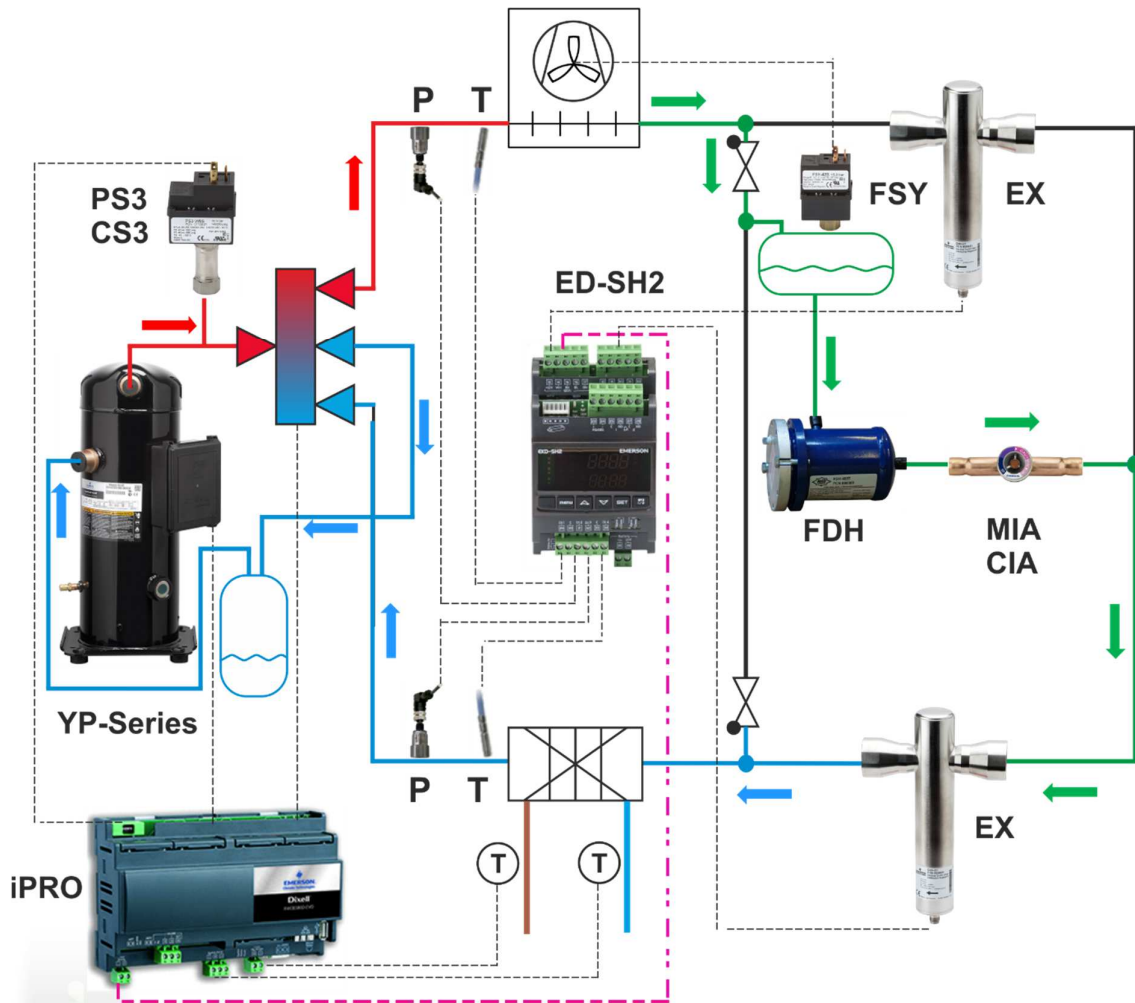


ALCO CONTROLS™

Product Guide 2019

R32 / R452B / R454B



Rooftops

Air conditioning

Heat pumps

Close Control

Reversible Chillers

Preface

Many end-users, equipment and compressor manufacturers are investigating ways to minimize their impact on the environment. Improving system architectures, using a refrigerant with lower global warming potential (GWP) can significantly improve the carbon footprint of an installation.

R410A is the most commonly used refrigerant in air conditioning, reversible chillers, heat pumps, close control systems. However, established F-Gas regulation leads the use of refrigerants with low GWP as long-term solution. R32, R452B and R454B with very low GWP are considered as mid- and long-term refrigerants and viable alternative to natural flammable Hydro Carbon or high-pressure CO₂ where the application of natural refrigerants is not favorable.

Note:

- Please see separate product guide document for use with propane.
- This document provides comprehensive technical data for selection of products required to design of system with three refrigerants R32, R452B and R454B dedicated mainly in air conditioning, heat pumps, reversible chillers, rooftops and close control.

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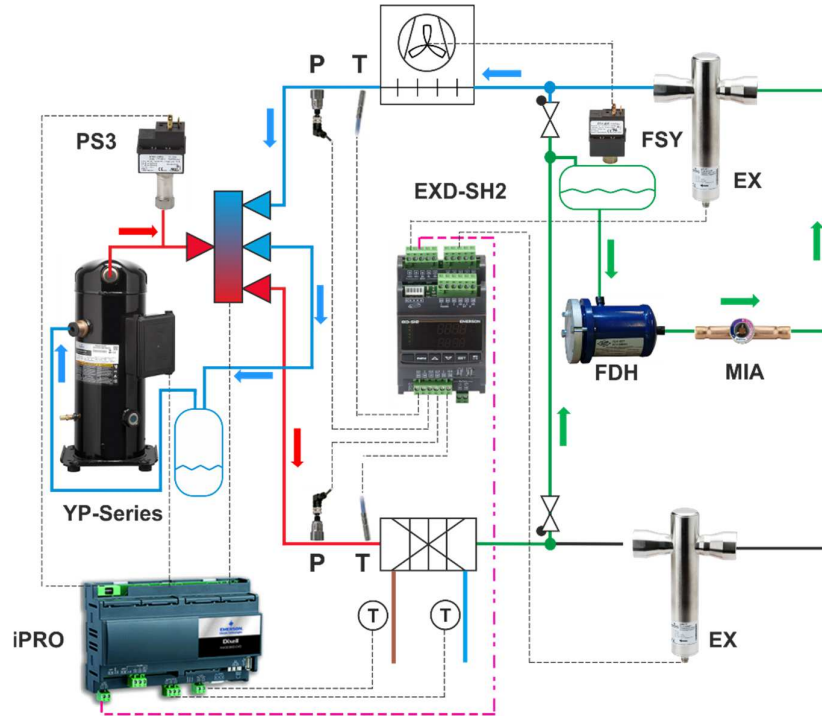
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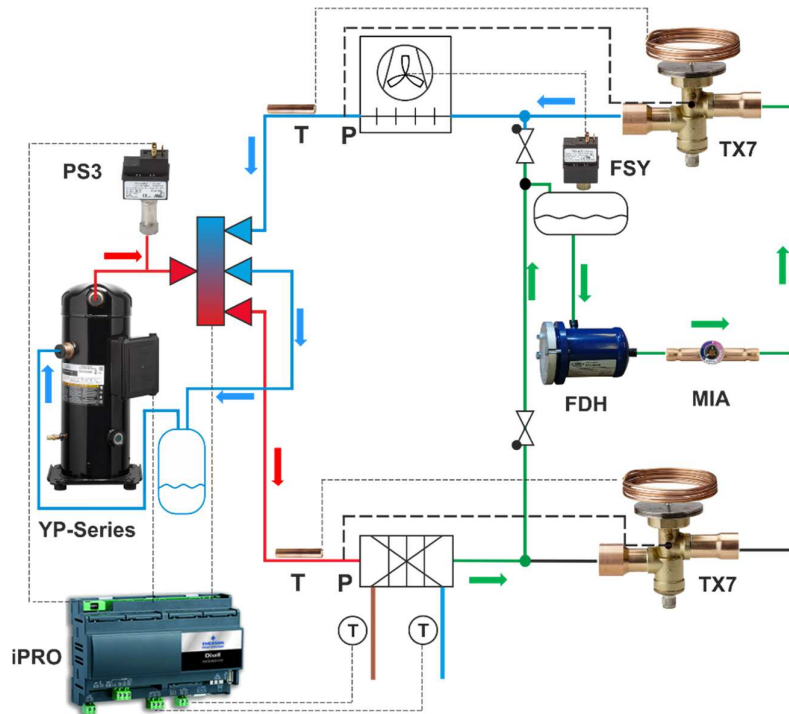
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Electronic expansion valve solution without compressor cooling



Thermo™-Expansion valve solution without compressor cooling



Introduction and General Information

Introduction

R32, R452B and R454B are mildly flammable A2L refrigerants with low GWP as successor of R410A. Applied products in systems with A2L refrigerants require compliance with certain standards and directive in term of design, qualification and manufacturing. The release of standard products with these three refrigerants is based on following consideration/tasks:

- Material compatibility of used elastomer in products and modification
- Majority of A2L refrigerants are classified as fluid group 1 similar to propane so it required to adopt the products in term of qualification, test, quality process and manufacturing to certain directives and standards. The safety aspect of components in systems with A2L refrigerants are different to traditional systems with HFCs refrigerant but not high as to systems with Hydrocarbon refrigerants.
- Operating conditions in comparison with R410A refrigerant in term of pressure, temperature, enthalpy etc.
- Capacity of valves based on flow capacity resulted from these three refrigerant thermodynamic properties
- Software modification in electronic devices when it is required
- Behavior of Thermo™-Expansion valves and required resetting

Applied directives and standard for product listed in this product guide:

Please consider that only the following fundamental directives and standards are considered, and compliance is given. Other available standards are not considered therefore any request for compliance with any other specific standard must be clarified before selection and installation of products.

Description	Nomenclature
European pressure equipment directive:	2014/68/EU
European hazardous chemical substances:	67/548/EEC
International electrotechnical commission for electrical operated equipment: - General requirement for electrical operating systems - Particular requirements for electrical heat pump and air conditioners	IEC 60335-1 & IEC 60335-2-40
European Refrigerating systems and heat pumps - Safety and environmental requirements:	EN378
European standard for safety pressure switches and valves:	EN12263 & EN12284
European standard for vessels:	EN14276

IEC60335-1/IEC60335-2-40 requirement for parts made from Plastic

External parts of non-metallic material, parts of insulating material supporting live parts including connections, and parts of thermoplastic material providing supplementary insulation or reinforced insulation, shall be sufficiently resistant to heat if their deterioration could cause the appliance to fail to comply with this standard. The following parts comply with the requirements:

- Electrical plugs for electronic expansion valves
- Coils of unipolar electronic expansion valves
- Electrical plugs for pressure transmitters
- Specific coils for solenoid valves
- Pressure switches

Comparison

Refrigerant group	Refrigerant	Composition			Safety classification
		R32	R125	R1234yf	
A2L	R32	100%	0%	0%	A2L
A2L	R452B	67%	7%	26%	A2L
A2L	R454B	68.9%	0%	31.1%	A2L
A1	R410A	50%	50%	0%	A1

Capacity changes

Due to the fact of thermodynamic property differences between R410A and these three refrigerants, system designer needs to consider the impact during system design and retrofit.

Condensing temperature (bubble point)	+30°C			+40°C			+50°C			+60°C		
	-10°C	0°C	+10°C	-10°C	0°C	+10°C	-10°C	0°C	+10°C	-10°C	0°C	+10°C
Electronic/mechanical expansion valves and solenoid valves capacity change												
R32 compare to R410A	+48%	+46%	+44%	+52%	+50%	+49%	+59%	+57%	+55%	+71%	+67%	+65%
R452B compare to R410A	13%	14%	14%	15%	15%	15%	17%	17%	17%	22%	21%	21%
R454B compare to R410A	14%	14%	15%	15%	15%	15%	18%	17%	17%	23%	22%	22%

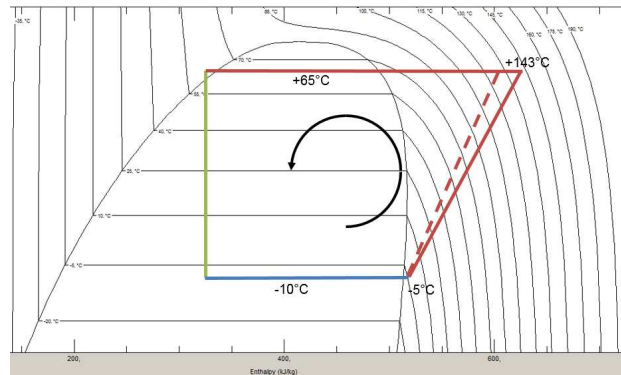
Introduction and General Information

System behavior: Discharge temperature

Unlike systems with R410A, these refrigerants are leading to higher discharge temperature mainly in heat pumps and reversible chillers in comparison to R410A. Below table is just a simple calculation for highlighting the subject.

Refrigerant	Saturated evaporating temperature	Suction temperature	Suction pressure	High condensing temperature to produce hot/warm water	Condensing pressure (bubble point)	Discharge temperature (isentropic compression)	Discharge temperature (Polytropic assumption: +15K above Isentropic)
R32	-10°C	-5°C	5.8 bara	+65°C	44.0 bara	+128°C	+143°C
R452B			5.4 bara		40.2 bara	+108°C	+123°C
R454B			5.2 bara		39.6 bara	+108°C	+123°C
R410A			5.7 bara		42.6 bara	+101°C	+116°C
R32	0°C	+5°C	8.1 bara	+65°C	44.0 bara	+118°C	+133°C
R452B			7.5 bara		40.2 bara	+102°C	+117°C
R454B			7.3 bara		39.6 bara	+102°C	+117°C
R410A			8.0 bara		42.6 bara	+96°C	+111°C

Log p-h-diagram: R32:
(at -10°C evaporating temperature)



This subject must be considered for selection and mounting position of components such as safety pressure switches, pressure transmitters, safety relief valves and reversing 4-ways valves in heat pumps and reversible chillers. These typical products are located between compressor and condenser. It is important to determine maximum operating discharge temperature of system and compare to maximum allowable medium temperature for each device as well as impact on performance of these components.

System protection against impermissible higher discharge pressure

EN378-2 describes the relation of maximum allowable operating pressure (PS), setting of protection devices and strength test pressure. Strength test pressure on assembly (piping, valves, protection devices on discharge line):

- If components are tested beforehand then a simple tightness test on the complete assembly is sufficient.
- If components are not tested on beforehand then the assembly of these components have to be tested under test pressure.

All EMERSON control products such as electronic expansion valves, Thermo™-Expansion valves, solenoid valves, pressure switches etc. are tested in factory at pressure higher than marked PS value on the label of products. The applied test pressure varies between 1.1*PS and 1.43*PS based on type/size/category of product. Test pressure are conducted on 100% of production line.

According EN378, different type/size of systems require different manner of protection against unallowable pressure by:

- Safety limiting pressure switch
- Safety limiting pressure switch plus pressure relief valve
- Others

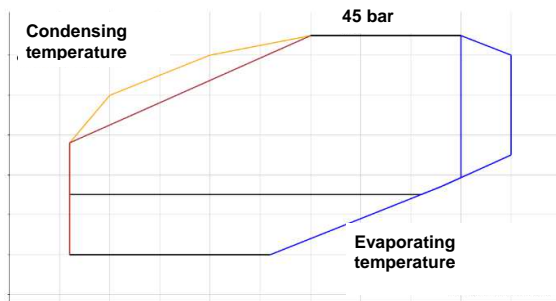
Each of protection devices or combination are capable to protect the system against unallowable pressures and the permissible setting is defined by EN378-2.

The capability of narrower tolerances for cut-out set-point of protection devices is important technical feature when they are applied in heat pumps and reversible chillers. It permits highest condensing pressure (highest hot water temperature) close to maximum allowable operating pressure.

Introduction and General Information

Example, case 1:

System (reversible chiller) with maximum allowable pressure PS:45 bar based on compressor operating envelope



Note: Compressor envelope only as illustration.

		Acc. Standards, safety pressure switch cut-out permitted: 41.4...45+0% bar				Factory pressure test for pressure switch > 1.1*PS				
		Compressor max. operating range								
Pressure (bar)	...	41.4	42	43	44	PS= 45 bar	46	47	48	49.5

System needs single safety limiting pressure switch: Setting at $\leq 1.0 \cdot PS$ (≤ 45 bar) per definition of EN378.

Example, case 2:

System with maximum allowable pressure PS:45 bar based on compressor operating envelope

System needs pressure relief valve and additional safety limiting pressure switch

- Pressure relief valve: setting at $\leq 1.0 \cdot PS$ (≤ 45 bar) per definition of EN378
- Safety limiting pressure switch: Setting at $0.9 \cdot PS$ (≤ 40.5 bar) per definition of EN378

		Safety valve is closing below setting 45 bar and fully closed at 41.4 bar				Safety relief valve setting at 45+0% bar		Valve is fully open at 49.5 bar						
		acc. Standard, safety pressure switch cut-out permitted: 37.3 bar...40.5+0% bar				Factory pressure test for pressure switch > 1.1*PS								
		Compressor operation will stop at 40.5 bar				Compressor envelop up to 45 bar (not to operate)								
Pressure (bar)	...	37.3	38	39	40.5	41	42	43	44	PS=45 bar	46	47	48	49.5

For permitting higher operating pressure and producing higher condensing temperature for warm/hot water in heat pumps, the maximum allowable pressure PS must be increased to higher value than 45 bar.

Example, case 3:

System with maximum allowable pressure PS:50 bar based on design pressure but maximum operating pressure at 45 bar.

System needs pressure relief valve and additional safety limiting pressure switch

- Pressure relief valve: setting at $\leq 1.0 \cdot PS$ (≤ 50 bar) per definition of EN378
- Safety limiting pressure switch (PS3-range-6): setting at $0.9 \cdot PS$ (≤ 45 bar) per definition of EN378

		Safety valve is closing below setting 50 bar and fully closed at 45 bar				Safety relief valve setting at 50 bar		Valve is fully open at 55 bar								
		Safety pressure switch cut-out setting 0.9*PS (50 bar) (acc. Standard, safety pressure switch cut-out permitted: 41.4...45+0% bar)				Factory pressure test for pressure switch > 1.1*PS										
		Compressor max. operating range														
Pressure (bar)	...	41.4	42	43	44	45	46	47	48	49	PS=50 bar	51	52	53	54	55

EMERSON offers Controls such as electronic expansion valves, pressure switches to meet the new requirements in term of design pressure at 50 bar and higher.

Electronic Expansion Valves EXM/L Series

EXM/EXL Unipolar stepper motor driven Electronic Expansion Valves are for precise control of refrigerant mass flow in heat pumps, heating units, air conditioning and close control applications. The valve is not released for refrigeration applications such as cold room and refrigeration display cabinet.

Features

- Hermetic design
- Continuous, linear modulation of mass flow
- Bi-flow with same capacity in normal and reverse flow direction
- High MOPD: 40bar in normal flow direction
- Unipolar stepper motor
- Removable coils in two versions: 12VDC/24VDC
- Fine resolution: 500 pulses (half steps) or 250 full steps
- Protection class of molded coil is IP65 (acc. EN 60529) excluding the cable end terminals (JST).
- Reliability: 225 million pulses at 40 bar differential pressure



EXM/EXL with Coil

Selection Table

Valve series	Description	Type	Part. No. (10 pcs)	Nominal capacity (kW)			Connections Size / Style
				R32	R452B	R454B	
EXM	Valve less coil	EXM-B0A	800399M	2.7	2.1	2.1	1/4" ODM
		EXM-B0B	800400M	8.2	6.3	6.3	
		EXM-B0D	800401M	17.3	13.3	13.3	
		EXM-B0E	800402M	20.4	15.7	15.7	
	Coil 12VDC	EXM-125	800403M	-	-	-	-
Coil 24VDC	EXM-24U	800415M	-	-	-	-	
EXL	Valve less coil	EXL-B1F	800405M	25.3	19.4	19.5	1/4" ODF 8 mm ODM
		EXL-B1G	800406M	34.2	26.3	26.4	
	Coil 12VDC	EXL-125	800407M	-	-	-	-
	Coil 24VDC	EXL-24U	800416M	-	-	-	-

Note1: The nominal capacity (Qn) is based on +4°C evaporating temperature and +38°C condensing temperature (bubble point).
For selection of other operating condition, please use quick selection tables in the next pages or Controls Navigator selection program.

Wiring

EXM-125/ EXL-125 (12 VDC, 5 wires coil)							EXM-24U/ EXL-24U (24 VDC, 5 wires coil)									
Winding Number	Wire Color	Recommended half step pulsing/switching mode								Remark						
		1	2	3	4	5	6	7	8							
1/2	White	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	1) The pulse sequence 1 to 8 will be repeated for further pulses in order to open the valve. 2) The pulse sequence 8 to 1 will be repeated for further pulses in order to close the valve.						
	Orange	OFF	OFF	OFF	ON	ON	ON	OFF	OFF							
3/4	Yellow	OFF	ON	ON	ON	OFF	OFF	OFF	OFF							
	Blue	OFF	OFF	OFF	OFF	OFF	ON	ON	ON							
Commons	12V: Brown 24V: Red	ON	ON	ON	ON	ON	ON	ON	ON							
Valve movement mode: (pulsing/switching sequence) Valve open: 1 → 2 → 3 → 4 → 5 → 6 → 7 → 8																
Valve close: 8 → 7 → 6 → 5 → 4 → 3 → 2 → 1																

Electronic Expansion Valves EXM/L Series

EXM/L: Quick Selection (included 1.5 bar pressure drop for liquid line components and distributor)

Condensing temperature (°C)	R32 Capacity (kW)										Valve type
	Evaporating temperature (°C)										
	15	10	5	0	-5	-10	-15	-20	-25	-30	
65	2.5	2.6	2.7	2.7	2.7	2.8	2.8	2.8	2.8	2.8	EXM-B0A
	7.7	8.0	8.1	8.3	8.4	8.4	8.5	8.5	8.5	8.5	EXM-B0B
	16.3	16.8	17.1	17.4	17.6	17.8	17.9	17.9	17.9	17.9	EXM-B0D
	19.3	19.8	20.2	20.6	20.8	21.0	21.1	21.2	21.1	21.1	EXM-B0E
	23.9	24.6	25.1	25.5	25.8	26.1	26.2	26.3	26.2	26.2	EXL-B1F
	32.4	33.3	34.0	34.5	35.0	35.3	35.4	35.5	35.5	35.4	EXL-B1G
60	2.6	2.7	2.7	2.8	2.8	2.9	2.9	2.9	2.9	2.9	EXM-B0A
	7.9	8.2	8.4	8.6	8.7	8.8	8.9	8.9	8.9	8.9	EXM-B0B
	16.7	17.3	17.7	18.1	18.3	18.6	18.7	18.8	18.8	18.8	EXM-B0D
	19.7	20.4	20.9	21.3	21.7	21.9	22.1	22.2	22.2	22.2	EXM-B0E
	24.5	25.3	26.0	26.5	26.9	27.2	27.4	27.5	27.6	27.5	EXL-B1F
	33.1	34.2	35.1	35.8	36.4	36.8	37.1	37.2	37.3	37.2	EXL-B1G
55	2.6	2.7	2.8	2.8	2.9	2.9	3.0	3.0	3.0	3.0	EXM-B0A
	7.9	8.2	8.5	8.7	8.8	9.0	9.1	9.1	9.2	9.2	EXM-B0B
	16.7	17.3	17.9	18.3	18.7	18.9	19.1	19.2	19.3	19.3	EXM-B0D
	19.7	20.5	21.1	21.6	22.0	22.3	22.6	22.7	22.8	22.8	EXM-B0E
	24.4	25.4	26.2	26.8	27.3	27.7	28.0	28.2	28.3	28.3	EXL-B1F
	33.1	34.4	35.4	36.3	37.0	37.5	37.9	38.1	38.3	38.3	EXL-B1G
50	2.5	2.6	2.7	2.8	2.9	2.9	3.0	3.0	3.0	3.0	EXM-B0A
	7.7	8.1	8.4	8.6	8.8	9.0	9.1	9.2	9.3	9.3	EXM-B0B
	16.3	17.1	17.7	18.2	18.7	19.0	19.2	19.4	19.5	19.6	EXM-B0D
	19.2	20.1	20.9	21.5	22.0	22.4	22.7	22.9	23.1	23.1	EXM-B0E
	23.8	25.0	25.9	26.7	27.3	27.8	28.2	28.4	28.6	28.7	EXL-B1F
	32.3	33.8	35.1	36.2	37.0	37.6	38.1	38.5	38.7	38.8	EXL-B1G
45	2.4	2.6	2.7	2.8	2.9	2.9	3.0	3.0	3.0	3.0	EXM-B0A
	7.4	7.8	8.2	8.5	8.7	8.9	9.1	9.2	9.2	9.3	EXM-B0B
	15.5	16.5	17.3	17.9	18.4	18.8	19.1	19.3	19.5	19.6	EXM-B0D
	18.3	19.5	20.4	21.1	21.7	22.2	22.6	22.8	23.0	23.1	EXM-B0E
	22.8	24.1	25.3	26.2	27.0	27.5	28.0	28.3	28.6	28.7	EXL-B1F
	30.8	32.7	34.2	35.5	36.5	37.3	37.9	38.3	38.7	38.8	EXL-B1G
40	2.2	2.4	2.6	2.7	2.8	2.9	2.9	3.0	3.0	3.0	EXM-B0A
	6.9	7.4	7.8	8.2	8.5	8.7	8.9	9.0	9.1	9.2	EXM-B0B
	14.5	15.6	16.5	17.3	17.9	18.4	18.8	19.1	19.3	19.4	EXM-B0D
	17.1	18.4	19.5	20.4	21.1	21.7	22.2	22.5	22.8	22.9	EXM-B0E
	21.2	22.9	24.2	25.3	26.2	26.9	27.5	27.9	28.2	28.4	EXL-B1F
	28.7	30.9	32.8	34.3	35.5	36.4	37.2	37.8	38.2	38.5	EXL-B1G
35	2.0	2.2	2.4	2.5	2.7	2.8	2.8	2.9	2.9	3.0	EXM-B0A
	6.2	6.8	7.4	7.8	8.1	8.4	8.6	8.8	8.9	9.0	EXM-B0B
	13.0	14.4	15.5	16.4	17.2	17.8	18.2	18.6	18.9	19.0	EXM-B0D
	15.4	17.0	18.3	19.4	20.3	21.0	21.5	21.9	22.3	22.5	EXM-B0E
	19.1	21.1	22.7	24.1	25.2	26.0	26.7	27.2	27.6	27.9	EXL-B1F
	25.8	28.6	30.8	32.6	34.0	35.2	36.1	36.8	37.4	37.8	EXL-B1G
30	1.7	2.0	2.2	2.4	2.5	2.6	2.7	2.8	2.8	2.9	EXM-B0A
	5.2	6.1	6.7	7.3	7.7	8.0	8.3	8.5	8.7	8.8	EXM-B0B
	11.1	12.8	14.2	15.3	16.2	16.9	17.5	17.9	18.3	18.5	EXM-B0D
	13.1	15.2	16.8	18.1	19.1	20.0	20.7	21.2	21.6	21.9	EXM-B0E
	16.2	18.8	20.9	22.5	23.8	24.8	25.6	26.3	26.8	27.1	EXL-B1F
	21.9	25.5	28.2	30.4	32.1	33.6	34.7	35.6	36.2	36.7	EXL-B1G

