MAKING MODERN LIVING POSSIBLE

Capacity regulator (hot gas bypass)

TUH/TCHE/TGHE

Technical brochure

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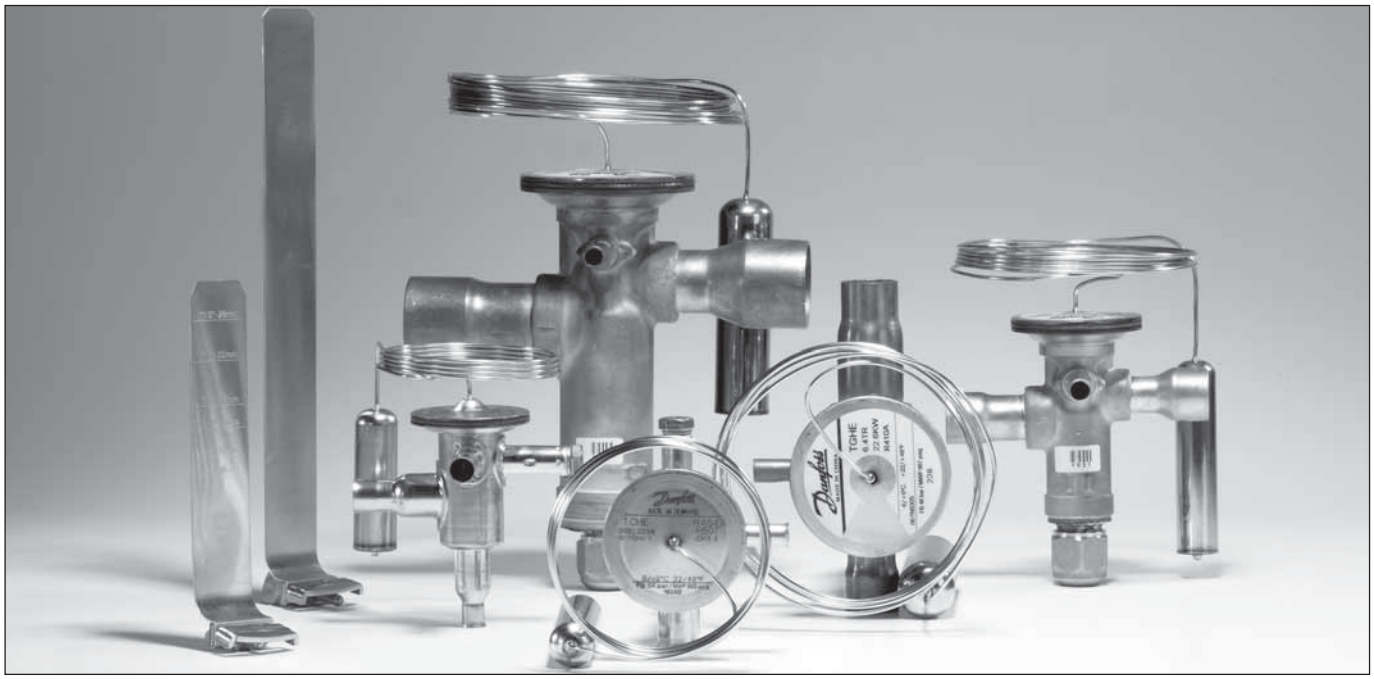


Introduction

TUH/TCHE/TGHE capacity regulators adapt compressor capacity to actual evaporator load in applications operating at an evaporating temperature of around 0°C. TUH/TCHE/TGHE 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/TGHE 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/TGHE 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 for TUH and TCHE*
  - straightforward and fast soldering (no wet cloth or refrigeration pliers required)
- *Refrigerants*
  R410A, R134a, R404A/R507, R407C, R22 and other refrigerants on request.
- *Replacement capacities up to 28.9 kW*
  (8.3 TR) for R410A
- Stable regulation
- Tight across the seat
- *Compact design*
  - small dimensions and low weight
- Hermetically tight design
- *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 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.
TGHE10	1.5 m / 5.0 ft.
TGHE20	1.5 m / 5.0 ft.
TGHE40	3.0 m / 10 ft.

Orifice sizes

TUH	Orifice 9
TCHE	Orifice 3 Orifice 4
TGHE10	Orifice 10
TGHE20	Orifice 20
TGHE40	Orifice 40

Connections
TUH & TCHE
Inlet: 10 mm / $^3/_8$ in.
Outlet: 12 mm / $^1/_2$ in.

TGHE10 & TGHE20
Inlet: 16 mm / $^5/_8$ in.
Outlet: 16 mm / $^5/_8$ in.

TGHE40
Inlet: 22 mm / $^7/_8$ in.
Outlet: 22 mm / $^7/_8$ 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
−1 → +13°C	= Adjusting range in °C
+30 → +56°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)

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

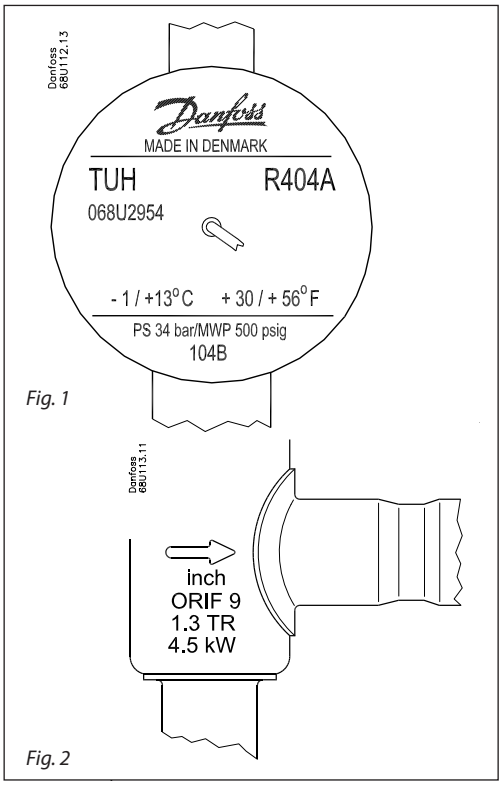


Fig. 1

Fig. 2

Identification - TGHE

Main valve data example, fig. 3

TGHE 10	= Type
1.3 TR	= Rated replacement capacity Q_{nom} in Tons of Refrigeration
4.5 kW	= Rated replacement capacity Q_{nom} in kW
R404A	= Refrigerant
−1 → +12°C	= Adjusting range in °C
+30 → +54°F	= Adjusting range in °F
067N8300	= Code number
PS 46 bar/ MWP 670 psig	= Max. working pressure
Date marking	= 08 Year, 03 Month, 12 Day

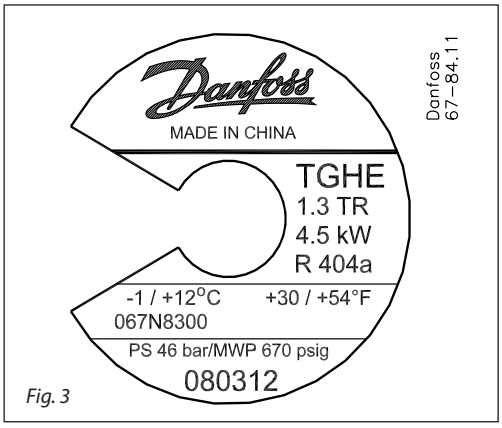


Fig. 3

Technical data

- *Max. valve body temperature:* 120°C / 248°F
  Transient peak: 150°C / 302°F
- *Max. 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

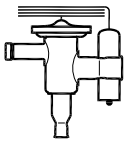
Valve type	Refrigerant	Adjustment range for start opening	
		[°C]	[°F]
TUH	R134a	–1 → +12°C	+30 → +54°F
	R22 / R407C	–1 → +14°C	+30 → +58°F
	R404A	–1 → +13°C	+30 → +56°F
	R410A	–1 → +10°C	+30 → +50°F
TCHE	R134a	–1 → +12°C	+30 → +54°F
	R22 / R407C	–1 → +8°C	+30 → +46°F
	R404A	–1 → +7°C	+30 → +45°F
	R410A	–1 → +9°C	+30 → +48°F

