

Data sheet

# Thermostatic expansion valve Types TCAE, TCBE and TCCE



The TC thermostatic expansion valve has been developed and designed for soldering into hermetic refrigeration systems. It is manufactured in stainless steel and is therefore very suitable for installation in refrigeration systems for the food industry.

TC can be used in many different forms of refrigeration system, in particular:

- Mobile refrigeration equipment
- Air conditioning units
- Heat pump systems
- Refrigeration appliances
- Liquid coolers
- Ice cube machines
- Traditional refrigeration systems

All variants are available in both singlepacks and industrial packs as required by the customer.

**TCAE** with interchangeable orifice assembly and adjustable superheat.

**TCBE** with fixed orifice assembly and adjustable superheat.

**TCCE** with fixed superheat, otherwise it is identical with TCBE.

All types are straightway versions.

TCCE is manufactured to order, and consequently this technical leaflet contains no description of standard range and code numbers.

TC is also available in a range of variants that give countless valve combination possibilities.

**Features**

- *Bimetal connections*
  - Straightforward and fast soldering (no wet cloth or cooling pliers required)
- *Refrigerants*  
R134a, R404A, R507, R407C, R22, R410A and future refrigerants
- *Capacities from 23 to 34 kW (6.5 to 9.8 TR) for R410A*
- *Stable regulation*
- *Biflow function (orifice 1 and 2)*
- *Compact design*
  - Small dimensions and low weight
- *Stainless steel, hermetically tight solder version*
  - High connection strength
  - High corrosion resistance
  - Capillary tube joints of high strength and vibration resistance
- *Laser-welded, stainless steel thermostatic diaphragm element*
  - Optimum function
  - Long diaphragm life
  - High pressure resistance
- *Stainless steel double contact bulb*
  - Straightforward and fast installation
  - Good heat transfer from bulb to pipe
- *Adjustable superheat type (TCAE/TCBE)*
  - Accurate setting
  - Adjustable in operation
- *Fixed superheat type (TCCE)*
- *Filter with high dirt retention capacity*
- *Available with self-cleaning bleed*
- *Available with MOP (Max. Operating Pressure)*

## Thermostatic expansion valve, type TCAE, TCBE and TCCE

### Standard range, TCAE

Versions available in the standard range.

Ranges for R134a, R404A, R507, R407C, R22 and R410A:

**N** -40 — +10 °C without MOP  
**N** -40 — +10 °C MOP + 15 °C  
**NM** -40 — -5 °C MOP + 0 °C

Ranges for R404A og R507

**B** -60 — -25 °C without MOP  
**B** -60 — -25 °C MOP -20 °C

Static superheat (SS) for R134a, R404A, R407C, R22 and R410A  
 Valves without MOP: 5 K  
 Valves with MOP: 4 K

Static superheat (SS) for R507  
 Valves without MOP: 6.4 K  
 Valves with MOP: 5.4 K

Capillary tube length 1.5 m

Connections:  
 Inlet  $\frac{3}{8}$  in./10 mm  
 $\frac{1}{2}$  in./12 mm  
 Outlet  $\frac{5}{8}$  in./16 mm

### Standard range, TCBE

Versions available in the standard range:  
 Ranges

**N** -40 — +10 °C without MOP  
**N** -40 — +10 °C MOP + 15 °C

Static superheat (SS) for R22, R134a, R404A, R407C, R410A  
 Valves without MOP: 5 K  
 Valves with MOP: 4 K

Static superheat (SS) for R507  
 Valves without MOP: 6.4 K  
 Valves with MOP: 5.4 K

Capillary tube length: 0.9 m

Connections:  
 Inlet Orifice 1  $\frac{3}{8}$  in./10 mm  
 Orifice 1-3  $\frac{1}{2}$  in./12 mm  
 Outlet  $\frac{5}{8}$  in./16 mm

### Variant range TCBE/TCCE

In addition to the standard range, TCBE valves are also available in these variants and variant combinations:

Ranges

**NM** -40 — -5 °C MOP 0 °C  
**B** -60 — -25 °C without MOP  
**B** -60 — -25 °C MOP -20 °C

Valves to special temperature ranges can be supplied.

Static superheat (SS)  
 2K, 3K, 4K, 5K or 6K for both TCBE and TCCE.

Capillary tube length: 1.5 m

Bleed: 15%

Connections:  
 Inlet Orifice 2-3  $\frac{3}{8}$  in./10 mm  
 Outlet Orifice 1-3  $\frac{1}{2}$  in./12 mm

### Technical data

Max. bulb temperature 100 °C  
 Max. valve body temperature 120 °C  
 short-lived peak 150 °C

Max. working pressure PS/MWP = 45.5 bar  
 Max. test pressure Pf = 50 bar

Biflow operation  
 With flow in the opposite direction, the rated capacity is reduced by up to 15%.  
 TC with orifice no. 3, cannot be used for biflow operation.

### MOP-Valves

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

#### MOP points

Refrigerant	Range <b>N</b> -40 — +10 °C	Range <b>NM</b> -40 — -5 °C	Range <b>B</b> -60 — -25 °C
	MOP point for evaporating temperature $t_0$ and evaporating pressure $p_0$ <sup>1)</sup> $t_e = +15$ °C/+60 °F $t_e = 0$ °C/+32 °F $t_e = -20$ °C/-4 °F		
R22	$p_e = 100$ psig/6.9 bar	$p_e = 60$ psig/4.0 bar	$p_e = 20$ psig/1.5 bar
R134a	$p_e = 55$ psig/3.9 bar	$p_e = 30$ psig/1.9 bar	
R404A / R507	$p_e = 120$ psig/8.4 bar	$p_e = 75$ psig/5.0 bar	$p_e = 30$ psig/2.0 bar
R407C	$p_e = 95$ psig/6.6 bar	$p_e = 50$ psig/3.6 bar	$p_e = 15$ psig/1.1 bar
R410A	$p_e = 165$ psig/11.5 bar	$p_e = 100$ psig/7.0 bar	$p_e = 45$ psig/3.0 bar

<sup>1)</sup>  $p_e$  in bar gauge

## Thermostatic expansion valve, types TCAE, TCBE and TCCE

### Identification

Main valve data is given on the element (fig. 1) on the valve body (fig. 2), or on the orifice assembly (fig. 3)

Valves with bleed are marked on the element or orifice assembly: BP 15 (=15% bleed of nominal capacity).

