Expansion Valves

Basic Terms and Technical Information

Operating principles
ALCO thermo expansion valves control the superheat of refrigerant vapour at the outlet of the evaporator. They act as throttle device between the highpressure and thelow pressuresides of refrigeration systems and ensure that the rate of refrigerant flow into the evaporator exactly matches the rate of evaporation of liquid refrigerant in the evaporator. Thus the evaporator is fully utilized and no liquid refrigerant may reach the compressor.

Description of bulb charges
The application ranges of thermo expansion valves are heavily influenced by the charge selected.

Liquid charges
The behaviour of thermo expansion valves with liquid charges is exclusively determined by temperature changes at the bulb and not subject to any cross-ambient interference. They feature a fast response time and thus react quickly in the control circuit. Liquid charges cannot incorporate MOP functions. Maximum bulb temperatures shall not exceed 75° C.

Gas charges
The behaviour of thermo expansion valves with gas charges will be determined by the lowest temperature at any part of the expansion valve (power assembly, capillary tube or bulb). If any parts other than the bulb are subject to the lowest temperature, malfunction of the expansion valve may occur (i.e. erratic low pressure or excessive superheat). ALCO thermo expansion valves with gas charges always feature MOP functions and include ballasted bulbs. Ballast in the bulb leads to slow opening and fast closure of the valve. Maximum bulb temperature is 175° C.

Adsorption charges
These charges feature control characteristics much like MOP charges but avoid the difficulties of cross-ambient interference. Response time is slow but perfectly suitable for common refrigeration systems. Maximum bulb temperature is 130° C.

MOP (Maximum Operating Pressure)
MOP functionality is somewhat similar to the application of a crankcase pressure regulator. Evaporator pressures are limited to a maximum value to protect compressor from overload conditions.
MOP selection should be within maximum allowed low pressure rating of the compressor and should be at approximately 3 K above evaporating temperatures.

Practical hints: Superheat adjustments influence the MOP:

Increase of superheat:	Decrease of MOP
Decrease of superheat:	Increase of MOP

Static superheat
ALCO thermo expansion valves are factory preset for optimum superheat settings. This setting should be modified only if absolutely necessary. The readjustment should be at the lowest expected evaporating temperature.

Subcooling
Subcooling generally increases the capacity of refrigeration system and may be accounted for when dimensioning an expansion valve by applying the correction factor K_t. The capacity corrections for evaporating temperature, condensing temperature and subcooling are all incorporated in K_t. These are in particular the liquid density upstream from the expansion valve, the different enthalpies of liquid and vapour phase refrigerants as well as certain part of flash gas after expansion. The percentage of flash gas differs with various refrigerants and depends on system conditions.
Heavy subcooling results in very small flash gas amounts and therefore increases expansion valve capacities. These conditions are not covered by K_t. Likewise, small flash gas amounts lead to reduced evaporator capacities and may result in substantial discrepancies between the capacities of the Thermo®-expansion valve and the evaporator. These effects must be considered during component selection when designing refrigeration circuits. In cases when subcooling exceeds 15 K sizing of components (K_t, $K\Delta p$) should be modified accordingly. The field practice indicates the following correction factors can be used to compensate the effect of the subcooling(liquid hammering) in addition to the use of correction factors K_t, and $K\Delta p$.

Subcooling	20K	30K	40K	50K	60K
Correction factor	0,8	0,7	0,6	0,5	0,4

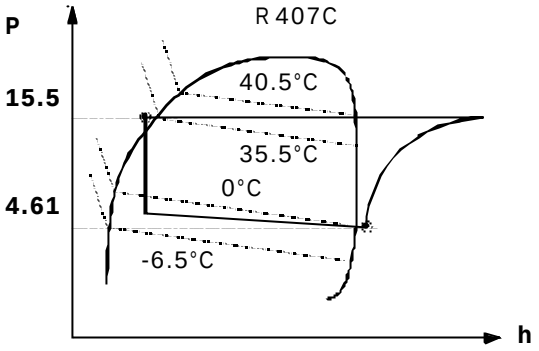
ALCO CONTROLS will be happy to assist you. Please contact application engineering department.

Dimensioning
To correctly select a thermo expansion valve on a system, the following design conditions must be available:
- Cooling capacity Q_O
- Effective pressure differential across thermo expansion valve Δp
- Evaporating temperature/pressure
- Lowest possible condensing temperature/ pressure
- Liquid temperature
- Type of refrigerant

As opposed to single substances (e.g. R22, R134a etc.) where the phase change takes place at a constant temperature/pressure, the evaporation and condensation of **zeotropic blend R407C** is in a gliding form (e.g. at a constant pressure the temperature varies within a certain range) through evaporators and condensers.
The evaporating/condensing pressure must be determined at saturated temperatures (bubble/dew points) for dimensioning of Thermo-Expansion valves.

Example

Cooling capacity of a system:	18 KW
Condensing temperature (saturated liquid):	+35°C
(Condensing pressure will be 15.5 bar)	
Evaporating temperature (saturated vapour):	0°C
(Evaporating pressure will be 4.61 bar)	
Subcooling:	1 K
Pressure drops through liquid line:	2.2 bar
Pressure drops through evaporator:	0.3 bar
Refrigerant:	R 407C
Required type of Thermo-Expansion valve:	T-series



To calculate the nominal capacity the following formula has to be used (Page 22):

Cooling capacity x K_t x K_{Dp} = Nominal capacity

1. Selected **K_t-factor** according to refrigerant, liquid and evaporating temperature from table on page 24.
K_t = 0.98 (for this example)

2. Determine pressure differential across the Thermo Expansion valve using condensing pressure, subtract evaporating pressure and all other possible pressure losses (pressure drops in evaporator, drier, solenoid valve, liquid distribution...).

For this example:
Δp = 15.5 - (4.61 +2.2 + 0.3) = 8.39 bar
Select K_{Dp} factor from table on page 24.
K_{Dp} = 1,15 (for this example)

3. Multiply cooling capacity with **K_t** and **K_{Dp}**, to find nominal capacity for Thermo-Expansion valve.
Qn = 18 x 0.98 x 1.15 = 20.29 KW
Select Thermo-Expansion Valve from table on page 20: TCLE 550 NW (for this example).

Please note that all evaporating/condensing temperatures in this catalogue are based on saturated vapour/liquid temperatures.

Selection Guide for Expansion Valves

Series	Selection Criteria				Catalogue Page
	Capacity Range kW (R 404A)	Evaporating Temp. Range °C	Main Application	Features	
TI	0,5 to14,2	+20 to -45	Refrig./Air-Cond. Heat Pumps	Interchangeable Orifices	13
TX2	0,8 to 15,0	+20 to -45	Air-Cond. Heat Pumps	Hermetic, fixed Superheat Setting, optional with check valve	*
TX3	0,8 to 15.0	+20 to -45	Refrig./Air-Cond. Heat Pumps	Hermetic, Superheat adjustable	*
TX6	13.3 to 57.0	+20 to -45	Refrig./Air-Cond. Heat Pumps	Hermetic Superheat adjustable	18
T	2 to 209	+30 to -45	Refrig./Air-Cond. Heat Pumps	Interchangeable Orifices, Power-Assembly and Flange	20
ZZ	1,9 to 81,2	-45 to -120	Low Temperature Application	Interchangeable Orifices, Power-Assembly and Flange	25
L	2 to 154	+20 to -50	Liquid Injection Superheat Control	Interchangeable Orifices, Power-Assembly and Flange	29
935	5,2 to 43,5	+20 to -45	Liquid Injection Temperature Control	Interchangeable Orifices, Power-Assembly and Flange	31

* Please ask for datasheets or download under www.alco-controls.com

Thermo®-Expansion Valves Series TI

Exchangeable Orifices

TISE

TIE

Solder Adapter

Features

- 6 valve bodies in conjunction with 8 cages lead to 48 thermo expansion valves to cover a very wide range of applications
- Very good stability is attained because of the large forces generated by the large diaphragm diameter
- With capacities between 0.5 kW and 19.5 kW (R 22), they are ideally suited for service work
- Tailored charges for different applications
- Constant superheat across a wide application range
- Solder and flare connections available
- Capillary tube length 1.5 m
- PS: 31 bar, TS: -45 ... +65°C
- No CE marking according art. 3.3 PED 97/23 EC

Type Code **TI S E – M W**

Valve series TI

Connection type
S: Brazing (outlet & external equaliser connection)
: Flare

Equaliser
E: External
: Internal

Refrigerant Charge
W: Liquid
Wxxx: Gas MOP
ADxxx: Adsorption

TI(E) Valve bodies – flare type Valve bodies without cage and nut

MOP (valve closed)	Evaporating temperature range	Equaliser	Refrigerant							
			R 134a alternative R 12, R 401A/B, R 408A/B, R 413A		**R 22**		**R 404A / R 507** alternative R 502, R 402A/B, R 403B, R 407A/B, R 408A		**R 407C**	
	°C		Type	Order No.	Type	Order No.	Type	Order No.	Type	Order No.
less	-45 to +20	intern	**TI-MW**	**800 975**	**TI-HW**	**800 649**	**TI-SW**	**800 553**	TI-NW	800 001
		extern	**TIE-MW**	**800 974**	**TIE-HW**	**800 652**	**TIE-SW**	**800 552**	TIE-NW	800 003
-20°C	-45 to -27	intern	-	-	-	-	**TI-SAD-20**	**800 554**	-	-
		extern	-	-	-	-	**TIE-SAD-20**	**800 555**	-	-
0°C	-45 to -5	intern	-	-	-	-	TI-SW75	800 501	-	-
		extern	-	-	-	-	TIE-SW75	801 331	-	-
+14°C	-45 to +9	intern	TI-MW55	800 543	-	-	-	-	-	-
		extern	TIE-MW55	800 997	-	-	-	-	-	-
+15°C	-45 to +11	intern	-	-	TI-HW100	800 991	-	-	-	-
		extern	-	-	TIE-HW100	800 992	-	-	-	-
+10°C	-45 to 0	intern	-	-	-	-	TI-SAD10	800 962	-	-
		extern	-	-	TIE-HAD10	800 969	TIE-SAD10	800 959	-	-

Inlet: Flare 5/8"-18UNF for 6mm, 8mm, 10mm, 1/4", 5/16" and 3/8" tubes
Outlet: Flare 3/4"-16UNF for 12mm and 1/2" tubes

TIS(E) Valve bodies – solder type metric Valve bodies without cage and nut

MOP (valve closed)	Evaporating temperature range °C	Equaliser	Refrigerant: R 134a alternative R 12, R 401A/B, R 408A/B, R 413A		R 22		R 404A / R 507 alternative R 502, R 402A/B, R 403B, R 407A/B, R 408A		R 407C	
			Type	Order No.	Type	Order No.	Type	Order No.	Type	Order No.
less	-45 to +20	intern	**TIS-MW**	**800 976**	**TIS-HW**	**800 947**	**TIS-SW**	**800 549**	TIS-NW	800 008
		extern	**TISE-MW**	**800 979**	**TISE-HW**	**800 950**	**TISE-SW**	**800 548**	TISE-NW	800 009
-20°C	-45 to -27	intern	-	-	-	-	**TIS-SAD-20**	**800 556**	-	-
		extern	-	-	-	-	**TISE-SAD-20**	**800 557**	-	-
0°C	-45 to -5	intern	-	-	-	-	TIS-SW75	800 502	-	-
		extern	-	-	-	-	TISE-SW75	800 503	-	-
+14°C	-45 to +9	intern	TIS-MW55	800 546	-	-	-	-	-	-
		extern	TISE-MW55	800 547	-	-	-	-	-	-
+15°C	-45 to +11	intern	-	-	TIS-HW100	800 993	-	-	-	-
		extern	-	-	TISE-HW100	800 994	-	-	-	-
+10°C	-45 to 0	intern	-	-	-	-	TIS-SAD10	800 938	-	-
		extern	-	-	-	-	TISE-SAD10	800 939	-	-

Inlet: Flare 5/8"-18UNF for 6mm, 8mm, 10mm, 1/4", 5/16" and 3/8" tubes
Outlet: Solder ODF for 12mm tubes

TIS(E) Valve bodies – solder type inch Valve bodies without cage and nut

MOP (valve closed)	Evaporating temperature range °C	Equaliser	Refrigerant: R 134a alternative R 12, R 401A/B, R 408A/B, R 413A		R 22		R 404A / R 507 alternative R 502, R 402A/B, R 403B, R 407A/B, R 408A		R 407C	
			Type	Order No.	Type	Order No.	Type	Order No.	Type	Order No.
less	-45to +20	intern	**TIS-MW**	**800 978**	**TIS-HW**	**800 953**	**TIS-SW**	**800 551**	**TIS-NW**	**800 004**
		extern	**TISE-MW**	**800 977**	**TISE-HW**	**800 956**	**TISE-SW**	**800 550**	**TISE-NW**	**800 007**
-20°C	-45 to -27	intern	-	-	-	-	**TIS-SAD-20**	**800 558**	-	-
		extern	-	-	-	-	**TISE-SAD-20**	**800 559**	-	-
0°C	-45 to -5	intern	-	-	-	-	TIS-SW75	800 504	-	-
		extern	-	-	-	-	TISE-SW75	800 505	-	-
+14°C	-45 to +9	intern	TIS-MW55	800 544	-	-	-	-	-	-
		extern	TISE-MW55	800 545	-	-	-	-	-	-
+15°C	-45 to +11	intern	-	-	TIS-HW100	800 995	-	-	-	-
		extern	-	-	TISE-HW100	800 996	-	-	-	-
+10°C	-45 to 0	intern	-	-	-	-	TIS-SAD10	800 989	-	-
		extern	-	-	-	-	TISE-SAD10	800 990	-	-

Inlet: Flare 5/8"-18UNF for 6mm, 8mm, 10mm, 1/4", 5/16" and 3/8" tubes
Outlet: Solder ODF for 1/2" tubes

Cages with strainer for inlet connection

Type	Order-No.	Nominal Capacity Q_n (kW)				
		R 134a	**R 22**	**R 404A**	**R407C**	**R 507**
TIO-00X	**800 532**	0,3	0,5	0,4	0,5	0,4
TIO-000	**800 533**	0,8	1,3	1,0	1,4	1,0
TIO-001	**800 534**	1,9	3,2	2,3	3,5	2,3
TIO-002	**800 535**	3,1	5,3	3,9	5,7	3,9
TIO-003	**800 536**	5,0	8,5	6,2	9,2	6,2
TIO-004	**800 537**	8,3	13,9	10,1	15,0	10,1
TIO-005	**800 538**	10,1	16,9	12,3	18,3	12,3
TIO-006	**800 539**	11,7	19,5	14,2	21,1	14,2

Nominal capacities at +38°C condensing temperature, +4°C evaporating temperature (saturated temperatures / dew point) and 1 K liquid subcooling at the inlet of the expansion valve. Valve selection for other operating conditions see page 22-24 or quick selection tables on page 15 - 17.

Accessories

Solder Adapter for TIS(E) with strainer

Type	Order-No.	Connection, ODF	
		mm	inch
X 99980	**801 046**	6,0	–
X 99981	**801 049**	10,0	–
X 99982	**801 047**	–	1/4
X 99983	**801 048**	–	3/8

Flare Nuts in Practical Stock Box

Type	Order-No.	pieces	mm	inch
B 6	800 663	30	6 mm	1/4"SAE
B 10 - 6	800 661	20	6 mm	1/4"SAE
B 10	800 660	20	10 mm	3/8"SAE
B 12*	800 662	18	12 mm	1/2"SAE
B 16	800 668	12	16 mm	5/8"SAE

*) with Ice Grooves. Any ice built-up in thread will be forced out and reduce the potential internal stess on thread.

Quick Selection Tables

Published capacity data at 1 K subcooling at the inlet of the expansion valve and 1.5 bar pressure drop in the refrigerationsystem. For proper valve selection especially in case of high pressure drops, we recommend the use of correction factors (see page 22-24).

Condensing Temperature °C	**R 134a** Capacity kW Valve Type TI..-M.... Evaporating Temperature °C											Cage Size
	+30	+20	+10	+5	0	-5	-10	-15	-20	-25	-30	
50	0,23	0,27	0,29	0,29	0,30	0,30	0,30	0,26	0,22	0,19	0,16	TIO-00X
	0,60	0,71	0,76	0,78	0,79	0,79	0,79	0,68	0,59	0,50	0,43	TIO-000
	1,42	1,68	1,81	1,85	1,87	1,88	1,87	1,63	1,39	1,20	1,01	TIO-001
	2,32	2,74	2,96	3,02	3,05	3,07	3,06	2,65	2,27	1,95	1,66	TIO-002
	3,74	4,42	4,77	7,87	4,92	4,94	4,93	4,28	3,66	3,15	2,67	TIO-003
	6,21	7,34	7,93	8,08	8,17	8,21	8,19	7,10	6,08	5,23	4,43	TIO-004
	7,56	8,93	9,64	9,84	9,95	9,99	9,97	8,64	7,40	6,36	5,39	TIO-005
	8,76	10,34	11,17	11,40	11,52	11,57	11,55	10,01	8,57	7,37	6,25	TIO-006
40	0,12	0,21	0,25	0,26	0,27	0,28	0,28	0,25	0,21	0,18	0,16	TIO-00X
	0,33	0,56	0,67	0,70	0,73	0,74	0,75	0,66	0,57	0,49	0,42	TIO-000
	0,79	1,34	1,60	1,67	1,73	1,76	1,78	1,56	1,35	1,17	1,00	TIO-001
	1,29	2,18	2,60	2,73	2,82	2,88	2,91	2,55	2,20	1,91	1,63	TIO-002
	2,08	3,52	4,20	4,40	4,55	4,64	4,69	4,11	3,56	3,08	2,63	TIO-003
	3,45	5,84	6,97	7,31	7,55	7,70	7,79	6,83	5,90	5,12	4,37	TIO-004
	4,19	7,10	8,48	8,90	9,19	9,38	9,48	8,31	7,18	6,23	5,32	TIO-005
	4,86	8,23	9,83	10,31	10,64	10,86	10,98	9,63	8,32	7,22	6,16	TIO-006
35		0,17	0,23	0,24	0,26	0,26	0,27	0,24	0,21	0,18	0,15	TIO-00X
		0,44	0,60	0,65	0,68	0,70	0,72	0,63	0,55	0,48	0,41	TIO-000
		1,06	10,43	1,54	1,61	1,67	1,70	1,50	1,31	1,14	0,98	TIO-001
		1,72	2,33	2,50	2,63	2,72	2,78	2,45	2,13	1,86	1,59	TIO-002
		2,78	3,75	4,04	4,24	4,39	4,48	3,95	3,44	3,00	2,57	TIO-003
		4,62	6,23	6,71	7,05	7,28	7,43	6,56	5,71	4,97	4,27	TIO-004
		5,62	7,58	8,16	8,57	8,86	9,05	7,99	6,95	6,05	5,19	TIO-005
		6,51	8,79	9,45	9,93	10,26	10,48	9,25	8,05	7,01	6,01	TIO-006
30		0,09	0,19	0,21	0,23	0,24	0,25	0,23	0,20	0,17	0,15	TIO-00X
		0,25	0,51	0,57	0,62	0,65	0,67	0,60	0,52	0,46	0,40	TIO-000
		0,60	1,20	1,35	1,46	1,54	1,59	1,42	1,25	1,09	0,94	TIO-001
		0,98	1,96	2,21	2,39	2,51	2,60	2,32	2,03	1,78	1,54	TIO-002
		1,58	3,16	3,57	3,85	4,05	4,19	3,74	3,28	2,87	2,48	TIO-003
		2,63	5,25	5,92	6,39	6,73	6,96	6,21	5,44	4,77	4,11	TIO-004
		3,20	6,39	7,20	7,78	8,19	8,47	7,56	6,62	5,81	5,00	TIO-005
		3,71	7,40	8,34	9,01	9,49	9,82	8,75	7,67	6,73	5,80	TIO-006
25			0,14	0,18	0,20	0,22	0,23	0,21	0,18	0,16	0,14	TIO-00X
			0,37	0,47	0,54	0,58	0,61	0,56	0,49	0,43	0,38	TIO-000
			0,89	1,12	1,27	1,38	1,46	1,32	1,17	1,03	0,90	TIO-001
			1,45	1,82	2,08	2,25	2,38	2,15	1,91	1,68	1,46	TIO-002
			2,33	2,94	3,35	3,64	3,84	3,47	3,07	2,72	2,36	TIO-003
			3,87	4,88	5,56	6,03	6,37	5,76	5,10	4,51	3,91	TIO-004
			4,71	5,94	6,76	7,34	7,75	7,01	6,21	5,49	4,76	TIO-005
			5,45	6,88	7,84	8,51	8,98	8,12	7,19	6,36	5,52	TIO-006
20			0,02	0,12	0,16	0,19	0,20	0,19	0,17	0,15	0,13	TIO-00X
			0,04	0,33	0,43	0,50	0,54	0,50	0,45	0,40	0,35	TIO-000
			0,10	0,77	1,02	1,18	1,29	1,19	1,07	0,96	0,84	TIO-001
			0,17	1,26	1,66	1,92	2,10	1,94	1,75	1,56	1,37	TIO-002
			0,27	2,04	2,68	3,10	3,39	3,13	2,82	2,52	2,20	TIO-003
			0,44	3,38	4,45	5,14	5,62	5,20	4,68	4,18	3,66	TIO-004
			0,54	4,11	5,41	6,25	6,84	6,33	5,69	5,09	4,45	TIO-005
			0,62	4,76	6,27	7,24	7,92	7,33	6,59	5,89	5,15	TIO-006