Valve type	Refrigerant	Adjustment range for start opening	
		[°C]	[°F]
TGHE10	R134a	–1 → +14°C	+30 → +58°F
	R22 / R407C	–1 → +14°C	+30 → +58°F
	R404A	–1 → +12°C	+30 → +54°F
	R410A	–1 → +10°C	+30 → +50°F
TGHE20	R134a	–1 → +15°C	+30→ +59°F
	R22 / R407C	–1 → +15°C	+30 → +59°F
	R404A	–1 → +12°C	+30 → +54°F
	R410A	–1 → +10°C	+30 → +50°F
TGHE40	R134a	–1 → +12°C	+30 → +54°F
	R22 / R407C	–1 → +12°C	+30 → +54°F
	R404A	–1 → +10°C	+30 → +50°F
	R410A	–1 → +8°C	+30 → +46°F

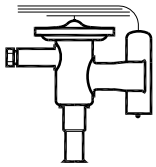
Ordering

Supplied with bulb strap

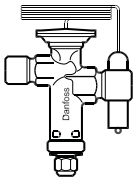
TUH



TCHE



TGHE



Standard range

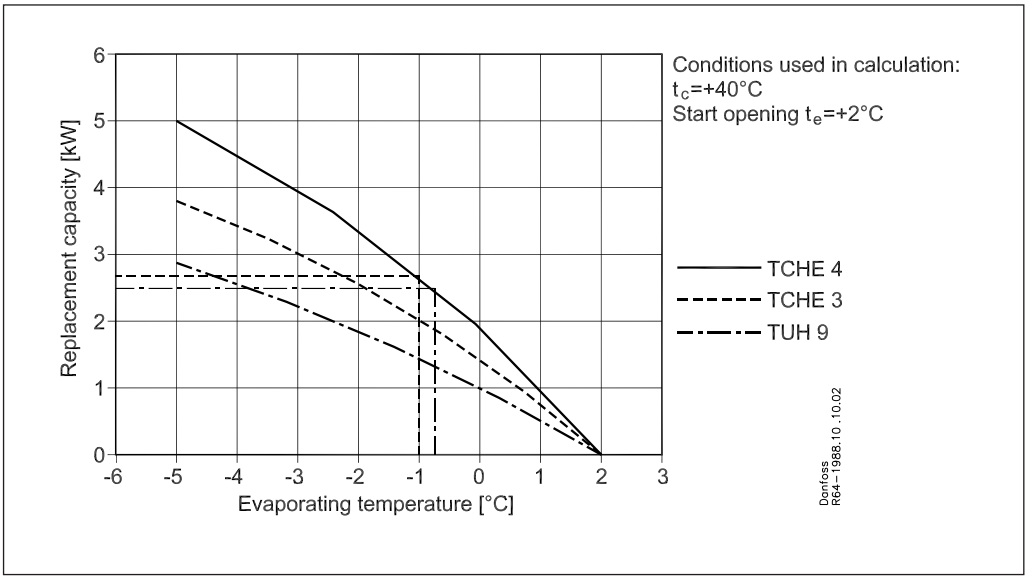
R134a, R22, R404A/R507, R407C, R410A

Refrigerant	Type	Orifice no.	Nominal replacement capacity [1]		Pressure equalisation	Connection Inlet × Outlet			
			kW	TR		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**
	TGHE10	10	3.2	0.9	ext.	5/8 × 5/8	**067N8312**	16 × 16	---
	TGHE20	20	5.6	1.6	ext.	5/8 × 5/8	**067N8301**	16 × 16	---
	TGHE40	40	10.7	3.1	ext.	7/8 × 7/8	**067N8306**	22 × 22	---
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**
	TGHE10	10	4.4	1.3	ext.	5/8 × 5/8	**067N8300**	16 × 16	---
	TGHE20	20	7.5	2.1	ext.	5/8 × 5/8	**067N8302**	16 × 16	---
	TGHE40	40	15.0	4.3	ext.	7/8 × 7/8	**067N8308**	22 × 22	---
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**
	TGHE10	10	3.8	1.1	ext.	5/8 × 5/8	**067N8313**	16 × 16	---
	TGHE20	20	6.5	1.9	ext.	5/8 × 5/8	**067N8303**	16 × 16	---
	TGHE40	40	13.0	3.7	ext.	7/8 × 7/8	**067N8309**	22 × 22	---
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**
	TGHE10	10	5.0	1.4	ext.	5/8 × 5/8	**067N8314**	16 × 16	---
	TGHE20	20	8.8	2.5	ext.	5/8 × 5/8	**067N8304**	16 × 16	---
	TGHE40	40	17.4	5.0	ext.	7/8 × 7/8	**067N8310**	22 × 22	---
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**
	TGHE10	10	8.4	2.4	ext.	5/8 × 5/8	**067N8315**	16 × 16	---
	TGHE20	20	14.5	4.1	ext.	5/8 × 5/8	**067N8305**	16 × 16	---
	TGHE40	40	28.9	8.3	ext.	7/8 × 7/8	**067N8311**	22 × 22	---

[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.

Sizing

R134a



Correction for condensing temperature
The corrected replacement capacity can be obtained by dividing the replacement capacity with the correction factor given below.

Correction factor for condensing temperature

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

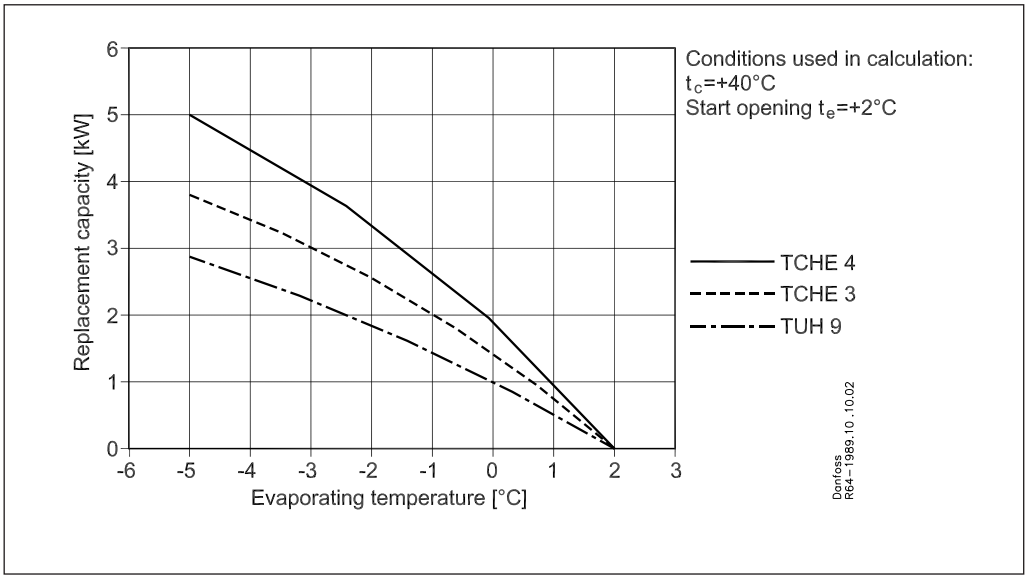
Example

Refrigerant	R134	The corrected replacement capacity thus becomes 3 kW divided by 1.2 = 2.5 kW.
Compressor capacity	6 kW at +2/+50°C	
Min. load 50%	3 kW	
Replacement capacity	6 – 3 = 3 kW	The TCHE 4 gives 2.7 kW at –1.0/+40°C (·····) and gives 2.5 kW at –0.8/+40°C (– –)
Min. evaporating temperature	t_e = –1.0°C	
Condensing temperature	t_c = +50°C	
Correction factor (table)	1.2	Thus the TCHE 4 would be a suitable choice.