Electronic Expansion Valves EXM/L Series

EXM/L: Quick Selection (included 1.5 bar pressure drop for liquid line components and distributor)

Condensing temperature (°C, bubble point)	R452B										Valve type
	Capacity (kW)										
	Evaporating temperature (°C)										
	15	10	5	0	-5	-10	-15	-20	-25	-30	
65	1.8	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	EXM-B0A
	5.6	5.7	5.8	5.8	5.8	5.9	5.8	5.8	5.8	5.7	EXM-B0B
	11.7	12.0	12.1	12.3	12.3	12.3	12.3	12.3	12.2	12.0	EXM-B0D
	13.9	14.1	14.3	14.5	14.6	14.6	14.5	14.5	14.4	14.2	EXM-B0E
	17.2	17.5	17.8	18.0	18.1	18.1	18.1	18.0	17.8	17.6	EXL-B1F
	23.3	23.7	24.1	24.3	24.4	24.5	24.4	24.3	24.1	23.8	EXL-B1G
60	1.9	2.0	2.0	2.0	2.0	2.1	2.1	2.0	2.0	2.0	EXM-B0A
	5.8	6.0	6.1	6.2	6.2	6.3	6.3	6.3	6.2	6.2	EXM-B0B
	12.3	12.6	12.9	13.0	13.2	13.2	13.2	13.2	13.1	13.0	EXM-B0D
	14.5	14.9	15.2	15.4	15.5	15.6	15.6	15.6	15.5	15.4	EXM-B0E
	18.0	18.5	18.9	19.1	19.3	19.4	19.4	19.3	19.2	19.1	EXL-B1F
	24.4	25.0	25.5	25.9	26.1	26.2	26.2	26.2	26.0	25.8	EXL-B1G
55	1.9	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1	EXM-B0A
	5.9	6.1	6.3	6.4	6.5	6.5	6.5	6.5	6.5	6.5	EXM-B0B
	12.5	12.9	13.2	13.4	13.6	13.7	13.8	13.8	13.8	13.7	EXM-B0D
	14.7	15.2	15.6	15.9	16.1	16.2	16.3	16.3	16.2	16.2	EXM-B0E
	18.3	18.9	19.3	19.7	20.0	20.1	20.2	20.2	20.2	20.0	EXL-B1F
	24.7	25.5	26.2	26.7	27.0	27.2	27.3	27.3	27.3	27.1	EXL-B1G
50	1.9	2.0	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	EXM-B0A
	5.8	6.1	6.3	6.4	6.5	6.6	6.7	6.7	6.7	6.7	EXM-B0B
	12.3	12.8	13.2	13.6	13.8	14.0	14.1	14.1	14.1	14.1	EXM-B0D
	14.6	15.2	15.6	16.0	16.3	16.5	16.6	16.7	16.7	16.6	EXM-B0E
	18.1	18.8	19.4	19.9	20.2	20.5	20.6	20.7	20.7	20.6	EXL-B1F
	24.5	25.5	26.3	26.9	27.4	27.7	27.9	28.0	28.0	27.9	EXL-B1G
45	1.8	1.9	2.0	2.1	2.1	2.2	2.2	2.2	2.2	2.2	EXM-B0A
	5.7	5.9	6.2	6.4	6.5	6.6	6.7	6.7	6.8	6.8	EXM-B0B
	11.9	12.5	13.1	13.5	13.8	14.0	14.1	14.2	14.3	14.3	EXM-B0D
	14.1	14.8	15.4	15.9	16.2	16.5	16.7	16.8	16.9	16.8	EXM-B0E
	17.5	18.4	19.1	19.7	20.2	20.5	20.7	20.9	20.9	20.9	EXL-B1F
	23.6	24.9	25.9	26.7	27.3	27.7	28.0	28.2	28.3	28.3	EXL-B1G
40	1.7	1.9	2.0	2.0	2.1	2.1	2.2	2.2	2.2	2.2	EXM-B0A
	5.3	5.7	6.0	6.2	6.4	6.6	6.7	6.7	6.8	6.8	EXM-B0B
	11.2	12.0	12.6	13.1	13.5	13.8	14.0	14.2	14.3	14.3	EXM-B0D
	13.3	14.2	14.9	15.5	16.0	16.3	16.6	16.7	16.8	16.9	EXM-B0E
	16.5	17.6	18.5	19.2	19.8	20.2	20.6	20.8	20.9	20.9	EXL-B1F
	22.3	23.8	25.1	26.0	26.8	27.4	27.8	28.1	28.3	28.3	EXL-B1G
35	1.6	1.7	1.9	2.0	2.0	2.1	2.1	2.2	2.2	2.2	EXM-B0A
	4.9	5.3	5.7	6.0	6.2	6.4	6.5	6.6	6.7	6.7	EXM-B0B
	10.2	11.2	12.0	12.6	13.1	13.5	13.8	14.0	14.1	14.2	EXM-B0D
	12.1	13.3	14.2	14.9	15.5	15.9	16.2	16.5	16.6	16.7	EXM-B0E
	15.0	16.5	17.6	18.5	19.2	19.7	20.2	20.5	20.7	20.8	EXL-B1F
	20.3	22.3	23.8	25.0	26.0	26.7	27.3	27.7	27.9	28.1	EXL-B1G
30	1.4	1.6	1.7	1.8	1.9	2.0	2.1	2.1	2.1	2.2	EXM-B0A
	4.2	4.8	5.3	5.6	5.9	6.1	6.3	6.4	6.5	6.6	EXM-B0B
	8.9	10.2	11.1	11.9	12.5	13.0	13.3	13.6	13.8	13.9	EXM-B0D
	10.5	12.0	13.1	14.0	14.8	15.3	15.7	16.1	16.3	16.4	EXM-B0E
	13.0	14.9	16.3	17.4	18.3	19.0	19.5	19.9	20.2	20.4	EXL-B1F
	17.6	20.1	22.1	23.6	24.8	25.7	26.4	27.0	27.3	27.6	EXL-B1G

Electronic Expansion Valves EXM/L Series

EXM/L: Quick Selection (included 1.5 bar pressure drop for liquid line components and distributor)

Condensing temperature (°C, bubble point)	R454B										Valve type
	Capacity (kW)										
	Evaporating temperature (°C)										
	15	10	5	0	-5	-10	-15	-20	-25	-30	
65	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	EXM-B0A
	5.7	5.8	5.9	5.9	5.9	6.0	5.9	5.9	5.9	5.8	EXM-B0B
	11.9	12.2	12.4	12.5	12.5	12.5	12.5	12.5	12.3	12.2	EXM-B0D
	14.1	14.4	14.6	14.7	14.8	14.8	14.8	14.7	14.6	14.4	EXM-B0E
	17.5	17.9	18.1	18.3	18.4	18.4	18.3	18.2	18.1	17.9	EXL-B1F
	23.7	24.2	24.5	24.7	24.9	24.9	24.8	24.7	24.5	24.2	EXL-B1G
60	1.9	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.0	EXM-B0A
	5.9	6.1	6.2	6.2	6.3	6.3	6.3	6.3	6.3	6.2	EXM-B0B
	12.5	12.8	13.0	13.2	13.3	13.3	13.4	13.3	13.2	13.1	EXM-B0D
	14.7	15.1	15.4	15.6	15.7	15.8	15.8	15.7	15.6	15.5	EXM-B0E
	18.2	18.7	19.1	19.3	19.5	19.6	19.6	19.5	19.4	19.3	EXL-B1F
	24.7	25.3	25.8	26.1	26.4	26.5	26.5	26.4	26.3	26.0	EXL-B1G
55	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.2	2.1	2.1	EXM-B0A
	6.0	6.2	6.3	6.4	6.5	6.5	6.6	6.6	6.6	6.5	EXM-B0B
	12.6	13.0	13.3	13.5	13.7	13.8	13.9	13.9	13.8	13.7	EXM-B0D
	14.9	15.3	15.7	16.0	16.2	16.3	16.4	16.4	16.3	16.2	EXM-B0E
	18.4	19.0	19.5	19.8	20.1	20.2	20.3	20.3	20.2	20.1	EXL-B1F
	24.9	25.7	26.4	26.8	27.2	27.4	27.5	27.5	27.4	27.2	EXL-B1G
50	1.9	2.0	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	EXM-B0A
	5.9	6.1	6.3	6.5	6.6	6.6	6.7	6.7	6.7	6.7	EXM-B0B
	12.4	12.9	13.3	13.6	13.9	14.0	14.1	14.2	14.1	14.1	EXM-B0D
	14.7	15.3	15.7	16.1	16.4	16.5	16.7	16.7	16.7	16.6	EXM-B0E
	18.2	18.9	19.5	20.0	20.3	20.5	20.7	20.7	20.7	20.7	EXL-B1F
	24.6	25.6	26.4	27.0	27.5	27.8	28.0	28.1	28.0	28.0	EXL-B1G
45	1.9	2.0	2.0	2.1	2.1	2.2	2.2	2.2	2.2	2.2	EXM-B0A
	5.7	6.0	6.2	6.4	6.5	6.6	6.7	6.8	6.8	6.8	EXM-B0B
	12.0	12.6	13.1	13.5	13.8	14.0	14.2	14.3	14.3	14.3	EXM-B0D
	14.2	14.9	15.5	15.9	16.3	16.6	16.7	16.8	16.9	16.9	EXM-B0E
	17.6	18.5	19.2	19.8	20.2	20.5	20.8	20.9	20.9	20.9	EXL-B1F
	23.8	25.0	26.0	26.8	27.4	27.8	28.1	28.3	28.3	28.3	EXL-B1G
40	1.8	1.9	2.0	2.0	2.1	2.1	2.2	2.2	2.2	2.2	EXM-B0A
	5.4	5.7	6.0	6.2	6.4	6.6	6.7	6.7	6.8	6.8	EXM-B0B
	11.3	12.1	12.7	13.2	13.6	13.8	14.0	14.2	14.3	14.3	EXM-B0D
	13.4	14.3	15.0	15.6	16.0	16.3	16.6	16.8	16.8	16.9	EXM-B0E
	16.6	17.7	18.6	19.3	19.9	20.3	20.6	20.8	20.9	20.9	EXL-B1F
	22.4	24.0	25.2	26.1	26.9	27.4	27.9	28.1	28.3	28.3	EXL-B1G
35	1.6	1.8	1.9	2.0	2.0	2.1	2.1	2.2	2.2	2.2	EXM-B0A
	4.9	5.4	5.7	6.0	6.2	6.4	6.5	6.6	6.7	6.7	EXM-B0B
	10.3	11.3	12.1	12.7	13.1	13.5	13.8	14.0	14.1	14.2	EXM-B0D
	12.2	13.3	14.2	15.0	15.5	15.9	16.3	16.5	16.6	16.7	EXM-B0E
	15.1	16.6	17.7	18.6	19.2	19.8	20.2	20.5	20.6	20.7	EXL-B1F
	20.5	22.4	23.9	25.1	26.0	26.8	27.3	27.7	27.9	28.1	EXL-B1G
30	1.4	1.6	1.7	1.9	1.9	2.0	2.1	2.1	2.1	2.2	EXM-B0A
	4.3	4.9	5.3	5.7	5.9	6.2	6.3	6.4	6.5	6.6	EXM-B0B
	9.0	10.2	11.2	11.9	12.5	13.0	13.3	13.6	13.8	13.9	EXM-B0D
	10.6	12.1	13.2	14.1	14.8	15.3	15.8	16.1	16.3	16.4	EXM-B0E
	13.2	15.0	16.4	17.5	18.4	19.0	19.5	19.9	20.2	20.4	EXL-B1F
	17.8	20.3	22.2	23.7	24.8	25.8	26.4	27.0	27.3	27.5	EXL-B1G

Electronic Expansion Valves EXM/L Series

Consideration for operating unipolar stepper motor in half step mode without holding current:

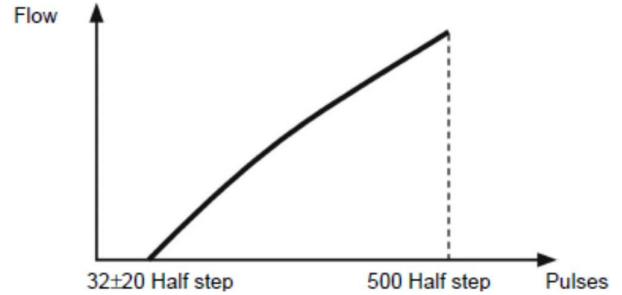
When the pulsing reaches the desired position, the valve gets stabilized by holding the final pulse for at least duration of one pulse up to 0.5 second. Before re-move to a new position, the same previous final pulse must be powered for at least duration of one pulse up to 0.5 seconds.

Note:

Zero pulse (base point) shall be the point of full close position of valve. Do not exceed total of 500 pulses (half steps). In case of more than 500 pulses applied by driver/controller or false movement due to the improper wiring, stop the operation and apply more than 700 pulses in close direction in order to close fully the valve and reset the counter to zero pulse (base point).

EXM/EXL air flow characteristics

Type	Air flow, liter /min. at 10 bar differential pressure, 500 half step
EXM-B0B	17.1
EXM-B0D	35.5
EXM-B0E	42.2
EXL-B1F	52.3
EXL-B1G	70.3



Technical Data

MOPD (maximum operating pressure differential)	40 bar in normal flow 33 bar in reverse flow
Max. working pressure PS	45 bar
External leakage	≤ 3 gram / year
Temperature range TS Liquid refrigerant Ambient	-30...+70°C -30...+60°C
Air seat leakage at 10 bar differential pressure	Typically, 150 cm ³ /min.
Relative humidity	95%

Connections, A and B	EXM: ¼" ODM EXL: ¼" ODF and 8 mm ODM
Bi-flow direction Normal: Reverse:	Connection A to B Connection B to A
Valve installation	Coil upside or to vertical within ±90°
CE marking	Not required
Package and delivery	10 pieces
Weight Valve Coil	EXM: 65 g, EXL: 76 g EXM: 124 g, EXL: 156 g

Endurance

- Continuous 40 bar differential pressure across the valve (In normal flow direction from A to B)
- Cycling between fully close and fully open while 40 bar differential pressure across the valve has been maintained during cycling
- Each cycle consists of:
 - From 0% to 100% fully open position equal to 500 pulses
 - From 100% to 0% fully close position equal to 500 pulses
- 225.000 cycles or equal to 225 million pulses

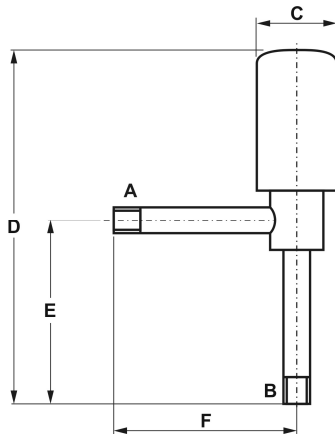
Electronic Expansion Valves EXM/L Series

Electrical Data

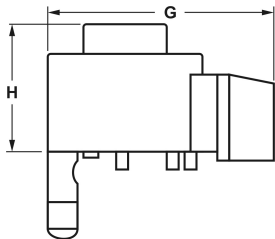
Stepper motor type	Uni-polar, constant voltage
Electrical connection	12 VDC coil: 5 wires 24 VDC coil: 5 wires
Supply voltage	12 VDC coil: 12V ± 10% 24 VDC coil: 24V ± 10%
Phase current, operating	12 VDC coil: 260 mA 24 VDC coil: 130 mA
Winding resistance per phase	12 VDC coil: 46 Ω 24 VDC coil: 185 Ω
Insulation resistance	Min. 100 MΩ at 500 VDC
Cable length	1 meter

Step mode	Half step = one pulse
Total number of pulses	500 half step (250 full step)
Pulsing rate	30...90 pulses (half step) per sec
Full travel time	16.6 seconds at 30 pulse/sec 5.5 seconds at 90 pulse/sec
Reference position	Mechanical stop at fully close position at 520 pulses
Valve starts to open at	32 pulses ± 20 pulses
Insulation class	E
Protection class Coil	IP65 excluding cable terminal (JST)

Dimensions (mm)



Valve type	A / B Connections		C (mm)	D (mm)	E (mm)	F (mm)
	Diameter	Length (mm)				
EXM-...	1/4" ODM	8	17.3	78	36	36.3
EXL-...	1/4" ODF / 8 mm ODM	8	21.8	90	42	42



Coil	G (mm)	H (mm)
EXM-...	52.5	32
EXL-...	59	34

Electronic Expansion Valves EXN Series

EXN Unipolar stepper motor driven Electronic Expansion Valves are for precise control of refrigerant mass flow in heat pumps, heating units, air conditioning and close control applications. The valve is not released for refrigeration applications such as cold room and refrigeration display cabinet.

Features

- Hermetic design
- Continuous, linear modulation of mass flow
- Bi-flow with same capacity in normal and reverse flow direction
- MOPD: 36 bar in both flow directions
- Unipolar stepper motor with gear mechanism enabling Bi-flow performance at 36 bar differential pressure across the valve
- High resolution: 2000 pulses (half steps) or 1000 full steps
- Removable coil: 12 VDC



EXN with Coil

Selection Table

Type	Description	Part No. Single pack	Nominal capacity (kW)				Connections Size / Style
			R32				
EXN-B2K	Valve less coil	800421	50.6				1/2" ODF
EXN-B2L	Valve less coil	800422	62.5				1/2" ODF
EXN-125	Coil 12VDC	800420	-				-

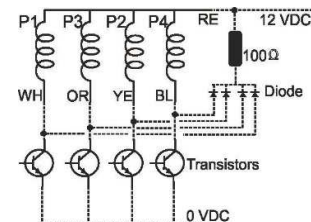
Note: The nominal capacity is based on +38°C condensing temperature and +4°C evaporating temperature. For other operating conditions, please see quick selection table in the next page.

Quick Selection: (included 1.5 bar pressure drop for liquid line components and distributor)

Condensing temperature (°C)	R32 Capacity (kW)													Valve
	Evaporating temperature (°C)													
	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	
65	42.0	44.3	46.2	47.9	49.2	50.3	51.1	51.7	52.2	52.4	52.5	52.5	52.4	EXN-B2K
	51.8	54.7	57.1	59.1	60.8	62.1	63.1	63.9	64.4	64.8	64.9	64.9	64.7	EXN-B2L
60	41.9	44.7	47.1	49.0	50.6	51.9	53.0	53.8	54.4	54.8	55.1	55.1	55.1	EXN-B2K
	51.8	55.2	58.1	60.5	62.5	64.2	65.5	66.5	67.2	67.7	68.0	68.1	68.0	EXN-B2L
55	40.4	43.7	46.6	48.9	50.8	52.4	53.7	54.7	55.5	56.1	56.4	56.6	56.7	EXN-B2K
	49.9	54.0	57.5	60.4	62.8	64.7	66.3	67.6	68.5	69.2	69.7	69.9	70.0	EXN-B2L
50	37.4	41.5	44.9	47.7	50.0	51.9	53.5	54.7	55.7	56.4	56.9	57.2	57.4	EXN-B2K
	46.2	51.3	55.5	58.9	61.8	64.1	66.0	67.6	68.8	69.7	70.3	70.7	70.9	EXN-B2L
45	32.9	38.0	42.2	45.6	48.3	50.6	52.4	53.9	55.1	56.0	56.7	57.2	57.5	EXN-B2K
	40.6	47.0	52.1	56.3	59.7	62.5	64.8	66.6	68.1	69.2	70.1	70.6	71.0	EXN-B2L
40	26.1	33.1	38.3	42.4	45.7	48.5	50.7	52.5	53.9	55.0	55.9	56.5	56.9	EXN-B2K
	32.2	40.8	47.3	52.4	56.5	59.8	62.6	64.8	66.6	68.0	69.0	69.8	70.3	EXN-B2L
35	14.6	25.9	32.9	38.1	42.2	45.5	48.2	50.3	52.1	53.4	54.5	55.3	55.8	EXN-B2K
	18.1	32.0	40.6	47.1	52.2	56.2	59.5	62.2	64.3	66.0	67.3	68.3	69.0	EXN-B2L
30		13.7	25.4	32.5	37.7	41.7	45.0	47.5	49.6	51.3	52.6	53.6	54.3	EXN-B2K
		16.9	31.3	40.1	46.5	51.5	55.5	58.7	61.3	63.3	64.9	66.2	67.1	EXN-B2L
25			12.3	24.6	31.7	36.9	40.9	44.1	46.6	48.6	50.2	51.4	52.3	EXN-B2K
			15.2	30.3	39.2	45.6	50.5	54.4	57.5	60.0	61.9	63.5	64.6	EXN-B2L
20				10.6	23.5	30.7	35.9	39.8	42.9	45.3	47.2	48.7	49.9	EXN-B2K
				13.1	29.0	38.0	44.3	49.2	53.0	56.0	58.3	60.2	61.6	EXN-B2L

Wiring EXN-125 (12 VDC, 5 wires coil)

Phase Number	Wire Color	Recommended half step pulsing/switching mode				Remark
		1	2	3	4	
P1	White	ON	OFF	OFF	ON	1) The pulse sequence 1 to 4 will be repeated for further pulses in order to close the valve. 2) The pulse sequence 4 to 1 will be repeated for further pulses in order to open the valve.
P2	Yellow	ON	ON	OFF	OFF	
P3	Orange	OFF	ON	ON	OFF	
P4	Blue	OFF	OFF	ON	ON	
	Red	ON	ON	ON	ON	



Note: If a 100Ω resistor against surge is not installed in electronic driving circuit, the torque of EXN stepper motor will decrease, which might lead to lower MOPD than the published 36 bar.

Electronic Expansion Valves EXN Series


Technical Data

MOPD (maximum operating pressure differential)	36 bar in normal flow 36 bar in reverse flow
Max. working pressure PS	45 bar
External leakage	1×10^{-6} Pa.m ³ /s at 43 bar pressure
Temperature range TS Liquid refrigerant Ambient	-30...+70°C -30...+60°C
Vibration at three axis (X, Y, Z)	9.8 m/s ² (1 g) Frequency: 10...150 Hz
Endurance/ Durability	- 200000 full cycles pressurizing between 4 and 43 bar - 100000 cycles (2000 pulses open and 2200 pulses close) at 36 bar pressure differential
Air seat leakage at 10 bar differential pressure	< 400 cm ³ /min.

Bi-flow direction	Normal: Connection A to B Reverse: Connection B to A
Valve installation	Coil upside or to vertical within $\pm 90^\circ$
Inlet and outlet connection	Copper 1/2" ODF brazing
Hysteresis	40 pulses
Resistant to humidity test	90...95% RH at 50°C for 96 hours
Weight	Valve EXN: 163 g Coil EXN: 158 g
CE marking	Not required
Package and delivery	Individual single packing for valves and coil
Salt spray test	At 35°C, 5% NaCl concentration for 72 hours

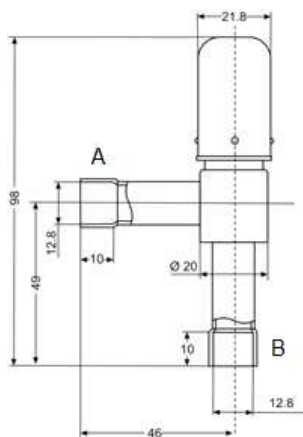
Electrical Data

Stepper motor type	Uni-polar, constant voltage, 5 wires
Supply voltage	12 VDC coil: 12 V \pm 10%
Nominal operating current	80 mA (each phase)
Winding resistance per phase	150 Ω \pm 10% at 20°C
Insulation resistance	Min. 100 M Ω at 500 VDC
Coil insulation class	A
Dielectric strength	500VAC for 1 minute 600 VAC for 1 second
Cable length	1 m
Step mode	Half step = one pulse

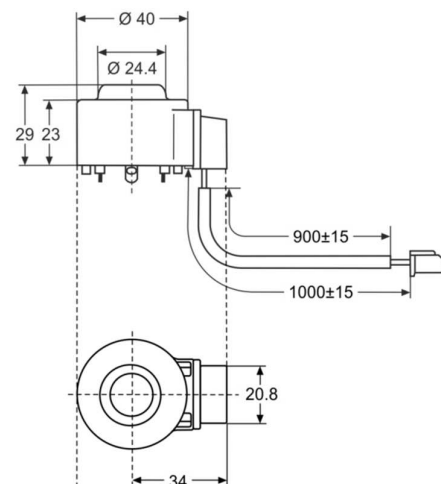
Total number of pulses	2000 half step (1000 full step)
Valve starts to open at:	100 \pm 60 pulses
Pulsing rate frequency (pulse/sec.)	100...200 Hz
Full travel time	20 seconds at 100 Hz 10 seconds at 200 Hz
Reference position	Mechanical stop at fully close position at 2200 pulses
Electrical connection	JST XH connector, 5 pole Housing: XHP-5 Pin: SXH-001T-P0.6 

Dimensions (mm)

Valve



Coil



Electrical Control Valves EX4-8

EMERSON **EX4-8** are stepper motor driven valves for precise control of refrigerant mass flow in air conditioning, refrigeration, heat pumps, close control and industrial process cooling applications.