Condensing Temperature °C	R 22 — Capacity kW Valve Type TI..-H.... Evaporating Temperature °C														Cage Size
	+30	+20	+10	+5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	
50	0,38	0,45	0,50	0,51	0,52	0,53	0,53	0,46	0,41	0,35	0,30	0,26	0,22	0,19	TIO-00X
	0,98	1,17	1,29	1,33	1,35	1,38	1,36	1,20	1,05	0,91	0,78	0,66	0,57	0,48	TIO-000
	2,40	2,86	3,16	3,26	3,32	3,39	3,33	2,95	2,58	2,24	1,91	1,62	1,40	1,19	TIO-001
	4,03	4,78	5,29	4,47	5,56	5,67	5,57	4,95	4,32	3,75	3,20	2,72	2,35	2,00	TIO-002
	6,41	7,64	8,42	8,70	8,85	9,03	8,87	7,88	6,87	5,97	5,10	4,34	3,45	3,18	TIO-003
	10,50	12,51	13,79	14,26	14,50	14,80	14,53	12,90	11,26	9,79	8,35	7,10	6,14	5,21	TIO-004
	12,80	15,24	16,81	17,37	17,67	18,03	17,70	15,72	13,72	11,93	10,18	8,66	7,49	6,35	TIO-005
	14,76	17,58	19,38	20,04	20,38	20,79	20,42	18,14	15,82	13,76	11,74	9,98	8,64	7,32	TIO-006
40	0,24	0,37	0,44	0,46	0,48	0,50	0,49	0,44	0,39	0,34	0,29	0,25	0,22	0,18	TIO-00X
	0,61	0,95	1,14	1,20	1,25	1,29	1,27	1,15	1,01	0,88	0,75	0,64	0,56	0,47	TIO-000
	1,51	2,33	2,78	2,94	3,07	3,17	3,12	2,82	2,47	2,16	1,85	1,58	1,38	1,17	TIO-001
	2,52	3,90	4,66	4,92	5,13	5,30	5,23	4,73	4,14	3,62	3,10	2,65	2,31	1,96	TIO-002
	4,02	6,21	7,42	7,84	8,18	8,44	8,33	7,53	6,59	5,76	4,94	4,23	3,68	3,12	TIO-003
	6,59	10,17	12,16	12,85	13,39	13,83	13,65	12,33	10,79	9,44	8,10	6,92	6,03	5,12	TIO-004
	8,03	12,40	14,82	15,65	16,32	16,85	16,63	15,03	13,15	11,50	9,87	8,44	7,35	6,23	TIO-005
	9,26	14,30	17,09	18,05	18,82	19,43	19,18	17,33	15,17	13,26	11,38	9,73	8,48	7,19	TIO-006
35		0,30	0,40	0,43	0,45	0,47	0,48	0,43	0,38	0,33	0,29	0,24	0,21	0,18	TIO-00X
		0,79	1,03	1,11	1,17	1,22	1,23	1,11	0,98	0,85	0,74	0,63	0,55	0,47	TIO-000
		1,93	2,53	2,72	2,88	3,00	3,01	2,71	2,40	2,09	1,81	1,55	1,35	1,15	TIO-001
		3,24	4,23	4,56	4,82	5,02	5,03	4,54	4,02	3,50	3,03	2,60	2,27	1,93	TIO-002
		5,16	6,74	7,27	7,68	8,00	8,01	7,23	6,40	5,57	4,83	4,14	3,61	3,07	TIO-003
		8,45	11,04	11,90	12,58	13,11	13,13	11,85	10,49	9,13	7,92	6,78	5,92	5,03	TIO-004
		10,30	13,46	14,50	15,32	15,97	16,00	14,44	12,78	11,12	9,65	8,27	7,21	6,13	TIO-005
		11,87	15,52	16,73	17,67	18,42	18,45	16,65	14,74	12,83	11,13	9,53	8,32	7,07	TIO-006
30		0,21	0,34	0,38	0,41	0,44	0,44	0,41	0,36	0,31	0,27	0,24	0,21	0,18	TIO-00X
		0,55	0,89	0,99	1,07	1,13	1,15	1,05	0,93	0,81	0,70	0,61	0,53	0,46	TIO-000
		1,35	2,19	2,44	2,63	2,78	2,81	2,57	2,29	1,99	1,72	1,50	1,31	1,12	TIO-001
		2,26	3,67	4,09	4,41	4,66	4,71	4,30	3,83	3,33	2,88	2,52	2,20	1,88	TIO-002
		3,59	5,84	6,51	7,02	7,42	7,50	6,84	6,10	5,30	4,59	4,01	3,51	2,99	TIO-003
		5,89	9,56	10,66	11,50	12,16	12,28	11,21	10,00	8,68	7,51	6,57	5,75	4,90	TIO-004
		7,18	11,65	12,99	14,02	14,81	14,97	13,66	12,18	10,58	9,16	8,01	7,01	5,98	TIO-005
		8,28	13,44	14,98	16,16	17,08	17,26	15,76	14,05	12,20	10,56	9,24	8,08	6,89	TIO-006
25			0,28	0,33	0,38	0,40	0,41	0,38	0,34	0,30	0,26	0,23	0,20	0,17	TIO-00X
			0,71	0,85	0,97	1,04	1,07	0,98	0,88	0,78	0,68	0,59	0,51	0,44	TIO-000
			1,76	2,10	2,37	2,56	2,62	2,40	2,16	1,91	1,67	1,44	1,26	1,08	TIO-001
			2,94	3,51	3,97	4,29	4,39	4,03	3,62	3,21	2,79	2,42	2,12	1,81	TIO-002
			4,68	5,59	6,33	6,84	7,00	6,41	5,77	5,11	4,45	3,85	3,37	2,88	TIO-003
			7,67	9,16	10,36	11,20	11,46	10,50	9,46	8,37	7,29	6,31	5,52	4,72	TIO-004
			9,35	11,16	12,63	13,64	13,96	12,80	11,52	10,19	8,89	7,69	6,73	5,75	TIO-005
			10,79	12,88	14,57	15,74	16,11	14,76	13,29	11,76	10,25	8,87	7,76	6,64	TIO-006
20			0,18	0,26	0,31	0,35	0,38	0,35	0,32	0,28	0,25	0,22	0,19	0,16	TIO-00X
			0,45	0,67	0,81	0,91	0,97	0,91	0,83	0,73	0,64	0,56	0,49	0,42	TIO-000
			1,12	1,65	2,00	2,24	2,38	2,22	2,03	1,79	1,58	1,37	1,21	1,04	TIO-001
			1,87	2,77	3,34	3,76	3,98	3,72	3,39	3,00	2,65	2,30	2,02	1,74	TIO-002
			2,98	4,41	5,33	5,99	6,34	5,92	5,40	4,78	4,22	3,66	3,22	2,77	TIO-003
			4,88	7,22	8,72	9,80	10,38	9,70	8,85	7,84	6,91	6,00	5,28	4,54	TIO-004
			5,95	8,80	10,63	11,95	12,65	11,83	10,79	9,55	8,42	7,31	6,44	5,53	TIO-005
			6,86	10,15	12,26	13,78	14,59	13,64	12,44	11,02	9,72	8,43	7,42	6,38	TIO-006

Condensing Temperature °C	R 404A — Capacity kW Valve Type TI..-S .... Evaporating Temperature °C														Cage Size
	+30	+20	+10	+5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	
50	0,27	0,32	0,34	0,35	0,35	0,35	0,34	0,30	0,25	0,22	0,18	0,15	0,13	0,10	TIO-00X
	0,71	0,82	0,88	0,89	0,89	0,89	0,88	0,77	0,65	0,56	0,47	0,39	0,33	0,27	TIO-000
	1,65	1,91	2,04	2,07	2,08	2,07	2,05	1,80	1,53	1,30	1,10	0,92	0,76	0,62	TIO-001
	2,82	3,28	3,50	3,55	3,57	3,55	3,52	3,08	2,62	2,24	1,88	1,58	1,30	1,07	TIO-002
	4,47	5,19	5,54	5,62	5,65	5,63	5,57	4,88	4,14	3,54	2,98	2,50	2,06	1,69	TIO-003
	7,29	8,47	9,05	9,17	9,21	9,18	9,09	7,96	6,76	5,78	4,86	4,07	3,37	2,76	TIO-004
	8,85	10,29	10,99	11,15	11,20	11,16	11,04	9,67	8,22	7,02	5,90	4,95	4,09	3,36	TIO-005
	10,26	11,93	12,74	12,92	12,98	12,93	12,80	11,21	9,53	8,13	6,84	5,74	4,75	3,89	TIO-006
40	0,20	0,29	0,34	0,35	0,36	0,37	0,37	0,33	0,28	0,24	0,21	0,18	0,15	0,12	TIO-00X
	0,51	0,75	0,87	0,91	0,93	0,95	0,95	0,84	0,73	0,63	0,54	0,46	0,38	0,32	TIO-000
	1,19	1,75	2,04	2,12	2,18	2,21	2,22	1,97	1,70	1,47	1,25	1,06	0,89	0,74	TIO-001
	2,03	3,00	3,49	3,64	3,73	3,78	3,80	3,38	2,91	2,52	2,14	1,82	1,53	1,27	TIO-002
	3,22	4,76	5,53	5,76	5,91	5,99	6,02	5,35	4,61	3,99	3,39	2,88	2,42	2,01	TIO-003
	5,25	7,76	9,02	9,40	9,64	9,78	9,83	8,73	7,52	6,50	5,54	4,70	3,94	3,28	TIO-004
	6,38	9,43	10,96	11,42	11,71	11,88	11,94	10,61	9,14	7,90	6,73	5,71	4,79	3,98	TIO-005
	7,40	10,93	12,71	13,23	13,58	13,77	13,84	12,30	10,59	9,16	7,80	6,62	5,55	4,62	TIO-006
35		0,25	0,32	0,34	0,36	0,37	0,37	0,33	0,29	0,25	0,21	0,18	0,15	0,13	TIO-00X
		0,65	0,83	0,88	0,92	0,94	0,95	0,85	0,74	0,64	0,55	0,47	0,40	0,33	TIO-000
		1,53	1,93	2,06	2,14	2,20	2,23	1,99	1,73	1,50	1,29	1,10	0,93	0,77	TIO-001
		2,62	3,32	3,52	3,67	3,76	3,82	3,42	2,96	2,58	2,21	1,88	1,59	1,33	TIO-002
		4,15	5,25	5,58	5,81	5,96	6,05	5,41	4,69	4,08	3,50	2,98	2,51	2,10	TIO-003
		6,77	8,56	9,10	9,48	9,72	9,86	8,83	7,65	6,66	5,70	4,87	4,10	3,43	TIO-004
		8,22	10,41	11,06	11,51	11,81	11,98	10,73	9,30	8,09	6,93	5,92	4,99	4,17	TIO-005
		9,53	12,06	12,82	13,35	13,69	13,89	12,44	10,78	9,38	8,03	6,86	5,78	4,83	TIO-006
30		0,19	0,29	0,32	0,34	0,36	0,36	0,33	0,29	0,25	0,22	0,19	0,16	0,13	TIO-00X
		0,49	0,75	0,83	0,88	0,91	0,94	0,85	0,74	0,65	0,56	0,48	0,41	0,34	TIO-000
		1,15	1,75	1,93	2,05	2,13	2,19	1,98	1,73	1,51	1,30	1,12	0,95	0,79	TIO-001
		1,97	3,01	3,30	3,51	3,66	3,75	3,39	2,96	2,59	2,23	1,92	1,62	1,36	TIO-002
		3,13	4,76	5,23	5,56	5,79	5,94	5,36	4,69	4,10	3,53	3,03	2,57	2,16	TIO-003
		5,10	7,77	8,53	9,07	9,44	9,69	8,75	7,65	6,70	5,77	4,95	4,19	3,52	TIO-004
		6,20	9,44	10,36	11,02	11,48	11,77	10,63	9,29	8,14	7,01	6,01	5,09	4,27	TIO-005
		7,18	10,94	12,01	12,77	13,30	13,65	12,33	10,77	9,43	8,12	6,97	5,90	4,95	TIO-006
25			0,25	0,29	0,32	0,34	0,35	0,32	0,28	0,25	0,22	0,19	0,16	0,13	TIO-00X
			0,63	0,74	0,81	0,86	0,90	0,82	0,73	0,64	0,55	0,48	0,41	0,34	TIO-000
			1,48	1,72	1,90	2,02	2,10	1,92	1,69	1,49	1,29	1,12	0,95	0,80	TIO-001
			2,53	2,95	3,25	3,46	3,60	3,29	2,90	2,56	2,22	1,91	1,63	1,37	TIO-002
			4,01	4,68	5,14	5,48	5,71	5,21	4,60	4,06	3,51	3,03	2,58	2,17	TIO-003
			6,54	7,63	8,39	8,94	9,31	8,51	7,50	6,62	5,73	4,95	4,21	3,55	TIO-004
			7,95	9,27	10,20	10,86	11,31	10,34	9,11	8,04	6,96	6,01	5,11	4,31	TIO-005
			9,22	10,75	11,82	12,59	13,11	11,98	10,56	9,32	8,07	6,97	5,93	5,00	TIO-006
20			0,17	0,24	0,28	0,31	0,33	0,30	0,27	0,24	0,21	0,18	0,16	0,13	TIO-00X
			0,44	0,61	0,72	0,79	0,84	0,78	0,70	0,62	0,54	0,47	0,40	0,34	TIO-000
			1,04	1,42	1,67	1,85	1,97	1,83	1,63	1,45	1,27	1,10	0,94	0,80	TIO-001
			1,78	2,44	2,87	3,16	3,37	3,13	2,79	2,49	2,17	1,88	1,61	1,36	TIO-002
			2,82	3,86	4,54	5,01	5,34	4,96	4,42	3,94	3,44	2,98	2,55	2,16	TIO-003
			4,59	6,30	7,41	8,17	8,71	8,09	7,21	6,42	5,61	4,87	4,16	3,53	TIO-004
			5,58	7,66	9,00	9,93	10,58	9,83	8,76	7,80	6,81	5,91	5,06	4,28	TIO-005
			6,47	8,88	10,43	11,51	12,27	11,39	10,16	9,05	7,90	6,86	5,86	4,97	TIO-006

Condensing Temperature °C	R 407C Capacity kW Valve Type TI..-N.... Evaporating Temperature °C									Cage Size
	+20	+10	+5	0	-5	-10	-15	-20	-25	
50	0,49	0,52	0,52	0,53	0,53	0,53	0,46	0,38	0,32	TIO-00X
	1,27	1,34	1,36	1,37	1,37	1,36	1,19	1,00	0,83	TIO-000
	3,17	3,35	3,39	3,42	3,42	3,41	2,99	2,49	2,07	TIO-001
	5,16	5,45	5,53	5,57	5,57	5,55	4,86	4,06	3,37	TIO-002
	8,33	8,80	8,92	8,98	9,00	8,96	7,85	6,55	5,44	TIO-003
	13,58	14,35	14,55	14,65	14,67	14,61	12,80	10,69	8,87	TIO-004
	16,57	17,50	17,75	17,87	17,89	17,82	15,61	13,04	10,82	TIO-005
	19,11	20,18	20,46	20,60	20,63	20,55	18,00	15,03	12,47	TIO-006
40	0,44	0,49	0,51	0,52	0,53	0,53	0,47	0,39	0,33	TIO-00X
	1,14	1,28	1,32	1,34	1,36	1,37	1,21	1,02	0,85	TIO-000
	2,86	3,19	3,29	3,36	3,4	3,42	3,02	2,54	2,13	TIO-001
	4,66	5,19	5,36	5,47	5,54	5,58	4,93	4,14	3,46	TIO-002
	7,52	8,38	8,65	8,83	8,95	9,00	7,95	6,69	5,59	TIO-003
	12,25	13,66	14,10	14,40	14,58	14,67	12,96	10,91	9,11	TIO-004
	14,95	16,67	17,20	17,57	17,79	17,90	15,82	13,31	11,12	TIO-005
	17,24	19,22	19,83	20,25	20,52	20,64	18,24	15,34	12,82	TIO-006
35	0,40	0,47	0,49	0,50	0,51	0,52	0,46	0,39	0,33	TIO-00X
	1,03	1,21	1,26	1,30	1,33	1,34	1,19	1,01	0,85	TIO-000
	2,58	3,02	3,15	3,25	3,32	3,36	2,99	2,52	2,12	TIO-001
	4,20	4,91	5,14	5,30	5,41	5,47	4,86	4,11	3,45	TIO-002
	6,78	7,93	8,29	8,55	8,73	8,84	7,85	6,63	5,56	TIO-003
	11,06	12,93	13,52	13,94	14,23	14,41	12,79	10,81	9,07	TIO-004
	13,49	15,77	16,49	17,01	17,36	17,58	15,61	13,19	11,06	TIO-005
	15,56	18,19	19,02	19,61	20,02	20,27	18,00	15,21	12,75	TIO-006
30	0,34	0,43	0,46	0,48	0,49	0,50	0,45	0,38	0,32	TIO-00X
	0,88	1,11	1,18	1,24	1,28	1,30	1,16	0,99	0,83	TIO-000
	2,19	2,78	2,96	3,09	3,19	3,25	2,91	2,47	2,08	TIO-001
	3,57	4,53	4,82	5,04	5,20	5,30	4,74	4,02	3,39	TIO-002
	5,76	7,30	7,78	8,13	8,39	8,56	7,64	6,49	5,47	TIO-003
	9,39	11,91	12,69	13,26	13,67	13,95	12,46	10,58	8,92	TIO-004
	11,46	14,53	15,48	16,18	16,68	17,02	15,21	12,91	10,88	TIO-005
	13,22	16,75	17,85	18,66	19,23	19,62	17,53	14,89	12,54	TIO-006
25		0,38	0,42	0,44	0,46	0,48	0,43	0,37	0,31	TIO-00X
		0,98	1,08	1,15	1,21	1,24	1,12	0,96	0,81	TIO-000
		2,46	2,70	2,88	3,01	3,11	2,80	2,39	2,02	TIO-001
		4,01	4,40	4,70	4,91	5,06	4,55	3,89	3,29	TIO-002
		6,47	7,11	7,58	7,92	8,16	7,35	6,28	5,32	TIO-003
		10,55	11,59	12,36	12,91	13,31	11,98	10,24	8,67	TIO-004
		12,87	14,14	15,07	15,75	16,24	14,62	12,49	10,58	TIO-005
		14,84	16,31	17,38	18,17	18,72	16,86	14,40	12,19	TIO-006
20			0,37	0,40	0,43	0,45	0,41	0,35	0,30	TIO-00X
			0,95	1,04	1,11	1,16	1,06	0,91	0,78	TIO-000
			2,37	2,61	2,78	2,91	2,65	2,28	1,94	TIO-001
			3,86	4,25	4,54	4,74	4,31	3,71	3,16	TIO-002
			6,23	6,86	7,32	7,65	6,96	6,00	5,11	TIO-003
			10,16	11,19	11,93	12,47	11,35	9,77	8,33	TIO-004
			12,40	13,65	14,56	15,22	13,85	11,92	10,16	TIO-005
			14,30	15,74	16,79	17,55	15,97	13,75	11,71	TIO-006