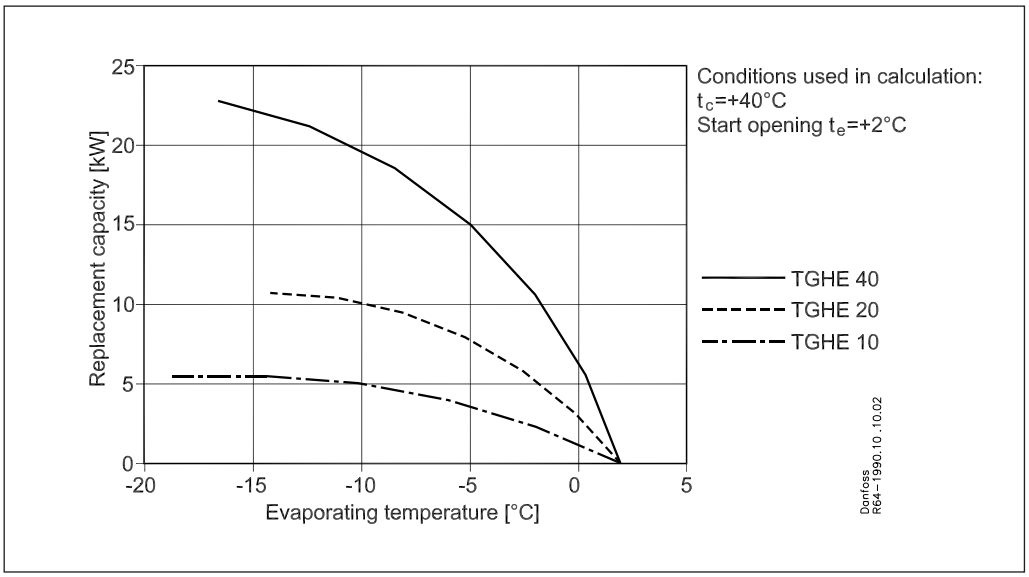
Replacement capacity

R134a

TUH & TCHE



TGHE



Correction factor for condensing temperature

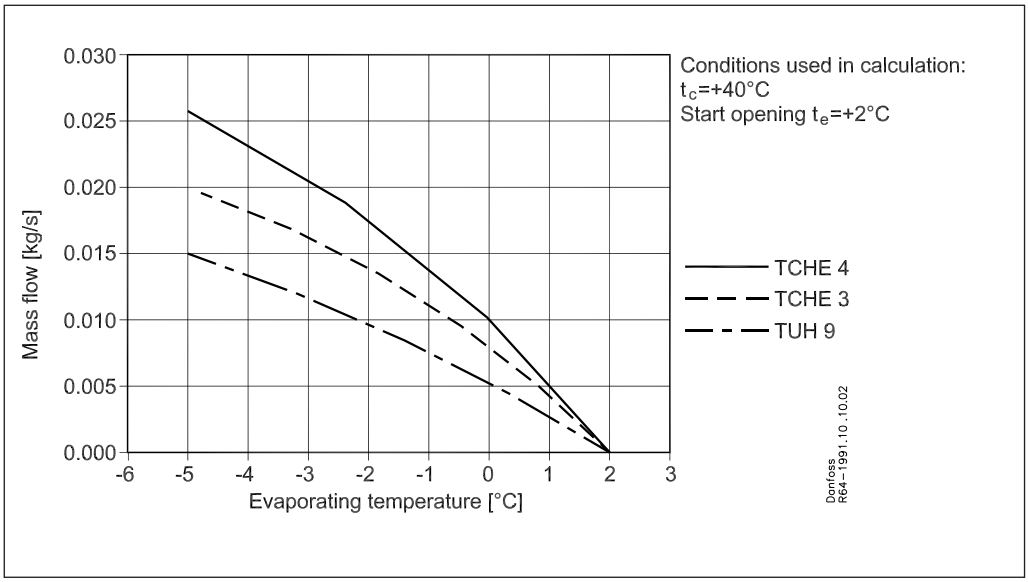
	Condensing temperature		
R134a	+30°C	**+40°C**	+50°C
	0.8	**1.0**	1.2

The correction factor can either be multiplied with the valve capacity or the replacement capacity can be divided with the correction factor.

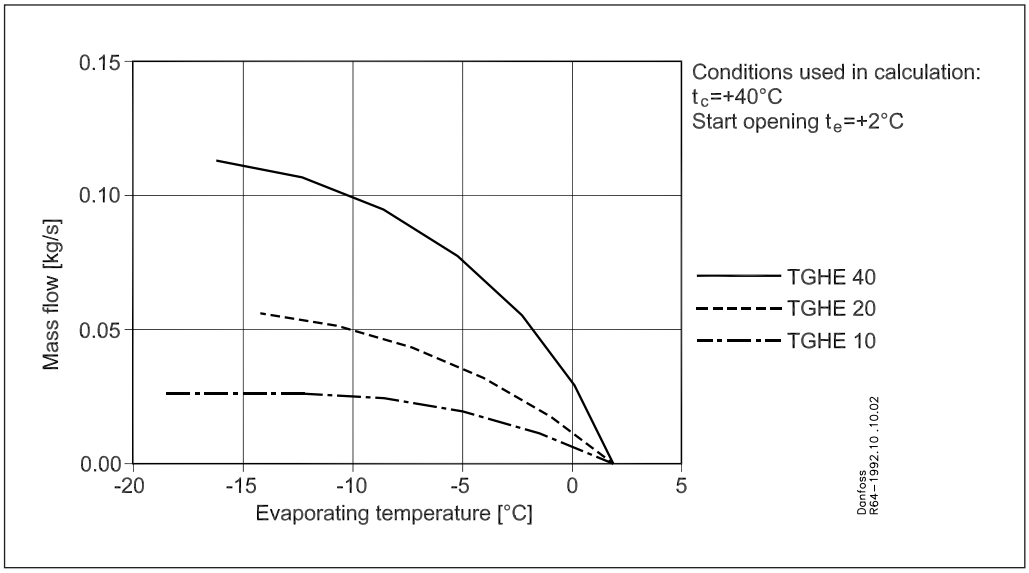
Mass flow

R134a

TUH & TCHE



TGHE



Correction factor for condensing temperature

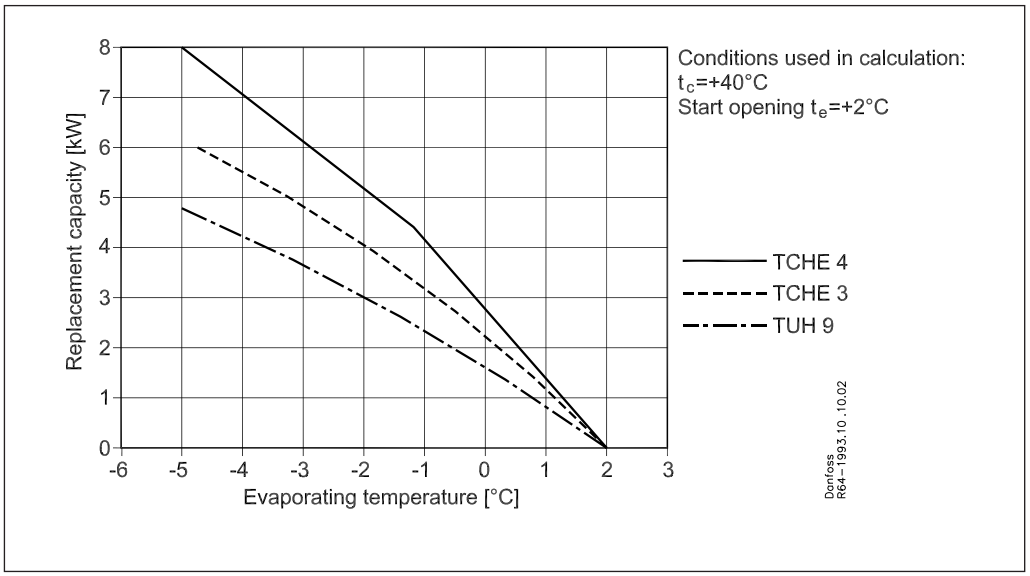
	Condensing temperature		
R134a	+30°C	**+40°C**	+50°C
	0.8	**1.0**	1.2

The correction factor can either be multiplied with the valve capacity or the replacement capacity can be divided with the correction factor.

