

Electronic controllers and sensors

Selection table electronic controllers

Description	Network Communication	
	Without	Modbus
Superheat Controllers and Stepper Motor Drivers		
Universal Stepper Driver Module for Electrical Control Valves EX4-8	EXD-U02	
Superheat Controller for Electrical Control Valves EX4-8		EXD-SH1/2
Superheat Controller for Electrical Control Valves EXM/L, EXN		EXD HP1/2
Economizer Controller for Tandem Compressors		
Enhanced Wet Vapor Injection with EXM/L		EXD TEVI
Pressure Transmitter		
Output Signal 4 ... 20 mA	PT5N	
Temperature Sensors		
NTC	TP1-NP..	
PT1000	ECN-Z.. / ECP-P..	
Compressor Soft Starter		
For Single Phase Compressor Motors with Up to 32 A	CSS	
Electronic Fan Speed Controllers		
Pressure Actuated, Current Range 0.1 ... 4 A	FSY/FSM	
Fan Speed Control Modules for EC-Type Motors	FSE	

Electronic superheat controllers and stepper motor drivers

Copeland designs superheat controllers and valve drivers for stepper motor driven control valves for all commercial refrigeration and air conditioning applications.

The EXD-U02 universal driver can be connected to any controller which can provide a 4-20 mA or 0-10 V analogue signal. The output is the opening/closing of EX4-8, CV4-6.5 and consequently the control of the refrigerant liquid or vapor mass flow in accordance with the analogue input.

EXD-SH1/2, EXD-HP1/2 and EXD-TEVI are superheat controllers and or economizer controllers with Modbus communication.

Sensors

PT5N series pressure transmitters are used to measure the suction and discharge pressures to modulate the compressor and fan capacities.

ECN, ECP, TP1 Temperature sensors (NTC/PT1000) are used to measure the suction and discharge temperatures.



EXD-SH1/2 controller for EX/CV with ModBus communication capability

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

Features

- EXD-SH1: Control of one valve
- EXD-SH2: Control of two valves in two independent circuits
- 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 Copeland EX4-8 & CV4-6.5
- For multiple refrigerants, including ultralow temperature refrigerant R23 (only with ECN-Z60)
- Released for applications using A2L and A3 refrigerants
- Modbus (RTU) communication
- EXD-SH2: capability the operation of two evaporator/ EXV / Pressure sensor with single pressure transmitter
- Integrated keyboard with two lines display
- Monitoring of sensors and detection of sensor (ECN-Z.../TP1-.../PT5N-...) 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

Type	Description	Part No.	
Controllers		Multipack (25 pieces)	Single Pack
EXD-SH1	Controller for single refrigeration circuit	-	807 855
EXD-SH2	Controller for two independent refrigeration circuits	-	807 856
EXD-M03	Molex terminal with 3 meter wires	-	807 865
Temperature Sensors		Multipack (20 pieces)	Single Pack
TP1-NP3	Temperature sensor with 3 meter cable	804489M	804 489
TP1-NP6	Temperature sensor with 6 meter cable	804490M	804 490
TP1-NP12	Temperature sensor with 12 meter cable	804491M	804491
ECN-Z60	Ultralow temperature sensor with 6 meter cable	-	807 826
Pressure Transmitters: PT5N (7/16-20UNF Connection)		Multipack (25 pieces)	Single Pack
PT5N-07M	Sensing pressure range -0.8...7 bar	805350M	805350
PT5N-18M	Sensing pressure range 0...18 bar	805351M	805351
PT5N-30M	Sensing pressure range 0...30 bar	805352M	805352
PT5N-50M	Sensing pressure range 0...50 bar	805353M	805353
PT5N-150D	Sensing pressure range 0...150 Bar (1/4 NPTF)	805379M	805379
Pressure Transmitters: PT5N (Brazeing Connection)		Multipack (25 pieces)	Single Pack
PT5N-07T	Sensing pressure range -0.8...7 bar	805380M	805380
PT5N-10P-FLR	Sensing pressure range -0.8...10 bar	805391M	805391
PT5N-18T	Sensing pressure range 0...18 bar	805381M	805381
PT5N-30T	Sensing pressure range 0...30 bar	805382M	805382
PT5N-50T	Sensing pressure range 0...50 bar	805383M	805383
PT5N-30P-FLR		805389M	805389
PT5-30L-FLR	Sensing pressure range 0...30 bar	802389M	802389

Note: Pressure range 18 bar for system with R410A, 30 bar for R410A economizer, 50/150 bar for CO₂

