IO-Link

Electronic pressure sensors
and pressure transmitters

Operating Instructions

TIANJIN SENTINEL ELECTRONICS CO .,LTD.

www.sentinel-china.com

Thank you for choosing the Sentinel SEH Series Programmable Display Integrated Pressure Sensor. This manual mainly describes the specifications, features, usage, and accessories of the Pressure sensor. Please read this manual carefully before using the product. Our company reserves the right to continuously improve the product. For the latest version of the documentation, please refer to the Sentinel company website (www.sentinel-china.com), as updates will not be separately notified.

1 Safety Instructions

■ Please read and follow these safety precautions before installing, operating, and maintaining the product.

■ To ensure personal and equipment safety, please follow the operating instructions or technical documentation to ensure that the product is suitable for your application range and is not subject to any limitations.

■ This product should be used in an environment that meets the design specifications. Failure to do so may result in malfunctions, and any issues arising from non-compliance are not covered by the warranty.

■ We are not liable for any personal injury or property damage caused by improper operation. Warranty claims will be void if the equipment is improperly installed or used.
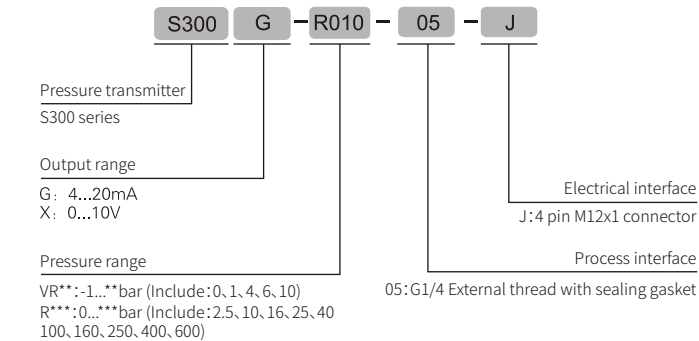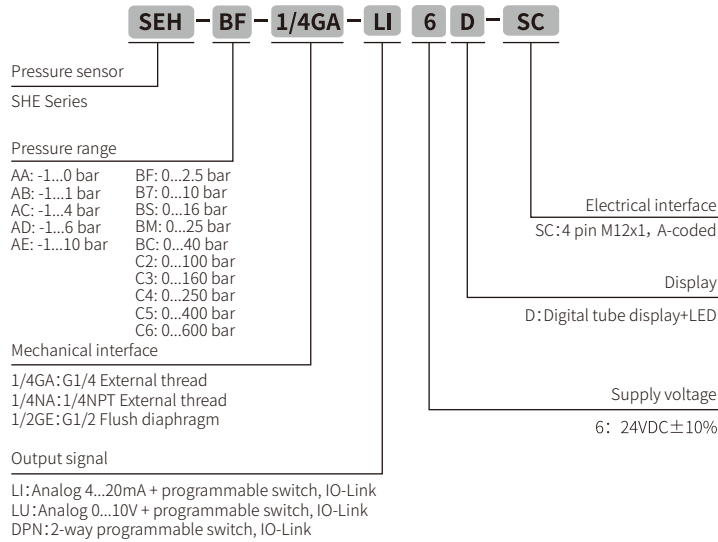
2 Product Overview

Pressure is one of the most commonly measured parameters in the industrial field. Whether it is the system pressure in the hydraulic system, the pipeline pressure in the cooling circuit, or the pressure parameter in the tank, it needs to be detected and measured at all times. Sentenya's pressure sensors have a variety of output signals and pressure measurement ranges. Among them, the SEH series pressure sensors have IO-Link function, which can meet the intelligent needs of Industry 4.0.