For valves with fixed superheat setting (type TCCE) the superheat is printed on the element (e.g. SS 5°C / 9°F).

Main valve data example, fig. 1

TCBE	=	Type (E = external pressure equalisation)
068Uxxxx	=	Code numbers
R407C	=	Refrigerant
MOP 95 / +15°C	=	MOP-point in psig and in °C
-40 / +10 °C	=	Evaporating temperature range in °C
-40 / +50°F	=	Evaporating temperature range in °F
PB 34 bar / MWP 500 psig	=	Max. working pressure in bar and psig
N1810B	=	Date marking (N = Nordborg, week <b>18</b> , year <b>2010</b> , weekday <b>B</b> = Tuesday)

Main valve data example, fig. 2

⇒	=	Normal flow direction
INCH	=	Connection in inches (MM = millimetres)
ORIF1	=	Orifice number 1
5.0 TR	=	Rated capacity $Q_{nom}$ , in Tons of Refrigeration
17.5 kW	=	Rated capacity $Q_{nom}$ , in kW

Example orifice assembly

TC	=	Valve type
1	=	Orifice number
68U4100	=	Code no., orifice with filter and gasket
3210	=	Date marking (week <b>32</b> , year <b>2010</b> )

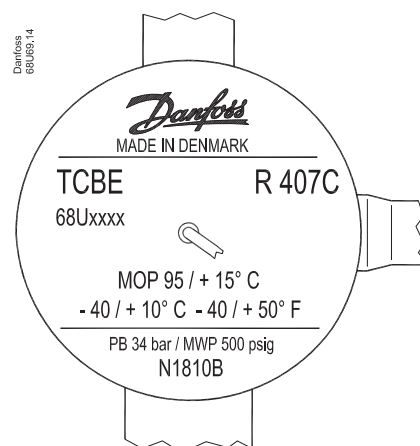


Fig. 1 Power element

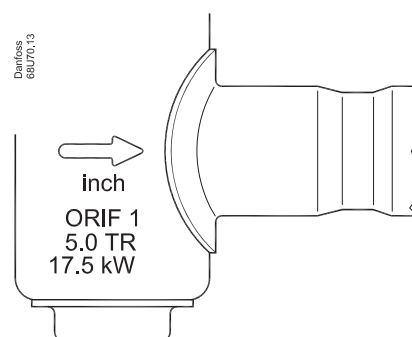


Fig. 2 Valve body

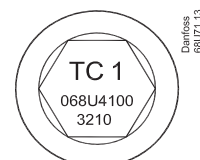
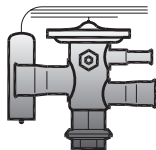


Fig. 3 Orifice assembly

## Thermostatic expansion valve, type TCAE, TCBE and TCCE

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



### R22, R134a, R404A, R507, R407C, R410A

Refrigerant	Type	Pressure equalisation	Connection Inlet x outlet		Code no.				
					Range N -40/+10 °C		Range NM -40/-5 °C	Range B -60/-25 °C	
					without MOP	with MOP	MOP 0 °C	without MOP	with MOP
R22/ R407C <sup>1)</sup>	TCAE	ext.	$\frac{3}{8} \times \frac{5}{8}$		068U4280				
	TCAE	$\frac{1}{4}$ in.	$\frac{1}{2} \times \frac{5}{8}$		068U4281	068U4283			
	TCAE	ext.		10 x 16					
	TCAE	6 mm		12 x 16			068U4291		
R134a	TCAE	ext.	$\frac{3}{8} \times \frac{5}{8}$		068U4292				
	TCAE	$\frac{1}{4}$ in.	$\frac{1}{2} \times \frac{5}{8}$		068U4293	068U4295			
	TCAE	ext.		10 x 16	068U4296				
	TCAE	6 mm		12 x 16	068U4297	068U4299			
R404A R507	TCAE	ext.	$\frac{3}{8} \times \frac{5}{8}$		068U4304				
	TCAE	$\frac{1}{4}$ in.	$\frac{1}{2} \times \frac{5}{8}$		068U4305	068U4307	068U4313	068U4317	068U4319
	TCAE	ext.		10 x 16	068U4308	068U4310	068U4314		068U4322
	TCAE	6 mm		12 x 16	068U4309		068U4315	068U4321	
R407C	TCAE	ext.	$\frac{3}{8} \times \frac{5}{8}$		068U4324	068U4326			
	TCAE	$\frac{1}{4}$ in.	$\frac{1}{2} \times \frac{5}{8}$		068U4325	068U4327			
	TCAE	ext.		10 x 16	068U4328				
	TCAE	$\frac{1}{4}$ in.		12 x 16	068U4329	068U4331			
R410A	TCAE	ext.	$\frac{3}{8} \times \frac{5}{8}$		068U4336				
	TCAE	$\frac{1}{4}$ in.	$\frac{1}{2} \times \frac{5}{8}$		068U4337	068U4339			
	TCAE	ext.		10 x 16					
	TCAE	6 mm		12 x 16	068U4341	068U4343			

<sup>1)</sup> For R407C plants, please select valves from the dedicated R407C program  
 Capillary tube length 1.5 m

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

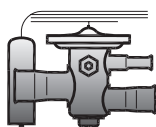
Orifice <sup>2)</sup>	Bleed%	Code no.
1	0	068U4100
1	15	068U4097
2	0	068U4101
2	15	068U4098
3	0	068U4102
3	15	068U4099

Spare parts	Code no.
TCAE gaskets <sup>3)</sup> (24-off)	068U0015
TCAE filter (24-off)	068U0016

<sup>3)</sup> To secure tightness the orifice gasket must be exchanged each time the orifice assembly is unscrewed.