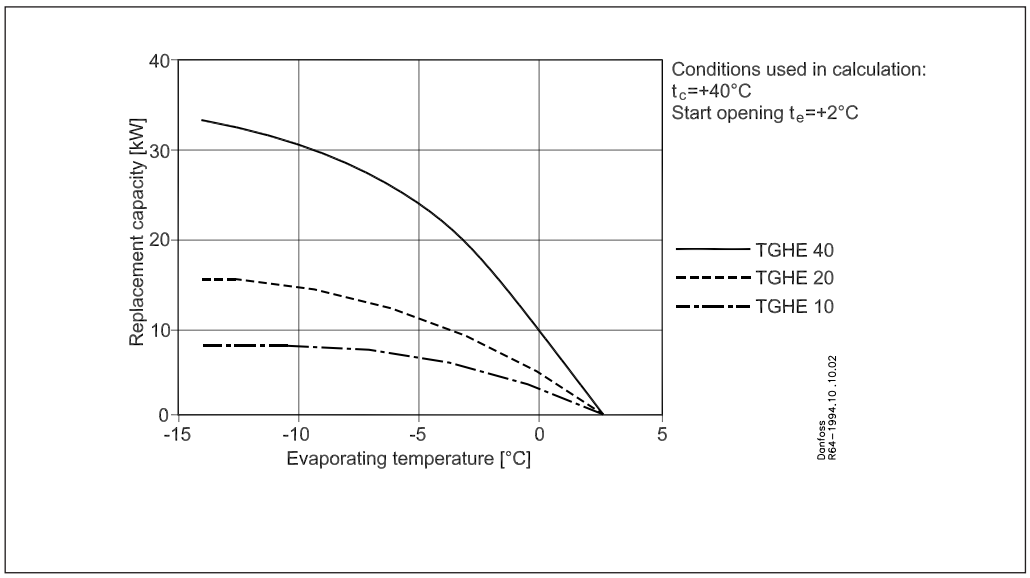
Replacement capacity

R22

TUH & TCHE



TGHE



Correction factor for condensing temperature

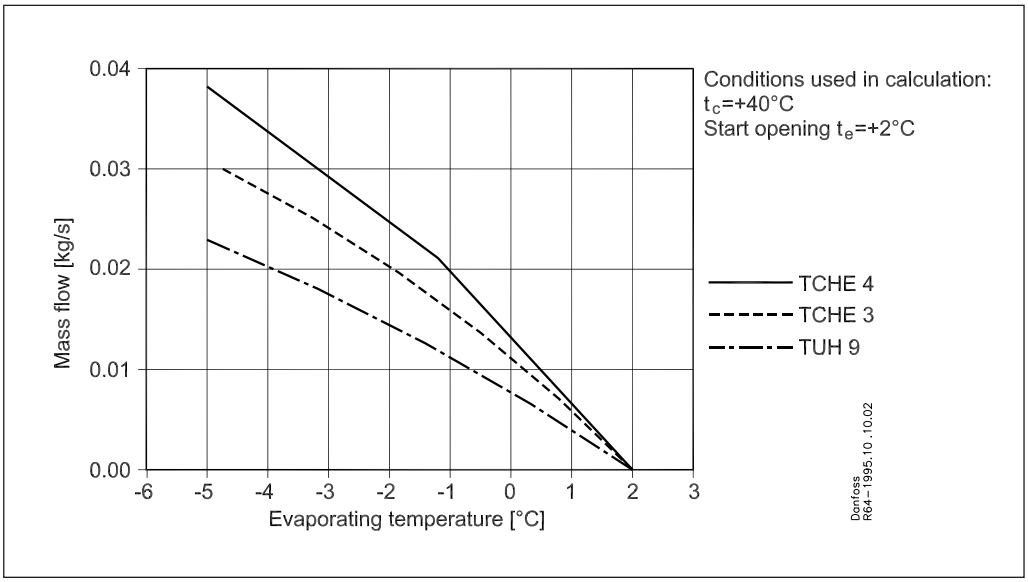
	Condensing temperature		
R22	+30°C	**+40°C**	+50°C
	0.8	**1.0**	1.2

The correction factor can either be multiplied with the valve capacity or the replacement capacity can be divided with the correction factor.

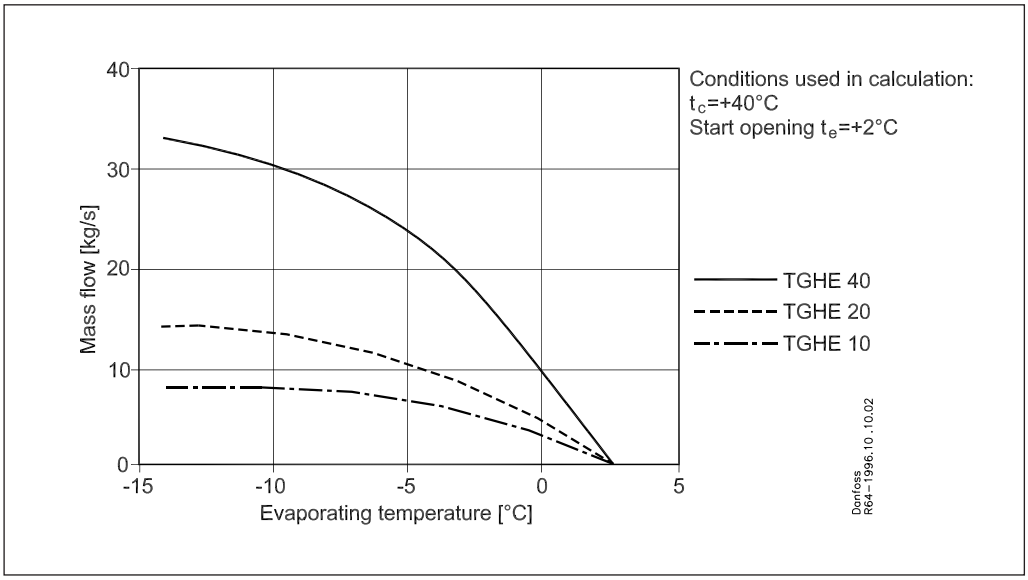
Mass flow

R22

TUH & TCHE



TGHE



Correction factor for condensing temperature

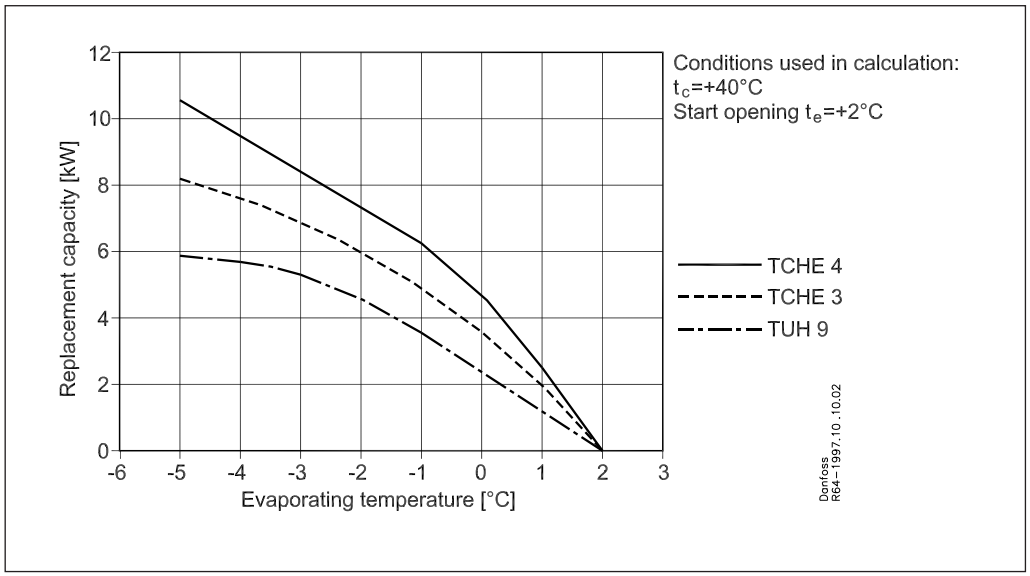
	Condensing temperature		
R22	+30°C	**+40°C**	+50°C
	0.8	**1.0**	1.2

The correction factor can either be multiplied with the valve capacity or the replacement capacity can be divided with the correction factor.