Condensing Temperature °C	R 507 Capacity kW Valve Type TI..-S.... Evaporating Temperature °C														Cage Size
	+30	+20	+10	+5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	
50	0,29	0,34	0,36	0,37	0,37	0,37	0,37	0,32	0,27	0,23	0,19	0,16	0,13	0,11	TIO-00X
	0,73	0,85	0,91	0,92	0,93	0,93	0,92	0,80	0,68	0,58	0,49	0,40	0,33	0,26	TIO-000
	1,68	1,95	2,09	2,12	2,13	2,13	2,11	1,83	1,57	1,33	1,12	0,92	0,76	0,61	TIO-001
	2,85	3,31	3,54	3,59	3,62	3,61	3,58	3,10	2,66	2,26	1,89	1,57	1,28	1,03	TIO-002
	4,54	5,26	5,63	5,71	5,75	5,74	5,69	4,93	4,23	3,59	3,01	2,49	2,04	1,64	TIO-003
	7,39	8,57	9,17	9,31	9,36	9,35	9,28	8,04	6,88	5,85	4,90	4,06	3,32	2,67	TIO-004
	9,00	10,44	11,16	11,33	11,40	11,39	11,30	9,79	8,38	7,12	5,97	4,94	4,04	3,26	TIO-005
	10,39	12,05	12,89	13,08	13,16	13,15	13,04	11,31	9,68	8,22	6,89	5,70	4,66	3,76	TIO-006
40	0,21	0,31	0,36	0,37	0,38	0,39	0,39	0,34	0,30	0,26	0,22	0,18	0,15	0,12	TIO-00X
	0,52	0,77	0,89	0,93	0,96	0,97	0,98	0,86	0,75	0,64	0,54	0,46	0,38	0,31	TIO-000
	1,20	1,77	2,05	2,14	2,20	2,23	2,25	1,98	1,71	1,47	1,25	1,05	0,87	0,71	TIO-001
	2,04	3,00	3,48	3,63	3,73	3,79	3,82	3,35	2,91	2,50	2,12	1,78	1,47	1,20	TIO-002
	3,24	4,76	5,54	5,77	5,93	6,02	6,07	5,33	4,62	3,97	3,37	2,82	2,34	1,91	TIO-003
	5,28	7,76	9,02	9,40	9,66	9,81	9,88	8,68	7,53	6,47	5,49	4,60	3,80	3,10	TIO-004
	6,43	9,45	10,99	11,45	11,76	11,95	12,04	10,57	9,17	7,88	6,68	5,60	4,63	3,78	TIO-005
	7,42	10,91	12,68	13,22	13,58	13,79	13,90	12,20	10,59	9,10	7,72	6,46	5,35	4,36	TIO-006
35		0,27	0,34	0,36	0,37	0,38	0,39	0,35	0,30	0,26	0,22	0,19	0,16	0,13	TIO-00X
		0,67	0,84	0,90	0,94	0,96	0,98	0,86	0,75	0,65	0,56	0,47	0,39	0,32	TIO-000
		1,53	1,94	2,06	2,15	2,21	2,25	1,99	1,74	1,50	1,28	1,08	0,90	0,73	TIO-001
		2,60	3,29	3,50	3,65	6,75	3,81	3,37	2,94	2,55	2,17	1,83	1,52	1,25	TIO-002
		4,14	5,23	5,56	5,80	5,96	6,06	5,36	4,68	4,05	3,45	2,90	2,41	1,98	TIO-003
		6,74	8,52	9,06	9,45	9,71	9,87	8,73	7,62	6,59	5,62	4,73	3,93	3,23	TIO-004
		8,21	10,38	11,04	11,50	11,82	12,02	10,63	9,28	8,03	6,84	5,76	4,79	3,93	TIO-005
		9,47	11,98	12,74	13,28	13,65	13,87	12,27	10,72	9,27	7,90	6,65	5,53	4,54	TIO-006
30		0,20	0,31	0,34	0,36	0,37	0,38	0,34	0,30	0,26	0,22	0,19	0,16	0,13	TIO-00X
		0,50	0,76	0,84	0,89	0,93	0,96	0,85	0,75	0,65	0,56	0,47	0,40	0,33	TIO-000
		1,16	1,75	1,93	2,05	2,14	2,20	1,96	1,73	1,50	1,29	1,09	0,91	0,75	TIO-001
		1,96	2,98	3,27	3,48	3,63	3,73	3,33	2,93	2,55	2,19	1,85	1,54	1,27	TIO-002
		3,12	4,73	5,19	5,53	5,77	5,93	5,29	4,66	4,05	3,47	2,94	2,45	2,02	TIO-003
		5,08	7,71	8,46	9,01	9,40	9,66	8,62	7,59	6,60	5,66	4,79	4,00	3,29	TIO-004
		6,18	9,38	10,30	10,97	11,44	11,76	10,50	9,24	8,04	6,89	5,83	4,87	4,01	TIO-005
		7,14	10,83	11,90	12,66	13,21	13,58	12,12	10,67	9,28	7,96	6,73	5,62	4,63	TIO-006
25			0,26	0,30	0,33	0,35	0,37	0,33	0,29	0,26	0,22	0,19	0,16	0,13	TIO-00X
			0,64	0,75	0,82	0,88	0,92	0,83	0,73	0,64	0,56	0,47	0,40	0,33	TIO-000
			1,48	1,72	1,90	2,02	2,11	1,90	1,69	1,48	1,28	1,09	0,91	0,75	TIO-001
			2,50	2,92	3,21	3,43	3,58	3,23	2,87	2,51	2,17	1,84	1,55	1,28	TIO-002
			3,98	4,64	5,11	5,45	5,68	5,13	4,56	3,99	3,45	2,93	2,46	2,03	TIO-003
			6,48	7,56	8,32	8,87	9,26	8,36	7,42	6,51	5,61	4,77	4,01	3,32	TIO-004
			7,89	9,20	10,13	10,80	11,28	10,18	9,04	7,92	6,84	5,82	4,88	4,04	TIO-005
			9,11	10,63	11,70	12,47	13,02	11,76	10,44	9,15	7,89	6,71	5,63	4,66	TIO-006
20			0,18	0,25	0,29	0,32	0,34	0,31	0,28	0,25	0,22	0,19	0,16	0,13	TIO-00X
			0,45	0,62	0,73	0,80	0,86	0,79	0,71	0,63	0,54	0,46	0,39	0,33	TIO-000
			1,04	1,42	1,67	1,85	1,97	1,81	1,63	1,44	1,25	1,07	0,90	0,75	TIO-001
			1,76	2,41	2,84	3,13	3,34	3,07	2,76	2,44	2,12	1,81	1,53	1,27	TIO-002
			2,80	3,84	4,51	4,98	5,32	4,88	4,38	3,88	3,37	2,88	2,43	2,02	TIO-003
			4,57	6,25	7,34	8,11	8,66	7,95	7,14	6,31	5,49	4,70	3,96	3,29	TIO-004
			5,56	7,61	8,94	9,88	10,55	9,68	8,69	7,69	6,68	5,72	4,82	4,01	TIO-005
			6,42	8,78	10,32	11,40	12,18	11,17	10,04	8,88	7,71	6,60	5,57	4,63	TIO-006

Thermo®-Expansion Valve Series TX6

Hermetic Design

Features

- Balanced port design for stable control at partial load conditions and fluctuating condensing pressure
- Hermetic monobloc design with solder connect-ions for minimal leakage
- Very good stability is attained because of large forces generated by the large diaphragm diameter
- Biflow capability for applications in heat pumps (see technical data sheet for more informations).
- Compact design
- Capillary tube length 1.5 m
- PS: 31 bar, TS: -45 ... +65°C
- No CE marking according art. 3.3 PED 97/23 EC

Standard-MOP

Refrigerant	MOP (bar)	Valve fully closed	Valve fully open*
R 134a	4,8	+14°C	+11°C
R 22	7,9	+15°C	+13°C
R 404A / R 507	3,8	-14°C	-18°C
R 407C	7,9	+17°C	+14°C

*) max. evaporating temperature

Note: All temperatures are saturated/dew point. Pressures are given in gauge pressure.

Quick Selection Tables

R 134a

Nominal Capacity Q_n kW	less MOP		with Standard-MOP		Connection straight through Solder/ODF
	Type	Order-No.	Type	Order-No.	
10,3	-	-	TX6 - M12	801 547	12 mm x 16 mm
10,3	TX6 - M02	801 541	TX6 - M12	801 545	1/2“ x 5/8“
18,4	TX6 - M03	801 544	TX6 - M13	801 548	12 mm x 16 mm
18,4	TX6 - M03	801 542	TX6 - M13	801 546	1/2“ x 5/8“
25,6	TX6 - M04	801 569	TX6 - M14	801 577	16 mm x 22 mm
25,6	TX6 - M04	801 565	TX6 - M14	801 573	5/8“ x 7/8“
32,5	-	-	TX6 - M15	801 578	16 mm x 22 mm
32,5	TX6 - M05	801 566	TX6 - M15	801 574	5/8“ x 7/8“
48,1	TX6 - M06	801 571	TX6 - M16	801 579	22 mm x 28 mm
48,1	TX6 - M06	801 567	TX6 - M16	801 575	7/8“ x 1-1/8“
62,8	-	-	TX6 - M17	801 580	22 mm x 28 mm
62,8	TX6 - M07	801 568	TX6 - M17	801 576	7/8“ x 1-1/8“

Nominal capacities at +38°C condensing temperature, +4°C evaporating temperature (saturated temperatures / dew point) and 1 K liquid subcooling at the inlet of the expansion valve.

Valve selection for other operating conditions see page 22-24.

R 407C

Nominal Capacity Q_n kW	less MOP		with Standard-MOP		Connection straight through Solder/ODF
	Type	Order-No.	Type	Order-No.	
14,4	TX6 - N02	801 651	TX6 - N12	801 655	12 mm x 16 mm
14,4	TX6 - N02	801 653	TX6 - N12	801 534	1/2“ x 5/8“
25,6	TX6 - N03	801 652	TX6 - N13	801 656	12 mm x 16 mm
25,6	TX6 - N03	801 654	TX6 - N13	801 535	1/2“ x 5/8“
35,7	TX6 - N04	801 659	TX6 - N14	801 667	16 mm x 22 mm
35,7	TX6 - N04	801 663	TX6 - N14	801 536	5/8“ x 7/8
45,2	TX6 - N05	801 660	TX6 - N15	801 668	16 mm x 22 mm
45,2	TX6 - N05	801 664	TX6 - N15	801 537	5/8“ x 7/8
66,9	TX6 - N06	801 661	TX6 - N16	801 669	22 mm x 28 mm
66,9	TX6 - N06	801 665	TX6 - N16	801 538	7/8“x 1-1/8“
87,3	TX6 - N07	801 662	TX6 - N17	801 670	22 mm x 28 mm
87,3	TX6 - N07	801 666	TX6 - N17	801 539	7/8“ x 1-1/8“

R 22

Nominal Capacity Q_n kW	less MOP		with Standard-MOP		Connection straight through Solder/ODF
	Type	Order-No.	Type	Order-No.	
13,3	-	-	TX6 - H12	801 555	12 mm x 16 mm
13,3	TX6 - H02	801 549	TX6 - H12	801 553	1/2“ x 5/8“
23,7	-	-	TX6 - H13	801 556	12 mm x 16 mm
23,7	TX6 - H03	801 550	TX6 - H13	801 554	1/2“ x 5/8“
33,0	TX6 - H04	801 585	TX6 - H14	801 593	16 mm x 22 mm
33,0	TX6 - H04	801 581	TX6 - H14	801 589	5/8“ x 7/8
41,8	TX6 - H05	801 586	TX6 - H15	801 594	16 mm x 22 mm
41,8	TX6 - H05	801 582	TX6 - H15	801 590	5/8“ x 7/8
61,9	-	-	TX6 - H16	801 595	22 mm x 28 mm
61,9	TX6 - H06	801 583	TX6 - H16	801 591	7/8“ x 1-1/8“
80,8	-	-	TX6 - H17	801 596	22 mm x 28 mm
80,8	TX6 - H07	801 584	TX6 - H17	801 592	7/8“ x 1-1/8“

Nominal capacities at +38°C condensing temperature, +4°C evaporating temperature (saturated temperatures / dew point) and 1 K liquid subcooling at the inlet of the expansion valve.

Valve selection for other operating conditions see page 22-24.

Thermo®-Expansion Valve Series T

Exchangeable Power Assemblies and Orifices

TCLE

Features

- Modular design for economical logistics and easy assembly and servicing
- Very good stability is attained because of the large forces generated by the large diaphragm diameter
- High quality materials and processes for high reliability and long lifetime
- Superior partial load performance due to double seat orifice design (TJRE, TERE, TIRE & THRE)
- Biflow capability for applications in heat pumps
- Capillary tube length 1.5 m (TCLE, TJRE) and 3 m (TERE, TIRE & THRE)
- PS: 31 bar, TS: -45 ... +65°C
- No CE marking according art. 3.3 PED 97/23 EC

Type Code TCL E 100 H W 100 WL 10x16

- **Valve Series**
- **External Equalizer**
- **Capacity Code**
- **Refrigerant Code**
- **Charge Code**
- **MOP Code**
- **Flange Style**
  - WL = Angle Style
  - DL = Straight through
- **Connection**

Selection Chart for Orifice

Series	R 134a		R 22		R 404A/R 507		R 407C		Orifice
	Type	Nominal Capacity kW	Type	Nominal Capacity kW	Type	Nominal Capacity kW	Type	Nominal Capacity kW	
TCLE	25 MW	1,5	50 HW	1,9	25 SW	1,3	50 NW	2,1	**X 22440-B1B**
	75 MW	2,9	100 HW	3,7	75 SW	2,6	100 NW	4,0	**X 22440-B2B**
	150 MW	6,1	200 HW	7,9	150 SW	5,6	200 NW	8,5	**X 22440-B3B**
	200 MW	9,3	250 HW	11,9	200 SW	8,4	300 NW	12,9	**X 22440-B3,5B**
	250 MW	13,5	300 HW	17,3	250 SW	12,2	400 NW	18,7	**X 22440-B4B**
	350 MW	17,3	500 HW	22,2	400 SW	15,7	550 NW	24,0	**X 22440-B5B**
	550 MW	23,6	750 HW	30,4	600 SW	21,5	750 NW	32,9	**X 22440-B6B**
	750 MW	32,0	1000 HW	41,1	850 SW	29,0	1000 NW	44,4	**X 22440-B7B**
	900 MW	37,2	1200 HW	47,8	1000 SW	33,8	1150 NW	51,7	**X 22440-B8B**
TJRE	11 MW	45	14 HW	58	12 SW	40	14 NW	62	**X 11873-B4B**
	13 MW	57	18 HW	74	14 SW	51	17 NW	80	**X 11873-B5B**
TERE	16 MW	71	22 HW	91	18 SW	63	21 NW	99	**X 9117-B6B**
	19 MW	81	26 HW	104	20 SW	72	25 NW	112	**X 9117-B7B**
	25 MW	112	35 HW	143	27 SW	99	33 NW	155	**X 9117-B8B**
	31 MW	135	45 HW	174	34 SW	120	42 NW	188	**X 9117-B9B**
TIRE	45 MW	174	55 HW	223	47 SW	154	52 NW	241	**X 9166-B10B**
THRE	55 MW	197	75 HW	253	61 SW	174	71 NW	273	**X 9144-B11B**
	68 MW	236	100 HW	302	77 SW	209	94 NW	327	**X 9144-B13B**

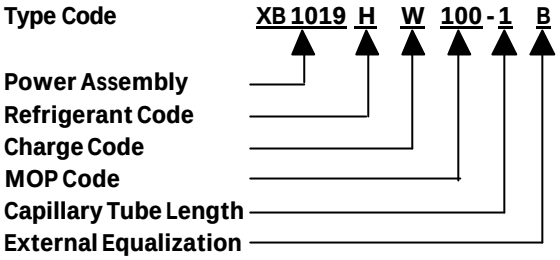
Nominal capacities at +38°C condensing temperature, +4°C evaporating temperature (saturated temperatures / dew point) and 1 K liquid subcooling at the inlet of the expansion valve.

Valve selection for other operating conditions see page 22 - 24.

