Data sheet

Thermostatic expansion valve

TU / TC

Thermostatic expansion valves maintain a constant superheat level at the evaporator outlet

Description

The thermostatic expansion valves TUA/TUAE, TCAE with exchangeable orifice, TUB/TUBE/ TCBE with fixed orifice and TUC/TUCE/TCCE with fixed orifice and fixed superheat setting, are made of stainless steel and therefore especially well suited to refrigeration systems in the food industry and where aggressive environments exist. These thermostatic expansion valves have been developed and designed especially for easy and quick soldering into hermetic refrigeration systems.

The valves are offered in the following rated capacities:

1. TU (R407C): 0.5 – 17.0 kW / 0.14 – 4.8 TR
2. TC (R407C): 19.0 – 28.5 kW / 5.4 – 8.1 TR

Features & benefits

- Bi-metal connections
  - Fast and easy brazing process – no wet wrap needed
  - Braze alloys with as little as 5% Ag can be used
- Compact, lightweight design
  - Flexible and easy integration in any system
- Stainless steel
  - High body strength
  - High corrosion resistance
  - High vibration resistance
- Laser-welded power element
  - Ensures diaphragm´s structural integrity and lengthens life
- Stainless steel capillary tube
  - Flexible lightweight capillary tube, tolerates more bending for trouble-free installation and longer life
  - Greater resistance to vibration during operation because of low weight
- Laser engraving
  - Durable positive valve identification; no label that peels off over time
  - Customer-specific engraving available on request
- Fully hermetic brazed and laser-welded design
  - Hermetic valve in accordance with EU F-gas Regulation EU 517/2014
  - No external leakage which saves costs on maintenance and refrigerant loss
  - Protecting the environment and climate
- Manufactured according to IATF16949
  - Quality and reliability that are second to none

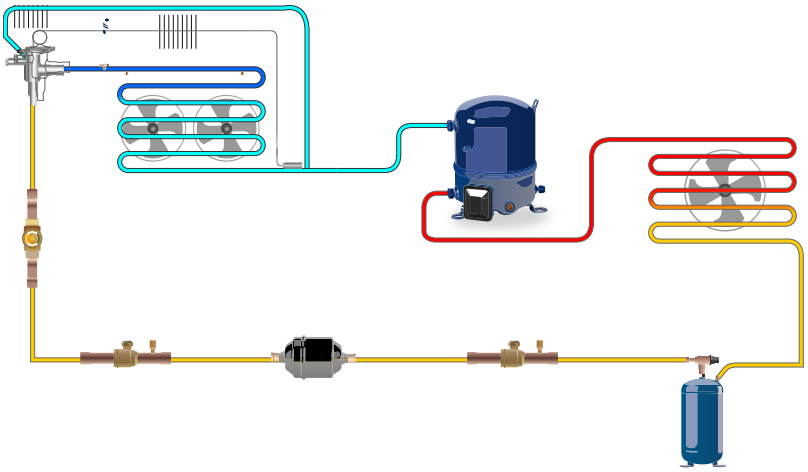
Applications

Thermostatic expansion valves regulate the amount of refrigerant that is injected into the evaporator. It does this to keep a constant superheat level at the outlet of the evaporator, thereby preventing liquid refrigerant from entering the suction line and possibly causing damage to the compressor.

Typical applications for TU and TC valves

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

Figure: Application Diagram



Available charges

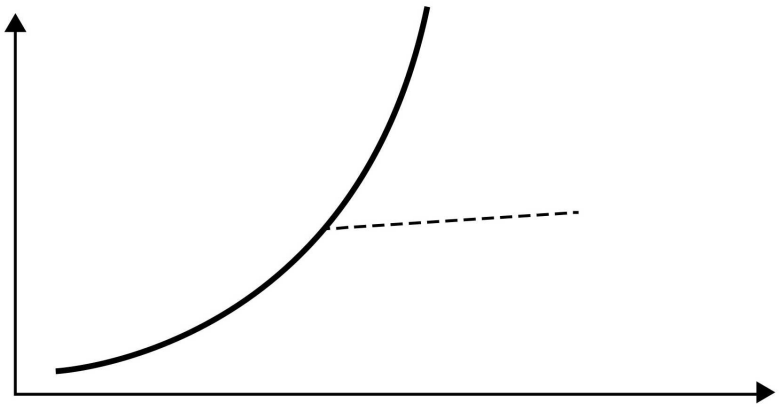
Universal charge

This is the standard charge, used in most applications. It is characterized by a very large operational evaporating temperature range, with only small variations in static superheat across the temperature range. It is available in two temperature ranges. One for normal (-40 – 10 °C / -40 – 50 °F) and one for low (-60 – -25 °C / -76 – -13 °F) temperature applications.

MOP charge (MOP = Maximum Operating Pressure)

The MOP charge is used to protect the compressor motor against overload during start-up. A valve with MOP charge will throttle liquid injection into the evaporator and thus prevent the evaporating pressure from rising above the specified MOP point. Above the MOP point, any increase in sensor temperature results in only minimal additional opening of the expansion valve. A number of different MOP points are available.

Figure: MOP = Maximum Operating Pressure



NOTE:

The MOP point will change if the factory superheat setting of the expansion valve is changed. If the setting is reduced, the MOP point will go up and vice versa.

MAH charge

The Danfoss Marinite Anti-Hunt (MAH) charge can be used in dynamic systems, often A/C systems. Here it reduces valve hunting during evaporator load changes, thereby helping to maintain stable system superheat and improve system performance.

F-charge

The F-charge is designed for refrigeration systems where low total superheat is required. Valves with this charge are delivered with an optimized low static superheat setting which allows for installation with no or minimal field adjustment. The F-charge also includes the Danfoss MAH function, as described above.

Ice charge

The ice charge is designed with an optimized static superheat characteristic, which allows for optimal function, particularly in Ice cubers, where low superheat is required in order to fully utilize the entire evaporator coil.

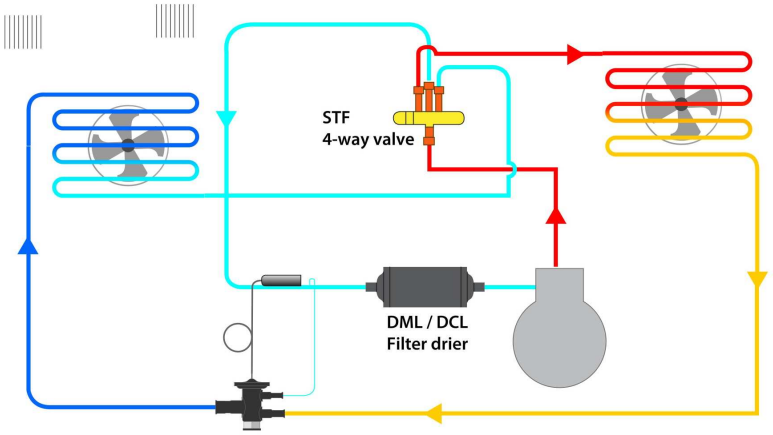
Milk charge

The milk charge is designed for use in milk cooling tanks where a limitation of the suction pressure is required, but where an MOP valve would suffer from charge migration.

Bi-flow

Bi-flow function is sometimes used in systems with 4-way reversing valves where hot gas defrosts, or heating cycles are required. Only externally equalized TU valves with orifices X to 8 and externally equalized TC valves with orifices 1 and 2 – without MOP charges, can be used in bi-flow mode. When used in reverse direction, the rated valve capacity will be reduced by up to 15%. Valves for bi-flow operation should be installed so that the normal refrigerant flow is towards the main evaporator

Figure: Bi-flow



Ordering

Product code numbers

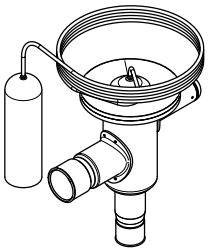
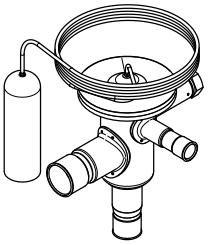
Figure: TUB	Figure: TUBE
	