Accessories

Type	Description	Part No.	
M12 Plug And Cable For Pressure Transmitters PT5N		Multipack (20 Pieces)	Single Pack
PT4-M15	1.5 m	804803M	804803
PT4-M30	3.0 m	804804M	804804
PT4-M60	6.0 m	804805M	804805
PT4-M10 FLR	1.0 m cable length, 2-wire, ATEX certified	804801M	804801
PT4-M15 FLR	1.5 m cable length, 2-wire, ATEX certified	804802M	804802
PT4-M60-FLR	6.0 m cable length, 2-wire, ATEX certified		804806
Uninterruptible Power Supply			
ECP-024	Backup battery with two outputs for two controllers	-	804558
K09-P00	Electrical terminal kit for ECP-024	-	804 560
EXD-PM	Super cap for only EXD-SH1 (Two pieces of EXD-PM required for one EXD-SH2)	-	807 854

Available configuration options

	Selectable Valves	
	EX4-8	CV4-6.5
Refrigerants	R11, R134a, R507, R404A, R407C, R410A, R124, R744, R407A, R407F, R23, R32*, R1234ze*, R448A, R449A, R450A, R513A, R290*, R1270*, R454C*, R452B*, R454B*, R454A, R452A, R444B*, R455A*, R1233zde, R1234yf	R744 (CO ₂)
Main Function	Superheat or and temperature control	
Pressure Transmitters	PT5N or 3rd party ratio metric	

Note: *) EXD-SH1/2 is not ATEX approved.

Technical data: EXD-SH1/2

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
Marking	

Mounting	DIN Rail Mounted
Accessory (12 Poles Molex Plug with 3 Meter Cable)	Type: EXD-M03 (to be Ordered Separately)

Optional EXD-PM supercap

Supply Voltage	24 VAC/DC $\pm 10\%$, 50/60 Hz
Output Voltage	12 VDC
Max. Output Current	-1.2 A -350 mA during charging
Power Consumption	12 VA
Terminals	Suitable for removable screw version: wire size 0.14... 1.5 mm ²
Output: to Driver/Controller	Suitable for one EXD-SH1 Two EXD-PM for one EXD-SH2
Charging Time	60 seconds
Max. Cable Length Between EXD-PM and EXD-SH1/2	50 cm AWG18 wire size

Protection Class	24 VAC/DC $\pm 10\%$, 50/60 Hz
Mounting	12 VDC
Temperatures Storage Operating/Surrounding	-20...+70°C -10...+60°C
Housing	Self-extinguishing ABS
Relative Humidity	20...85% non-condensing
Marking	
Weight	125 g

Optional uninterruptible power supply ECP-024

Backup Battery Type	Lead acid gel rechargeable battery
Number of Backup Batteries	2, each 12 VDC, 0.8 Ah
Supply Voltage	24 VAC $\pm 10\%$, 50-60 Hz
Output Voltage, UB	18 VDC
Number of Outputs to Drivers	2
Battery Recharge Time	Approximately 2 hours
Marking	

Protection Class	IP 20
Mounting	DIN rail mounted
Temperatures Storage Operating/Surrounding	-20...+65°C -10...+60°C
Housing	Aluminum
Relative Humidity	< 90% non-condensing
Connection	Screw terminals for wire size 0.5...2.5 mm ²
Accessories: Terminals	K09-U00 Part No: 804559
Weight	1200 g

Input, output EXD-SH1/2

Description	Specification
Analogue Input(s): NTC Temperature Sensor Analogue Input: PT1000 Temperature Sensor	TP1-N... (-45...+150°C operating range) ECN-Z60 (-80 ... -40°C sensing range)
Analogue Input(s): 4...20 mA Pressure Transmitters Analogue Input(s): 0.5...4.5 V Pressure Transmitters	PT5N 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 V AC/DC, Max. 1 A Inductive Load 24 V AC, Max. 0.5 A
Communication	RS485 RTU Modbus, Two Wires

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.

