EXD-SH1/2 Controller for EX/FX/CX with ModBus Communication Capability

Technical Bulletin

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 EMERSON FX5-9, EX4-8 and CX4-7 series
- For multiple refrigerants, including ultralow temperature refrigerant R23
- Modbus (RTU) communication
- Integrated keyboard with two lines display
- Monitoring of sensors and detection of sensor (ECN/PT5) /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. Multipack	Single pack
Controllers EXD-SH1	Controller for single refrigeration circuit	-	**807855**
EXD-SH2	Controller for two independent refrigeration circuits	-	807856
EXD-M03	Molex terminal with 3 meter wires	-	807865
ECN-N30	Temperature sensor with 3 m cable	-	804496
ECN-N60	Temperature sensor with 6 m cable	-	804497
ECN-Z60	Ultralow Temperature sensor with 6 m cable	-	807826
Pressure transmitters: PT5 (7/16-20UNF connection)			
PT5-07M	Sensing pressure range -0.8…7 bar	**802350M**	**802350**
PT5-18M	Sensing pressure range 0…18 bar	**802351M**	**802351**
PT5-30M	Sensing pressure range 0…30 bar	**802352M**	**802352**
PT5-50M	Sensing pressure range 0…50 bar	**802353M**	**802353**
PT5-150D	Sensing pressure range 0…150 bar **(1/4 NPTF)**	-	802379
Pressure transmitters: PT5 (Brazing connection)			
PT5-07T	Sensing pressure range -0.8…7 bar	**802380M**	**802380**
PT5-18T	Sensing pressure range 0…18 bar	**802381M**	**802381**
PT5-30T	Sensing pressure range 0…30 bar	**802382M**	**802382**
PT5-50T	Sensing pressure range 0…50 bar	**802383M**	**802383**

Note: Pressure range 18 bar for system with R410A, 30 bar for R410A economizer, 50/150 bar for CO_2
PT5-xxM Multipack = 20 pcs, PT5-xxT Multipack = 10pcs

EMERSON

Accessories

Type	Description	Part No.	
		Multipack (20 pieces)	Single pack
M12 Plug and cable for pressure transmitters PT5			
PT4-M15	1.5 m	**804803M**	**804803**
PT4-M30	3.0 m	**804804M**	**804804**
PT4-M60	6.0 m	**804805M**	**804805**
Uninterruptible Power supply			
ECP-024	Backup battery with two outputs for two controllers	-	**804558**
K09-P00	Electrical Terminal Kit for ECP-024	-	**804560**
EXD-PM	Super cap for only EXD-SH1 (two pieces of EXD-PM required for one EXD-SH2)	-	**807854**

Description of functions

Controllers are featured with a main function as superheat controller or temperature controller. The main function is selectable.

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.
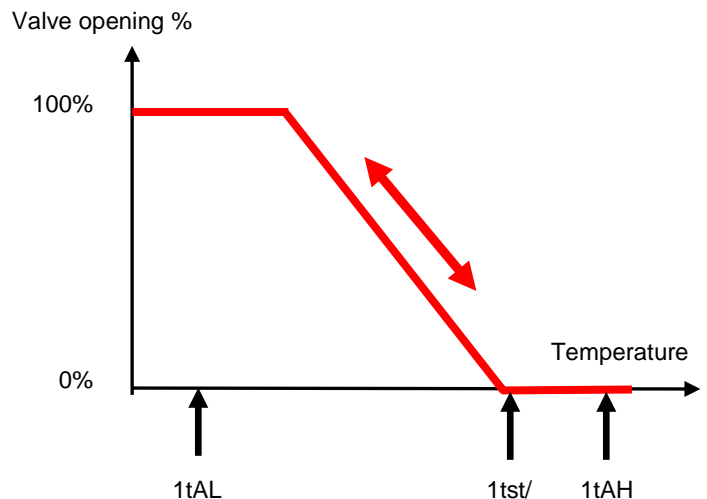
Temperature controller

The function is to maintain desired temperature by modulating refrigerant mass flow. If controller is operated as temperature controller, the connection of pressure transmitter is not required.

