Principle structure

The TS500 uses high-precision platinum resistance for temperature measurement, and the signal is processed by the rear processing circuit and converted into a standard industrial electrical signal output and display. The metal housing design, with a high-light LED digital display, makes this series of products can be used in a variety of industrial applications. The three-button design and menu make the product easier to use. A variety of connection methods can fully meet a variety of specific installation needs. The display head, which can be rotated at 330°, guarantees the best viewing Angle in

Technical parameter

- ◇ Measuring range: -200... 400 ℃
- ◇ Supply voltage: 12... 30VDC
- ◇ No-load current consumption: ≤30mA, 24VDC
- ◇ Switch output:

Output type: PNP/NPN can be switched, normally open/normally closed can be set

Switching load: <200mA/24VDC

- ◇ Response time: 0.01~2s (factory default)
- ◇ Measurement accuracy: ±1.0℃
- ◇ Current type analog output: ≤±0.5% range

Output type: 4... 20mA can be configured

Load RA: ≤500Ω

Linearity: ≤0.5% range

- ◇ Communication output: IO-Link/RS485
- ◇ Wiring protection: reverse phase, overload, short circuit protection
- ◇ Display:

Design: Red 4-bit 12mm high brightness LED

Display range: -1999... 9999

- ◇ Stability (annual drift) : ≤±0.5℃
- ◇ Temperature:

Medium temperature: -20... 100°C (conventional type);

- 200... 400°C (high and low temperature type)

Ambient temperature: -20... 80°C

Storage temperature: -30... 80°C

- ◇ Material:

Watch head housing: engineering plastic

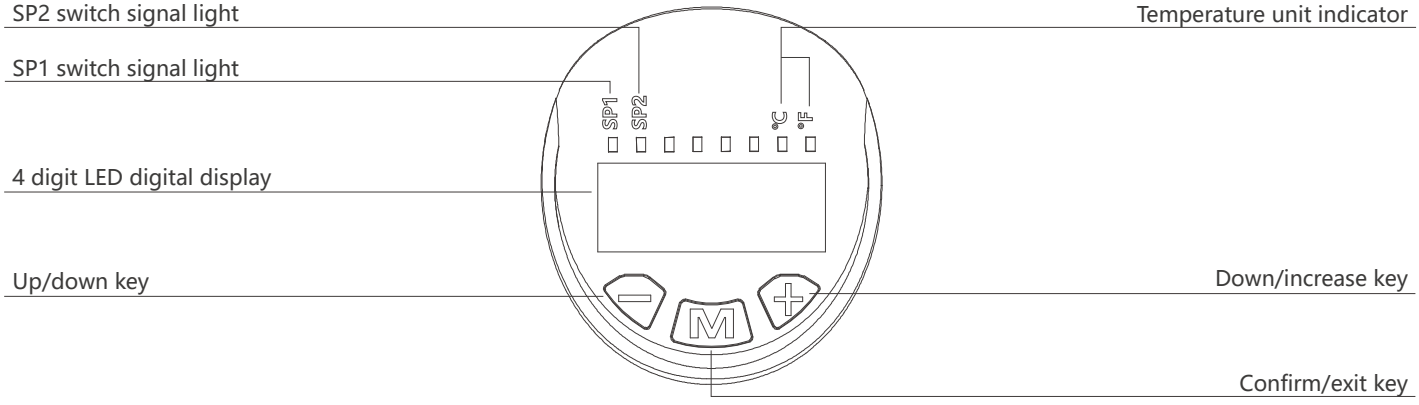
Flame retardant class: UL-94 V-0

Housing: stainless steel 304

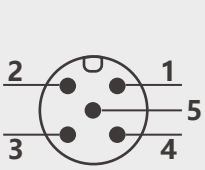
Medium contact part: stainless steel 304

- ◇ Protection grade: IP67
- ◇ Outlet: M12x1 connector

Panel diagram

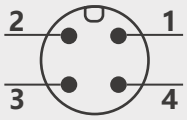


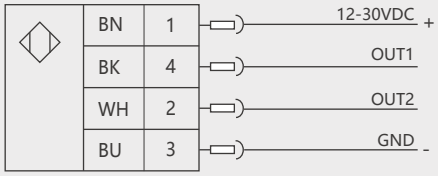
Wiring diagram



A3: Two way switch + one way analog

color	stitch	Instructions	color	stitch	Instructions	color	stitch	Instructions
BN	1	power supply (+)	BU	3	power supply (-)	GY	5 (OUT3)	4-20mA (Factory default) 1-5V 0-10V
BK	4 (OUT1)	SP1 switch PNP (Factory default) SP1 switch NPN	WH	2 (OUT2)	SP2 switch PNP (Factory default) SP2 switch NPN			