Features

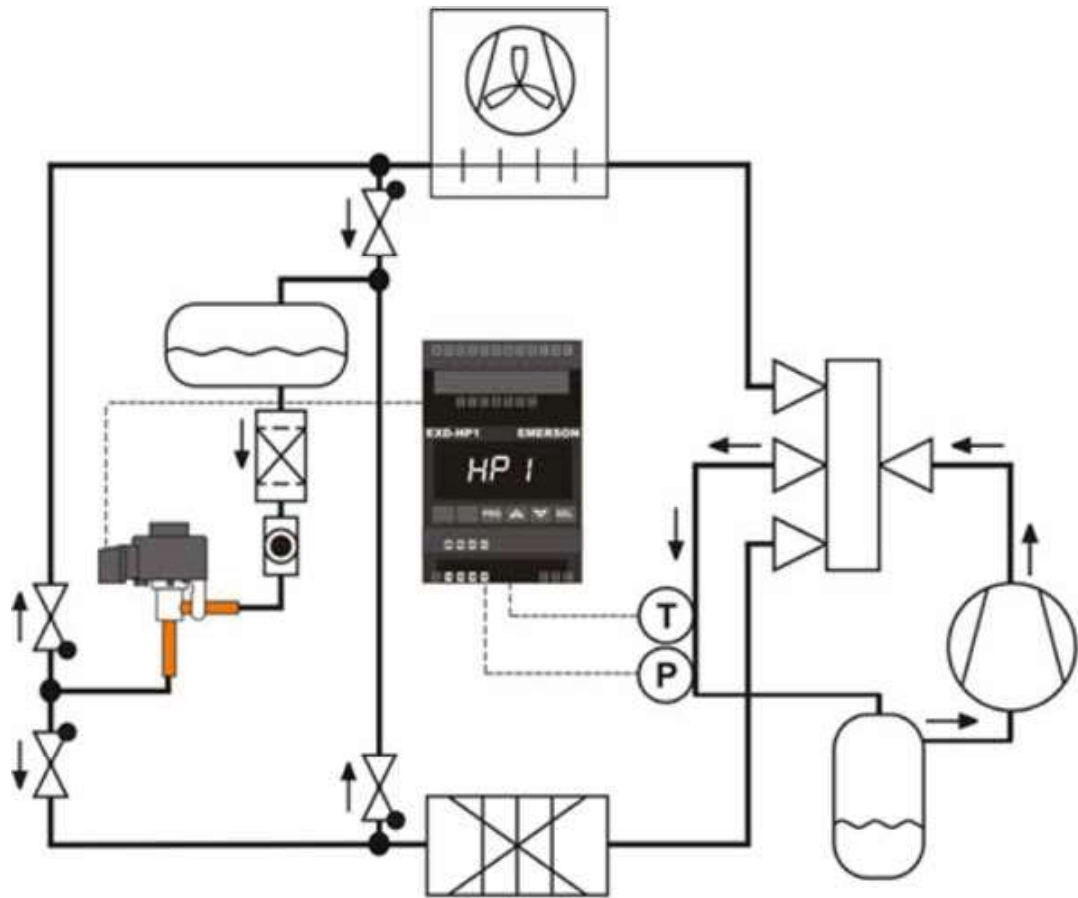
- Self adapting superheat/economizer control in conjunction with Copeland stepper motor driven electronic expansion valves EXM/EXL
- Discharge hot gas temperature control by liquid/vapor injection to compressor
- EXD-HP1: Controller with one EXV output
- EXD-HP2: Controller with two independent EXV outputs
- Controllers as slave with Modbus (RTU) communication capability. All data (read/write) accessible by any third party controller having modbus communication (RTU)
- Upload/download key (accessory) for transmission of parameter settings among controllers with the same setting
- Released for applications using A2L and A3 refrigerants
- 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 / detection of sensor and wiring failures
- Integrated display (3-digit LEDs) and keyboard
- Electrical connection via plug-in type screw terminals (included with controller)
- DIN rail mounting housing



EXD-HP2

Selection table

Type	Description	Part No.	
		Multipack (20 pieces)	Multipack (20 pieces) Single pack
EXD-HP1	with 1 EXV output	807836M	-
EXD-HP2	with 2 EXV outputs	807837M	-
Valves / coils			
EXM-B0A	Electronic expansion valve	800399M	-
EXM-B0B		800400M	-
EXM-B0D		800401M	-
EXM-B0E		800402M	-
EXM-125	Coil 12 VDC	800403M	-
EXL-B1F	Electronic expansion valve	800405M	-
EXL-B1G		800406M	-
EXL-125	Coil 12 VDC	800407M	-
EXN-B2K	Electronic expansion valve (not selectable in conjunction with R290)	-	800421
EXN-B2L		-	800422
EXN-125	Coil 12 VDC	-	800420
Temperature sensor			
ECP-P30	Temperature sensor with 3 m cable	-	804495
Suction pressure (refrigerant)			
PT5N-07M / PT5N-07T	-0.8...7 bar	805350M / 805380M	805350 / 805380
PT5N-10P-FLR	-0.8...10 bar	805391M	805391
PT5N-18M / PT5N-18T	0...18 bar	805351M / 805381M	805351 / 805381
PT5N-30M / PT5N-30T	0...30 bar	805352M / 805382M	805352 / 805382
PT5N-30P-FLR		805389M (25 pcs)	805389
PT5-30L-FLR	Sensing pressure range 0...30 bar	802389M	802389
Plug and cable assembly for pressure sensors			
PT4-M15	1.5 m cable length	804803M	804803
PT4-M30	3.0 m cable length	804804M	804804
PT4-M60	6.0 m cable length	804805M	804805
PT4-M60-FLR	6.0 m cable length, 2-wire, ATEX certified	-	804806