MOP Code	Upper limit of evaporating Temperature range °C				
	R 134a	R 22	R 404A	R 407C	R 507
15	-17				
35	0	-16			
40			-18		-18
55	11		-10		-10
65		0			
75			-5		-5
80			0		0
100		13		14	

Available upon special request:

- Power assembly with solder connection for external pressure equalization
- Non-standard MOPs
- Non-standard charges
- Non-standard connection sizes (selection see page 35)



Selection Chart for Power Assemblies and Recommended Flanges

Orifice	Connection Standard-Flange, Angle Solder/ODF mm	inch	Power Assembly
X 22440-B1B	**C 501 - 5 mm** 10 x 16	**C 501 - 5** 3/8 x 5/8	XB1019...1 B
X 22440-B2B			
X 22440-B3B			
X 22440-B3,5B			
X 22440-B4B			
X 22440-B5B	**C 501 - 7 mm** 12 x 16	**C 501 - 7** 1/2 x 5/8	
X 22440-B6B			
X 22440-B7B	**A 576 mm** 16 x 22 (22 x 28 ODM)	**A 576** 5/8 x 7/8 (7/8 x 1 1/8 ODM)	
X 22440-B8B			
X 11873-B4B	**10331** 22 x 22	**10331** 7/8 x 7/8 (1 1/8 x 1 1/8 ODM)	
X 11873-B5B			
X 9117-B6B	**9153** 22 x 22	**9153** 7/8 x 7/8 (1 1/8 x 1 1/8 ODM)	XC726...2B
X 9117-B7B			
X 9117-B8B			
X 9117-B9B			
X 9166-B10B			
X 9144-B11B	**9149** 22 x 22	**9149** 7/8 x 7/8 (1 1/8 x 1 1/8 ODM)	
X 9144-B13B			

Accessories

	Type	Order-No.
Gasket Set for T Series Valves	X 13455 -1	027 579
Service Tool for T Series	X 99999	800 005
Heat Transfer Paste Thermal Mastik	PS 984	026 650
Joint Sealing 'Leak Lock'	PS 1255 - 7	053 517
Steel Screws for Following Flange Types:		
C501 , 9761 , 6346 , A576	Screw ST 32	803 573
9148 , 9149, 9152, 9153, 10331 , 10332	Screw ST 48	803 574

Correction Tables for Thermo Expansion Valves, Series TI, TX6, T and L

Valve selection for operating conditions other than +38°C/+4°C and 1 K liquid subcooling at the inlet of the expansion valve:

$$Q_n = Q_o \times K_t \times K_{Dp}$$

Q_n: Nominal valve capacity
Q_o: Required cooling capacity
K_t : Correction factor for evaporating and liquid temperature
$K_{\Delta p}$: Correction factor for pressure drop at valve

Liquid Temperature entering Valve °C	**R 134a** Correction Factor K_t Evaporating Temperature °C															
	+30	+25	+20	+15	+10	+5	0	-5	-10	-15	-20	-25	-30			
+60	1,22	1,25	1,27	1,30	1,33	1,36	1,40	1,44	1,48	1,75	2,08	2,46	2,94			
+55	1,14	1,16	1,18	1,21	1,23	1,26	1,29	1,33	1,36	1,60	1,90	2,25	2,68			
+50	1,07	1,08	1,10	1,13	1,15	1,17	1,20	1,23	1,26	1,48	1,76	2,07	2,46			
+45	1,00	1,02	1,04	1,06	1,08	1,10	1,12	1,15	1,17	1,38	1,63	1,92	2,28			
+40	0,93	0,96	0,98	0,99	1,01	1,03	1,05	1,08	1,10	1,29	1,52	1,79	2,12			
+35	0,90	0,91	0,92	0,94	0,96	0,97	0,99	1,01	1,03	1,21	1,43	1,68	1,99			
+30	0,85	0,86	0,88	0,89	0,91	0,92	0,94	0,96	0,98	1,14	1,35	1,58	1,87			
+25		0,82	0,83	0,85	0,86	0,87	0,89	0,91	0,92	1,08	1,27	1,49	1,76			
+20			0,80	0,81	0,82	0,83	0,85	0,89	0,88	1,02	1,21	1,41	1,67			
+15				0,77	0,78	0,79	0,81	0,82	0,84	0,97	1,15	1,34	1,58			
+10					0,75	0,76	0,77	0,78	0,80	0,93	1,09	1,28	1,51			
+5						0,73	0,74	0,75	0,76	0,89	1,04	1,22	1,44			
0							0,71	0,72	0,73	0,85	1,00	1,17	1,37			
-5								0,69	0,70	0,82	0,96	1,12	1,31			
-10									0,68	0,79	0,92	1,07	1,26			
Correction Factor K_{Dp}																
Δp (bar)	0,5	1,0	1,5	2,0	2,5	3,0	3,5	4,0	4,5	5,0	5,5	6,0	6,5	7,0	7,5	8,0
$K_{\Delta p}$	3,50	2,48	2,02	1,75	1,57	1,43	1,32	1,24	1,17	1,11	1,06	1,01	0,97	0,94	0,90	0,88
Δp (bar)	8,5	9,0	9,5	10,0	10,5	11,0	11,5	12,0	13,0	14,0	15,0	16,0	17,0	18,0	19,0	20,0
$K_{\Delta p}$	0,85	0,83	0,80	0,78	0,76	0,75	0,73	0,72	0,69	0,66	0,64	0,62	0,60	0,58	0,57	0,55

For the proper sizing of thermo expansion valves in cases of subcooling of more than 15 K please use the correction factors on page 6 of this brochure.

Liquid Temperature entering Valve °C	**R 22** Correction Factor K_t Evaporating Temperature °C															
	+30	+25	+20	+15	+10	+5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
+60	1,22	1,23	1,24	1,25	1,26	1,28	1,30	1,31	1,38	1,58	1,84	2,16	2,56	3,04	3,55	4,23
+55	1,14	1,15	1,16	1,17	1,19	1,20	1,22	1,23	1,29	1,42	1,72	2,02	2,39	2,83	3,30	3,94
+50	1,08	1,09	1,10	1,11	1,12	1,13	1,15	1,16	1,21	1,39	1,62	1,89	2,24	2,66	3,10	3,68
+45	1,02	1,03	1,04	1,05	1,06	1,07	1,08	1,10	1,15	1,31	1,52	1,79	2,11	2,50	2,91	3,46
+40	0,97	0,98	0,99	1,00	1,01	1,02	1,03	1,04	1,09	1,24	1,45	1,69	2,00	2,37	2,75	3,27
+35	0,92	0,93	0,94	0,95	0,96	0,97	0,98	0,99	1,03	1,18	1,37	1,61	1,89	2,24	2,60	3,09
+30	0,88	0,89	0,90	0,91	0,92	0,93	0,94	0,95	0,99	1,13	1,31	1,55	1,83	2,13	2,47	2,93
+25		0,85	0,86	0,87	0,88	0,89	0,89	0,90	0,94	1,08	1,25	1,46	1,72	2,03	2,36	2,80
+20			0,83	0,83	0,84	0,85	0,86	0,87	0,90	1,03	1,19	1,40	1,64	1,94	2,25	2,66
+15				0,80	0,81	0,81	0,82	0,83	0,87	0,99	1,14	1,34	1,57	1,86	2,15	2,55
+10					0,78	0,78	0,79	0,80	0,83	0,95	1,10	1,28	1,51	1,78	2,06	2,44
+5						0,75	0,76	0,77	0,80	0,91	1,06	1,23	1,45	1,71	1,98	2,34
0							0,73	0,74	0,77	0,88	1,02	1,19	1,39	1,65	1,90	2,25
-5								0,71	0,74	0,85	0,98	1,14	1,34	1,58	1,83	2,17
-10									0,72	0,82	0,95	1,10	1,30	1,53	1,77	2,09
Correction Factor $K_{\Delta p}$																
Δp (bar)	0,5	1,0	1,5	2,0	2,5	3,0	3,5	4,0	4,5	5,0	5,5	6,0	6,5	7,0	8,0	9,0
$K_{\Delta p}$	4,25	3,00	2,46	2,13	1,90	1,74	1,61	1,50	1,42	1,35	1,28	1,23	1,18	1,14	1,06	1,00
Δp (bar)	10,0	11,0	12,0	13,0	14,0	15,0	16,0	17,0	18,0	19,0	20,0	21,0	22,0	23,0	24,0	25,0
$K_{\Delta p}$	0,95	0,91	0,87	0,83	0,80	0,78	0,75	0,73	0,71	0,69	0,67	0,66	0,64	0,63	0,61	0,60

Liquid Temperature entering Valve °C	**R 404A** Correction Factor K_t Evaporating Temperature °C															
	+30	+25	+20	+15	+10	+5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
+60	1,56	1,59	1,64	1,69	1,74	1,81	1,88	1,96	2,06	2,43	2,95	3,56	4,37	5,38	6,71	8,47
+55	1,32	1,35	1,38	1,42	1,46	1,50	1,55	1,61	1,68	1,96	2,36	2,83	3,43	4,16	5,12	6,34
+50	1,16	1,18	1,20	1,23	1,26	1,30	1,34	1,38	1,43	1,67	1,99	2,37	2,85	3,43	4,18	5,14
+45	1,04	1,05	1,07	1,10	1,12	1,15	1,18	1,22	1,26	1,46	1,74	2,05	2,46	2,95	3,57	4,35
+40	0,94	0,96	0,97	0,99	1,02	1,04	1,07	1,09	1,13	1,30	1,55	1,82	2,17	2,59	3,13	3,80
+35	0,87	0,88	0,90	0,91	0,93	0,95	0,97	1,00	1,02	1,18	1,40	1,64	1,96	2,33	2,80	3,38
+30	0,81	0,82	0,83	0,84	0,86	0,88	0,90	0,92	0,94	1,08	1,28	1,50	1,78	2,11	2,53	3,05
+25		0,76	0,77	0,79	0,80	0,82	0,83	0,85	0,87	1,00	1,18	1,39	1,64	1,94	2,32	2,79
+20			0,73	0,74	0,75	0,77	0,78	0,80	0,81	0,94	1,10	1,29	1,52	1,80	2,15	2,58
+15				0,70	0,71	0,72	0,73	0,75	0,76	0,88	1,03	1,21	1,42	1,68	2,00	2,40
+10					0,67	0,68	0,69	0,71	0,72	0,83	0,97	1,13	1,34	1,58	1,88	2,25
+5						0,65	0,66	0,67	0,68	0,78	0,92	1,07	1,26	1,49	1,77	2,11
0							0,63	0,64	0,65	0,75	0,88	1,02	1,20	1,41	1,67	2,00
-5								0,61	0,62	0,71	0,83	0,97	1,14	1,34	1,59	1,90
-10									0,60	0,68	0,80	0,93	1,09	1,28	1,52	1,81
Correction Factor $K_{\Delta p}$																
Δp (bar)	0,5	1,0	1,5	2,0	2,5	3,0	3,5	4,0	4,5	5,0	5,5	6,0	6,5	7,0	8,0	9,0
$K_{\Delta p}$	4,55	3,21	2,62	2,27	2,03	1,86	1,72	1,61	1,52	1,44	1,37	1,31	1,26	1,21	1,14	1,07
Δp (bar)	10,0	11,0	12,0	13,0	14,0	15,0	16,0	17,0	18,0	19,0	20,0	21,0	22,0	23,0	24,0	25,0
$K_{\Delta p}$	1,02	0,97	0,93	0,89	0,86	0,83	0,80	0,78	0,76	0,74	0,72	0,70	0,69	0,67	0,66	0,64

For the proper sizing of thermo expansion valves in cases of subcooling of more than 15 K please use the correction factors on page 6 of this brochure.

Liquid Temperature entering Valve °C	**R 407C** Correction Factor K_t Evaporating Temperature °C											
	+30	+25	+20	+15	+10	+5	0	-5	-10	-15	-20	-25
+55	1,20	1,21	1,23	1,26	1,28	1,31	1,34	1,37	1,40	1,63	1,98	2,42
+50	1,10	1,11	1,13	1,15	1,17	1,19	1,22	1,24	1,27	1,48	1,79	2,18
+45	1,02	1,03	1,05	1,06	1,08	1,10	1,12	1,14	1,17	1,35	1,64	2,00
+40	0,95	0,96	0,98	0,99	1,01	1,02	1,04	1,06	1,08	1,25	1,52	1,84
+35	0,89	0,90	0,92	0,93	0,94	0,96	0,98	0,99	1,01	1,17	1,41	1,71
+30	0,85	0,85	0,87	0,88	0,89	0,90	0,92	0,93	0,95	1,10	1,32	1,60
+25		0,81	0,82	0,83	0,84	0,85	0,87	0,88	0,90	1,03	1,25	1,51
+20			0,78	0,79	0,80	0,81	0,82	0,84	0,85	0,98	1,18	1,43
+15				0,75	0,76	0,77	0,78	0,80	0,81	0,93	1,12	1,35
+10					0,73	0,74	0,75	0,76	0,77	0,89	1,07	1,29
+5						0,71	0,72	0,73	0,74	0,85	1,02	1,23
0							0,69	0,70	0,71	0,81	0,98	1,18
-5								0,67	0,68	0,78	0,94	1,13
-10									0,65	0,75	0,90	1,08

Correction Factor $K_{\Delta p}$																
Δp (bar)	0,5	1,0	1,5	2,0	2,5	3,0	3,5	4,0	4,5	5,0	5,5	6,0	6,5	7,0	8,0	9,0
$K_{\Delta p}$	4,78	3,33	2,72	2,36	2,11	1,92	1,78	1,67	1,57	1,49	1,42	1,36	1,31	1,26	1,18	1,11
Δp (bar)	10,0	11,0	12,0	13,0	14,0	15,0	16,0	17,0	18,0	19,0	20,0	21,0	22,0	23,0	24,0	25,0
$K_{\Delta p}$	1,05	1,01	0,96	0,92	0,89	0,86	0,83	0,81	0,79	0,76	0,75	0,73	0,71	0,70	0,68	0,67

Attention: See page 6 for determining of conditions for systems with R 407C.

Liquid Temperature entering Valve °C	**R 507** Correction Factor K_t Evaporating Temperature °C															
	+30	+25	+20	+15	+10	+5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
+60	1,54	1,57	1,61	1,65	1,71	1,76	1,83	1,90	1,98	2,36	2,84	3,44	4,23	5,25	6,61	8,45
+55	1,30	1,33	1,36	1,39	1,43	1,47	1,52	1,57	1,62	1,92	2,29	2,75	3,35	4,11	5,11	6,44
+50	1,15	1,17	1,19	1,22	1,24	1,28	1,31	1,35	1,40	1,64	1,95	2,33	2,81	3,43	4,23	5,29
+45	1,03	1,05	1,07	1,09	1,11	1,14	1,17	1,20	1,23	1,45	1,71	2,04	2,45	2,97	3,64	4,53
+40	0,94	0,96	0,97	0,99	1,01	1,03	1,06	1,08	1,11	1,30	1,53	1,82	2,18	2,63	3,22	3,98
+35	0,87	0,88	0,90	0,91	0,93	0,95	0,97	0,99	1,01	1,18	1,39	1,65	1,97	2,37	2,89	3,56
+30	0,81	0,82	0,83	0,85	0,86	0,88	0,89	0,91	0,93	1,09	1,28	1,51	1,80	2,17	2,63	3,23
+25		0,77	0,78	0,79	0,80	0,82	0,83	0,85	0,87	1,01	1,18	1,40	1,66	1,99	2,42	2,97
+20			0,73	0,74	0,75	0,77	0,78	0,79	0,81	0,94	1,10	1,30	1,54	1,85	2,24	2,74
+15				0,70	0,71	0,72	0,73	0,75	0,76	0,88	1,03	1,21	1,44	1,73	2,09	2,55
+10					0,67	0,68	0,69	0,70	0,72	0,83	0,97	1,14	1,35	1,62	1,95	2,38
+5						0,64	0,65	0,67	0,68	0,78	0,92	1,07	1,27	1,52	1,83	2,23
0							0,62	0,63	0,64	0,74	0,87	1,02	1,20	1,43	1,73	2,10
-5								0,60	0,61	0,70	0,82	0,96	1,14	1,35	1,63	1,98
-10									0,58	0,67	0,78	0,91	1,08	1,28	1,54	1,87

Correction Faktor $K_{\Delta p}$																
Δp (bar)	0,5	1,0	1,5	2,0	2,5	3,0	3,5	4,0	4,5	5,0	5,5	6,0	6,5	7,0	8,0	9,0
$K_{\Delta p}$	4,63	3,27	2,67	2,31	2,07	1,89	1,75	1,64	1,54	1,46	1,40	1,34	1,28	1,24	1,16	1,09
Δp (bar)	10,0	11,0	12,0	13,0	14,0	15,0	16,0	17,0	18,0	19,0	20,0	21,0	22,0	23,0	24,0	25,0
$K_{\Delta p}$	1,03	0,99	0,94	0,91	0,87	0,85	0,82	0,79	0,77	0,75	0,73	0,71	0,70	0,68	0,67	0,65

For the proper sizing of thermo expansion valves in cases of subcooling of more than 15 K please use the correction factors on page 6 of this brochure.

Thermo®-Expansion Valve Series ZZ

for Low Evaporating Temperatures between -45 to -120°C

Features

- Modular design for economical logistics and easy assembly and servicing
- Very good stability is attained because of the large forces generated by the large diaphragm diameter
- High quality materials and processes for high reliability and long lifetime
- Capillary tube length 3 m
- PS: 31 bar, TS: -120 ... +65°C
- No CE marking according art. 3.3 PED 97/23 EC

ZZCE

Type Code ZZC E 1 1/2 H W 35 WL 10x16

- **Valve Series**
- **External Equalizer**
- **Capacity Code**
- **Refrigerant Code**
- **Charge Code**
- **MOP Code**
- **Flange Style**
  - WL=Angle Style
  - DL=Straight through
- **Connection**

XC 726 H W 35 - 2 B

- **Power Assembly**
- **Refrigerant Code**
- **Charge Code**
- **MOP Code**
- **Capillary Tube Length**
- **External Equalization**

Series	R 22 Type	R 22 Nom. Cap. kW	R 23 Type	R 23 Nom. Cap. kW	R 404A / R 507 Type	R 404A / R 507 Nom. Cap. kW	Orifice	Connection Standard Flange, Angle Solder/ODF mm	Connection Standard Flange, Angle Solder/ODF inch	Power Assembly
ZZCE	3/4 HW	1,8	2 BG	1,9	3/4 SW	1,2	**X 10110-B1B**	C 501 - 5 mm 10 x 16	C 501 - 5 $^{3}/_{8}$" x $^{5}/_{8}$"	XC726... ...2B
	1 1/2 HW	3,8	6 BG	4,0	1 1/2 SW	2,6	**X 10110-B2B**			
	2 1/2 HW	6,4	8 BG	6,8	2 1/2 SW	4,4	**X 10110-B3B**			
	4 HW	10,2	12 BG	10,8	3 1/2 SW	7,0	**X 10110-B4B**	C 501 - 7 mm 12 x 16	C 501 - 7 $^{1}/_{2}$" x $^{5}/_{8}$"	
	6 HW	15,4	17 BG	16,3	5 SW	10,6	**X 10110-B5B**			
	8 HW	20,5	25 BG	21,7	8 SW	14,1	**X 10110-B6B**	A 576 mm 16 X 22 (22 x 28 ODM)	A 576 $^{5}/_{8}$" x $^{7}/_{8}$" ($^{7}/_{8}$" x 1 $^{1}/_{8}$" ODM)	
ZZJRE	10 HW	25,6	31 BG	27,1	9 SW	17,6	**X 10111-B5B**	10331 22 x 22	10331 $^{7}/_{8}$" x $^{7}/_{8}$" (1 $^{1}/_{8}$" x 1 $^{1}/_{8}$" ODM)	
ZZERE	12 HW	30,7	39 BG	32,5	11 SW	21,2	**X 10059-B6B**			
	13 HW	33,3	42 BG	35,2	13 SW	22,9	**X 10059-B7B**	9153 22 x 22	9153 $^{7}/_{8}$" x $^{7}/_{8}$" (1 $^{1}/_{8}$" x 1 $^{1}/_{8}$" ODM)	
	18 HW	46,1	57 BG	48,8	18 SW	31,7	**X 10059-B8B**			
	21 HW	53,7	67 BG	56,8	20 SW	37,0	**X 10059-B9B**			

Attention: To withstand stress at extremely low temperatures, thermo expansion valves series ZZ feature bronze bolts.