S2: Two-way switch/IO-Link

color	stitch	Instructions	color	stitch	Instructions
BN	1	power supply (+)	BU	3	power supply (-)
BK	4 (OUT1)	SP1 switch PNP (Factory default) SP1 switch NPN IO-Link	WH	2 (OUT2)	SP2 switch PNP (Factory default) SP2 switch NPN

SA: One switch /IO-Link + analog

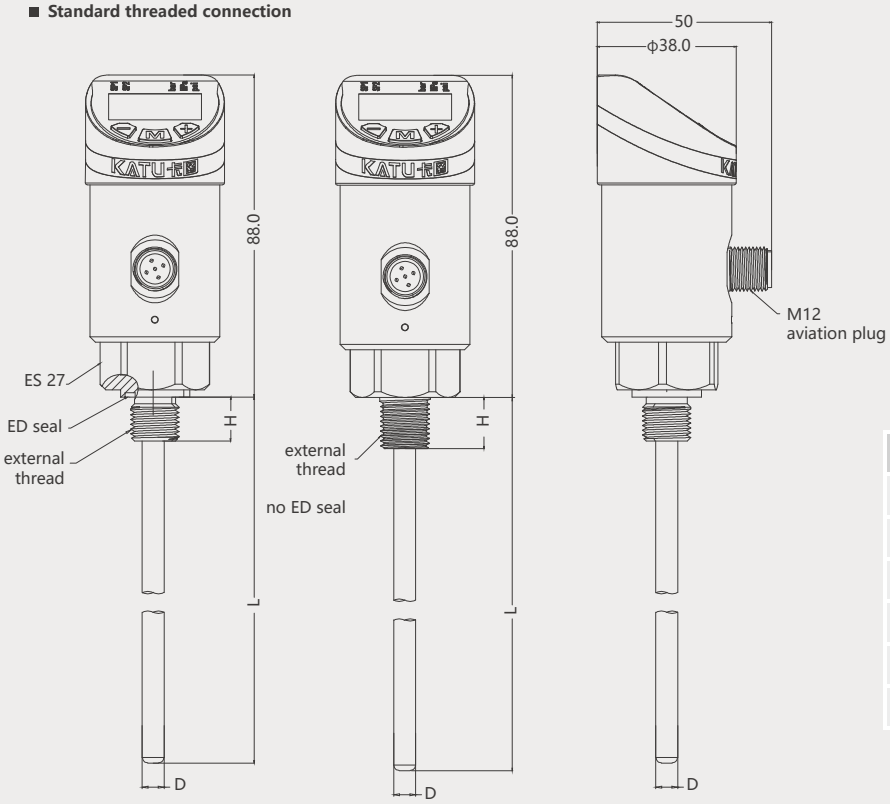
color	stitch	Instructions	color	stitch	Instructions
BN	1	power supply (+)	BU	3	power supply (-)
BK	4 (OUT1)	SP1 switch PNP (Factory default) SP1 switch NPN IO-Link	WH	2 (OUT2)	4-20mA (Factory default) 1-5V 0-10V

RS: RS485

color	stitch	Instructions	color	stitch	Instructions
BN	1	power supply (+)	BU	3	power supply (-)
BK	4 (OUT1)	RS485(B)	WH	2 (OUT2)	RS485(A)