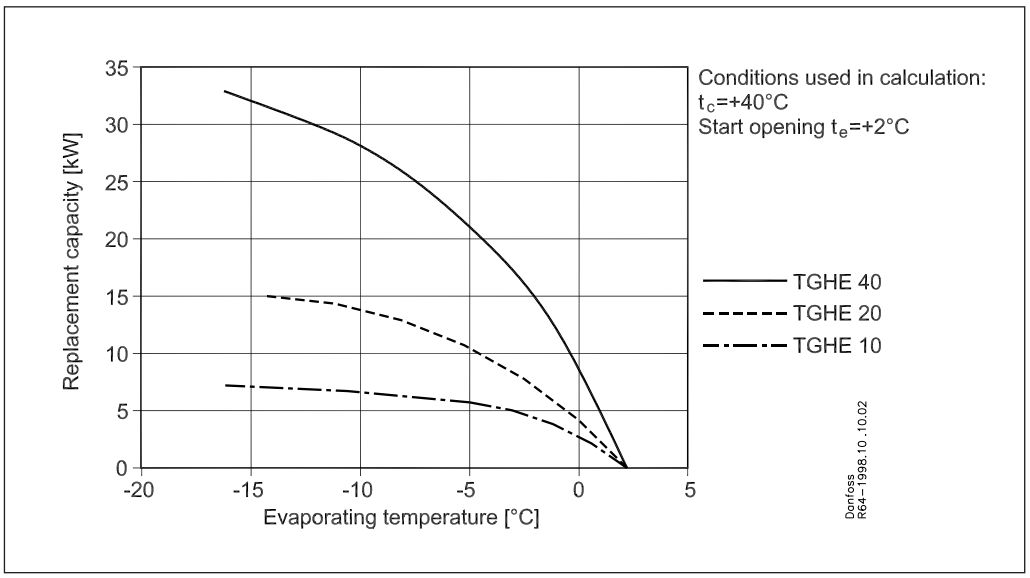
Replacement capacity

R404A/R507

TUH & TCHE



TGHE



Correction factor for condensing temperature

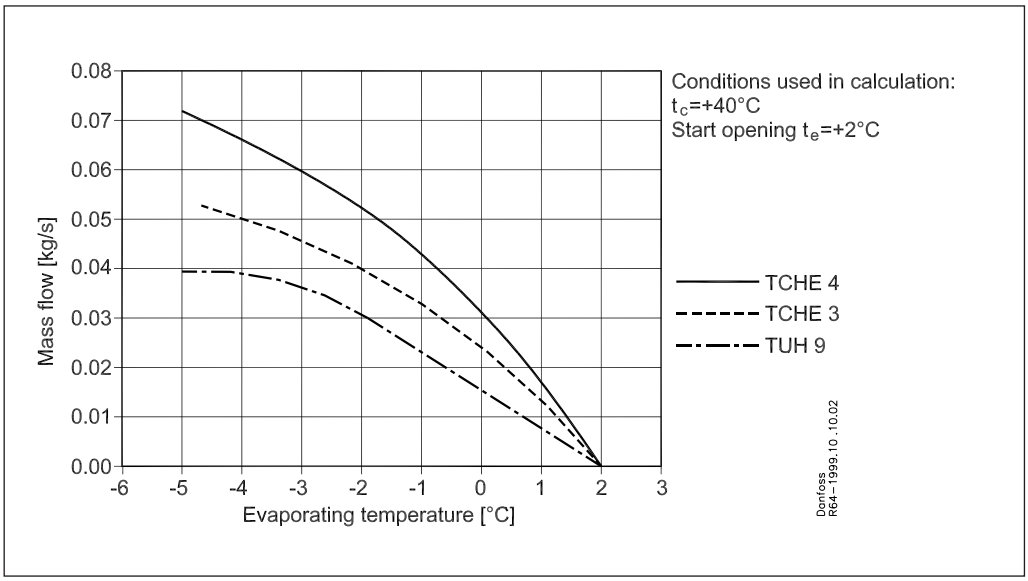
	Condensing temperature		
R404A/R507	+30°C	**+40°C**	+50°C
	0.8	**1.0**	1.2

The correction factor can either be multiplied with the valve capacity or the replacement capacity can be divided with the correction factor.

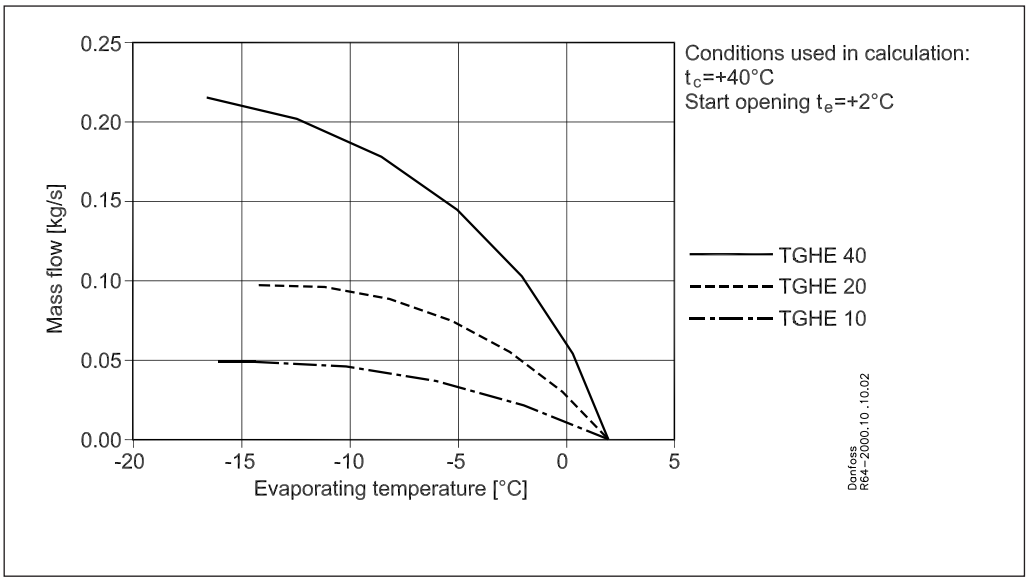
Mass flow

R404A/R507

TUH & TCHE



TGHE



Correction factor for condensing temperature

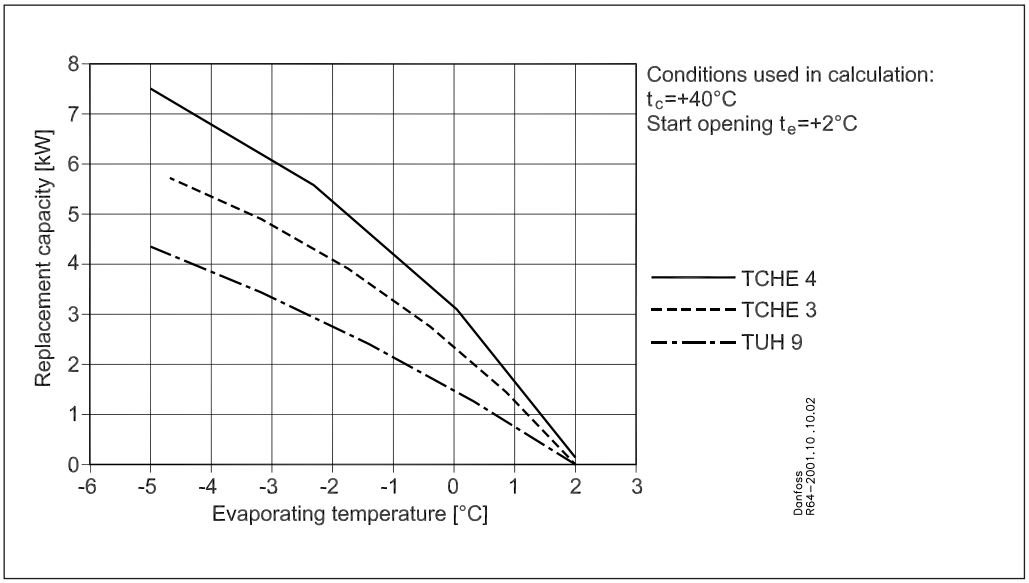
	Condensing temperature		
R404A/R507	+30°C	**+40°C**	+50°C
	0.8	**1.0**	1.2

The correction factor can either be multiplied with the valve capacity or the replacement capacity can be divided with the correction factor.