Nominal capacities at the following operating conditions

Refrigerant	R22	R23	R404A / R507
Evaporating Temperature (°C)	-40	-60	-40
Condensing Temperature (°C)	25	-25	25
Subcooling (K)	1	1	1

Valve selection at other operating conditions see page 26 - 28.
Accessories: see page 26.

Preferred MOPs

Upper limit of Evaporating Temperature Range (°C)	MOP-Code R 22	MOP-Code R 23	R 404A / R 507
-10	–	–	55
-18	**35**	–	**40**
-33	–	125	–
-50	–	**60**	–
-70	–	**20**	–

Available upon special request:

- Power assembly with solder connection for external pressure equalization
- Non-standard MOPs
- Non-standard charges
- Non-standard connection sizes (Selection see page 35)

Accessories

	Type	Order-No.
Gasket Set for ZZ Series Valves	X 13455 -1	027 579
Service Tool for ZZ Series	X 99999	800 005
Heat Transfer Paste Thermal Mastik	PS 984	026 650
Joint Sealing 'Leak Lock'	PS 1255 - 7	053 517
Bronze Screws for Following Flange Types: (ZZ-Valves)		
C501 , 9761 , 6346 , A576	Screw BZ 32	803 575
9152 , 9153 , 10331 , 10332	Screw BZ 48	803 576

Correction Tables for Series ZZ

Valve selection for operating conditions other than mentioned on page 25:

$$Q_n = Q_o \times K_t \times K_{\Delta p}$$

Q_n: Nominal valve capacity
Q_o: Required cooling capacity
K_t: Correction factor for evaporating and liquid temperature
$K_{\Delta p}$: Correction factor for pressure drop at valve

Liquid Temperature entering Valve °C	**R 22**	**Correction Factor K_t** Evaporating Temperature °C					
	-45	-50	-55	-60	-65	-70
+10	1,02	1,21	1,42	1,66	1,97	2,30
0	0,94	1,12	1,30	1,53	1,75	2,02
-10	0,88	1,04	1,21	1,42	1,61	1,83
-20	0,82	0,98	1,13	1,32	1,50	1,71
-30	0,77	0,92	1,05	1,23	1,39	1,56
-40		0,86	1,00	1,15	1,30	1,47
-50				1,09	1,25	1,42

Correction Factor $K_{\Delta p}$

Δp (bar)	0,5	1,0	1,5	2,0	2,5	3,0	3,5	4,0	4,5	5,0	6,0	7,0
$K_{\Delta p}$	4,40	3,10	2,50	2,20	2,00	1,80	1,70	1,60	1,50	1,40	1,30	1,20
Δp (bar)	8,0	9,0	10,0	11,0	12,0	13,0	14,0	15,0	16,0	17,0	18,0	19,0
$K_{\Delta p}$	1,10	1,04	0,98	0,94	0,90	0,87	0,83	0,81	0,78	0,76	0,74	0,72

For the proper sizing of thermo expansion valves in cases of subcooling of more than 15K please use the correction Factors on page 6 of this brochure.

Liquid Temperature entering Valve °C	**R 23**	**Correction Factor K_t** Evaporating Temperature °C										
	-45	-50	-55	-60	-65	-70	-75	-80	-85	-90	-95	-100
-10	1,18	1,18	1,19	1,21	1,28	1,48	1,86	2,21	2,73	3,36	4,15	5,06
-15	1,11	1,11	1,12	1,13	1,20	1,39	1,74	2,07	2,56	3,14	3,88	4,72
-20	1,04	1,05	1,06	1,07	1,13	1,31	1,64	1,95	2,41	2,95	3,64	4,43
-25	0,99	0,99	1,00	1,01	1,07	1,24	1,55	1,84	2,27	2,78	3,43	4,17
-30	0,94	0,94	0,95	0,96	1,02	1,17	1,47	1,75	2,15	2,63	3,24	3,94
-35	0,89	0,90	0,91	0,91	0,97	1,12	1,40	1,66	2,04	2,50	3,08	3,74
-40	0,85	0,86	0,86	0,87	0,92	1,06	1,33	1,58	1,94	2,38	2,92	3,55
-45		0,82	0,83	0,83	0,88	1,02	1,27	1,51	1,85	2,27	2,79	3,38
-50			0,79	0,80	0,84	0,97	1,22	1,44	1,77	2,17	2,86	3,23
-55				0,76	0,81	0,93	1,17	1,38	1,70	2,07	2,55	3,09
-60					0,78	0,90	1,12	1,33	1,63	1,99	2,44	2,96
-65						0,86	1,08	1,27	1,57	1,91	2,35	2,84
-70							1,04	1,23	1,51	1,84	2,26	2,73
-75								1,18	1,45	1,77	2,18	2,63
-80									1,40	1,71	2,10	2,54
	Correction Factor $K_{\Delta p}$											
Δp (bar)	0,5	1,0	1,5	2,0	2,5	3,0	3,5	4,0	4,5	5,0	6,0	7,0
$K_{\Delta p}$	4,20	2,97	2,43	2,10	1,88	1,72	1,59	1,49	1,40	1,33	1,21	1,12
Δp (bar)	8,0	9,0	10,0	11,0	12,0	13,0	14,0	15,0	16,0	17,0	18,0	19,0
$K_{\Delta p}$	1,05	0,99	0,94	0,90	0,86	0,82	0,79	0,77	0,74	0,72	0,70	0,68

Liquid Temperature entering Valve °C	**R 507**	**Correction Factor K_t** Evaporating Temperature °C				
	-45	-50	-55	-60	-65	-70
+30	1,26	1,67	2,10	2,68	3,48	4,58
+20	1,07	1,41	1,77	2,25	2,89	3,78
+10	0,94	1,22	1,52	1,92	2,46	3,23
0	0,83	1,08	1,33	1,68	2,16	2,82
-10	0,75	0,95	1,19	1,49	1,92	2,48
-20	0,67	0,86	1,07	1,34	1,70	2,20
-30	0,61	0,78	0,96	1,21	1,54	2,00
-40	0,55	0,71	0,86	1,08	1,38	1,79
-50			0,79	0,99	1,24	1,62
	Correction Factor $K_{\Delta p}$					
Δp (bar)	0,5	1,0	1,5	2,0	2,5	3,0	3,5	4,0	4,5	5,0	6,0	7,0
$K_{\Delta p}$	4,77	3,37	2,75	2,38	2,13	1,95	1,80	1,69	1,59	1,51	1,38	1,27
Δp (bar)	8,0	9,0	10,0	11,0	12,0	13,0	14,0	15,0	16,0	17,0	18,0	19,0
$K_{\Delta p}$	1,19	1,12	1,07	1,02	0,97	0,94	0,90	0,87	0,84	0,82	0,79	0,77

For the proper sizing of thermo expansion valves in cases of subcooling of more than 15 K please use the correction factors on page 6 of this brochure.

Liquid Temperature entering Valve °C	**R 404A** Correction Factor K_t Evaporating Temperature °C							
	-40	-45	-50	-55	-60	-65	-70	-75
+40	1,40	1,76	2,21	2,77	3,56	4,30	4,87	5,61
+35	1,24	1,55	1,94	2,42	3,09	3,71	4,17	4,77
+30	1,12	1,39	1,73	2,15	2,74	3,27	3,66	4,17
+25	1,02	1,26	1,57	1,94	2,46	2,93	3,27	3,70
+20	0,94	1,16	1,44	1,77	2,24	1,66	2,96	3,34
+15	0,87	1,07	1,33	1,63	2,06	2,44	2,71	3,05
+10	0,81	1,00	1,23	1,52	1,91	2,26	2,49	2,80
+5	0,76	0,94	1,15	1,42	1,78	2,10	2,32	2,60
0	0,71	0,88	1,08	1,33	1,67	1,97	2,17	2,43
-5	0,68	0,83	1,02	1,25	1,57	1,85	2,04	2,28
-10	0,64	0,79	0,97	1,19	1,49	1,75	1,92	2,14
-15	0,61	0,75	0,92	1,13	1,41	1,66	1,82	2,03
-20	0,58	0,72	0,88	1,07	1,34	1,57	1,73	1,92
-25	0,56	0,69	0,84	1,03	1,28	1,50	1,65	1,83
-30	0,54	0,66	0,80	0,98	1,22	1,43	1,57	1,75
-35	0,51	0,63	0,77	0,94	1,17	1,36	1,49	1,66
-40		0,60	0,74	0,90	1,12	1,31	1,43	1,59
-45			0,71	0,86	1,07	1,25	1,37	1,52
-50				0,83	1,03	1,21	1,32	1,46

Correction Factor $K_{\Delta p}$

Δp (bar)	0,5	1	1,5	2	2,5	3	3,5	4	4,5	5	6	7
$K_{\Delta p}$	4,73	3,34	2,73	2,36	2,11	1,93	1,79	1,67	1,58	1,5	1,37	1,26
Δp (bar)	8	9	10	11	12	13	14	15	16	17	18	19
$K_{\Delta p}$	1,18	1,11	1,06	1,01	0,97	0,93	0,89	0,86	0,84	0,8	0,79	0,77

For the proper sizing of thermo expansion valves in cases of subcooling of more than 15 K please use the correction factors on page 6 of this brochure.

Liquid Injection Valve Series L

Exchangeable Power Assemblies and Orifices

Features

- Applications for Series L valves include superheat control (desuperheating of suction gas i.e. in hotgas bypass systems and interstage cooling in multiple stage compressors)
- Modular design for economical logistics and easy assembly and servicing
- Very good stability is attained because of the large forces generated by the large diaphragm diameter
- High quality materials and processes for high reliability and long lifetime
- Superior partial load performance due to seat orifice design (LJRE, LERE & LIRE)
- Capillary tube length 3 m
- PS: 31 bar, TS: -45 ... +65°C
- No CE marking according art. 3.3 PED 97/23 EC

LCLE

Type Code LCL E 4 CL WL 10x16

- **Valve Series**
- **External Equalizer**
- **Capacity Code**
- **Charge Code**
- **Flange Style**
  - WL=Angle Style
  - DL=Straight through
- **Connection**

Type Code XB1019 CL - 2 B

- **Power Assembly**
- **Charge Code**
- **Capillary Tube Length (3 m)**
- **External Equalization**

Series		Nominal Capacity Q_n kW					Orifice	Connections Standard Flange, Angle Solder/ODF		Power Assembly
		R 134a	R 22	R 404A	R 407C	R 507		mm	inch	
	1 *	1,5	1,9	1,3	2,1	1,3	**X 22440-B1B**			
	2 *	2,9	3,7	2,6	4,0	2,6	**X 22440-B2B**	**C 501 – 5 mm**	**C 501 – 5**	
	3 *	6,1	7,9	5,6	8,5	5,6	**X 22440-B3B**	10 x16	3/8 x 5/8	
	3,5 *	9,3	11,9	8,4	12,9	8,4	**X 22440-B3,5B**			
LCLE	4 *	13,5	17,3	12,2	18,7	12,2	**X 22440-B4B**			
	6 *	17,3	22,2	15,7	24,0	15,7	**X 22440-B5B**	**C 501 – 7 mm**	**C 501 – 7**	
	7 *	23,6	30,4	21,5	32,9	21,5	**X 22440-B6B**	12 x 16	1/2 x 5/8	XB1019...2B
	9 *	32,0	41,1	29,0	44,4	29,0	**X 22440-B7B**	**A 576 mm**	**A 576**	
	10 *	37,2	47,8	33,8	51,7	33,8	**X 22440-B8B**	16 x 22 (22 x 28 ODM)	5/8 x 7/8 (7/8 x 1 1/8 ODM)	
	11 *	45	58	40	62	40	**X 11873-B4B**	**10331**	**10331**	
LJRE	12 *	57	74	51	80	51	**X 11873-B5B**	22 x 22	7/8 x 7/8 (1 1/8 x 1 1/8 ODM)	
	13 *	71	91	63	99	63	**X 9117-B6B**			
	14 *	81	104	72	112	72	**X 9117-B7B**	**9153**	**9153**	
LERE	15 *	112	143	99	155	99	**X 9117-B8B**	22 x 22	7/8 x 7/8	XC726...2B
	16 *	135	174	120	188	120	**X 9117-B9B**		(1 1/8 x 1 1/8 ODM)	
LIRE	17 *	174	223	154	241	154	**X 9166-B10B**			

Nominal capacities at +38°C condensing temperature, +4°C evaporating temperature (saturated temperatures / dew point) and 1 K liquid subcooling at the inlet of the expansion valve.

Superheat selection

* Charge Code	Refrigerant				
	R 134a	R 22	R 404A	R 407C	R 507
CL	–	**15 K**	**22 K**	**13 K**	**22 K**
GL	**15 K**	30 K	35 K	25 K	35 K
UL	30 K	45 K		40 K	

* Please indicate designation character for desired superheat

Available upon special request

- Power assembly with solder connection for external pressure equalization
- Non-standard connection sizes see page 35.

Accessories

	Type	Order-No.
Gasket Set for L Series Valves	X 13455 -1	027 579
Service Tool for L Series	X 99999	800 005
Heat Transfer Paste Thermal Mastik	PS 984	026 650
Joint Sealing 'Leak Lock'	PS 1255 - 7	053 517
Steel Screws for Following Flange Types:		
C501, 9761 , 6346 , A576	Screw ST 32	803 573
9152, 9153, 10331 , 10332	Screw ST 48	803 574

Correction Tables for Series L

Valve selection for desuperheating of suction gas:

The required desuperheating capacity Q_{des} has to be multiplied with the correction factors on page 22 - 24.

$$\mathbf{Q_{des} \times K_t \times K_{\Delta p} = Q_n}$$

Q_{des}: Required desuperheating capacity
K_t : Correction factor for evaporating and liquid temperature
$K_{\Delta p}$: Correction factor for pressure drop at valve
Q_n : Nominal valve capacity

Valve selection for desuperheating of suction gas in conjunction with hotgas-bypass regulation:

The required bypass capacity Q_{Byp} has to be multiplied with correction factor K_{ti} per table below.

$$\mathbf{Q_{Byp} \times K_{ti} = Q_n}$$

Q_{Byp}: Required bypass capacity
K_{ti} : Correction factor for evaporating temperature
Q_n : Nominal valve capacity

Condensing Temperature °C	Refrigerant	Correction Factor K_{ti} Evaporating Temperature °C							
		+10	+5	0	-10	-20	-30	-40	-50
+50	**R 22**	0,33	0,36	0,40	0,47	0,56	0,66	0,78	0,93
	R 407 C	0,41	0,45	0,49	0,58	0,69			
	R 134a	0,38	0,42	0,44	0,54	0,64			
	R 507/404A	0,50	0,54	0,59	0,70	0,83	0,98	1,18	1,38
+40	**R 22**	0,26	0,29	0,32	0,38	0,46	0,55	0,66	0,78
	R 407 C	0,32	0,35	0,39	0,46	0,55			
	R 134a	0,31	0,33	0,36	0,44	0,52			
	R 507/404A	0,38	0,42	0,45	0,54	0,64	0,76	0,90	1,08
+30	**R 22**	0,20	0,22	0,25	0,31	0,38	0,46	0,55	0,66
	R 407 C	0,25	0,28	0,31	0,37	0,45			
	R 134a	0,24	0,26	0,29	0,35	0,43			
	R 507/404A	0,29	0,32	0,35	0,42	0,51	0,60	0,72	0,86
+20	**R 22**	0,15	0,17	0,19	0,25	0,31	0,38	0,46	0,56
	R 407 C	0,19	0,21	0,24	0,30	0,37			
	R 134a	0,18	0,20	0,22	0,28	0,35			
	R 507/404A	0,22	0,25	0,27	0,33	0,40	0,48	0,58	0,70

Correction factors based on 20K superheat suction gas at the inlet of compressor, discharge temperature 28K above isentropic compression and 1K subcooling.

Liquid Injection Valves Series 935

Exchangeable Power Assemblies and Orifices

Applications

- Series 935 valves are applied as temperature controls. Applications include:
  - Desuperheating of discharge gas on compressors. In this case bulbs are mounted on the high pressure outlet of the compressor
  - Control of compressor oil temperatures
- Series 935 valves shall not be used to control superheat

Features

- Modular design for economical logistics and easy assembly and servicing
- Very good stability is attained because of the large forces generated by the large diaphragm diameter
- High quality materials and processes for high reliability and long lifetime
- Combinations of different charges with various orifice springs cover a very large application range
- PS: 31 bar, TS: -45 ... +65°C
- No CE marking according art. 3.3 PED 97/23 EC
- Non-standard connection sizes see page 35

935

Type Code **935 - 7 - B WL 10x16**

Valve Series
Temperature Code
Capacity Code
Flange Style
WL=Angle Style
DL=Straight through
Connection Size

Type Code **XB1019 YL - 2A**

Power Assembly
Charge Code
Capillary Tube Length (3 m)

Series		Nominal Capacity Q_n kW					Orifice	Standard Flange, Angle Solder/ODF		Power Assembly
		R134a	R22	R 404A	R 407C	R 507		mm	Inch	
935-*-	A	4,0	5,2	3,8	5,6	3,8	X10110- * - 1B			XB1019 - * - 2A
	B	7,8	10,1	7,4	10,9	7,4	X10110- * - 2B	**C 501 - 5 mm** 10 x 16	**C 501 - 5** 3/8 x 5/8	
	C	11,1	14,2	10,3	15,4	10,3	X10110- * - 3B			
	D	16,3	21,1	15,6	22,8	15,6	X10110- * - 4B	**C 501 - 7 mm** 12 x 16	**C 501 - 7** 1/2 x 5/8	
	E	22,5	28,9	21,0	31,2	21,0	X10110- * - 5B			
	G	32,0	41,2	29,9	44,5	29,9	X10110- * - 6B	**A 576 mm** 16 x 22 (22 x 28 ODM)	**A 576** 5/8 x 7/8 (7/8 x 1 1/8 ODM)	
	K	46,6	60,0	43,5	64,9	43,5	X10111- * - 5B	**10331** 22 x 22	**10331** 7/8 x 7/8 (1 1/8 x 1 1/8 ODM)	

* = Temperature Code	* = Spring Code	Temperature Range °C	* = Charge Code
3	**B**	-1 / +17	UL
6	C	+14 / +38	KL
7	A	+36 / +50	YL
105	C	+44 / +70	YL
106	C	+66 / +94	JL
100	C	+94 / +121	LL

Nominal capacities at +38°C condensing temperature, +4°C evaporting temperature (saturated temperatures / dew point) and 1 K liquid subcooling at the inlet of the valve. Valve selection for other operating conditions see page 32 - 34.