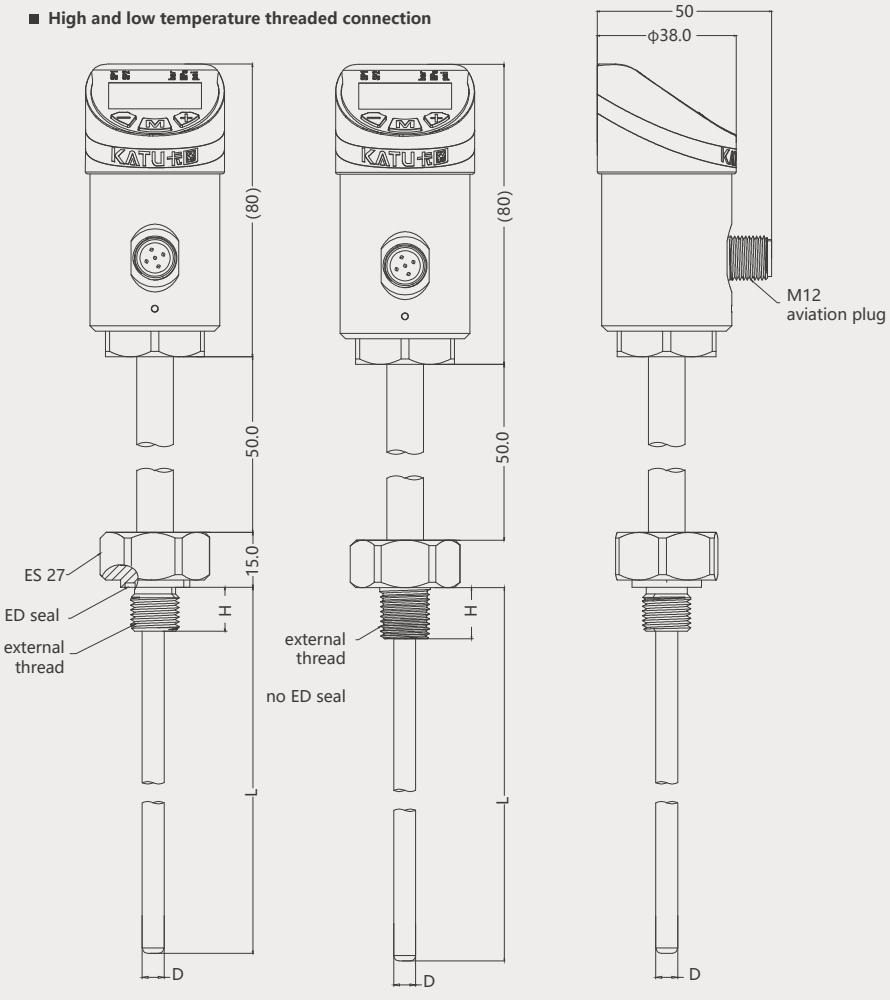
Size drawing (mm)

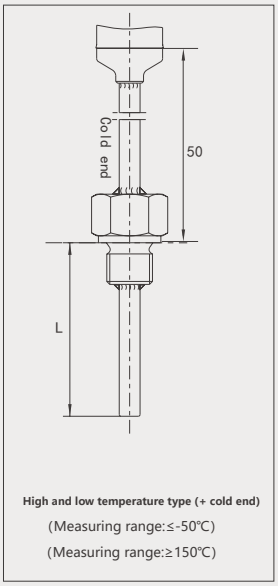
■ **Standard threaded connection**



Screw thread	Thread height(H)	seal
G1/4	12	Sealed with ED
G1/2	12	
M20*1.5	12	
R1/4	14	No ED seal
R1/2	14	
NPT1/4	14	

■ **High and low temperature threaded connection**



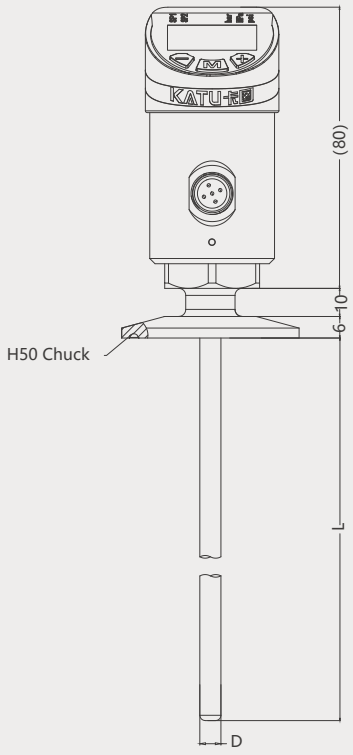


High and low temperature type (+ cold end)