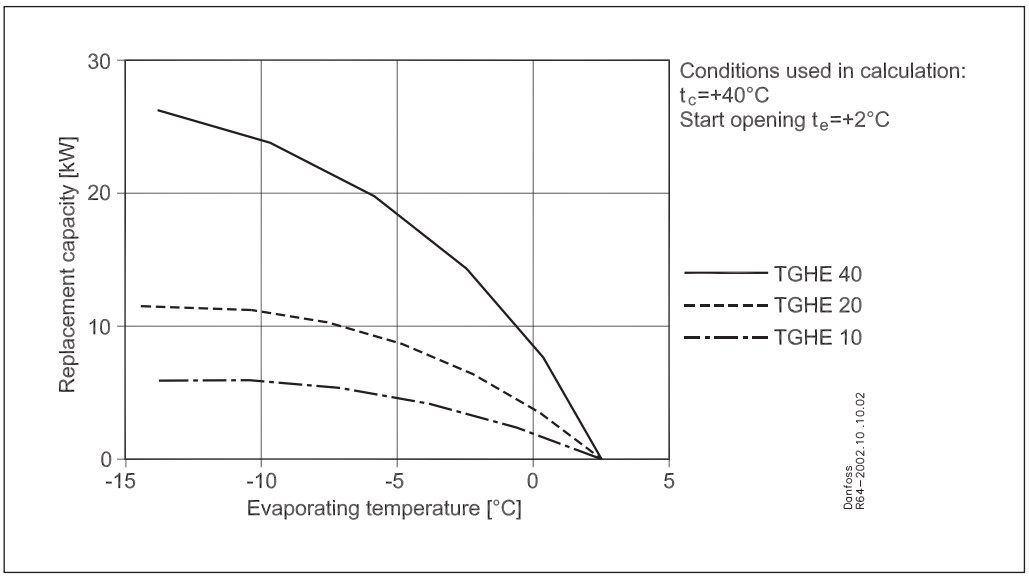
Replacement capacity

R407C

TUH & TCHE



TGHE



Correction factor for condensing temperature

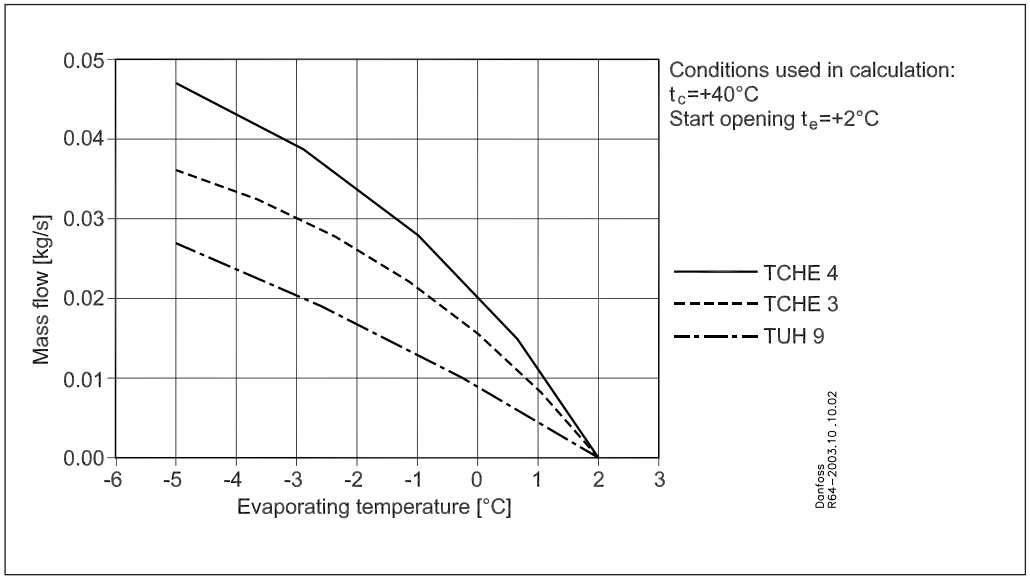
R407C	Condensing temperature		
	+30°C	**+40°C**	+50°C
	0.7	**1.0**	1.4

The correction factor can either be multiplied with the valve capacity or the replacement capacity can be divided with the correction factor.

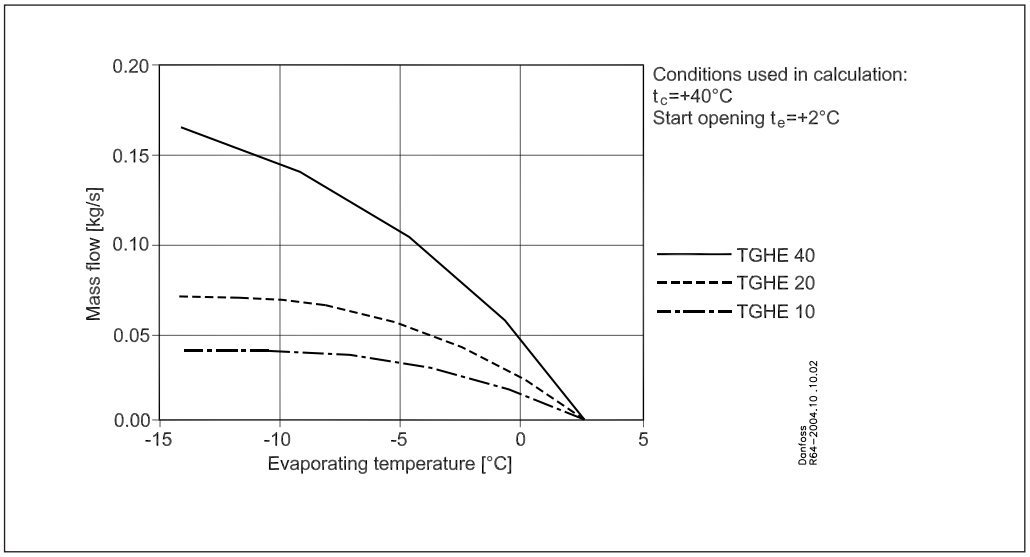
Mass flow

R407C

TUH & TCHE



TGHE



Correction factor for condensing temperature

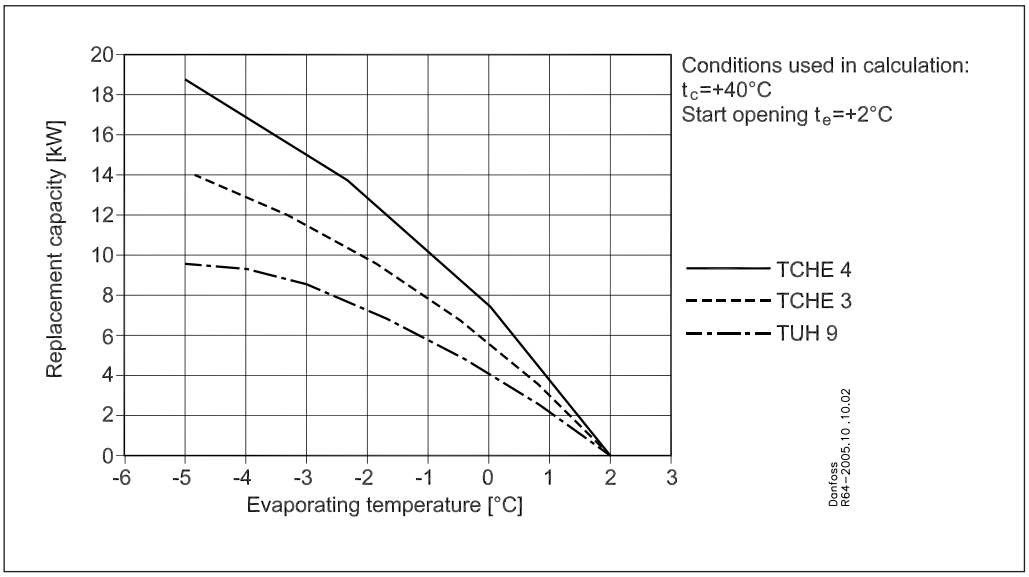
R407C	Condensing temperature		
	+30°C	**+40°C**	+50°C
	0.7	**1.0**	1.4

The correction factor can either be multiplied with the valve capacity or the replacement capacity can be divided with the correction factor.