Technical data

Supply Voltage	24 VAC/DC $\pm 10\%$
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
Mounting	DIN Rail Mounted
Marking	CE

Input sensors, output valves

Description	Specification
Temperature Input	ECP-P30 (3 meter cable length) Range: -30°C...+150°C
Pressure Sensor Input	PT5N Signal: 4 ... 20 mA

EXD-TEVI economizer controller for tandem compressors

EXD-TEVI is a stand-alone controller for enhanced wet vapor injection for Copeland scroll tandem compressors in heating applications.

Features

- Copeland solution for specified operating map of tandem scroll
- Two EXL valves can be driven in parallel for required wide injection capacity
- Input signals: Injection (intermediate) pressure and temperature sensor as well as two compressor discharge temperature sensors
- Two independent digital inputs for recognition of tandem compressors operation
- High discharge temperature alarm
- Monitoring of sensors and sensor wiring and detection of sensor wiring failures
- Controllers as slave with Modbus (RTU) communication capability
- Upload/download key (accessory) allows to copy parameter settings from one controller to others
- Integrated 3½ digit 7-segment display with 6 indicator LEDs
- Electrical connection via plug-in type screw terminals (included with controller)



EXD-TEVI

Selection table

Type	Description	Part No.	
		Multipack	Single pack
Controller			
EXD-TEVI	Controller with connectors	807838M	807838
Temperature Sensors			
TP1-NP3	Temperature sensor with 3 m cable	804489M (20pcs)	804489
TP1-NP6	Temperature sensor with 6 m cable	804490M (20pcs)	804490
TP1-NP12	Temperature sensor with 12 m cable	804491M (20pcs)	804491
Pressure transmitters: PT5N			
PT5N-30M	Sensing pressure range 0...30 bar (7/16-20UNF connection)	805352M	805352
PT5N-30T	Sensing pressure range 0...30 bar (Brazing connection)	805382M	805382
Plug and cable assembly for pressure transmitters			
PT4-M15	1.5 m cable	804803M	804803
PT4-M30	3 m cable	804804M	804804
Electronic expansion valve with coils			
EXL-B1F	Valve body	800405M	-
EXL-B1G		800406M	-
EXL-125	coil for EXL 12 VDC	800407M	-

Technical data

Supply Voltage	24 VAC/DC $\pm 10\%$
Power Consumption	EXD-TEVI: Max. 20 VA
Digital Inputs	2 (Potential Free)
Relay Output (Alarm)	SPDT, with AgSnO Contacts Inductive (AC15) 24 V AC: 1 A Resistive: 24 V AC/DC: 4 A
Plug-In Connector Size	Removable Screw Version Wire Size 0.14 ... 1.5 mm ²

Protection Class	IP 20
Mounting	DIN Rail Mounted
Marking	CE

Technical data: sensors

Description	Specification
Temperature Sensors	1 x 10k NTC for Injection Line Temperature (TP1-N...) 2 x 86k NTC for Discharge Gas Temperature (Part of Compressor Delivery)
Pressure Transmitter EVI	PT5N-30M/T: 4...20 mA (Range: 0...30 bar)

Universal driver modules series EXD-U02

Stepper motor valve driver specifically designed for the EX and CV series of electrical control valves in applications such as:

- Capacity control by means of hot gas bypass
- Evaporating pressure regulator or crankcase pressure regulator
- Hot gas flow such as heat reclaim
- Condensing pressure regulation and liquid duty
- Refrigerant mass flow control in CO₂ transcritical systems

Features

- Plug and play, no parameter setting
- Valve opening proportional to 4...20 mA or 0...10 V analogue input signal
- Digital input can be used to force valve closing
- Easy configurable by dip-switches
- Easy wiring
- Fully tested and ready for operation

Selection table

Type	Part No.	Description
EXD-U02	804752	Universal Driver Module
EXD-U02 Contr. Kit	808053	Universal Driver Module with Terminal Kit
K09-U00	804559	Terminal Kit for EXD-U01

Accessories

Type	Part No.	Description
ECP-024	804558	Uninterruptible power supply for up to 2 drive modules
K09-P00	804560	Electrical terminal kit for ECP-024
ECT-323	804424	Transformer 25 VA
ECT-623	804421	Transformer 60 VA 24V/230 VAC – DIN-rail mounting

Function

The driver module EXD-U02 requires an analog input signal of 4...20 mA or 0...10 V. The output is the closing/opening of EX/CX valve series and consequently the control of liquid or vapor refrigerant mass flow in accordance with the analog input. The universal driver module can be connected to any controller which can provide a 4...20 mA or 0...10 V analog signal. This gives extreme flexibility to system manufacturers to use any desired controller and achieve different functionalities. The universal driver module keeps the valve at fully close position when the input signal is 4 mA or 0 V. The valve will be fully open at 20 mA or 10 V.