<sup>2)</sup> TC with orifice no. 3, cannot be used for biflow operation.

**Ordering**  
**TCBE, straightway**  
 Thermostatic expansion valve with bulb strap



### R22, R134a, R404A, R507, R407C, R410A

Refrigerant	Type	Rated capacity <sup>5)</sup>		Orifice no.	Pressure equalisation	Code no.					
						Range N -40/+10 °C		Connection inlet x outlet mm x mm	Range N -40/+10 °C		
						without MOP	with MOP		without MOP	with MOP	
R22/ R407C <sup>6)</sup>	TCBE	17.5	5	1	ext.	$\frac{3}{8} \times \frac{5}{8}$		068U4204	10 x 16		
	TCBE	17.5	5	1	ext.	$\frac{1}{2} \times \frac{5}{8}$	068U4201	068U4205	12 x 16		068U4213
	TCBE	21.0	6	2	ext.	$\frac{1}{2} \times \frac{5}{8}$	068U4202		12 x 16		
	TCBE	26.5	7.5	3 <sup>4)</sup>	ext.	$\frac{1}{2} \times \frac{5}{8}$		068U4207	12 x 16		
R134a	TCBE	12.0	3.5	1	ext.	$\frac{3}{8} \times \frac{5}{8}$			10 x 16	068U4224	068U4228
	TCBE	12.0	3.5	1	ext.	$\frac{1}{2} \times \frac{5}{8}$	068U4217		12 x 16	068U4225	
	TCBE	14.5	4.1	2	ext.	$\frac{1}{2} \times \frac{5}{8}$	068U4218		12 x 16	068U4226	068U4230
	TCBE	18.0	5.2	3 <sup>4)</sup>	ext.	$\frac{1}{2} \times \frac{5}{8}$	068U4219		12 x 16	068U4227	068U4231
R404A R507	TCBE	13.5	3.8	1	ext.	$\frac{3}{8} \times \frac{5}{8}$			10 x 16		068U4244
	TCBE	13.5	3.8	1	ext.	$\frac{1}{2} \times \frac{5}{8}$			12 x 16	068U4241	
	TCBE	16.0	4.5	2	ext.	$\frac{1}{2} \times \frac{5}{8}$	068U4234		12 x 16	068U4242	068U4246
	TCBE	20.0	5.7	3 <sup>4)</sup>	ext.	$\frac{1}{2} \times \frac{5}{8}$	068U4235		12 x 16	068U4243	068U4247
R407C	TCBE	19.0	5.4	1	ext.	$\frac{3}{8} \times \frac{5}{8}$	068U4248		10 x 16	068U4256	068U4260
	TCBE	19.0	5.4	1	ext.	$\frac{1}{2} \times \frac{5}{8}$	068U4249	068U4253	12 x 16	068U4257	068U4261
	TCBE	23.0	6.5	2	ext.	$\frac{1}{2} \times \frac{5}{8}$	068U4250	068U4254	12 x 16	068U4258	068U4262
	TCBE	28.5	8.1	3 <sup>4)</sup>	ext.	$\frac{1}{2} \times \frac{5}{8}$	068U4251		12 x 16	068U4259	068U4263
R410A	TCBE	23.0	6.5	1	ext.	$\frac{3}{8} \times \frac{5}{8}$	068U4264		10 x 16		
	TCBE	23.0	6.5	1	ext.	$\frac{1}{2} \times \frac{5}{8}$	068U4265		12 x 16	068U4273	
	TCBE	27.5	7.8	2	ext.	$\frac{1}{2} \times \frac{5}{8}$	068U4266		12 x 16	068U4274	
	TCBE	34.0	9.8	3 <sup>4)</sup>	ext.	$\frac{1}{2} \times \frac{5}{8}$	068U4267		12 x 16	068U4275	068U4279

<sup>4)</sup> TC with orifice no. 3, cannot be used for biflow operation.

<sup>5)</sup> Rated capacity is based on:  
 Evaporating temperature  $t_e = +5^\circ\text{C}$ , Condensing temperature  $t_c = +32^\circ\text{C}$ ,  
 Refrigerant liquid temperature  $t_l = +28^\circ\text{C}$ , Opening superheat OS = 4 K

<sup>6)</sup> For R407C plants, please select valves from the dedicated R407C program

Capillary tube length 0.9 m  
 Valves with inch connections have  $\frac{1}{4}$  in. pressure equalisation.  
 Valves with mm connections have 6 mm pressure equalisation.