3 Features and Functions

■ IO-Link Smart Pressure Sensor

■ 4-digit large digital tube display, mirroring, semi-transparent design

■ The upper part of the housing can be rotated 300°

■ Normally open/normally closed, PNP/NPN/push-pull, hysteresis/window configurable

■ Switching signal/analog signal, switching signal/IO-Link can be set

■ Sensor parameters can be set via buttons and IO-Link

■ The starting and ending points of the analog signal can be set

■ The interface is M12 A code 4-pin

■ Key lock function, simple key menu operation

■ The display panel adopts an intergrated housing
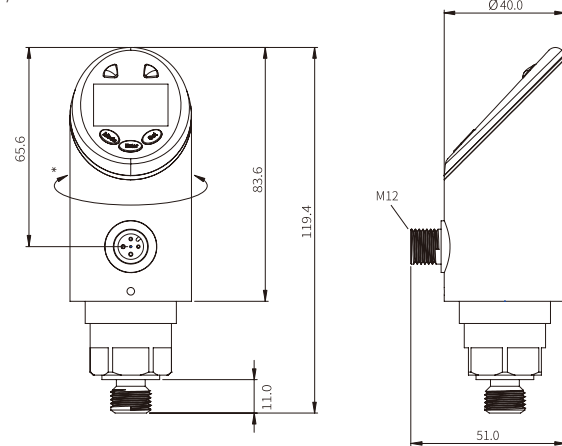
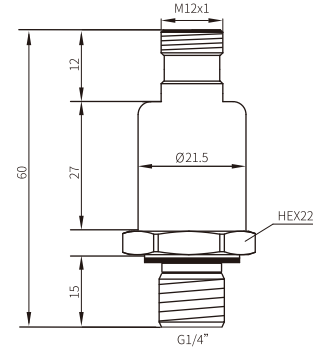■ The main body of the housing is made of stainess steel

4 Selection Guide

SEH – BF – 1/4GA – LI – 6 – D – SC

Pressure sensor
SHE Series

Pressure range

AA: -1...0 bar	BF: 0...2.5 bar
AB: -1...1 bar	B7: 0...10 bar
AC: -1...4 bar	BS: 0...16 bar
AD: -1...6 bar	BM: 0...25 bar
AE: -1...10 bar	BC: 0...40 bar
	C2: 0...100 bar
	C3: 0...160 bar
	C4: 0...250 bar
	C5: 0...400 bar
	C6: 0...600 bar

Mechanical interface
1/4GA：G1/4 External thread
1/4NA：1/4NPT External thread
1/2GE：G1/2 Flush diaphragm

Output signal
LI：Analog 4...20mA + programmable switch, IO-Link
LU：Analog 0...10V + programmable switch, IO-Link
DPN：2-way programmable switch, IO-Link

Supply voltage
6：24VDC±10%

Display
D：Digital tube display+LED

Electrical interface
SC：4 pin M12x1, A-coded

S300 – G – R010 – 05 – J

Pressure transmitter
S300 series

Output range
G：4...20mA
X：0...10V

Pressure range
VR**：-1...***bar (Include:0、1、4、6、10)
R***：0...***bar (Include:2.5、10、16、25、40
100、160、250、400、600)

Electrical interface
J：4 pin M12x1 connector

Process interface
05：G1/4 External thread with sealing gasket

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5 Dimensions

Unit：mm

5.1 G1/4 External thread

Ø40.0
65.6
83.6
119.4
M12
11.0
51.0

*The upper part of the housing can be rotated approximately 300°.

5.2 Pressure transmitter

M12x1
12
60
27
Ø21.5
15
HEX22
G1/4"

6 Wiring Diagram

6.1 Sensor wiring instructions

1: BN brown
2: WH white
3: BU blue
4: BK black

M12 interface, pin

SEH		
1	+24VDC	
3	0V	
2	OUT2	
4	OUT1	

Pin	LI Output definition	LU Output definition	DPN Output definition
1	+24VDC	+24VDC	+24VDC
2	(OUT2) Switch or 4...20mA	(OUT2) Switch or 0...10V	(OUT2) Switch
3	0V	0V	0V
4	(OUT1) Switch or IO-Link	(OUT1) Switch or IO-Link	(OUT1) Switch or IO-Link
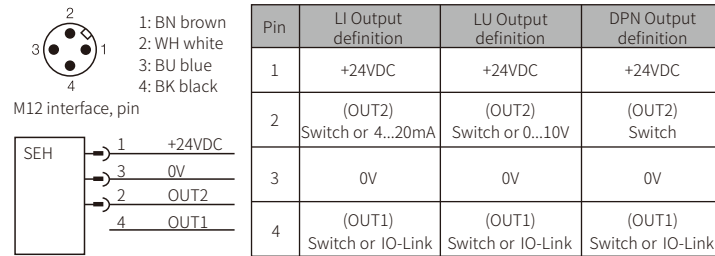
6.2 Transmitter wiring instructions