In order to fulfill 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)
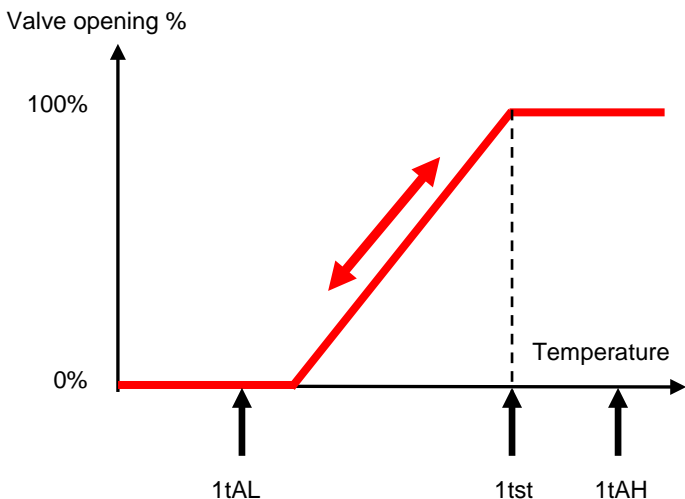
Temperature control in reverse sense
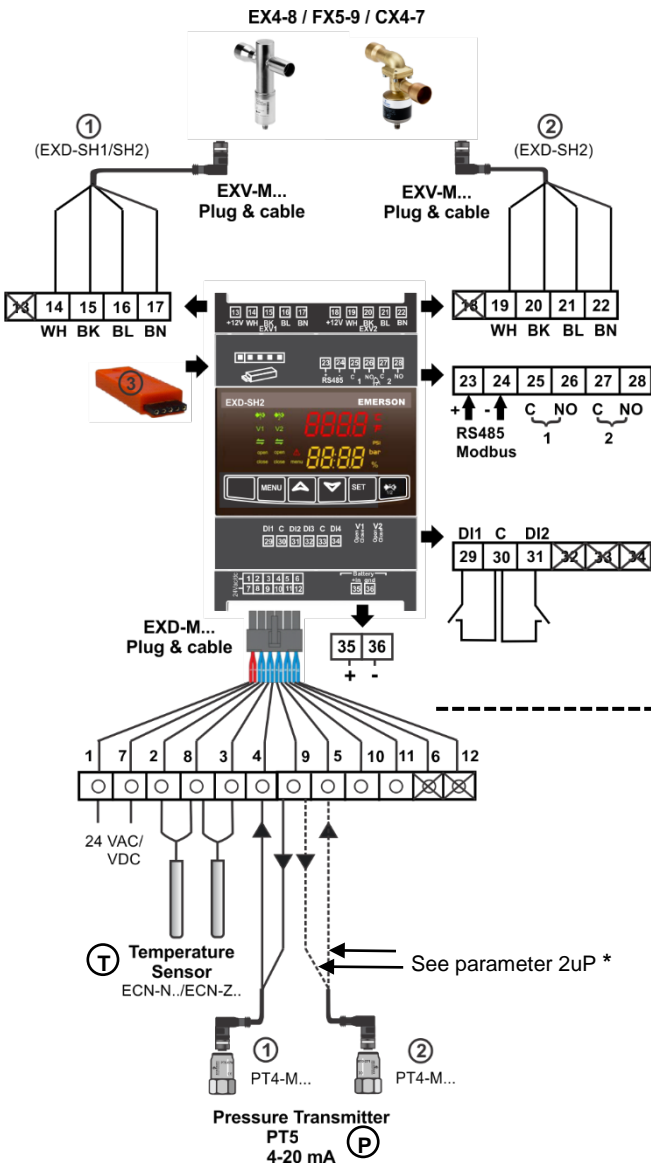**(B: Mass flow decreases if temperature rises)**

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)
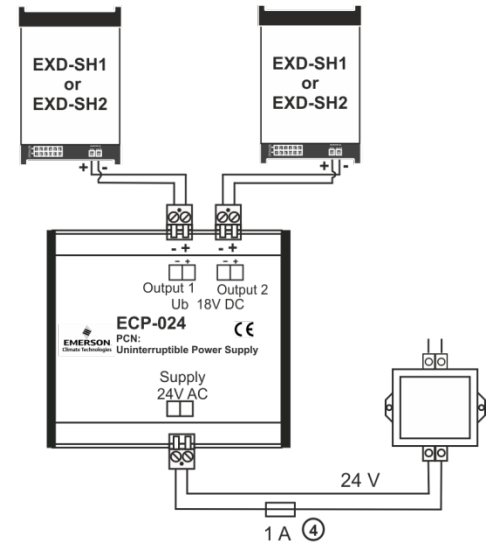
2

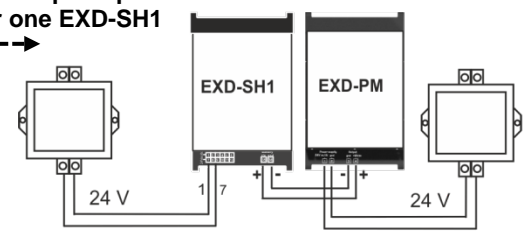# EXD-SH1/2 Controller with ModBus Communication Capability