## Thermostatic expansion valve, types TCAE, TCBE and TCCE

### Design/ Function

1. Bulb with capillary tube
2. Thermostatic element with diaphragm
3. Setting spindle for adjustment of static superheat SS
4. Orifice assembly
5. Filter

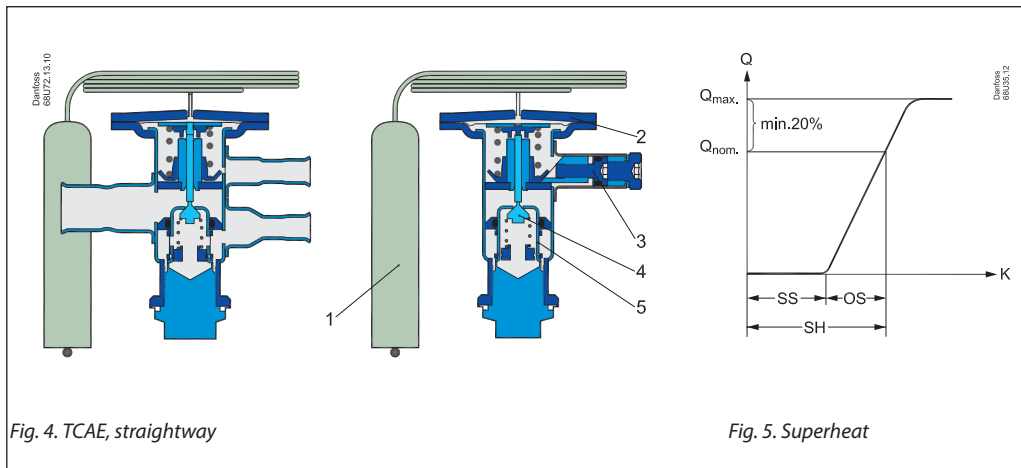


Fig. 4. TCAE, straightway

Fig. 5. Superheat

### Superheat, TC

See fig. 5.

- SS = static superheat  
 OS = opening superheat  
 SH = SS + OS = total superheat  
 $Q_{nom.}$  = rated capacity of the valve  
 $Q_{max.}$  = maximum capacity of the valve

Static superheat SS can be adjusted with setting spindle 3, see fig. 4 (TCAE/TCBE). Static superheat cannot be adjusted on TCCE.

The standard superheat setting SS is 5 K for valves without MOP and 4 K for valve with MOP. The opening superheat OS is 4 K from when opening begins to where the valve gives its rated capacity  $Q_{nom.}$ .

### Example

- Static superheat SS = 5 K  
 Opening superheat OS = 4 K  
 Total superheat SH = 5 + 4 = 9 K

### Capacity

#### Correction for subcooling $\Delta t_{sub}$

The evaporator capacity used must be corrected if subcooling deviates from 4 K. The corrected capacity can be obtained by dividing the evaporator capacity by the correction factor given below.

#### Note:

Insufficient subcooling can produce flash gas.

Correction factor	$\Delta t_{sub}$									
	4 K	10 K	15 K	20 K	25 K	30 K	35 K	40 K	45 K	50 K
R22	1.00	1.06	1.11	1.15	1.2	1.25	1.3	1.35	1.39	1.44
R134a	1.00	1.08	1.13	1.19	1.25	1.31	1.37	1.42	1.48	1.54
R404A / R507	1.00	1.1	1.2	1.29	1.37	1.46	1.54	1.63	1.7	1.78
R407C	1.00	1.08	1.14	1.21	1.27	1.33	1.39	1.45	1.51	1.57
R410A	1.00	1.08	1.15	1.21	1.27	1.33	1.39	1.45	1.50	1.56

#### Example

Refrigerant = R22  
 Evaporating temperature  $t_e = -10^\circ\text{C}$   
 Pressure drop in valve  $\Delta p = 10$  bar  
 Subcooling  $\Delta t_{sub} = 15$  K  
 Evaporator capacity = 18 kW  
 Correction factor (table) = 1.11  
 The corrected evaporator capacity thus becomes 18 divided by 1.11 = 16.2 kW

Since the expansion valve capacity must be equal to or lightly more than the corrected evaporator capacity of 16.2 kW, a TC with orifice 1 and a table capacity of 16.3 would be a suitable choice.

## Thermostatic expansion valve, type TCAE, TCBE and TCCE

### Capacity

# R22

Capacity in kW for range N: -40 °C to +10 °C and opening superheat OS = 4 K

Type	Orifice no.	Pressure drop across the valve $\Delta p$ bar								Pressure drop across the valve $\Delta p$ bar							
		2	4	6	8	10	12	14	16	2	4	6	8	10	12	14	16
<b>Evaporating temperature +10 °C</b>										<b>Evaporating temperature 0 °C</b>							
TC	1	11.6	15.4	17.7	19.3	20.5	21.3	21.8	22.2	10.8	14.1	16.2	17.6	18.6	19.2	19.7	20.1
	2	14.0	18.7	21.3	23.3	24.8	25.7	26.5	27.0	12.9	16.9	19.4	21.1	22.3	23.2	23.9	24.3
	3	17.4	23.0	26.5	28.9	30.7	31.9	32.8	33.4	16.2	21.2	24.4	26.4	27.8	29.1	30.0	30.6
<b>Evaporating temperature -10 °C</b>										<b>Evaporating temperature -20 °C</b>							
TC	1	9.6	12.5	14.2	15.4	16.3	16.9	17.3	17.5	10.7	13.1	13.8	14.2	14.5	14.8		
	2	11.4	14.9	17.3	18.5	19.5	20.2	20.8	21.2	12.6	14.3	15.5	16.3	17.0	17.4	17.7	
	3	14.4	18.8	21.4	23.3	24.7	25.7	26.5	27.1	16.0	18.2	19.8	21.2	21.8	22.5	23.0	
<b>Evaporating temperature -30 °C</b>										<b>Evaporating temperature -40 °C</b>							
TC	1		8.7	9.9	10.6	11.1	11.5	11.8	11.9	7.7	8.3	8.7	8.9	9.1	9.3		
	2		10.2	11.6	12.5	13.2	13.7	14.0	14.3	9.0	9.7	10.2	10.6	10.8	11.0		
	3		13.1	14.9	16.1	17.1	17.8	18.3	18.7	11.6	12.6	13.3	13.9	14.3	14.6		

