2.320	2.670	3.010	3.300	3.460
	8		1.520	1.810	2.140	2.510	2.930	3.390	3.870	4.320	4.670	4.810
9	2.030	2.400	2.830	3.340	3.930	4.610	5.360	6.140	6.830	7.270		
TC	1		3.140	3.610	4.090	4.560	5.030	5.460	5.830	6.110	6.260	6.220
	2		3.360	3.890	4.440	5.010	5.580	6.120	6.610	7.010	7.240	7.240
	3		3.840	4.470	5.150	5.870	6.610	7.350	8.060	8.670	9.080	9.200

Subcooling correction factor  $f_{sub} \Delta t_{sub}$

Subcooling [°F]	2	7	10	20	30	40	50	60	70	80	90
Correction factor	0.95	0.98	1.00	1.07	1.13	1.20	1.26	1.32	1.39	1.45	1.51

Distributor correction factor  $f_{p}^*$

Evaporating temperature [°F]	-40	-30	-20	-10	0	10	20	30	40	50
Pressure drop [psi]	0	1	1	1	1	1	1	1	1	1
	15	0.97	0.97	0.97	0.97	0.97	0.96	0.96	0.96	0.95
	25	0.95	0.95	0.95	0.95	0.94	0.94	0.93	0.93	0.92
	30	0.94	0.94	0.94	0.93	0.93	0.93	0.92	0.91	0.90

\*calculated at 90°F condensing temperature

Capacities

Capacities (TR)

-40 °F – 50 °F.  $\Delta t_{sub} = 10$  °F, OSH = 7 °F

R410A

Type	Orifice no.	Cond. temp. [°F]	Evaporating temperature [°F]									
			-40	-30	-20	-10	0	10	20	30	40	50
			Capacity in TR									
TU	0	115	0.112	0.133	0.156	0.182	0.209	0.237	0.264	0.289	0.308	0.317
	1		0.152	0.180	0.210	0.244	0.279	0.315	0.352	0.387	0.415	0.433
	2		0.169	0.202	0.238	0.279	0.324	0.374	0.427	0.480	0.528	0.563
	3		0.231	0.274	0.321	0.373	0.430	0.489	0.550	0.608	0.657	0.689
	4		0.367	0.437	0.517	0.610	0.717	0.840	0.977	1.120	1.270	1.380
	5		0.493	0.587	0.694	0.819	0.961	1.120	1.300	1.490	1.670	1.810
	6		0.770	0.912	1.080	1.270	1.490	1.740	2.030	2.340	2.660	2.920
	7		1.010	1.200	1.420	1.670	1.970	2.300	2.680	3.090	3.490	3.810
	8		1.480	1.750	2.080	2.450	2.870	3.350	3.880	4.430	4.940	5.300
TC	1		3.000	3.470	3.960	4.450	4.940	5.420	5.870	6.270	6.580	6.770
	2		3.190	3.720	4.270	4.840	5.430	6.030	6.610	7.140	7.580	7.870
	3		3.600	4.200	4.860	5.560	6.320	7.100	7.910	8.680	9.380	9.900

Type	Orifice no.	Cond. temp. [°F]	Evaporating temperature [°F]									
			-40	-30	-20	-10	0	10	20	30	40	50
			Capacity in TR									
TU	0	130	0.106	0.126	0.148	0.173	0.199	0.226	0.253	0.279	0.300	0.313
	1		0.146	0.173	0.202	0.234	0.268	0.303	0.340	0.374	0.405	0.426
	2		0.163	0.194	0.229	0.268	0.312	0.360	0.412	0.465	0.515	0.554
	3		0.222	0.263	0.309	0.359	0.413	0.471	0.531	0.589	0.641	0.679
	4		0.354	0.421	0.498	0.586	0.689	0.807	0.941	1.090	1.230	1.360
	5		0.476	0.565	0.668	0.787	0.924	1.080	1.260	1.440	1.630	1.780
	6		0.748	0.883	1.040	1.220	1.430	1.670	1.950	2.260	2.570	2.850
	7		0.982	1.160	1.370	1.610	1.890	2.210	2.580	2.980	3.380	3.740
	8		1.420	1.690	1.990	2.340	2.750	3.210	3.720	4.270	4.800	5.230
TC	1		2.840	3.300	3.770	4.250	4.740	5.210	5.670	6.090	6.440	6.700
	2		3.010	3.510	4.040	4.590	5.170	5.750	6.330	6.890	7.380	7.760
	3		3.350	3.920	4.530	5.200	5.910	6.660	7.440	8.230	8.980	9.630