1: BN brown
2: WH white
3: BU bule
4: BK black

M12 interface, pin

S300
1BN +24VDC
2WH
Current output
2-wire current

S300
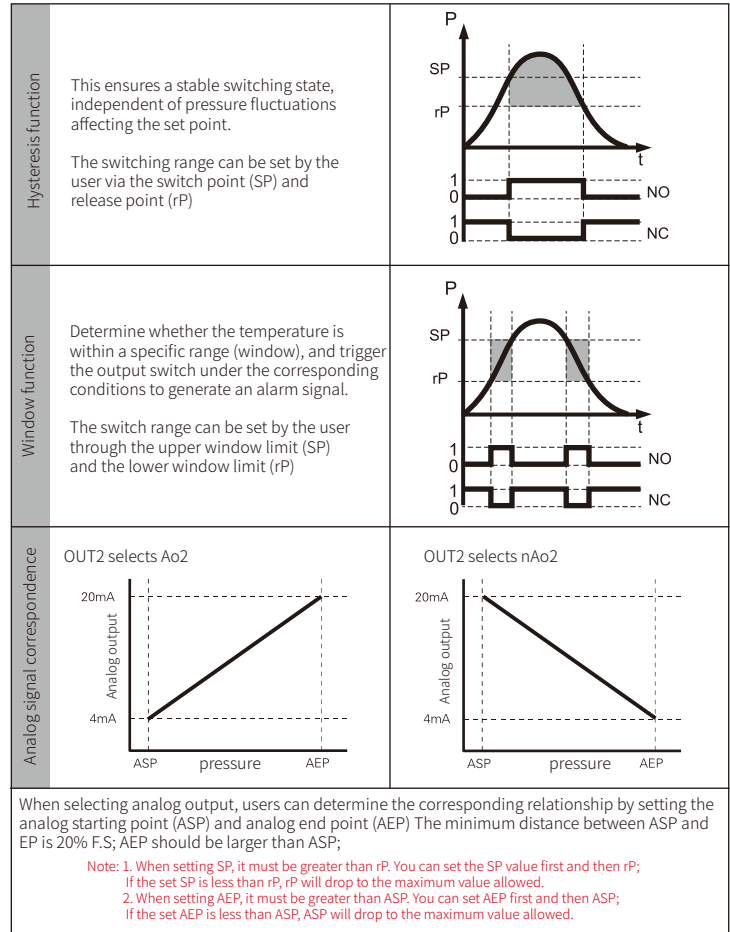1BN +24VDC
3BU 0V
2WH
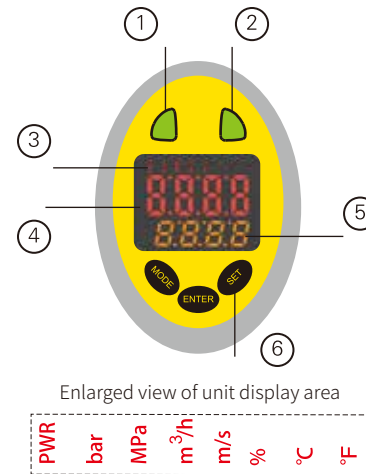Voltage output
3-wire voltage
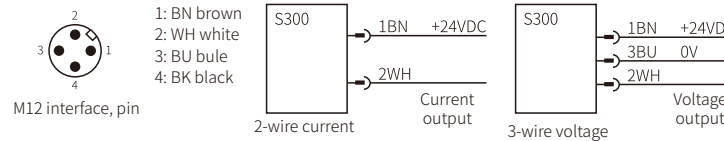
7 Installation Instructions

Before installing and removing equipment, make sure that the system is not under any pressure
Insert the sensor into the G1/4 process connection and tighten securely. The recommended tightening torque can be found in the table below.

Pressure range (unit: bar)	Tightening torque (unit: Nm)
−1...400	25...35
600	30...50
Depends on lubrication, sealing, and pressure load.	

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8 Description of switching signal data and analog signal data output

Hysteresis function

This ensures a stable switching state, independent of pressure fluctuations affecting the set point.