Optional uninterruptible power supply ECP-024

The optional uninterruptible power supply ECP-024 contains a rechargeable lead-acid battery, which provides enough energy to close the valve in case of power loss. ECP-024 can be connected to two EXD-U01 Driver Modules for closure of up to two valves.

Technical data

Supply Voltage	24 VAC ±10%, 50-60 Hz Note: 24 VDC supply voltage can be used but it results to lower MOPD and it needs to be verified by system manufacture.
Supply Current	To be protected by a 1.0 A external fuse
Power Consumption	10 VA in conjunction with EXV
Protection Class	IP20
Weight	800 g
Marking	

Analog Input Signal Burden	4...20 mA 364 Ω
Analog Input Signal Impedance	0...10 V 27 kΩ
Digital Input	24 VAC ±10%, 50-60 Hz 24 VDC ±10%
Connector	Screw terminals for wire size 0.5...2.5 mm ²
Mounting	DIN rail mounted
Housing	Aluminum

Optional uninterruptible power supply ECP-024

Backup Battery Type	Lead acid gel rechargeable battery
Number of Backup Batteries	2, each 12 VDC, 0.8 Ah
Supply Voltage	24 VAC ±10%, 50-60Hz
Output Voltage, UB	18 VDC
Number Of Outputs to Drivers	2
Marking	

Connection	Screw terminals for wire size 0.5...2.5 mm ²
Mounting	DIN rail mounted
Protection Class	IP20
Housing	Aluminum



EXD-U02

Options

- Uninterruptible power supply ECP-024 to automatically close valve after power down



K09-U00



ECP-024



K09-P00



ECT-323



ECT-623

Compressor soft starter CSS-25U / CSS-32U

The compressor soft starter CSS-25U / CSS-32U is used for switching, protecting and starting current limitation of single phase compressors in residential heat pump applications.

Features

- For motors with maximum operating current up to 25 A/32 A
- Limitation of starting current to less than 45 A (Part No. 805209 less than 30 A)
- Self-adjusting for use in 50 Hz or 60 Hz supply
- Self-adjusting to motor current - no manual adjustment or calibration necessary
- Alarm relay output
- Start capacitor for improved motor acceleration is switched off after start
- Low voltage shutdown
- Locked rotor recognition and shutdown
- Delay function to limit number of motor starts per hour
- Thyristor protected contactor for long life
- No extra motor contactor needed
- Self-diagnostics
- Mounting clip for easy installation allows DIN rail mounting in two directions
- Easy connection by cage type screw terminals wire Ø 4 mm



CSS-32W

CE Standards:

- LVD 2014/35/EU Low Voltage Directive
- EN 60947-1 Low voltage switchgear and controlgear
- EN 60947-4-2 Contactors and motor-starters - AC semiconductor motor controllers and starters
- EN 60335-1, EN 60335-2-40: Safety of household and similar electrical appliances (Part No. 805 204 and 805 205 only , confirmed and certified by independent test lab VDE.)
- EMC 2014/30/EU
- ROHS 2011/65/EU

Selection table

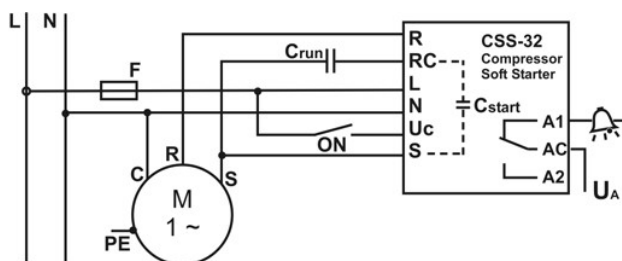
Type	Part No.	Part No. (20 pieces)	Description	I max
CSS-32U	805212	805212 M	Soft Starter Incl. Mounting Clip, VDE Released Version	32 A
CSS-25U	805213	805213 M	Soft Starter Incl. Mounting Clip, VDE Released Version	25 A
CSS-25U	805214	805214 M	Soft Starter Incl. Mounting Clip (limitation of starting current to less than 30 A)	25 A
K00-003	807663	-	3-pol screw connector to alarm output for wires up to 2.5 mm ² ; bag with 50 pieces	