Table: Angle, TUB_TUBE: Range N = -40 – 10 °C / -40 – 50 °F

Refrigerant	Type	Orifice Number	Pressure eq.	Connection (in X out)			
				inch	Code Number	mm	Code Number
R407C	TUB	X	Internal	¼ x ½	–	6x12	–
		0			–		–
		1			–		068U1901
		2			–		–
		3			–		068U1903
		4			–		068U1904
		5			–		068U1905
		6		⅜ x ½	068U1890		068U1906
		7		–	–	10x12	068U1907
	TUBE	5	External	⅜ x ½	068U1897	6x12	068U1915
		6		¼ x ½	068U1936		068U1916
		7		⅜ x ½	068U1937	10x12	068U1917
		8			068U1938		068U1918
		9			068U1939		–
R410A	TUB	X	Internal	–	–	-	–
		0		–	–		–
		1		¼ x ½	068U1958		–
		2			068U1959		–
		3			068U1960		–
		4			068U1961		–
		5			068U1962		–
		6			068U1963		–
		7		⅜ x ½	068U1964		–
	TUBE	5	External	¼ x ½	068U1971	6x12	068U1953
		6			068U1972		068U1954
		7		⅜ x ½	068U1973	10x12	068U1955
		8			068U1974		068U1956
		9			068U1975		068U1957

R134a	TUB	X	Internal	–	–	–	–
		0		–	–	–	–
		1		¼ x ½	068U2027	6x12	068U2000
		2			068U2028		068U2001
		3			068U2029		068U2002
		4			068U2030		068U2003
		5			068U2031		068U2004
		6			068U2032		068U2005
		7		⅜ x ½	-	10x12	068U2006
	TUBE	5	External	¼ x ½	068U2022	6x12	068U2013
		6			068U2023		068U2014
		7		⅜ x ½	068U2024	10x12	068U2015
		8			068U2025		068U2016
		9			068U2026		068U2017
R290	TUB	X	Internal	¼ x ½	–	6x12	–
		0			–		–
		1			068U3731		–
		2			068U3732		–
		3			068U3733		–
		4			068U3735		068U3744
		5			–		068U3831
		6			–		068U3745
		7			–		–
	TUBE	5	External	¼ x ⅜	068U3706	6x12	068U3717
		6			068U3707		068U3718
		7			068U3708		068U3719
		8		⅜ x ½	068U3709	10x12	068U3720
		9			068U3710		068U3721
R404A/R507A	TUB	X	Internal	¼ x ½	–	6x12	–
		0			–		–
		1			068U2094		068U2076
		2			068U2095		068U2077
		3			068U2096		068U2078
		4			068U2097		068U2079
		5			–		068U2080
		6			068U2099		068U2081
		7		⅜ x ½	068U2100	10x12	068U2082
	TUBE	5	External	¼ x ½	068U2107	6x12	068U2089
		6			068U2108		068U2090
		7		⅜ x ½	068U2109	10x12	068U2091
		8			068U2110		068U2092
		9			068U2111		068U2093

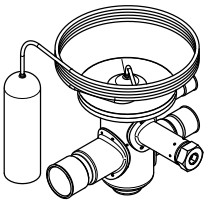
Figure: TUB	Figure: TUBE
	

Table: Straight, TUB_TUBE, Range N = -40 – 10 °C / -40 – 50 °F

Refrigerant	Type	Orifice Number	Pressure eq.	Connection (in x out)			
				inch	Code Number	mm	Code Number
R407C	TUB	7	Internal	⅜ x ½	068U2647	–	–
	TUBE	5	External	¼ x ½	068U2655	6 x 12	–
		6			–		068U2636
		7		⅜ x ½	068U2657	10 x 12	068U2637
		8			068U2658		068U2638
		9			068U2659		–
R410A	TUBE	6	External	¼ x ½	–	–	–
		7		⅜ x ½	–		–
		8			–		–
		9			068U3316		–
R134a / R513A	TUB	X	Internal	¼ x ⅜	–	6 x 12	–
		00			–		–
		1			068U3656		068U2540
		2			–		–
		3			–		068U2542
		4		¼ x ½	068U2561		068U2543
		5			–		068U2544
		6			–		–
		7		⅜ x ½	–		–
	TUBE	5	External	⅜ x ½	068U3498	10 x 12	–
		6			068U3818		–
		7			068U2573		068U2555
		8			068U2574		–
		9			068U2575		–
R290	TUB	X	Internal	¼ x ⅜	068U3700	6 x 12	068U3711
		00			068U3701		068U3712
R404A / R507A	TUB	X	Internal	¼ x ½	–	6 x 12	–
		00			–		–
		1			068U2594		068U3495
		2			–		–
		3			–		–
		4			–		068U2579
		5			–		–
		6			–		–
		7		⅜ x ½	–	10 x 12	–
	TUBE	5	External	¼ x ½	068U2607	–	–
		6			068U2608		–
		7		⅜ x ½	068U2609	–	–
		8			068U2610		–
		9			068U2611		–
R454B	TUB	3	Internal	⅜ x ⅝	068U7153	–	068U7159
		4			068U7154		068U7160
		6			068U7155		068U7161
	TUBE	4	External	⅜ x ½	068U7276	–	–
		5			068U7277		–
		6			068U7278		–

Figure: TCBE

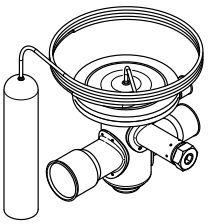


Table: Straight, TCBE, Range N = -40 – 10 °C / -40 – 50 °F

Refrigerant	Type	Orifice Number	Pressure eq.	Connection (in x out)			
				inch	Code Number	mm	Code Number
R407C	TCBE	1	External	½ x ⅝	068U4257	12 x 16	068U4249
		2			068U4258		068U4250
		3			068U4251		068U4259
R410A	TCBE	1	External	½ x ⅝	068U4265	12 x 16	068U4273
		2			068U4266		068U4274
		3			068U4267		068U4275
R134a / R513A	TCBE	1	External	½ x ⅝	068U4217	12 x 16	068U4225
		2			068U4218		068U4226
		3			068U4219		068U4227
R404A / R507A	TCBE	1	External	½ x ⅝	–	12 x 16	068U4241
		2			068U4234		068U4242
		3			068U4235		068U4243
R290	TCBE	1	External	⅜ x ⅝	068U4383	10 x 16	068U4386
		2		½ x ⅝	068U4384	12 x 16	068U4387
		3			068U4385		068U4388
Range N MOP 95 psig / 15 °C							
R407C	TCBE	1	External	½ x ⅝	068U4253	12 x 16	068U4261
		2			068U4254		068U4262
		3			–		068U4263
Range N MOP 165 psig / 15 °C							
R410A	TCBE	1	External	½ x ⅝	–	12 x 16	–
		2			068U4270		–
		3			–		068U4279
Range N MOP 55 psig / 15 °C							
R134a/R513A	TCBE	1	External	–	–	10 x 16	068U4228
		2			–	12 x 16	068U4230
		3			–		068U4231
Range N MOP 120 psig / 15 °C							
R404A / R507A	TCBE	1	External	–	–	10 x 16	068U4244
		2			–	12 x 16	068U4246
		3			–		068U4247