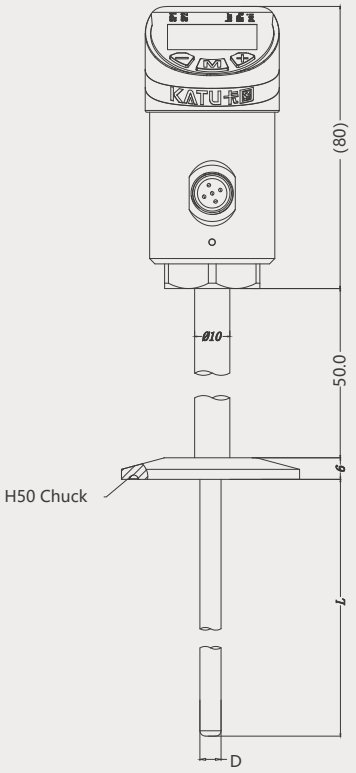
(Measuring range:≤-50℃)

(Measuring range:≥150℃)

■ Standard chuck type connection



■ High and low temperature chuck type connection

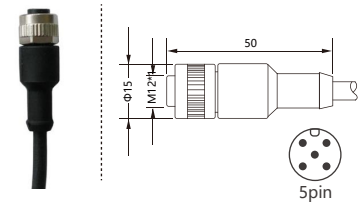
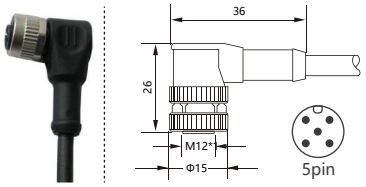


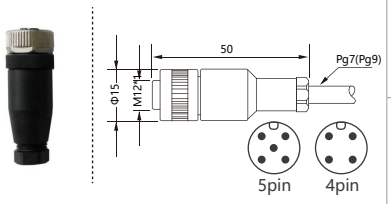
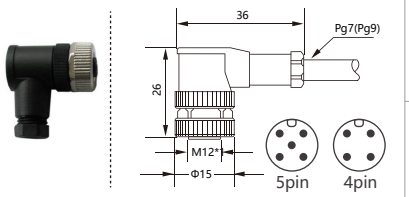
Selection table

TS500-	C2080	S2	G14M	L025	D6	expatiate	
TS500						TS500 electronic temperature switch	
	C2080					Range: -20... 80 ° C	
	C0100					Range: 0... 100 ° C	
	C50200					Range: -50... 200℃ high and low temperature type	If the temperature is too low or too high, add a cold end (Refer to size drawing)
	C50400					Range: -50... 400℃ high and low temperature type	
	C100100					Range: -100... 100℃ high and low temperature type	
	C200100					Range: -200... 100℃ high and low temperature type	
		S2				Output signal: Two switch output/IO-link (4-core cable)	
		SA				Output signal: One switch output /IO-link + analog output (4-core cable)	
		A3				Output signal: two switch output + analog output (5-core cable)	
		RS				Output signal: RS485 communication (4-core cable)	
			G14M			Process connection: G1/4 external thread	
			G12M			Process connection: G1/2 external thread	
			M20M			Process connection: M20*1.5 external thread	
			N14M			Process connection: NPT1/4 external thread	
			R14M			Process connection: R1/4 external thread	
			R12M			Process connection: R1/2 external thread	
			K50			Process connection: Sanitary chuck connection 50.5mm OD	
				L025		Rod length: L=mm (example: 025 represents rod length including thread 25mm)	
					D6	Rod diameter: 6mm	
					D8	Rod diameter: 8mm	

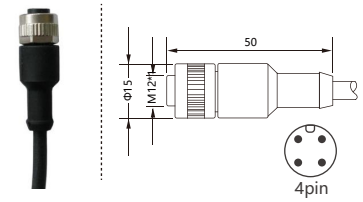
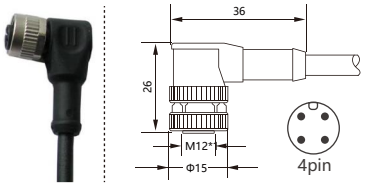
* If the temperature probe rod needs to add protective sleeve, the sensor selection thread should be G1/2;
* Mounting thread and probe length can be customized
* Temperature range: User can specify the range

Optional accessories - Electrical accessories (M12-5Pin: Factory default ZL05-PC02G)

name	Outline drawing/dimension drawing (unit :mm)	material	Model number	Shielded wire
M12*1-5Pin (2m cable)		PUR	ZL05-PU02G	-P
M12*1-5Pin (5m cable)			ZL05-PU05G	
M12*1-5Pin (10m cable)			ZL05-PU010G	
		PVC	ZL05-PC02G	
			ZL05-PC05G	
			ZL05-PC010G	
M12*1-5Pin (2m cable)		PUR	ZL05-PU02W	
M12*1-5Pin (5m cable)			ZL05-PU05W	
M12*1-5Pin (10m cable)			ZL05-PU010W	
		PVC	ZL05-PC02W	
			ZL05-PC05W	
			ZL05-PC010W	