Technical data

Operating Voltage	230 V 50/60 Hz Nominal
Nominal Compressor Current	CSS-32U: 32 A Max. CSS-25U: 25 A Max.
Maximum Start Current	CSS-32U: 45 A CSS-25U (805 205): 45 A CSS-25U (805 209): 30 A
Operating Temperature	-20 ... +55°C Non Condensing
Storage Temperature	-20 ... +65°C Non Condensing
Start Capacitor	200 ... 240 µF
Time Delay After Stop	0.5 ... 5 Min

Alarm Relay, AgNi (SPDT)	
Resistive (AC1) Max.	250 V _~ / 3 A 30 V= / 3 A
Flexible Cable Cross Section	
CSS-32U/-25U All Terminals	0.25 ... 4 mm ²
Flexible Cable Cross Section	
Alarm Output Connector K00-003	0.25 ... 2.5 mm ²
Max. Vibration (At 10 ... 1000 Hz)	4 g
Weight	430 g
Protection Acc. IEC 529	IP 20

Wiring diagram



CSS contacts

R = Output Motor Run Winding
 RC = Output Run Capacitor
 L = 230 V / AC Power Input
 N = Neutral Line
 Uc = Start Input (ON if Connected to 230 V)
 S = Output Start Winding from Start Capacitor
 A1, AC, A2 = Alarm Relay Contact

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 designers choice for all heat pump, refrigeration and air conditioning applications.



PT5N-30M



PT5N-30T

Features

- Piezo-resistive sensor with output signal 4...20 mA and 2-wire connection for the precise operation of superheat, compressor or fan control systems
- Specially calibrated pressure ranges with $\pm 1\%$ accuracy performance to fulfill demands of today's refrigeration and HVAC applications
- Fully hermetic
- PT5N-xxM with 7/16"-20UNF pressure connection and Schrader valve opener
- PT5N-xxT with 40 mm stainless steel tube and integrated brazing neck for easy mounting in applications requiring a fully hermetic system solution
- PT5N-150D for subcritical and transcritical CO₂ systems
- Vibration, shock and pulsation resistant
- Protection class IP65 / IP67 (type-specific)
- UL (File No. E499688)

Selection table

Type	Part No.		Pressure Range For Signal Output (bar) *	Output Signal (mA)	Medium Temp. Range at Pressure Connection (°C)	Max. Allowable Pressure PS (bar)	Test Pressure PT (bar)	Burst Pressure (bar) *	Pressure Connection
	Single Pack	MultiPack**							
PT5N-07M	805350	805350M	-0.8 .. 7	4 .. 20	-40 .. +135	27	30	150	7/16" - 20 UNF (with Schrader Valve Opener)
PT5N-18M	805351	805351M	0 .. 18			48	63	250	
PT5N-30M	805352	805352M	0 .. 30			60	100	400	
PT5N-50M	805353	805353M	0 .. 50			75	150	400	
PT5N-07T	805380	805380M	-0.8 .. 7			27	30	150	6 mm ODM
PT5N-18T	805381	805381M	0 .. 18			48	63	250	
PT5N-30T	805382	805382M	0 .. 30			60	100	400	
PT5N-50T	805383	805383M	0 .. 50			75	150	400	
PT5N-150D	805379	-	0 .. 150			150	320	1000	" NPT (male)

Note: *) Sealed Gauge Pressure

**) 25 pcs

Selection table plug/cable assemblies: assembly fits all models

Type	Part No.		Cable Length	Weight (g/Piece)	Temperature Range
	Single Pack	Multi Pack*			
PT4-M15	804 803	804 803M	1.5 m	50	-50 ... +80°C Static Application -25 ... +80°C Mobile Application
PT4-M30	804 804	804 804M	3.0 m	80	
PT4-M60	804 805	804 805M	6.0 m	140	

Note 1: *) 20 pieces

Note 2: PT4-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.