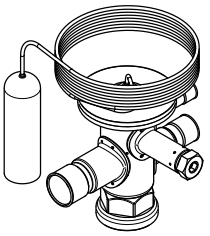
Figure: TUA	Figure: TUAE
	

Table: Straight, TUA_TUAE, Range N = -40 – 10 °C / -40 – 50 °F

Refrigerant	Type	Range	MOP	Pressure eq.	Connection (in x out)			
					inch	Code Number	mm	Code Number
R407C	TUA	N	–	Internal	¼ x ½	068U2324	06 x 12	068U2320
		N	–		⅜ x ½	068U2325	10 x 12	068U2321
		N MOP	95 psig / 15 °C		¼ x ½	068U2332	–	–
		N MOP	95 psig / 15 °C		⅜ x ½	068U2333	–	–
	TUAE	N	–	External	¼ x ½	068U2326	06 x 12	068U2322
		N	–		⅜ x ½	068U2327	10 x 12	068U2323
		N MOP	95 psig / 15 °C		–	–	06 x 12	068U2330
		N MOP	95 psig / 15 °C		⅜ x ½	068U2335	10 x 12	068U2331
R410A	TUA	N	–	Internal	⅜ x ½	068U2414	–	–
	TUAE	N	–	External	–	–	10 x 12	068U2780
		N MOP	165 psig / 15 °C		⅜ x ½	068U2939	–	–
		B MOP	55 psig / -15 °C		–	–	10 x 12	068U2450
R134a	TUA	N	–	Internal	¼ x ½	068U2204	6 x 12	068U2200
		N	–		⅜ x ½	068U2205	10 X 12	068U2201
		N MOP	55 psig / 15 °C		¼ x ½	068U2212	6 x 12	068U2208
		N MOP	55 psig / 15 °C		⅜ x ½	068U2213	–	–
	TUAE	F	–	External	¼ x ½	068U1256	–	–
		F	–		⅜ x ½	068U1257	–	–
		N	–		¼ x ½	068U2206	6 x 12	068U2202
		N	–		⅜ x ½	068U2207	10 X 12	068U2203
		N MOP	55 psig / 15 °C		¼ x ½	068U2214	–	–
		N MOP	55 psig / 15 °C		⅜ x ½	068U2215	10 X 12	068U2211
R404A / R507A	TUA	N	–	Internal	¼ x ½	068U2284	6 x 12	068U2280
		N	–		⅜ x ½	068U2285	10 x 12	068U2281
		N MOP	120 psig / 15 °C		¼ X ½	068U2292	–	–
		N MOP	120 psig / 15 °C		⅜ x ½	068U2293	–	–
		NM	75 psig / 0°C		¼ X ½	068U2300	6 x 12	068U2296
		B	–		¼ x ½	068U2308	–	–
		B	–		⅜ x ½	068U2309	–	–
		B MOP	30 psig / -20 °C		¼ x ½	068U2316	6 x 12	068U2312
		B MOP	30 psig / -20 °C		⅜ x ½	068U2317	–	–
	TUAE	F	–	External	¼ x ½	068U1252	–	–
		F	–		⅜ x ½	068U1253	–	–
		N	–		¼ x ½	068U2286	6 x 12	068U2282
		N	–		⅜ x ½	068U2287	10 x 12	068U2283
		N MOP	120 psig / 15 °C		3/8 x ½	068U2295		–
		NL	50 psig / -10 °C		¼ x ½	068U2931	–	–
		B MOP	30 psig / -20 °C		¼ x ½	068U2318		–
		B MOP	30 psig / -20 °C		⅜ x ½	068U2319	10 x 12	068U2315
R407A	TUAE	F	–	External	¼ x ½	068U1258	–	–
		F	–		⅜ x ½	068U1259	–	–
R407F	TUAE	F	–	External	¼ x ½	068U1250	–	–
		F	–		⅜ x ½	068U1251	–	–
R134a / R513A	TUAE	F	–	External	¼ x ½	068U1256	–	–
		F	–		⅜ x ½	068U1257	–	–
R448A	TUAE	F	–	External	¼ x ½	068U3772	–	–
		F	–		⅜ x ½	068U3773	–	–
R449A	TUAE	F	–	External	¼ x ½	068U3776	–	–
		F	–		⅜ x ½	068U3858	–	–

R454C	TUA	–	–	Internal	¼ x ½	068U3948	–	–
					–	–	6 x 12	068U3949
	TUAE	–	–	External	¼ x ½	068U3950	–	–
					–	–	6 x 12	068U3951
R455A	TUA	–	–	Internal	¼ x ½	068U3952	–	–
					–	–	6 x 12	068U3953
	TUAE	–	–	External	¼ x ½	068U3954	–	–
					–	–	6 x 12	068U3955
R1234yf	TUA	–	–	Internal	¼ x ½	068U3956	–	–
					–	–	6 x 12	068U3957
	TUAE	–	–	External	¼ x ½	068U3958	–	–
					–	–	6 x 12	068U3959
R1234ze(E)	TUA	–	–	Internal	¼ x ½	068U3960	–	–
					–	–	6 x 12	068U3962
	TUAE	–	–	External	¼ x ½	068U3961	–	–
					–	–	6 x 12	068U3964
R454A	TUA	–	–	Internal	¼ x ½	068U3963	–	–
					–	–	6 x 12	068U3966
	TUAE	–	–	External	¼ x ½	068U3965	–	–
					–	–	6 x 12	068U3970

Figure: TCAE

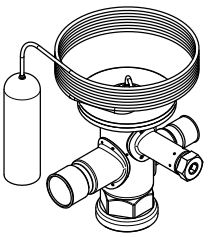


Table: Straight, TCAE, Range N = -40 – 10 °C / -40 – 50 °F

Refrigerant	Type	Range	MOP	Pressure eq.	Connection (in x out)			
					inch	Code Number	mm	Code Number
R407C	TCAE	N	–	External	⅜ x ⅝	068U4324	10 x 16	068U4328
		N	–		½ x ⅝	068U4325	12 x 16	068U4329
		N MOP	95 psig / 15 °C		⅜ x ⅝	068U4326	–	–
		N MOP	95 psig / 15 °C		½ x ⅝	068U4327	12 x 16	068U4331
R410A	TCAE	N	–	External	⅜ x ⅝	068U4336	–	–
		N	-		½ x ⅝	068U4337	12 x 16	068U4341
		N MOP	165 psig / 15 °C			068U4339	12 x 16	068U4343
R134a/R513A	TCAE	N	–	External	⅜ x ⅝	068U4292	10 x 16	068U4296
		N	–		½ x ⅝	068U4293	12 x 16	068U4297
		N MOP	55 psig / 15 °C			068U4295	12 x 16	068U4299
R404A / R507A	TCAE	N	–	External	⅜ x ⅝	068U4304	10 x 16	068U4308
		N	–		½ x ⅝	068U4305	12 x 16	068U4309
		N MOP	120 psig / 15 °C			068U4307	10 x 16	068U4310
		B	–			068U4317	12 x 16	068U4321
		B MOP	30 psig / -20 °C			068U4319	10 x 16	068U4322
R448A	TCAE	N	–	External	½ x ⅝	068U4599	–	–
R449A		N	–			068U4598	–	–

Table: TUA / TUAE and TCAE, orifice assembly with inlet screen and gasket

Type	Orifice Number	Bleed	Code Number
TUA / TUAE	0	–	068U1030
	1	–	068U1031
	1	15%	068U1131
	2	–	068U1032
	2	15%	068U1132
	3	–	068U1033
	3	15%	068U1133
	4	–	068U1034
	4	15%	068U1134
	5	–	068U1035
	5	15%	068U1135
	6	–	068U1036
	6	15%	068U1136
	7	–	068U1037
	7	15%	068U1137
	8	–	068U1038
	8	15%	068U1138
	9	–	068U1039
	9	15%	068U 1139
TCAE	1	–	068U4100
	1	15%	068U4097
	2	–	068U4101
	2	15%	068U4098
	3	–	068U4202
	3	15%	068U4099

Accessories code numbers

Figure: Bulb strap

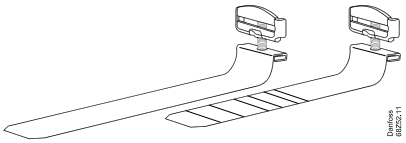


Table: Bulb strap for TU, TC, T2

Code number	Description	Pack mode	Quantity / pack
068U3525	Accessory bag with short bulb strap I/45	I	45
068U3527	Accessory bag with long bulb strap I/45	I	45
068U3520	Accessory bag with short Bulb strap M/25	M	25
068U3528	Accessory bag with long Bulb strap M/45	M	45

Figure: OEM bulb strap

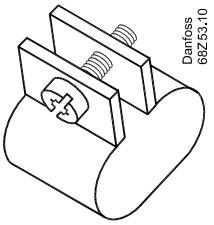
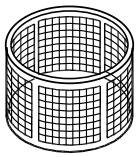


Table: Bulb strap for TU, TC, T2

Code number	Description	Pack mode	Quantity / pack
068U3509	OEM bulb strap 3/8 in tube	I	45
068U3510	OEM bulb strap 1/2 in tube	I	45
068U3511	OEM bulb strap 5/8 in tube	I	45

I	Industrial pack (OEM)
M	Multipack (Wholesaler)

