Capacity regulator (hot gas bypass), type TUH/TCHE/TRHE

REFRIGERATION AND
AIR CONDITIONING

Technical leaflet

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Introduction

TUH/TCHE/TRHE capacity regulators adapt compressor capacity to actual evaporator load in applications operating at an evaporating temperature of around 0°C. TUH/TCHE/TRHE valves are typically used in applications such as:

- Air driers
- Water chillers

Fitted in a bypass between the high and low-pressure sides of the air-drier system, TUH/TCHE/TRHE maintain compressor suction pressure by injecting hot gas/cool gas from the high-pressure side.

TUH has internal pressure equalisation and opens when pressure drops at the valve outlet. TCHE/TRHE have external pressure equalisation and open directly when compressor suction pressure drops.

For all types, the bulb only serves as a reservoir for the charge. However, it is recommended that the bulb be mounted in a location where temperature variation during operation is limited (see application drawings).

Features

- *Bimetal connections*
  - straightforward and fast soldering (no wet cloth or refrigeration pliers required)
  - high connection strength
- *Refrigerants*
  R410A, R134a, R404A/R507, R407C, R22 and other refrigerants on request.
- Replacement capacities up to 70.3 kW (20.1 TR) for R410A
- Stable regulation
- Tight across the seat
- Compact design
  - small dimensions and low weight
- Hermetically tight design
- Stainless steel element
  - high corrosion resistance
  - capillary tube joints of high strength and vibration resistance
- Laser-welded, stainless steel diaphragm element
  - optimum function
  - long diaphragm life
  - high pressure resistance
- Adjustable setting
  - accurate setting
  - fine tuning possible
- Low p-band
- Low hysteresis
- TUH & TCHE have an advanced filter/strainer design

Standard range

(Variants available on request)

Standard models:

One standard range per refrigerant

Refrigerants
R134a, R404A/R507, R407C, R22, R410A

Capillary tube length

TUH	0.8 m / 2.6 ft.
TCHE	0.9 m / 2.9 ft.
TRHE10	1.5 m / 5.0 ft.
TRHE20	1.5 m / 5.0 ft.
TRHE40	3.0 m / 10 ft.
TRHE80	3.0 m / 10 ft.

Orifice sizes

TUH	Orifice 9
TCHE	Orifice 3 Orifice 4
TRHE10	Orifice 10
TRHE20	Orifice 20
TRHE40	Orifice 40
TRHE80	Orifice 70

Connections

TUH & TCHE
Inlet: 10 mm / $^{3}/_{8}$ in.
Outlet: 12 mm / $^{1}/_{2}$ in.

TRHE10 & TRHE20
Inlet: 16 mm / $^{5}/_{8}$ in.
Outlet: 16 mm / $^{5}/_{8}$ in.

TRHE40
Inlet: 22 mm / $^{7}/_{8}$ in.
Outlet: 22 mm / $^{7}/_{8}$ in.

TRHE80
Inlet: 28 mm / $1^{1}/_{8}$ in.
Outlet: 28 mm / $1^{1}/_{8}$ in.

Identification - TUH & TCHE

Main valve data is given on the element (fig. 1) and on the valve body (fig. 2).

Main valve data example, fig. 1

TUH	= Type
068U2954	= Code number
R404A	= Refrigerant
−5 → +5°C	= Adjusting range in °C
+23 → +41°F	= Adjusting range in °F
PS 34 bar/ MWP 500 psig	= Max. working pressure
104B	= Date marking (week **10**, year 200**4**, weekday **B** = Tuesday)

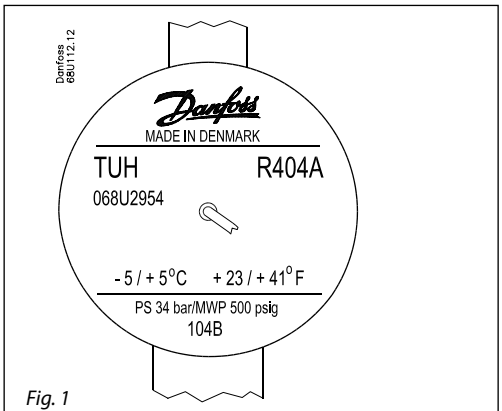


Fig. 1

Main valve data example, fig. 2

⇒	= Normal flow direction
inch	= Connection in inches (MM = millimetres)
ORIF 9	= Orifice number 9
1.3 TR	= Replacement capacity in Tons of Refrigeration
4.5 kW	= Replacement capacity in kW

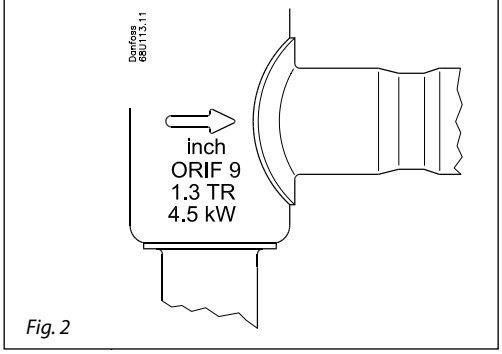


Fig. 2

Identification - TRHE

Main valve data example, fig. 3

TRHE10	= Type
3.0 TR	= Rated replacement capacity Q_{nom} in Tons of Refrigeration
10.3 kW	= Rated replacement capacity Q_{nom} in kW
R410A	= Refrigerant
−5 → +5°C	= Adjusting range in °C
+23 → +41°F	= Adjusting range in °F
067Lxxxx	= Code number
PS 42 bar/ MWP 600 psig	= Max. working pressure

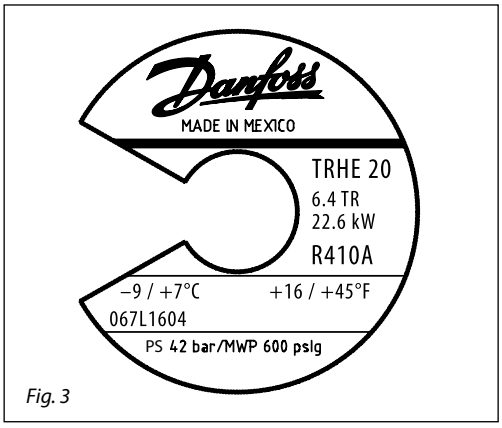


Fig. 3

Technical data

- *Max. valve body temperature:* 120°C / 248°F
  Transient peak: 150°C / 302°F
- *Permissible working pressure*
  R134a, R22, R407C, R404A:
  PS = 34 bar / MWP = 500 psig
  R410A
  PS = 42.5 bar / MWP = 615 psig
- *Max. test pressure*
  R134a, R22, R407C, R404A:
  p' = 37.5 bar / 540 psig
  R410A:
  p' = 47 bar / 680 psig
- *P-band*
  max. 0.5 bar / 7.3 psig
- *Setting*
  The valve is set to start opening at an evaporating temperature of +2°C/+36°F . The setting can be changed by turning the setting spindle. The temperature at which the valve starts opening is increased by turning the spindle anti-clockwise and decreased by turning the spindle clockwise.
- Specifically designed for hot gas applications.
- All valves react only on to suction pressure variations.