Capacity in kW for range B: -60 °C to -25 °C and opening superheat OS = 4 K

Type	Orifice no.	Pressure drop across the valve $\Delta p$ bar								Pressure drop across the valve $\Delta p$ bar							
		2	4	6	8	10	12	14	16	2	4	6	8	10	12	14	16
<b>Evaporating temperature -25 °C</b>										<b>Evaporating temperature -30 °C</b>							
TC	1	8.1	10.5	11.9	12.9	13.6	14.2	14.6	14.8	7.4	9.5	10.8	11.7	12.3	12.8	13.1	13.4
	2	10.4	13.4	15.3	16.7	17.8	18.6	19.3	19.9	9.4	12.1	13.9	15.1	16.1	16.8	17.4	17.9
	3	13.6	17.3	19.8	21.7	23.1	24.3	25.3	26.1	12.2	15.7	18.0	19.7	21.0	22.1	23.0	23.8
<b>Evaporating temperature -40 °C</b>										<b>Evaporating temperature -50 °C</b>							
TC	1	5.9	7.5	8.5	9.2	9.7	10.1	10.3	10.5	4.5	5.7	6.4	6.9	7.3	7.6	7.8	7.9
	2	7.4	9.5	10.9	11.9	12.6	13.2	13.7	14.1	5.6	7.2	8.2	8.9	9.5	9.9	10.3	10.6
	3	9.7	12.5	14.3	15.7	16.8	17.7	18.4	19.1	7.4	9.5	10.8	11.9	12.7	13.4	14.0	14.5
<b>Evaporating temperature -60 °C</b>																	
TC	1	3.2	4.1	4.6	5.0	5.2	5.4	5.6	5.6								
	2	4.0	5.1	5.9	6.4	6.8	7.1	7.4	7.6								
	3	5.3	6.8	7.8	8.6	9.2	9.7	10.1	10.5								

### Correction factors for subcooling $\Delta t_{sub}$

$\Delta t_{sub}$	4 K	10 K	15 K	20 K	25 K	30 K	35 K	40 K	45 K	50 K
R22	1.00	1.06	1.11	1.15	1.20	1.25	1.30	1.35	1.39	1.44

### Capacity

# R134a

Capacity in kW for range N: -40 °C to +10 °C and opening superheat OS = 4 K

Type	Orifice no.	Pressure drop across the valve $\Delta p$ bar								Pressure drop across the valve $\Delta p$ bar							
		2	4	6	8	10	12	14	16	2	4	6	8	10	12	14	16
<b>Evaporating temperature +10 °C</b>										<b>Evaporating temperature 0 °C</b>							
TC	1	9.0	11.4	12.8	13.6	13.9	14.1			8.0	10.1	11.2	11.6	12.1	12.3		
	2	11.3	14.5	16.2	17.2	17.8	18.0			10.1	12.7	14.1	14.9	15.4	15.6		
	3	14.5	18.5	20.6	21.9	22.7	23.1			13.0	16.5	18.2	19.3	19.9	20.3		
<b>Evaporating temperature -10 °C</b>										<b>Evaporating temperature -20 °C</b>							
TC	1	6.8	8.5	9.4	9.9	10.2	10.2			6.9	7.6	8.0	8.1	8.2			
	2	8.6	10.7	11.8	12.5	12.8	13.0			8.6	9.5	10.0	10.3	10.4			
	3	11.2	13.9	15.4	16.3	16.8	17.1			11.3	12.5	13.2	13.6	13.8			
<b>Evaporating temperature -30 °C</b>										<b>Evaporating temperature -40 °C</b>							
TC	1		5.4	5.9	6.1	6.2	6.2			4.0	4.3	4.5	4.6	4.5			
	2		6.5	7.3	7.6	7.8	7.9			4.9	5.3	5.6	5.7	5.7			
	3		8.8	9.7	10.2	10.5	10.7			6.5	7.2	7.5	7.7	7.8			

### Correction factors for subcooling $\Delta t_{sub}$

$\Delta t_{sub}$	4 K	10 K	15 K	20 K	25 K	30 K	35 K	40 K	45 K	50 K
R134a	1.00	1.08	1.13	1.19	1.25	1.31	1.37	1.42	1.48	1.54

## Thermostatic expansion valve, type TCAE, TCBE and TCCE

### Capacity

# R404A

Capacity in kW for range N: -40 °C to +10 °C and opening superheat OS = 4 K

Type	Orifice no.	Pressure drop across the valve $\Delta p$ bar								Pressure drop across the valve $\Delta p$ bar							
		2	4	6	8	10	12	14	16	2	4	6	8	10	12	14	16
<b>Evaporating temperature +10 °C</b>										<b>Evaporating temperature 0 °C</b>							
TC	1	8.2	10.6	11.9	12.6	12.9	13.0	12.8	12.5	7.7	9.9	11.1	11.7	12.0	12.0	11.9	11.6
	2	10.4	13.5	15.1	16.1	16.4	16.5	16.3	15.9	9.8	12.6	14.0	14.8	15.2	15.2	15.1	14.7
	3	13.2	17.0	19.0	20.2	20.7	20.8	20.6	20.1	12.6	16.0	17.8	18.9	19.3	19.4	19.2	18.8
<b>Evaporating temperature -10 °C</b>										<b>Evaporating temperature -20 °C</b>							
TC	1	7.0	8.9	9.9	10.4	10.6	10.7	10.3	10.2		7.7	8.5	8.9	9.1	9.1	8.9	8.7
	2	8.9	11.3	12.7	13.1	13.4	13.5	13.3	13.0		9.6	10.7	11.2	11.4	11.4	11.3	11.0
	3	11.4	14.5	16.1	16.9	17.3	17.4	17.2	16.8		12.6	13.8	14.5	14.8	14.9	14.7	14.5
<b>Evaporating temperature -30 °C</b>										<b>Evaporating temperature -40 °C</b>							
TC	1			7.0	7.3	7.4	7.4	7.2	7.0			5.5	5.7	5.8	5.7	5.6	5.4
	2			8.7	9.1	9.2	9.2	9.1	8.9			6.8	7.1	7.2	7.2	7.0	6.8
	3			11.4	11.9	12.2	12.2	12.0	11.8			9.1	9.5	9.6	9.6	9.5	9.3