Features

- Multifunction as expansion valves, hot gas bypass, suction gas throttling, head pressure, liquid level actuator etc.
- Fully hermetic design
- Stepper motor driven
- Short opening and closing time
- Very fast full stroke time
- High resolution and excellent repeatability
- Bi-flow versions with positive shut-off in both flow directions
- Positive shut-off function to eliminate the use of an additional solenoid valve
- Linear flow capacity
- Extremely wide capacity range (5...100%)
- Direct coupling of motor and valve for high reliability (no gear mechanism)
- Ceramic slide and port for accurate flow and minimal wear




Selection Table

Type	Part No.	Nominal capacity (kW)			Flow pattern	Capacity range	Inlet connection	Outlet connection	Electrical connector
		R32	R452B	R454B					
EX4-I21	800615	28.6	22	22.1	Uni-flow	5...100%	3/8" ODF	5/8" ODF	M12 plug
EX4-M21	800616	28.6	22	22.1			10 mm ODF	16 mm ODF	
EX5-U21	800618	86.8	67	67.1			5/8" (16 mm) ODF	7/8" (22 mm) ODF	
EX6-I21	800620	208	160	161.			7/8" ODF	1-1/8" ODF	
EX6-M21	800621	208	160	16.			22 mm ODF	28 mm ODF	
EX7-I21*	800624	573	441	443			1-1/8" ODF	1-3/8" ODF	
EX7-M21*	800625	573	441	443			28 mm ODF	35 mm ODF	
EX8-M21*	800629	1528	1175	1180			42 mm ODF	42 mm ODF	
EX8-U21*	800630	1528	1175	1180			1-3/8" (35 mm) ODF	1-3/8" (35 mm) ODF	
EX8-I21*	800631	1528	1175	1180			1-5/8" ODF	1-5/8" ODF	
EX4-U31	800617	28.6	22	22.1	Bi-flow (Heat pump)		5/8" (16 mm) ODF	5/8" (16 mm) ODF	
EX5-U31	800619	86.8	67	67.1			7/8" (22 mm) ODF	7/8" (22 mm) ODF	
EX6-I31	800622	208	160	161			1-1/8" ODF	1-1/8" ODF	
EX6-M31	800623	208	160	161			28 mm ODF	28 mm ODF	
EX7-U31*	800626	573	441	443			1-3/8" (35 mm) ODF	1-3/8" (35 mm) ODF	

Note1: *) EX7 and EX8 have CE marking according to hazard category 1 based on PED. These valves EX7/8 requires upgrade to Hazard category II and are under obtaining certification. Before selection or use, please contact EMERSON local sales offices for availability of approval.

Note2: The nominal capacity is based on +4°C evaporating temperature and +38°C condensing temperature (bubble point). For selection of other operating condition, please use quick selection tables in the next pages or Controls Navigator selection program.

Cable and Connector Assembly

Type	Part No.	Length	Connector type
EXV-M15	804663	1.5 m	 M12
EXV-M30	804664	3.0 m	
EXV-M60**	804665	6.0 m	

Note: EXV-M... are not in compliance with EN60335-1/2-40, clause 30 in term of glue wire test. However, they comply to EN60079-15, clause 22.3 heat endurance test.

Electrical Control Valves EX4-8

EX4-8: Quick Selection (included 1.5 bar pressure drop for liquid line components and distributor)

Condensing temperature (°C)	R32 Capacity (kW)										Valve type
	Evaporating temperature (°C)										
	20	15	10	5	0	-5	-10	-15	-20	-25	
65°C	26.2	27.1	27.8	28.4	28.9	29.3	29.5	29.7	29.7	29.7	EX4
	79	82	84	86	88	89	89	90	90	90	EX5
	190	197	202	207	210	213	215	216	216	216	EX6
	523	542	557	569	578	585	590	593	595	594	EX7*
	1396	1445	1485	1517	1542	1561	1575	1583	1586	1585	EX8*
60°C	26.6	27.7	28.7	29.4	30.0	30.5	30.8	31.0	31.2	31.2	EX4
	81	84	87	89	91	92	93	94	94	95	EX5
	194	202	208	214	218	222	224	226	227	227	EX6
	533	555	573	588	600	609	616	621	623	624	EX7*
	1421	1480	1529	1568	1600	1624	1643	1655	1662	1665	EX8*
55°C	26.4	27.7	28.8	29.7	30.4	31.0	31.4	31.7	31.9	32.1	EX4
	80	84	87	90	92	94	95	96	97	97	EX5
	192	201	209	216	221	225	228	231	232	233	EX6
	527	554	575	593	608	619	628	635	639	641	EX7*
	1406	1476	1535	1583	1621	1652	1675	1692	1703	1709	EX8*
50°C	25.4	27.0	28.3	29.4	30.3	31.0	31.5	31.9	32.2	32.4	EX4
	77	82	86	89	92	94	96	97	98	98	EX5
	185	196	206	214	220	225	229	232	234	236	EX6
	509	540	566	588	605	619	630	639	645	648	EX7*
	1356	1441	1510	1568	1614	1652	1681	1703	1719	1728	EX8*
45°C	23.9	25.8	27.4	28.6	29.7	30.5	31.2	31.7	32.1	32.4	EX4
	72	78	83	87	90	93	95	96	97	98	EX5
	174	188	199	208	216	222	227	231	234	235	EX6
	478	516	547	573	594	611	624	634	642	647	EX7*
	1274	1375	1459	1527	1583	1628	1664	1692	1712	1726	EX8*
40°C	21.7	24.0	25.9	27.4	28.7	29.7	30.5	31.2	31.6	32.0	EX4
	66	73	78	83	87	90	92	94	96	97	EX5
	158	175	188	199	209	216	222	227	230	233	EX6
	433	480	518	549	574	594	610	623	633	640	EX7*
	1156	1280	1381	1463	1530	1584	1627	1661	1687	1706	EX8*
35°C	18.6	21.6	23.9	25.8	27.3	28.5	29.5	30.2	30.9	31.3	EX4
	56	65	72	78	83	86	89	92	93	95	EX5
	135	157	174	187	198	207	214	220	224	228	EX6
	373	432	478	515	546	570	589	605	617	626	EX7*
	994	1151	1275	1374	1455	1520	1572	1613	1645	1669	EX8*
30°C	14.4	18.4	21.3	23.6	25.4	26.9	28.1	29.0	29.8	30.3	EX4
	43	56	65	72	77	82	85	88	90	92	EX5
	104	134	155	172	185	196	204	211	216	221	EX6
	287	367	427	472	509	538	562	581	595	607	EX7*
	765	980	1137	1260	1357	1435	1498	1548	1587	1617	EX8*

Note: *) EX7 and EX8 have CE marking according to hazard category 1 based on PED. These valves EX7/8 requires upgrade to Hazard category II and are under obtaining certification. Before selection or use, please contact EMERSON local sales offices for availability of approval.

Electrical Control Valves EX4-8

EX4-8: Quick Selection (included 1.5 bar pressure drop for liquid line components and distributor)

Condensing temperature (°C, bubble point)	R452B										Valve type
	Capacity (kW)										
	Evaporating temperature (°C)										
	20	15	10	5	0	-5	-10	-15	-20	-25	
65°C	19.0	19.5	19.9	20.2	20.4	20.5	20.5	20.4	20.3	20.2	EX4
	57	59	60	61	62	62	62	62	62	61	EX5
	138	142	145	147	148	149	149	149	148	147	EX6
	379	390	398	403	407	409	410	409	407	403	EX7*
	1011	1039	1060	1076	1086	1092	1093	1091	1085	1076	EX8*
60°C	19.7	20.4	21.0	21.4	21.7	21.8	21.9	22.0	21.9	21.8	EX4
	60	62	63	65	66	66	67	67	66	66	EX5
	144	149	152	155	157	159	160	160	159	159	EX6
	395	408	419	427	433	437	439	439	438	436	EX7*
	1053	1089	1117	1139	1155	1165	1170	1172	1169	1163	EX8*
55°C	19.9	20.7	21.4	21.9	22.3	22.6	22.8	22.9	22.9	22.8	EX4
	60	63	65	66	68	68	69	69	69	69	EX5
	144	151	156	159	162	164	166	166	166	166	EX6
	397	414	428	438	446	452	456	458	458	457	EX7*
	1059	1104	1140	1169	1190	1205	1215	1220	1221	1218	EX8*
50°C	19.4	20.5	21.3	22.0	22.5	22.9	23.2	23.3	23.4	23.4	EX4
	59	62	65	67	68	69	70	71	71	71	EX5
	141	149	155	160	164	167	169	170	170	170	EX6
	388	409	426	440	450	458	464	467	469	469	EX7*
	1036	1092	1137	1173	1201	1221	1236	1245	1250	1250	EX8*
45°C	18.5	19.8	20.8	21.7	22.3	22.8	23.2	23.5	23.6	23.7	EX4
	56	60	63	66	68	69	70	71	72	72	EX5
	134	144	152	158	162	166	169	171	172	172	EX6
	370	396	417	433	447	457	464	469	473	474	EX7*
	986	1055	1111	1156	1191	1218	1238	1252	1260	1264	EX8*
40°C	17.0	18.6	19.9	21.0	21.8	22.4	22.9	23.3	23.5	23.7	EX4
	52	57	60	64	66	68	69	71	71	72	EX5
	124	136	145	153	159	163	167	169	171	172	EX6
	340	373	399	420	436	449	459	466	471	473	EX7*
	908	994	1064	1119	1163	1197	1223	1242	1255	1262	EX8*
35°C	14.9	17.0	18.6	19.9	20.9	21.7	22.4	22.8	23.2	23.4	EX4
	45	52	56	60	63	66	68	69	70	71	EX5
	109	124	136	145	152	158	163	166	169	170	EX6
	299	340	373	398	419	435	447	457	463	468	EX7*
	796	907	994	1062	1117	1160	1193	1218	1236	1248	EX8*
30°C	11.9	14.8	16.9	18.5	19.7	20.7	21.5	22.1	22.6	22.9	EX4
	36	45	51	56	60	63	65	67	68	69	EX5
	87	107	123	134	144	151	157	161	164	166	EX6
	239	295	337	369	395	415	430	442	451	458	EX7*
	637	787	899	985	1053	1106	1148	1180	1204	1220	EX8*

Note: *) EX7 and EX8 have CE marking according to hazard category 1 based on PED. These valves EX7/8 requires upgrade to Hazard category II and are under obtaining certification. Before selection or use, please contact EMERSON local sales offices for availability of approval.

Electrical Control Valves EX4-8

EX4-8: Quick Selection (included 1.5 bar pressure drop for liquid line components and distributor)



Condensing temperature (°C, bubble point)	R454B										Valve type
	Capacity (kW)										
	Evaporating temperature (°C)										
	20	15	10	5	0	-5	-10	-15	-20	-25	
65°C	19.3	19.8	20.2	20.5	20.7	20.8	20.8	20.8	20.7	20.5	EX4
	59	60	61	62	63	63	63	63	63	62	EX5
	140	144	147	149	151	151	152	151	150	149	EX6
	386	397	405	410	414	416	417	416	413	410	EX7*
	1030	1058	1079	1095	1105	1110	1111	1108	1102	1093	EX8*
60°C	20.0	20.7	21.2	21.6	21.9	22.1	22.2	22.2	22.1	22.0	EX4
	61	63	64	65	66	67	67	67	67	67	EX5
	145	150	154	157	159	160	161	161	161	160	EX6
	400	413	424	432	438	441	443	443	442	440	EX7*
	1066	1102	1130	1152	1167	1177	1182	1182	1179	1173	EX8*
55°C	20.0	20.9	21.6	22.1	22.5	22.7	22.9	23.0	23.0	22.9	EX4
	61	63	65	67	68	69	69	70	70	69	EX5
	146	152	157	161	163	165	167	167	167	167	EX6
	401	418	431	442	449	455	458	460	460	459	EX7*
	1069	1114	1150	1178	1198	1213	1222	1227	1227	1223	EX8*
50°C	19.6	20.6	21.5	22.1	22.6	23.0	23.3	23.4	23.5	23.5	EX4
	59	62	65	67	69	70	70	71	71	71	EX5
	142	150	156	161	165	167	169	170	171	171	EX6
	392	412	429	442	452	460	465	468	470	470	EX7*
	1044	1100	1144	1180	1207	1227	1241	1249	1253	1252	EX8*
45°C	18.6	19.9	21.0	21.8	22.4	22.9	23.3	23.5	23.7	23.7	EX4
	56	60	63	66	68	69	71	71	72	72	EX5
	135	145	152	158	163	167	169	171	172	172	EX6
	373	398	419	435	448	458	465	470	473	474	EX7*
	994	1062	1117	1161	1196	1222	1241	1254	1262	1265	EX8*
40°C	17.2	18.8	20.1	21.1	21.9	22.5	23.0	23.3	23.5	23.7	EX4
	52	57	61	64	66	68	70	71	71	72	EX5
	125	137	146	153	159	164	167	170	171	172	EX6
	343	376	401	422	438	450	460	466	471	474	EX7*
	916	1002	1070	1124	1167	1200	1226	1244	1256	1263	EX8*
35°C	15.1	17.2	18.8	20.0	21.0	21.8	22.4	22.9	23.2	23.4	EX4
	46	52	57	61	64	66	68	69	70	71	EX5
	110	125	136	146	153	159	163	166	169	170	EX6
	302	343	375	400	420	436	448	457	464	468	EX7*
	805	915	1000	1068	1121	1163	1195	1219	1236	1248	EX8*
30°C	12.2	14.9	17.0	18.6	19.8	20.8	21.6	22.1	22.6	22.9	EX4
	37	45	51	56	60	63	65	67	68	69	EX5
	88	109	124	135	144	151	157	161	164	166	EX6
	243	299	340	372	396	416	431	443	451	457	EX7*
	648	797	906	991	1057	1109	1150	1181	1204	1220	EX8*

Note: *) EX7 and EX8 have CE marking according to hazard category 1 based on PED. These valves EX7/8 requires upgrade to Hazard category II and are under obtaining certification. Before selection or use, please contact EMERSON local sales offices for availability of approval.

Electrical Control Valves EX4-8

Technical Data

MOPD (maximum operating pressure differential)	EX4/EX5/EX6: 40 bar EX7: 35 bar EX8: 30 bar
Max. working pressure PS	EX4/5/6/7: 60 bar EX8: 56 bar (UL versions 45 bar)
Factory test pressure PT	EX4/5/6/7: 66 bar EX8: 61.6 bar
Evaporating temperature	-100...+55°C
Ambient temperature Storage temperature	-40...+55°C -40...+70°C
Medium inlet temperature Bi-flow version: Uni-flow version: Medium outlet temperature:	-40...+80°C -50*...+100°C -100*...+100°C *(UL-Approval above $\geq -40^{\circ}\text{C}$)
Protection accordance to IEC 529, DIN 40050	IP67 with EMERSON supplied cable connector assembly
Connections	ODF stainless steel fittings

Salt spray test	non-corrosion stainless steel body
Relative Humidity	5 to 95% R.H.
Vibration for non-connected and fastened valve	4g (0...1000 Hz, 1 octave /min.)
Shock	20g at 11 ms 80g at 1 ms
External leakage	≤ 3 gram / year
Net weight	0.5 kg (EX4), 0.52 kg (EX5), 0.60 kg (EX6), 1.1 kg (EX7), 1.5 kg (EX8)
Seat leakage	Positive shut-off better than solenoid valves
Marking	 (only EX7 & EX8), * 
Package/delivery (individual)	without electrical connector

Note: *) EX7, and EX8 have CE marking according to hazard category 1 based on PED. These valves EX7/8 requires upgrade to Hazard category II and are under obtaining certification. Before selection or use, please contact EMERSON local sales offices for availability of approval.

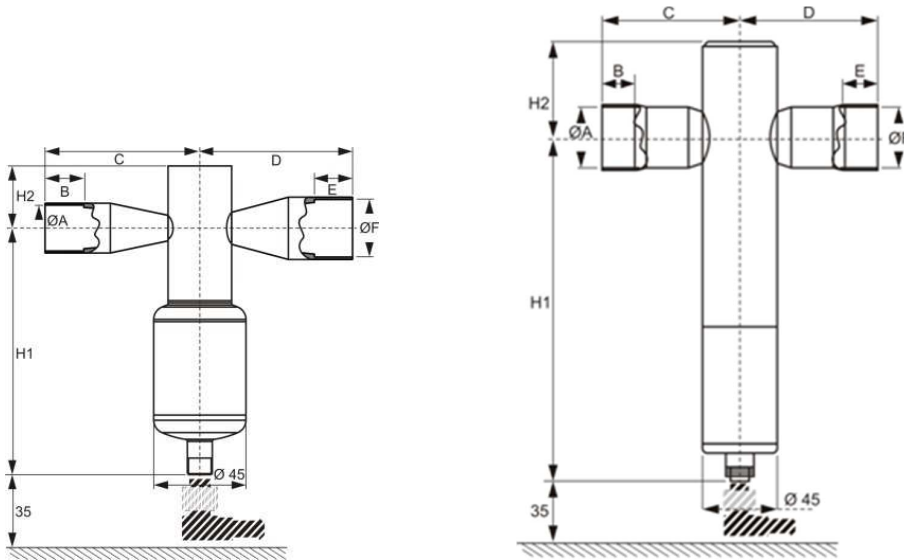
Electrical Data

Stepper motor type	Bi-polar, phase current by chopper control (constant current)
Electrical connection	4 pin terminal via plug
Nominal supply voltage to the valve U:	24 VDC
Driver supply voltage range	18...36 VDC
Phase current, operating	EX4-6: 500 mA EX7: 750 mA EX8: 800 mA $\pm 10\%$
Holding current	EX4-6: 100 mA EX7: 250 mA EX8: 500 mA
Nominal input power per phase	EX4/EX5/EX6: 3.5 W EX7/EX8: 5 W

Step mode	2 phase full step, half step or microstep
Step angle	1.8° per step $\pm 8\%$
Stepping rate	500 Hz
Total number of steps	EX4-6: 750 full steps EX7: 1600 full steps EX8: 2600 full steps
Winding resistance per phase	EX4-6: 13 Ohm $\pm 10\%$ EX7: 8 Ohm $\pm 10\%$ EX8: 6 Ohm $\pm 10\%$
Full travel time	EX4-6: 1.5 seconds EX7: 3.2 seconds EX8: 5.2 seconds
Reference position	Mechanical stop at fully closed position

Electrical Control Valves EX4-8

Dimensions (mm)



Type	Flow pattern	Part No.	Ø A x Ø F(ODF)	B	C	D	E	H1	H2
EX4-I21	Uni-flow	800615	3/8" x 5/8"	8	45	55	11	113	25
EX4-M21		800616	10 x 16 mm	8	45	55	11	113	25
EX5-U21		800618	5/8" x 7/8" (16 x 22 mm)	11	55	65	16	113	25
EX6-I21		800620	7/8" x 1-1/8"	16	65	75	19	113	25
EX6-M21		800621	22 x 28 mm	16	65	75	19	113	25
EX7-I21		800624	1-1/8" x 1-3/8"	20	78	83	20	158	42
EX7-M21		800625	28 x 35 mm	20	78	83	20	158	42
EX8-M21		800629	42 x 42 mm	20	80	80	20	200	56
EX8-U21		800630	1-3/8" (35 mm) x 1-3/8" (35 mm)	20	80	80	20	200	56
EX8-I21		800631	1-5/8" x 1-5/8"	20	80	80	20	200	56
EX4-U31	Bi-flow	800617	5/8" x 5/8" (16 x 16 mm)	11	55	55	11	113	25
EX5-U31		800619	7/8" x 7/8" (22 x 22 mm)	16	65	65	16	113	25
EX6-I31		800622	1-1/8" x 1-1/8"	19	75	75	19	113	25
EX6-M31		800623	28 x 28 mm	19	75	75	19	113	25
EX7-U31		800626	1-1/8" (35 mm) x 1-1/8" (35 mm)	23	83	83	23	158	42

EXD-HP1/2 Stand-alone Superheat/Economizer Controller

EXD-HP1/2 are stand-alone universal superheat and or economizer controllers for heat pumps, heating units, air conditioning and precision cooling such as telecom and shelter applications.

EXD-HP1/2 have not been evaluated for compliance according to IEC60335-2-40.

Features

- Self-adapting superheat/economizer control in conjunction with EMERSON stepper motor driven electronic expansion Valves EXM/EXL
- Among other refrigerants: R32, R410A, R407C and R290
- Discharge hot gas temperature control by wet refrigerant vapor/vapor injection to compressor
- Controllers as slave with Modbus (RTU) communication capability.
- Upload/download key (accessory) for transmission of parameter settings among controllers with the same setting
- Low pressure switch and freeze protection function
- Manual positioning of valve(s)
- Limitation of evaporating pressure (MOP)
- Low/high superheat alarm
- Monitoring of sensors and sensor wiring connectivity/failures
- Integrated display (3-digits LEDs) and key board
- Electrical connection via plug-in type screw terminals (included with controller)



EXD-HP2

Selection table – Controllers & Accessories

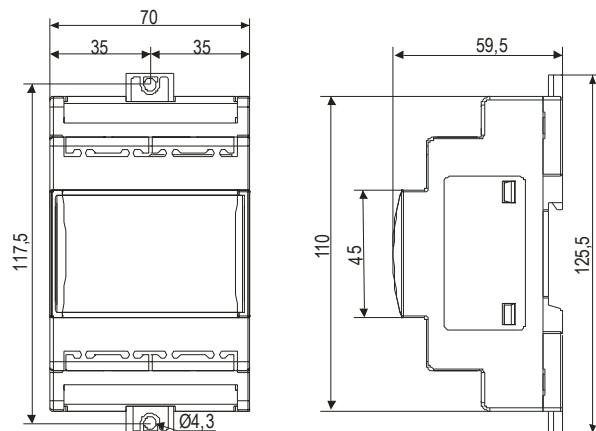
Description		Type	Part No.	
			Single pack	Multipack*
Controllers	Controller with 1 EXV output	EXD-HP1	807836	807836M
	Controller with 2 independent EXV outputs	EXD-HP2	807837	807837M
Valves & coils EXM/L - see page 8-13				
Temperature sensor	Cable length 3.0 m, -30...+150°C	ECN-P30	804495	-
Pressure transmitters - see page 30-31				

Note: *) Multipack = 20 pcs

Technical Data

Supply voltage	24 VAC/DC ±10%
Power consumption	EXD-HP1: Max. 15 VA EXD-HP2: Max. 20 VA
Digital inputs	EXD-HP1: Two, each potential free EXD-HP2: Three each potential free
Relay output	SPDT contacts, AgSnO Inductive (AC15) 24 VAC: 1 A Resistive: 24 VAC/DC: 4 A
Plug-in connector size	Removable screw version wire size 0.14...1.5 mm ²
Protection class	IP 20
Housing	Self-extinguishing ABS
Mounting	DIN rail mounted
Temperatures	storage -20...+65°C operating -10...+60°C
Relative humidity	0...85% RH non condensing
Compliance with	DIN EN60335-1 DIN EN 55014-1, DIN EN 55014-2
Marking/ applied directives	CE / LVD, EMC, RoHS

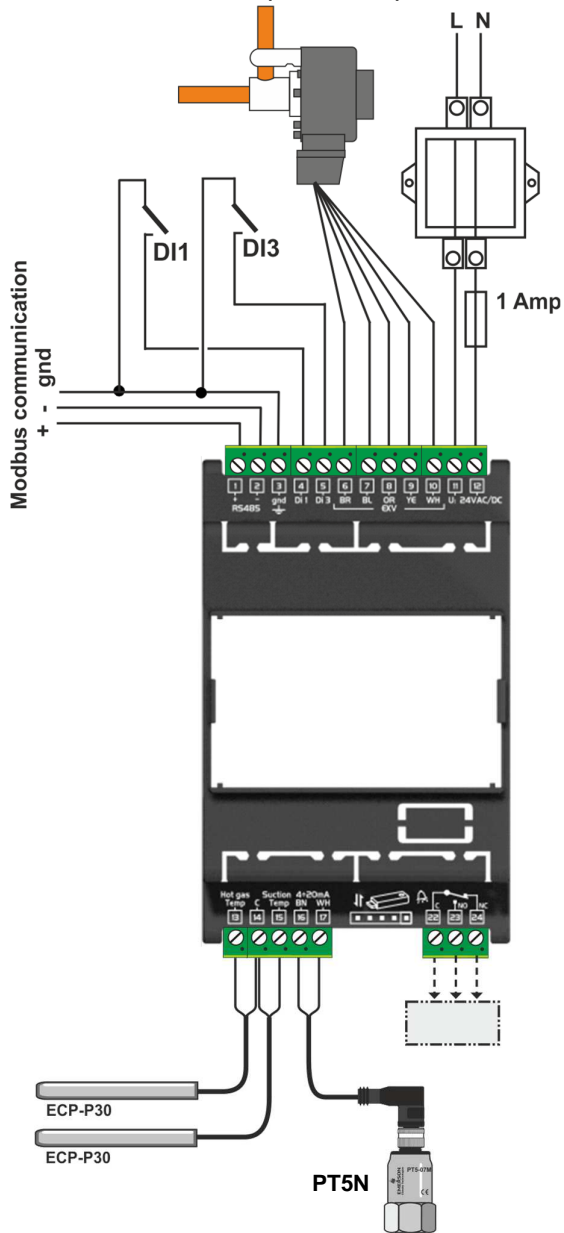
Dimensions (mm)



EXD-HP1/2 Stand-alone Superheat/Economizer Controller

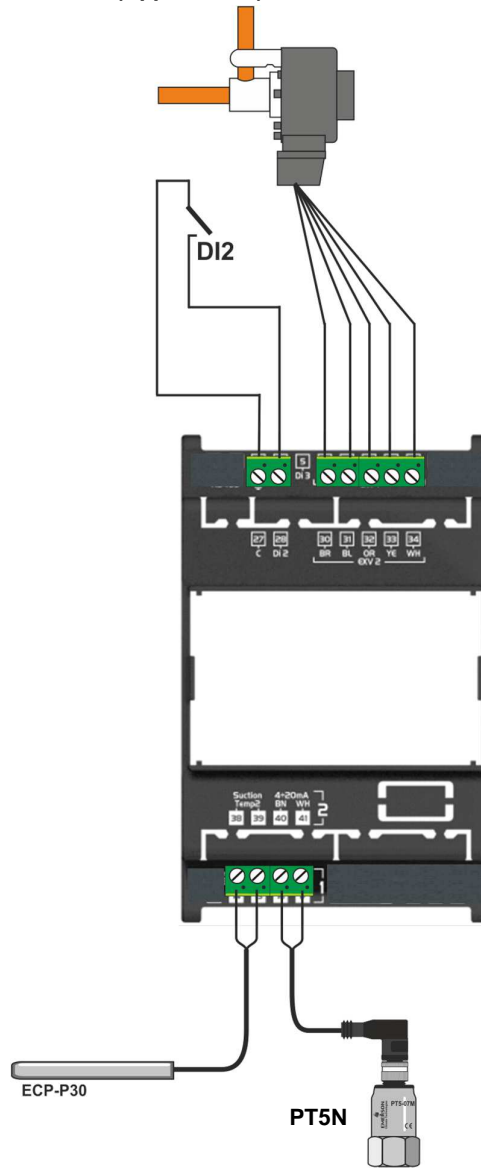
Wiring Diagrams *EXD-HP1/2 have not been evaluated for compliance according to IEC60335-2-40.*

EXD-HP1 and EXD-HP2 (Base board)



- Notes:**
- Base board for superheat control or Economizer control.
 - Alarm relay, dry contact. Relay coil is not energized at alarm condition or power off and energized during normal operation
 - Hot gas discharge sensor input is mandatory only for economizer control function.
 - Transformer shall be class 2

EXD-HP2 (Upper board)



- Notes:**
- Upper board only for superheat control
 - Upper board does not need to be wired if circuit 2 of EXD-HP2 is disabled

EXD-SH1/2 Controller with ModBus Communication Capability

EXD-SH1/2 are stand-alone universal superheat and/or temperature controllers for air conditioning units or refrigeration systems.