Figure: Spare parts TUA / TUAE and TCAE



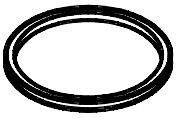


Table: TUA / TUAE and TCAE

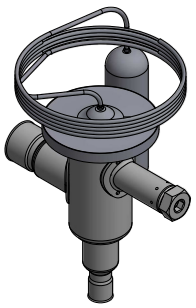
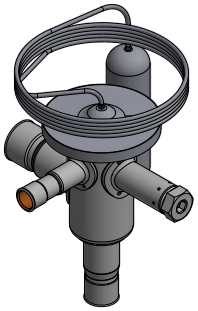
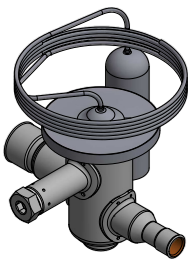
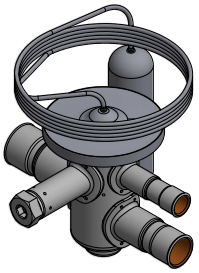
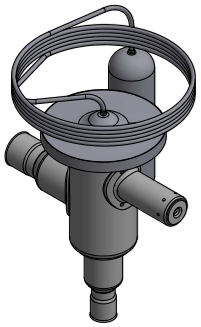
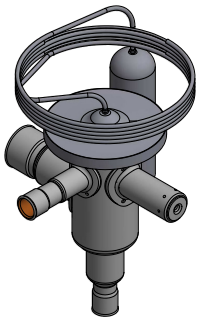
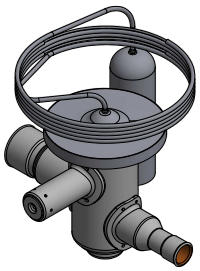
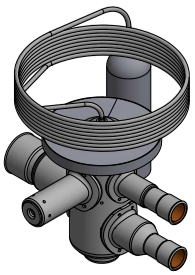
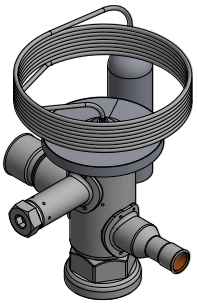
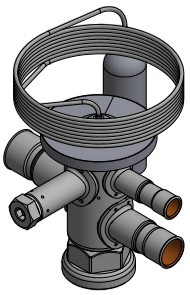
Code number	Description	Pack mode	Quantity pack
068U1706	Inlet screen TUA/TUAE 0 - 4	Industrial packing	24
068U0016	Inlet screen TUA/TUAE 5 - 9, TCAE 1 - 3	Industrial packing	24
068U0015	Gasket	Industrial packing	24

NOTE:
To secure tightness, the orifice gasket must be changed each time the orifice is disassembled

Overview

Product portfolio

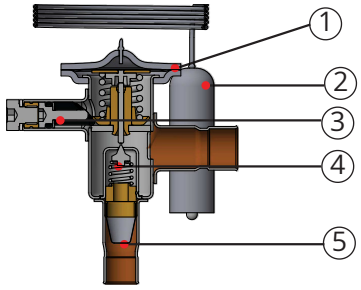
Table: Overview of available versions

Type	Angleway		Straightway	
	Internal pressure equalization	External pressure equalization	Internal pressure equalization	External pressure equalization
TUB/TUBE/TCBE Adjustable superheat				
TUC/TUCE/TCCE Non-adjustable superheat				
TUA/TUAE/TCAE Adjustable superheat and exchangeable orifice				

Functions

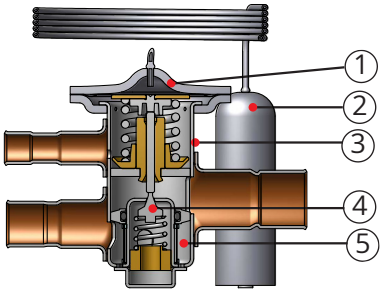
Thermostatic expansion valves maintain a constant superheat level at the evaporator outlet. It does this by controlling the amount of refrigerant that is injected into the evaporator, taking both the evaporator load and ambient temperatures into consideration. This both optimizes the efficiency of the refrigeration system and prevents liquid refrigerant from entering the suction line, possibly causing damage to the compressor. Particularly when compared to systems that use capillary tubes, the thermostatic expansion valve will offer a significant energy saving.

Figure: Angleway



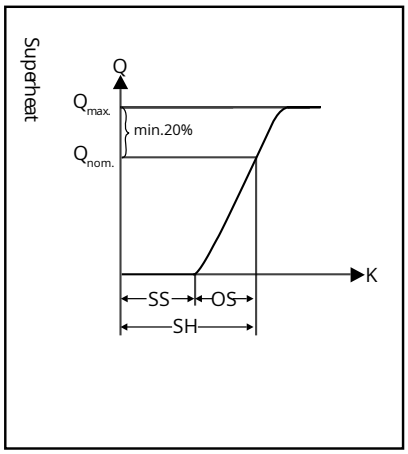
1	Thermostatic element with diaphragm
2	Bulb with capillary tube
3	Setting spindle for adjustment of static superheat SS
4	Orifice assembly
5	Filter

Figure: Straightway



1	Thermostatic element with diaphragm
2	Bulb with capillary tube
3	Setting spindle for adjustment of static superheat SS (behind valve, not visible)
4	Orifice assembly
5	Filter

Figure: Superheat



SS	Static superheat
OS	Opening superheat
SH=SS+OS	Opening superheat
Q_{nom}	Rated capacity
Q_{max}	Maximum capacity

Static superheat (SS) can be adjusted by turning the setting spindle (3), (TUB/TUBE/TCBE) Static Superheat cannot be adjusted on TUC/TUCE/TCCE.
The superheat setting is 4K for all standard valves. The opening superheat is 4K, measured from when the valve begins to open to when the valve gives its rated capacity (Q_{nom}).

Table: Example

Features	Value
Static superheat	SS = 4K
Opening Superheat	OS = 4K
Total superheat	SH = 4 + 4 = 8K

Operation

Superheat

Superheat is the controlling parameter of a TXV. Superheat, measured at the evaporator outlet, is defined as the number of degrees the refrigerant vapor is heated above its saturation temperature (boiling point), at a specific pressure. Liquid entering the compressor causes serious damage. To prevent this, the TXV will maintain a certain minimum superheat. When discussing superheat in relation to TXV valve operation, the following terms are used:

Static superheat

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

Opening superheat

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

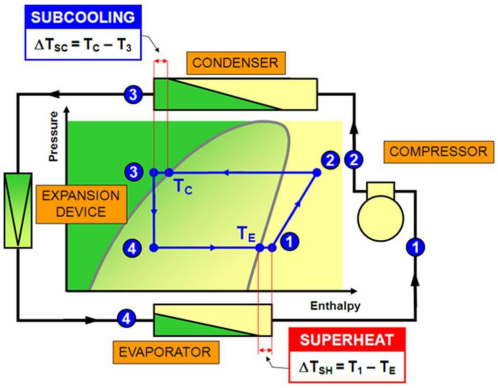
Total superheat

Total superheat is static superheat plus opening superheat, and is what is measured at the evaporator outlet.

Subcooling

Subcooling, measured at the condenser outlet, is defined as the number of degrees a liquid refrigerant is cooled below its saturation temperature (boiling point), at a specific pressure. Subcooling is necessary to prevent flash gas forming in the liquid line. Depending on system design, various levels of subcooling may be needed. In most cases, 2 to 5K of subcooling is adequate. If flash gas forms in the liquid line, the capacity of the TXV will be greatly reduced.

Figure: Superheat and Subcooling



Presettings

Sizing example

How to select a TU or TC thermostatic expansion valve.
Example: Refrigerant: R134a
Cooling capacity: 3KW
Evaporating temperature: -10 °C
Condensing temperature: 35 °C
Total (useful) superheat: 8K
Subcooling: 6K

This guide will help select a thermostatic expansion valve based on the above system parameters using the Coolselector tool.

Step 1

Open the Coolselector tool and select thermostatic expansion valve. Coolselector can be downloaded from

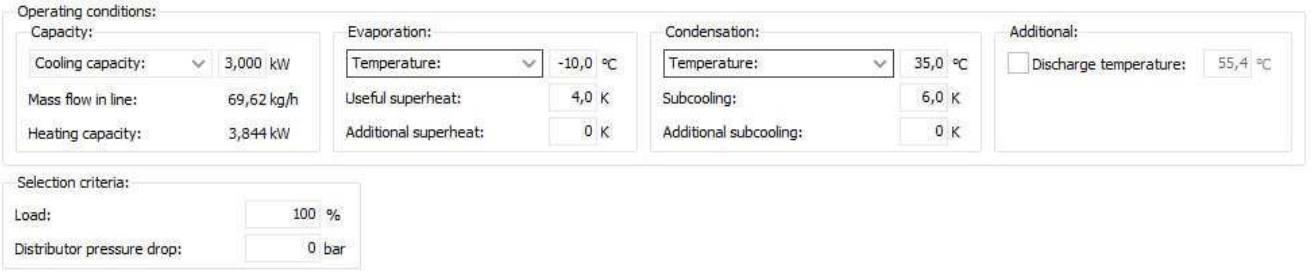
https:// www.danfoss.com/en/service-and-support/downloads/dcs/coolselector-2/ or use online on

http:// coolselectoronline.danfoss.com

Step 2
Select TU/TC from product families and the refrigerant. For this example: R134a.