Technical data *(Continued)*

Adjustment range for start opening

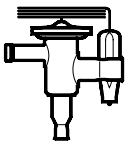
Valve Type	Refrigerant	Adjustment range for start opening [°C]	[°F]
TUH	R134a	–7 → +11°C	+20 → +51°F
	R22 / R407C	–4 → +8°C	+25 → +46°F
	R404A	–3 → +7°C	+27 → +44°F
	R410A	–2 → +6°C	+29 → +42°F
TCHE	R134a	–6 → +9°C	+22 → +48°F
	R22 / R407C	–3 → +6°C	+26 → +43°F
	R404A	–3 → +6°C	+28 → +42°F
	R410A	–5 → +8°C	+22 → +47°F
TRHE10	R134a	–6 → +9°C	+22 → +48°F
	R22 / R407C	–6 → +9°C	+22 → +48°F
	R404A	–5 → +8°C	+24 → +46°F
	R410A	–4 → +7°C	+25 → +44°F

Valve Type	Refrigerant	Adjustment range for start opening [°C]	[°F]
TRHE20	R134a	–7 → +10°C	+19 → +51°F
	R22 / R407C	–6 → +9°C	+21 → +48°F
	R404A	–5 → +8°C	+22 → +47°F
	R410A	–6 → +9°C	+21 → +48°F
TRHE40	R134a	–5 → +8°C	+24 → +46°F
	R22 / R407C	–5 → +8°C	+24 → +46°F
	R404A	–4 → +7°C	+26 → +44°F
	R410A	–3 → +6°C	+27 → +43°F
TRHE80	R134a	–4 → +7°C	+25 → +44°F
	R22 / R407C	–5 → +8°C	+23 → +46°F
	R404A	–4 → +7°C	+25 → +44°F
	R410A	–3 → +6°C	+28 → +42°F

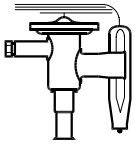
Ordering

Supplied with bulb strap

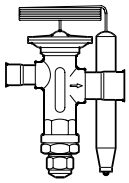
TUH



TCHE



TRHE



Standard range

R134a, R22, R404A/R507, R407C, R410A

Refrigerant	Type	Orifice no.	Nominal replacement capacity [1] kW	TR	Pressure equalisation	Connection Inlet × Outlet in. [2]	Code no.	mm [3]	Code no.
R134a	TUH	9	1.8	0.5	int.	3/8 × 1/2	**068U2953**	10 × 12	**068U2950**
	TCHE	3	2.6	0.8	ext.	3/8 × 1/2	**068U4540**	10 × 12	**068U4530**
	TCHE	4	3.4	1	ext.	3/8 × 1/2	**068U4537**	10 × 12	**068U4534**
	TRHE10	10	2.9	0.8	ext.	5/8 × 5/8	**067L1500**	16 × 16	---
	TRHE20	20	6.5	1.9	ext.	5/8 × 5/8	**067L1600**	16 × 16	---
	TRHE40	40	11.3	3.2	ext.	7/8 × 7/8	**067L3500**	22 × 22	---
	TRHE80	70	20.8	5.9	ext.	1 1/8 × 1 1/8	**067L3600**	28 × 28	---
R404A/R507	TUH	9	4.5	1.3	int.	3/8 × 1/2	**068U2954**	10 × 12	**068U2951**
	TCHE	3	5.9	1.7	ext.	3/8 × 1/2	**068U4541**	10 × 12	**068U4531**
	TCHE	4	7.6	2.2	ext.	3/8 × 1/2	**068U4538**	10 × 12	**068U4535**
	TRHE10	10	5.1	1.5	ext.	5/8 × 5/8	**067L1501**	16 × 16	---
	TRHE20	20	11.3	3.2	ext.	5/8 × 5/8	**067L1601**	16 × 16	---
	TRHE40	40	20.0	5.7	ext.	7/8 × 7/8	**067L3501**	22 × 22	---
	TRHE80	70	41.3	11.8	ext.	1 1/8 × 1 1/8	**067L3601**	28 × 28	---
R407C	TUH	9	2.8	0.8	int.	3/8 × 1/2	**068U2955**	10 × 12	**068U2952**
	TCHE	3	4.1	1.2	ext.	3/8 × 1/2	**068U4542**	10 × 12	**068U4532**
	TCHE	4	5.3	1.5	ext.	3/8 × 1/2	**068U4539**	10 × 12	**068U4536**
	TRHE10	10	4.1	1.2	ext.	5/8 × 5/8	**067L1502**	16 × 16	---
	TRHE20	20	9.1	2.6	ext.	5/8 × 5/8	**067L1602**	16 × 16	---
	TRHE40	40	16.6	4.7	ext.	7/8 × 7/8	**067L3502**	22 × 22	---
	TRHE80	70	28.8	8.2	ext.	1 1/8 × 1 1/8	**067L3602**	28 × 28	---
R22	TUH	9	3.0	0.9	int.	3/8 × 1/2	**068U2959**	10 × 12	**068U2957**
	TCHE	3	4.1	1.2	ext.	3/8 × 1/2	**068U4546**	10 × 12	**068U4544**
	TCHE	4	5.3	1.5	ext.	3/8 × 1/2	**068U4547**	10 × 12	**068U4545**
	TRHE10	10	5.4	1.6	ext.	5/8 × 5/8	**067L1503**	16 × 16	---
	TRHE20	20	11.9	3.4	ext.	5/8 × 5/8	**067L1603**	16 × 16	---
	TRHE40	40	20.8	5.9	ext.	7/8 × 7/8	**067L3503**	22 × 22	---
	TRHE80	70	37.5	10.7	ext.	1 1/8 × 1 1/8	**067L3603**	28 × 28	---
R410A	TUH	9	7.3	2.1	int.	3/8 × 1/2	**068U2960**	10 × 12	**068U2958**
	TCHE	3	10.0	2.9	ext.	3/8 × 1/2	**068U4548**	10 × 12	**068U4528**
	TCHE	4	12.9	3.7	ext.	3/8 × 1/2	**068U4549**	10 × 12	**068U4529**
	TRHE10	10	10.3	3.0	ext.	5/8 × 5/8	**067L1504**	16 × 16	---
	TRHE20	20	22.6	6.4	ext.	5/8 × 5/8	**067L1604**	16 × 16	---
	TRHE40	40	34.9	10.0	ext.	7/8 × 7/8	**067L3504**	22 × 22	---
	TRHE80	70	70.3	20.1	ext.	1 1/8 × 1 1/8	**067L3604**	28 × 28	---

[1] The nominal replacement capacity is the regulator capacity at evaporating temperature t_e = –2°C / 28°F, condensing temperature t_c = +40°C / 104°F, reduction of suction temperature / suction pressure Δt_s = 4 K / 7°F.

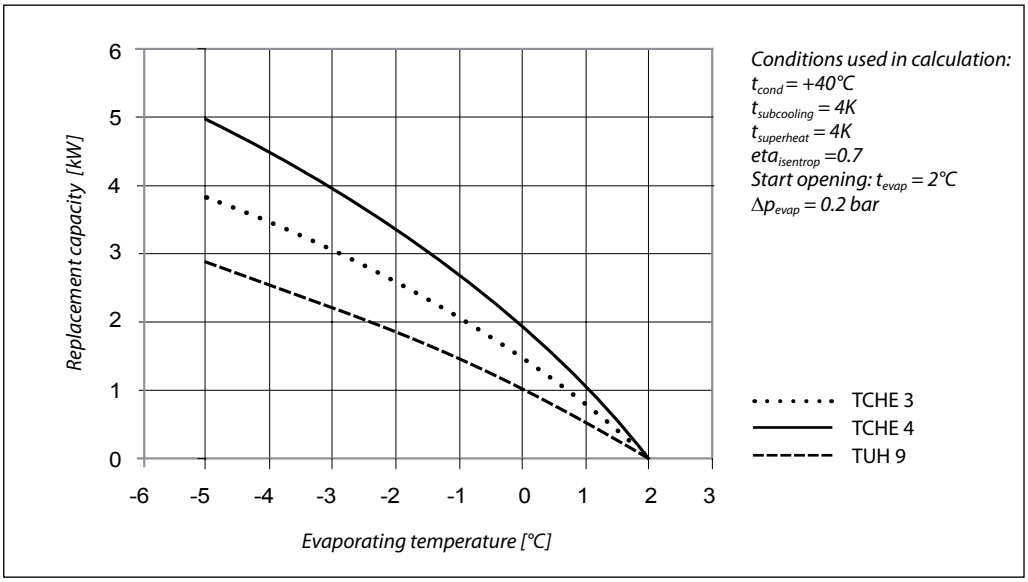
[2] Valves with inch connections have 1/4 in. pressure-equalisation.

[3] Valves with mm connections have 6 mm pressure-equalisation.