EXD-... have not been evaluated for compliance acc. to IEC60335-2-40.

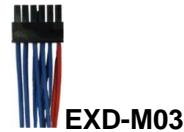
Features

Main function	Circuit 1	Circuit 2
EXD-SH1	Superheat or temperature control	
EXD-SH2	Superheat or temperature control	Superheat Control

- Other functions: Limitation of evaporating pressure (MOP), Low pressure switch, freeze protection and manual positioning of valve(s)
- Self-adapting superheat control function in conjunction with EX series
- Modbus (RTU) communication
- Among other refrigerants: R32
- Integrated keyboard with two lines display
- Monitoring of sensors and detection of sensor/ stepper motor wiring failures
- Optional upload/download key (accessory) for transmission of parameter settings among controllers with the same setting
- Low/high superheat alarm as well as other function alarms
- Electrical connection via plug-in type screw terminals included with controller and Micro Molex EXD-M03 (must be ordered separately)
- DIN rail mounting housing



EXD-SH2



EXD-M03

Selection Table – Controllers & Accessories

Description		Type	Part No.	
			Single pack	Multipack
Controllers	Controller for single refrigeration circuit	EXD-SH1	807855	-
	Controller for two independent refrigeration circuits	EXD-SH2	807856	-
Molex terminal	Cable length 3.0 m	EXD-M03	807865	-
Temperature sensor	Cable length 3.0 m	ECN-N30	804496	-
	Cable length 6.0 m	ECN-N60	804497	-
	Cable length 12.0 m	ECN-N99	804499	-
Pressure transmitters - see page 30-31				
Uninterruptible Power supply				
Backup battery with two outputs for two controllers		ECP-024	804558	-
Electrical Terminal Kit for ECP-024		K09-P00	804560	-
Super cap for only EXD-SH1, two pieces of EXD-PM required for one EXD-SH2		EXD-PM	807854	-

Functions

Superheat Control of Evaporators or Economizers:

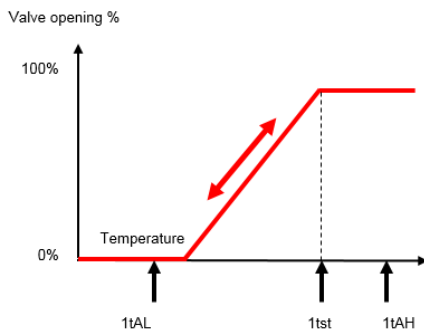
This function requires the connection of temperature sensor(s) as well as pressure transmitters(s). The other functions are:

- MOP control: enables the limitation of saturated temperature of suction line (outlet of evaporator/economizer)
- Low pressure behaves similar to low pressure switch including alarm conditions
- Freeze protection is based on saturated temperature from converting measuring suction pressure. It provides alarm condition below certain adjusted temperature.

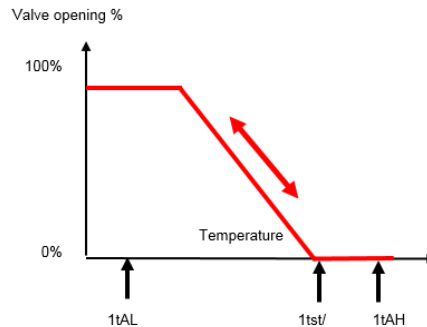
Temperature Controller:

- desired temperature by modulating refrigerant mass flow
- connection of pressure transmitter is not required.
- For varieties of the applications, the refrigerant mass flow variation can be set according temperature increase or decrease.

Temperature control in normal sense
(A: Mass flow increases if temperature rises)



Temperature control in reverse sense
(B: Mass flow decreases if temperature rises)

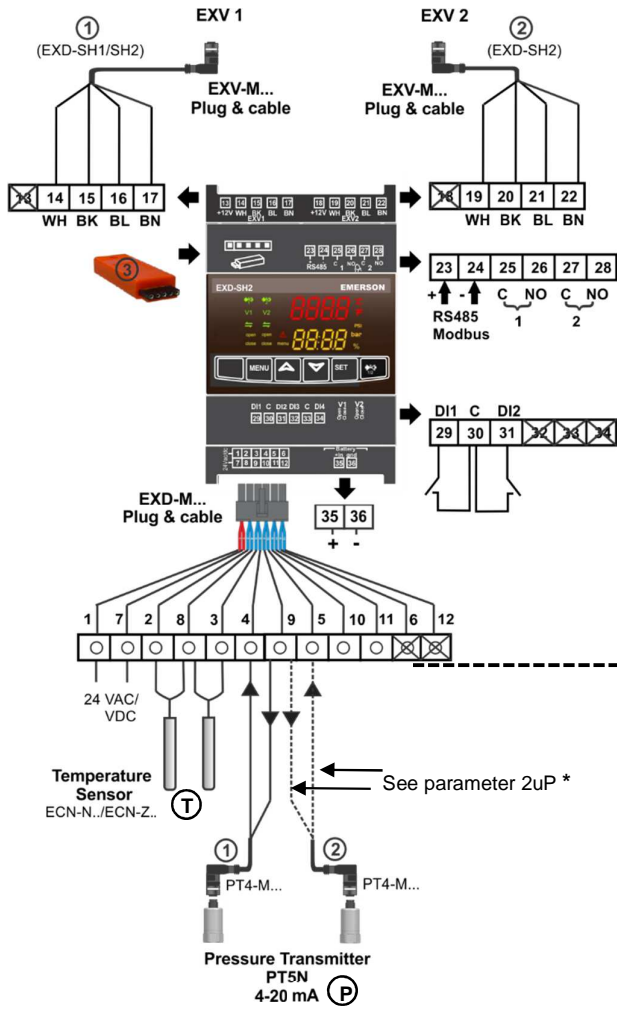


Examples of applications:

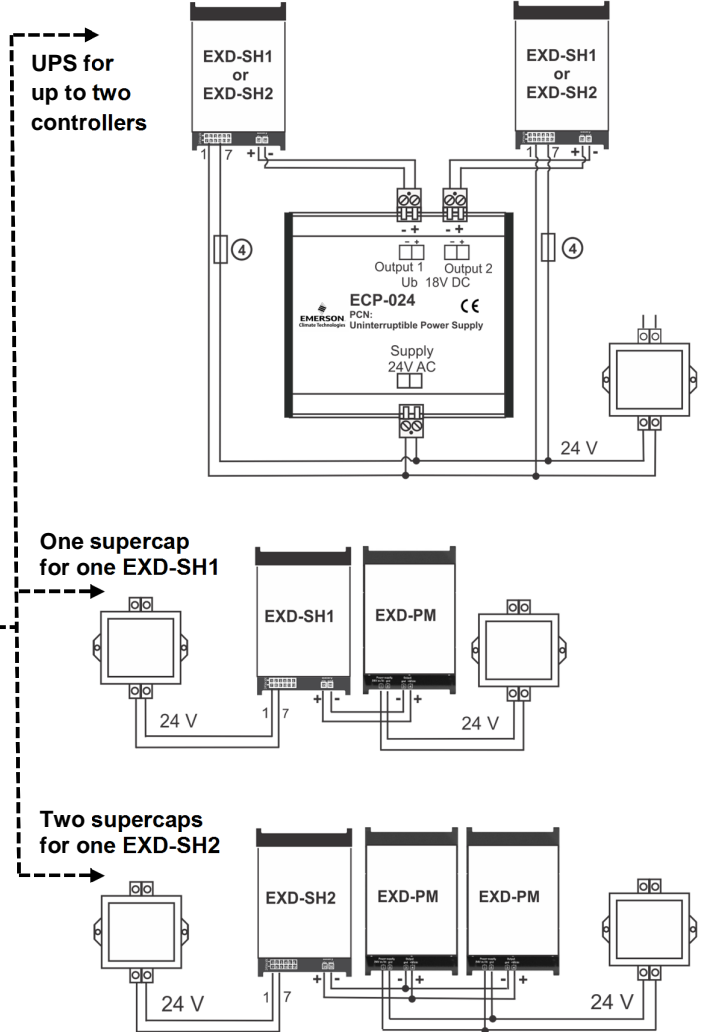
- Temperature control by throttling suction mass flow (normal sense, A)
- Temperature control by modulating hot gas into inlet or outlet of evaporators (reverse sense, B)
- Discharge temperature control by injecting liquid (normal sense, A)
- Head pressure control by means of temperature control (normal sense, A)

EXD-SH1/2 Controller with ModBus Communication Capability

Wiring *EXD-... have not been evaluated for compliance acc. to IEC60335-2-40.*



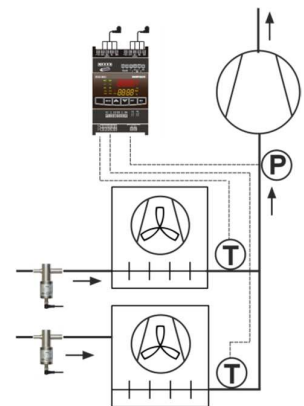
Wiring options: UPS (ECP-024) /Supercap (EXD-PM)



①	Circuit 1 (EXD-SH1/SH2)		Electronic expansion valve circuit 1
②	Circuit 2 (EXD-SH2)	14-17	EXV-M... Electrical plug: wire colors <i>WH-white BK-black BL-blue BN-brown</i>
③	Download/upload key		Electronic expansion valve circuit 2
1 & 7	Supply voltage 24 VAC/DC	19-22	EXV-M... Electrical plug: wire colors <i>WH-white BK-black BL-blue BN-brown</i>
2 & 8	Temperature sensor circuit 1	23 & 24	RS485 (+/-terminal)
3 & 8	Temperature sensor circuit 2	25 & 26	Alarm relay circuit 1 (C, NO) – Suitable for 24 VAC/DC
4 & 5	PT5N circuit 1 & circuit 2 (white wire: 4...20 mA signal)	27 & 28	Alarm relay circuit 2 (C, NO) – Suitable for 24 VAC/DC
9	+ 12 VDC Voltage input for PT5N (brown wire)	29 & 30	Digital input circuit1 (DI1) – Dry contact, potential free
Alternative ratiometric third Party Pressure Transmitter:			
4 & 5	Pressure transmitter circuit 1 & circuit 2 (0.5...4.5 V signal)	31 & 30	Digital input circuit 2 (DI2) – Dry contact, potential free
11	+ 5 VDC voltage input	35 & 36	Battery/Super capacitor connection terminal
10	GND Ground	④	Fuse
		6,12,13, 18,32-34	Not used (Terminals on EXD-SH12)

Note: No hard failure detection if ground wire of transmitter to be interrupted.

*) Parameter **2uP** with No. 8 = only Pressure sensor circuit 1 is used



EXD-SH1/2 Controller with ModBus Communication Capability

Technical Data

Supply voltage	24 VAC/DC \pm 10%, 50/60 Hz
Power consumption	EXD-SH1: Max. 25 VA EXD-SH2: Max. 50 VA
Terminals 1 to 12	Suitable for 12 poles molex plug
Terminals 13 to 36	Suitable for removable screw version: wire size 0.14...1.5 mm ² Included in controller delivery
Protection class	IP 00
Compliance	EMC, RoHS,
Marking	CE

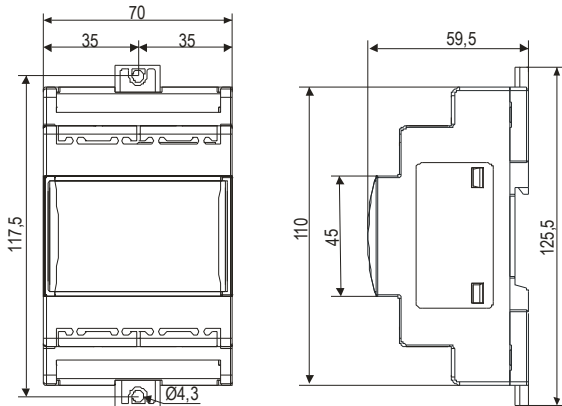
Mounting	DIN rail mounted
Temperatures operating/ surrounding	Storage -25...+60°C 0...+55°C
Relative humidity	20...85% non-condensing
Accessory (12 poles molex plug with 3 m cable)	Type: EXD-M03 (to be ordered separately)
Housing	Self-extinguishing ABS
Weight	320 g

Input, Output

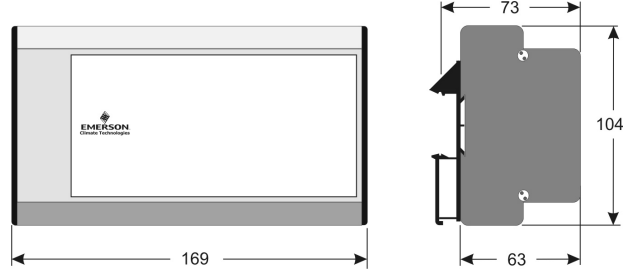
Description	Specification
Analogue input(s): NTC Temperature sensor	ECN-N... (-45...+50°C sensing range)
Analogue input(s): 4...20 mA pressure transmitters Analogue input(s): 0.5...4.5 V pressure transmitters	See page 30-31 Third party ratio metric pressure transmitters (total error: \leq 1%)
Digital input(s)	Dry contact, potential free
Digital output(s): Alarm relay(s) Contact is closed: During alarm condition Contact is open: During normal operation and supply power OFF	Resistive Load 24 VAC/DC, max. 1 A Inductive Load 24 V AC, max. 0.5 A
Communication	RS485 RTU Modbus, two wires
Stepper motor output	Valves: EX series

Dimensions (mm)

EXD-SH1/2 or EXD-PM



ECP-024



EC3-X32 / -X33 Superheat Controller with or without TCP/IP Communication Capability

EC3-X32/ -X33 are stand-alone universal superheat controllers for air conditioning, refrigeration and industrial applications such as chillers, industrial process cooling, AC rooftops, heat pumps, package unit, close control, cold room, food process and air driers.

EC3-... have not been evaluated for compliance acc. to IEC60335-2-40.

EC3-X32 offers remote access with built-in TCP/IP Ethernet communications and WebServer functionality. Any standard WebBrowser can be used for monitoring or parameter setting.

EC3-X33 has no network communication.

Features

- Superheat control in conjunction with EMERSON stepper motor driven Electrical Control Valves EX series
- Limitation of evaporating pressure (MOP)
- Low superheat alarm
- Available refrigerants: several including R32
- Feed through of 4...20 mA signal from evaporator pressure sensor to analogue output. This may also be connected to pressure input of any other controller to avoid need for multiple pressure sensors
- Monitoring of sensors and sensor wiring and detection of sensor and wiring failures
- Intelligent alarm management in order to protect the compressor i.e. fail-safe operation
- Integral rechargeable battery to close Electrical Control Valve in case of power loss
- Electrical connection via plug-in type screw terminals
- Aluminum housing for DIN rail mounting



EC3-X32

Additional Features EC3-X32 only

- High superheat alarm
- Low pressure switch function/alarm
- Freeze protection function/alarm
- Pump down function



**EC3-X32
& ECD-002**

Features ECD-002 Display Unit

- Can be used as option for service purposes and may be connected or removed from controller at any time.
- Front panel mounted interface for parameter and status readout and controller setup via keypad
- Indicator LEDs for valve opening/closing, external ON and alarm

Selection Table Controllers

Description	Stand alone		TCP/IP	
	Type	Part No.	Type	Part No.
Superheat Controller for EX series	EC3-X33	807783	EC3-X32	807782
Terminal kit	K03-X33	807645	K03-X32	807644

Selection Table Accessories

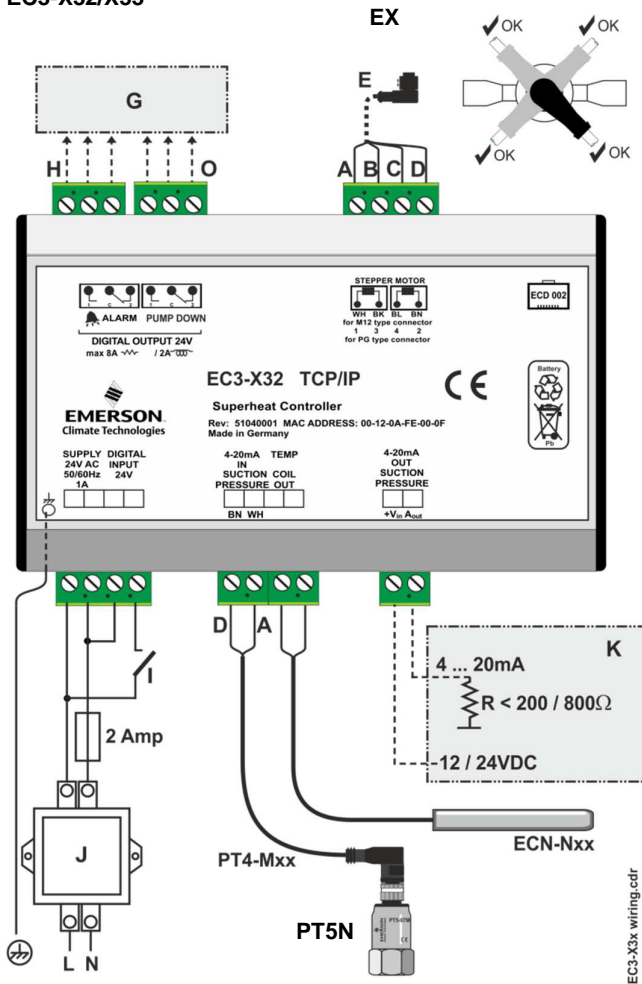
Description	Type	Part No.
Display/keypad unit (opt.)	ECD-002	807657
Connection cable EC3 to ECD-002	Cable length 1.0 m	ECC-N10 807860
	Cable length 3.0 m	ECC-N30 807861
	Cable length 5.0m	ECC-N50 807862
Temperature Sensor	Cable length 3.0 m	ECN-N30 804496
	Cable length 6.0 m	ECN-N60 804497
	Cable length 12.0 m	ECN-N99 804499
Pressure Sensor - see page 30-31		
Transformer - 230VAC Input, 24V output, Din rail mounting		
For one set of controller and valve	25 VA	ECT-323 804424
For two sets of controllers and valves	60 VA	ECT-623 804421
Replacement battery kit		807790

EC3-X32 / -X33 Superheat Controller with or without TCP/IP Communication Capability

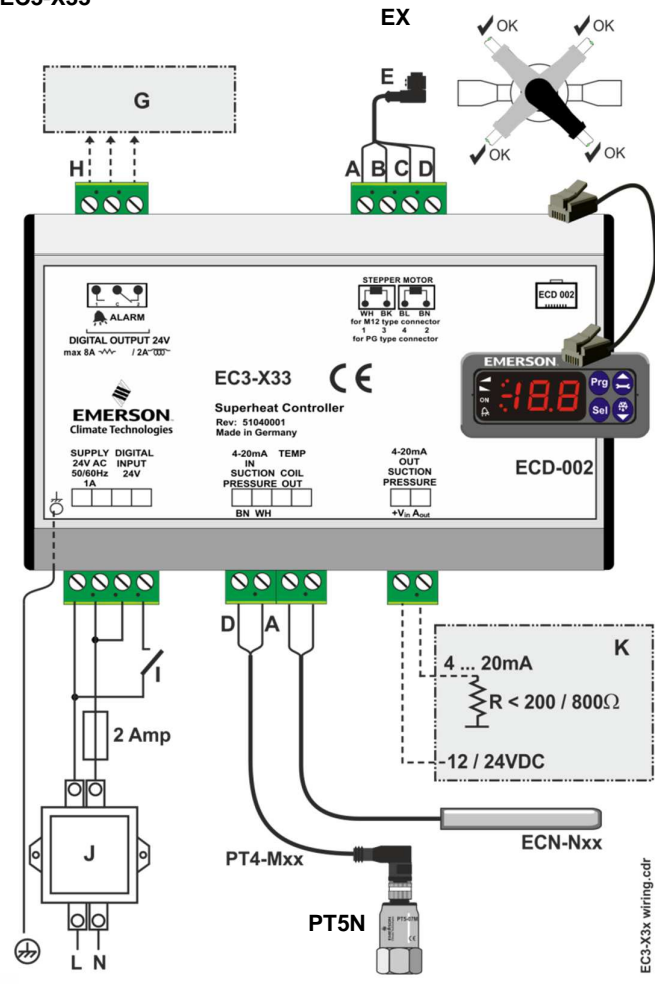
Wiring Diagram

EC3-... have not been evaluated for compliance acc. to IEC60335-2-40.

EC3-X32/X33



EC3-X33



- A: White B: Black C: Blue D: Brown wire
- E: Plug cable assembly EXV-Mxx for connection to EX series
- G: Remote control panel, system controller
- H: Alarm relay, dry contact. Relay coil is not energized at alarm condition or power off

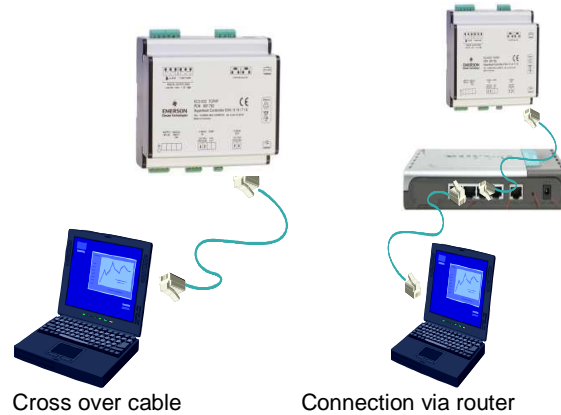
⚠ The use of the relay is essential to protect the system in case of power failure if the communications interface or the ECD-002 are not utilized

- I: Digital input (0V/open = Stop; 24V/closed = Start)
- J: Transformer Class II, 24VAC secondary / 25VA
- K: Third party controller (can use analog output signal of EC3)
- O: Pump **down** relay, dry contact, Relay is energized during normal operation.

Note: The internal resistor of a third-party controller must fulfill the following conditions:

- Supply voltage 12VDC: $R \leq 200\Omega$
- Supply voltage 24VDC: $R \leq 800\Omega$

Network Connection, EC3-X32 only:



EC3-X32 / -X33 Superheat Controller with or without TCP/IP Communication Capability

Technical Data EC3-X32 / -X33

Supply voltage	24 VAC \pm 10%, 50/60 Hz
Digital input	24 VAC \pm 10%, 50-60 Hz 24 VDC \pm 10%
Power consumption	25 VA max. including connected ECV and display/keyboard
Internal battery charging time	Approximately 2 hours if battery is fully empty
Plug-in connector size	Removable screw version wire size 0.14...1.5 mm ²
Ground connection	6.3 mm spade earth connector
Protection class	IP20 (acc. DIN EN60529)
Vibration	4 g, 10-1000 Hz
Humidity	0...80% r.h. non-condensing
Weight	~ 800g
Mounting	DIN rail mounted
Temperature	storage -20...+65°C operating 0...+60°C 1...+25°C for optimum battery life
Marking	CE

Applied directive EMC LVD RoHS	EN 61326, EN 50081, EN 61000-6-2, EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6, EN 61000-4-11
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Inputs and Outputs

Description	Specification EC3-X32/-33
Temperature input	ECN-Nxx 10 k Ω at 25°C, Range: -50...+50°C
Pressure sensor input	See page 30-31
Digital input	0 / 24 VAC/DC
Output relay	SPDT contacts, AgCdO, 24VAC/DC Inductive 2A, Resistive 8 A
Stepper motor output	for EX Electrical Control Valves
Connection to ECD-002	RJ45
TCP/IP communication	RJ45 (EC3-X32 only)

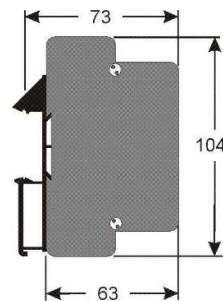
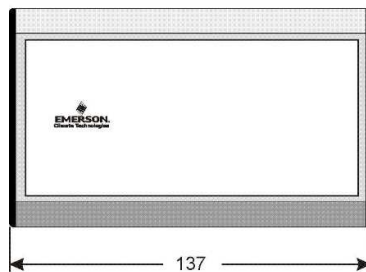
Technical Data ECD-002 Display Unit

Supply	From EC3 Series Controller via connecting cable
LED indicators	Valve opening, valve closing, alarm, demand
Display LED	Numeric segmental display, 2½-digits, red, with automatic decimal point between \pm 19.9, switchable between °C and °F
Connecting cable	ECC-Nxx or standard CAT5 patch cord with RJ45 connectors

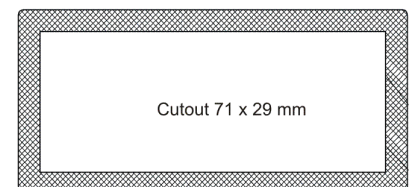
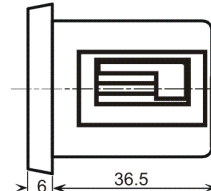
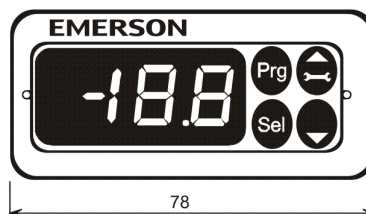
Temperature	storage -20...+65°C operating 0...+60°C
Humidity	0...80% r.h. non-condensing
Protection class (DIN EN 60529)	IP65 (mounting in front panel with gasket)
Mounting	Panel mount (71 x 29 mm cutout)
Weight	~ 52g

Dimensions (mm)

EC3-X32 / -X33



ECD-002



Pressure Transmitter PT5N

PT5N Pressure Transmitters convert a pressure into a linear electrical 4...20 mA output signal suitable for controlling simple compressor and fan switching to the more sophisticated application of superheat modulation of Electronic Control Valves. With competitive performance to price characteristics and an easy to install pre-fabricated M12 cable assembly, PT5N transmitters are the designer's choice for all heat pump, refrigeration and air conditioning applications.