The switching range can be set by the user via the switch point (SP) and release point (rP)

P
SP
rP
t
1 0   NO
1 0   NC

Window function

Determine whether the temperature is within a specific range (window), and trigger the output switch under the corresponding conditions to generate an alarm signal.

The switch range can be set by the user through the upper window limit (SP) and the lower window limit (rP)

P
SP
rP
t
1 0   NO
1 0   NC

Analog signal correspondence

OUT2 selects Ao2

20mA
Analog output
4mA
ASP   pressure   AEP

OUT2 selects nAo2

20mA
Analog output
4mA
ASP   pressure   AEP

When selecting analog output, users can determine the corresponding relationship by setting the analog starting point (ASP) and analog end point (AEP) The minimum distance between ASP and EP is 20% F.S; AEP should be larger than ASP;

Note: 1. When setting SP, it must be greater than rP. You can set the SP value first and then rP;
　　　　if the set SP is less than rP, rP will drop to the maximum value allowed.
　　　2. When setting AEP, it must be greater than ASP. You can set AEP first and then ASP;
　　　　If the set AEP is less than ASP, ASP will drop to the maximum value allowed.

9 Display and Operation Panel

Enlarged view of unit display area

PWR bar MPa m³/h m/s % ℃ ℉

	Definition		Status Indication
1	Output Status Indicator Light OUT1	Green	On: The corresponding switch pin is turned on for output Off: The corresponding switch pin turns off the output Note: This LED indicates the output status and is not an alarm light.
2	Output Status Indicator Light OUT2		
3	Unit display area PWR	Red	On: Power supply is normal Off: Power supply is abnormal Flashing: IO-Link is communicating normally
	Unit display area bar MPa	Red	On: Represents the unit of the current digital tube display data Off: Not the current unit
4	Big digital tube	Red	Display sensor measurement data "- - - -" is displayed to indicate invalid data
5	Small digital tube	Orange	Display Loc Indicates that the key lock is turned on
6	Setting button		

Note: The display area adopts a semi-transparent design. It can be seen when the LED is on, but not when it is off; other unused units are not visible on the sensor.
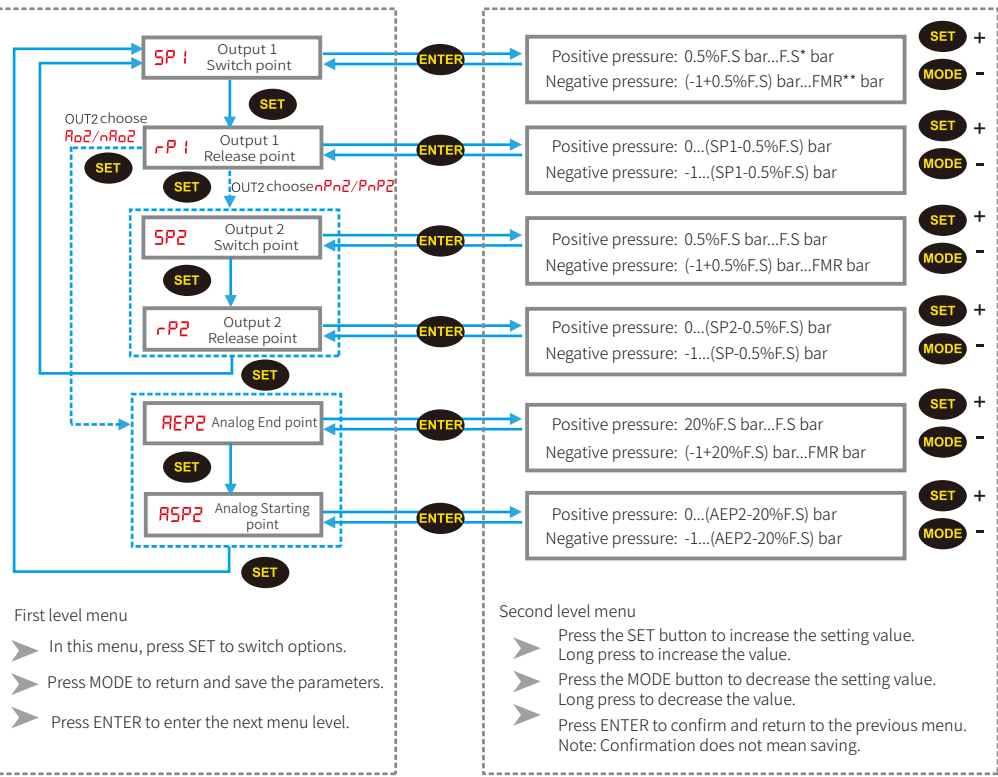
10 Key Operation