Technical data pressure transmitter

Supply Voltage (Polarity Protected)	Nominal: 24 VDC Range: 7.. 33 VDC	Sensor Lifetime	30 Million Load Cycles with 1.3 Times of Nominal Pressure
Medium Compatibility	A1: R134a, R410A, R407C, R404A, R507, R448A, R449A, R513A, R450A, R452A, R23, R124, R744 A2L: R32	Electrical Connection PT4-Mxx Cable Assembly	M12 Connection according to IEC 61076-2-101:2012 Prefabricated, various cable lengths
Operating Current	Maximum ≤ 23 mA 4...20 mA Output	Approvals/Marking	 acc. EMC Directive (EN 61326-2-3)  cULus(LISTED) (UL File Nr. 499688) pending
Load Resistance	$R_L \leq \frac{U_b - 7.0 \text{ V}}{0.02 \text{ A}}$	Protection Class (EN 60529)	IP67 with mounted plug and cable assembly
Response Time	≤ 2 ms	Vibration at 15...2000Hz	20 g according to IEC60068-2-6
Temperatures Transport and Storage Operating Ambient Housing Medium:	-50 ... +100 °C -30 ... +85 °C -40 ... +135 °C (UL listed -40...+100 °C)	Materials Housing Pressure Connection PT5N-xxT	Stainless steel 1.4404 / AISI316L Stainless steel 1.4301 / AISI 304

Accuracy performance

Type	Total Error *	Temperature Range
PT5N-07 / 18	$\pm 1\%$ FS	-40 ... +20 °C
PT5N-30 / -50/	$\pm 1\%$ FS $\pm 2\%$ FS	+10 ... +50 °C -10 ... +80 °C
PT5N-150D	$\pm 1\%$ FS $\pm 2\%$ FS	+10 ... +50 °C -10 ... +90 °C

*) Total Error Includes Non-Linearity, Hysteresis, Repeatability As Well As Offset And Span Drift Due To The Temperature Changes.
Note: % FS is Related to Percentage of Full sensor Scale.

Electronic fan speed controller series FSY/FSM

Electronic speed controllers FSY / FSM control the speed of fan motors depending on pressure.

Features

- Adjustable pressure for cut-off
- High Voltage Triac (800 Volts)
- Integrated protection circuit against voltage peaks
- Compact design
- Easy mounting and adjustment
- Easy retrofit in existing systems
- No additional gasket required (completely molded into plug)
- Multi-position plug with EMC filter cable for flexible installation
-  per 2014/30/EU (together with FSF cable)
- Other pressure connection upon request (minimum order volume 100 pieces)



FSY-43S

Selection table

Type	Part No.	Pressure range *	Factory-setting *	Max. Allowable Pressure PS	Test Pressure PT	Pressure connection
Fan Speed Controllers with Cut-off Mode						
FSY-41S	0715533	4.0...12.5 bar	8.0 bar	27 bar	30 bar	7/16"-20 UNF female
FSY-42S	0715534	9.2...21.2 bar	15.0 bar	32 bar	36 bar	
FSY-43S	0715537	12.4...28.4 bar	21.8 bar	45 bar	50 bar	
Fan Speed Controllers with Min. Speed Mode						
FSM-41S	0715520	4.0...2.5 bar	8.0 bar	27 bar	30 bar	7/16"-20 UNF female
FSM-42S	0715521	9.2...21.2 bar	15.0 bar	32 bar	36 bar	
FSM-43S	0715522	12.4...28.4 bar	21.8 bar	45 bar	50 bar	

Note: *) Pressure at which fan is switched off (FSY) or at which fan is running with minimum speed (FSM)

Cable assemblies with plug and EMC filter

Type	Part No.	Temperature Range	Cable Length
FSF-N15	804640	Temperature Range: -50...+80°C	Cable length 1.5 m
FSF-N30	804641		Cable length 3.0 m
FSF-N60	804642		Cable length 6.0 m
Seal Ring Pack	803780	Copper Gaskets 100 pcs	

Technical data

Supply Voltage	230 VAC, +15%, -20%, 50/60 Hz
Nominal Current (See Diagram Below)	FSY: 0.1 – 4.0 A FSM: 0.5 – 4.0 A
Starting Current	Max. 8 A/5 Sec.
Medium Compatibility	R410A, R134a, R404a, R507, R407C, R407A, R407F, R1234ze, R452A, R448a, R449a, R450A, R513A, R22
Protection Class According to IEC529 /EN 60529	IP 65 (with Fitted Connectors FSF-xxx)
Temperature Ranges Ambient Storage & Transportation Medium	-20...+55°C (>40°C See Diagramm) -30...+70°C -20...+70°C