Accessories

	Type	Order-No.
Gasket Set for 935 Series Valves	X 13455 -1	027 579
Service Tool for 935 Series	X 99999	800 005
Heat Transfer Paste Thermal Mastik	PS 984	026 650
Joint Sealing 'Leak Lock'	PS 1255 - 7	053 517
Steel Screws for Following Flange Types:		
C501, 9761 , 6346 , A576	Screw ST 32	803 573
10331 , 10332	Screw ST 48	803 574

Correction Tables for Series 935

Valve selection for operating conditions other than +38°C/+4°C and 1 K liquid subcooling at the inlet of the expansion valve:

$$Q_n = Q_o \times K_t \times K_{\Delta p}$$

Q_n: Nominal valve capacity
Q_o: Required cooling or desuperheading capacity
K_t: Correction factor for evaporating and liquid temperature
$K_{\Delta p}$: Correction factor for pressure drop at valve

Liquid Temperature entering Valve °C	**R 134a** Correction Factor K_t Evaporating Temperature °C															
	+30	+25	+20	+15	+10	+5	0	-5	-10	-15	-20	-25	-30			
+60	1,22	1,25	1,27	1,30	1,33	1,36	1,40	1,44	1,48	1,51	1,56	1,61	1,67			
+55	1,14	1,16	1,18	1,21	1,23	1,26	1,29	1,33	1,36	1,39	1,43	1,47	1,52			
+50	1,07	1,08	1,10	1,13	1,15	1,17	1,20	1,23	1,26	1,28	1,32	1,36	1,39			
+45	1,00	1,02	1,04	1,06	1,08	1,10	1,12	1,15	1,17	1,19	1,22	1,26	1,29			
+40	0,93	0,96	0,98	0,99	1,01	1,03	1,05	1,08	1,10	1,12	1,14	1,17	1,20			
+35	0,90	0,91	0,92	0,94	0,96	0,97	0,99	1,01	1,03	1,05	1,07	1,10	1,12			
+30	0,85	0,86	0,88	0,89	0,91	0,92	0,94	0,96	0,98	0,99	1,01	1,03	1,06			
+25		0,82	0,83	0,85	0,86	0,87	0,89	0,91	0,92	0,94	0,95	0,97	1,00			
+20			0,80	0,81	0,82	0,83	0,85	0,89	0,88	0,89	0,91	0,92	0,94			
+15				0,77	0,78	0,79	0,81	0,82	0,84	0,84	0,86	0,88	0,89			
+10					0,75	0,76	0,77	0,78	0,80	0,81	0,82	0,84	0,85			
+5						0,73	0,74	0,75	0,76	0,77	0,78	0,80	0,81			
0							0,71	0,72	0,73	0,74	0,75	0,76	0,78			
-5								0,69	0,70	0,71	0,72	0,73	0,74			
-10									0,68	0,68	0,69	0,70	0,71			
Correction Factor $K_{\Delta p}$																
Δp (bar)	0,5	1,0	1,5	2,0	2,5	3,0	3,5	4,0	4,5	5,0	5,5	6,0	6,5	7,0	7,5	8,0
$K_{\Delta p}$	3,50	2,48	2,02	1,75	1,57	1,43	1,32	1,24	1,17	1,11	1,06	1,01	0,97	0,94	0,90	0,88
Δp (bar)	8,5	9,0	9,5	10,0	10,5	11,0	11,5	12,0	13,0	14,0	15,0	16,0	17,0	18,0	19,0	20,0
$K_{\Delta p}$	0,85	0,83	0,80	0,78	0,76	0,75	0,73	0,72	0,69	0,66	0,64	0,62	0,60	0,58	0,57	0,55

Liquid Temperature entering Valve °C	**R 22** Correction Factor K_t Evaporating Temperature °C															
	+30	+25	+20	+15	+10	+5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
+60	1,22	1,23	1,24	1,25	1,27	1,28	1,30	1,32	1,34	1,36	1,38	1,41	1,44	1,47	1,50	1,53
+55	1,15	1,16	1,17	1,18	1,19	1,20	1,22	1,24	1,25	1,27	1,29	1,32	1,34	1,37	1,39	1,42
+50	1,08	1,09	1,10	1,11	1,12	1,14	1,15	1,16	1,18	1,20	1,22	1,24	1,26	1,28	1,30	1,33
+45	1,03	1,04	1,04	1,05	1,06	1,07	1,09	1,10	1,12	1,13	1,15	1,17	1,18	1,20	1,23	1,25
+40	0,98	0,99	0,99	1,00	1,01	1,02	1,03	1,04	1,06	1,07	1,09	1,10	1,12	1,14	1,16	1,18
+35	0,93	0,94	0,95	0,95	0,96	0,97	0,98	0,99	1,01	1,02	1,03	1,05	1,06	1,08	1,10	1,12
+30	0,89	0,90	0,90	0,91	0,92	0,93	0,94	0,95	0,96	0,97	0,98	1,00	1,01	1,03	1,04	1,06
+25		0,86	0,87	0,87	0,88	0,89	0,90	0,91	0,92	0,93	0,94	0,95	0,96	0,98	0,99	1,01
+20			0,83	0,84	0,84	0,85	0,86	0,87	0,88	0,89	0,90	0,91	0,92	0,93	0,95	0,96
+15				0,80	0,81	0,82	0,82	0,83	0,84	0,85	0,86	0,87	0,88	0,89	0,91	0,92
+10					0,78	0,79	0,79	0,80	0,81	0,82	0,83	0,84	0,85	0,86	0,87	0,88
+5						0,76	0,76	0,77	0,78	0,79	0,79	0,80	0,81	0,82	0,83	0,85
0							0,74	0,74	0,75	0,76	0,77	0,77	0,78	0,79	0,80	0,81
-5								0,72	0,72	0,73	0,74	0,75	0,75	0,76	0,77	0,78
-10									0,70	0,71	0,71	0,72	0,73	0,71	0,74	0,75
Correction Factor $K_{\Delta p}$																
Δp (bar)	0,5	1,0	1,5	2,0	2,5	3,0	3,5	4,0	4,5	5,0	5,5	6,0	6,5	7,0	8,0	9,0
$K_{\Delta p}$	4,25	3,00	2,46	2,13	1,90	1,74	1,61	1,50	1,42	1,35	1,28	1,23	1,18	1,14	1,06	1,00
Δp (bar)	10,0	11,0	12,0	13,0	14,0	15,0	16,0	17,0	18,0	19,0	20,0	21,0	22,0	23,0	24,0	25,0
$K_{\Delta p}$	0,95	0,91	0,87	0,83	0,80	0,78	0,75	0,73	0,71	0,69	0,67	0,66	0,64	0,63	0,61	0,60

Liquid Temperature entering Valve °C	**R 404A** Correction Factor K_t Evaporating Temperature °C															
	+30	+25	+20	+15	+10	+5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
+60	1,56	1,59	1,64	1,69	1,74	1,81	1,88	1,96	2,06	2,16	2,28	2,42	2,57	2,75	2,95	3,19
+55	1,32	1,35	1,38	1,42	1,46	1,50	1,55	1,61	1,68	1,75	1,83	1,92	2,01	2,13	2,25	2,39
+50	1,16	1,18	1,20	1,23	1,26	1,30	1,34	1,38	1,43	1,48	1,54	1,61	1,68	1,75	1,84	1,94
+45	1,04	1,05	1,07	1,10	1,12	1,15	1,18	1,22	1,26	1,30	1,34	1,39	1,45	1,51	1,57	1,64
+40	0,94	0,96	0,97	0,99	1,02	1,04	1,07	1,09	1,13	1,16	1,20	1,24	1,28	1,33	1,38	1,43
+35	0,87	0,88	0,90	0,91	0,93	0,95	0,97	1,00	1,02	1,05	1,08	1,11	1,15	1,19	1,23	1,27
+30	0,81	0,82	0,83	0,84	0,86	0,88	0,90	0,92	0,94	0,96	0,99	1,02	1,05	1,08	1,11	1,15
+25		0,76	0,77	0,79	0,80	0,82	0,83	0,85	0,87	0,89	0,92	0,94	0,97	0,99	1,02	1,05
+20			0,73	0,74	0,75	0,77	0,78	0,80	0,81	0,83	0,85	0,87	0,90	0,92	0,95	0,97
+15				0,70	0,71	0,72	0,73	0,75	0,76	0,78	0,80	0,82	0,84	0,86	0,88	0,90
+10					0,67	0,68	0,69	0,71	0,72	0,74	0,75	0,77	0,79	0,81	0,83	0,85
+5						0,65	0,66	0,67	0,68	0,70	0,71	0,73	0,74	0,76	0,78	0,80
0							0,63	0,64	0,65	0,66	0,68	0,69	0,71	0,72	0,74	0,75
-5								0,61	0,62	0,63	0,65	0,66	0,67	0,69	0,70	0,72
-10									0,60	0,61	0,62	0,63	0,64	0,65	0,67	0,68
Correction Factor $K_{\Delta p}$																
Δp (bar)	0,5	1,0	1,5	2,0	2,5	3,0	3,5	4,0	4,5	5,0	5,5	6,0	6,5	7,0	8,0	9,0
$K_{\Delta p}$	4,55	3,21	2,62	2,27	2,03	1,86	1,72	1,61	1,52	1,44	1,37	1,31	1,26	1,21	1,14	1,07
Δp (bar)	10,0	11,0	12,0	13,0	14,0	15,0	16,0	17,0	18,0	19,0	20,0	21,0	22,0	23,0	24,0	25,0
$K_{\Delta p}$	1,02	0,97	0,93	0,89	0,86	0,83	0,80	0,78	0,76	0,74	0,72	0,70	0,69	0,67	0,66	0,64

Liquid Temperature entering Valve °C	**R 407C** Correction Factor K_t Evaporating Temperature °C											
	+30	+25	+20	+15	+10	+5	0	-5	-10	-15	-20	-25
+55	1,20	1,21	1,23	1,26	1,28	1,31	1,34	1,37	1,40	1,44	1,48	1,52
+50	1,10	1,11	1,13	1,15	1,17	1,19	1,22	1,24	1,27	1,30	1,33	1,37
+45	1,02	1,03	1,05	1,06	1,08	1,10	1,12	1,14	1,17	1,19	1,22	1,25
+40	0,95	0,96	0,98	0,99	1,01	1,02	1,04	1,06	1,08	1,11	1,13	1,16
+35	0,89	0,90	0,92	0,93	0,94	0,96	0,98	0,99	1,01	1,03	1,05	1,07
+30	0,85	0,85	0,87	0,88	0,89	0,90	0,92	0,93	0,95	0,97	0,99	1,01
+25		0,81	0,82	0,83	0,84	0,85	0,87	0,88	0,90	0,91	0,93	0,95
+20			0,78	0,79	0,80	0,81	0,82	0,84	0,85	0,86	0,88	0,90
+15				0,75	0,76	0,77	0,78	0,80	0,81	0,82	0,84	0,85
+10					0,73	0,74	0,75	0,76	0,77	0,78	0,80	0,81
+5						0,71	0,72	0,73	0,74	0,75	0,76	0,77
0							0,69	0,70	0,71	0,72	0,73	0,74
-5								0,67	0,68	0,69	0,70	0,71
-10									0,65	0,66	0,67	0,68

Correction Factor $K_{\Delta p}$

Δp (bar)	0,5	1,0	1,5	2,0	2,5	3,0	3,5	4,0	4,5	5,0	5,5	6,0	6,5	7,0	8,0	9,0
$K_{\Delta p}$	4,78	3,33	2,72	2,36	2,11	1,92	1,78	1,67	1,57	1,49	1,42	1,36	1,31	1,26	1,18	1,11
Δp (bar)	10,0	11,0	12,0	13,0	14,0	15,0	16,0	17,0	18,0	19,0	20,0	21,0	22,0	23,0	24,0	25,0
$K_{\Delta p}$	1,05	1,01	0,96	0,92	0,89	0,86	0,83	0,81	0,79	0,76	0,75	0,73	0,71	0,70	0,68	0,67

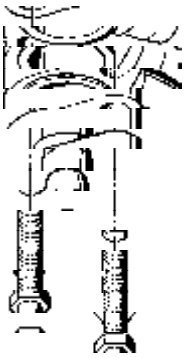
Note: See page 6 for determining of conditions for systems with R 407C.

Liquid Temperature entering Valve °C	**R 507** Correction Factor K_t Evaporating Temperature °C															
	+30	+25	+20	+15	+10	+5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
+60	1,54	1,57	1,61	1,65	1,71	1,76	1,83	1,90	1,98	2,08	2,18	2,30	2,43	2,58	2,75	2,95
+55	1,30	1,33	1,36	1,39	1,43	1,47	1,52	1,57	1,62	1,69	1,76	1,83	1,92	2,02	2,12	2,25
+50	1,15	1,17	1,19	1,22	1,24	1,28	1,31	1,35	1,40	1,44	1,49	1,55	1,61	1,68	1,76	1,84
+45	1,03	1,05	1,07	1,09	1,11	1,14	1,17	1,20	1,23	1,27	1,31	1,36	1,40	1,46	1,52	1,58
+40	0,94	0,96	0,97	0,99	1,01	1,03	1,06	1,08	1,11	1,14	1,17	1,21	1,25	1,29	1,34	1,39
+35	0,87	0,88	0,90	0,91	0,93	0,95	0,97	0,99	1,01	1,04	1,07	1,10	1,13	1,16	1,20	1,24
+30	0,81	0,82	0,83	0,85	0,86	0,88	0,89	0,91	0,93	0,96	0,98	1,01	1,03	1,06	1,09	1,13
+25		0,77	0,78	0,79	0,80	0,82	0,83	0,85	0,87	0,89	0,91	0,93	0,95	0,98	1,01	1,03
+20			0,73	0,74	0,75	0,77	0,78	0,79	0,81	0,83	0,85	0,87	0,89	0,91	0,93	0,96
+15				0,70	0,71	0,72	0,73	0,75	0,76	0,78	0,79	0,81	0,83	0,85	0,87	0,89
+10					0,67	0,68	0,69	0,70	0,72	0,73	0,74	0,76	0,78	0,79	0,81	0,83
+5						0,64	0,65	0,67	0,68	0,69	0,70	0,72	0,73	0,75	0,76	0,78
0							0,62	0,63	0,64	0,65	0,66	0,68	0,69	0,70	0,72	0,73
-5								0,60	0,61	0,62	0,63	0,64	0,65	0,66	0,68	0,69
-10									0,58	0,59	0,60	0,61	0,62	0,63	0,64	0,65

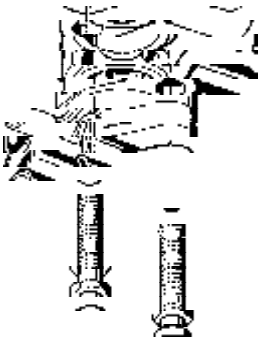
Correction Factor $K_{\Delta p}$

Δp (bar)	0,5	1,0	1,5	2,0	2,5	3,0	3,5	4,0	4,5	5,0	5,5	6,0	6,5	7,0	8,0	9,0
$K_{\Delta p}$	4,63	3,27	2,67	2,31	2,07	1,89	1,75	1,64	1,54	1,46	1,40	1,34	1,28	1,24	1,16	1,09
Δp (bar)	10,0	11,0	12,0	13,0	14,0	15,0	16,0	17,0	18,0	19,0	20,0	21,0	22,0	23,0	24,0	25,0
$K_{\Delta p}$	1,03	0,99	0,94	0,91	0,87	0,85	0,82	0,79	0,77	0,75	0,73	0,71	0,70	0,68	0,67	0,65

Flanges for Valves



Angle Style Flange



Straight Through Flange

Angle Style Type	Angle Style Order No.	Straight Through Type	Straight Through Order No.	Connections mm Solder ODF	Connections mm Solder ODM	Connections inch Solder ODF	Connections inch Solder ODM	for Valve Series
C 501 - 4	**803 230**			—	—	3/8 x 1/2	—	
C 501 - 4 MM	**803 231**			10 x 12	—	—	—	TCLE
C 501 - 5	**803 232**	9761 - 3	803 240	—	—	3/8 x 5/8	—	ZZCE
C 501 - 5 MM	**803 233**	9761 - 3 MM	803 241	10 x 16	—	—	—	LCLE
C 501 - 7	**803 234**	9761 - 4	803 350	—	—	1/2 x 5/8	—	935 A-G
C 501 - 7 MM	**803 235**	9761 - 4 MM	803 243	12 x 16	—	—	—	CPHE 1
—	—	6346 - 17	803 330	16 x 22	—	5/8 x 7/8	—	CPHE 2
A 576	**803 238**	—	—	—	—	5/8 x 7/8	7/8 x 1-1/8	
A 576 - MM	**803 239**	—	—	16 x 22	22 x 28	—	—	
10331	**803 338**	10332	803 324	22 x 22	—	7/8 x 7/8	1-1/8 x 1-1/8	TJRE ZZJRE LJRE 935 K CPHE 3
9153 **9153 MM**	**803 244** **803 245**	9152 9152 MM	803 286 803 287	— 22 x 22	— 28 x 28	7/8 x 7/8 —	1-1/8 x 1-1/8	TERE TIRE ZZERE ZZIRE LERE LIRE CPHE 3,5 CPHE 4 CPHE 5
9149	**803 284**	9148	803 283	22 x 22	—	7/8 x 7/8	1-1/8 x 1-1/8	THRE CPHE 6

Solenoid Valves

2-Way Solenoid Valves

Basic Terms and Technical Information

Operating principles

Directly actuated: The magnetic field of the solenoid coil forces a movement of the plunger and thus causes the opening of the valve seat.

Servo actuated: The magnetic field of the solenoid coil is only utilized for the opening of the pilot valve seat. The necessary energy to actuate the piston or diaphragm of the main valve seat is provided by the refrigerant flow and results in a certain pressure drop.

Minimum pressure drop

Directly actuated solenoid valves do not require a minimum pressure drop for proper operation.
Servo operated solenoid valves require a minimum pressure drop of approximately 0.05 bar to remain fully open. In case of insufficent refrigerant flow this value will not be reached and the solenoid valve may close unintentionally. These closures may lead to malfunctions and oscillations in the refrigeration circuit. Improper sizing of solenoid valves (i.e. use of excessively large solenoid valves) is the main cause of this effect. This is particularly important in capacity controlled refrigeration circuits.

Therefore the decisive factor for proper solenoid valve sizing is the respective capacity of the valve and not its connection size.

Formula for calculating the actual pressure drop of a solenoid valve:

$$\Delta_{p1} = \Delta_{p2} \times (Q_{n1}/Q_{n2})^2$$

Δ_{p1}: Actual pressure drop
Δ_{p2}: Nominal pressure drop at Q_{n1}
Q_{n1}: Calculated nominal capacity
Q_{n2}: Nominal capacity of selected valve

Maximum Operating Pressure Differential (MOPD)

MOPD is the maximum pressure differential between inlet and outlet of the solenoid valve which permits proper opening of the valve. When used with ALCO AC solenoid coils all ALCO solenoid valves employ 25 bar MOPD. Operation in conjunction with DC solenoid coils lead to reduced MOPD values depending on valve type and size. Please contact ALCO application engineering for additional details.