10.1 Simple menu operation

> 2s

Normal display mode

Return Save

In this mode, press the MODE button for more than 2 seconds to enter the first level menu

In this mode, press the ENTER key + SET key simultaneously for more than 6 seconds to turn the key lock on or off

When turned on, the small digital tube display area will display LoC

First level menu

➤ In this menu, press SET to switch options.
➤ Press MODE to return and save the parameters.
➤ Press ENTER to enter the next menu level.

Second level menu

➤ Press the SET button to increase the setting value. Long press to increase the value.
➤ Press the MODE button to decrease the setting value. Long press to decrease the value.
➤ Press ENTER to confirm and return to the previous menu. Note: Confirmation does not mean saving.

Simple menu flow:

- **SP1** Output 1 Switch point → Positive pressure: 0.5%F.S bar...F.S* bar / Negative pressure: (-1+0.5%F.S) bar...FMR** bar
- OUT2 choose Ao2/nAo2 **rP1** Output 1 Release point → Positive pressure: 0...(SP1-0.5%F.S) bar / Negative pressure: -1...(SP1-0.5%F.S) bar
- OUT2 choose Pn2/PnP2 **SP2** Output 2 Switch point → Positive pressure: 0.5%F.S bar...F.S bar / Negative pressure: (-1+0.5%F.S) bar...FMR bar
- **rP2** Output 2 Release point → Positive pressure: 0...(SP2-0.5%F.S) bar / Negative pressure: -1...(SP-0.5%F.S) bar
- **AEP2** Analog End point → Positive pressure: 20%F.S bar...F.S bar / Negative pressure: (-1+20%F.S) bar...FMR bar
- **ASP2** Analog Starting point → Positive pressure: 0...(AEP2-20%F.S) bar / Negative pressure: -1...(AEP2-20%F.S) bar

(SET +, MODE -, ENTER buttons)

10.2 Programming menu operation

> 2s

Normal display mode

Return Save

In this mode, press the MODE button for more than 2 seconds to enter the first level menu

In this mode, press the ENTER key + SET key simultaneously for more than 6 seconds to turn the key lock on or off