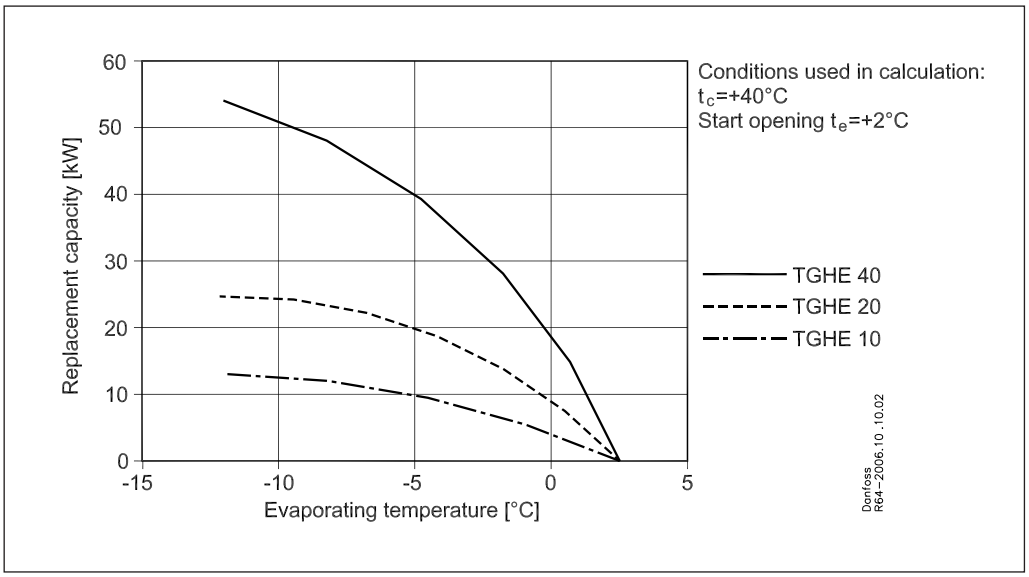
Replacement capacity

R410A

TUH & TCHE



TGHE



Correction factor for condensing temperature

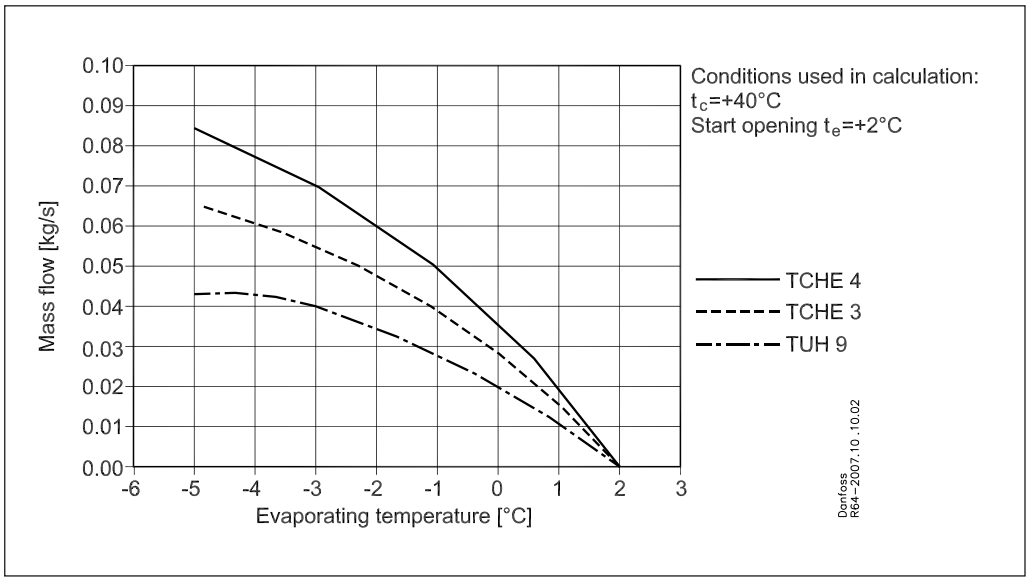
R410A	Condensing temperature		
	+30°C	**+40°C**	+50°C
	0.8	**1.0**	1.2

The correction factor can either be multiplied with the valve capacity or the replacement capacity can be divided with the correction factor.

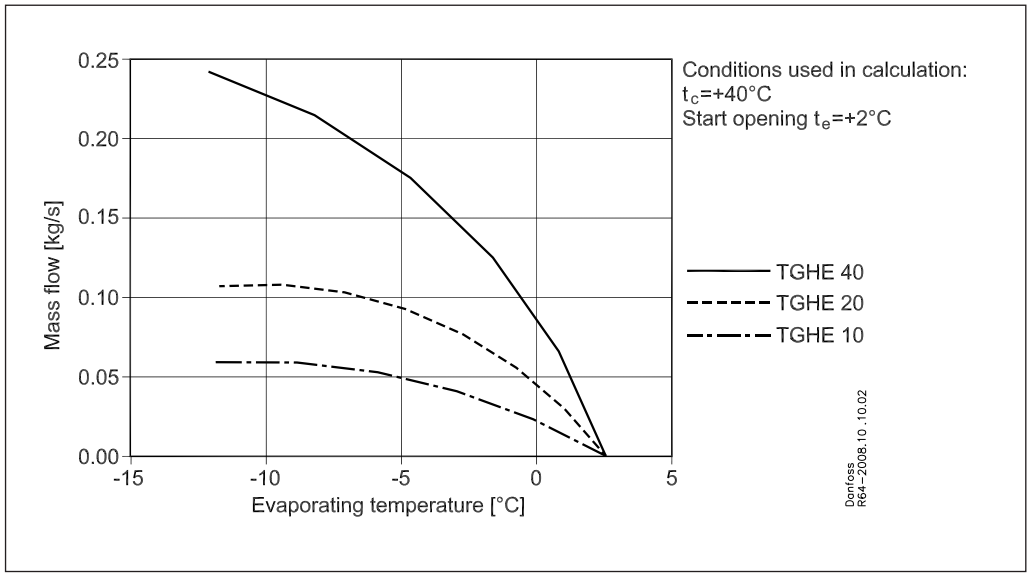
Mass flow

R410A

TUH & TCHE



TGHE



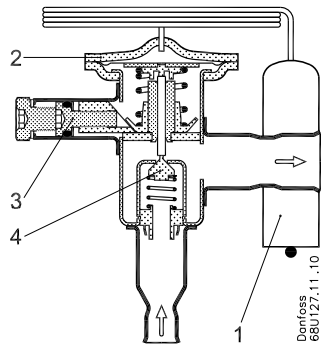
Correction factor for condensing temperature

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

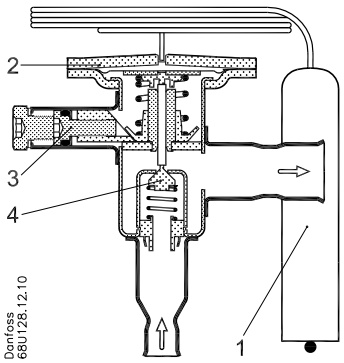
The correction factor can either be multiplied with the valve capacity or the replacement capacity can be divided with the correction factor.

Design/Function

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

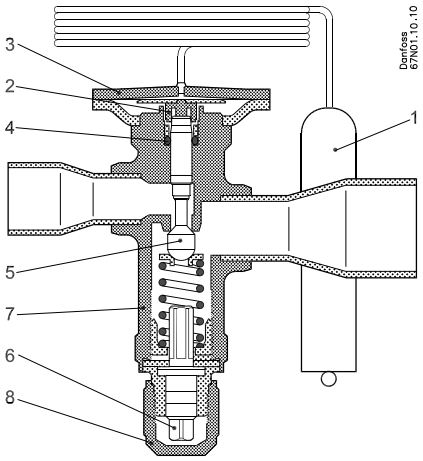


TUH, Angleway

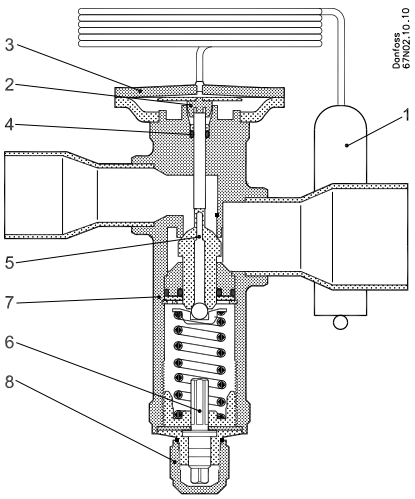


TCHE, Angleway

1. Bulb with capillary tube
2. Thrust pad
3. Element
4. Push pin seal
5. Two-way balance port
6. Static superheat adjustment spindle
7. Valve body
8. Protective cap