Selection Guide for Solenoid Valves

Selection Criteria	Series				
	110 RB	**200 RB**	**240 RA**	**540 RA**	**3031RB/C**
2-Way	+	+	+	+	
3-Way					+
Normally Closed (NC)	+	+	+		
Normally Open (NO)				+	
Min. Pressure Differential (bar)	0.00	0.05	0.05	0.05	
MWP (bar)	35	35	35	35	
Media Temp. Range (°C)	-40 / +120	-40 / +120	-40 / +120	-40 / +120	-40 / +150
Coil Type	ASC	ASC	ASC	ASC	ASC
Catalogue Page	40	40	40	41	44

Type Code **200 RB 6 T 4**

- **200 RB** — Model Series
- **6** — Seat diameter in multiples of $^1/_{16}$" i.e. $^3/_8$"
- **T** — Solder
- **F** — Flare
- **4** — Tube connection in multiple of 1/8" i.e. 1/2" or nearest mm equivalent

ASC

Coils ASC

Type	Order-No.	Voltage	Power Input	Electr. Connection	Protection
ASC 230V / 50HZ	**801 064**	AC	8 W	without plug, see cable assemblies	IP65 with plug / cable assembly
ASC 120V / 50HZ	801 063				
ASC 24V / 50HZ	801 062				
ASC 12V	801 054	DC	15 W		
ASC 120V	801 050				
ASC 230V	801 056				

Note: Coils are delivered with mounting clip.
Please order cable assemblies separately.

ASC-N15

Cable Assemblies for ASC Coils

Type	Order-No.	Temperature Range	Cable length	Wire diameter	Connector Type
ASC-N15	804 570	-25 ..+80°C	1,5	3 x 0,75 mm^2	loose wires
ASC-N30	804 571		3,0		
ASC-N60	804 572		6,0		
ASC-L15	804 573	-50..+80°C	1,5		
ASC-L30	804 574		3,0		
ASC-L60	804 575		6,0		

DS2-N15

Cable Assemblies with 24V DC Chopper Plug

- Enables standard 24V AC Coil to be used for DC applications
- Low power assumption (3W only)
- No MOPD degradation

Type	Order-No.	Temperature Range	Cable length	Wire diameter	Connector Type
DS2-N15	804 620	-25 ..+80°C	1,5	2 x 0,75 mm^2	loose wires
DS2-N30	804 621		3,0		
DS2-N60	804 622		6,0		
DS2-L60	804 625	-50..+80°C	6,0		

Other Accessories for Solenoid Valves

Type	Order-No.	Description
X 11981 - 1	027 451	Service Tool for 110RB, 240RA, 540RA, 3031
X 13983 -1	027 622	Mounting Bracket for 240RA
X 13740 -1	027 600	Clip for Coil
PG9 Plug	801 012	Plug according to DIN 43650 with Cable Gland PG 9
PG11 Plug	801 013	Plug according to DIN 43650 with Cable Gland PG 11

2-Way Solenoid Valves Series 110, 200, 240

Normally Closed

Features

- Compact size
- Snap-on clip for attaching solenoid coils
- No disassembly necessary for soldering

200 RB

110 RB

240 RA

Capacity Data

Type	Nominal Capcity Q_n (kW)												kv-Wert	Δp min
	Liquid				Hot Gas				Suction Gas					
	R 134a	R 22	R 404A R 507	R 407C	R 134a	R 22	R 404A R 507	R 407C	R 134a	R 22	R 507	R 407C	m³/h	bar
110 RB 2	3,5	3,8	2,5	3,6	1,6	2,0	1,7	2,1					0,2	0
200 RB 3	6,6	7,1	4,6	6,8	3,0	3,7	3,2	3,9					0,4	0,05
200 RB 4	15,5	16,8	10,9	16,1	7,1	8,8	7,5	9,2					0,9	0,05
200 RB 6	27,3	29,5	18,9	28,0	12,5	15,4	13,1	16,1					1,6	0,05
240 RA 8	36,3	39,3	25,2	37,3	16,7	20,5	17,4	21,4	4,2	5,6	4,6	5,2	2,3	0,05
240 RA 9	76,2	82,5	52,9	78,4	35,1	43,1	36,5	44,9	8,8	11,7	9,7	10,9	4,8	0,05
240 RA 12	85,7	92,8	59,5	88,1	39,4	48,4	41,1	50,5	9,9	13,1	10,9	12,3	5,4	0,05
240 RA 16	139,1	150,5	96,5	142,9	64,0	78,5	66,6	81,9	16,0	21,3	17,7	19,9	8,8	0,05
240 RA 20	202,6	219,3	140,7	208,3	93,2	114,4	97,1	119,3	33,0	31,0	25,7	29,0	12,8	0,05

Nominal capacities at +38°C condensing temperature, +4°C evaporating temperature, 0.15 bar pressure drop between valve inlet and outlet in liquid applications (for hot gas applications 1 bar pressure drop and +18 °C suction gas temperature); subcooling 1 K.
Correction tables for other operating conditions see page 42-43.

Selection Guide

Type		Order-No.	Connection Solder / ODF mm	Inch
110 RB 2	**T2**	**801 217**	6	
	T2	**801 210**		1/4
	T3	**801 209**	10	3/8
200 RB 3	**T3**	**801 239**	10	3/8
200 RB 4	**T3**	**801 176**	10	
	T3	**801 190**		3/8
	T4	**801 178**	12	
	T4	801 179		1/2
200 RB 6	**T4**	**801 182**	12	
	T4	**801 183**		1/2
	T5	801 186	16	5/8
240 RA 8	T5	801 160		5/8
	T7	801 143	22	7/8
240 RA 9	**T5**	**801 161**	16	5/8
	T7	801 162	22	7/8
	T9	801 142		1-1/8
240 RA 12	**T7**	**801 163**	22	7/8
	T9	801 144		1-1/8
240 RA 16	**T9**	**801 164**		1-1/8
	T11	801 166	35	1-3/8
240 RA 20	**T11-M**	**801 172**	35	1-3/8
	T13-M	**801 224**	42	
	T13-M	801 173		1-5/8
	T17-M	801 174	54	2-1/8

Special Versions:
Manual stems available upon request for Series 2 40 RA 8 to 240 RA 16 (Type M).

Manual stems standard on Series 240 RA 20.

Options:

- Actuation coil available for various voltages, see page 39

2-Way Solenoid Valves Series 540

Normally Open

Features

- Compact size
- Snap-on clip for attaching solenoid coils
- No disassembly necessary for soldering

540 RA

Capacity Data

Type	Nominal Capacity Q_n (kW)													
	Liquid				Hot Gas				Suction Gas					
	R 134a	R 22	R 404A R 507	R 407C	R 134a	R 22	R 404A R 507	R 407C	R 134a	R 22	R 507	R 407C	kv-Wert m^3/h	Δp min bar
540 RA 8	36,3	39,3	25,2	37,3	16,7	20,5	17,4	21,4	4,2	5,6	4,6	5,2	2,3	0,05
540 RA 9	76,2	82,5	52,9	78,4	35,1	43,1	36,5	44,9	8,8	11,7	9,7	10,9	4,8	0,05
540 RA 12	85,7	92,8	59,5	88,1	39,4	48,4	41,1	50,5	9,9	13,1	10,9	12,3	5,4	0,05
540 RA 16	139,1	150,5	96,5	142,9	64,0	78,5	66,6	81,9	16,0	21,3	17,7	19,9	8,8	0,05
540 RA 20	202,6	219,3	140,7	208,3	93,2	114,4	97,1	119,3	23,3	31,0	25,7	29,0	12,8	0,05

Nominal capacities at +38°C condensing temperature, +4°C evaporating temperature, 0.15 bar pressure drop between valve inlet and outlet in liquid applications (for hot gas applications 1 bar pressure drop and +18 °C suction gas temperature); subcooling 1 K.
Correction tables for other operating conditions see page 42-43.

Selection Guide

Type		Order-No.	Connection Solder /ODF mm	Inch
540 RA 8	**T5**	**046 265**		5/8
540 RA 9	T5	046 266		5/8
	T7	**046 268**	22	7/8
540 RA 12	**T7**	**046 269**	22	7/8
540 RA 16	**T9**	**046 270**		1-1/8
540 RA 20	**T11**	**047 953**	35	1-3/8

Options:

- Actuation coil and cable assemblies available for various voltages, see page 39

Accessories and spare parts for solenoid valves

Description	Type	Order-No.
Service Tool for 110 RB, 240 RA, 540 RA und 3031	X 11981 - 1	027 451
Mounting bracket for 240 RA / 540 RA	X 13983 - 1	027 622
Changeover Kit T to M		
240RA8	KS 30066	801 265
240RA9/12	KS 30067	801 261
240RA16	KS 30068	801 266
240RA20	KS 30098	801 267
Gasket Kits		
110RB	KS 30040-2	801 232
200RB	KS 30039-1	801 233
240RA8	KS 30061-1	801 234
240RA9/12	KS 30062-1	801 235
240RA16	KS 30065-1	801 236
240RA20	KS 30097-1	801 237

Repair Kits	Type	Order-No.
110RB	KS 30040-1	801 206
200RB	KS 30039 / KS 30109	801 205
240RA8	KS 30061	801 262
240RA9	KS 30062	801 263
240RA12	KS 30063	801 264
240RA16	KS 30065	801 200
240RA20	KS 30097	801 216

Correction tables for the selection of solenoid valves

For use with 110 RB, 200 RB, 240 RA and 540 RA Series

Valve selection for operating conditions other than nominal:

$$Q_n = Q_o \times K_t \times K_{\Delta p}$$

Q_n: Nominal valve capacity
K_t: Correction factor for evaporating and liquid temperature
$K_{\Delta p}$: Correction factor for pressure drop at valve
Q_o: Required cooling capacity

1. Suction gas application

Evaporating Temperature	**Correction Factor K_t** Condensing Temperature °C								
°C	+60	+55	+50	+45	+40	+35	+30	+25	+20
+10	1,03	0,97	0,92	0,88	0,84	0,80	0,76	0,74	0,71
0	1,40	1,32	1,25	1,20	1,14	1,10	1,04	1,01	0,96
-10	1,71	1,62	1,53	1,47	1,40	1,34	1,27	1,23	1,18
-20	2,20	2,08	1,97	1,88	1,80	1,72	1,64	1,58	1,51
-30	2,79	2,63	2,50	2,39	2,27	2,19	2,07	2,01	1,92
-40	3,68	3,47	3,29	3,15	3,00	2,89	2,73	2,65	2,53

Correction Factor $K_{\Delta p}$

Δp (bar)	0,05	0,10	0,15	0,20	0,25	0,30	0,35	0,40	0,45	0,50	0,55
$K_{\Delta p}$	1,73	1,22	1,00	0,87	0,77	0,71	0,65	0,61	0,48	0,55	0,52

2. Liquid application

Liquid Temperature entering Valve	**Correction Factor K_t** **R 134a** Evaporating Temperature °C						**R 22**					
°C	+10	0	-10	-20	-30		+10	0	-10	-20	-30	-40
+60	1,33	1,40	1,48	1,56	1,67		1,26	1,30	1,38	1,38	1,44	1,50
+55	1,23	1,29	1,36	1,43	1,52		1,19	1,22	1,29	1,29	1,34	1,39
+50	1,15	1,20	1,26	1,32	1,39		1,12	1,15	1,21	1,22	1,26	1,30
+45	1,08	1,12	1,17	1,22	1,29		1,06	1,08	1,15	1,15	1,18	1,23
+40	1,01	1,05	1,10	1,14	1,20		1,01	1,03	1,09	1,09	1,12	1,16
+35	0,96	0,99	1,03	1,07	1,12		0,96	0,98	1,03	1,03	1,06	1,10
+30	0,91	0,94	0,98	1,01	1,06		0,92	0,94	0,99	0,98	1,01	1,04
+25	0,86	0,89	0,92	0,95	1,00		0,88	0,89	0,94	0,94	0,96	0,99
+20	0,82	0,85	0,88	0,91	0,94		0,84	0,86	0,90	0,90	0,92	0,95
+15	0,78	0,81	0,84	0,86	0,89		0,81	0,82	0,87	0,86	0,88	0,91
+10	0,75	0,77	0,80	0,82	0,85		0,78	0,79	0,83	0,83	0,85	0,87
+5		0,74	0,76	0,78	0,81			0,76	0,80	0,79	0,81	0,83
0		0,71	0,73	0,75	0,78			0,73	0,77	0,77	0,78	0,80
-5			0,70	0,72	0,74				0,74	0,74	0,75	0,77
-10			0,68	0,69	0,71				0,72	0,71	0,73	0,74

Correction Factor $K_{\Delta p}$

Δp (bar)	0,05	0,10	0,15	0,20	0,25	0,30	0,35	0,40	0,45	0,50	0,55	0,60	0,65	0,70	0,75
$K_{\Delta p}$	1,73	1,22	1,00	0,87	0,77	0,71	0,65	0,61	0,58	0,55	0,52	0,50	0,48	0,46	0,45

2. Liquid application

Liquid Temperature entering Valve °C	Correction Factor K_t R 404A Evaporating Temperature °C						Correction Factor K_t R 507 Evaporating Temperature °C					
	+10	0	-10	-20	-30	-40	+10	0	-10	-20	-30	-40
+60	1,74	1,88	2,06	2,28	2,57	2,95	1,71	1,83	1,98	2,18	2,43	2,75
+55	1,46	1,55	1,68	1,83	2,01	2,25	1,43	1,52	1,62	1,76	1,92	2,12
+50	1,26	1,34	1,43	1,54	1,68	1,84	1,24	1,31	1,40	1,49	1,61	1,76
+45	1,12	1,18	1,26	1,34	1,45	1,57	1,11	1,17	1,23	1,31	1,40	1,52
+40	1,02	1,07	1,13	1,20	1,28	1,38	1,01	1,06	1,11	1,17	1,25	1,34
+35	0,93	0,97	1,02	1,08	1,15	1,23	0,93	0,97	1,01	1,07	1,13	1,20
+30	0,86	0,90	0,94	0,99	1,05	1,11	0,86	0,89	0,93	0,98	1,03	1,09
+25	0,80	0,83	0,87	0,92	0,97	1,02	0,80	0,83	0,87	0,91	0,95	1,01
+20	0,75	0,78	0,81	0,85	0,90	0,95	0,75	0,78	0,81	0,85	0,89	0,93
+15	0,71	0,73	0,76	0,80	0,84	0,88	0,71	0,73	0,76	0,79	0,83	0,87
+10	0,67	0,69	0,72	0,75	0,79	0,83	0,67	0,69	0,72	0,74	0,78	0,81
+5		0,66	0,68	0,71	0,74	0,78		0,65	0,68	0,70	0,73	0,76
0		0,63	0,65	0,68	0,71	0,74		0,62	0,64	0,66	0,69	0,72
-5			0,62	0,65	0,67	0,70			0,61	0,63	0,65	0,68
-10			0,60	0,62	0,64	0,67			0,58	0,60	0,62	0,64

Liquid Temperature entering Valve °C	Correction Factor K_t R 407C Evaporating Temperature °C					
	+10	0	-10	-20	-30	-40
+60						
+55	1,28	1,34	1,40	1,48		
+50	1,17	1,22	1,27	1,33		
+45	1,08	1,12	1,17	1,22		
+40	1,01	1,04	1,08	1,13		
+35	0,94	0,98	1,01	1,05		
+30	0,89	0,92	0,95	0,99		
+25	0,84	0,87	0,90	0,93		
+20	0,80	0,82	0,85	0,88		
+15	0,76	0,78	0,81	0,84		
+10	0,73	0,75	0,77	0,80		
+5		0,72	0,74	0,76		
0		0,69	0,71	0,73		
-5			0,68	0,70		
-10			0,65	0,67		

Correction Factor $K_{\Delta p}$

Δp (bar)	0,05	0,10	0,15	0,20	0,25	0,30	0,35	0,40	0,45	0,50	0,55	0,60	0,65	0,70	0,75
$K_{\Delta p}$	1,73	1,22	1,00	0,87	0,77	0,71	0,65	0,61	0,58	0,55	0,52	0,50	0,48	0,46	0,45

3. Hot gas application

Correction Factor K_t

Evaporating Temperature °C

	+10	+5	0	-5	-10	-15	-20	-25	-30	-35	-40
K_t	0,96	1,00	1,03	1,06	1,10	1,13	1,17	1,20	1,24	1,29	1,33

Correction Factor $K_{\Delta p}$

Δp (bar)	0,35	0,50	0,70	1,00	1,50	2,00	2,50	3,00	4,00
$K_{\Delta p}$	1,72	1,49	1,22	1,00	0,86	0,78	0,73	0,70	0,65

3-Way Solenoid Valves Series 3031

Features

- For heat reclaim application
- Pilot connection to suction line required, no minimum pressure drop
- Compact size
- Snap-on clip for attaching solenoid coils
- No disassembly necessary for brazing

Options:

- Actuation coil and cable assemblies available for various voltages, see page 39

3031 RC

Capacity Data

Type		Order-No.	Connection Solder/ODF		Nominal Capacity Q_n (kW)			kv-Value m^3/h	Coil Type
			mm	inch	**R 134a**	**R 22**	**R 404A / R 507**		
3031 RC 12	S7	055 939	22	7/8	28,9	35,1	31,3	6,7	ASC (Page 39)
	S9	055 940		1-1/8					

Nominal capacities at +38°C condensing temperature, +4°C evaporating temperature (saturated pressures / dew point), 0.15 bar pressure drop between valve inlet and outlet.

For other operating conditions multiply required capacity Q_o with correction factors K_t and $K_{\Delta p}$.

$$\mathbf{Q_o \times K_t \times K_{\Delta p} = Q_n}$$

Q_o: Required cooling capacity
K_t: Correction factor for evaporating and liquid temperature
$K_{\Delta p}$: Correction factor for pressure drop at valve
Q_n: Nominal valve capacity

Correction Tables

Correction Factor K_t

Evaporating Temperature (°C)

	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40
K_t	0,96	1,00	1,03	1,06	1,10	1,13	1,17	1,20	1,24	1,29	1,33

Correction Factor $K_{\Delta p}$

Pressure drop across Valve (bar)

	0,10	0,14	0,20	0,30	0,40	0,50	0,60	0,70	0,80	0,90	1,00
$K_{\Delta p}$	1,22	1,00	0,87	0,71	0,61	0,55	0,50	0,46	0,43	0,41	0,39

Accessories and spare parts for series 3031

Description	Type	Order-No.
Service Tool for 110 RB, 240 RA, 540 RA, 3031	X 11981 - 1	027 451
Gasket Kit for 3031	KS 30177-1	801 268
Changeover Kit T to M for 3031RC12	KS 30291	055 999

Mechanical Pressure Regulators

Pressure Regulators

Basic Terms and Technical Information

Capacity regulators
Regulator series ACP and CPHE are hot gas bypass regulators and serve the purpose of compensating excess compressor capacity.
Thus they prevent the generation of evaporator pressures below predetermined levels.
In case of hot gas injection into the suction line, a liquid injection valve in conjunction with a solenoid valve is required to desuperheat the excessively hot suction gas. The capacity should not be reduced below 60 % of maximum in this application to avoid oil return problems.
With hot gas injection at the evaporator inlet, no liquid injection valve is necessary. The injection must be such that the incremental gas volume is taken into account. No problems with oil return should be expected even when regulating 100% of capacity.