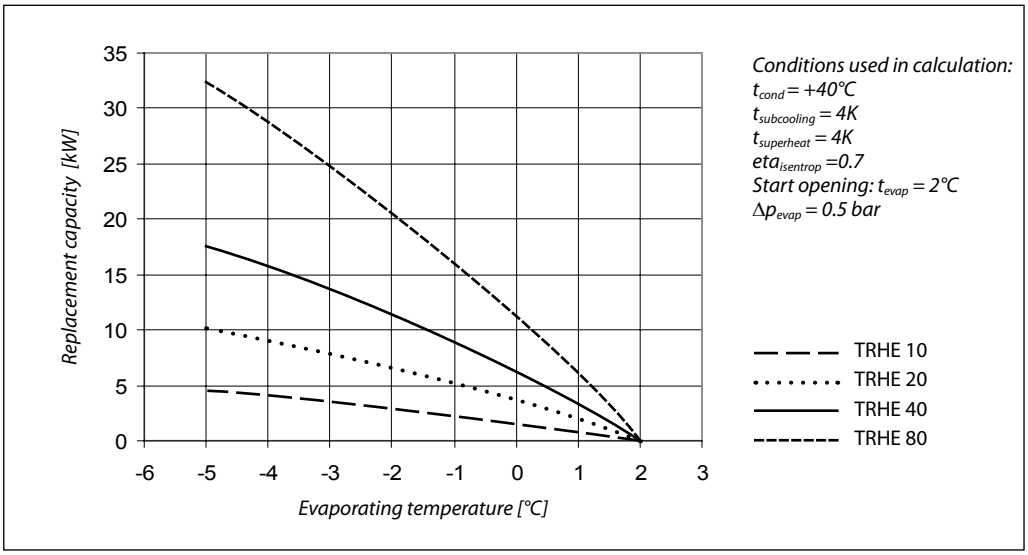
Replacement capacity

R134a

TUH & TCHE



TRHE



Correction factor for condensing temperature

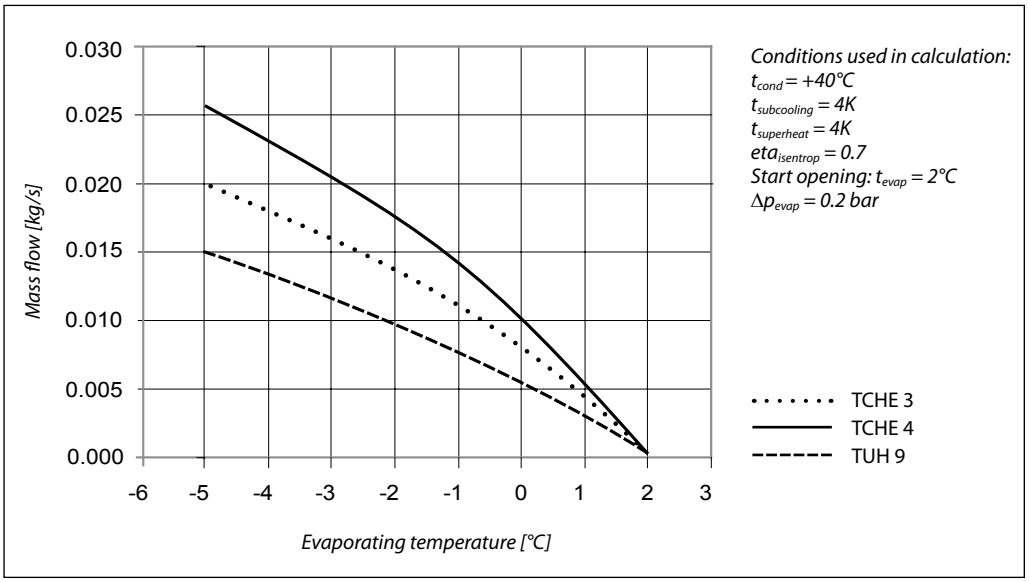
	Condensing temperature		
R134a	+30°C	**+40°C**	+50°C
	0.8	**1.0**	1.2

Above capacities have to be multiplied with the correction factor.

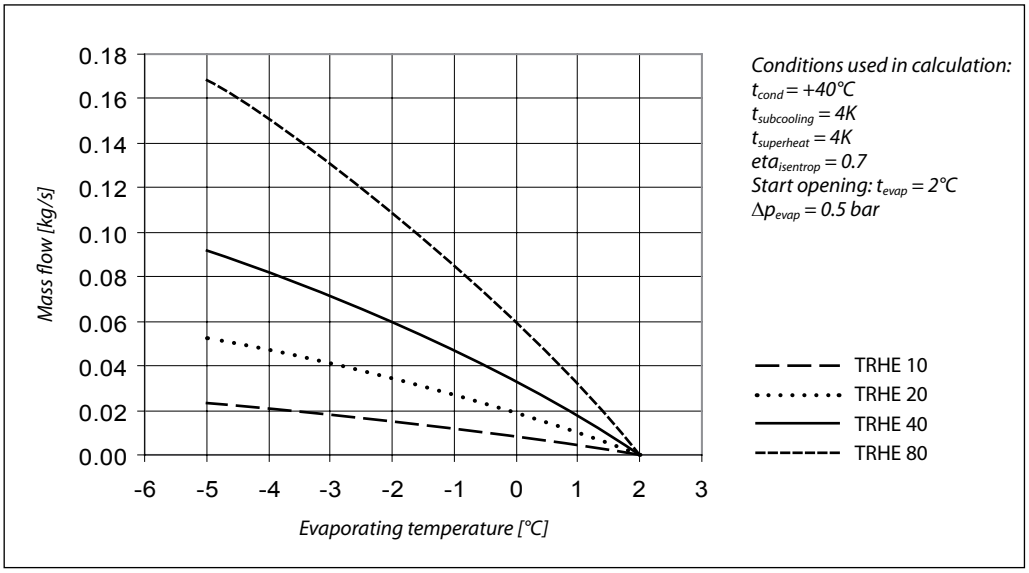
Mass flow rate

R134a

TUH & TCHE



TRHE



Correction factor for condensing temperature

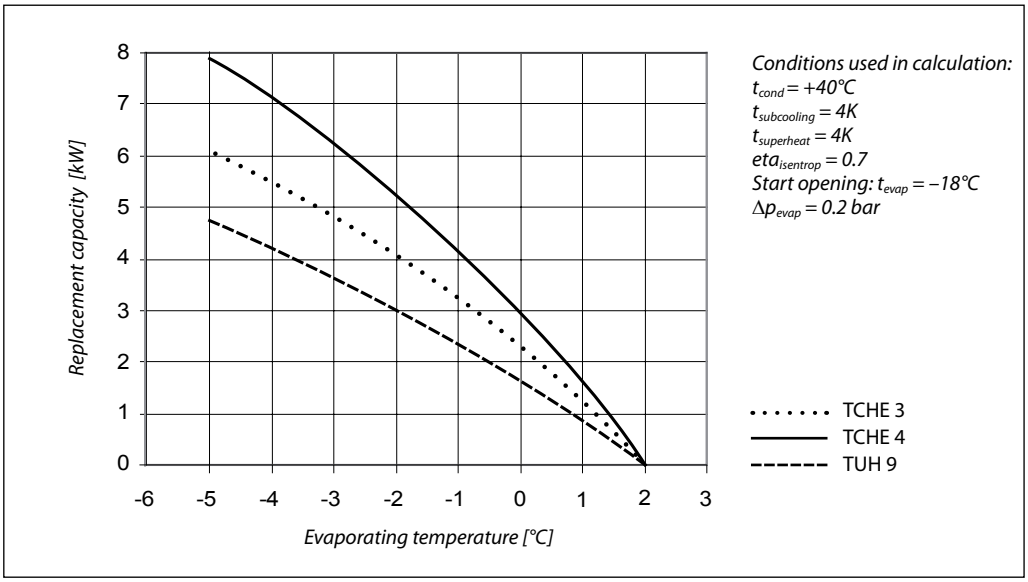
	Condensing temperature		
R134a	+30°C	**+40°C**	+50°C
	0.8	**1.0**	1.2

Above capacities have to be multiplied with the correction factor.