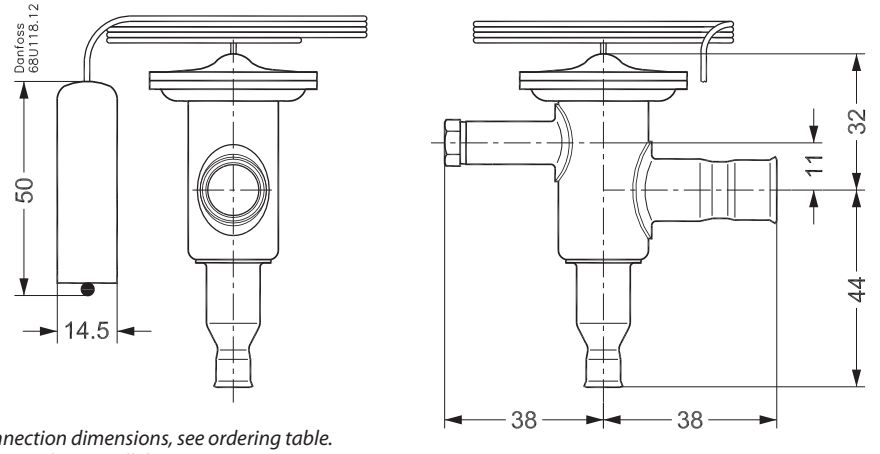


TGHE, Straightway



Dimensions and weight

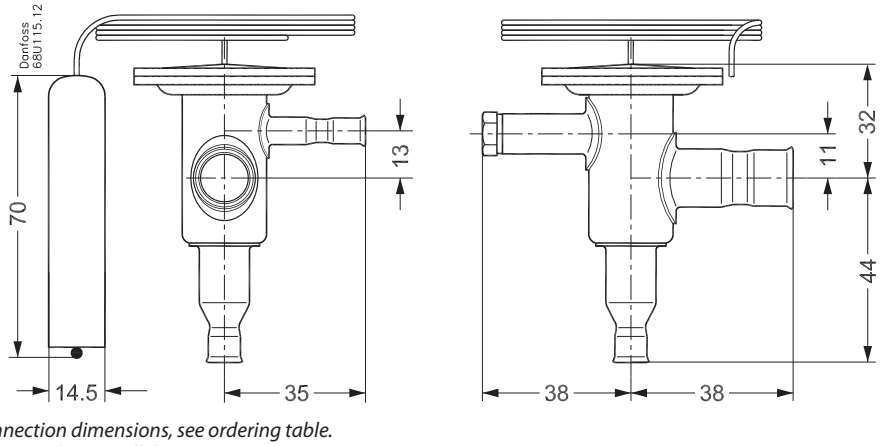
TUH



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

Weight
0.13 kg

TCHE

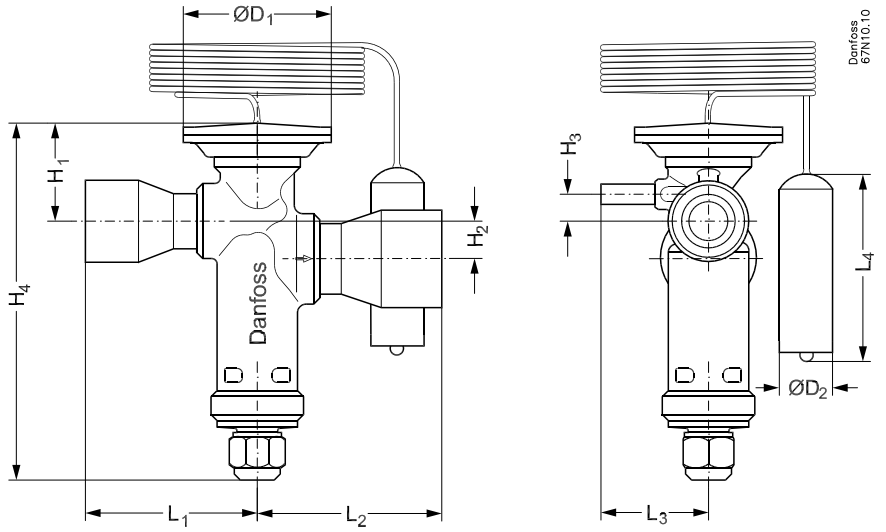


Connection dimensions, see ordering table.
TCHE, Angleway - all dimensions in mm

Weight
0.15 kg

Dimensions and weight

TGHE



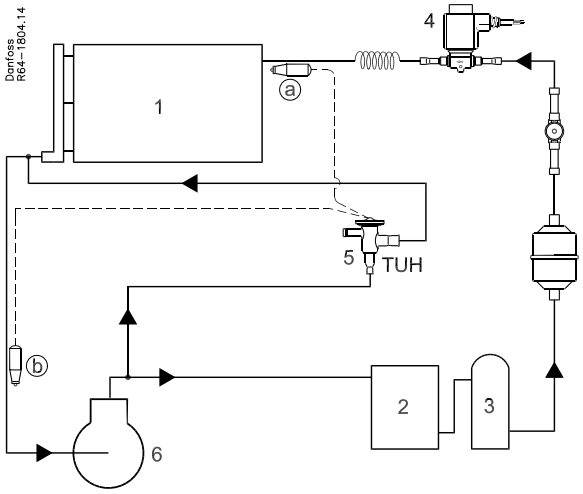
Connection dimensions, see ordering table.
TGHE, Straightway

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
TGEH 10	$^5/_8 \times ^5/_8$	16 × 16	1.5	25.0	7.5	5.0	93.0	41.5	45.5	36.5	70.0	45.0	14.5	0.42
TGEH 20	$^5/_8 \times ^5/_8$	16 × 16	1.5	28.5	9.0	8.0	117.0	48.0	62.0	40.0	70.0	53.0	14.5	0.65
TGHE 40	$1^1/_8 \times 1^1/_8$	28 × 28	3.0	31.0	15.0	11.0	144.0	69.5	43.5	78.0	60.0	60.0	19.2	1.06

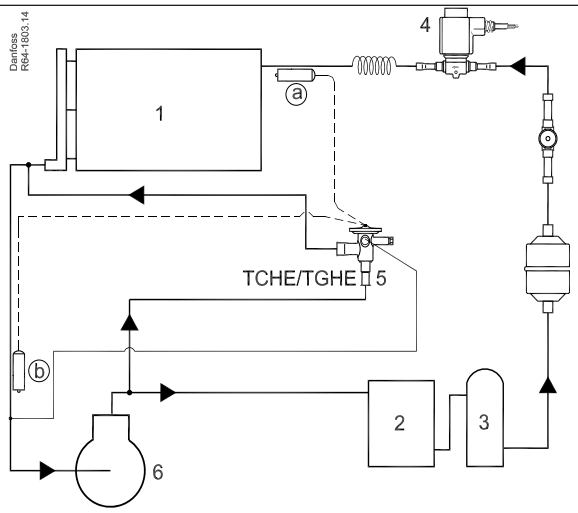
Application

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).

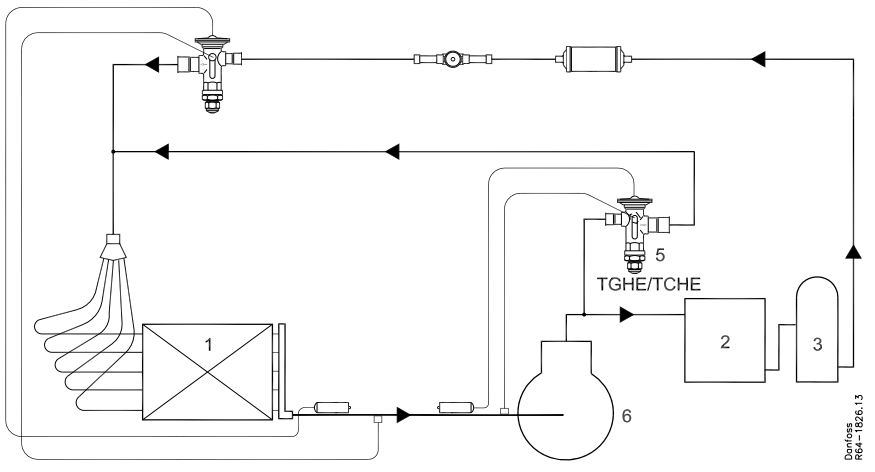
1. Evaporator
2. Condenser
3. Receiver
4. Solenoid valve
5. Discharge bypass valve with adjustable setting
6. Compressor



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 TGHE



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