Features

- Thick film technology where the pressure measuring cell is fully welded with the pressure transducer without seals.
- With output signal 4...20 mA and 2-wire connection for the precise operation of superheat, compressor or fan control systems
- Fully hermetic
- Calibrated for specific temperature and pressure ranges
- Easy install M12 electrical connection with pre-assembled cable assemblies available in various lengths
- PT5N-xxM with 7/16"-20UNF pressure connection and Schrader valve opener
- PT5N-xxT with 6x40 mm stainless steel tube and integrated brazing neck for easy mounting in applications requiring a fully hermetic system solution
- Protection class IP67 with mounted Plug and Cable Assembly



PT5N-xxM


PT5N-xxT

Selection Table Pressure Transmitter

Type	Part No.		Pressure range for signal output (bar)*	Output signal	Medium temperature range	Max. Working pressure PS (bar)*	Pressure Connection
	Single pack	Multipack 25 pcs					
PT5N-18M	805351	805351M	0...18	4-20 mA	-40...+135°C	48	7/16" – 20 UNF (with Schrader valve opener)
PT5N-30M	805352	805352M	0...30			60	
PT5N-50M	805353	805353M	0...50			75	
PT5N-18T	805381	805381M	0...18			48	6 mm tube x 40 mm long
PT5N-30T	805382	805382M	0...30			60	
PT5N-50T	805383	805383M	0...50			75	

Note: *) Sealed gauge pressure

Selection Table Cable and Connector Assembly

Type	Part No.	Temperature Range	Length	Connector type to valve	Connector type to driver board or controller	Illustration
PT4-M15	804803	-50...+80°C	1.5 m	M12	Loose wires	
PT4-M30	804804		3.0 m			
PT4-M60	804805		6.0 m			

Note: EXV-M.. are not in compliance with EN60335-1/2-40, clause 30 in term of glue wire test however, they comply to EN60079-15, clause 22.3 heat endurance test.

Pressure Transmitter PT5N

Technical Data

Supply voltage (polarity protected)	Nominal: 24VDC Range: 7...33VDC
Operating current	Maximum ≤ 23 mA 4...20 mA output
Load resistance	$R_L \leq \frac{U_b - 7.0V}{0.02A}$
Response time	≤ 2 ms
Weight (without plug and cable ass.)	PT5N-xxM: ~ 87 g PT5N-xxT: ~ 103 g
Mounting position	Non-position sensitive; details see operating instructions
Temperatures ...Transport and storage ...Operating ambient housing ...Medium	-50...+100°C -30...+85°C -40...+135°C

Electrical connection PT4-Mxx Cable Assembly	M12 connection according to EN61076-2-101 Part 2 Prefabricated, various cable lengths
Medium compatibility	A1 group refrigerants
Marking	CE acc. EMC Directive (EN 61326-2-3, EN 50121-3-2) UL LISTED (E499688)
Protection class (EN 60529)	IP67 with mounted plug and cable assembly
Vibration at 15...2000Hz	20 g according to IEC 60068-2-6
Materials Housing pressure connection PT5N-xxT	Stainless steel 1.4404 / AISI316L Stainless steel 1.4301 / AISI 304

Accuracy Performance

Type	Total error ¹	Temperature range
PT5N-18	$\leq \pm 1\%$ FS	-40...+20°C
PT5N-30 / -50	$\leq \pm 1\%$ FS	+10...+50°C
	$\leq \pm 2\%$ FS	-10...+80°C

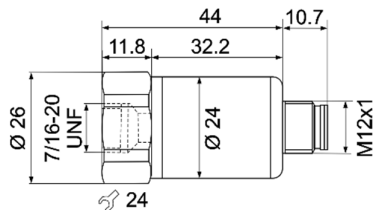
Note:

¹) Total error includes non-linearity, hysteresis, repeatability as well as offset and span drift due to the temperature changes.

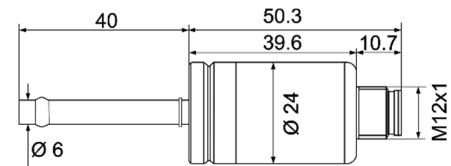
%FS is related to Percentage of Full sensor Scale.

Dimensions (mm)

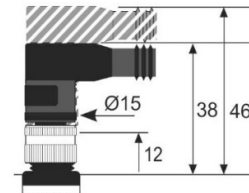
PT5N-xxM



PT5N-xxT



PT4-Mxx M12 Plug



Superheat

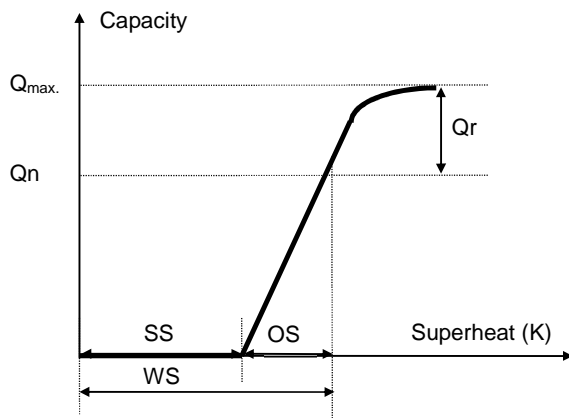
The factory setting of a TI is made with the valve pin just starting to move away from the seat. The superheat increment necessary to get the pin ready to move is called static superheat (SS). An increase of superheat over and beyond the static superheat (factory setting) is necessary for the valve pin to open to its rated capacity. This additional superheat is known as gradient or opening superheat (OS).

The working superheat (WS), which can be measured in the field, is the sum of static superheat and opening superheat.

The opening superheat of TXV varies if the selected valve operates at higher or lower capacities than the rated capacity. It is highly recommended to select the valve according to the rated capacity. Using reserve capacity leads to larger opening superheat and longer pull down time during start-up or after defrost.

Selecting a larger valve than required in a system may lead to smaller opening superheat and/or hunting of TXV.

EMERSON Thermo™-Expansion Valves are factory pre-set for optimum superheat settings. This setting should be modified only if absolutely necessary. The readjustment should be at the **lowest** expected evaporating temperature.



$Q_r = 0$ for TIO-00X and TIO-000
 $Q_r \approx 15\%$ of Q_n for all other orifices
 SS: Static superheat
 OS: Opening superheat
 WS: Working superheat

Subcooling

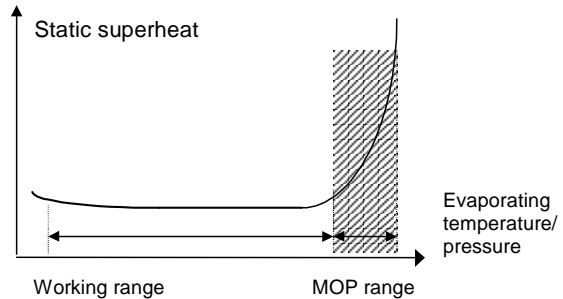
Subcooling generally increases the capacity of a refrigeration system and may be accounted for when dimensioning an expansion valve by applying the correction factor K_t . The capacity corrections for evaporating temperature, condensing temperature and subcooling are all incorporated in K_t . These are in particular the liquid density upstream from the expansion valve, the different enthalpies of liquid and vapor 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.

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 the compressor from overload conditions.

MOP selection should be within maximum allowed suction pressure rating of the compressor and at approximately 3 K above maximum evaporating temperature.

Performance of TXV with MOP function with gas charge



Valve operates as superheat control in normal working range and operates as pressure regulator within MOP range.

Cross ambient

The cross ambient effect occurs on TXV with a gas charge when the temperature at the bulb is higher than temperature at the valve head. The construction of TXV with interchangeable orifice from liquid inlet connection leads that the warmer liquid enters into the bottom of valve and cold refrigerant leaves the valve near the valve head. Therefore the valve head becomes cold.

The chance of cross ambient effect is very great if the total superheat is/becomes large. In many applications gas charges are not suitable for the valve with interchangeable orifice construction unless the valve head is wrapped by an electric strip heater. The adsorption charge with similar MOP function is another solution.

Heavy subcooling results in very small flash gas amounts and therefore **increases expansion valve capacities**. These conditions are not covered. 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.

Quick selection tables are for very small amount of subcooling. For larger subcooling than 5K, please use Controls navigator selection program.

Thermo™-Expansion Valves TIH-Series

TIH series of Thermo™-Expansion Valves are designed for air conditioning, heat pumps and commercial refrigeration applications. The TIH is ideal for those applications requiring hermetic / compact size combined with stable and accurate control over wide load and evaporating temperature ranges.

Features

- Compact size and hermetic design
- up to 49kW, R32
- Brazing connections with straight through configuration
- Stainless steel power element resists corrosion
- Large diaphragm provides smoother and consistent valve control
- Internal or external equalizer
- External superheat adjustment
- Standard with integrated 100 mesh size strainer at inlet of valve
- Packaging with 20 pieces necked valves

Options

- Single engineering sample for test purpose
- Special setting or bleed hole function on request: Minimum order quantity 100 pieces per batch, type and order
- Valve without internal strainer on request: Minimum order quantity 100 pieces per batch, type and order



TIH-M24

Selection Table (20 Pieces)

Capacity (kW)			Metric connection		Imperial connection		Connection			
R32	R452B	R454B	with MOP (12.1 bar / +15°C)					Inlet	Outlet	Equalizer
			Type	Part No.	Type	Part No.				
5.4	4.1	4.2	TIH-Z12MM				6 mm	10 mm	internal	
5.4	4.1	4.2			TIH-Z12		1/4"	3/8"	internal	
9.0	6.9	6.9	TIH-Z13MM				6 mm	10 mm	internal	
9.0	6.9	6.9			TIH-Z13		1/4"	3/8"	internal	
12.5	9.6	9.7	TIH-Z14MM				10 mm	12 mm	internal	
12.5	9.6	9.7			TIH-Z14		3/8"	1/2"	internal	
5.4	4.1	4.2	TIH-Z32MM				6 mm	10 mm	6 mm	
5.4	4.1	4.2			TIH-Z32		1/4"	3/8"	1/4"	
9.0	6.9	6.9	TIH-Z33MM				6 mm	10 mm	6 mm	
9.0	6.9	6.9			TIH-Z33		1/4"	3/8"	1/4"	
12.5	9.6	9.7	TIH-Z34MM				10 mm	12 mm	6 mm	
12.5	9.6	9.7			TIH-Z34		3/8"	1/2"	1/4"	
18.4	14.2	14.2	TIH-Z35MM				10 mm	12 mm	6 mm	
18.4	14.2	14.2			TIH-Z35		3/8"	1/2"	1/4"	
21.8	16.7	16.8	TIH-Z36MM				10 mm	12 mm	6 mm	
21.8	16.7	16.8			TIH-Z36		3/8"	1/2"	1/4"	
31.0	23.8	23.9	TIH-Z37MM				12 mm	16 mm	6 mm	
31.0	23.8	23.9			TIH-Z37		1/2"	5/8"	1/4"	
34.6	26.6	26.7	TIH-Z38MM				12 mm	16 mm	6 mm	
34.6	26.6	26.7			TIH-Z38		1/2"	5/8"	1/4"	
39.7	30.5	30.7	TIH-Z39MM				12 mm	16 mm	6 mm	
39.7	30.5	30.7			TIH-Z39		1/2"	5/8"	1/4"	
49.4	38.0	38.2	TIH-Z3AMM				12 mm	16 mm	6 mm	
49.4	38.0	38.2			TIH-Z3A		1/2"	5/8"	1/4"	

Note: The nominal capacities are based +4°C evaporating temperature, +38°C condensing temperature (bubble point) and 1K subcooling.

TIH: Quick Selection (included 1.5 bar pressure drop for liquid line components and distributor)

Condensing temperature (°C)	R32 Capacity (kW)									Valve type
	Evaporating temperature (°C)									
	15	10	5	0	-5	-10	-15	-20	-25	
65	5.1	5.2	5.3	5.4	5.5	5.5	4.9	4.3	3.7	TIH-Z...2
	8.5	8.7	8.9	9.0	9.2	9.2	8.2	7.2	6.1	TIH-Z...3
	11.9	12.2	12.5	12.7	12.8	12.9	11.5	10.1	8.6	TIH-Z...4
	17.4	17.9	18.3	18.6	18.8	19.0	16.9	14.8	12.6	TIH-Z...5
	20.6	21.2	21.6	22.0	22.2	22.4	19.9	17.4	14.9	TIH-Z...6
	29.3	30.1	30.8	31.3	31.7	31.9	28.4	24.8	21.2	TIH-Z...7
	32.7	33.6	34.3	34.9	35.3	35.6	31.7	27.7	23.7	TIH-Z...8
	37.5	38.6	39.4	40.1	40.6	40.9	36.4	31.8	27.2	TIH-Z...9
46.7	48.0	49.1	49.9	50.5	50.9	45.3	39.6	33.8	TIH-Z...A	
60	5.2	5.4	5.5	5.6	5.7	5.8	5.2	4.5	3.9	TIH-Z...2
	8.7	9.0	9.2	9.4	9.5	9.6	8.6	7.5	6.4	TIH-Z...3
	12.2	12.6	12.9	13.1	13.3	13.5	12.0	10.5	9.0	TIH-Z...4
	17.9	18.4	18.9	19.3	19.6	19.8	17.7	15.5	13.2	TIH-Z...5
	21.1	21.8	22.3	22.8	23.1	23.4	20.8	18.3	15.6	TIH-Z...6
	30.0	31.0	31.8	32.4	32.9	33.3	29.7	26.0	22.3	TIH-Z...7
	33.5	34.6	35.5	36.2	36.8	37.2	33.1	29.0	24.8	TIH-Z...8
	38.4	39.7	40.7	41.6	42.2	42.7	38.0	33.3	28.5	TIH-Z...9
47.9	49.4	50.7	51.7	52.5	53.1	47.3	41.5	35.5	TIH-Z...A	
55	5.2	5.4	5.6	5.7	5.8	5.9	5.3	4.6	4.0	TIH-Z...2
	8.7	9.0	9.3	9.5	9.7	9.8	8.8	7.7	6.6	TIH-Z...3
	12.1	12.6	13.0	13.3	13.6	13.8	12.3	10.8	9.3	TIH-Z...4
	17.8	18.5	19.1	19.6	19.9	20.2	18.1	15.9	13.6	TIH-Z...5
	21.0	21.9	22.5	23.1	23.5	23.9	21.3	18.7	16.1	TIH-Z...6
	29.9	31.1	32.1	32.9	33.5	34.0	30.3	26.7	22.9	TIH-Z...7
	33.4	34.7	35.8	36.7	37.4	37.9	33.9	29.7	25.5	TIH-Z...8
	38.3	39.9	41.1	42.1	42.9	43.5	38.9	34.1	29.3	TIH-Z...9
47.7	49.6	51.2	52.4	53.4	54.2	48.4	42.5	36.5	TIH-Z...A	
50	5.1	5.3	5.5	5.7	5.8	5.9	5.3	4.7	4.0	TIH-Z...2
	8.4	8.9	9.2	9.5	9.7	9.9	8.8	7.8	6.7	TIH-Z...3
	11.8	12.4	12.9	13.3	13.6	13.8	12.4	10.9	9.4	TIH-Z...4
	17.4	18.2	18.9	19.5	19.9	20.3	18.2	16.0	13.8	TIH-Z...5
	20.5	21.5	22.3	23.0	23.5	23.9	21.5	18.9	16.2	TIH-Z...6
	29.2	30.6	31.8	32.7	33.5	34.1	30.5	26.9	23.1	TIH-Z...7
	32.6	34.2	35.5	36.5	37.4	38.0	34.1	30.0	25.8	TIH-Z...8
	37.4	39.2	40.7	41.9	42.9	43.7	39.1	34.5	29.6	TIH-Z...9
46.6	48.8	50.7	52.2	53.4	54.4	48.7	42.9	36.9	TIH-Z...A	
45	4.8	5.1	5.4	5.6	5.7	5.9	5.3	4.7	4.0	TIH-Z...2
	8.1	8.6	9.0	9.3	9.6	9.8	8.8	7.8	6.7	TIH-Z...3
	11.3	12.0	12.5	13.0	13.4	13.7	12.3	10.9	9.4	TIH-Z...4
	16.6	17.6	18.4	19.1	19.6	20.1	18.1	15.9	13.7	TIH-Z...5
	19.6	20.8	21.8	22.6	23.2	23.7	21.3	18.8	16.2	TIH-Z...6
	27.9	29.6	31.0	32.1	33.0	33.7	30.3	26.8	23.1	TIH-Z...7
	31.1	33.0	34.6	35.8	36.8	37.7	33.8	29.9	25.8	TIH-Z...8
	35.7	37.9	39.7	41.1	42.3	43.2	38.9	34.3	29.6	TIH-Z...9
44.5	47.2	49.4	51.2	52.7	53.8	48.4	42.7	36.8	TIH-Z...A	
40	4.5	4.9	5.1	5.4	5.6	5.7	5.2	4.6	4.0	TIH-Z...2
	7.5	8.1	8.6	9.0	9.3	9.5	8.6	7.6	6.6	TIH-Z...3
	10.5	11.3	12.0	12.6	13.0	13.4	12.1	10.7	9.2	TIH-Z...4
	15.4	16.7	17.7	18.5	19.1	19.6	17.7	15.7	13.6	TIH-Z...5
	18.2	19.7	20.8	21.8	22.6	23.2	20.9	18.5	16.0	TIH-Z...6
	26.0	28.0	29.7	31.0	32.1	33.0	29.8	26.4	22.8	TIH-Z...7
	29.0	31.2	33.1	34.6	35.8	36.8	33.2	29.5	25.5	TIH-Z...8
	33.3	35.9	38.0	39.7	41.1	42.3	38.2	33.8	29.2	TIH-Z...9
41.4	44.7	47.3	49.5	51.2	52.6	47.5	42.1	36.4	TIH-Z...A	
30	3.4	4.0	4.4	4.8	5.1	5.3	4.8	4.3	3.8	TIH-Z...2
	5.7	6.7	7.4	8.0	8.4	8.8	8.0	7.2	6.3	TIH-Z...3
	8.0	9.3	10.3	11.1	11.8	12.3	11.2	10.1	8.8	TIH-Z...4
	11.8	13.7	15.2	16.4	17.3	18.1	16.5	14.8	12.9	TIH-Z...5
	14.0	16.2	17.9	19.3	20.4	21.3	19.5	17.4	15.2	TIH-Z...6
	19.9	23.1	25.5	27.5	29.1	30.4	27.8	24.8	21.6	TIH-Z...7
	22.2	25.7	28.5	30.7	32.5	33.9	31.0	27.7	24.1	TIH-Z...8
	25.5	29.5	32.7	35.3	37.3	38.9	35.6	31.8	27.7	TIH-Z...9
31.7	36.8	40.7	43.9	46.4	48.5	44.3	39.6	34.5	TIH-Z...A	

Thermo™-Expansion Valves TIH

TIH: Quick Selection (included 1.5 bar pressure drop for liquid line components and distributor)

Condensing temperature (°C, bubble point)	R452B Capacity (kW)									Valve type
	Evaporating temperature (°C)									
	15	10	5	0	-5	-10	-15	-20	-25	
65	3.7	3.7	3.8	3.8	3.8	3.8	3.4	2.9	2.5	TIH-Z...2
	6.1	6.2	6.3	6.4	6.4	6.4	5.7	4.9	4.2	TIH-Z...3
	8.5	8.7	8.8	8.9	9.0	9.0	7.9	6.9	5.8	TIH-Z...4
	12.5	12.8	13.0	13.1	13.2	13.2	11.6	10.1	8.6	TIH-Z...5
	14.8	15.1	15.3	15.5	15.5	15.6	13.7	11.9	10.1	TIH-Z...6
	21.1	21.5	21.8	22.0	22.1	22.2	19.6	17.0	14.4	TIH-Z...7
	23.5	24.0	24.3	24.6	24.7	24.7	21.8	18.9	16.1	TIH-Z...8
	27.0	27.5	27.9	28.2	28.4	28.4	25.1	21.7	18.4	TIH-Z...9
	33.6	34.3	34.8	35.1	35.3	35.4	31.2	27.1	23.0	TIH-Z...A
60	3.8	3.9	4.0	4.1	4.1	4.1	3.6	3.2	2.7	TIH-Z...2
	6.4	6.6	6.7	6.8	6.8	6.9	6.1	5.3	4.5	TIH-Z...3
	8.9	9.2	9.4	9.5	9.6	9.6	8.5	7.4	6.3	TIH-Z...4
	13.1	13.5	13.7	13.9	14.1	14.1	12.5	10.9	9.3	TIH-Z...5
	15.5	15.9	16.2	16.4	16.6	16.7	14.8	12.8	10.9	TIH-Z...6
	22.1	22.7	23.1	23.4	23.6	23.7	21.0	18.3	15.6	TIH-Z...7
	24.6	25.3	25.8	26.1	26.4	26.5	23.4	20.4	17.4	TIH-Z...8
	28.3	29.0	29.6	30.0	30.3	30.4	26.9	23.4	19.9	TIH-Z...9
	35.2	36.1	36.8	37.3	37.7	37.9	33.5	29.2	24.8	TIH-Z...A
55	3.9	4.0	4.1	4.2	4.2	4.3	3.8	3.3	2.8	TIH-Z...2
	6.5	6.7	6.9	7.0	7.1	7.1	6.3	5.5	4.7	TIH-Z...3
	9.1	9.4	9.6	9.8	9.9	10.0	8.9	7.7	6.6	TIH-Z...4
	13.3	13.8	14.1	14.4	14.5	14.7	13.0	11.4	9.7	TIH-Z...5
	15.7	16.2	16.6	17.0	17.2	17.3	15.4	13.4	11.4	TIH-Z...6
	22.4	23.1	23.7	24.1	24.4	24.6	21.9	19.1	16.3	TIH-Z...7
	25.0	25.8	26.4	26.9	27.3	27.5	24.4	21.3	18.2	TIH-Z...8
	28.7	29.6	30.4	30.9	31.3	31.6	28.0	24.5	20.9	TIH-Z...9
	35.7	36.9	37.8	38.5	39.0	39.3	34.9	30.5	26.0	TIH-Z...A
50	3.8	4.0	4.1	4.2	4.3	4.4	3.9	3.4	2.9	TIH-Z...2
	6.4	6.7	6.9	7.0	7.2	7.3	6.5	5.7	4.8	TIH-Z...3
	9.0	9.3	9.6	9.9	10.0	10.2	9.0	7.9	6.8	TIH-Z...4
	13.2	13.7	14.2	14.5	14.7	14.9	13.3	11.6	9.9	TIH-Z...5
	15.6	16.2	16.7	17.1	17.4	17.6	15.7	13.7	11.7	TIH-Z...6
	22.1	23.1	23.8	24.3	24.8	25.1	22.3	19.6	16.7	TIH-Z...7
	24.7	25.7	26.5	27.2	27.6	28.0	24.9	21.8	18.6	TIH-Z...8
	28.4	29.5	30.5	31.2	31.7	32.1	28.6	25.0	21.4	TIH-Z...9
	35.3	36.8	37.9	38.8	39.5	40.0	35.6	31.2	26.7	TIH-Z...A
45	3.7	3.9	4.1	4.2	4.3	4.4	3.9	3.4	2.9	TIH-Z...2
	6.2	6.5	6.8	7.0	7.1	7.3	6.5	5.7	4.9	TIH-Z...3
	8.7	9.1	9.5	9.8	10.0	10.2	9.1	8.0	6.8	TIH-Z...4
	12.7	13.4	13.9	14.4	14.7	14.9	13.4	11.7	10.1	TIH-Z...5
	15.0	15.8	16.5	17.0	17.3	17.6	15.8	13.9	11.9	TIH-Z...6
	21.4	22.5	23.4	24.1	24.7	25.1	22.4	19.7	16.9	TIH-Z...7
	23.9	25.1	26.1	26.9	27.6	28.0	25.0	22.0	18.9	TIH-Z...8
	27.4	28.9	30.0	30.9	31.6	32.2	28.8	25.3	21.7	TIH-Z...9
	34.1	35.9	37.4	38.5	39.4	40.0	35.8	31.4	27.0	TIH-Z...A
40	3.5	3.7	3.9	4.1	4.2	4.3	3.9	3.4	2.9	TIH-Z...2
	5.8	6.2	6.6	6.8	7.0	7.2	6.4	5.7	4.9	TIH-Z...3
	8.2	8.7	9.2	9.5	9.8	10.0	9.0	8.0	6.8	TIH-Z...4
	12.0	12.8	13.5	14.0	14.4	14.8	13.3	11.7	10.0	TIH-Z...5
	14.2	15.1	15.9	16.6	17.1	17.4	15.6	13.8	11.9	TIH-Z...6
	20.2	21.6	22.7	23.6	24.3	24.8	22.3	19.6	16.9	TIH-Z...7
	22.5	24.1	25.3	26.3	27.1	27.7	24.8	21.9	18.8	TIH-Z...8
	25.8	27.6	29.1	30.2	31.1	31.8	28.5	25.2	21.6	TIH-Z...9
	32.2	34.4	36.2	37.6	38.7	39.6	35.5	31.3	26.9	TIH-Z...A
30	3.2	3.5	3.7	3.9	4.1	4.2	3.8	3.4	2.9	TIH-Z...2
	5.3	5.8	6.2	6.6	6.8	7.0	6.3	5.6	4.8	TIH-Z...3
	7.5	8.2	8.7	9.2	9.5	9.8	8.8	7.8	6.8	TIH-Z...4
	10.9	12.0	12.8	13.5	14.0	14.4	13.0	11.5	9.9	TIH-Z...5
	12.9	14.2	15.1	15.9	16.5	17.0	15.3	13.6	11.7	TIH-Z...6
	18.4	20.2	21.5	22.6	23.5	24.2	21.8	19.3	16.7	TIH-Z...7
	20.5	22.5	24.0	25.3	26.2	27.0	24.4	21.6	18.6	TIH-Z...8
	23.6	25.8	27.6	29.0	30.1	31.0	28.0	24.8	21.4	TIH-Z...9
	29.3	32.1	34.4	36.1	37.5	38.6	34.8	30.8	26.6	TIH-Z...A

TIH: Quick Selection (included 1.5 bar pressure drop for liquid line components and distributor)