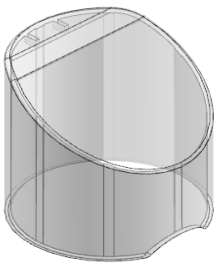
M12*1-4Pin/5Pin self-connector/Dimensions (Unit :mm)	Model number
	GL04 (4 Pin connector)
	GL05 (4 Pin connector)
	WL04 (4 Pin connector)
	WL05 (5 Pin connector)

Optional accessories - Electrical accessories (M12-4Pin: Factory default ZL04-PC02G)

name	Outline drawing/dimension drawing (unit :mm)	material	Model number	Shielded wire
M12*1-4Pin (2m cable)		PUR	ZL04-PU02G	-P
M12*1-4Pin (5m cable)			ZL04-PU05G	
M12*1-4Pin (10m cable)			ZL04-PU010G	
		PVC	ZL04-PC02G	
			ZL04-PC05G	
			ZL04-PC010G	
M12*1-4Pin (2m cable)		PUR	ZL04-PU02W	
M12*1-4Pin (5m cable)			ZL04-PU05W	
M12*1-4Pin (10m cable)			ZL04-PU010W	
		PVC	ZL04-PC02W	
			ZL04-PC05W	
			ZL04-PC010W	

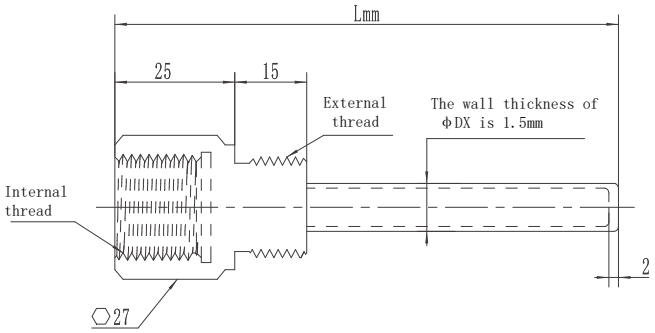
Optional accessories - Protective cover

500 Series(switch) Sensor protection cover



Order number: KTCS33662

Contour drawing/dimension drawing (Unit :mm)



Selection table

TM-	10	G12K	G14M	-	detail
TM					Temperature protective sleeve
	10				Rod diameter: 10mm
	12				Rod diameter: 12mm
		G14K			G1/4 internal thread
		G12K			G1/2 internal thread
			G14M		G1/4 external thread
			G12M		G1/2 external thread
			M27M		M27*2 external thread
			F25		National standard flange: DN25
				-	Total length of sleeve: The length can be customized
				50	Total length of protective sleeve: 50mm
				100	Total length of protective sleeve: 100mm
				250	Total length of protective sleeve: 250mm

* The probe rod with diameter ϕ6mm shall be equipped with protective sleeve with diameter ϕ10mm; Diameter ϕ8mm probe rod needs to be equipped with outer diameter ϕ12mm protective sleeve;

Sensor and controller

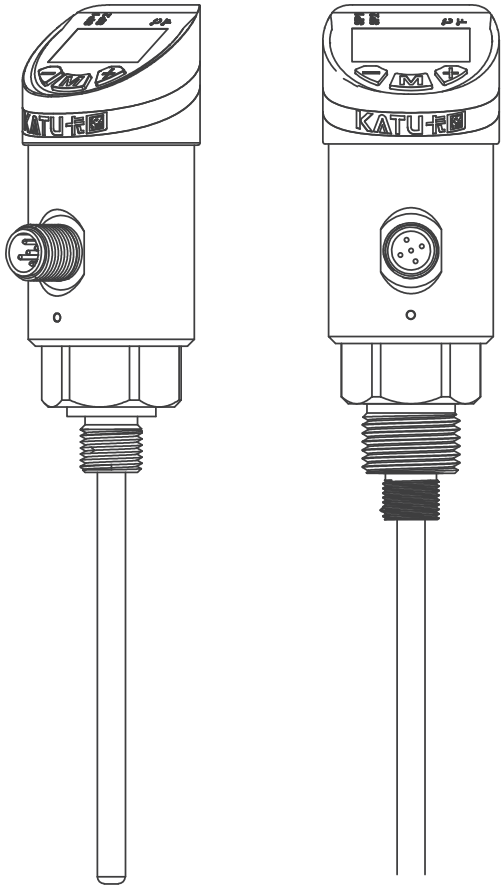
■ Flow ■ pressure ■ temperature ■ level ■ position