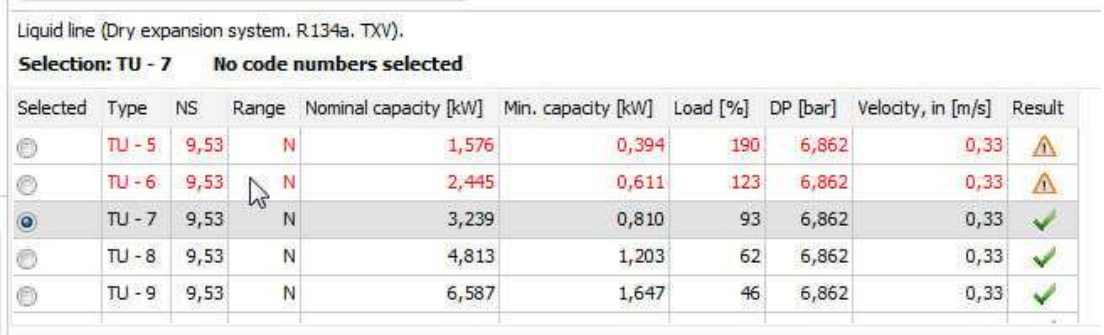
Step 3
Fill in the operating conditions at the top as per the system parameters stated in the example.

Figure: Operating conditions



Step 4
Now select the appropriate orifice size from the list provided by the tool. For this example, the tool suggests TU-7, which is the valve size closest to 100% load.

Figure: Coolselector2 Selection TU

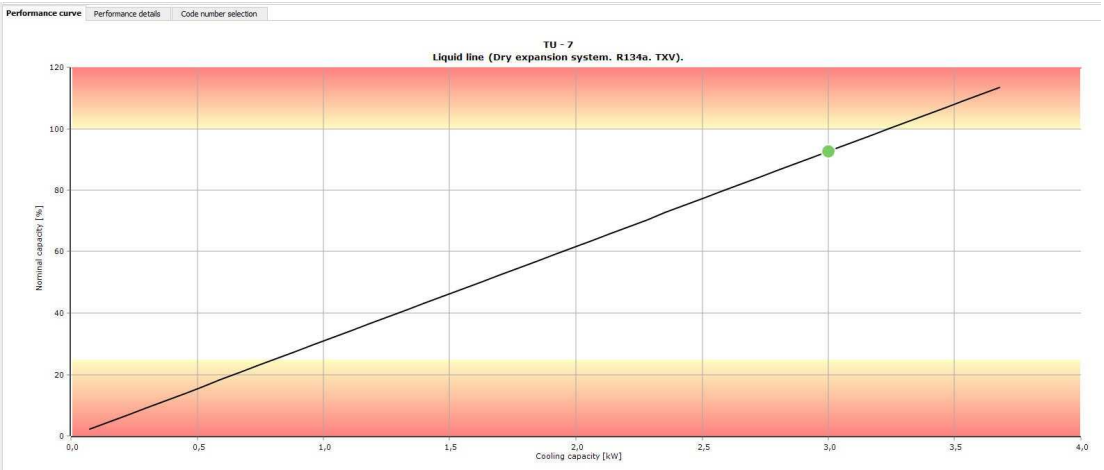


Selected	Type	NS	Range	Nominal capacity [kW]	Min. capacity [kW]	Load [%]	DP [bar]	Velocity, in [m/s]	Result
○	TU - 5	9,53	N	1,576	0,394	190	6,862	0,33	⚠
○	TU - 6	9,53	N	2,445	0,611	123	6,862	0,33	⚠
◉	TU - 7	9,53	N	3,239	0,810	93	6,862	0,33	✓
○	TU - 8	9,53	N	4,813	1,203	62	6,862	0,33	✓
○	TU - 9	9,53	N	6,587	1,647	46	6,862	0,33	✓

: 1. Always remember to include sub cooling in the selection parameters. It is important for TXV selection. When all other parameters remain constant, an increase in sub cooling will increase the capacity of the thermostatic expansion valve. Insufficient sub cooling can create flash gas before the valve and high sub cooling can create lesser flash gas after the valve.
: 2. Coolselector determines pressure drop across the valve based on the condensing and evaporating temperatures. If the system is using a distributor, has valves in the liquid line or height variations between evaporator and condenser, the pressure drops from these components must be summarized, and given as input to the tool, using the "Distributor pressure drop" field. The capacity of the thermostatic expansion valve is influenced by these pressure drops.

Step 5
The code number for the valve can be selected based on additional parameters like specific charge, equalization, connector type, connection size etc. at the code number selection tab. The performance details will also be shown in detail under the Performance details tab.

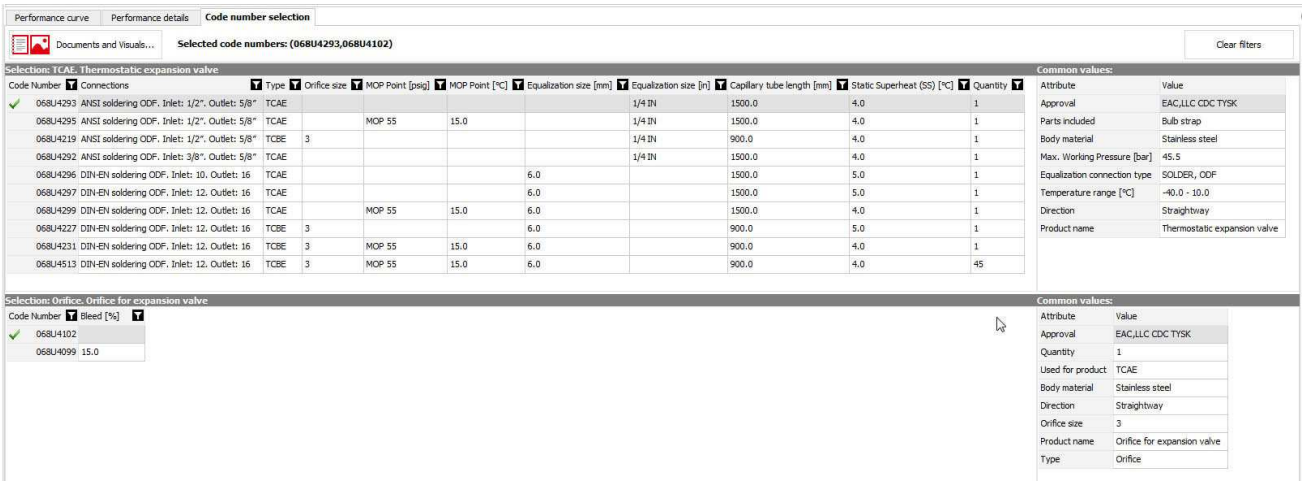
Figure: Coolselector2 Performance curve



Step 6

For list of code numbers, click the "Code number selection" tab.

Figure: Coolselector2 code number selection



Code Number	Connections	Type	Orifice size	MOP Point [psig]	MOP Point [°C]	Equalization size [mm]	Equalization size [in]	Capillary tube length [mm]	Static Superheat (SS) [°C]	Quantity
068U4293	ANSI soldering ODF. Inlet: 1/2". Outlet: 5/8"	TCAE					1/4 IN	1500.0	4.0	1
068U4295	ANSI soldering ODF. Inlet: 1/2". Outlet: 5/8"	TCAE		MOP 55	15.0		1/4 IN	1500.0	4.0	1
068U4219	ANSI soldering ODF. Inlet: 1/2". Outlet: 5/8"	TCBE	3				1/4 IN	900.0	4.0	1
068U4292	ANSI soldering ODF. Inlet: 3/8". Outlet: 5/8"	TCAE					1/4 IN	1500.0	4.0	1
068U4296	DIN-EN soldering ODF. Inlet: 10. Outlet: 16	TCAE				6.0		1500.0	5.0	1
068U4297	DIN-EN soldering ODF. Inlet: 12. Outlet: 16	TCAE				6.0		1500.0	5.0	1
068U4299	DIN-EN soldering ODF. Inlet: 12. Outlet: 16	TCAE		MOP 55	15.0	6.0		1500.0	4.0	1
068U4227	DIN-EN soldering ODF. Inlet: 12. Outlet: 16	TCBE	3			6.0		900.0	5.0	1
068U4231	DIN-EN soldering ODF. Inlet: 12. Outlet: 16	TCBE	3	MOP 55	15.0	6.0		900.0	4.0	1
068U4513	DIN-EN soldering ODF. Inlet: 12. Outlet: 16	TCBE	3	MOP 55	15.0	6.0		900.0	4.0	45