Max. Current vs Ambient Temperature

Note: 3.0A at 55°C

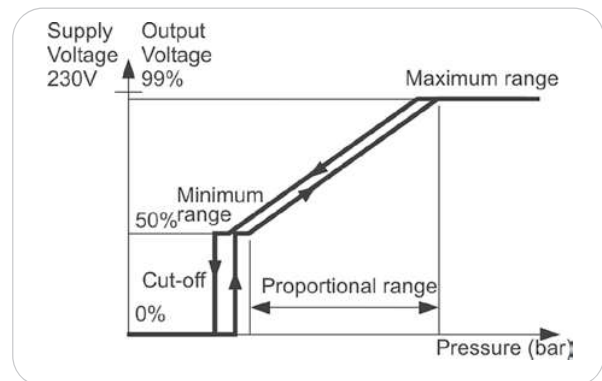
Pressure Change Per Turn of Adjustment Screw	FSY-41: 4.0...12.5 bar Clockwise ~ +1.2 bar Counterclockwise ~ -1.2 bar
	FSY-42: 9.2...21.2 bar Clockwise ~ +2.5 bar Counterclockwise ~ -2.5 bar
	FSY-43: 12.4 .. 28.4 bar Clockwise ~ +3.3 bar Counterclockwise ~ -3.3 bar
Proportional Range	FSY-41: 2.5 bar FSY-42: 3.8 bar FSY-43: 4.6 bar
Housing Material	PC and PA
Marking	CE (EMC 2014/30/EU, LVD 2014/35/ EU, RoHS 2011/65/EU) (FSY)

Function diagram

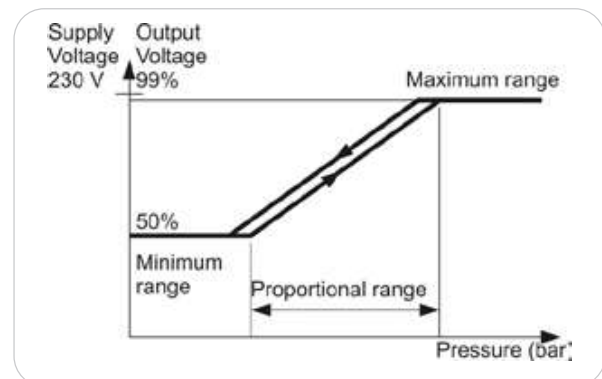
The control behaviour can be easily described by looking at the function of output voltage versus input pressure: In the maximum range the FSY provides a constant output voltage of approximately 1% below the supply voltage. The fan is running at maximum speed.

Along the proportional range, the output voltage varies between maximum and minimum voltage of approximately 50% of the supply voltage. This causes the fan to slow down from maximum to minimum speed.

Further decrease of pressure in the minimum range leads to cut-off of the fan motor. Reincrease of input pressure will start the motor with a hysteresis of approximately 0.7 bar to avoid cycling. The pressure from which motor cuts off is adjustable (see selection table - adjustment range).



FSY



FSM

FSE fan speed control module

Electronic fan speed control modules FSE generate a 0...10 V signal, which is used to control the speed of condenser fan motors in commercial refrigeration and air-conditioning systems. Ideal for use with high efficient EC-motors, but can be also used with phase cut controllers for induction motors.

Features

- Energy saving due to improved cooling efficiency
- Pressure for minimum speed adjustable
- Small proportional band and large hysteresis to minimize cycling at small pressure changes
- Reduced fan noise level during low ambient temp. conditions
- Improved overall performance of cooling system
- Easy installation with cables for power supply and motor connection factory wired
- IP 65 protection for outdoor mounting suitable for any size of EC fan motors
- UL file nr.: E355325 (Released for 43 bar)



FSE Control Modules

Selection table control modules FSE

Type	Part No.	Adjustment Range PCut*	Factory settings	Max. Allowable Pressure PS	PT	Pressure Connection
FSE-01S	804 701	4 ... 12.5 bar	7.8 bar	27 bar	30 bar	7/16" -20 UNF female
FSE-02S	804 706	10 ... 21 bar	15.5 bar	32 bar	36 bar	7/16" -20 UNF female
FSE-03S	804 711	12 ... 28 bar	20.4 bar	45 bar	50 bar	7/16" -20 UNF female

Cable assemblies for connection of FSE control module to controller

Type	Part No.	No of Leads	Diameter of Leads	Temperature Range	Cable Length
PS3-N15	804 580	3	0.75 mm ²	-25...+80°C	1.5 m
PS3-N30	804 581				3.0 m
PS3-N60	804 582				6.0 m

Technical data FSE

Supply Voltage	10 V; Supplied by Controller
Operating Current 0...10 VDC Output	Max. 1 mA
Medium Compatibility	R410A, R134a, R404a, R507, R407C, R1234ze, R452A, R448A, R449A, R450A, R513A, R22
Protection Class (IEC529/EN 60529)	IP 65 with Cable Connector Assemblies PS3-Nxx

Pressure Connection FSE-01S and FSE-02S FSE-03S	Brass Stainless Steel
Temperature Range Storage and Transportation Operation	-30 ... +70°C -20 ... +65°C
Materials Housing Cover	PA
Marking	UL (File No.E355325)