KATU 卡图

Operation instruction

Electronic digital temperature sensor

500 series



Purpose of product application

The 500 Series sensor (switch) has two switch outputs and one analog output.

danger

The sensor (switch) can only be used in the specified application range.
The temperature range must be within the permissible range. Do not exceed the rated pressure and power load value.
Assembly, commissioning and operation must be carried out in accordance with applicable national and local safety instructions.
The switch is designed to be used as a safety device for pressurizing the system in accordance with "Pressure Equipment Directive 97/23 / EC(PED)".

Standard

The standards applied during development, manufacturing and configuration are listed in the CE Compliance and manufacturer declarations.

Quality assurance

Our scope of delivery and service is subject to legal warranties and warranty periods.

Warranty clause

We guarantee that the functions and materials of the dual pressure switch meet the statutory requirements under normal operation and maintenance conditions.

Security of loss

Such as:

- Incorrect use,
- Incorrect installation
- Incorrect operation or operation in violation of the provisions of this operation manual.

No liability shall be assumed for any damage resulting therefrom or consequential.

Safety instruction

Safety instructions are intended to protect users from dangerous situations and /or prevent material damage.
In the operating instructions, the severity of the potential risk can be indicated by the following signal words:

danger

An imminent danger to the user. Failure to comply may result in fatal injury.

warning

An identifiable hazard.

Failure to comply may result in fatal injury and damage to equipment or plant parts.

caution

It means a danger.

Non-compliance may result in minor injury and material damage to the sensor (switch) and/or plant.

important

Information that is important to the user.

Deal with

Sensors (switches) must be handled correctly in accordance with national or local regulations for electrical/electronic equipment.

Sensors (switches) cannot be disposed of with household waste!

Product characteristics

The all-metal casing design, with a highlighted LED digital display, enables the product line to be used in a variety of industrial applications. The three-button design and menu make the product more convenient to use, and a variety of connection methods can fully meet various specific installation needs. The device, which can rotate at 330°, guarantees the best viewing Angle in different mounting modes.

Switching function

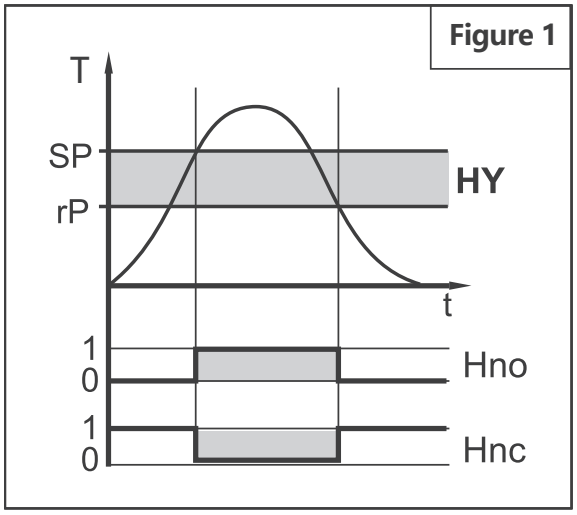
If the switch is higher or lower than the set switching limit (SP, rP), its switching state is changed. The following switch functions can be selected:

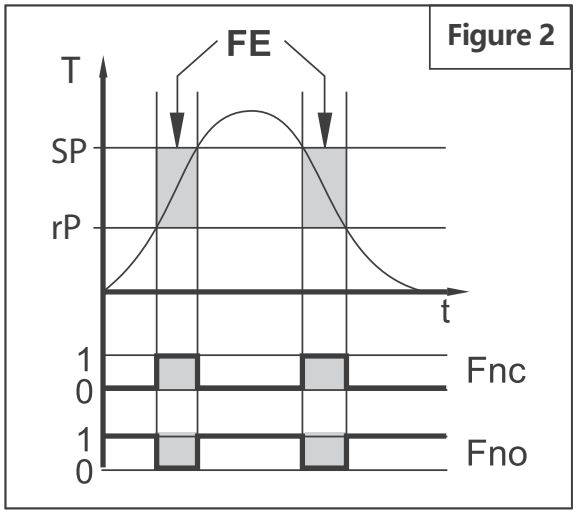
- Hysteresis function normally open: = [Hno] (→ Figure 1)
- Hysteresis function normally closed: = [Hnc] (→ Figure 1)

  First set the switch point: (SP), Then set the reset point: (rP)。
  If SP changes again, the hysteresis will change with it.