Wiring

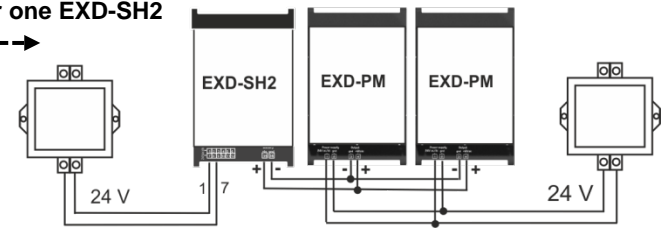Wiring options: UPS (ECP-024) /Supercap (EXD-PM)

①	Circuit 1 (EXD-SH1/SH2)		Electronic expansion valve circuit 1
②	Circuit 2 (EXD-SH2)	14-17	EXV-M… Electrical plug: wire colors *WH-white BK-black BL-blue BN-brown*
③	Download/upload key	19-22	Electronic expansion valve circuit 2 EXV-M… Electrical plug: wire colors *WH-white BK-black BL-blue BN-brown*
1 & 7	Supply voltage 24 VAC/DC		
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	PT5 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 PT5 (brown wire)	29 & 30	Digital input circuit1 (DI1) – Dry contact, potential free
Alternative ratiometric third Party Pressure Transmitter:		31 & 30	Digital input circuit 2 (DI2) – Dry contact, potential free
4 & 5	Pressure transmitter circuit 1 & circuit 2 (0.5…4.5 V signal)	35 & 36	Battery/Super capacitor connection terminal
11	+ 5 VDC voltage input	④	Fuse
10	GND Ground	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

Available configuration options

	Selectable Valves		
	FX5-9	**EX4-8**	**CX4-7**
Refrigerants	R134a, R407C, R410A, R22, R32*, R22, R134a, R407C, R410A, R450A, R513A	R22; R134a; R507; R404A; R407C; R410A; R124; R744; R407A; R407F; R23; R32*; R1234ze; R448A; R449A; R450A; R513A	R744 (CO_2)
Main function	Superheat control	Superheat or and temperature control	Superheat control
Pressure transmitters	PT5 or 3rd party ratio metric	PT5 or 3rd party ratio metric	PT5

*) R32 is for systems/regions which it does not consider R32 as potential explosive media (flammable or low flammable) and PED/CE marking is not required.
EXD-SH1/2 IS NOT ATEX APPROVED.

Technical Data: EXD-SH1/2

Supply voltage	24 VAC/DC ±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, EHL

Mounting	DIN rail mounted

Temperatures
    storage
    operating/ surrounding
	-25°C…+60°C
	  0°C…+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 EXD-SH1/2

Description	Specification
Analogue input(s): NTC Temperature sensor Analogue input: PT1000 Temperature sensor	ECN-N… (-45°C…+50°C sensing range) ECN-Z60 (-80°C…-40°C sensing range)
Analogue input(s): 4…20 mA pressure transmitters Analogue input(s): 0.5…4.5 V pressure transmitters	PT5 Third party ratio metric pressure transmitters (total error: ≤ 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: EX4-8, CX4-7 and FX5-9

EXD-SH1/2 Controller with ModBus Communication Capability

Optional EXD-PM supercap

Supply voltage	24 VAC/DC ±10%, 50/60 Hz		Protection class	IP 20
Output voltage	12 VDC		Mounting	DIN rail mounted

Max. output current	- 1.2 A
	- 350 mA during charging
			Temperatures
			  storage
			  operating/ surrounding
				-20°C…+70°C
				-10°C…+60°C

Power consumption	12 VA		Housing	Self-extinguishing ABS
Terminals	Suitable for removable screw version: wire size 0.14…1.5 mm^2		Relative humidity	20…85% non condensing
Output: to driver/controller	Suitable for one EXD-SH1 Two EXD-PM for one EXD-SH2		Marking	$C\epsilon$, EHC pending
Charging time	60 seconds		Weight	125 g
Max. cable length between EXD-PM and EXD-SH1/2	50 cm AWG18 wire size			

Optional Uninterruptible Power Supply ECP-024

Backup battery type	Lead acid gel rechargeable battery		Protection class	IP 20
Number of backup batteries	2, each 12 VDC, 0.8 Ah		Mounting	DIN rail mounted

Supply voltage	24 VAC ±10%, 50-60 Hz		Temperatures
			  storage
			  operating/ surrounding
				-20°C…+65°C
				-10°C…+60°C