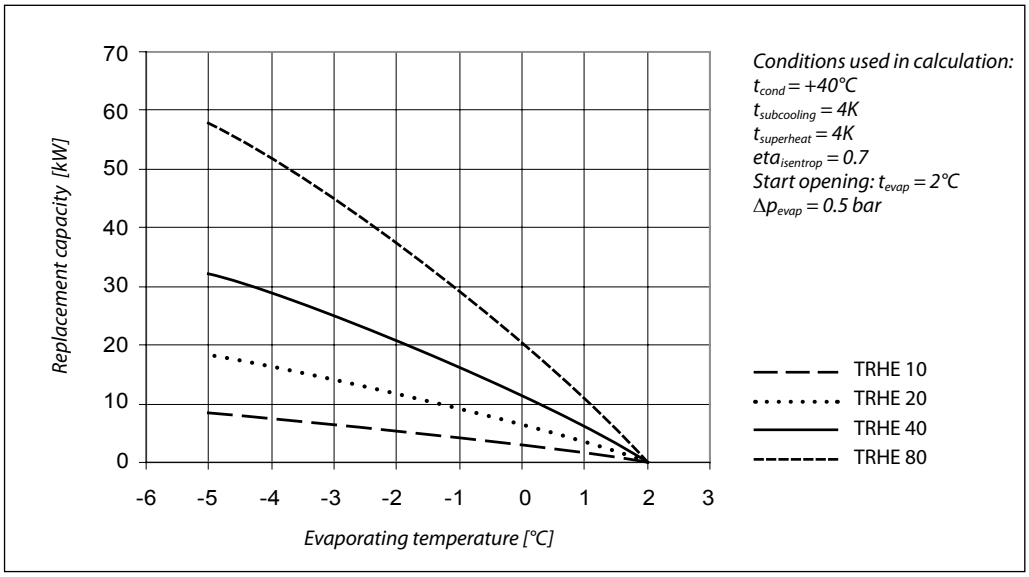
Replacement capacity

R22

TUH & TCHE



TRHE



Correction factor for condensing temperature

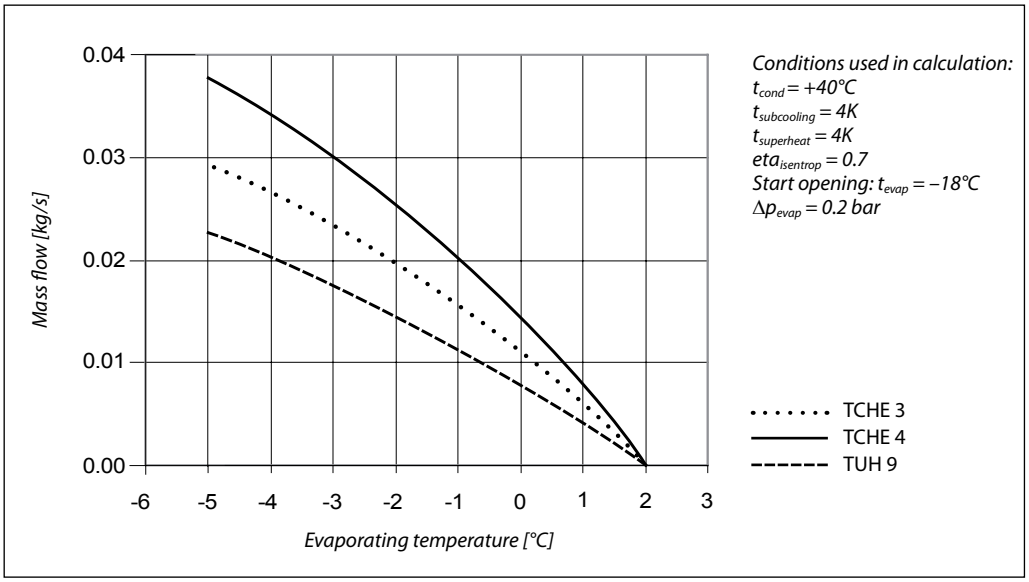
	Condensing temperature		
R22	+30°C	**+40°C**	+50°C
	0.8	**1.0**	1.2

Above capacities have to be multiplied with the correction factor.

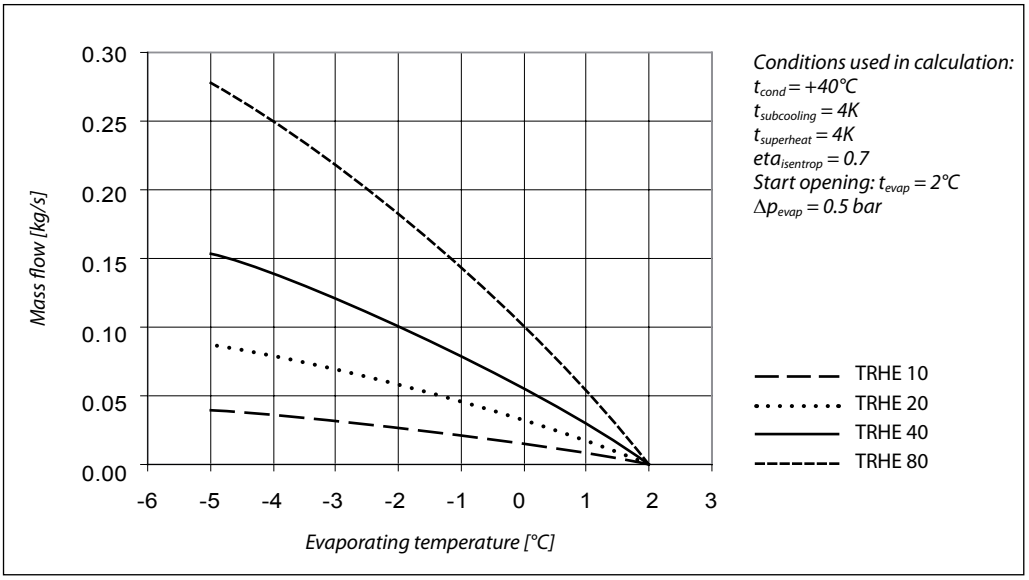
Mass flow rate

R22

TUH & TCHE



TRHE



Correction factor for condensing temperature

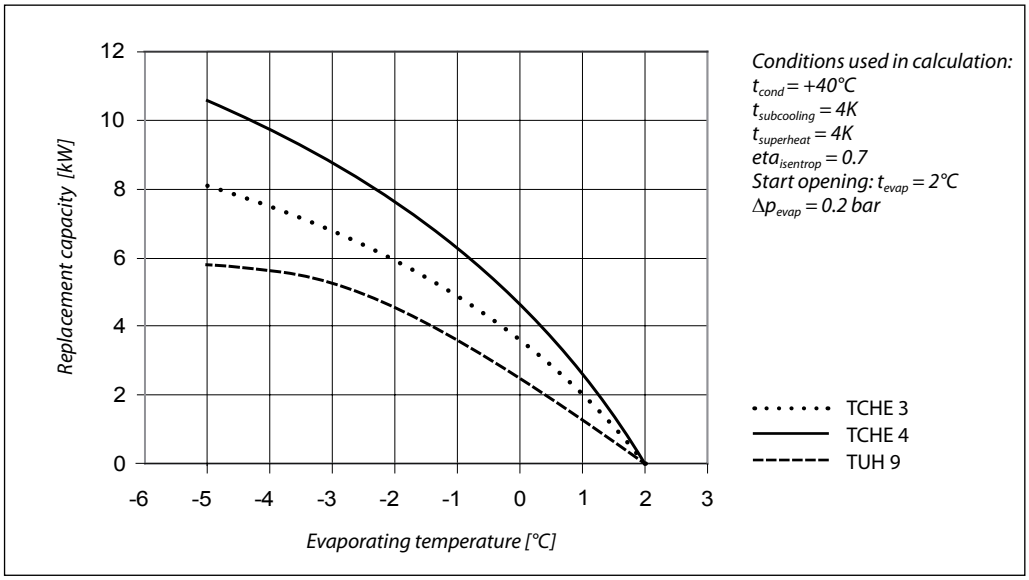
	Condensing temperature		
R22	+30°C	**+40°C**	+50°C
	0.8	**1.0**	1.2

Above capacities have to be multiplied with the correction factor.