Capacity in kW for range B: -60 °C to -25 °C and opening superheat OS = 4 K

Type	Orifice no.	Pressure drop across the valve $\Delta p$ bar								Pressure drop across the valve $\Delta p$ bar							
		2	4	6	8	10	12	14	16	2	4	6	8	10	12	14	16
<b>Evaporating temperature -25 °C</b>										<b>Evaporating temperature -30 °C</b>							
TC	1	7.2	9.1	10.0	10.4	10.6	10.6	10.4	10.1	6.7	8.3	9.1	9.5	9.6	9.6	9.4	9.2
	2	9.1	11.4	12.6	13.3	13.6	13.6	13.5	13.2	8.4	10.4	11.5	12.0	12.3	12.3	12.2	12.0
	3	11.9	14.8	16.4	17.2	17.7	17.9	17.8	17.6	10.3	13.6	15.0	15.8	16.2	16.4	16.3	16.1
<b>Evaporating temperature -40 °C</b>										<b>Evaporating temperature -50 °C</b>							
TC	1	5.4	6.6	7.2	7.5	7.6	7.6	7.4	7.2		5.1	5.5	5.7	5.7	5.7	5.6	5.4
	2	6.8	8.5	9.1	9.6	9.7	9.8	9.6	9.4		6.3	6.9	7.2	7.3	7.3	7.2	7.0
	3	8.9	11.0	12.1	12.7	13.1	13.2	13.1	12.9		8.4	9.2	9.7	10.0	10.0	10.0	9.8
<b>Evaporating temperature -60 °C</b>																	
TC	1			3.9	4.1	4.1	4.0	3.9	3.8								
	2			4.9	5.1	5.2	5.2	5.1	4.9								
	3			6.7	7.0	7.2	7.3	7.2	7.0								

### Correction factors for subcooling $\Delta t_{sub}$

$\Delta t_{sub}$	4 K	10 K	15 K	20 K	25 K	30 K	35 K	40 K	45 K	50 K
R404A	1.00	1.10	1.20	1.29	1.37	1.46	1.54	1.63	1.70	1.78



## Thermostatic expansion valve, types TCAE, TCBE and TCCE

### Capacity

# R407C

Capacity in kW for range N:  $-40\text{ }^{\circ}\text{C}$  to  $+10\text{ }^{\circ}\text{C}$  and opening superheat OS = 4 K

Type	Orifice no.	Pressure drop across the valve $\Delta p$ bar								Pressure drop across the valve $\Delta p$ bar							
		2	4	6	8	10	12	14	16	2	4	6	8	10	12	14	16
<b>Evaporating temperature <math>+10\text{ }^{\circ}\text{C}</math></b>										<b>Evaporating temperature <math>0\text{ }^{\circ}\text{C}</math></b>							
TC	1	11.5	15.0	17.0	18.4	19.2	19.7	19.9	19.9	10.6	13.7	15.5	16.6	17.0	17.7	17.9	17.9
	2	14.5	18.8	21.6	23.2	24.3	25.0	25.3	25.4	13.3	17.2	19.5	21.0	21.9	22.4	22.7	22.8
	3	18.3	23.9	27.1	29.2	30.5	31.4	31.9	31.9	16.8	21.9	24.7	26.6	27.8	28.6	29.9	29.2
<b>Evaporating temperature <math>-10\text{ }^{\circ}\text{C}</math></b>										<b>Evaporating temperature <math>-20\text{ }^{\circ}\text{C}</math></b>							
TC	1	9.3	12.0	13.5	14.5	15.1	15.4	15.5	15.5	7.9	10.1	11.3	12.1	12.5	12.8	12.9	12.9
	2	11.7	15.1	17.0	18.2	18.9	19.4	19.7	19.7	9.9	12.6	14.2	15.1	15.7	16.1	16.3	16.3
	3	15.3	19.3	21.8	23.3	24.3	25.0	25.4	25.6	12.9	16.3	18.3	19.6	20.5	21.0	21.4	21.5
<b>Evaporating temperature <math>-30\text{ }^{\circ}\text{C}</math></b>										<b>Evaporating temperature <math>-40\text{ }^{\circ}\text{C}</math></b>							
TC	1		8.2	9.1	9.7	10.0	10.2	10.3	10.3			7.0	7.4	7.7	7.8	7.8	7.8
	2		10.1	11.3	12.0	12.5	12.8	12.9	13.0			8.6	9.2	9.5	9.7	9.8	9.8
	3		13.2	14.8	15.8	16.5	16.9	17.2	17.3			11.4	12.2	12.7	13.0	13.2	13.3

Capacity in kW for range B:  $-60\text{ }^{\circ}\text{C}$  to  $-25\text{ }^{\circ}\text{C}$  and opening superheat OS = 4 K