Output voltage, UB	18 VDC		Housing	Aluminum
Number of outputs to drivers	2		Relative humidity	< 90% non condensing
Battery recharge time	approximately 2 hours		Connection	Screw terminals for wire size 0.5…2.5 mm^2
Marking	$C\epsilon$, EHC		Accessories: Terminals	K09-U00 Part.No: 804559
			Weight	1200 g

Dimensions [mm]
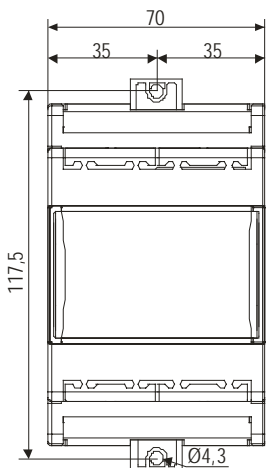
EXD-SH1/2 or EXD-PM
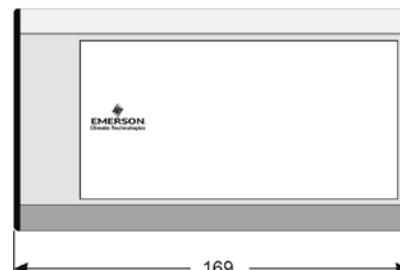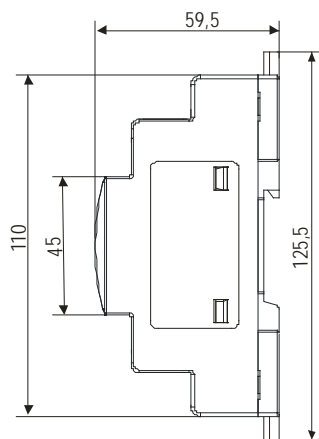
ECP-024
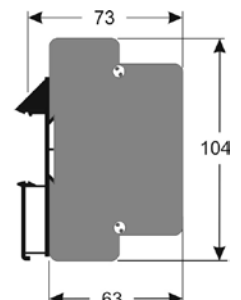
Communication

The use of communication is not necessary/mandatory; however, the communication is available for connection to upper level of system controller (third party controller) in order to perform data and commands transfer as well as data logging. EXD-SH1/2 act as slave and third party controller is master. In case of several EXD-SH1/2 connections to master, each driver needs to be addressed for proper communication.