Condensing pressure regulators
The HP series regulator are designed to keep condensing pressures above certain levels in case of low ambient temperatures.
Thus they ensure sufficient pressure at the inlet port of the expansion valve and permit trouble free start-up of the refrigerant circuit independent of ambient temperatures.
This kind of refrigeration circuit design is “flooding the condenser” at low ambient conditions and therefore requires increased receiver capacity.

Evaporator pressure regulators
Series PRE regulators serve the purpose of maintaining evaporator pressure above certain predetermined levels.
The most important application is the use of several evaporators with different evaporating temperatures in conjunction with a common suction line.
The freezing of water in water chillers and air-conditioning systems can be savely prevented if evaporating temperatures are kept above 0°C, even when loads are greatly reduced.

Crankcase pressure regulators
Series PRC regulators serve the purpose of preventing excessively high suction pressures to protect compressor motors from overloading.
Excessively high suction pressures can occur at start-up of a refrigeration circuit in case of high loads and after defrost. Crankcase regulators are adjusted to the maximum allowed suction pressure rating of the compressors as given by the compressor manufacturers.

Selection Guide for Pressure Regulators

Selection Criteria	Series				
	ACP	CPHE	HP	PRE	PRC
Head Pressure Control			+		
Capacity Control	+	+			
Evaporator Pressure Regulator				+	
Crankcase Pressure Regulator					+
Receiver Pressure Regulator			+		
Catalogue Page	47	47	49	51	52

Hot Gas Bypass Regulators Series ACP

Features

- High quality materials and processes for high reliability and long lifetime
- Internal equalization
- Compact size

ACP

Technical Data

Adjustable from:	0 to5 bar
Factory Setting:	2,7 bar
Max. operating Pressure PS:	31 bar
Operating Temperature Range TS:	–40°C to 120°C
Ambient Temperature Range:	-40 to 50°C
Transport Temperature Range:	-40 to 70°C

Capacity Data

Type	Order No.	Connection, Angle Solder/ODF inch	Nominal Bypass Capacity* Q_n kW				
			R 134a	**R 22**	**R 407C**	**R 404A/507**	**R 410A**
ACP 1	**047 680**	$^1/_4$ x $^3/_8$"	0.21	0.35	0.41	0.30	0.5
ACP 3	**047 283**	$^1/_4$ x $^3/_8$"	0.50	0.77	0.89	0.68	1.2
ACP 5	**053 374**	$^3/_8$ x $^3/_8$"	1.18	1.83	2.12	1.59	2.8

*)Nominal capacities at +38°C condensing temperature, +4°C evaporating temperature (saturated temperatures / dew point) and 1 K liquid subcooling at the inlet of the expansion valve.

Hot Gas Bypass Regulators Series CPHE

Features

- High quality materials and processes for high reliability and long lifetime
- Superior partial load performance due to double seat orifice design (CPHE 3 to CPHE 6)
- Modular design for economical logistics and easy assembly and servicing
- External equalization

Specific connection sizes and flanges available on request. Selection see page 35.

CPHE

Technical Data

Adjustable from:	-0,4 to 5 bar
Factory Setting:	1,4 bar
Max. operating Pressure PS:	28 bar
Operating Temperature Range TS:	–40°C to 120°C
Ambient Temperature Range:	-40 to 50°C
Transport Temperature Range:	-40 to 70°C

Capacity Data CPHE

Type	Nominal Bypass Capacity Q_n kW					Orifice	Standard Flange Solder/ODF		Power Assembly
	R 134a	R 22	R 407C	R 404A/507	R 410A		mm	inch	
CPHE - 1	3.3	4.6	5.4	4.3	7.2	**X 22440-B5B**	**C 501 - 7 mm** 12 x 16	**C 501 - 7** $^1/_2$ x $^5/_8$	
CPHE - 2	7.1	10.0	11.6	9.2	15.6	**X 22440-B8B**	**A 576 mm** 16 x 22 (22 x 28 ODM)	**A 576** $^5/_8$ x $^7/_8$ ($^7/_8$ x 1-$^1/_8$ ODM)	**X7118 - 4**
CPHE - 3	10.8	15.5	17.9	13.8	24.1	**X 11873-B5B**	**10331** 22 x 22	**10331** $^7/_8$ x $^7/_8$ (1-$^1/_8$ x 1-$^1/_8$ ODM)	
CPHE - 3,5	15.4	21.7	25.1	19.5	33.7	**X 9117-B7B**	**9153 mm** 22 x 22	**9153** $^7/_8$ x $^7/_8$ (1-$^1/_8$ x 1-$^1/_8$ ODM)	**X7428 - 2**
CPHE - 4	25.6	36.3	42.1	32.5	56.4	**X 9117-B9B**			
CPHE - 5	33.0	46.6	54.0	41.7	72.5	**X 9166-B10B**			
CPHE - 6	44.7	63.1	73.2	56.6	98.1	**X 9144-B13B**	**9149 mm** 22 x 22	**9149** $^7/_8$ x $^7/_8$ (1-$^1/_8$ x 1-$^1/_8$ ODM)	

Nominal capacities at +38°C condensing temperature, +4°C evaporating temperature (saturated temperatures / dew point) and 1 K liquid subcooling at the inlet of the expansion valve.

Correction Tables for Series ACP and CPHE

For other evaporating temperatures the bypasscapacity Q_{Byp} shall be multiplied with the correction factor K_{Byp}.

$$\mathbf{Q_{Byp} \times K_{Byp} = Q_n}$$

Q_{Byp}: Required bypass capacity
K_{Byp}: Correction factor for evaporating temperature
Q_n: Nominal valve capacity

Refrigerant	Condensing Temperature °C	**Correction Factor K_{Byp}** Evaporating Temperature °C					
		+10	0	-10	-20	-30	-40
R 134 a	50	0.78	0.77	0.78	0.80		
	40	0.99	0.94	0.93	0.94		
	30	1.35	1.21	1.15	1.14		
R 22	50	0.80	0.77	0.77	0.77	0.79	0.82
	40	1.00	0.93	0.91	0.91	0.92	0.95
	30	1.34	1.19	1.12	1.10	1.09	1.12
R 407 C	50	0.83	0.82	0.83	0.86		
	40	0.99	0.95	0.95	0.97		
	30	1.26	1.17	1.13	1.13		
R 404A/ R 507	50	0.86	0.85	0.87	0.91	0.97	1.06
	40	0.99	0.95	0.94	0.96	1.00	1.05
	30	1.26	1.13	1.09	1.08	1.10	1.14
R 410A	30	1.31	1.16	1.11	1.07	1.08	1.10
	40	0.99	0.94	0.92	0.92	0.92	0.95
	50	0.84	0.81	0.81	0.82	0.94	0.87

Head Pressure Control Valves Series HP

Features

- Fast attainment of required minimal condensing pressure
- For larger capacities the HP can be applied in parallel
- Compact size; replacing a receiver pressure regulator (or a check valve) and a condensing pressure regulator respectively

HP

Technical Data

Max. Operating Pressure PS:	28 bar
Max. Test Pressure PT:	31 bar
Operating Temperature Range TS:	–40°C to 150°C
Max. Ambient Temperature:	-40 to 50°C
Max. Transport Temperature:	-40 to 70°C
Max. Body Temperature:	150°C

Capacity Data

Type		Order-No.	Connection Solder/ODF	Nominal Capacity Q_n kW (Minimum Capacity Q_n kW)				
				R134a	**R22**	**R404A/R 507**	**R 407C**	**R 410A**
HP5 T4	**-165**	**803 531**	$^1/_2$"	16.3 (2.4)	17.6 (2.6)	11.6 (1.7)	16.9 (2.5)	17.1 (2.6)
	-225	**803 545**						
HP8 T5	**-165**	**803 512**	$^5/_8$"	43.9 (8.8)	47.5 (9.5)	30.6 (6.1)	45.6 (9.1)	46.0 (9.2)
	-225	**803 504**						
HP8 T7	**- 95**	**803 518**	22 mm / $^7/_8$"					
	-165	**803 519**						
	-225	**803 521**						
HP14 T11	**-165**	**803 515**	35 mm / 1-$^3/_8$"	109.9 (22.0)	118.9 (23.8)	76.7 (15.4)	114.0 (22.8)	115.2 (23.0)
	-225	**803 526**						

Nominal capacities at +38°C condensing temperature, +4°C evaporating temperature (saturated temperatures / dew point) and 1 K liquid subcooling at the inlet of the expansion valve.

Valve selection for other operating conditions see page 50.

Temperature Codes for Minimum Condensing Temperatures

	R 134a	**R 22**	**R 404A/R 507**	**R 407C**	**R 410A**
- 95	30°C				
-165	47°C	30°C	25°C	26°C	15°C
-225		43°C	35°C	37°C	25°C

Correction Tables for Series HP

Valve selection for operating conditions other than +4°C/+38°C and 1 K liquid subcooling:

$$Q_n = Q_o \times K_t \times K_{\Delta p}$$

Q_n: Nominal valve capacity
K_t: Correction factor for evaporting and liquid temperature
$K_{\Delta p}$: Correction factor for pressure drop at valve
Q_o: Required cooling capacity

Liquid Temperature entering Valve	Correction Factor K_t Evaporating Temperature															
	R 134a				R 22						R 404A					
°C	+10	0	-10	-20	+10	0	-10	-20	-30	-40	+10	0	-10	-20	-30	-40
+60	1,33	1,40	1,48	1,56	1,26	1,30	1,33	1,38	1,44	1,50	1,74	1,88	2,06	2,28	2,57	2,95
+55	1,23	1,29	1,36	1,43	1,19	1,22	1,25	1,29	1,34	1,39	1,46	1,55	1,68	1,83	2,01	2,25
+50	1,15	1,20	1,26	1,32	1,12	1,15	1,18	1,21	1,26	1,30	1,26	1,34	1,43	1,54	1,68	1,84
+45	1,08	1,12	1,17	1,22	1,06	1,08	1,11	1,14	1,18	1,23	1,12	1,18	1,26	1,34	1,45	1,57
+40	1,01	1,05	1,10	1,14	1,01	1,03	1,05	1,08	1,12	1,16	1,02	1,07	1,13	1,20	1,28	1,38
+35	0,96	0,99	1,03	1,07	0,96	0,98	1,00	1,03	1,06	1,10	0,93	0,97	1,02	1,08	1,15	1,23
+30	0,91	0,94	0,98	1,01	0,92	0,94	0,96	0,98	1,01	1,04	0,86	0,90	0,94	0,99	1,05	1,11
+25	0,86	0,89	0,92	0,95	0,88	0,89	0,91	0,94	0,96	0,99	0,80	0,83	0,87	0,92	0,97	1,02
+20	0,82	0,85	0,88	0,91	0,84	0,86	0,87	0,90	0,92	0,95	0,75	0,78	0,81	0,85	0,90	0,95
+15	0,78	0,81	0,84	0,86	0,81	0,82	0,84	0,86	0,88	0,91	0,71	0,73	0,76	0,80	0,84	0,88
+10		0,77	0,80	0,82		0,79	0,81	0,82	0,85	0,87		0,69	0,72	0,75	0,79	0,83
+5		0,74	0,76	0,78		0,76	0,78	0,79	0,81	0,83		0,66	0,68	0,71	0,74	0,78
0			0,73	0,75			0,75	0,76	0,78	0,80			0,65	0,68	0,71	0,74
-5			0,70	0,72			0,74	0,74	0,75	0,77			0,62	0,65	0,67	0,70
-10				0,69				0,71	0,73	0,74				0,62	0,64	0,67

Correction Factor $K_{\Delta p}$													
Δp (bar)	0,10	0,15	0,20	0,25	0,30	0,35	0,40	0,45	0,50	0,55	0,60	0,65	0,70
$K_{\Delta p}$	1,87	1,53	1,32	1,18	1,08	1,00	0,94	0,88	0,84	0,80	0,76	0,73	0,71

Liquid Temperature entering Valve	Correction Factor K_t Evaporating Temperature															
	R 407C				R 507						R 410A					
°C	+10	0	-10	-20	+10	0	-10	-20	-30	-40	+10	0	-10	-20	-30	-40
+55	1,28	1,34	1,40	1,48	1,45	1,54	1,65	1,79	1,95	2,16						
+50	1,17	1,22	1,27	1,33	1,27	1,34	1,42	1,52	1,64	1,79	1,23	1,26	1,30	1,35	1,40	1,46
+45	1,08	1,12	1,17	1,22	1,13	1,19	1,25	1,33	1,43	1,54	1,12	1,15	1,18	1,22	1,26	1,31
+40	1,01	1,04	1,08	1,13	1,03	1,07	1,13	1,20	1,27	1,36	1,03	1,06	1,08	1,12	1,15	1,20
+35	0,94	0,98	1,01	1,05	0,94	0,98	1,03	1,09	1,15	1,22	0,96	0,98	1,00	1,03	1,06	1,10
+30	0,89	0,92	0,95	0,99	0,88	0,91	0,95	1,00	1,05	1,11	0,90	0,92	0,94	0,96	0,99	1,02
+25	0,84	0,87	0,90	0,93	0,82	0,85	0,88	0,92	0,97	1,02	0,85	0,86	0,88	0,90	0,93	0,96
+20	0,80	0,82	0,85	0,88	0,77	0,79	0,82	0,86	0,90	0,95	0,80	0,81	0,83	0,85	0,87	0,90
+15	0,76	0,78	0,81	0,84	0,72	0,75	0,77	0,81	0,84	0,88	0,76	0,77	0,79	0,81	0,83	0,85
+10		0,75	0,77	0,80		0,70	0,73	0,76	0,79	0,83		0,74	0,75	0,77	0,78	0,81
+5		0,72	0,74	0,76		0,67	0,69	0,71	0,74	0,78		0,70	0,71	0,73	0,75	0,77
0			0,71	0,73			0,65	0,68	0,70	0,73			0,68	0,70	0,71	0,73
-5			0,68	0,70			0,62	0,64	0,66	0,69			0,65	0,67	0,68	0,70
-10				0,67				0,61	0,63	0,65				0,64	0,65	0,67

Correction Factor $K_{\Delta p}$													
Δp (bar)	0,10	0,15	0,20	0,25	0,30	0,35	0,40	0,45	0,50	0,55	0,60	0,65	0,70
$K_{\Delta p}$	1,87	1,53	1,32	1,18	1,08	1,00	0,94	0,88	0,84	0,80	0,76	0,73	0,71

Evaporator and Crankcase Pressure Regulator Series PRE and PRC

Features

- Compact Design permits minimal space requirements
- Schraeder Valve on Inlet for ease of setting
- Direct operated Regulator
- Balanced Port Design provides accurate Pressure Control
- Copper tubes for easy soldering

Technical Data

Refrigerant		HFC, HCFC
Oil compatibility		Mineral, Alkyl Benzene and Polyol-Ester (POE) lubricants
Max. Operating Pressure PS:		25 bar
Max. Test pressure PT:		30 bar
Material, Housing		CW509L (EN12420)
Temperature:	Storage	-30°C to 80°C
	Medium	TS: -30°C to 80°C
	Ambient	-30°C to 80°C

Pressure change per turn:	
Valve Size 1	0,6 bar
Valve Size 2	0,4 bar
Pressure range:	0,5 to 6,9 bar
Factory setting:	2 bar
Weight:	
PRC/PRE-1..	0,6 kg
PRC/PRE-2..	1,3 kg

Evaporator Pressure Regulator Series PRE

Selection

Type	Order-No.	Tube Connection ODF	Nominal Capacity* Q_n (kW)			
			R 134a	**R 404A / R 507**	**R 407C**	**R 22**
PRE - 11A	800 380	16 mm - 5/8"	3,0	4,5	4,5	4,8
PRE - 11B	800 381	22 mm - 7/8"				
PRE - 21C	800 382	28 mm	7,4	11,1	11,1	11,9
PRE - 21D	800 383	1 - 1/8"				

*Nominal Capacities are based on Evaporating Temperature +4°C and Condensing Temperature +38°C and a pressure drop of 1 K.

Correction Table

Selection for operating conditions other than +38°C/+4°C and 1 K liquid subcooling at the inlet of the valve: $\mathbf{Q_n = Q_o \times K_t}$

Q_n: Nominal valve capacity
Q_o: Required cooling capacity

Refrigerant	Condensing Temperature °C	**Correction Factor K_t** Evaporating Temperature °C				
		10	0	-10	-20	-30
R 404A / R 507	60	1,35	1,91	2,77	4,18	6,53
	50	1,05	1,46	2,07	3,05	4,62
	40	0,88	1,22	1,71	2,48	3,69
R 407C	30	0,77	1,06	1,48	2,12	3,13
	55	1,02	1,42	2,04		
	50	0,94	1,31	1,87		
	40	0,84	1,17	1,66		
R 134a	30	0,77	1,06	1,50		
	60	1,04	1,51	2,17		
	50	0,92	1,34	1,91		
	40	0,83	1,20	1,71		
R 22	30	0,76	1,1	1,55		
	60	1,02	1,37	1,87	2,67	3,91
	50	0,93	1,25	1,70	2,42	3,53
	40	0,86	1,15	1,57	2,22	3,23
	30	0,80	1,07	1,45	2,05	2,98

Crankcase Pressure Regulator Series PRC

Selection

Type	Order-No.	Tube Connection ODF	Nominal Capacity* Q_n kW			
			R 134a	**R 404A/R 507**	**R 407C**	**R 22**
PRC - 11A	800 384	16 mm - 5/8"	3,0	4,5	4,5	4,8
PRC - 11B	800 385	22 mm - 7/8"				
PRC - 21C	800 386	28 mm	7,4	11,1	11,1	11,9
PRC - 21D	800 387	1 - 1/8"				
PRC - 21E	800 388	33 mm -1 - 3/8"				

*Nominal Capacities are based on Evaporating Temperature +4°C and Condensing Temperature +38°C and a pressure drop of 1 K.

Capacity Table

Selection for operating conditions other than +38°C / +4°C and 1 K liquid subcooling at the inlet of the valve:
(capacities are based on a pressure drop of 0,07 bar)

Refrigerant	Evaporating Temperature °C	**Capacity (kW)** Valve setting °C													
		Valve Size 1 PRC-11x							Valve Size 2 PRC-21x						
		-20	-15	-10	-5	0	5	10	-20	-15	-10	-5	0	5	10
R 22	-29	2,3	3,4	4,4	4,8	4,9			5,8	8,8	10,0	10,0	10,0		
	-21		2,4	4,1	5,4	5,8				6,5	12,1	12,1	12,1		
	-14			2,7	4,9	6,2					8,1	13,8	13,8		
	-8				3,5	5,3						9,0	15,4		
	-3					3,1							9,9		
R 407 C	-6				3,1	4,8						7,9	13,9		
	-1					2,9							9,2		
R 134 a	-6					2,1	3,9	5,3					5,2	10,3	12,9
	1						2,4	4,7						6,1	12,2
	7							3,3							8,1
R 404A / R 507	-27	1,6	2,9	3,7	3,9				4,8	8,2	8,2	8,2			
	-20		1,9	3,5	4,5					5,7	9,8	9,8			
	-14			2,2	4,5						6,8	11,6			
	-10				3,1							8,1			