- Window function usually open: = [Fno] (→ Figure 2)
- Window function normally closed: = [Fnc] (→ Figure 2)

  The width of the window can be set by the difference between SP and rP.
  SP = Upper limit value, rP = Lower limit value.





T = temperature; HY = lag; FE = window

Install

Safety instructions are intended to protect users from dangerous situations and/or prevent material damage. In the operating instructions, the severity of the potential risk can be indicated by the following signal words:

caution

Vibration and violent vibration must be avoided during transportation. Even if the sensor (switch) housing is not damaged,

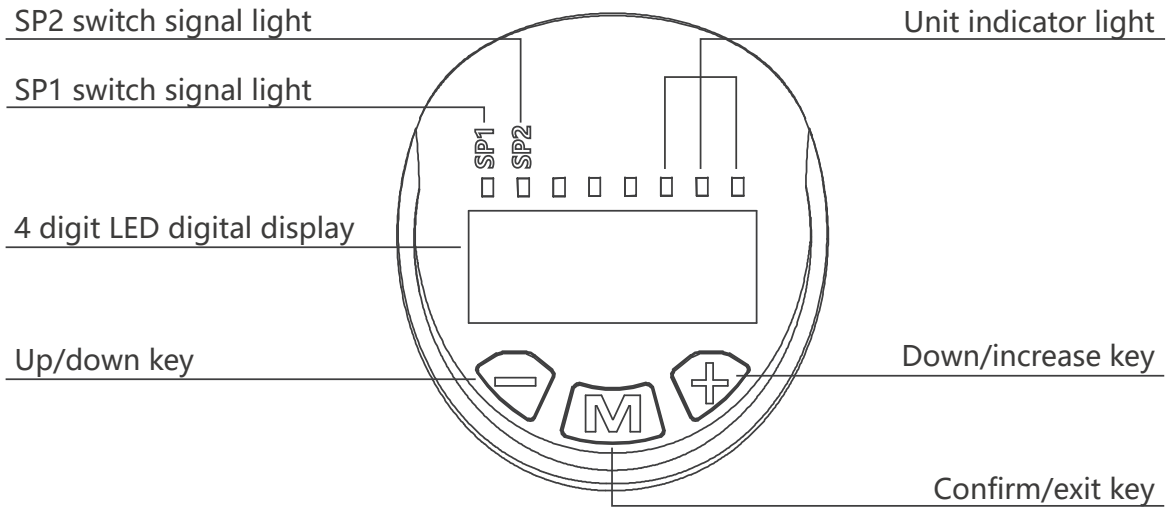
Internal components can also break down and cause failure.

danger

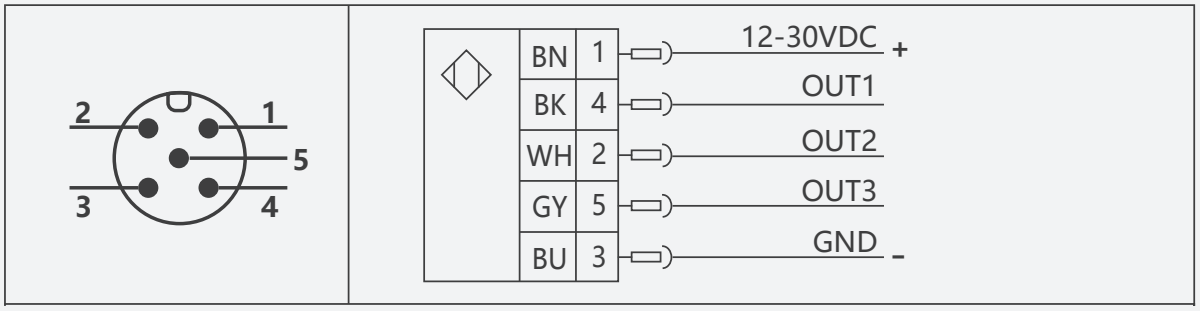
Sensors (switches) should only be installed in systems that do not exceed the maximum pressure Pmax (see type label).