Type	Orifice no.	Pressure drop across the valve $\Delta p$ bar								Pressure drop across the valve $\Delta p$ bar							
		2	4	6	8	10	12	14	16	2	4	6	8	10	12	14	16
<b>Evaporating temperature <math>-25\text{ }^{\circ}\text{C}</math></b>										<b>Evaporating temperature <math>-30\text{ }^{\circ}\text{C}</math></b>							
TC	1	7.5	9.5	10.6	11.5	11.8	12.1	12.2	12.3	6.7	8.5	9.5	10.2	10.6	10.8	10.9	10.9
	2	9.4	12.0	13.5	14.5	15.2	15.7	16.0	16.1	8.5	10.8	12.1	13.0	13.6	14.0	14.2	14.4
	3	12.5	15.9	18.0	19.4	20.5	21.2	21.8	22.2	11.2	14.3	16.1	17.4	18.4	19.1	19.6	20.0
<b>Evaporating temperature <math>-40\text{ }^{\circ}\text{C}</math></b>										<b>Evaporating temperature <math>-50\text{ }^{\circ}\text{C}</math></b>							
TC	1	5.3	6.6	7.4	7.8	8.2	8.3	8.4	8.4	3.9	4.9	5.5	5.8	6.0	6.1	6.2	6.2
	2	6.6	8.3	9.3	10.0	10.5	10.8	11.0	11.1	4.9	6.1	6.9	7.4	7.7	7.9	8.1	8.1
	3	8.8	11.1	12.6	13.6	14.4	14.9	15.4	15.7	6.6	8.3	9.4	10.1	10.7	11.1	11.4	11.7
<b>Evaporating temperature <math>-60\text{ }^{\circ}\text{C}</math></b>																	
TC	1	2.8	3.5	3.9	4.1	4.2	4.3	4.3	4.3								
	2	3.5	4.3	4.9	5.2	5.4	5.6	5.6	5.7								
	3	4.7	5.9	6.7	7.2	7.6	7.9	8.1	8.3								

### Correction factors for subcooling $\Delta t_{\text{sub}}$

$\Delta t_{\text{sub}}$	4 K	10 K	15 K	20 K	25 K	30 K	35 K	40 K	45 K	50 K
R407C	1.00	1.08	1.14	1.21	1.27	1.33	1.39	1.45	1.51	1.57



## Thermostatic expansion valve, type TCAE, TCBE and TCCE

### Capacity

# R507

Capacity in kW for range N: -40 °C to +10 °C and opening superheat OS = 4 K

Type	Orifice no.	Pressure drop across the valve $\Delta p$ bar								Pressure drop across the valve $\Delta p$ bar							
		2	4	6	8	10	12	14	16	2	4	6	8	10	12	14	16
<b>Evaporating temperature +10 °C</b>										<b>Evaporating temperature 0 °C</b>							
TC	1	8.1	10.6	12.1	13.0	13.4	13.7	13.8	13.6	7.6	9.9	11.2	11.9	12.4	12.6	12.6	12.5
	2	10.3	13.5	15.3	16.5	17.1	17.4	17.6	17.4	9.7	12.5	13.9	15.1	15.8	16.0	16.1	16.0
	3	13.0	17.1	19.2	20.8	21.6	22.1	22.1	22.0	12.4	15.9	18.0	19.3	20.0	20.4	20.5	20.4
<b>Evaporating temperature -10 °C</b>										<b>Evaporating temperature -20 °C</b>							
TC	1	7.0	8.9	10.0	10.6	11.0	11.1	11.2	11.1	7.7	8.6	9.1	9.4	9.5	9.5	9.5	9.4
	2	8.7	11.2	12.6	13.4	13.9	14.1	14.2	14.1	9.7	10.8	11.4	11.8	12.0	12.0	11.9	11.9
	3	11.3	14.4	16.2	17.3	17.9	18.2	18.3	18.2	12.6	14.0	14.8	15.3	15.6	15.7	15.6	15.6
<b>Evaporating temperature -30 °C</b>										<b>Evaporating temperature -40 °C</b>							
TC	1			7.1	7.5	7.7	7.7	7.7	7.6			5.6	5.9	6.0	6.0	6.0	5.9
	2			8.8	9.3	9.6	9.7	9.7	9.6			7.0	7.3	7.5	7.6	7.5	7.5
	3			11.5	12.2	12.6	12.8	12.9	12.8			9.2	9.7	10.0	10.1	10.1	10.0

Capacity in kW for range B: -60 °C to -25 °C and opening superheat OS = 4 K

Type	Orifice no.	Pressure drop across the valve $\Delta p$ bar								Pressure drop across the valve $\Delta p$ bar							
		2	4	6	8	10	12	14	16	2	4	6	8	10	12	14	16
<b>Evaporating temperature -25 °C</b>										<b>Evaporating temperature -30 °C</b>							
TC	1	7.4	9.3	10.3	10.8	11.2	11.3	11.3	11.2	6.8	8.5	9.4	9.9	10.2	10.3	10.3	10.2
	2	9.2	11.9	13.2	14.0	14.5	14.8	14.9	14.8	8.7	10.9	12.0	12.8	13.2	13.4	13.5	13.5
	3	12.3	15.4	17.1	18.3	19.0	19.4	19.7	19.7	11.4	14.2	15.7	16.8	17.4	17.8	18.1	18.1
<b>Evaporating temperature -40 °C</b>										<b>Evaporating temperature -50 °C</b>							
TC	1	5.6	6.9	7.5	7.9	8.1	8.2	8.2	8.1	5.3	5.8	6.0	6.1	6.2	6.1	6.1	6.0
	2	7.1	8.8	9.6	10.2	10.5	10.7	10.7	10.7	6.7	7.3	7.7	7.9	8.1	8.1	8.1	8.0
	3	9.4	11.5	12.8	13.6	14.1	14.5	14.6	14.7	8.9	9.8	10.4	10.8	11.1	11.2	11.2	11.3
<b>Evaporating temperature -60 °C</b>																	
TC	1			4.2	4.3	4.4	4.4	4.4	4.3								
	2			5.3	5.5	5.7	5.8	5.7	5.7								
	3			7.2	7.6	7.9	8.1	8.1	8.1								