Subcooling correction factor  $f_{sub} \Delta t_{sub}$

Subcooling [°F]	2	7	10	20	30	40	50	60	70	80	90
Correction factor	0.95	0.98	1.00	1.07	1.13	1.20	1.26	1.32	1.39	1.45	1.51

Distributor correction factor  $f_p$  \*

Evaporating temperature [°F]	-40	-30	-20	-10	0	10	20	30	40	50
Pressure drop [psi]	0	1	1	1	1	1	1	1	1	1
	15	0.97	0.97	0.97	0.97	0.97	0.96	0.96	0.96	0.95
	25	0.95	0.95	0.95	0.95	0.94	0.94	0.93	0.93	0.92
	30	0.94	0.94	0.94	0.93	0.93	0.93	0.92	0.91	0.90

\*calculated at 90°F condensing temperature

Design

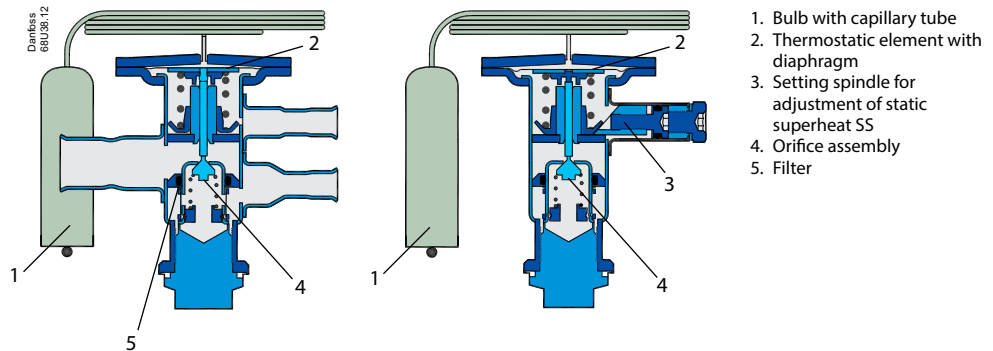


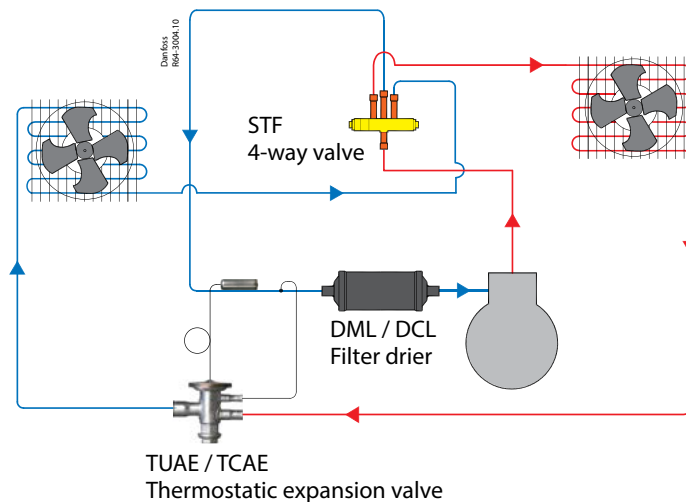
Fig. 4

TU operation and function

*Bi-flow*

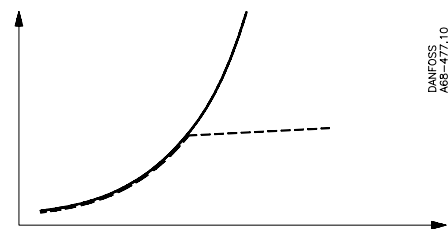
Bi-flow function is sometimes used in systems with 4-way reversing valves where hot gas defrost or heating cycles are required. Only TUAE (orifices 1 – 8), and TCAE (orifices 1 and 2) - without MOP charges, can be used in bi-flow mode.

Note that the reverse direction can reduce the rated capacity by up to 15%. Valves for bi-flow operation should be installed so that the normal refrigerant flow through the valve direction is toward the main evaporator.