Condensing temperature (°C, bubble point)	R454B Capacity (kW)									Valve type
	Evaporating temperature (°C)									
	15	10	5	0	-5	-10	-15	-20	-25	
65	3.7	3.8	3.9	3.9	3.9	3.9	3.4	3.0	2.5	TIH-Z...2
	6.2	6.3	6.4	6.5	6.5	6.5	5.7	5.0	4.2	TIH-Z...3
	8.7	8.9	9.0	9.1	9.1	9.1	8.0	7.0	5.9	TIH-Z...4
	12.8	13.0	13.2	13.3	13.4	13.4	11.8	10.3	8.7	TIH-Z...5
	15.1	15.4	15.6	15.7	15.8	15.8	14.0	12.1	10.3	TIH-Z...6
	21.5	21.9	22.2	22.4	22.5	22.5	19.9	17.2	14.6	TIH-Z...7
	23.9	24.4	24.8	25.0	25.1	25.1	22.2	19.2	16.3	TIH-Z...8
	27.5	28.0	28.4	28.7	28.8	28.9	25.5	22.1	18.7	TIH-Z...9
	34.2	34.9	35.4	35.7	35.9	35.9	31.7	27.5	23.3	TIH-Z...A
60	3.9	4.0	4.1	4.1	4.1	4.2	3.7	3.2	2.7	TIH-Z...2
	6.5	6.6	6.8	6.8	6.9	6.9	6.1	5.3	4.5	TIH-Z...3
	9.1	9.3	9.5	9.6	9.7	9.7	8.6	7.5	6.4	TIH-Z...4
	13.3	13.6	13.9	14.1	14.2	14.3	12.6	11.0	9.3	TIH-Z...5
	15.7	16.1	16.4	16.6	16.8	16.8	14.9	13.0	11.0	TIH-Z...6
	22.4	22.9	23.4	23.7	23.9	24.0	21.2	18.5	15.7	TIH-Z...7
	24.9	25.6	26.1	26.4	26.6	26.7	23.7	20.6	17.5	TIH-Z...8
	28.6	29.4	29.9	30.3	30.6	30.7	27.2	23.6	20.1	TIH-Z...9
	35.7	36.6	37.3	37.7	38.1	38.2	33.8	29.4	25.0	TIH-Z...A
55	3.9	4.0	4.1	4.2	4.3	4.3	3.8	3.3	2.8	TIH-Z...2
	6.5	6.7	6.9	7.0	7.1	7.2	6.4	5.6	4.7	TIH-Z...3
	9.1	9.4	9.7	9.8	10.0	10.0	8.9	7.8	6.6	TIH-Z...4
	13.4	13.9	14.2	14.5	14.6	14.7	13.1	11.4	9.7	TIH-Z...5
	15.9	16.4	16.8	17.1	17.3	17.4	15.5	13.5	11.5	TIH-Z...6
	22.6	23.3	23.9	24.3	24.6	24.8	22.0	19.2	16.4	TIH-Z...7
	25.2	26.0	26.6	27.1	27.4	27.7	24.5	21.4	18.3	TIH-Z...8
	28.9	29.9	30.6	31.1	31.5	31.7	28.2	24.6	21.0	TIH-Z...9
	36.0	37.2	38.1	38.8	39.2	39.5	35.1	30.6	26.1	TIH-Z...A
50	3.9	4.0	4.2	4.2	4.3	4.4	3.9	3.4	2.9	TIH-Z...2
	6.5	6.7	6.9	7.1	7.2	7.3	6.5	5.7	4.8	TIH-Z...3
	9.0	9.4	9.7	9.9	10.1	10.2	9.1	7.9	6.8	TIH-Z...4
	13.3	13.8	14.2	14.6	14.8	15.0	13.3	11.7	10.0	TIH-Z...5
	15.7	16.3	16.8	17.2	17.5	17.7	15.7	13.8	11.8	TIH-Z...6
	22.3	23.2	23.9	24.5	24.9	25.2	22.4	19.6	16.8	TIH-Z...7
	24.9	25.9	26.7	27.3	27.8	28.1	25.0	21.9	18.7	TIH-Z...8
	28.6	29.7	30.6	31.3	31.9	32.2	28.7	25.1	21.5	TIH-Z...9
	35.6	37.0	38.2	39.0	39.7	40.1	35.7	31.3	26.7	TIH-Z...A
45	3.7	3.9	4.1	4.2	4.3	4.4	3.9	3.4	2.9	TIH-Z...2
	6.2	6.6	6.8	7.0	7.2	7.3	6.5	5.7	4.9	TIH-Z...3
	8.7	9.2	9.5	9.8	10.0	10.2	9.1	8.0	6.9	TIH-Z...4
	12.8	13.5	14.0	14.4	14.7	15.0	13.4	11.7	10.1	TIH-Z...5
	15.1	15.9	16.5	17.0	17.4	17.7	15.8	13.9	11.9	TIH-Z...6
	21.5	22.7	23.5	24.2	24.8	25.2	22.5	19.7	16.9	TIH-Z...7
	24.0	25.3	26.3	27.0	27.6	28.1	25.1	22.0	18.9	TIH-Z...8
	27.6	29.0	30.2	31.1	31.7	32.2	28.8	25.3	21.7	TIH-Z...9
	34.4	36.1	37.6	38.7	39.5	40.1	35.9	31.5	27.0	TIH-Z...A
40	3.5	3.8	4.0	4.1	4.2	4.3	3.9	3.4	2.9	TIH-Z...2
	5.9	6.3	6.6	6.8	7.0	7.2	6.5	5.7	4.9	TIH-Z...3
	8.2	8.8	9.2	9.6	9.9	10.1	9.0	8.0	6.8	TIH-Z...4
	12.1	12.9	13.6	14.1	14.5	14.8	13.3	11.7	10.1	TIH-Z...5
	14.3	15.2	16.0	16.6	17.1	17.5	15.7	13.8	11.9	TIH-Z...6
	20.3	21.7	22.8	23.7	24.3	24.9	22.3	19.7	16.9	TIH-Z...7
	22.7	24.2	25.4	26.4	27.2	27.7	24.9	21.9	18.8	TIH-Z...8
	26.0	27.8	29.2	30.3	31.2	31.8	28.6	25.2	21.6	TIH-Z...9
	32.4	34.6	36.4	37.7	38.8	39.6	35.6	31.3	26.9	TIH-Z...A
30	3.2	3.5	3.8	3.9	4.1	4.2	3.8	3.4	2.9	TIH-Z...2
	5.4	5.9	6.3	6.6	6.8	7.0	6.3	5.6	4.8	TIH-Z...3
	7.5	8.2	8.8	9.2	9.5	9.8	8.9	7.8	6.8	TIH-Z...4
	11.0	12.1	12.9	13.5	14.0	14.4	13.0	11.5	9.9	TIH-Z...5
	13.0	14.2	15.2	16.0	16.6	17.0	15.4	13.6	11.7	TIH-Z...6
	18.6	20.3	21.7	22.7	23.6	24.2	21.9	19.3	16.7	TIH-Z...7
	20.7	22.6	24.2	25.4	26.3	27.0	24.4	21.6	18.6	TIH-Z...8
	23.8	26.0	27.7	29.1	30.2	31.0	28.0	24.8	21.4	TIH-Z...9
	29.6	32.4	34.5	36.3	37.6	38.7	34.9	30.9	26.6	TIH-Z...A

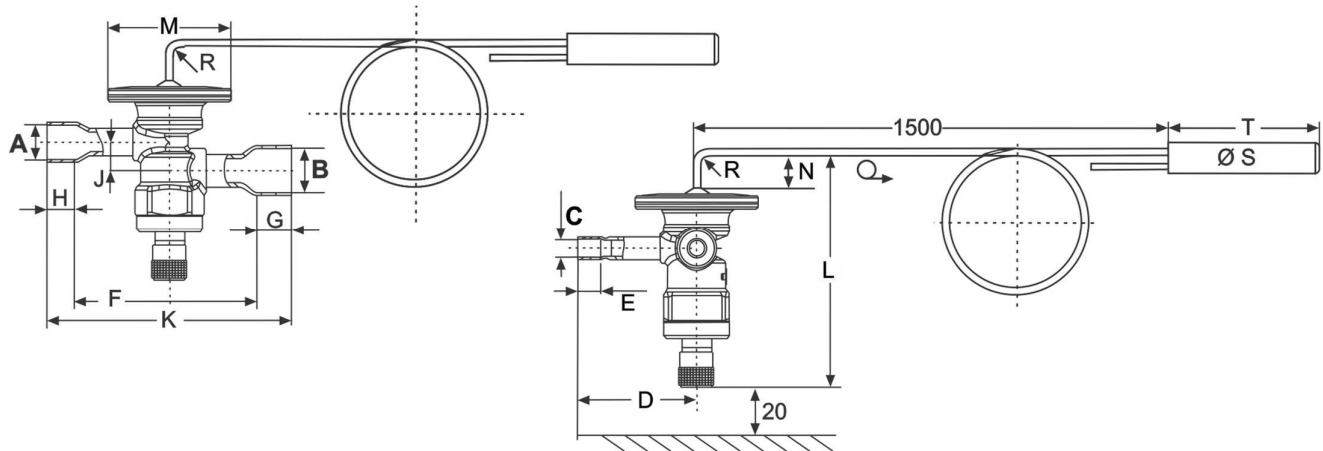
Thermo™-Expansion Valves TIH

Technical Data

Maximum working pressure PS	46 bar	Connections	Copper ODF
Factory test pressure PT	50.6 bar	Gross weight	270-305 g (depend on the valve size)
Medium temperature range TS	-40...+70°C	Marking	CE is not required
Power elements	Stainless steel, Laser welded	Label	Laser printing

Charge	Refrigerant	MOP	Maximum bulb temperature
TIH-Z1../Z3..	R32, R452B, R454B	12.1 bar	+120°C

Dimensions (mm)



Body:

Type	ODF (mm)/ (inch)			(mm)								
	A	B	C	D	E	F	G	H	J	K	L	M
TIH-Z..2(MM)	6 / 1/4"	10 / 3/8"	internal			70.7	8.4	8.4	10.3	87.5	83.2	45
TIH-Z..3(MM)			43.5	8.4								
TIH-Z..4(MM)	10 / 3/8"	12 / 1/2"	internal			68.7	10.4	8.4	10.3	87.5	83.2	45
TIH-Z..5(MM)			43.5	8.4								
TIH-Z..6(MM)	12 / 1/2"	16 / 5/8"	6 / 1/4"	43.5	8.4	64	13.1	10.4	10.3	87.5	83.2	45
TIH-Z..7(MM)												
TIH-Z..8(MM)												
TIH-Z..9(MM)	12 / 1/2"	16 / 5/8"	6 / 1/4"	43.5	8.4	64	13.1	10.4	10.3	87.5	83.2	45
TIH-Z..A(MM)												

Bulb:

Charge	N	Bending radius R	Ø S	T	Capillary tube length
Z1/Z3	10 mm	5 mm	15.9 mm	53 mm	1.5 m

Thermo™-Expansion Valves TX7

TX7 series of Thermo™-Expansion Valves are designed predominantly for AC, heat pumps, close control and industrial process cooling applications. The TX7 is ideal for those applications requiring hermetic / compact size combined with stable and accurate control over wide load and evaporating temperature ranges.

Features

- 7 sizes up to 270 kW (R32)
- Maximum working pressure: 46 bar
- Factory test pressure: 50.6 bar
- Bi-Flow application
 - Balanced port in normal and reverse flow directions eliminates disturbance forces resulting from condensing pressure
 - Optimum static superheat in normal and reverse flow
 - Capacities performance in normal and reverse flow correlates to capacity of heat pumps in cooling and heating mode
- Power Element with 65 mm diameter enables low partial load (20-25%) performance at stable superheat
- Applicable in systems with digital scroll, step less screw compressors and variable speed compressors
- Floating superheat in reverse flow (heating mode) supports evaporator efficiency during low ambient operating conditions in air cooled reversible chillers
- Laser welded stainless steel power element with a special diaphragm profile provides life expectancy against high pressure during reversed flow via external equalizer.
- Special factory setting upon request. Minimum order quantity 60 pieces



TX7-Z13

Selection Table

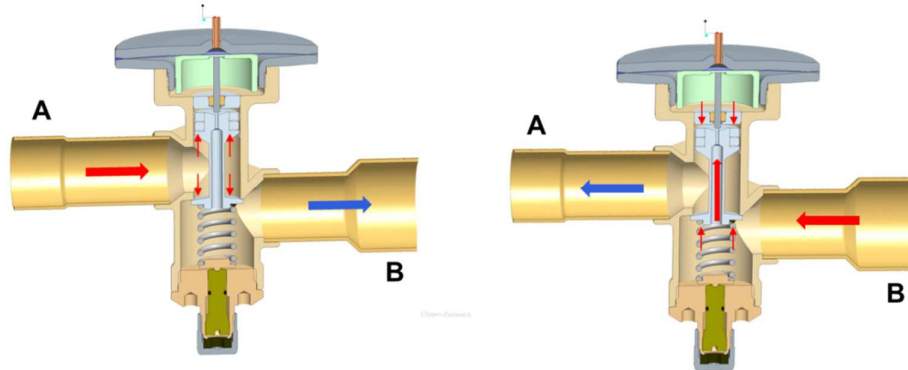
Capacity (kW), R32		Capacity (kW), R452B		Capacity (kW), R454B		Type	Part No.	Connection	
Normal flow	Reverse flow	Normal flow	Reverse flow	Normal flow	Reverse flow			Inlet x Outlet	Equalizer
47.7	46.9	36.7	36.3	36.9	36.5	TX7-Z13 m	806811	12 mm x 16 mm	6 mm
47.7	46.9	36.7	36.3	36.9	36.5	TX7-Z13	806810	1/2" x 5/8"	1/4"
59.3	57.8	45.6	44.7	45.8	44.9	TX7-Z14 m	806813	16 mm x 22 mm	6 mm
59.3	57.8	45.6	44.7	45.8	44.9	TX7-Z14	806812	5/8" x 7/8"	1/4"
72.7	70.1	55.9	54.2	56.1	54.4	TX7-Z15 m	806815	16 mm x 22 mm	6 mm
72.7	70.1	55.9	54.2	56.1	54.4	TX7-Z15	806814	5/8" x 7/8"	1/4"
120	100.2	92.2	77.4	92.7	77.9	TX7-Z16 m	806817	22 mm x 28 mm	6 mm
120	100.2	92.2	77.4	92.7	77.9	TX7-Z16	806816	7/8" x 1-1/8"	1/4"
147.9	120.5	113.7	93.2	114.3	93.7	TX7-Z17 m	806819	22 mm x 28 mm	6 mm
147.9	120.5	113.7	93.2	114.3	93.7	TX7-Z17	806818	7/8" x 1-1/8"	1/4"
194.7	168.4	149.7	130.2	150.4	130.8	TX7-Z18 m	806821	22 mm x 28 mm	6 mm
194.7	168.4	149.7	130.2	150.4	130.8	TX7-Z18	806820	7/8" x 1-1/8"	1/4"
272.9	244.1	209.8	188.8	210.8	189.7	TX7-Z19 m	806823	22 mm x 28 mm	6 mm
272.9	244.1	209.8	188.8	210.8	189.7	TX7-Z19	806822	7/8" x 1-1/8"	1/4"

Note: The nominal capacity is based on +4°C evaporating temperature and +38°C condensing temperature (bubble point). For selection of other operating condition, please use quick selection tables in the next pages or Controls Navigator selection program.

Thermo™-Expansion Valves TX7

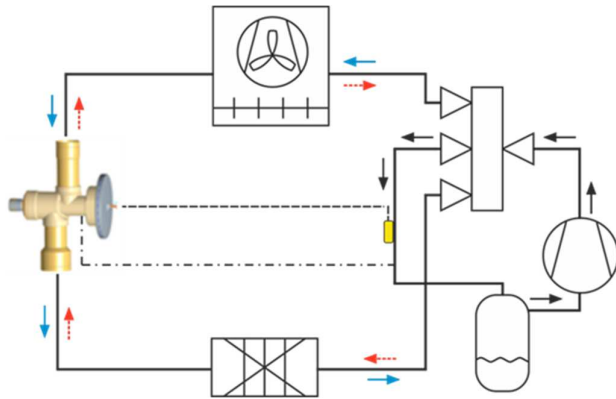
True Bi-flow Design

The valve pin is balanced against inlet pressure changes in both flow directions. The inlet pressure impact negatively performance of Thermo™- Expansion valves.



Typical applications in Reversible chillers and heat pumps

Single Bi-Flow (package unit)



Note: : Flow direction in cooling mode →
 : Flow direction in heating mode →
 : Flow direction independent from heating and cooling mode →

Thermo™-Expansion Valves TX7

TX7: Quick Selection (included 1.5 bar pressure drop for liquid line components and distributor)

Quick selection capacity table is for operation in normal flow direction. For reverse flow direction use the following factors:

Valve size	TX7-Z13	TX7-Z14	TX7-Z15	TX7-Z16	TX7-Z17	TX7-Z18	TX7-Z19
Reverse flow versus normal flow capacity	-1%	-2%	-3%	-16%	-18%	-13%	-10%

Condensing temperature (°C)	R32 Capacity in normal flow direction (kW)								R32 Valve type
	Evaporating temperature (°C)								
	10	5	0	-5	-10	-15	-20	-25	
65	46.4	47.4	48.2	48.7	49.2	43.7	38.2	32.7	TX7-Z13
	57.6	58.9	59.9	60.6	61.1	54.3	47.5	40.6	TX7-Z14
	70.6	72.2	73.4	74.3	74.9	66.6	58.2	49.7	TX7-Z15
	116.6	119.1	121.1	122.6	123.6	109.9	96.1	82.1	TX7-Z16
	143.7	146.9	149.3	151.1	152.4	135.5	118.5	101.2	TX7-Z17
	189.3	193.4	196.6	199.0	200.7	178.4	156.0	133.3	TX7-Z18
	265.2	271.0	275.5	278.9	281.2	250.0	218.6	186.8	TX7-Z19
60	47.7	49.0	50.0	50.7	51.3	45.7	40.0	34.3	TX7-Z13
	59.3	60.9	62.1	63.1	63.8	56.8	49.8	42.6	TX7-Z14
	72.7	74.6	76.1	77.3	78.1	69.6	61.0	52.2	TX7-Z15
	120.0	123.2	125.6	127.6	129.0	114.9	100.7	86.2	TX7-Z16
	148.0	151.8	154.9	157.3	159.0	141.7	124.2	106.3	TX7-Z17
	194.8	199.9	203.9	207.1	209.4	186.5	163.5	140.0	TX7-Z18
	273.0	280.1	285.8	290.1	293.4	261.4	229.1	196.1	TX7-Z19
55	47.9	49.4	50.6	51.6	52.3	46.7	41.0	35.2	TX7-Z13
	59.6	61.4	62.9	64.1	65.0	58.1	51.0	43.8	TX7-Z14
	73.0	75.3	77.1	78.6	79.7	71.2	62.5	53.6	TX7-Z15
	120.5	124.3	127.3	129.7	131.6	117.5	103.2	88.6	TX7-Z16
	148.6	153.2	156.9	159.9	162.2	144.9	127.2	109.2	TX7-Z17
	195.6	201.7	206.7	210.6	213.5	190.7	167.6	143.7	TX7-Z18
	274.1	282.7	289.6	295.0	299.2	267.3	234.8	201.4	TX7-Z19
50	47.2	48.9	50.4	51.6	52.5	47.0	41.4	35.6	TX7-Z13
	58.6	60.9	62.7	64.1	65.3	58.5	51.5	44.3	TX7-Z14
	71.8	74.6	76.8	78.6	80.0	71.6	63.1	54.2	TX7-Z15
	118.6	123.1	126.8	129.7	132.0	118.3	104.1	89.5	TX7-Z16
	146.2	151.8	156.3	159.9	162.7	145.8	128.4	110.4	TX7-Z17
	192.5	199.8	205.8	210.6	214.3	192.0	169.0	145.3	TX7-Z18
	269.7	280.0	288.3	295.0	300.3	269.0	236.9	203.7	TX7-Z19
45	45.5	47.7	49.4	50.8	52.0	46.7	41.3	35.6	TX7-Z13
	56.6	59.3	61.5	63.2	64.6	58.1	51.3	44.2	TX7-Z14
	69.4	72.7	75.3	77.5	79.2	71.2	62.9	54.2	TX7-Z15
	114.6	119.9	124.3	127.9	130.7	117.5	103.8	89.4	TX7-Z16
	141.2	147.8	153.3	157.6	161.1	144.8	127.9	110.2	TX7-Z17
	185.9	194.7	201.8	207.6	212.1	190.7	168.4	145.2	TX7-Z18
	260.6	272.8	282.8	290.9	297.3	267.2	236.0	203.4	TX7-Z19
40	43.1	45.7	47.8	49.5	50.8	45.9	40.7	35.1	TX7-Z13
	53.6	56.8	59.4	61.5	63.2	57.0	50.5	43.7	TX7-Z14
	65.7	69.6	72.8	75.4	77.4	69.9	61.9	53.5	TX7-Z15
	108.4	114.9	120.1	124.4	127.8	115.4	102.3	88.4	TX7-Z16
	133.7	141.6	148.1	153.3	157.5	142.2	126.0	108.9	TX7-Z17
	176.0	186.5	195.0	201.9	207.4	187.3	166.0	143.5	TX7-Z18
	246.6	261.3	273.2	282.9	290.7	262.4	232.6	201.0	TX7-Z19
35	39.8	42.9	45.4	47.4	49.1	44.5	39.6	34.4	TX7-Z13
	49.5	53.3	56.5	59.0	61.0	55.4	49.3	42.7	TX7-Z14
	60.7	65.4	69.2	72.3	74.8	67.9	60.4	52.4	TX7-Z15
	100.1	107.9	114.2	119.3	123.4	112.0	99.7	86.5	TX7-Z16
	123.4	133.0	140.8	147.1	152.2	138.1	122.9	106.6	TX7-Z17
	162.5	175.2	185.4	193.7	200.4	181.8	161.8	140.4	TX7-Z18
	227.7	245.5	259.8	271.4	280.8	254.8	226.8	196.7	TX7-Z19

Thermo™-Expansion Valves TX7

TX7: Quick Selection (included 1.5 bar pressure drop for liquid line components and distributor)

Quick selection capacity table is for operation in normal flow direction. For reverse flow direction use the following factors:

Valve size	TX7-Z13	TX7-Z14	TX7-Z15	TX7-Z16	TX7-Z17	TX7-Z18	TX7-Z19
Reverse flow versus normal flow capacity	-1%	-2%	-3%	-16%	-18%	-13%	-10%

Condensing temperature (°C, bubble point)	R452B Capacity in normal flow direction (kW)								R452B Valve type
	Evaporating temperature (°C)								
	10	5	0	-5	-10	-15	-20	-25	
65	33.1	33.6	33.9	34.1	34.1	30.1	26.1	22.2	TX7-Z13
	41.1	41.7	42.1	42.4	42.4	37.4	32.5	27.6	TX7-Z14
	50.4	51.2	51.7	51.9	52.0	45.9	39.8	33.8	TX7-Z15
	83.2	84.5	85.3	85.7	85.8	75.7	65.7	55.7	TX7-Z16
	102.6	104.1	105.1	105.7	105.8	93.4	81.0	68.7	TX7-Z17
	135.1	137.1	138.4	139.1	139.3	122.9	106.7	90.5	TX7-Z18
60	189.3	192.1	193.9	195.0	195.2	172.2	149.5	126.8	TX7-Z19
	34.9	35.6	36.1	36.4	36.5	32.3	28.2	23.9	TX7-Z13
	43.4	44.2	44.8	45.2	45.4	40.2	35.0	29.8	TX7-Z14
	53.2	54.2	54.9	55.4	55.7	49.3	42.9	36.5	TX7-Z15
	87.8	89.5	90.7	91.5	91.9	81.4	70.8	60.2	TX7-Z16
	108.2	110.3	111.8	112.8	113.3	100.3	87.3	74.3	TX7-Z17
55	142.4	145.2	147.2	148.5	149.2	132.1	115.0	97.8	TX7-Z18
	199.6	203.5	206.2	208.1	209.1	185.0	161.1	137.0	TX7-Z19
	35.6	36.5	37.2	37.6	37.9	33.7	29.4	25.1	TX7-Z13
	44.3	45.4	46.2	46.8	47.2	41.9	36.6	31.2	TX7-Z14
	54.2	55.6	56.6	57.3	57.8	51.3	44.8	38.2	TX7-Z15
	89.6	91.8	93.5	94.7	95.4	84.7	74.0	63.1	TX7-Z16
50	110.4	113.1	115.2	116.7	117.6	104.4	91.2	77.7	TX7-Z17
	145.4	149.0	151.7	153.6	154.9	137.5	120.1	102.4	TX7-Z18
	203.7	208.7	212.6	215.3	217.0	192.7	168.3	143.5	TX7-Z19
	35.5	36.6	37.5	38.1	38.6	34.4	30.1	25.7	TX7-Z13
	44.1	45.5	46.6	47.4	48.0	42.7	37.4	32.0	TX7-Z14
	54.1	55.8	57.1	58.1	58.8	52.4	45.9	39.2	TX7-Z15
45	89.3	92.1	94.3	95.9	97.1	86.5	75.7	64.7	TX7-Z16
	110.1	113.5	116.2	118.2	119.7	106.6	93.3	79.8	TX7-Z17
	144.9	149.5	153.0	155.7	157.6	140.3	122.9	105.1	TX7-Z18
	203.1	209.5	214.4	218.2	220.8	196.7	172.2	147.2	TX7-Z19
	34.7	36.1	37.2	38.0	38.6	34.6	30.4	26.0	TX7-Z13
	43.1	44.9	46.2	47.3	48.1	43.0	37.7	32.4	TX7-Z14
40	52.9	55.0	56.6	57.9	58.9	52.7	46.3	39.7	TX7-Z15
	87.2	90.8	93.5	95.6	97.2	86.9	76.4	65.5	TX7-Z16
	107.5	111.9	115.3	117.9	119.8	107.1	94.1	80.7	TX7-Z17
	141.6	147.3	151.8	155.2	157.8	141.1	123.9	106.2	TX7-Z18
	198.4	206.4	212.7	217.5	221.1	197.7	173.7	148.9	TX7-Z19
	33.2	34.9	36.3	37.4	38.2	34.3	30.2	26.0	TX7-Z13
35	41.3	43.4	45.1	46.5	47.5	42.6	37.6	32.3	TX7-Z14
	50.6	53.2	55.3	56.9	58.2	52.2	46.1	39.6	TX7-Z15
	83.5	87.9	91.3	94.0	96.1	86.3	76.1	65.4	TX7-Z16
	103.0	108.3	112.6	115.9	118.4	106.3	93.7	80.6	TX7-Z17
	135.6	142.6	148.2	152.6	155.9	140.0	123.4	106.2	TX7-Z18
	190.0	199.8	207.7	213.8	218.5	196.2	173.0	148.7	TX7-Z19
30	31.0	33.2	34.9	36.2	37.2	33.6	29.8	25.7	TX7-Z13
	38.6	41.2	43.4	45.0	46.3	41.8	37.0	32.0	TX7-Z14
	47.3	50.5	53.1	55.2	56.7	51.2	45.4	39.2	TX7-Z15
	78.0	83.4	87.7	91.1	93.7	84.6	74.9	64.6	TX7-Z16
	96.2	102.8	108.1	112.3	115.5	104.3	92.3	79.7	TX7-Z17
	126.7	135.4	142.4	147.8	152.1	137.3	121.6	104.9	TX7-Z18
	177.5	189.8	199.5	207.1	213.1	192.4	170.3	147.0	TX7-Z19

Thermo™-Expansion Valves TX7

TX7: Quick Selection (included 1.5 bar pressure drop for liquid line components and distributor)

Quick selection capacity table is for operation in normal flow direction. For reverse flow direction use the following factors:

Valve size	TX7-Z13	TX7-Z14	TX7-Z15	TX7-Z16	TX7-Z17	TX7-Z18	TX7-Z19
Reverse flow versus normal flow capacity	-1%	-2%	-3%	-16%	-18%	-13%	-10%