Bus topology
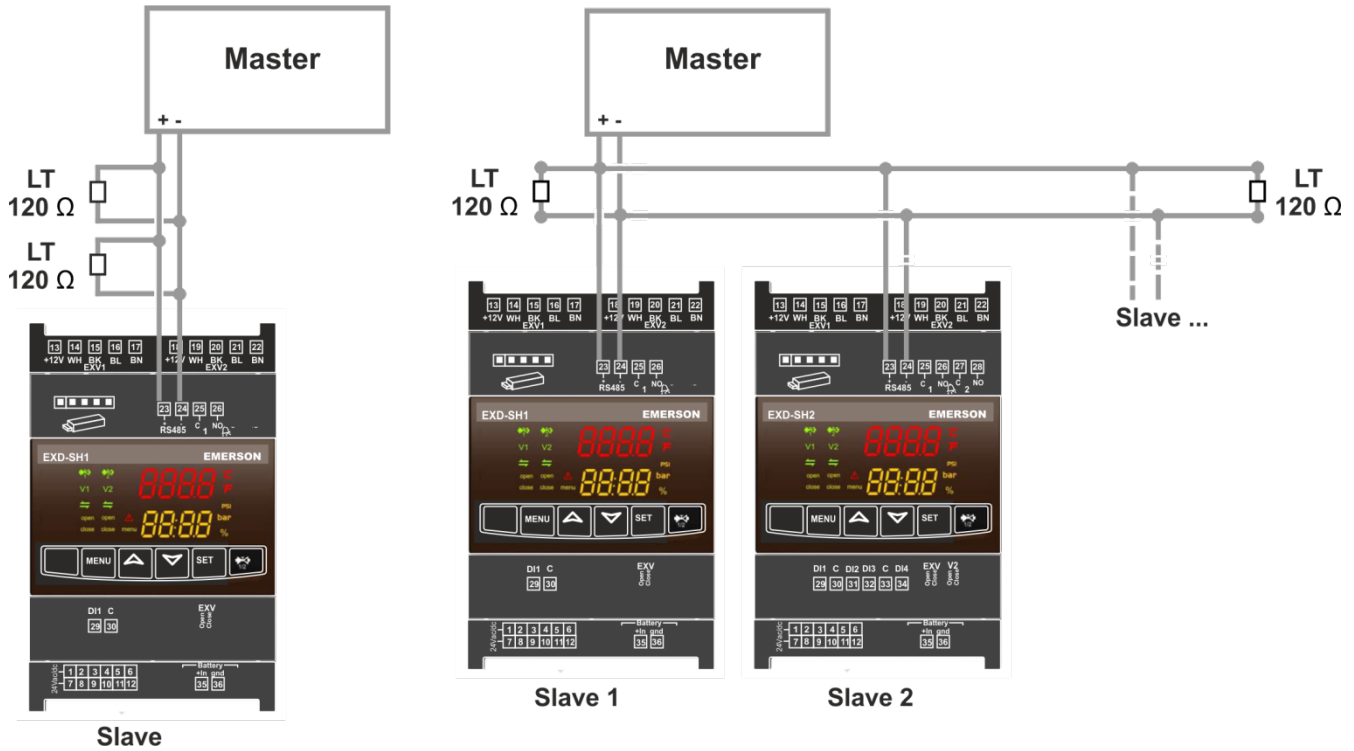
ModBus protocol details

Mode: RTU
Modbus slave address range: 1 to 127 (parameter **Adr**)
Baud rate: 9600 bps, 19200 bps (default, parameter **Br**)
Start bit: 1
Data bits: 8
Parity: even (default), no parity (parameter **Par**)
Stop bits: 1
Master response timeout: 500ms

Transmission Details
ModBus register address ranges

Read-only data: Starting address: 0x0100 (256)
Writable data: Starting address: 0x0200 (512)
Configuration data: Starting address: 0x0300 (768)

Read Data transmission
Available through Modbus Function code 03 (0x03) Read Holding Registers

Request

Function code	1 Byte	0x03
Starting Address	2 Bytes	0x0000 to 0xFFFF
Register count	2 Bytes	1 to 125 (0x7D)

Response

Function code	1 Byte	0x03
Byte count	1 Byte	2 x N*
Holding Registers	N* x 2 Bytes	

*N = Quantity of Input Registers

Error

Error code	1 Byte	0x83
Exception code	1 Byte	01 or 02 or 03

01 = Function code not supported
02 = Starting Address or register count out of range
03 = Register count out of range

Write Data transmission (single register)
Available through Modbus Function code 06 (0x06) Write Holding Register

Request

Function code	1 Byte	0x06
Starting Address	2 Bytes	0x0000 to 0xFFFF
Value	2 Bytes	0x0000 to 0xFFFF

Response

Function code	1 Byte	0x06
Starting Address	2 Bytes	0x0000 to 0xFFFF
Value	2 Bytes	0x0000 to 0xFFFF

Error

Error code	1 Byte	0x86
Exception code	1 Byte	01 or 02 or 03

01 = Function code not supported
02 = Starting Address out of range

Write Data transmission (multiple registers)
Available through Modbus Function code 16 (0x10) Write Holding Registers

Request

Function code	1 Byte	0x10
Start Address	2 Bytes	0x0000 to 0xFFFF
Register count	2 Bytes	0x0001 to 0x0078
Byte count	1 Byte	2 x N
Registers values	2 x N Bytes	Value

N = register count.

Response

Function code	1 Byte	0x10
Starting Address	2 Bytes	0x0000 to 0xFFFF
Register count	2 Bytes	0x0001 to 0x0078

Error

Error code	1 Byte	0x90
Exception code	1 Byte	01 or 02 or 03

01 = Function code not supported
02 = Register Address invalid
03 = Register Value out of range

Read-only variables

Modbus address dec.	Modbus address hex.	Description	Unit	Remarks

256	0x100	Software version		Hexadecimal format
				1 hex digit for controller type
				   1 = SH1,
				   2 = SH2
				1 hex digit for major revision
				2 hex digits for minor revision