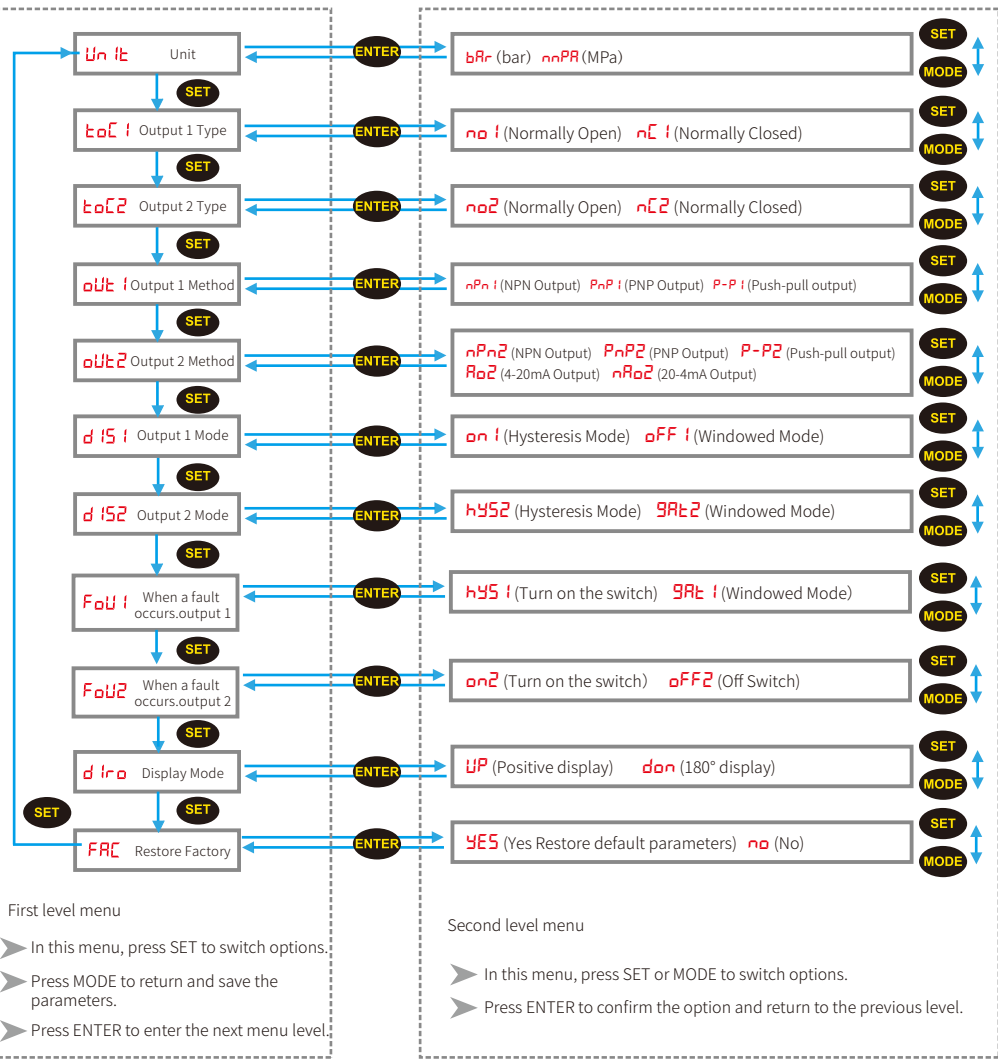When turned on, the small digital tube display area will display LoC

Programming menu flow:

- **Unit** Unit → bAr (bar) nnPA (MPa)
- **toC1** Output 1 Type → no1 (Normally Open) nC1 (Normally Closed)
- **toC2** Output 2 Type → no2 (Normally Open) nC2 (Normally Closed)
- **oUt1** Output 1 Method → nPn1 (NPN Output) PnP1 (PNP Output) P-P1 (Push-pull output)
- **oUt2** Output 2 Method → nPn2 (NPN Output) PnP2 (PNP Output) P-P2 (Push-pull output) Ao2 (4-20mA Output) nAo2 (20-4mA Output)
- **d1S1** Output 1 Mode → on1 (Hysteresis Mode) oFF1 (Windowed Mode)
- **d1S2** Output 2 Mode → hYS2 (Hysteresis Mode) 9At2 (Windowed Mode)
- **FoU1** When a fault occurs.output 1 → hYS1 (Turn on the switch) 9At1 (Windowed Mode)
- **FoU2** When a fault occurs.output 2 → on2 (Turn on the switch) oFF2 (Off Switch)
- **diro** Display Mode → UP (Positive display) don (180° display)
- **FAC** Restore Factory → YES (Yes Restore default parameters) no (No)

First level menu

➤ In this menu, press SET to switch options.
➤ Press MODE to return and save the parameters.
➤ Press ENTER to enter the next menu level.

Second level menu

➤ In this menu, press SET or MODE to switch options.
➤ Press ENTER to confirm the option and return to the previous level.

Note: After entering the simple or programming menu, if there is no key operation within 3.5 minutes, it will automatically return to the normal display mode without changing the setting parameters;
For the switch output mode, NPN controls the 0V switch, providing a low level without a high level; PNP controls the 24V switch, providing a high level without a low level;
P-P push-pull is a combination of NPN and PNP;
*F.S: Measuring range full scale (e.g. measuring range -1...6Bar, then F.S=7)
**FMR: Final value of the measuring range (e.g. measuring range -1...6Bar, then FMR=6)