Condensing temperature (°C, bubble point)	R454B Capacity in normal flow direction (kW)								R454B Valve type
	Evaporating temperature (°C)								
	10	5	0	-5	-10	-15	-20	-25	
65	33.7	34.2	34.5	34.7	34.7	30.6	26.6	22.5	TX7-Z13
	41.9	42.5	42.9	43.1	43.1	38.0	33.0	28.0	TX7-Z14
	51.3	52.1	52.6	52.8	52.9	46.6	40.5	34.3	TX7-Z15
	84.8	86.0	86.8	87.2	87.3	77.0	66.8	56.6	TX7-Z16
	104.5	106.0	106.9	107.5	107.6	94.9	82.3	69.8	TX7-Z17
	137.6	139.5	140.8	141.5	141.6	124.9	108.4	91.9	TX7-Z18
60	192.8	195.5	197.3	198.3	198.5	175.1	151.9	128.8	TX7-Z19
	35.3	36.0	36.4	36.7	36.9	32.6	28.4	24.2	TX7-Z13
	43.9	44.7	45.3	45.7	45.9	40.6	35.3	30.0	TX7-Z14
	53.8	54.8	55.5	56.0	56.2	49.7	43.3	36.8	TX7-Z15
	88.8	90.4	91.6	92.4	92.8	82.1	71.5	60.8	TX7-Z16
	109.4	111.5	113.0	113.9	114.4	101.2	88.1	74.9	TX7-Z17
55	144.1	146.8	148.7	150.0	150.6	133.3	116.0	98.6	TX7-Z18
	201.9	205.7	208.4	210.2	211.1	186.7	162.5	138.2	TX7-Z19
	35.9	36.8	37.4	37.9	38.2	33.9	29.6	25.2	TX7-Z13
	44.6	45.7	46.5	47.1	47.4	42.1	36.7	31.3	TX7-Z14
	54.7	56.0	57.0	57.7	58.1	51.6	45.0	38.4	TX7-Z15
	90.3	92.5	94.1	95.3	96.0	85.2	74.3	63.4	TX7-Z16
50	111.3	114.0	116.0	117.4	118.3	105.0	91.6	78.1	TX7-Z17
	146.6	150.1	152.7	154.6	155.8	138.3	120.7	102.8	TX7-Z18
	205.4	210.3	214.0	216.6	218.3	193.7	169.1	144.1	TX7-Z19
	35.7	36.8	37.7	38.3	38.7	34.5	30.2	25.8	TX7-Z13
	44.4	45.8	46.8	47.6	48.2	42.9	37.5	32.1	TX7-Z14
	54.4	56.1	57.4	58.4	59.0	52.5	46.0	39.3	TX7-Z15
45	89.9	92.6	94.8	96.3	97.4	86.7	75.9	64.9	TX7-Z16
	110.8	114.2	116.8	118.7	120.1	106.9	93.6	80.0	TX7-Z17
	145.9	150.3	153.8	156.4	158.1	140.8	123.2	105.3	TX7-Z18
	204.4	210.7	215.5	219.1	221.6	197.3	172.7	147.6	TX7-Z19
	34.9	36.3	37.3	38.1	38.7	34.6	30.4	26.1	TX7-Z13
	43.4	45.1	46.4	47.4	48.2	43.0	37.8	32.4	TX7-Z14
40	53.2	55.2	56.9	58.1	59.0	52.8	46.3	39.7	TX7-Z15
	87.8	91.2	93.9	96.0	97.5	87.1	76.5	65.5	TX7-Z16
	108.2	112.4	115.7	118.3	120.1	107.4	94.3	80.8	TX7-Z17
	142.4	148.0	152.4	155.7	158.2	141.4	124.1	106.3	TX7-Z18
	199.6	207.4	213.5	218.2	221.7	198.1	173.9	149.0	TX7-Z19
	33.4	35.1	36.4	37.5	38.3	34.3	30.3	26.0	TX7-Z13
35	41.5	43.6	45.3	46.6	47.6	42.7	37.6	32.3	TX7-Z14
	50.9	53.5	55.5	57.1	58.3	52.3	46.1	39.6	TX7-Z15
	84.0	88.3	91.6	94.3	96.2	86.4	76.1	65.4	TX7-Z16
	103.6	108.8	113.0	116.2	118.6	106.5	93.8	80.6	TX7-Z17
	136.4	143.3	148.7	153.0	156.2	140.2	123.5	106.2	TX7-Z18
	191.1	200.8	208.4	214.4	218.9	196.4	173.1	148.8	TX7-Z19
30	31.2	33.3	35.0	36.3	37.3	33.7	29.8	25.7	TX7-Z13
	38.8	41.4	43.5	45.1	46.4	41.8	37.0	31.9	TX7-Z14
	47.6	50.8	53.3	55.3	56.8	51.3	45.4	39.1	TX7-Z15
	78.6	83.8	88.0	91.3	93.8	84.7	74.9	64.6	TX7-Z16
	96.8	103.4	108.5	112.6	115.7	104.4	92.4	79.7	TX7-Z17
	127.5	136.1	142.9	148.2	152.3	137.4	121.6	104.9	TX7-Z18
178.7	190.7	200.2	207.7	213.4	192.6	170.4	147.0	TX7-Z19	

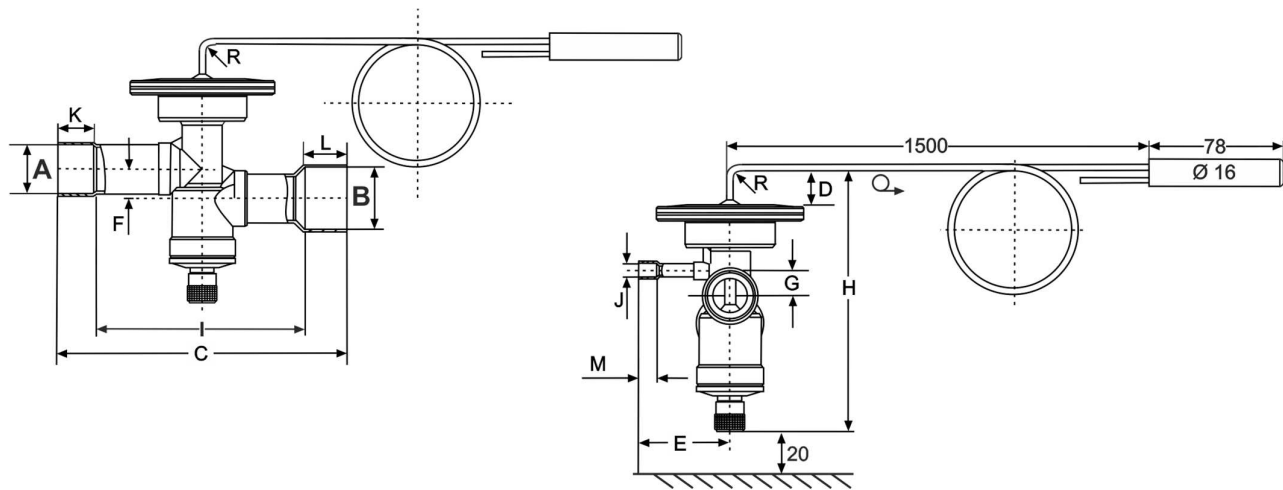
Thermo™-Expansion Valves TX7

Technical Data

Maximum working pressure PS	46 bar	Connections	Copper ODF
Burst pressure	230 bar	Capillary tube length	1.5 m
Factory test pressure PT	50.6 bar	Power elements	Stainless steel. Laser welded
Medium temperature range TS	-25...+70°C	Label	Laser printing
Storage temperature	-30...+70°C	Gross weight	Approx. 0.54...0.6 kg (depend on the valve size)
		Marking	CE is not required. UL

Charge	MOP	Refrigerant	Recommended evaporating temperature range	Maximum bulb temperature
Z1	12.1 bar	R32/R452B/R454B	-25...+14°C	120°C

Dimensions (mm)



Size/ Type	Inlet * A ODF	Outlet * B ODF	External equalizer J ODF	Min. overall height (mm) H	Distance between inlet & outlet pipes (mm) I	Min. capillary tube bending height ** (mm) D	Other (mm)							
							C	E	F	G	K	L	M	
TX7-..3	1/2"	5/8"	1/4"	106	109.8	10	130	39	8	11.1	15.9	8		
TX7-..3M	12mm	16mm	6mm											
TX7-..4	5/8"	7/8"	1/4"		103								11.1	15.9
TX7-..4M	16mm	22mm	6mm											
TX7-..5	5/8"	7/8"	1/4"		109								95.2	40.5
TX7-..5M	16mm	22mm	6mm											
TX7-..6	7/8"	1-1/8"	1/4"											
TX7-..6M	22mm	28mm	6mm											
TX7-..7	7/8"	1-1/8"	1/4"											
TX7-..7M	22mm	28mm	6mm											
TX7-..8	7/8"	1-1/8"	1/4"											
TX7-..8M	22mm	28mm	6mm											
TX7-..9	7/8"	1-1/8"	1/4"											
TX7-..9M	22mm	28mm	6mm											

Note: *) Indication for normal flow direction

***) Bending radius R = 5 mm

2-Way Solenoid Valves Series

Features

- Normally closed
- Pilot operated requires minimum operating pressure differential
- Compact size
- Extended fittings: No disassembly necessary for brazing
- Only specific coils for use with R32 in compliance with IEC60335-2-1/40



200RH

Selection Table Valves

Type	Part No.	ODF Connection		Kv (m ³ /h)	ΔP_{min} (bar)	Function	Liquid			
		(mm)	(inch)				R32	R452B	R454B	
200RH3...	T3	802070	10		0.05	Normally closed	9.7	7.6	7.7	
200RH4...	T3	802071	10	0.9			23.0	18.0	18.2	
	T3	802072		3/8"						0.9
	T4	802073	12							0.9
	T4	802074		1/2"						0.9
200RH6...	T4	802075	12	1.6			40.3	31.7	31.9	
	T4	802076		1/2"						1.6
	T5	802077	16	5/8"						1.6

Note: The nominal capacity is based on +4°C evaporating temperature, +38°C condensing temperature and 0.15 bar pressure drop across valve. For selection of other operating condition, please use quick selection tables in the next pages or Controls Navigator selection program.

Selection Table Coils and Accessory

Type Coils	Part No.	Supply voltage	Power Input	Description	Ambient temperature	Picture
ESC-EX24VAC	801035	24 VAC \pm 10% 50 Hz	17VA	IP65 acc. EN 60529 test conditions. incl. screw cap with 2x O-ring & fixing retainer	-40...+60°C	
ESC-EX230VAC	801036	230 VAC \pm 10% 50 Hz	17VA			
ESC-K01	801034	Screw cap (incl. 2x O-ring & fixing retainer)				

Liquid line Solenoid Valve: Quick Selection (at 0.15 bar pressure drop)

Condensing temperature (°C)	R32 Capacity (kW)								Solenoid Valve type
	Evaporating temperature (°C)								
	10	5	0	-5	-10	-15	-20	-25	
+65°C	6.4	6.4	6.3	6.3	6.3	6.2	6.2	6.1	200RH3
	15.1	15.1	15.0	15.0	14.9	14.7	14.6	14.5	200RH4
	26.5	26.5	26.3	26.2	26.0	25.8	25.6	25.4	200RH6
+60°C	7.1	7.1	7.1	7.0	7.0	6.9	6.9	6.8	200RH3
	16.8	16.8	16.7	16.7	16.6	16.4	16.3	16.2	200RH4
	29.5	29.4	29.3	29.2	29.0	28.8	28.6	28.3	200RH6
+55°C	7.8	7.7	7.7	7.7	7.6	7.6	7.5	7.5	200RH3
	18.4	18.3	18.3	18.2	18.1	18.0	17.8	17.7	200RH4
	32.2	32.1	32.0	31.9	31.7	31.5	31.3	31.0	200RH6
+50°C	8.4	8.3	8.3	8.3	8.2	8.2	8.1	8.1	200RH3
	19.8	19.8	19.7	19.6	19.5	19.4	19.3	19.1	200RH4
	34.8	34.7	34.6	34.4	34.2	34.0	33.8	33.5	200RH6
+45°C	8.9	8.9	8.9	8.9	8.8	8.8	8.7	8.6	200RH3
	21.2	21.2	21.1	21.0	20.9	20.8	20.7	20.5	200RH4
	37.2	37.1	37.0	36.8	36.6	36.4	36.2	35.9	200RH6
+40°C	9.5	9.5	9.5	9.4	9.4	9.3	9.3	9.2	200RH3
	22.5	22.5	22.4	22.3	22.2	22.1	22.0	21.8	200RH4
	39.5	39.4	39.3	39.1	39.0	38.7	38.5	38.2	200RH6
+35°C	10.0	10.0	10.0	10.0	9.9	9.9	9.8	9.7	200RH3
	23.8	23.8	23.7	23.6	23.5	23.4	23.2	23.1	200RH4
	41.7	41.7	41.5	41.4	41.2	41.0	40.7	40.5	200RH6

2-Way Solenoid Valves Series

Liquid line Solenoid Valve: Quick Selection (at 0.15 bar pressure drop)

Condensing temperature (°C, bubble point)	R452B Capacity (kW)								Solenoid Valve type
	Evaporating temperature (°C)								
	10	5	0	-5	-10	-15	-20	-25	
+65°C	4.7	4.7	4.6	4.6	4.5	4.4	4.4	4.3	200RH3
	11.1	11.0	10.9	10.8	10.6	10.5	10.3	10.2	200RH4
	19.6	19.4	19.2	19.0	18.8	18.5	18.2	17.9	200RH6
+60°C	5.4	5.3	5.3	5.2	5.1	5.1	5.0	4.9	200RH3
	12.7	12.6	12.4	12.3	12.2	12.0	11.8	11.7	200RH4
	22.3	22.1	21.9	21.7	21.4	21.1	20.8	20.5	200RH6
+55°C	5.9	5.9	5.8	5.8	5.7	5.6	5.6	5.5	200RH3
	14.0	13.9	13.8	13.7	13.5	13.4	13.2	13.0	200RH4
	24.7	24.5	24.3	24.1	23.8	23.5	23.2	22.9	200RH6
+50°C	6.5	6.4	6.4	6.3	6.2	6.2	6.1	6.0	200RH3
	15.3	15.2	15.1	14.9	14.8	14.6	14.4	14.2	200RH4
	27.0	26.8	26.5	26.3	26.0	25.7	25.4	25.1	200RH6
+45°C	7.0	6.9	6.9	6.8	6.7	6.7	6.6	6.5	200RH3
	16.5	16.4	16.3	16.1	16.0	15.8	15.6	15.4	200RH4
	29.1	28.9	28.7	28.4	28.1	27.8	27.5	27.2	200RH6
+40°C	7.5	7.4	7.4	7.3	7.2	7.2	7.1	7.0	200RH3
	17.7	17.6	17.4	17.3	17.1	17.0	16.8	16.6	200RH4
	31.1	30.9	30.7	30.5	30.2	29.9	29.5	29.2	200RH6
+35°C	7.9	7.9	7.8	7.8	7.7	7.6	7.6	7.5	200RH3
	18.8	18.7	18.6	18.4	18.3	18.1	17.9	17.7	200RH4
	33.1	32.9	32.7	32.5	32.2	31.9	31.5	31.2	200RH6

Liquid line Solenoid Valve: Quick Selection (at 0.15 bar pressure drop)

Condensing temperature (°C, bubble Point)	R454B Capacity (kW)								Solenoid Valve type
	Evaporating temperature (°C)								
	10	5	0	-5	-10	-15	-20	-25	
+65°C	4.8	4.8	4.7	4.7	4.6	4.6	4.5	4.4	200RH3
	11.4	11.3	11.2	11.1	10.9	10.8	10.6	10.4	200RH4
	20.1	19.9	19.7	19.4	19.2	18.9	18.6	18.3	200RH6
+60°C	5.5	5.4	5.4	5.3	5.2	5.2	5.1	5.0	200RH3
	12.9	12.8	12.7	12.6	12.4	12.2	12.1	11.9	200RH4
	22.7	22.5	22.2	22.0	21.7	21.4	21.1	20.8	200RH6
+55°C	6.0	6.0	5.9	5.9	5.8	5.7	5.7	5.6	200RH3
	14.3	14.2	14.0	13.9	13.7	13.6	13.4	13.2	200RH4
	25.0	24.8	24.6	24.3	24.1	23.8	23.4	23.1	200RH6
+50°C	6.6	6.5	6.5	6.4	6.3	6.3	6.2	6.1	200RH3
	15.5	15.4	15.3	15.1	15.0	14.8	14.6	14.4	200RH4
	27.2	27.0	26.8	26.5	26.2	25.9	25.6	25.3	200RH6
+45°C	7.1	7.0	7.0	6.9	6.8	6.8	6.7	6.6	200RH3
	16.7	16.6	16.5	16.3	16.2	16.0	15.8	15.6	200RH4
	29.3	29.1	28.9	28.6	28.3	28.0	27.7	27.3	200RH6
+40°C	7.6	7.5	7.5	7.4	7.3	7.3	7.2	7.1	200RH3
	17.9	17.8	17.6	17.5	17.3	17.1	16.9	16.7	200RH4
	31.3	31.1	30.9	30.6	30.4	30.0	29.7	29.4	200RH6
+35°C	8.0	8.0	7.9	7.9	7.8	7.7	7.6	7.6	200RH3
	19.0	18.9	18.8	18.6	18.5	18.3	18.1	17.9	200RH4
	33.3	33.1	32.9	32.6	32.3	32.0	31.7	31.3	200RH6

2-Way Solenoid Valves Series


Technical Data Valve

Max. allowable working pressure PS	60 bar
Test pressure PT	66 bar

Operating Temperature Range TS	-40...+120°C
Ambient temperature range	-40...+50°C

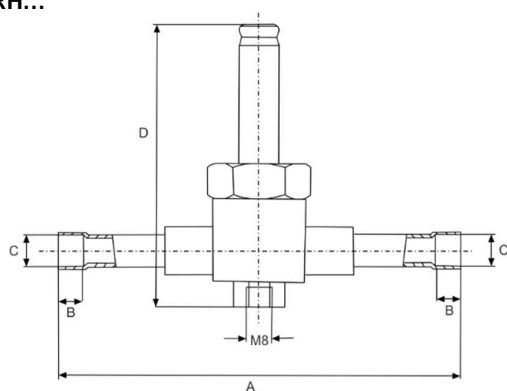
Technical Data ESC-EX... Coil

Supply voltage ESC EX24VAC ESC EX230VAC	24VAC ±10% 230VAC ±10%
Frequency	50 Hz
Vibration resistance	0.7g 10 ... 200 Hz
Protection Class	IP65

Ambient temperature range	-40...+60°C
Marking	

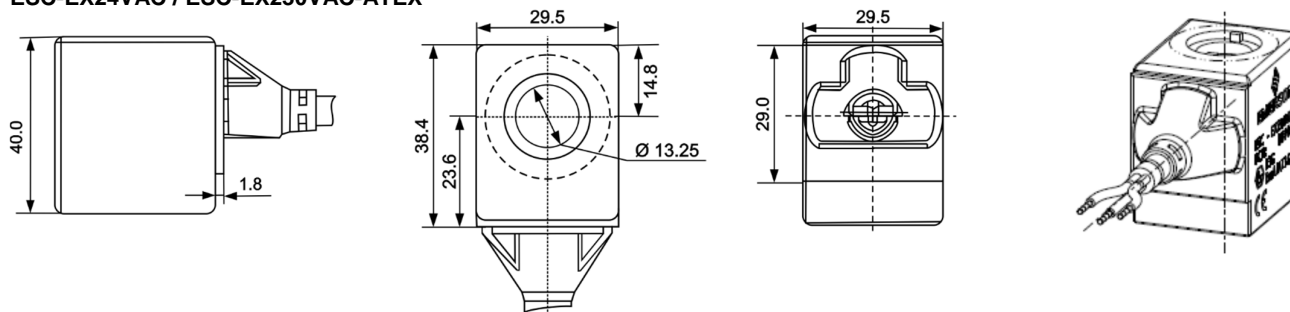
Dimensions (mm)

200RH...



Type	Part No.	(mm)			C	
		A	B	D	Connections Solder / ODF (mm)	(inch)
200RH 3T3	802070	126	8	88.3	10	
200RH 4T3	802071		8	88.3	10	
200RH 4T3	802072		8	88.3		3/8"
200RH 4T4	802073	126	10	88.3	12	
200RH 4T4	802074		10	88.3		1/2"
200RH 6T4	802075		10	88.3	12	
200RH 6T4	802076	126	10	88.3		1/2"
200RH 6T5	802077		13	88.3	16	5/8"

ESC-EX24VAC / ESC-EX230VAC-ATEX



Pressure Controls PS3 with fixed Setpoints

Features

- Max. working pressure up to 45 bar. Test Pressure up to 50 bar
- High and low-pressure switches
- High temperature with snubber for direct compressor mounting
- For direct mounting on a pressure connection (free standing)
- Precise setting and repeatability
- Electrical connection via DIN plug, to be ordered separately

Options and Accessories

- Micro-switch for narrow pressure differentials
- Gold plated contacts for low voltage/current applications



PS3



PS3-N... DIN plug

Selection Table: Standard types as single packaging

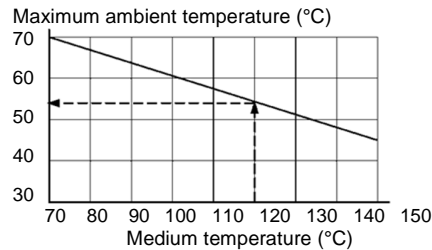
Type	Part No.	Fixed setting (bar)		Reset	Max. temp. ambient	Pressure connection	Leakage test pressure (bar)	Pressure connection
		Cut-out	Cut-in					
Low Pressure Controls / Pressure Limiter for low pressure protection PSL EN 12263								
PS3-W1S	0714762	2.0	3.5	auto	+70°C	+70°C	30	7/16"-20 UNF female thread with Schrader opener
Pressure Limiter for high pressure protection PSH with snubber for direct compressor mounting EN 12263								
PS3-W6S	0715550	33.5	27.5	auto	+70°C	+150°C	50	7/16"-20 UNF female thread with Schrader opener & snubber
PS3-W6S	0715553	40.0	33.0					
Pressure Cut Out for high pressure protection PZH with snubber for direct compressor mounting EN 12263								
PS3-B6S	0715560	36.0	approx. 5 bar below cut-out	External manual reset	+70°C	+150°C	50	7/16"-20 UNF female thread with Schrader opener & snubber

Note1: Customer specific types/setpoints available in multipacks. minimum order quantity: 100 pieces

Note2: PS3-M... are not in compliance with EN60335-1/2-40, clause 30 in term of glue wire test.

Note: For medium temperatures between 70°C and 150°C. The maximum ambient temperature must be derated as per drawing.

e.g.: On medium temperature 120 C the ambient temperature of 55°C around the switch housing should not be exceeded.



Technical Data

Temperature range TS	
Ambient, storage	-40...+70°C
transportation	-40...+70°C
Medium	(150°C for Range 6)

Resistance to vibration	According to EN12663
-------------------------	----------------------

Available approvals	TÜV. UL
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Weight (approx.)	0.1 kg
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Electrical Data

	Standard (SPDT)	Standard (SPDT) Gold plated contacts	Micro switch (SPDT)	Micro switch (SPDT) Gold plated Contacts
Inductive load (AC15)	3A / 230VAC	0.1A / 230VAC	1.5A / 230VAC	0.1A / 230VAC
Inductive load (DC)	0.1A / 230VDC	0.1A / 230VDC	0.1A / 230VDC	0.1A / 230VDC

Note: Standard contact not suitable for electronic applications (< 100 mA)

Tolerances (bar)

Range code	1 / J	3 / L	4	5 / N	6 / O	4, 5, 6 (TÜV appr.)
Setting	±0.16	±0.4	±0.8	±0.8	±0.8	according to EN 12 263 and to a maximum of +0 to -1.6 bar (in case of HP application)

Note: Tolerances are valid between -20°C... +55°C.

Pressure Controls CS3 with fixed Setpoints

Features

- Fixed factory cut-out settings available between 40...70 bar
- Maximum working pressure 90 bar
- Factory test pressure of 100 bar
- Narrow differential of approximately 4 bar
- Manual reset versions available
- Precise switching and repeatability; Snap Action Contacts. Chatter Free (Bounce free) and accurate Operation
- Contacts are designed as SPDT (Single pole double throw) for control function and alarm/status reporting
- 2 million cycles reliability (TÜV EN 12263 approved)
- For direct mounting on a pressure connection (free standing)
- TÜV approved versions for high and low pressure
- Electrical connection via DIN plug, to be ordered separately



CS3



PS3-N...
DIN plug

Option:

- Gold plated contacts for low voltage/current applications

Selection Table

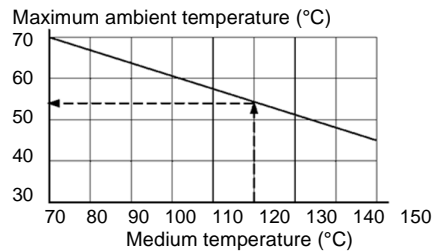
Type	Part No.	Fixed setting (bar)		Function designation	Reset	Electrical Switch	Pressure connection
		Cut-out	Cut-in				
Pressure Limiter CS3-WPS	814020/ 814020M*	50	45.5	PSH	Automatic	Micro switch	7/16"-20 UNF female thread with Schrader opener
Pressure Limiter CS3-WPS	814021/ 814021M*	45	41	PSH			

Note1: *) M = Multipack = 60pcs. Customer specific types/setpoints available in multipacks. minimum order quantity: 60 pieces

Note2: PS3-M... are not in compliance with EN60335-1/2-40, clause 30 in term of glue wire test.

Note: For medium temperatures between 70°C and 150°C. The maximum ambient temperature must be derated as per drawing.

e.g.: On medium temperature 120 C the ambient temperature of 55°C around the switch housing should not be exceeded.