*MOP - Maximum Operating Pressure*

MOP function protects the compressor motor against overload during start-up. MOP is the evaporating pressure at which the expansion valve will throttle liquid injection into the evaporator and thus prevent the evaporating pressure from rising. MOP valves are primarily used in low temperature applications with a single evaporator and a single compressor. MOP occurs when the sensor reaches a predetermined maximum value. Above MOP any increase in sensor temperature results in only minimal additional opening of the expansion valve. An MOP charge is also known as a *pressure limiting charge*.



**Note:** The MOP point will change if the factory superheat setting of the expansion valve is changed.

**TU operation and function**  
(continued)

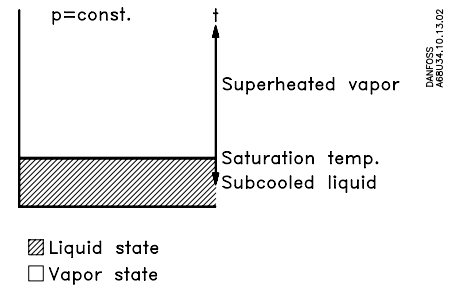
**F-bulb charge**

The F-bulb charge is designed for refrigeration applications where low superheat is required. Valves with this charge are delivered with an optimized static superheat setting which allows for installation with minimal field adjustment of superheat. F-charge valves also include the Danfoss Marinit Anti-Hunt (MAH) function, which reduces valve hunting during evaporator load changes, helping maintain stable system superheat and improved system performance.

**Subcooling  $\Delta t_{sub}$**

Subcooling is defined as the difference between the liquid refrigerant temperature and its saturation temperature. Depending on system design, subcooling may be necessary to prevent flash gas from forming in the liquid line. If flash gas forms in the liquid line, the capacity of the expansion valve will be greatly reduced.

**Superheat-subcooling relationship**



**Superheat**

Superheat is the controlling parameter of the valve. Superheat, measured at the evaporator outlet, is defined as the difference between actual bulb temperature and the evaporating temperature at the saturation point. In other words, vapor is said to be superheated if its temperature is higher than the saturation temperature corresponding to its pressure. In order to prevent liquid refrigerant from entering the compressor, a certain minimum superheat must be maintained. Liquid entering the compressor causes serious damage. When discussing superheat, the following terms are used with respect to valve operation:

**Static Superheat**

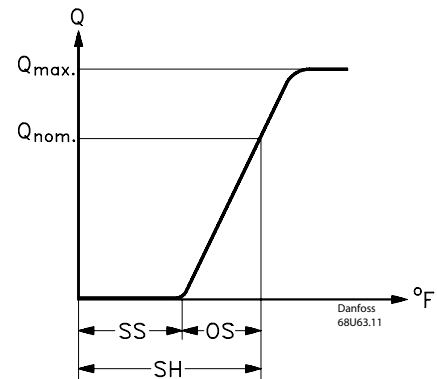
Static superheat, SS, is superheat above which the valve will begin to open.

**Opening Superheat**

The opening superheat, OS, is the amount of superheat above static superheat, SS, required to produce a given valve capacity.