Attribute	Value
Approval	EAC,LLC CDC TYSK
Parts included	Bulb strap
Body material	Stainless steel
Max. Working Pressure [bar]	45.5
Equalization connection type	SOLDER, ODF
Temperature range [°C]	-40.0 - 10.0
Direction	Straightway
Product name	Thermostatic expansion valve

Code Number	Bleed [%]
068U4102	
068U4099	15.0

Attribute	Value
Approval	EAC,LLC CDC TYSK
Quantity	1
Used for product	TCAE
Body material	Stainless steel
Direction	Straightway
Orifice size	3
Product name	Orifice for expansion valve
Type	Orifice

Product details

General data

Table: Technical data

Types	Description
Charges available for following refrigerants	R290, R134a, R513A, R404A, R407A, R407C, R407F, R448A, R449A, R507, R410A, R452A, R600a, R454C, R455A, R1234yf, R1234ze(E), R454A TU and TC valves are continually evaluated for use with newer refrigerants. For further information please contact Danfoss.
Ignition assessment	Positive. Zone 2 (Category 3, IIA) TUA/TUAE and TCAE only approved for A1 refrigerants
Complies with PED	Yes, fluid group 2, Article 4 paragraph 3, DN < 25 (inner bore)
Standard charge ranges with MOP	-40 –10 °C / -40 – 50 °F MOP 15 °C / 60 °F -40 – -5 °C / -40 – 25 °F MOP 0 °C / 32 °F -60 – -25 °C / -75 – -15 °F MOP -20 °C / -4 °F (not for R134a and R513A) For other ranges, please contact Danfoss.
Max. working pressure PS/MWP	TU (non R410A): 34 bar(g) / 500 psi(g) TU (R410A): 45.5 bar(g) / 660 psi(g) TC (all): 45.5 bar(g) / 660 psi(g)
Connection type	Solder, ODF
Connection sizes, Angleway	Inlet: ¼ in, ⅜ in, 6 mm, 10 mm Outlet: ⅜ in, ½ in, ⅝ in, 10 mm, 12 mm, 16 mm
Connection sizes, Straightway	Inlet: ¼ in, ⅜ in, ½ in, 6 mm, 10 mm, 12 mm Outlet: ⅜ in, ½ in, ⅝ in, 10 mm, 12 mm, 16 mm
Connection sizes, [External equalization]	¼ in, 6 mm
Orifices, TUB(E), TUC(E)	X, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9
Orifices TUA(E)	1, 2, 3, 4, 5, 6, 7, 8, 9
Orifices TCAE, TCBE, TCCE	1, 2, 3
Bleed	15% (of nominal capacity) available. For 30%, contact Danfoss.
Biflow operation	With flow in the opposite direction, the rated capacity is reduced by up to 15%.
Biflow not recommended in	TU with orifice 9 TC with orifice 3 All valves with MOP charges
Biflow not possible in	All valves with internal equalization
Environmental transport/storage temperature and humidity	Max. 65 °C / 150 °F, Humidity: <100% RH
Max. body temperature (mounting/operation)	120 °C / 250 °F (short lived peak: 150 °C / 300 °F)
Min. body temperature	See Evaporating temperature range low end.
Max. bulb temperature (operation)	Standard valves: 100 °C / 212 °F Valves with MOP charges: 150 °C / 300 °F
Static superheat (SS)	Standard 4K / 7.2 °F Customer-specific settings and non-adjustable valves are available. Please contact Danfoss.
Material of product	Body: Stainless steel Capillary tube: Stainless steel Connector: Bimetal (stainless steel and copper)
Standard capillary tube lengths	TU: 0.8 m / 31.5 in TC: 0.9 m / 35 in
Special capillary tube lengths available	0.3 m / 11.8 in, 0.45 m / 18.0 in and 1.5 m / 59 in
Inlet strainer	TU orifice X - 4 = 100 mesh / All other TU and TC = 50 mesh / TU and TC angle = 80 mesh

Serviceable	No
Corrosion	Passed salt spray test (EN ISO 9227 NSS) and ASTM prohesion (ASTM G85) test. Both 2000 hours

Identification

Main valve data is given on the power element (Fig. TUA / TUAE (incl. orifice) and TC Angle way), on the valve body (Fig. TC Straightway) and on the orifice assembly (Fig. TCAE (incl. orifice).

For valves and separate orifices with bleed (optional), the bleed size is marked on the valve body or orifice assembly respectively. BP15 (= 15% bleed of nominal capacity).

For valves with fixed superheat setting (types TUC, TUCE or TCCE), the static superheat is printed on the power element (e.g. SS 4 °C/7.2 °F).

All standard valves are marked with EAC, in case they need to be exported to Eurasia.

Figure: Power element, TUBE

Figure: Power element, TCBE

Table: Power element, data example:

TUBE	Type (E = external pressure equalization)
068Uxxxx	Code number
R404A/R507	Refrigerant
MOP 55/+15°C	MOP-point in psig and °C (optional)
-40/+10°C	Evaporating temperature range in °C
-40/+50°F	Evaporating temperature range in °F
PS 34 bar/MWP 500 psig	Max. working pressure in bar and psig
N0619A	Date marking (N = Nordborg, week 06, year 2019, weekday A = Monday)

Figure: Valve body, TUBE and TCBE

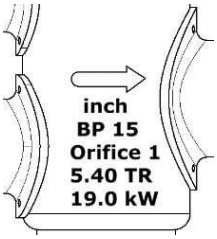


Table: Valve body, data example

Arrow	Normal flow direction
Inch	Connection in Inches (MM = millimeters)
BP15	15% bleed (optional)
Orifice 1	Orifice number 1
5.40 TR	Rated capacity Qnom, in tons of refrigeration
19.0 kW	Rated capacity Qnom, in kW

Figure: TUA / TCA, orifice

Table: Orifice assembly, data example

TU	Orifice for valve type (TUA or TCA)
5	Orifice assembly number
068Uxxxx	Code number, orifice with filter and gasket
0619	Date marking (week 06, year 19)

Design

TU and TC valves are basically identical, except for the larger diaphragm on the TC. The larger diaphragm allows for more travel of the orifice cone, which gives the TC valve more capacity than the TU valve.
TU and TC valves are available in both Straightway and Angleway versions. TUA(E) and TCAE only as straight flow.

Figure: Angle flow (fixed orifice)

Figure: Straight flow (fixed orifice)

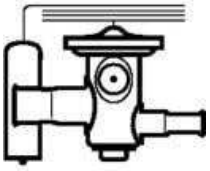


Figure: Straight flow (exchangeable orifice)

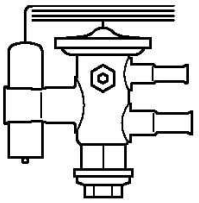


Figure: TU Angleway

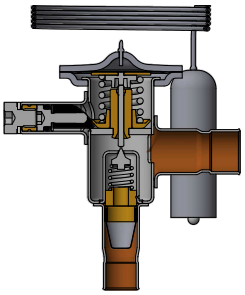


Figure: TU Straightway

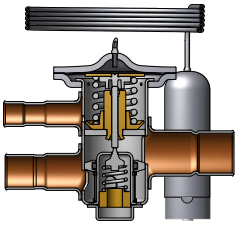


Figure: TUA / TUAE (incl. orifice)

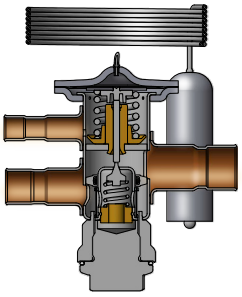


Figure: TC Angleway

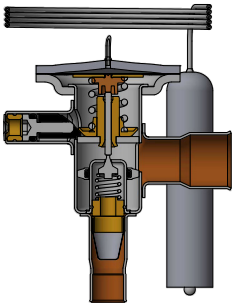


Figure: TC Straightway

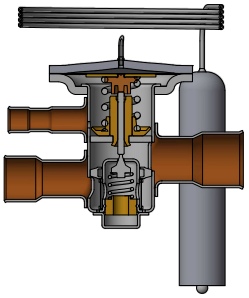
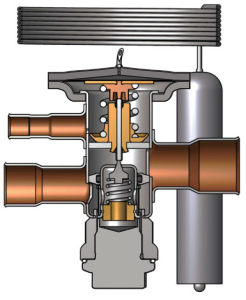


Figure: TCAE (incl. orifice)



Materials

TU stainless steel technology

Figure: Type TU and TC

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 a longer life.