Technical Data

Temperature range TS:	
Ambient. storage & transportation	-40...+70°C
Medium	-40...+70°C (150°C for Range 6)

Resistance to vibration	According to EN12663
Available approvals	TÜV. UL
Weight (approx.)	0.1 kg

Electrical Data

	Standard (SPDT)	Standard (SPDT) Gold plated contacts	Micro switch (SPDT)	Micro switch (SPDT) Gold plated Contacts
Inductive load (AC15)	3A / 230VAC	0.1A / 230VAC	1.5A / 230VAC	0.1A / 230VAC
Inductive load (DC)	0.1A / 230VDC	0.1A / 230VDC	0.1A / 230VDC	0.1A / 230VDC

Note: Standard contact not suitable for electronic applications (< 100 mA)

Tolerances (bar)

Range code	1 / J	3 / L	4	5 / N	6 / O	4, 5, 6 (TÜV appr.)
Setting	±0.16	±0.4	±0.8	±0.8	±0.8	according to EN 12 263 and to a maximum of +0 to -1.6 bar (in case of HP application)

Note: Tolerances are valid between -20°C... +55°C

Pressure Controls PS4 with fixed Setpoints

Features

- High- and low-pressure switches
- Precise settings and repeatability
- Cable version with IP67 (IP20 for terminal version)
- TUV approved versions
- Minimum lot size 100 pieces
- Other settings are not available
- Max. fluid temperature of +135°C for versions with tube connection for brazing
- Max. fluid temperature of +110°C for versions with 7/16-20UNF female connection
- Protection class IP67



PS4

Approval

- acc. Pressure Equipment Directive 2014/68/EU
- Underwriter Laboratories file No. E258370

Option

- Gold plated contacts for low voltage/current applications
- Customer specific types/setpoints available in multipacks. min. order quantity: 100 pieces

Low Pressure Switches with Automatic Reset; Open on Falling Pressure

Type	Part No.	Setting (bar)		Test pressure (bar)	Connector Cable (m)	Contact	EN 12263	Max. fluid temperature	Pressure connection
		Cut-out	Cut-in						
PS4-W1	808271	1.8	3.2	30	1.5	Standard	PSL	+110°C	7/16-20UNF female *
PS4-A1	808276	3.3	4.8	30	1.5		None	+110°C	

Note: *) with schrader valve opener

High Pressure Switches with Automatic Reset; Open on Rising Pressure

Type	Part No.	Setting (bar)		Test pressure (bar)	Connector Cable (m)	Contact	EN 12263	Max. fluid temperature	Pressure connection
		Cut-out	Cut-in						
PS4-W1	808261	45	35	69	1.5	Standard	PSH	+135°C	6 mm

Note1: *) with schrader valve opener

Electrical Data

	PS4 with standard contact (none gold plated)
Inductive Load 230 VAC	6A
Inductive Load (DC <28V)	2A
Motor rating FLA 230 VAC	6A
Motor rating LRA 230 VAC	36A

Pressure setting (Cut-out) drifting:

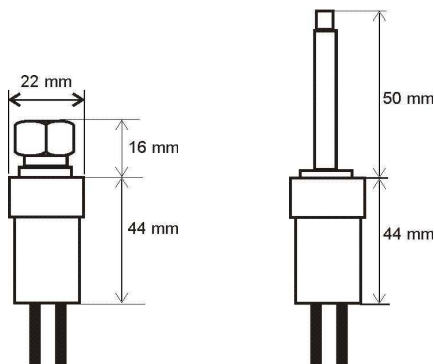
PS4 factory setting is at 23°C room temperature however, the setting will drift by other ambient and fluid temperatures. The table indicates the amount of drift in function of ambient and media temperature.

PS4 high pressure cut-out - Brazing connection

Media temp. (°C)	Ambient temperature (°C)									
	0	10	23	25	30	35	40	45	50	55
	Total drift of cut-out set point (%)									
80	+5	+2,8	0.0	-0.4	-1.5	-2.6	-3.7	-4.8	-5.9	-7.0
85	+5	+2,8	-0.1	-0.5	-1.6	-2.7	-3.8	-4.9	-6.0	-7.1
90	+5	+2,8	-0.2	-0.6	-1.7	-2.8	-3.9	-5.0	-6.1	-7.2
95	+5	+2,8	-0.3	-0.7	-1.8	-2.9	-4.0	-5.1	-6.2	-7.3
100	+5	+2,8	-0.4	-0.8	-1.9	-3.0	-4.1	-5.2	-6.3	-7.4
105	+5	+2,8	-0.5	-0.9	-2.0	-3.1	-4.2	-5.3	-6.4	-7.5
110	+5	+2,8	-0.5	-1.0	-2.1	-3.2	-4.3	-5.4	-6.5	-7.6
115	+5	+2,8	-0.6	-1.1	-2.2	-3.3	-4.4	-5.5	-6.5	-7.6
120	+5	+2,8	-0.7	-1.2	-2.3	-3.4	-4.5	-5.5	-6.6	-7.7
125	+5	+2,8	-0.8	-1.3	-2.4	-3.4	-4.5	-5.6	-6.7	-7.8
130	+5	+2,8	-0.9	-1.4	-2.4	-3.5	-4.6	-5.7	-6.8	-7.9
135	+5	+2,8	-1.0	-1.4	-2.5	-3.6	-4.7	-5.8	-6.9	-8.0

Note: European standard for high safety pressure switches permits maximum +0% / -8% of the setting at extreme operating conditions.

Dimensions (mm)



Hermetic Liquid Line Filter-Driers Series ADK

ADK filter-driers are used for protection of systems against contaminant.

Features

- Solid block
- Hermetic design. rugged steel shells
- Corrosion resistant epoxy paint
- Cushioned flow for non-turbulent performance
- High water and acid adsorption capacity
- High filtration capacity / efficiency
- Max. working pressure PS: 45 bar (680 psi)
- Fluid temperature: -45...+65°C



ADK

Selection Table

Type	Part No.	Connection ODF*/SAE*	Flow capacity (kW)		
			R32	R452B	R454B
ADK-032	003595	1/4"(6 mm) SAE	10.4	8.1	8.1
ADK-032S	003596	1/4" ODF	12.4	9.7	9.8
ADK-036MMS	003597	6 mm ODF	11.3	8.9	8.9
ADK-052	003598	1/4"(6 mm) SAE	10.7	8.4	8.4
ADK-052S	003599	1/4" ODF	15.3	12.0	12.0
ADK-056MMS	003600	6 mm ODF	14.2	11.1	11.1
ADK-053	003601	3/8"(10 mm) SAE	20.1	15.7	15.8
ADK-053S	003602	3/8" ODF	23.2	18.1	18.2
ADK-0510MMS	003603	10 mm ODF	23.2	18.1	18.2
ADK-082	003604	1/4"(6 mm) SAE	11.0	8.6	8.7
ADK-082S	003605	1/4" ODF	16.9	13.2	13.3
ADK-086MMS	003606	6 mm ODF	15.1	11.8	11.9
ADK-083	003607	3/8"(10 mm) SAE	23.2	18.2	18.3
ADK-083S	003608	3/8" ODF	23.2	18.2	18.3
ADK-0810MMS	003609	10 mm ODF	23.2	18.2	18.3
ADK-084	003610	1/2"(12 mm) SAE	36.3	28.4	28.6
ADK-084S	003611	1/2" ODF	37.9	29.7	29.9
ADK-0812MMS	003612	12 mm ODF	37.3	29.2	29.3
ADK-162	003613	1/4"(6 mm) SAE	11.3	8.8	8.9
ADK-163	003614	3/8"(10 mm) SAE	23.7	18.6	18.7
ADK-163S	003615	3/8" ODF	26.5	20.7	20.9
ADK-1610MMS	003616	10 mm ODF	26.5	20.7	20.8
ADK-164	003617	1/2"(12 mm) SAE	44.4	34.7	34.9
ADK-164S	003618	1/2" ODF	51.0	39.9	40.1
ADK-1612MMS	003619	12 mm ODF	45.8	35.8	36.0
ADK-165	003620	5/8"(16 mm) SAE	63.5	49.7	50.0
ADK-165S	003621	5/8"(16 mm) ODF	70.4	55.1	55.4
ADK-303	003622	3/8"(10 mm) SAE	25.0	19.6	19.7
ADK-304	003623	1/2"(12 mm) SAE	44.4	34.7	34.9
ADK-304S	003624	1/2" ODF	51.0	39.9	40.1
ADK-305	003626	5/8"(16 mm) SAE	74.5	58.3	58.7
ADK-305S	003627	5/8"(16 mm) ODF	74.8	58.5	58.8
ADK-307S	003628	7/8"(22 mm) ODF	93.9	73.4	73.9
ADK-414	003629	1/2"(12 mm) SAE	52.1	40.8	41.0
ADK-415	003632	5/8"(16 mm) SAE	83.0	64.9	65.3
ADK-415S	003633	5/8"(16 mm) ODF	89.2	69.8	70.2
ADK-417S	003634	7/8"(22 mm) ODF	110.4	86.3	86.8
ADK-757S	003635	7/8"(22 mm) ODF	149.4	116.9	117.6
ADK-759S	003636	1-1/8" ODF	166.0	129.8	130.6

Note1: Flow capacities are at +30°C liquid temperature, at -15°C evaporating temperature and 0.07 bar pressure drop.

Note2: *) SAE = Flare. ODF = Brazing female

Note3: Product label update is pending!

Filter-Driers Series BFK

BFK Bi-flow filter-driers are used for protection of systems such as heat pumps against contaminant.

Features

- Solid block
- Hermetic design
- Bi-flow
- Rugged steel shells, corrosion resistant epoxy powder paint
- Cushioned flow for non-turbulent performance
- High water adsorption capacity
- High acid adsorption capacity
- High filtration capacity / efficiency
- Max. working pressure PS: 45 bar
- Fluid temperature: -45...+65°C



BFK

Selection Table

Type	Part No.	Connection ODF*/SAE*	Flow capacity (kW)		
			R32	R452B	R454B
BFK-052	*	1/4" / 6 mm SAE	8.1	6.3	6.4
BFK-052S	*	1/4" ODF	10.4	8.1	8.2
BFK-083	*	3/8" / 10 mm SAE	16.3	12.8	12.8
BFK-083S	*	3/8" ODF	18.5	14.5	14.6
BFK-163	*	3/8" / 10 mm SAE	21.1	16.5	16.6
BFK-163S	*	3/8" ODF	23.9	18.7	18.8
BFK-084	*	1/2" / 12 mm SAE	23.5	18.4	18.5
BFK-084S	*	1/2" ODF	24.1	18.8	18.9
BFK-164	*	1/2" / 12 mm SAE	31.3	24.5	24.7
BFK-164S	*	1/2" ODF	37.5	29.3	29.5
BFK-165	*	5/8" / 16 mm SAE	38.8	30.4	30.6
BFK-165S	*	5/8" ODF	39.7	31.0	31.2
BFK-305S	*	5/8" / 16 mm ODF	52.8	41.3	41.5
BFK-307S	*	7/8" / 22 mm ODF	62.8	49.1	49.4
BFK-309S	804090	1 1/8" ODF	72.7	56.9	57.2

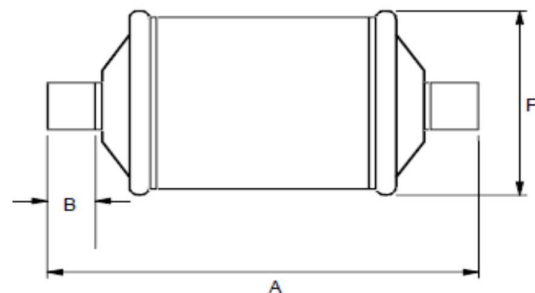
Note1: Flow capacities are at +30°C liquid temperature, at -15°C evaporating temperature and 0.07 bar pressure drop.

Note2: *) SAE = Flare. ODF = Brazing female

Note3: Product label update is pending!

Dimensions

Type	Connection size & type	(mm)		F
		A	B	
BFK-052	1/4" (6mm) SAE	123	-	64
BFK-052S	1/4" ODF	106	9.5	
BFK-083	3/8" (10mm) SAE	151	-	
BFK-083S	3/8" ODF	134	11	
BFK-084	1/2" (12mm) SAE	157	-	
BFK-084S	1/2" ODF	136	12.7	
BFK-163	3/8" (10mm) SAE	172	-	76
BFK-163S	3/8" ODF	155	11	
BFK-164	1/2" (12mm) SAE	177	-	
BFK-164S	1/2" ODF	156	12.7	
BFK-165	5/8" (16mm) SAE	189	-	
BFK-165S	5/8" ODF	163	16	
BFK-305	5/8" (16mm) SAE	262	-	
BFK-305S	5/8" ODF	236	16	
BFK-307S	7/8" ODF	251	19	
BFK-309S	1-1/8" ODF	251	24	



Filter-Driers Series FDB

FDB is a hermetic filter-drier in compacted bead style for use on liquid line.

Features

- Compacted bead style (spring loaded)
- Hermetic design. rugged steel shells
- Corrosion resistant epoxy paint
- Solder connection made from copper for easy soldering
- Cushioned flow for non-turbulent performance
- High water adsorption capacity
- High acid adsorption capacity
- High filtration capacity / efficiency
- Filtration first for more effective use of surface area of desiccant
- Max. working pressure PS: 45 bar (680 psi)
- Temperature range: -40...+65°C



FDB-164

Selection Table

Type	Part No.	Connection ODF*/SAE*	Flow capacity (kW)		
			R32	R452B	R454B
FDB-032	059305	1/4"(6 mm) SAE	9.8	7.6	7.7
FDB-032S	059306	1/4" ODF	15.0	11.7	11.8
FDB-052	059307	1/4"(6 mm) SAE	10.1	7.9	7.9
FDB-052S	059309	1/4" ODF	15.0	11.7	11.8
FDB-053	059308	3/8"(10 mm) SAE	23.9	18.7	18.8
FDB-053S	059310	3/8" ODF	29.9	23.4	23.5
FDB-082	059311	1/4"(6 mm) SAE	10.5	8.2	8.2
FDB-082S	059314	1/4" ODF	15.3	12.0	12.0
FDB-083	059312	3/8"(10 mm) SAE	24.4	19.1	19.2
FDB-083S	059315	3/8" ODF	30.6	23.9	24.1
FDB-084	059313	1/2"(12 mm) SAE	40.8	31.9	32.1
FDB-084S	059316	1/2" ODF	43.8	34.2	34.4
FDB-162	059317	1/4"(6 mm) SAE	10.5	8.2	8.2
FDB-163	059318	3/8"(10 mm) SAE	25.1	19.6	19.7
FDB-163S	059321	3/8" ODF	35.5	27.8	28.0
FDB-164	059319	1/2"(12 mm) SAE	43.2	33.8	34.0
FDB-164S	059322	1/2" ODF	55.7	43.5	43.8
FDB-165	059320	5/8"(16 mm) SAE	56.6	44.3	44.6
FDB-165S	059323	5/8" ODF	75.5	59.0	59.4
FDB-303	059324	3/8"(10 mm) SAE	27.9	21.8	21.9
FDB-304	059325	1/2"(12 mm) SAE	49.1	38.4	38.7
FDB-304S	003667	1/2" ODF	58.8	46.0	46.2
FDB-305	059326	5/8"(16 mm) SAE	62.3	48.7	49.0
FDB-305S	059327	5/8" ODF	83.1	65.0	65.4
FDB-307S	059328	7/8" ODF	93.6	73.2	73.6
FDB-415	059329	5/8"(16 mm) SAE	76.9	60.1	60.5
FDB-417S	059330	7/8" ODF	119.4	93.4	93.9

Note1: Flow capacities are at +30°C liquid temperature, at -15°C evaporating temperature and 0.07 bar pressure drop.

Note2: *) SAE = Flare. ODF = Brazing female

Note3: Product label update is pending!

Filter-Driers Shells Series FDH

Features

- Rustproof Aluminum flange cover
- ODF copper fittings for easy soldering
- Rigid core holder from steel (no plastic)
- Service friendly core holder and flange cover
- Optimum flow capacity at low pressure drop
- Temperature range TS: -45°C...+65°C
- Max allowable working pressure PS:
46 bar (-10...+65°C)
25.9 bar (-45...-10°C)
- **CE** marking according PED 2014/68/EU



FDH

Selection Table

Type	Part No.	Connection ODF		Nominal Flow capacity (kW)			Number of blocks S48. H48
		(mm)	(inch)	Pressure drop 0.07 bar			
FDH-485		16	5/8"	111			1
FDH-487		22	7/8"	205			
FDH-489T			1-1/8"	289			
FDH-969			1-1/8"	354			
FDH-9611		35	1-3/8"	432			


Note1: Flow capacities are at +30°C liquid temperature at and at -15°C evaporating temperature.

Note2: FDH range has CE marking according to hazard category 1 based on PED. FDH requires upgrade to Hazard category II and are under obtaining certification. Before selection or use, please contact EMERSON local sales offices for availability of approval.

MIA / CIA Moisture / Liquid Indicators

The **MIA/ CIA** series of Moisture Indicators are designed to monitor the moisture content within the liquid line of a refrigeration system.

Features

- Maximum working pressure PS: MIA 45 bar. CIA 60 bar
- Lightweight and corrosion free stainless-steel body
- Fully hermetic without the use of any gasket
- Low pressure drop
- Crystal Indicator element for long lifetime and reliability
- Indication of dryness according to ASERCOM recommendation
- Easily determination of moisture content
- Sensitive indicator with calibrated four colors
- Large clear viewing area
- Operating temperature TS: -40...+100°C
- ODF extended tube configurations suitable for all commercial applications
-  for connection >32mm
- CSA for Canada & UL (see SA 4876 - except MIA-078)

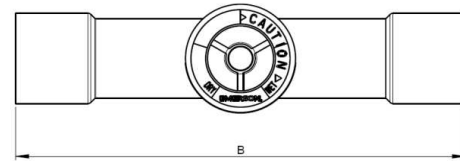
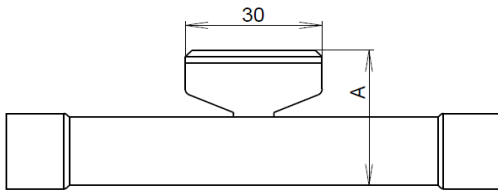


MIA / CIA

Selection Table

For tube outside diameter		Type MIA	Part No.	Type CIA	Part No.
(mm)	(inch)				
6		MIA M06	805880	CIA M06	805914
	1/4	MIA 014	805883	CIA 014	805910
10		MIA M10	805881	CIA M10	805915
	3/8	MIA 038	805884	CIA 038	805911
12		MIA M12	805882	CIA M12	805916
	1/2	MIA 012	805885	CIA 012	805912
16	5/8	MIA M16 / 058	805886	CIA M16 / 058	805913
22	7/8	MIA 078	805887		
28		MIA M28	805891		
	1 1/8	MIA 118	805892		
10		MIA M10S female/male	805888		
12		MIA M12S female/male	805889		

Dimensions (mm)



Type	Part No.	For tube outside diameter	Height A (mm)	Length B (mm)	Weight (g)
MIA 014	805883	1/4"	25.7	98.0	60
CIA 014	805910				
MIA 038	805884	3/8"	28.5	109.0	70
CIA 038	805911				
MIA 012	805885	1/2"	31.8	113.0	75
CIA 012	805912				
MIA 058	805886	5/8"	31.8	108.5	85
CIA 058	805913				
MIA 078	805887	7/8"	37.8	122.5	150
MIA 118	805892	1 1/8"	43.5	122.5	190

Type	Part No.	For tube outside diameter	Height A (mm)	Length B (mm)	Weight (g)
MIA M06	805880	6 mm	25.9	98.0	60
CIA M06	805914				
MIA M10	805881	10 mm	28.5	109.0	70
CIA M10	805915				
MIA M12	805882	12 mm	28.5	113.0	75
CIA M12	805916				
MIA M16	805886	16 mm	28.5	108.5	85
CIA M16	805913				
MIA M28	805891	28 mm	43.5	122.5	190
MIA M10 S Female/Male	805888	10 mm	28.7	119	75
MIA M12 S Female/Male	805889	12 mm	28.5	113	75

Ball Valves BVE / BVS and CVE / CVS

The **BVE/BVS/CVE/CSV** are ball valves with fully hermetic body design for the Refrigeration and A/C industry.

Features

- Maximum working pressure 45 bar
- BVS models have 7/16-20 UNF – 1/4" flare connection and Schrader valve
- Hermetic design with Laser welded valve body
- Patented Laser welding process
- Full flow design for minimal pressure drop
- Two threads at valve body for easy mounting
- Bi-directional flow characteristics
- Valve cap retained by strap attached to main body
- Applied Standards EN 12284. EN 378. EN 12420. PED 2014/68/EU
- RoHS 2002/95/EC
- UL File No: SA5312
- **CE** acc. PED 2014/68/EU



BVE / CVE



BVS / CVS

Selection Table BVE/ CVE

Type BVE	Part No.	Type BVS	Part No.	Connection size ODF		Weight (kg)	Marking
				(inch)	(mm)		
BVE-014	806730	BVS-014	806750	1/4"		0.16	UL
BVE-M06	806731	BVS-M06	806751		6	0.16	
BVE-038	806732	BVS-038	806752	3/8"		0.16	
BVE-M10	806733	BVS-M10	806753		10	0.16	
BVE-012	806734	BVS-012	806754	1/2"		0.36	
BVE-M12	806735	BVS-M12	806755		12	0.38	
BVE-058	806736	BVS-058	806756	5/8"	16	0.38	
BVE-034	806737	BVS-034	806757	3/4"		0.44	
BVE-078	806738	BVS-078	806758	7/8"	22	0.46	
BVE-118	806739	BVS-118	806759	1 1/8"		1.04	
BVE-M28	806740	BVS-M28	806760		28	1.04	CE UL
BVE-138	806741	BVS-138	806761	1 3/8"	35	1.64	
BVE-158	806742	BVS-158	806762	1 5/8"		2.43	
BVE-M42	806743	BVS-M42	806763		42	2.43	
BVE-218	806744	BVS-218	806764	2 1/8"	54	4.55	
BVE-258	806745	BVS-258	806765	2 5/8"		4.65	
BVE-318	806746	BVS-318	806766	3 1/8"		5.00	

Note: BVE-138 through BVE-318 range has CE marking according to hazard category 1 based on PED. BVE requires upgrade to Hazard category II and are under obtaining certification. Before selection or use, please contact EMERSON local sales offices for availability of approval.

Selection Table BVS/ CVS

Type CVE	Part No.	Type CVS	Part No.	Connection size ODF		Weight (kg)	Marking
				(inch)	(mm)		
CVE-014	808130	CVS-014	808150	1/4"		0.16	
CVE-M06	808131	CVS-M06	808151		6	0.16	
CVE-038	808132	CVS-038	808152	3/8"		0.16	
CVE-M10	808133	CVS-M10	808153		10	0.16	
CVE-012	808134	CVS-012	808154	1/2"		0.36	
CVE-M12	808135	CVS-M12	808155		12	0.38	
CVE-058	808136	CVS-058	808156	5/8"	16	0.38	
CVE-034	808137	CVS-034	808157	3/4"		0.44	
CVE-078	808138	CVS-078	808158	7/8"	22	0.46	

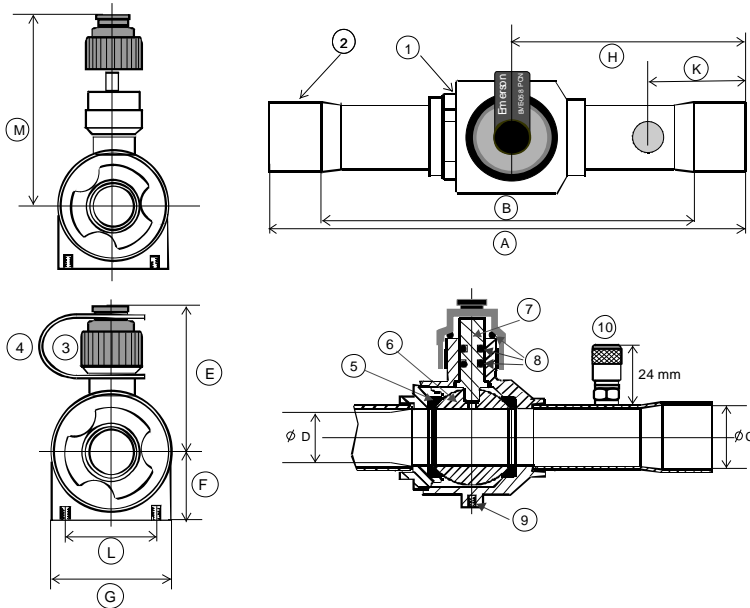
Ball Valves BVE / BVS and CVE / CVS

Technical Data

Max. working pressure PS	45 bar for BVE/BVS 60 bar for CVE/CVS
Test pressure PT	49.5 bar for BVE/BVS 66 bar for CVE/CVS
Medium temperature TS	-40...+120°C

Construction	Forged brass body. Copper extension tubes. Chrome plated ball
Applied Standards	EN 12284. EN 378. PED when applicable. RoHS. AD 2000-B1
Material	Body CW617N. Copper Tubes CW 024A acc. EN12420

Dimensions (mm)



- 1 Sealed brass body
- 2 Copper extension tubes
- 3 Plastic stem cap (Pocan)
- 4 Label strap
- 5 PTFE seats
- 6 Chromate brass ball
- 7 Stem
- 8 O-Rings
- 9 Mounting threads
- 10 BVS/CVS with Schrader connection
7/16-20 UNF-1/4" flare

Model	Nominal size C	A	B	D	E	F	G	H	K	L	M	Thread (9)	Cap (3)
BVE/S 014; CVE/S 014	1/4" ODF	120	104	8	41	14	23	56	26	15	60	M3	M18
BVE/S M06; CVE/S M06	6mm ODF	118	102										
BVE/S 038; CVE/S 038	3/8" ODF												
BVE/S M10; CVE/S M10	10mm ODF												
BVE/S 012; CVE/S 012	1/2" ODF	127	107	14	45	17	31	61	26	22	63	M4	
BVE/S M12; CVE/S M12	12mm ODF		101										
BVE/S 058; CVE/S 058	5/8" / 16mmODF												
BVE/S 034; CVE/S 034	3/4" ODF	157	125	20	49	20	40	77	35	31	67	M6	
BVE/S 078; CVE/S 078	7/8" / 22mmODF		118										
BVE/S 118	1 1/8" ODF	169	123	25	69	26	51	85	39	38	95		
BVE/S M28	28mm ODF												
BVE/S 138	1-3/8" / 35mm ODF	231	182	32	74	31	61	116	52	48	101	M6	
BVE/S 158	1-5/8" ODF												
BVE/S M42	42mm ODF	277	220	39	89	37	74	138	60	55	121		
BVE/S 218	2-1/8" / 54mm ODF	297	228	50	97	47	93	148	65	74	129	M36	
BVE/S 258	2-5/8" ODF		222						70				
BVE/S 318	3-1/8" ODF		213						80				

Accessories: Special seal caps (Pocan)

BVE/S and CVE/S Valve Size	Part No.	Thread (3)	Quantity per pack
1/4" ... 7/8" (6 ... 22mm)	806770	M18x1	10 pcs
1-1/8" ... 1 3/8" (28 ... 35mm)	806771	M27x1	10 pcs
1-5/8 (42 mm) ... 3-1/8"	806772	M36x1	10 pcs