		Circuit 1		
257	0x101	Main function, circuit 1		**0** = superheat control **1** = temperature control **2** = reverse temperature control
258	0x102	Valve opening circuit 1	1/100 %	
259	0x103	Digital input circuit 1		**0x0000** = No demand **0x0001** = Demand
260	0x104	Digital output circuit 1		**0x0001** = alarm relay
261	0x105	P1 suction pressure circuit 1	1/100 barg	
262	0x106	T1 suction temperature circuit 1	1/100 °C	
263	0x107	Sat. Temp circuit 1	1/100 °C	
264	0x108	Pressure 1 sensor failure circuit 1		**0** = No failure **1** = Failure
265	0x109	Temp 1 sensor failure circuit 1		**0** = No failure **1** = Failure
266	0x10A	Functional Alarm set circuit 1		**0x0001** = N/A **0x0002** = Low pressure **0x0004** = High superheat **0x0008** = Low superheat **0x0010** = Freeze **0x0020** = Max. Temp (Temp control) **0x0040** = Min. Temp (Temp control)
267	0x10B	Hardware alarm set		**0x0001** = Temp sensor 1 **0x0002** = Temp sensor 2 (SH2) **0x0004** = Pressure sensor 1 **0x0008** = Pressure sensor 2 (SH2) **0x0010** = Stepper 1 **0x0020** = Stepper 2 (SH2) **0x0040** = Modbus timeout (3sec) **0x0080** = Config. inconsistency 1 **0x0100** = Config. inconsistency 2 **0x0200** = Power Failure
268	0x10C	Application state circuit 1		**0** = OFF **1** = Waiting startup (valve reference is pending) **2** = Startup **3** = Control **4** = Closing **5** = Alarm **6** = Manual mode **7** = Power fail **8** = MOP
269	0x10D	Superheat set point circuit 1	1/100 K	
270	0x10E	Superheat circuit 1	1/100 K	

Read-only variables

Modbus address dec.	Modbus address hex.	Description	Unit	Remarks
		Circuit 2		
271	0x10F	Valve opening circuit 2	1/100 %	
272	0x110	Digital input circuit 2		**0** = no demand **1** = demand
273	0x111	Digital output circuit 2		**0x0001** = alarm relay
274	0x112	P2 suction pressure circuit 2	1/100 bar	
275	0x113	T2 suction temperature circuit 2	1/100 °C	
276	0x114	Sat. Temp circuit 2	1/100 °C	
277	0x115	Pressure 2 sensor failure circuit 2		**0** = No failure **1** = Failure
278	0x116	Temp 2 sensor failure circuit 2		**0** = No failure **1** = Failure
279	0x117	Functional alarm circuit 2		**0x0001** = N/A **0x0002** = Low pressure **0x0004** = High superheat **0x0008** = Low superheat **0x0010** = Freeze
280	0x118	Application state circuit 2		**0** = OFF **1** = Waiting startup (valve reference is pending) **2** = Startup **3** = Control **4** = Closing **5** = Alarm **6** = Manual mode **7** = Power fail **8** = MOP
281	0x119	Superheat setpoint circuit 2	1/100 K	
282	0x11A	Superheat circuit 2	1/100 K	

EXD-SH1/2 Controller with ModBus Communication Capability

Writable variables

Modbus address dec.	Modbus address hex.	Display code	Description	Unit	Remarks
512	0x0200		Factory default		**1** = do a factory default
513	0x0201		Future use		
514	0x0202		Alarm reset		**1** = Resets alarms (only the alarms which are set as manual reset)
515	0x0203	**1Ho**	Manual mode circuit 1		**0** = off, **1** = on
516	0x0204	**1HP**	Manual valve opening circuit 1	%	only active while manual mode = on
517	0x0205		Alternative to digital input, circuit 1 via Modbus		Demand circuit 1 **0** = disabled **1** = enabled
518	0x0206		Pressure circuit 1 via Modbus	1/100 barg	Pressure if **1uP** selection is Modbus Range: -0.1 … 150 barg Minimum update rate: 1s Alarm timeout: 3 sec.
519	0x207		Digital output circuit 1		To set the relay 1 manually, only active when manual mode circuit 1 = on **0** = off **1** = on
520	0x0208	**2Ho**	Manual mode circuit 2		**0** = off, **1** = on
521	0x0209	**2HP**	Manual valve opening circuit 2	%	only active while manual mode 2 = on
522	0x020A		Alternative to digital input, circuit 2 via Modbus		Demand circuit 2 **0** = disabled **1** = enabled
523	0x020B		Pressure circuit 2 via Modbus	1/100 barg	Pressure if **2uP** selection is Modbus Range: -0.1 to 150 barg Minimum update rate: 1s Alarm timeout: 3 sec.
524	0x20C		Digital output circuit 2		To set the relay 2 manually, only active when manual mode circuit 2 = on **0** = off **1** = on

Note: References to control circuit 2 are invisible in configuration/write list if disabled.