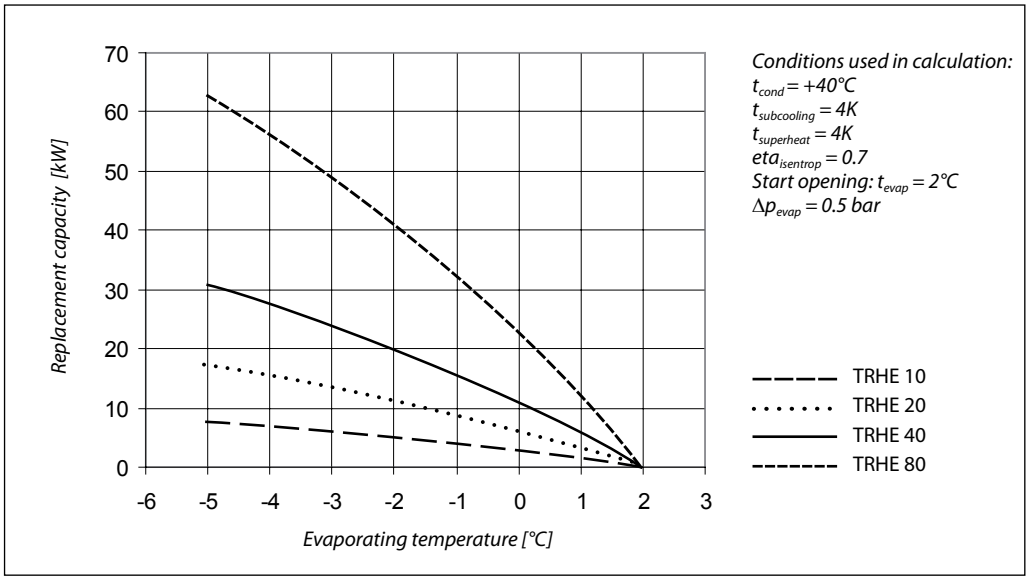
Replacement capacity

R404A/R507

TUH & TCHE



TRHE



Correction factor for condensing temperature

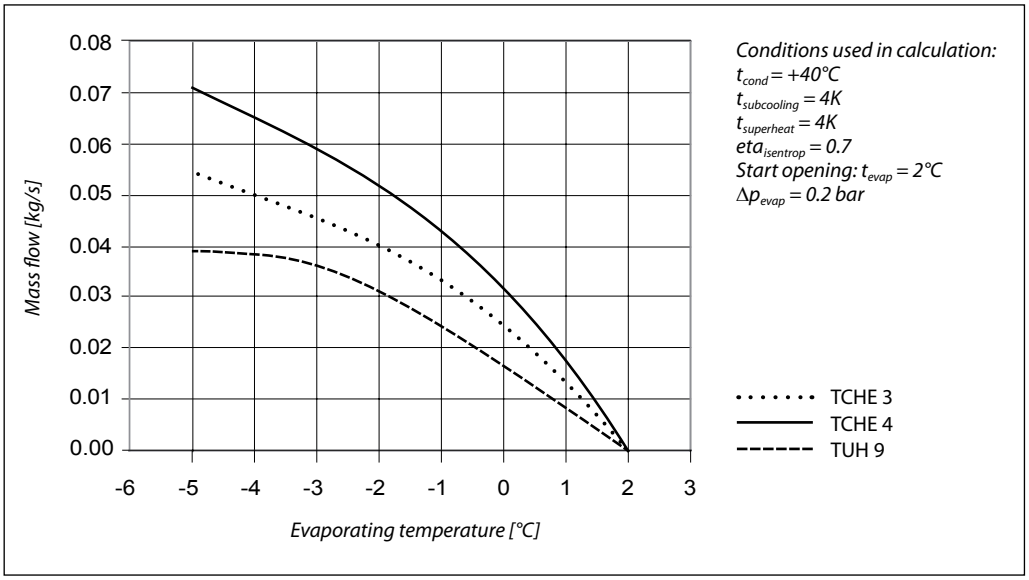
	Condensing temperature		
R404A/R507	+30°C	**+40°C**	+50°C
	0.8	**1.0**	1.2

Above capacities have to be multiplied with the correction factor.

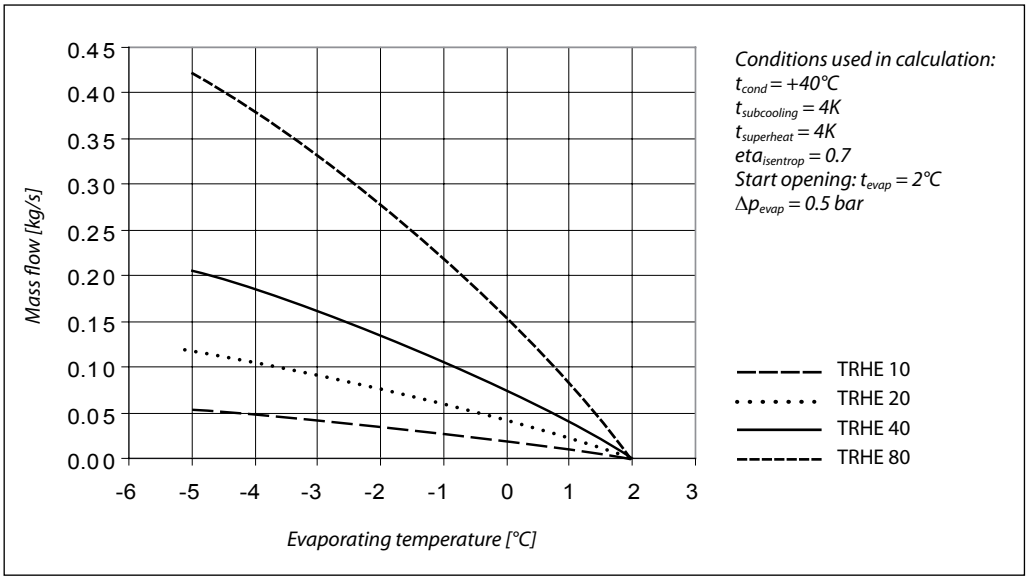
Mass flow rate

R404A/R507

TUH & TCHE



TRHE



Correction factor for condensing temperature

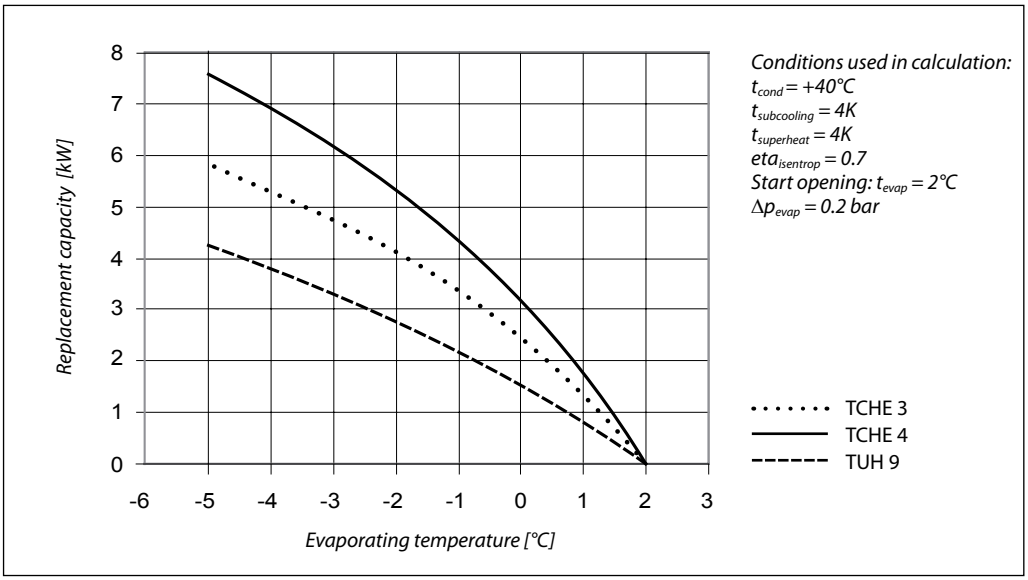
	Condensing temperature		
R404A/R507	+30°C	**+40°C**	+50°C
	0.8	**1.0**	1.2

Above capacities have to be multiplied with the correction factor.