Danfoss precision port design

The TU thermostatic expansion valve introduces precision port design, incorporating four features that ensure 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 pushrod is self-aligning and eliminates binding.
· The precision-machined cone and orifice accurately meter refrigerant under all operating conditions.

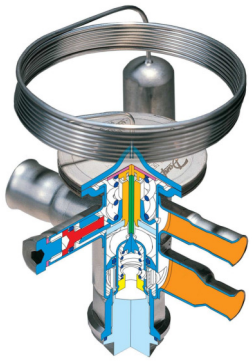
High quality

The TU is manufactured on fully automated, process-monitored production lines. Cellularized computer-monitored technology ensures 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.

Advanced technology - fast and easy installation

The 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 bimetal which makes installation easy, reliable, and fast.

Figure: TUAE



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.

Capacity

Table: Type TU and TC

Type	Orifice	R410		R134		R407C		R404A/R507		R290		R22	
		[kw]	[TR]	[kw]	[TR]	[kw]	[TR]	[kw]	[TR]	[kw]	[TR]	[kw]	[TR]
TU	X	0.74	0.21	0.32	0.09	0.5	0.15	0.37	0.11	0.49	0.14	0.48	0.13
TU	0	0.99	0.28	0.42	0.12	0.66	0.19	0.49	0.14	0.64	0.18	0.63	0.18
TU	1	1.3	0.38	0.61	0.17	0.94	0.27	0.71	0.21	0.94	0.27	0.92	0.26
TU	1	1.7	0.49	0.72	0.2	1.1	0.33	0.87	0.26	1.1	0.32	1.1	0.31
TU	3	2.1	0.61	0.95	0.27	1.5	0.42	1.1	0.33	1.5	0.41	1.4	0.4
TU	4	4.1	1.2	1.6	0.45	2.5	0.74	2	0.59	2.6	0.72	2.5	0.7
TU	5	5.3	1.5	2.1	0.6	3.4	0.98	2.7	0.79	3.4	0.96	3.4	0.93
TU	6	8.5	2.4	3.4	0.94	5.3	1.5	4.2	1.2	5.3	1.5	5.3	1.5
TU	7	11.2	3.2	4.4	1.3	7	2	5.6	1.6	7	2	7	1.9
TU	8	15.8	4.5	6.5	1.8	10.2	3	8	2.4	10.2	2.9	10.1	2.8
TU	9	23.1	6.6	9	2.5	14	4.1	11.3	3.4	14.3	4.1	14.1	4
TC	1	21.2	6.1	13	3.7	17.8	5.1	13	3.8	19.1	5.4	18.3	5.1
TC	2	24.5	7	14.9	4.2	20.4	5.9	15.1	4.4	22.2	6.3	21.2	5.9
TC	3	30.6	8.9	18.6	5.2	25.2	7.3	18.9	5.6	27.9	7.9	26.7	7.4

The rated capacity is based on:
Evaporating temperature t_e = 4.4 °C / 40 °F
Liquid temperature t_l = 37 °C / 98 °F
Condensing temperature t_c = 38 ° C / 100 °F

Table: Type TU and TC

Type	Orifice	R407F		R407A		R448A		R449A		R513A		R452A	
		[kw]	[TR]	[kw]	[TR]	[kw]	[TR]	[kw]	[TR]	[kw]	[TR]	[kw]	[TR]
TU	X	0.58	0.17	0.49	0.14	0.48	0.14	0.47	0.14	0.28	0.08	0.41	0.12
TU	0	0.76	0.22	0.65	0.19	0.63	0.18	0.61	0.18	0.36	0.1	0.45	0.13
TU	1	1.1	0.32	0.94	0.28	0.93	0.27	0.9	0.26	0.53	0.15	0.68	0.19
TU	1	1.4	0.39	1.1	0.33	1.1	0.33	1.1	0.31	0.62	0.18	0.82	0.23
TU	3	1.7	0.5	1.5	0.43	1.4	0.42	1.4	0.41	0.82	0.23	1.1	0.30
TU	4	3.1	0.91	2.6	0.77	2.5	0.74	2.4	0.71	1.4	0.4	1.8	0.53
TU	5	4.2	1.2	3.5	1	3.4	1	3.2	1	1.8	0.53	2.5	0.70
TU	6	6.5	1.9	5.5	1.6	5.3	1.5	5.1	1.5	2.9	0.83	3.9	1.1
TU	7	8.6	2.5	7.2	2.1	7	2	6.7	2	3.8	1.1	5.1	1.5
TU	8	12.4	3.6	10.5	3.1	10.1	3	9.8	2.9	5.6	1.6	7.4	2.1
TU	9	17.1	5	14.4	4.2	13.9	4.1	13.6	4	7.7	2.2	10.3	2.9
TC	1	20.6	5.9	17.6	5.1	17.6	5.1	16.9	4.9	11.5	3.3	12.6	3.6
TC	2	24	6.9	20.3	5.9	20.3	5.9	19.3	5.6	13.2	3.8	14.5	4.1
TC	3	30.1	8.7	25.2	7.4	25.1	7.4	23.9	7	16.5	4.7	18.1	5.2

The rated capacity is based on:
Evaporating temperature t_e = 4.4 ° C / 40 °F
Liquid temperature t_l = 37 °C / 98 °F
Condensing temperature t_c = 38 ° C / 100 °F

Table: Type TU and TC

Type	Orifice	R454A		R454C		R455A		R1234yf		R1234ze(E)	
		[kw]	[TR]	[kw]	[TR]	[kw]	[TR]	[kw]	[TR]	[kw]	[TR]
TU	X	0.59	0.17	0.46	0.13	0.52	0.15	0.27	0.08	0.20	0.06
TU	0	0.65	0.19	0.50	0.14	0.57	0.16	0.30	0.08	0.21	0.06
TU	1	0.99	0.28	0.76	0.22	0.87	0.25	0.45	0.13	0.32	0.09
TU	2	1.2	0.34	0.91	0.26	1.0	0.30	0.53	0.15	0.37	0.10
TU	3	1.6	0.44	1.2	0.34	1.4	0.38	0.69	0.20	0.49	0.14
TU	4	2.8	0.79	2.0	0.58	2.4	0.67	1.2	0.34	0.80	0.23
TU	5	3.7	1.1	2.7	0.78	3.2	0.90	1.6	0.45	1.1	0.30
TU	6	5.9	1.7	4.3	1.2	4.9	1.4	2.5	0.70	1.7	0.47
TU	7	7.8	2.2	5.6	1.6	6.5	1.9	3.3	0.92	2.2	0.62
TU	8	11.1	3.2	8.2	2.3	9.5	2.7	4.8	1.4	3.3	0.93
TU	9	15.7	4.5	11.2	3.2	12.9	3.7	6.6	1.9	4.4	1.2

The rated capacity is based on:
Evaporating temperature te = 4.4 °C / 40 °F
Liquid temperature t_l = 37 °C / 98 °F
Condensing temperature t_c = 38 ° C / 100 °F

Dimensions

Figure: TUBE and TUCE

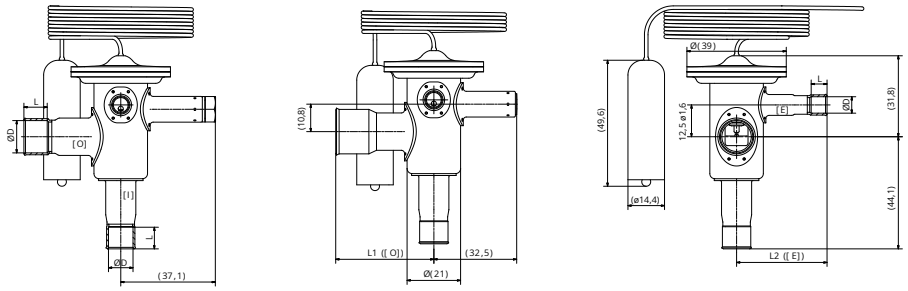


Table: Dimensions for TU and TC

Con / Dim	Size	[øD]	[øD] tolerance	[L]	[L] tolerance	[L1] ([O])	[L1] tolerance	[L2] ([E]; [I])	[L2] tolerance
Equalization [E]	6 mm	6.00	+0.155 +0.065	7	±1.2	–	–	35.5	±2
	¼ in	6.35		7	±1.2	–	–		
Inlet [I]	6 mm	6.00		7	±1.2	–	–	–	–
	¼ in	6.35		7	±1.2	–	–	–	–
	⅜ in	9.52		8	±1.2	–	–	–	–
	10 mm	10.00		9	±1.2	–	–	–	–
	½ in	12.70		10	±1.4	–	–	–	–
Outlet [O]	⅜ in	9.52		8	±1.2	38.5	±2	–	–
	12 mm	12.00		10	±1.4			–	–
	½ in	12.70		10	±1.4			–	–
	⅝ in	15.88		12	±1.4	41.5	±2	–	–