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11 IO-Link Parameter

11.1 Parameter data / Request data /Indexing Service(ISDU indexed service data unit)

Index	Subindex	Parameter name	Length	Permissions	Describe
0x02 2	0	System Commands	1Byte	Write	0x80 128 Reset device 0x82 130 Restore factory settings
0x10 16	0	Manufacturer's name	8Byte	Read	Sentinel
0x11 17	0	Manufacturer Description	41Byte	Read	Sentinel Industrial Ethernet manufacturer
0x12 18	0	Product name	17Byte	Read	SEH-xxx-xxx-SC
0x13 19	0	Product ID	8Byte	Read	19867301
0x14 20	0	Product Description	23Byte	Read	Pressure sensor io-link
0x15 21	0	Serial-Number	10Byte	Read	1986730101
0x16 22	0	Hardware version	8Byte	Read	HW-V0.01
0x17 23	0	Software version	8Byte	Read	FW-V0.01
0x18 24	0	Apply Tags	maximum 32Byte	Read Write	ApplicationSpecificTag is used to mark the device in the application This item is defined in the IODD file, Included in the DataStorage (DS)
0x19 25	0	Function Label	maximum 32Byte	Read Write	FunctionTag is a special tag for device functions, including This item is not defined in the IODD file, It can be set directly through Index.
0x1A 26	0	Local Tags	maximum 32Byte	Read Write	LocationTag is a special tag used for local devices, including DS This item is not defined in the IODD file, It can be set directly through Index.
0x24 36	0	Device status	1Byte	Read	0: The equipment is operating normally；1: Need to maintain；2: Running incorrect environment or parameters；3: Device abeyance；4: Device failed to run；

Index	Subindex	Parameter name	Length	Permissions	Ranges
0x1F4 500	0	Unit	1Byte	Read Write	0: bar 1: Mpa
0x1F5 501	0	toC1 Output 1 Type	1Byte	Read Write	0: NO Normally open 1: NC Normally Closed
0x1F6 502	0	toC2 Output 2 Type	1Byte	Read Write	0: NO Normally open 1: NC Normally Closed
0x1F7 503	0	oUt1 Output 1 method	1Byte	Read Write	0: NPN output 1: PNP output 2: P-P push-pull output
0x1F8 504	0	oUt2 Output 2 method	1Byte	Read Write	0: NPN output 1:PNP output 2:P-P push-pull output 3:Ao(4-20mA) 4:nAo(20-4mA)
0x1F9 505	0	diS1 Output 1 Mode	1Byte	Read Write	0: hyS hysteresis mode 1: gAt window mode
0x1FA 506	0	diS2 Output 2 Mode	1Byte	Read Write	0: hyS hysteresis mode 1: gAt window mode
0x1FB 507	0	diro Display Mode	1Byte	Read Write	0: UP positive display 1: don 180°display
0x1FC 508	0	Lock Key lock	1Byte	Read Write	0: Unlocked 1: Key locked
0x1FD 509	0	When FoU1 fails, output mode 1	1Byte	Read Write	0: oFF1(Off switch) 1: on1(Turn on the switch)
0x1FE 510	0	When FoU2 fails, output mode 2	1Byte	Read Write	0: oFF2(Off switch) 1: on2(Turn on the switch)
0x258 600	0	SP1 Output 1 Switch point	2Byte	Read Write	SP1 should be greater than rP1 otherwise it will be rejected
0x259 601	0	rP1 Output 1Release point	2Byte	Read Write	rP1 should be less than SP1 or it will be rejected
0x25A 602	0	SP2 Output 2 Switch point	2Byte	Read Write	SP2 should be greater than rP2 or it will be rejected
0x25B 603	0	rP2 Output 2 Release point	2Byte	Read Write	rP2 should be less than SP2 or it will be rejected
0x25C 604	0	ASP2 Analog Starting point	2Byte	Read Write	ASP2 should be smaller than AEP2 or it will be rejected
0x25D 605	0	AEP2 Analog End point	2Byte	Read Write	AEP2 should be greater than ASP2 otherwise it will be rejected

For specific values, see Table 1 on the right.

11.2 Error code

32785 / 0x8011：Invalid index   32819 / 0x8033：The length of the written parameter exceeds the defined length
32786 / 0x8012：Invalid subindex   32820 / 0x8034：The length of the written parameter is less than the defined length
32816 / 0x8030：The written parameter exceeds the settable range

11.3 General information

The sensor has an IO-Link communication interface and requires a module with IO-Link function (IO-Link master) to operate. For more detailed information about IO-Link, please visit the company website.