Configuration parameters

Modbus address dec.	Modbus address hex.	Display code	Description	Unit	Default value	Range	Remarks
768	0x300	**H5**	Password		12	1 - 1999	
769	0x301	**Adr**	Modbus address		1	1 - 127	
770	0x302	**br**	Modbus baudrate		0	0 - 1	**0** = 9600 baud **1** = 19200 baud
771	0x303	**PAr**	Modbus parity		0	0 - 1	**0** = parity even **1** = no parity
773	0x305	**-C2**	Circuit 2 Enabled		1	0 - 1	**0** = circuit 2 disabled **1** = circuit 2 enabled Only EXD-SH2
774	0x306	**-uC**	Units conversion		0	0 - 1	**0** = °C, K, barg **1** = °F, psig This parameter only affects the display. Internally (as well as for MODBUS communication) the units are always SI-based.
775	0x307		Future use				
776	0x308		Future use				

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Configuration parameters

Modbus address dec.	Modbus address hex.	Display code	Description	Unit	Default value	Range	Remarks
					Circuit 1		
777	0x309	1Fct	Function circuit 1		0	0 - 2	Changes only allowed if circuit 1 is in OFF state **0** = superheat control **1** = Temperature control Normal sense **2** = Temperature control Reverse sense
778	0x30A	1u4	Control mode circuit 1		0	0 - 2	**0** = standard control **1** = slow control **2** = intermediate control
779	0x30B	1u0	Refrigerant circuit 1		1	0 - 16	Changes only allowed if circuit 1 is in OFF state **0** = R22, **1** = R134a, **2** = R507, **3** = R404A, **4** = R407C, **5** = R410A, **6** = R124, **7** = R744 **8** = R407A, **9** = R407F, **10** = R23, **11** = R32 **12** = R1234ze, **13** = R448A **14** = R449A, **15** = R450A **16** = R513A
780	0x30C	1uP	Pressure sensor type 1		1	0 - 7	Changes only allowed if circuit 1 is in OFF state **0** = PT5-07x, **1** = PT5-18x **2** = PT5 -30x **3** = PT5 -50x **4** = PT5-150 **5** = Ratio metric(gauge) **6** = Ratio metric(absolute) **7** = Modbus
781	0x30D	1Prr	Ratio metric range 1	1/10 bar	30	3 - 60	If ratiometric is used
782	0x30E	1ut	Valve type 1		0	0 - 11	Changes only allowed if circuit 1 is in OFF state **0** = EX4-6, **1** = EX7, **2** = EX8, **3** = FX5, **4** = FX6, **5** = FX6.5, **6** = FX7, **7** = FX7.5, **8** = FX8, **9** = FX9, **10** = CX4-6, **11** = CX7
783	0x30F	1uF	Valve scaling 1	%	100	5 - 100	
784	0x310	1uu	Start opening valve1	**%**	10	0 - 100	
785	0x311	1u9	Start opening duration valve 1	s	5	0 - 120	
786	0x312	1uL	Low superheat alarm mode circuit 1		1	0 - 2	**0** = disabled **1** = enabled auto-reset **2** = enabled manual reset
787	0x313	1u5	Superheat setpoint circuit 1	1/10 K	6	0.5 - 30	**Range** = 3 – 30K with **1uL** = 1,2
788	0x314	1u2	MOP mode circuit 1		1	0 - 1	**0** = disabled **1** = enabled

Note: Number of overwriting is limited. Please consult Emerson sales office.

Configuration parameters

Modbus address dec.	Modbus address hex.	Display code	Description	Unit	Default value	Range	Remarks
789	0x315	**1u3**	MOP sat. temp. limit circuit 1	1/10 °C			
790	0x316	**1P9**	Low pressure alarm mode circuit 1		0	0 - 2	**0** = disabled **1** = enabled auto-reset **2** = enabled manual reset
791	0x317	**1PA**	Low pressure alarm cut-out circuit 1	1/10 bar	0	-0.8 - 17.7	
792	0x318	**1Pb**	Low pressure alarm delay circuit 1	s	5	5 - 199	
793	0x319	**1Pd**	Low pressure alarm cut-in circuit 1	1/10 bar	0.3	-0.5 - 18	
794	0x31A	**1P4**	Freeze alarm mode circuit 1		0	0 - 2	**0** = disabled **1** = enabled auto-reset **2** = enabled manual reset
795	0x31B	**1P2**	Freeze alarm cut-out circuit 1	1/10 °C	0	-5 - 5	
796	0x31C	**1P5**	Freeze alarm delay circuit 1	s	30	5 - 199	
797	0x31D	**1uH**	High superheat alarm mode circuit 1		0	0 - 1	**0** = disabled **1** = enabled auto-reset
798	0x31E	**1uA**	High superheat alarm setpoint circuit 1	1/10 K	30	16 - 40	
799	0x31F	**1ud**	High superheat alarm delay circuit 1	min	3	1-15	
800	0x320	**1tSt**	Temperature set point	1/10 °C	4	-50 - 50	
801	0x321	**1tbd**	Temperature band	1/10 K	2	1 - 10	
802	0x322	**1tAF**	Temperature alarm enable		0	0 - 1	**0** = disabled **1** = enabled
803	0x323	**1tAL**	Min. temperature alarm set-point	1/10 °C	0	-50 - 50	
804	0x324	**1tdL**	Min. temperature alarm delay	min	3	1 - 10	
805	0x325	**1tAH**	Max. temperature alarm set-point	1/10 °C	15	-50 - 50	
806	0x326	**1tdH**	Max. temperature alarm delay	min	3	1 - 10	
807	0x327		Future use				
808	0x328		Future use				
809	0x329	**1tt-**	Temperature sensor type		0	0 - 1	**0** = ECN-Nxx **1** = ECN-Z60
Circuit 2							
810	0x32A	**2u4**	Control mode circuit 2		0	0 - 2	**0** = standard control **1** = slow control **2** = intermediate control
811	0x32B	**2u0**	Refrigerant circuit 2		1	0 - 16	Changes only allowed if circuit 2 is in OFF state **0** = R22, **1** = R134a, **2** = R507, **3** = R404A, **4** = R407C, **5** = R410A, **6** = R124, **7** = R744 **8** = R407A, **9** = R407F, **10** = R23, **11** = R32 **12** = R1234ze, **13** = R448A **14** = R449A, **15** = R450A **16** = R513A