Figure: TUBE and TUCE

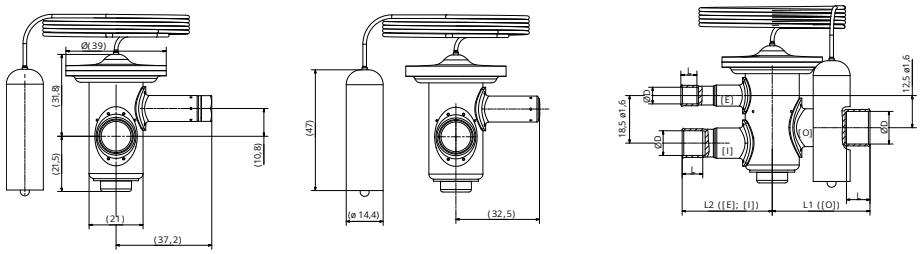


Table: Dimensions for TUBE and TUCE

Con / Dim	Size	[øD]	[øD] tolerance	[L]	[L] tolerance	[L1] ([O])	[L1] tolerance	[L2] ([E]; [I])	[L2] tolerance
Equalization [E]	6 mm	6.00	+0.155 +0.065	7	±1.2	–	–	35.5	±2
	¼ in	6.35		7	±1.2	–	–		
Inlet [I]	6 mm	6.00		7	±1.2	–	–		
	¼ in	6.35		7	±1.2	–	–		
	⅜ in	9.52		8	±1.2	–	–		
	10 mm	10.00		9	±1.2	–	–		
	½ in	12.70		10	±1.4	–	–	38.5	±2
Outlet [O]	⅜ in	9.52		8	±1.2	38.5	±2	–	–
	12 mm	12.00		10	±1.4			–	–
	½ in	12.70		10	±1.4			–	–
	⅝ in	15.88		12	±1.4	41.5	±2	–	–

Figure: TUAE

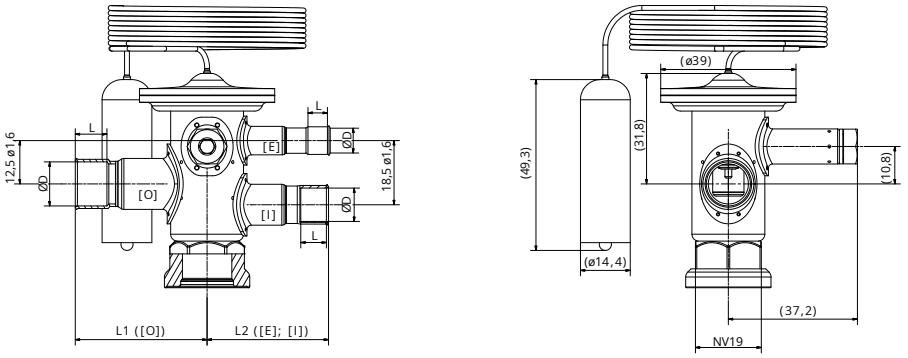


Table: Dimensions for TUAE

Con / Dim	Size	[øD]	[øD] tolerance	[L]	[L] tolerance	[L1] ([O])	[L1] tolerance	[L2] ([E]; [I])	[L2] tolerance
Equalization [E]	6 mm	6.00	+0.155 +0.065	7	±1.2	-	-	35.5	±2
	¼ in	6.35		7	±1.2	-	-		
Inlet [I]	6 mm	6.00		7	±1.2	-	-		
	¼ in	6.35		7	±1.2	-	-		
	⅜ in	9.52		8	±1.2	-	-		
	10 mm	10.00		9	±1.2	-	-		
	½ in	12.70		10	±1.4	-	-	38.5	±2
Outlet [O]	3/8 in	9.52		8	±1.2	38.5	±2	-	-
	12 mm	12.00		10	±1.4			-	-
	½ in	12.70		10	±1.4			-	-
	⅝ in	15.88		12	±1.4	41.5	±2	-	-

Figure: TCBE and TCCE

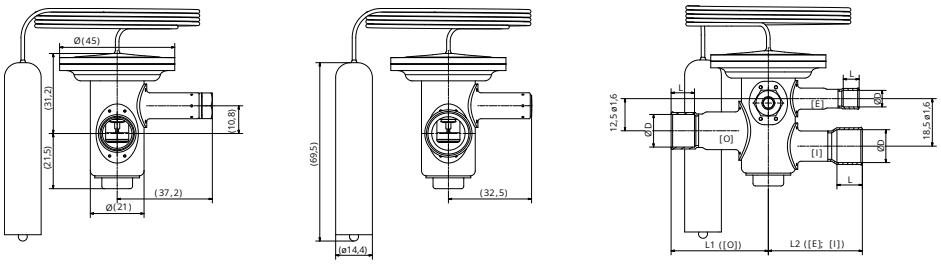


Table: Dimensions for TCBE and TCCE

Con / Dim	Size	[øD]	[øD] tolerance	[L]	[L] tolerance	[L1] ([O])	[L1] tolerance	[L2] ([E]; [I])	[L2] tolerance
Equalization [E]	6 mm	6.00	+0.155 +0.065	7	±1.2	–	–	35.5	±2
	¼ in	6.35		7	±1.2	–	–		
Inlet [I]	6 mm	6.00		7	±1.2	–	–		
	¼ in	6.35		7	±1.2	–	–		
	⅜ in	9.52		8	±1.2	–	–		
	10 mm	10.00		9	±1.2	–	–		
	½ in	12.70		10	±1.4	–	–	38.5	±2
Outlet [O]	⅜ in	9.52		8	±1.2	38.5	±2	–	–
	12 mm	12.00		10	±1.4			–	–
	½ in	12.70		10	±1.4			–	–
	⅝ in	15.88		12	±1.4	41.5	±2	–	–

Figure: TCAE

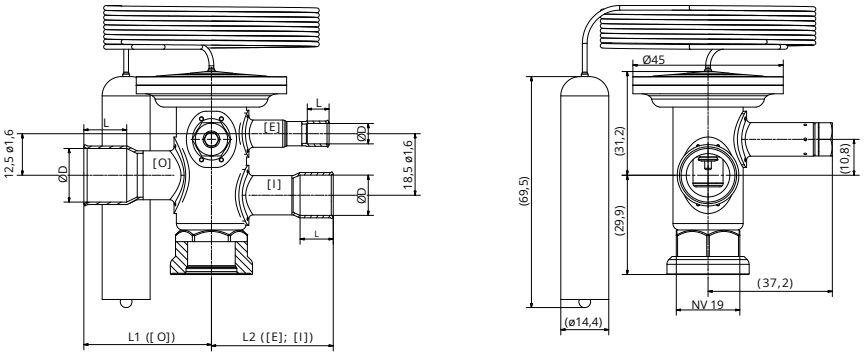


Table: Dimensions for TCAE

Con / Dim	Size	[øD]	[øD] tolerance	[L]	[L] tolerance	[L1] ([O])	[L1] tolerance	[L2] ([E]; [I])	[L2] tolerance
Equalization [E]	6 mm	6.00	+0.155 +0.065	7	±1.2	–	–	35.5	±2
	¼ in	6.35		7	±1.2	–	–		
Inlet [I]	6 mm	6.00		7	±1.2	–	–		
	¼ in	6.35		7	±1.2	–	–		
	⅜ in	9.52		8	±1.2	–	–		
	10 mm	10.00		9	±1.2	–	–		
	½ in	12.70		10	±1.4	–	–	38.5	±2
Outlet [O]	⅜ in	9.52		8	±1.2	38.5	±2	–	–
	12 mm	12.00		10	±1.4			–	–
	½ in	12.70		10	±1.4			–	–
	⅝ in	15.88		12	±1.4	41.5	±2	–	–

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Export Control Declaration	TU/TC valves and orifice	Danfoss	
EU Declaration	Danfoss EU 068U9903.01	Danfoss	EU RoHS
Pressure Safety Certificate	LLC CDC EURO-TYSK UA.TR.089.1015.02-22	LLC CDC EURO TYSK - Ukraine	Pressure, PED
UA Declaration	Danfoss UA 2023-01-10 Valves PL01 PL40	Danfoss	Pressure, PED

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