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12 FAC Default Parameter

12.1 Positive pressure

Parameter List	SP1	rP1	SP2	rP2	AEP2	ASP2	Unit	toC1	toC2
FAC Default Value	25%F.S	23%F.S	75%F.S	73%F.S	F.S	0	bar	no1	no2
Parameter List	oUt1	oUt2	d1S1	d1S2	FoU1	FoU2	diro	Loc	
FAC Default Value	PnP1	PnP2	hyS1	hyS2	oFF1	oFF2 *	UP	0:unlock	

12.2、Negative pressure

Parameter List	SP1	rP1	SP2	rP2	AEP2	ASP2	Unit	toC1	toC2
FAC Default Value	25%FMR	23%FMR	75%FMR	73%FMR	FMR	-1	bar	no1	no2
Parameter List	oUt1	oUt2	d1S1	d1S2	FoU1	FoU2	diro	Loc	
FAC Default Value	PnP1	PnP2	hyS1	hyS2	oFF1	oFF2 *	UP	0:unlock	

12.3、-1...0bar

Parameter List	SP1	rP1	SP2	rP2	AEP2	ASP2	Unit	toC1	toC2
FAC Default Value	-0.75	-0.77	-0.25	-0.27	0	-1	bar	no1	no2
Parameter List	oUt1	oUt2	d1S1	d1S2	FoU1	FoU2	diro	Loc	
FAC Default Value	PnP1	PnP2	hyS1	hyS2	oFF1	oFF2 *	UP	0:unlock	

* When [oUt2] selects analog signal output, In case of an internal fault, The output signal will run according to the parameter settings in [FoU2]

	FoU2=ON	FoU2=OFF
[oUt2] =Ao2	20mA	4mA
[oUt2] =nAo2	4mA	20mA

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13 IO-Link Process Data Mapping

BYTE	BYTE0							
BIT	15	14	13	12	11	10	9	8
DATA	Pbit13	Pbit12	Pbit11	Pbit10	Pbit9	Pbit8	Pbit7	Pbit6
BYTE	BYTE1							
BIT	7	6	5	4	3	2	1	0
DATA	Pbit5	Pbit4	Pbit3	Pbit2	Pbit1	Pbit0	OUT2	OUT1

Note:
Pbit represents 14-bit pressure data. The pressure data is a valid symbol number in bar, and the value is "W" times the actual pressure. For specific magnification, see Table 1
OUT1 and OUT2 represent the output status; use the right shift instruction to remove OUT1 and OUT2 to obtain 14 times the pressure data

表1

Pressure range	Magnification W	SP1 Output 1 Switch point	rP1 Output 1 Release point	SP2 Output 2 Switch point	rP2 Output 2 Release point	ASP2 Analog Starting point	AEP2 Analog end point
−1...0 bar	1000	−995...0	−1000...−5	−995...0	−1000...−5	−1000...−200	−800...0
−1...1 bar	1000	−990...1000	−1000...−990	−990...1000	−1000...990	−1000...600	600...1000
−1...4 bar	1000	−975...4000	−1000...3975	−975...4000	−1000...3975	−1000...3000	0...4000
−1...6 bar	1000	−965...6000	−1000...5965	−965...6000	−1000...5965	−1000...4600	400...6000
−1...10 bar	100	−95...1000	−100...995	−95...1000	−100...995	−100...780	120...1000
0...2.5 bar	1000	12...2500	0...2488	12...2500	0...2488	0...2000	500...2500
0...10 bar	100	5...1000	0...995	5...1000	0...995	0...800	200...1000
0...16 bar	100	8...1600	0...1592	8...1600	0...1592	0...1280	320...1600
0...25 bar	100	12...2500	0...2488	12...2500	0...2488	0...2000	500...2500
0...40 bar	100	20...4000	0...3980	20...4000	0...3980	0...3200	800...4000
0...100 bar	10	5...1000	0...995	5...1000	0...995	0...800	200...1000
0...160 bar	10	8...1600	0...1592	8...1600	0...1592	0...1280	320...1600
0...250 bar	10	12...2500	0...2488	12...2500	0...2488	0...2000	500...2500
0...400 bar	10	20...4000	0...3980	20...4000	0...3980	0...3200	800...4000
0...600 bar	10	30...6000	0...5970	30...6000	0...5970	0...4800	1200...6000