### Correction factors for subcooling $\Delta t_{sub}$

$\Delta t_{sub}$	4 K	10 K	15 K	20 K	25 K	30 K	35 K	40 K	45 K	50 K
R507	1.00	1.10	1.20	1.29	1.37	1.46	1.54	1.63	1.70	1.78

## Thermostatic expansion valve, types TCAE, TCBE and TCCE

### Capacity

# R410A

Capacity in kW for range N:  $-40\text{ }^{\circ}\text{C}$  to  $+10\text{ }^{\circ}\text{C}$  and opening superheat OS = 4 K

Type	Orifice no.	Pressure drop across the valve $\Delta p$ bar								Pressure drop across the valve $\Delta p$ bar							
		3	6	9	12	15	18	21	24	3	6	9	12	15	18	21	24
<b>Evaporating temperature <math>+10\text{ }^{\circ}\text{C}</math></b>										<b>Evaporating temperature <math>0\text{ }^{\circ}\text{C}</math></b>							
TC	1	13.9	18.2	20.6	22.2	23.0	23.4	23.3	22.9	12.7	16.6	18.9	20.2	21.0	21.4	21.4	21.2
	2	17.6	23.1	26.3	28.2	29.3	29.8	29.8	29.4	16.1	21.1	23.9	25.7	26.7	27.2	27.3	27.0
	3	22.2	29.2	33.2	35.6	37.0	37.7	37.6	36.9	20.8	26.9	30.6	32.8	34.2	34.9	35.0	34.7
<b>Evaporating temperature <math>-10\text{ }^{\circ}\text{C}</math></b>										<b>Evaporating temperature <math>-20\text{ }^{\circ}\text{C}</math></b>							
TC	1	11.3	14.6	16.6	17.7	18.4	18.7	18.8	18.6		12.4	13.8	14.9	15.5	15.7	15.8	15.6
	2	14.1	18.4	20.9	22.4	23.3	23.8	23.9	23.7		15.5	17.5	18.8	19.5	19.9	20.0	19.9
	3	18.4	23.8	27.0	29.0	30.2	30.8	31.1	30.9		20.3	22.9	24.5	25.6	26.1	26.3	26.3
<b>Evaporating temperature <math>-30\text{ }^{\circ}\text{C}</math></b>										<b>Evaporating temperature <math>-40\text{ }^{\circ}\text{C}</math></b>							
TC	1		10.1	11.3	12.0	12.5	12.7	12.7	12.6			8.8	9.3	9.7	9.8	9.8	9.7
	2		12.4	14.0	15.1	15.6	16.0	16.0	15.9			10.9	11.6	12.1	12.3	12.3	12.3
	3		16.5	18.6	19.9	20.7	21.2	21.4	21.3			14.5	15.5	16.1	16.5	16.6	16.6

Capacity in kW for range B:  $-60\text{ }^{\circ}\text{C}$  to  $-25\text{ }^{\circ}\text{C}$  and opening superheat OS = 4 K

Type	Orifice no.	Pressure drop across the valve $\Delta p$ bar								Pressure drop across the valve $\Delta p$ bar							
		3	6	9	12	15	18	21	24	3	6	9	12	15	18	21	24
<b>Evaporating temperature <math>-25\text{ }^{\circ}\text{C}</math></b>										<b>Evaporating temperature <math>-30\text{ }^{\circ}\text{C}</math></b>							
TC	1	12.7	16.4	18.5	19.8	20.5	20.9	21.0	20.9	11.8	15.1	17.0	18.2	18.9	19.3	19.4	19.3
	2	16.3	21.0	23.8	25.6	26.7	27.4	27.7	27.7	15.1	19.3	21.8	23.5	24.6	25.2	25.6	25.6
	3	21.2	27.2	30.9	33.3	34.9	35.9	36.6	36.6	19.7	25.3	28.6	30.9	32.4	33.5	34.1	34.3
<b>Evaporating temperature <math>-40\text{ }^{\circ}\text{C}</math></b>										<b>Evaporating temperature <math>-50\text{ }^{\circ}\text{C}</math></b>							
TC	1	9.8	12.4	13.9	14.9	15.5	15.8	15.9	15.8	7.7	9.7	10.9	11.6	12.0	12.3	12.3	12.3
	2	12.4	15.8	17.8	19.2	20.1	20.7	21.0	21.0	9.6	12.2	13.8	14.9	15.6	16.1	16.3	16.4
	3	16.3	20.9	23.7	25.6	27.0	28.0	28.6	28.9	12.9	16.4	18.7	20.2	21.4	22.2	22.7	23.0
<b>Evaporating temperature <math>-60\text{ }^{\circ}\text{C}</math></b>																	
TC	1		7.2	8.0	8.5	8.9	9.0	9.1	9.0								
	2		9.0	10.2	11.0	11.5	11.8	12.0	12.1								
	3		12.2	13.9	15.1	16.0	16.6	17.0	17.3								

### Correction factors for subcooling $\Delta t_{\text{sub}}$

$\Delta t_{\text{sub}}$	4 K	10 K	15 K	20 K	25 K	30 K	35 K	40 K	45 K	50 K
R410A	1.00	1.08	1.15	1.21	1.27	1.33	1.39	1.45	1.50	1.56

## Thermostatic expansion valve, type TCAE, TCBE and TCCE

### Dimensions and weights