Note: Number of overwriting is limited. Please consult Emerson sales office.

Modbus address dec.	Modbus address hex.	Display code	Description	Unit	Default value	Range	Remarks
812	0x32C	2uP	Pressure sensor type circuit 2		1	0 - 8	Changes only allowed if circuit 2 is in OFF state **0** = PT5-07x **1** = PT5 -18x **2** = PT5 -30x **3** = PT5 -50x **4** = PT5-150 **5** = Ratio metric (gauge) **6** = Ratio metric (absolute) **7** = Modbus **8** = Pressure sensor circuit1 is used (1uP)
813	0x32D	2Prr	Ratio metric range circuit 2	1/10 bar	30	3 - 60	If ratio metric is used
814	0x32E	2ut	Valve type circuit 2		0	0 - 11	Changes only allowed if circuit 2 is in OFF state **0** = EX4-6, **1** = EX7, **2** = EX8, **3** = FX5, **4** = FX6, **5** = FX6.5 **6** = FX7, **7** = FX7.5, **8** = FX8, **9** = FX9, **10** = CX4-6, **11** = CX7
815	0x32F	2uF	Valve scaling circuit 2	%	100	5 - 100	
816	0x330	2uu	Start opening valve circuit 2	%	10	0 - 100	
817	0x331	2u9	Start opening duration valve circuit 2	s	5	0 - 120	
818	0x332	2uL	Low superheat alarm mode circuit 2		1	0 - 2	**0** = disabled **1** = enabled auto-reset **2** = enabled manual reset
819	0x333	2u5	Superheat setpoint circuit 2	1/10 K	6	0.5 - 30	**Range** = 3 – 30K with **1uL** = 1,2
820	0x334	2u2	MOP mode circuit 2		1	0 - 1	**0** = disabled **1** = enabled
821	0x335	2u3	MOP sat. temp. limit circuit 2	1/10 °C			
822	0x336	2P9	Low pressure alarm mode circuit 2		0	0 - 2	**0** = disabled **1** = enabled auto-reset **2** = enabled manual reset
823	0x337	2PA	Low pressure alarm cut-out circuit 2	1/10 bar	0	-0.8 - 17.7	
824	0x338	2Pb	Low pressure alarm delay circuit 2	s	5	5 - 199	
825	0x339	2Pd	Low pressure alarm cut-in circuit 2	1/10 bar	0.3	-0.5 - 18	
826	0x33A	2P4	Freeze alarm mode circuit 2		0	0 - 2	**0** = disabled **1** = enabled auto-reset **2** = enabled manual reset
827	0x33B	2P2	Freeze alarm cut-out circuit 2	1/10 °C	0	-5 - 5	
828	0x33C	2P5	Freeze alarm delay circuit 2	s	30	5 - 199	
829	0x33D	2uH	High superheat alarm mode circuit 2		0	0 - 1	**0** = disabled **1** = enabled auto-reset
830	0x33E	2uA	High superheat alarm setpoint circuit 2	1/10 K	30	16 - 40	
831	0x33F	2ud	High superheat alarm delay circuit 2	min	3	1-15	
832	0x329	2tt-	Temperature sensor type		0	0 - 1	**0** = ECN-Nxx **1** = ECN-Z60

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