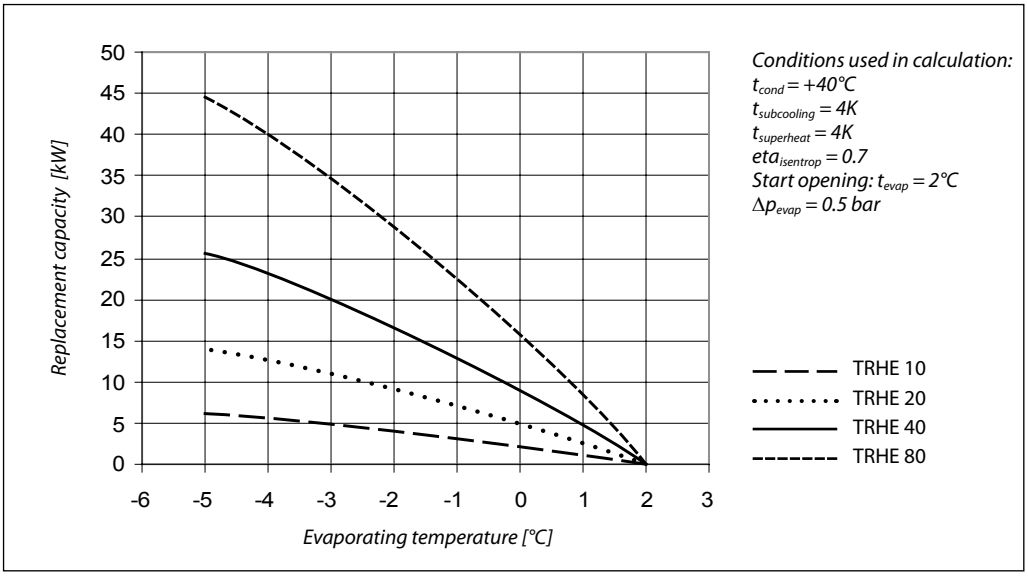
Rplacement capacity

R407C

TUH & TCHE



TRHE



Correction factor for condensing temperature

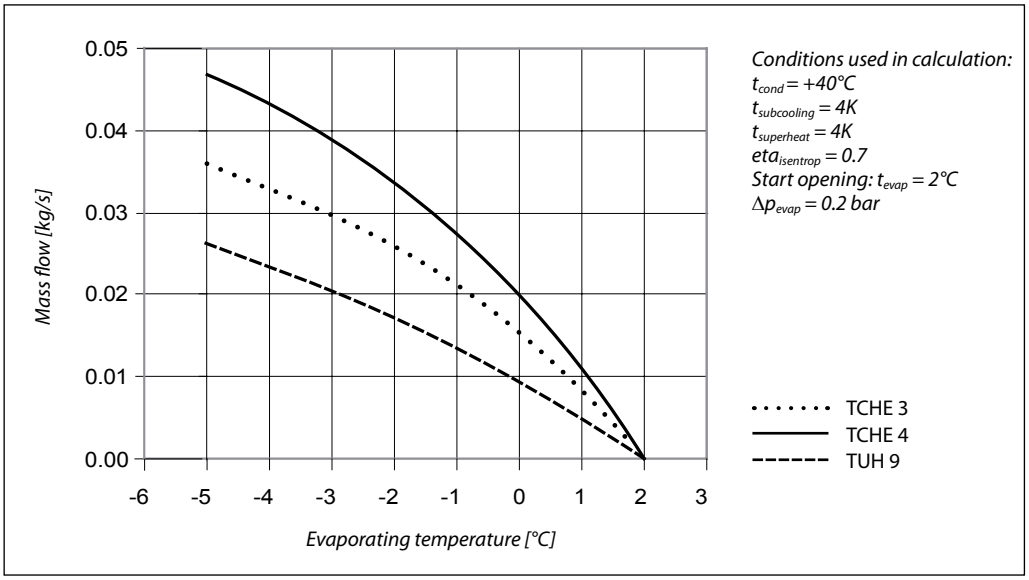
R407C	Condensing temperature		
	+30°C	**+40°C**	+50°C
	0.7	**1.0**	1.4

Above capacities have to be multiplied with the correction factor.

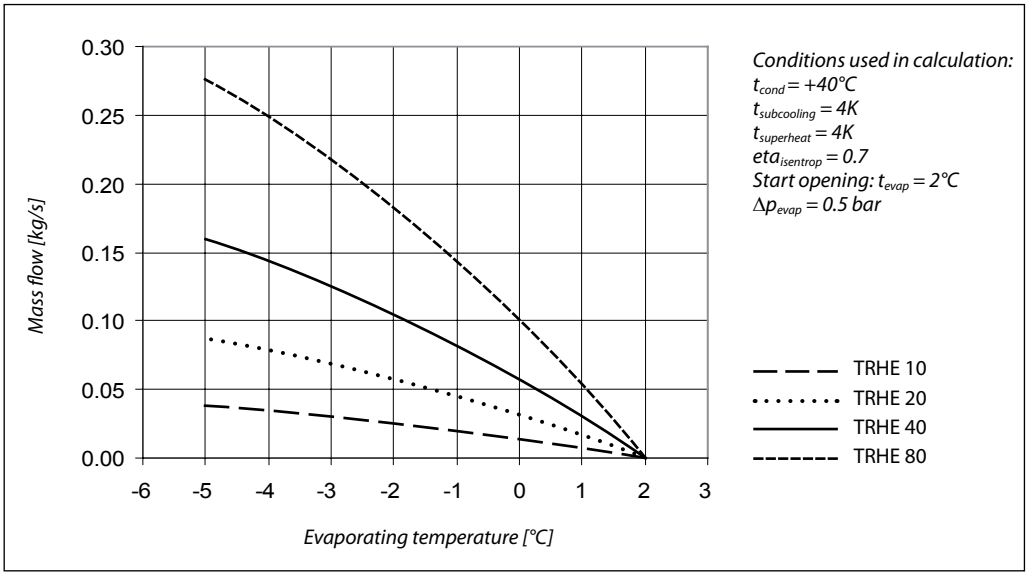
Mass flow rate

R407C

TUH & TCHE



TRHE



Correction factor for condensing temperature

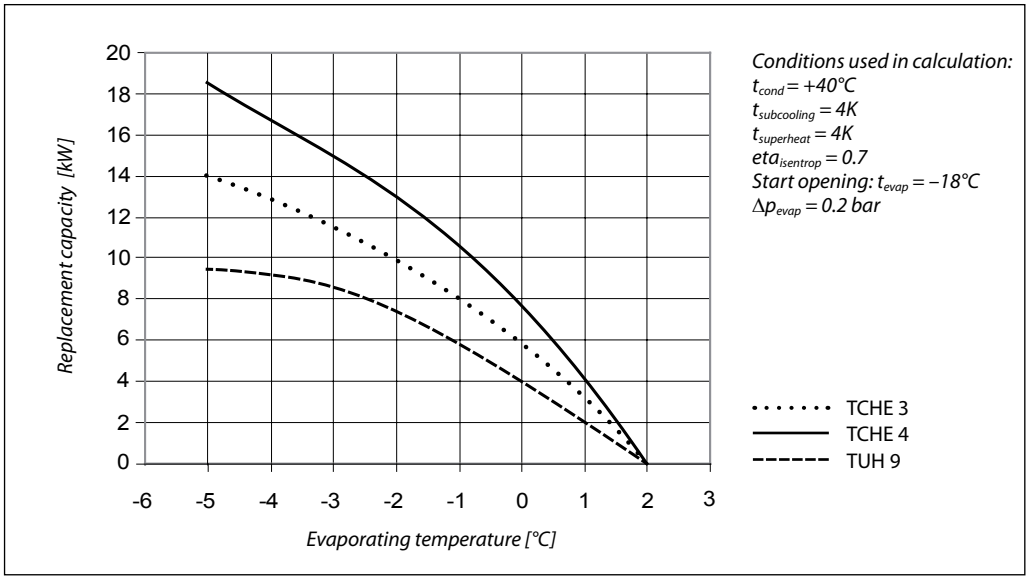
R407C	Condensing temperature		
	+30°C	**+40°C**	+50°C
	0.7	**1.0**	1.4

Above capacities have to be multiplied with the correction factor.