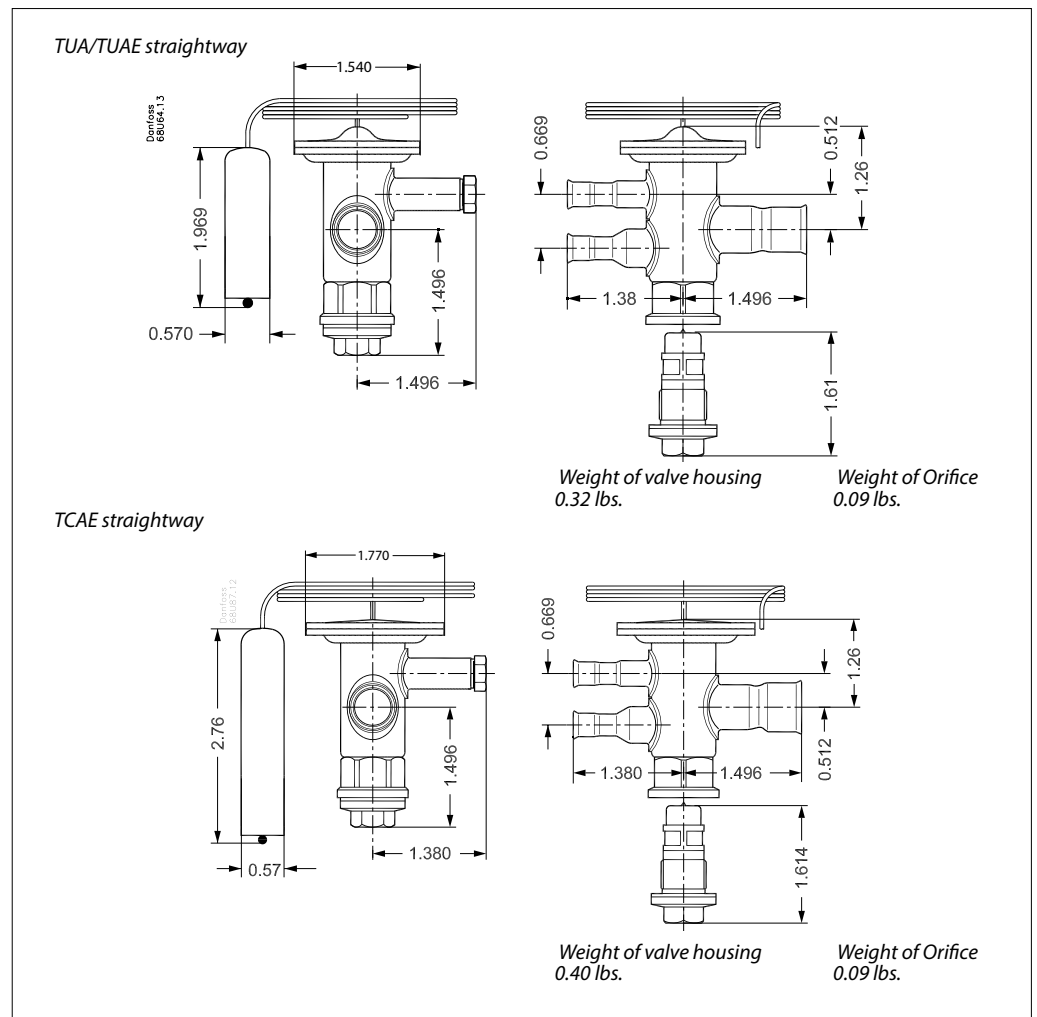
**Operating superheat**

The operating superheat, SH, is the sum of the static superheat, SS, and the opening superheat, OS.





Dimensions and weights



## TU stainless steel technology



### High quality

The TU is manufactured on fully automated, process-monitored production lines. Cellularized computer-monitored technology insures uniform high quality and that when delivered, every valve meets Danfoss quality standards and customer specifications. Cellularized production also makes possible simultaneous production of large and small quantities of standard and custom version valves.

### Benefits of stainless steel

The fact that the TU is an all stainless steel expansion valve offers a number of benefits:

- Stainless steel is far more corrosion resistant than traditional valve materials.
- Stainless steel valves require no surface treatment.
- Stainless steel capillary tubes are three times stronger and twenty times more resistant to vibration than copper capillary tubes.
- Stainless steel has a greater strength-to-weight ratio, making TU valves lighter and more compact.
- Stainless steel diaphragms have greater strength and corrosion resistance for longer life.

### Danfoss precision port design

The TU thermostatic expansion valve introduces Precision Port design incorporating four features that insure superior repeatable performance over an extended valve life.



- Laser welding of the power element preserves the structural uniformity of the diaphragm, assuring consistent operation.
- A precision-machined pushrod and bushing make a practically frictionless seal with no need for a packing gland.
- The free-floating push-rod is selfaligning and eliminates binding.
- The precision-machined cone and orifice accurately meter refrigerant under all operating conditions.

### Advanced technology - fast and easy installation

The new TU stainless steel thermostatic expansion valve has significant installation advantages because it is a valve designed specifically for soldering. The TU can be installed in less than half the time required for traditional brass-bodied valves.

The valve connections are made of copper and stainless steel bi-metal which makes installation easy, reliable, and fast.



### No need for a wet cloth...

Bi-metal has a very low thermal conductivity, actually only 10% that of copper, so heat applied during soldering remains largely in the copper layer of the connection tube, instead of being conducted to the valve body. External cooling is unnecessary. The result is less energy consumption and better solder quality. At the same time, the diaphragm's structural integrity is preserved.