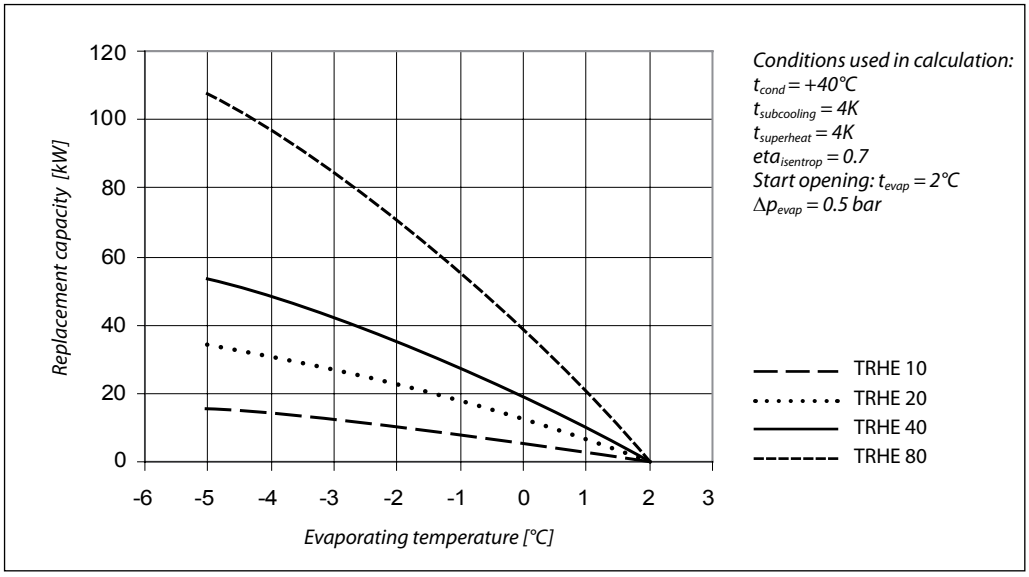
Replacement capacity

R410A

TUH & TCHE



TRHE



Correction factor for condensing temperature

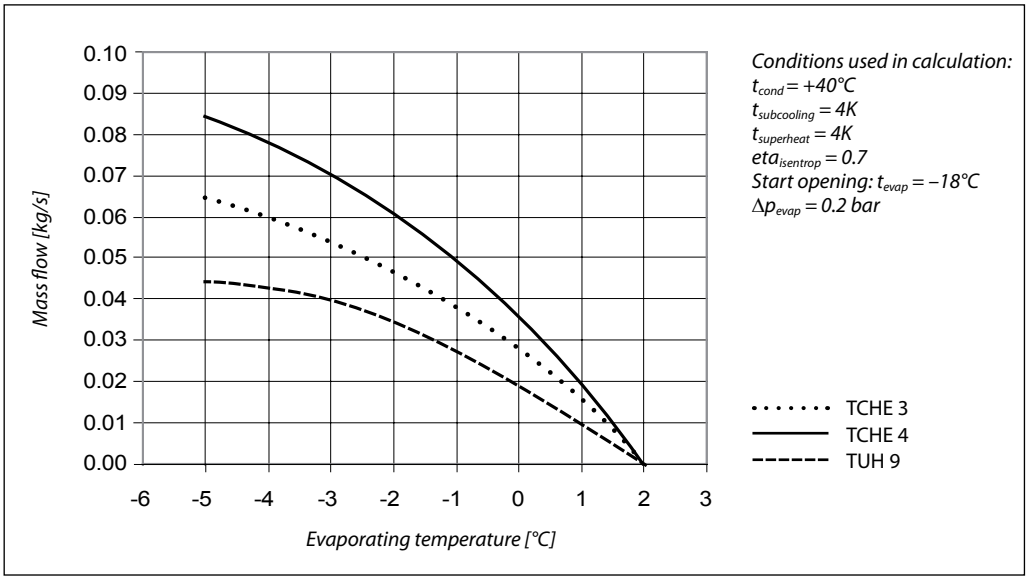
R410A	Condensing temperature		
	+30°C	**+40°C**	+50°C
	0.8	**1.0**	1.2

Above replacement capacity has to be multiplied with the correction factor.

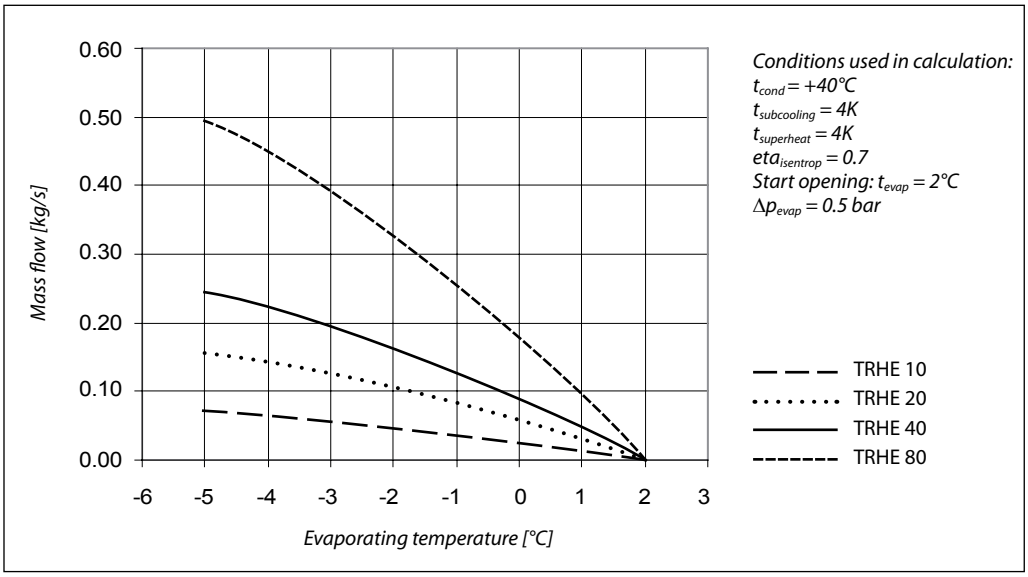
Mass flow rate

R410A

TUH & TCHE



TRHE



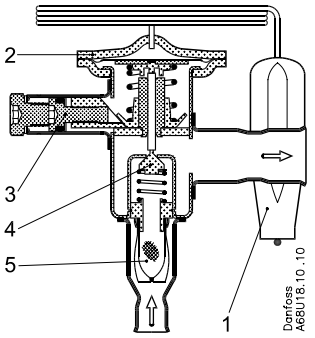
Correction factor for condensing temperature

R410A	Condensing temperature		
	+30°C	+40°C	+50°C
	0.8	1.0	1.2

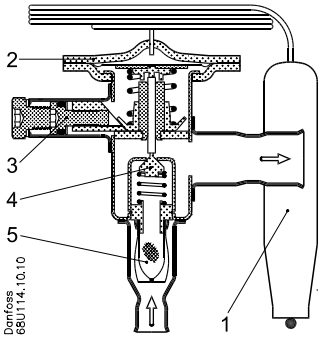
Above replacement capacity has to be multiplied with the correction factor.

Design/Function

1. Bulb with capillary tube
2. Diaphragm element
3. Setting spindle for adjustment of opening point/minimum suction pressure
4. Fixed orifice
5. Filter

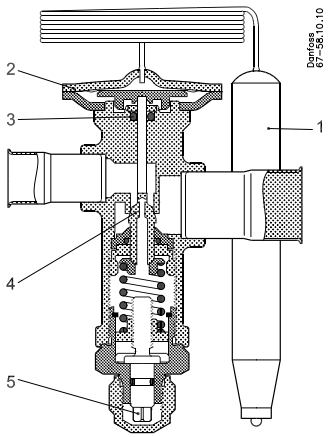


TUH, Angleway



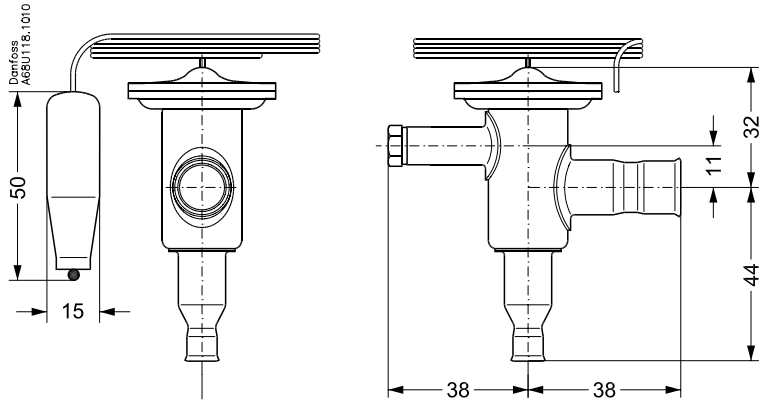
TCHE, Angleway

1. Bulb with capillary tube
2. Thermostatic element
3. Pressure pin seal
4. Two-way balanced port
5. Setting spindle for adjustment of static superheat SS



TRHE, Straightway

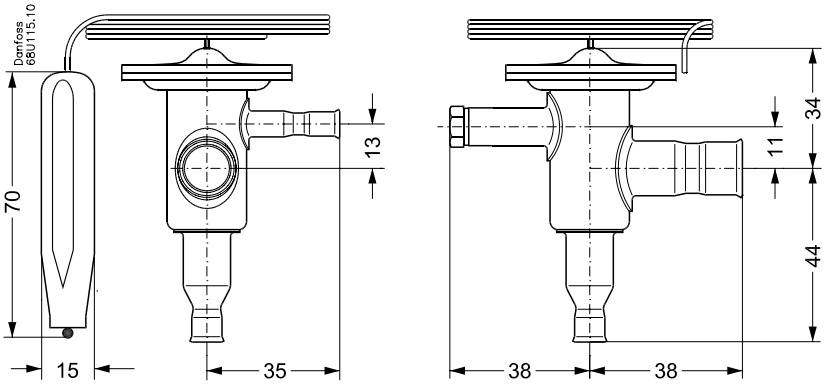
Dimensions and weight
TUH



Connection dimensions, see ordering table.
TUH, Angleway - all dimensions in mm

Weight
0.13 kg

Dimensions and weight
TCHE

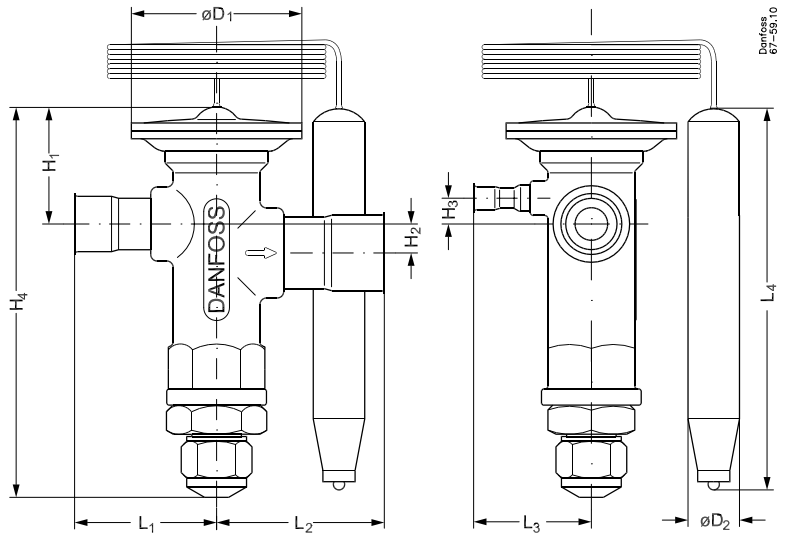


Connection dimensions, see ordering table.
TCHE, Angleway - all dimensions in mm

Weight
0.15 kg

Dimensions and weight

TRHE



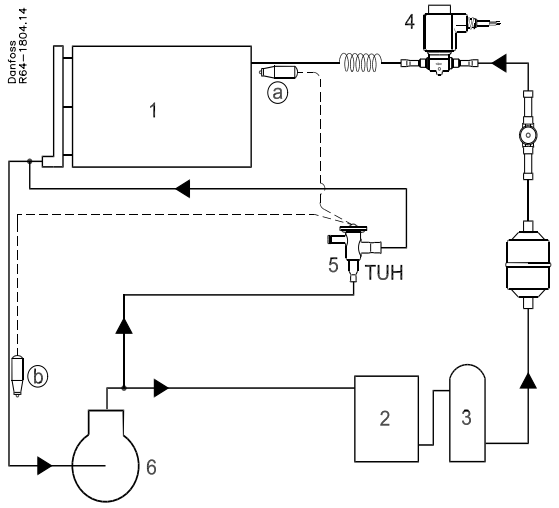
Connection dimensions, see ordering table.
TRHE, Straightway

Type	Connection, ODF solder		Capillary tube length	H_1	H_2	H_3	H_4	L_1	L_2	L_3	L_4	$øD_1$	$øD_2$	Weight
	Inlet × outlet	Inlet × outlet												
	in.	mm	m	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	kg
TRHE10	$^5/_8 \times ^5/_8$	16 × 16	1.5	32	7.5	5	104	45.5	45.5	34.5	70	45	15	0.39
TRHE20	$^5/_8 \times ^5/_8$	16 × 16	1.5	37	9	8	122	48	48	38	119	53	16.5	0.60
TRHE40	$^7/_8 \times ^7/_8$	22 × 22	3	42	13	11	145	57.5	57.5	41	111	60	20.3	0.79
TRHE80	$1^1/_8 \times 1^1/_8$	28 × 28	3	47	17	13	165	67	67	44	148	72	20.3	1.34

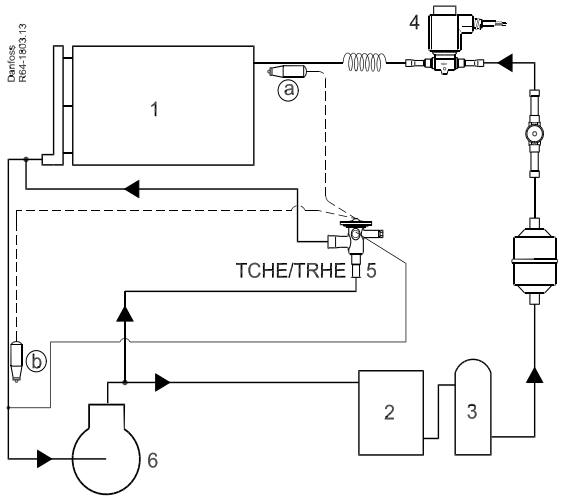
Application
TUH and TCHE

Note:
The bulb serves only as a reservoir for the charge, however, it is recommended to mount it in a position where the temperature variation during running conditions is limited (see ⓐ and ⓑ in the application drawings).

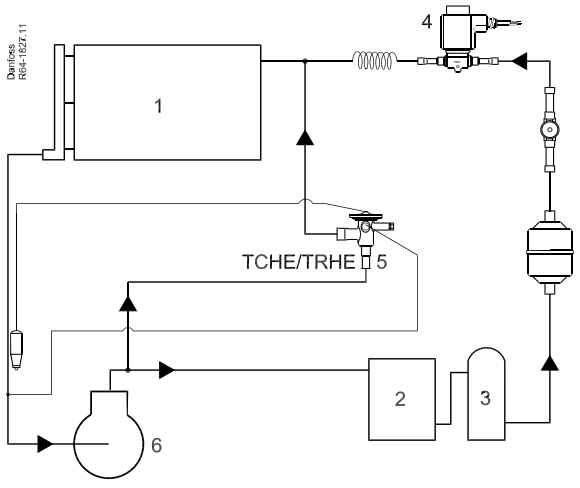
1. Evaporator
2. Condenser
3. Receiver
4. Solenoid valve
5. Discharge bypass valve with adjustable setting
6. Compressor



System with capillary tube expansion and internal pressure-equalised hot gas bypass valve type TUH



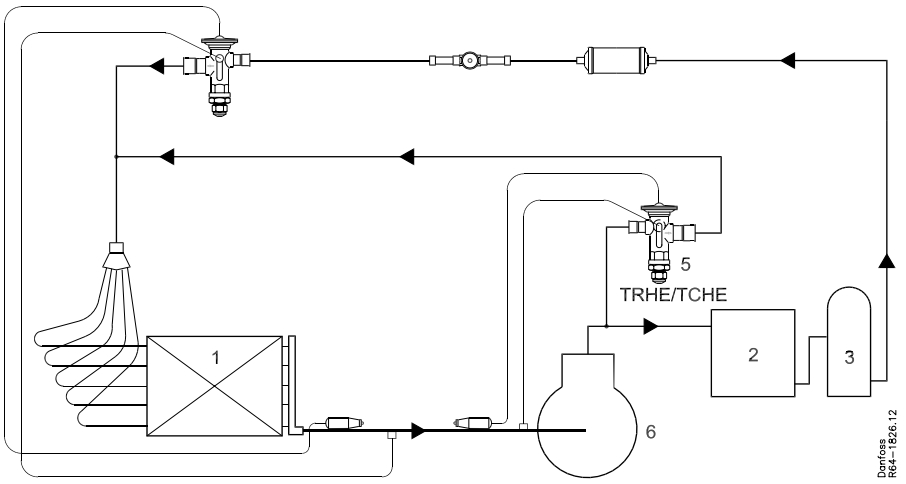
System with capillary tube expansion and external pressure-equalised hot gas bypass valve TCHE or TRHE



System with capillary tube expansion and external pressure-equalised hot gas bypass valve TCHE or TRHE

Application

TRHE



System with thermostatic expansion valve expansion and external pressure-equalised hot gas bypass valve TCHE or TRHE

1. Evaporator
2. Condenser
3. Receiver
4. Solenoid valve
5. Discharge bypass valve with adjustable setting
6. Compressor