Install sensors (switches) only when power is off (electric, hydraulic/pneumatic).

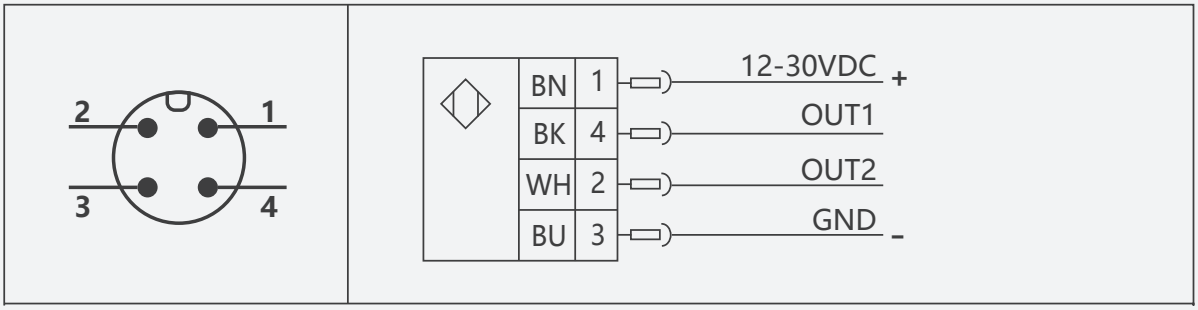
Panel description



Electrical connection

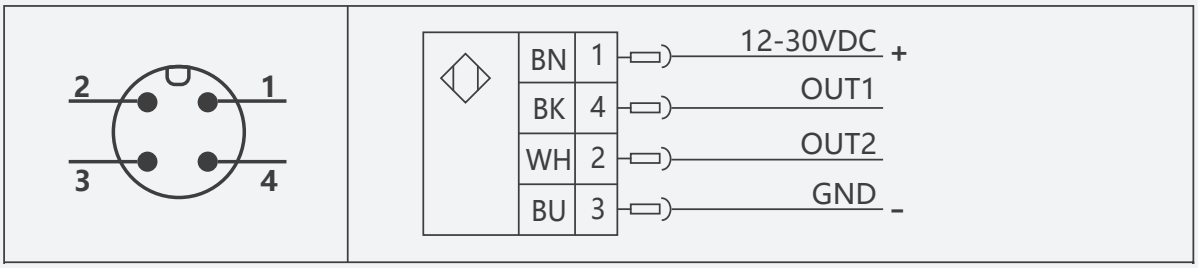


A3: Two-way switch + one-way analog		
color	**stitch**	**Instructions**
BN	1	power supply (+)
BU	3	power supply (-)
BK	4 (OUT1)	SP1 Switch PNP (factory default) SP1 Switch NPN
WH	2 (OUT2)	SP2 Switch PNP (factory default) SP2 Switch NPN
GY	5 (OUT3)	4-20mA (factory default) 1-5V 0-10V



S2: Two way switch/IO-Link		
color	**stitch**	**Instructions**
BN	1	power supply (+)
BU	3	power supply (-)
BK	4 (OUT1)	SP1 Switch PNP (factory default) SP1 Switch NPN IO-Link
WH	2 (OUT2)	SP2 Switch PNP (factory default) SP2 Switch NPN

SA: One switch /IO-Link + one analog		
color	**stitch**	**Instructions**
BN	1	power supply (+)
BU	3	power supply (-)
BK	4 (OUT1)	SP1 Switch PNP (factory default) SP1 Switch NPN IO-Link
WH	2 (OUT2)	4-20mA (factory default) 1-5v 0-10v



RS485		
color	**stitch**	**Instructions**
BN	1	power supply（+）
BU	3	power supply（-）
BK	4 (OUT1)	RS485(B)
WH	2 (OUT2)	RS485(A)

Debugging/operation

Sensors can only be debugged and operated by authorized personnel.

caution

Do not put the switch into operation when the sensor itself or the connecting cable is damaged.
Do not use any sharp, hard objects to make entries. The key may be damaged by something sharp and hard.

warning

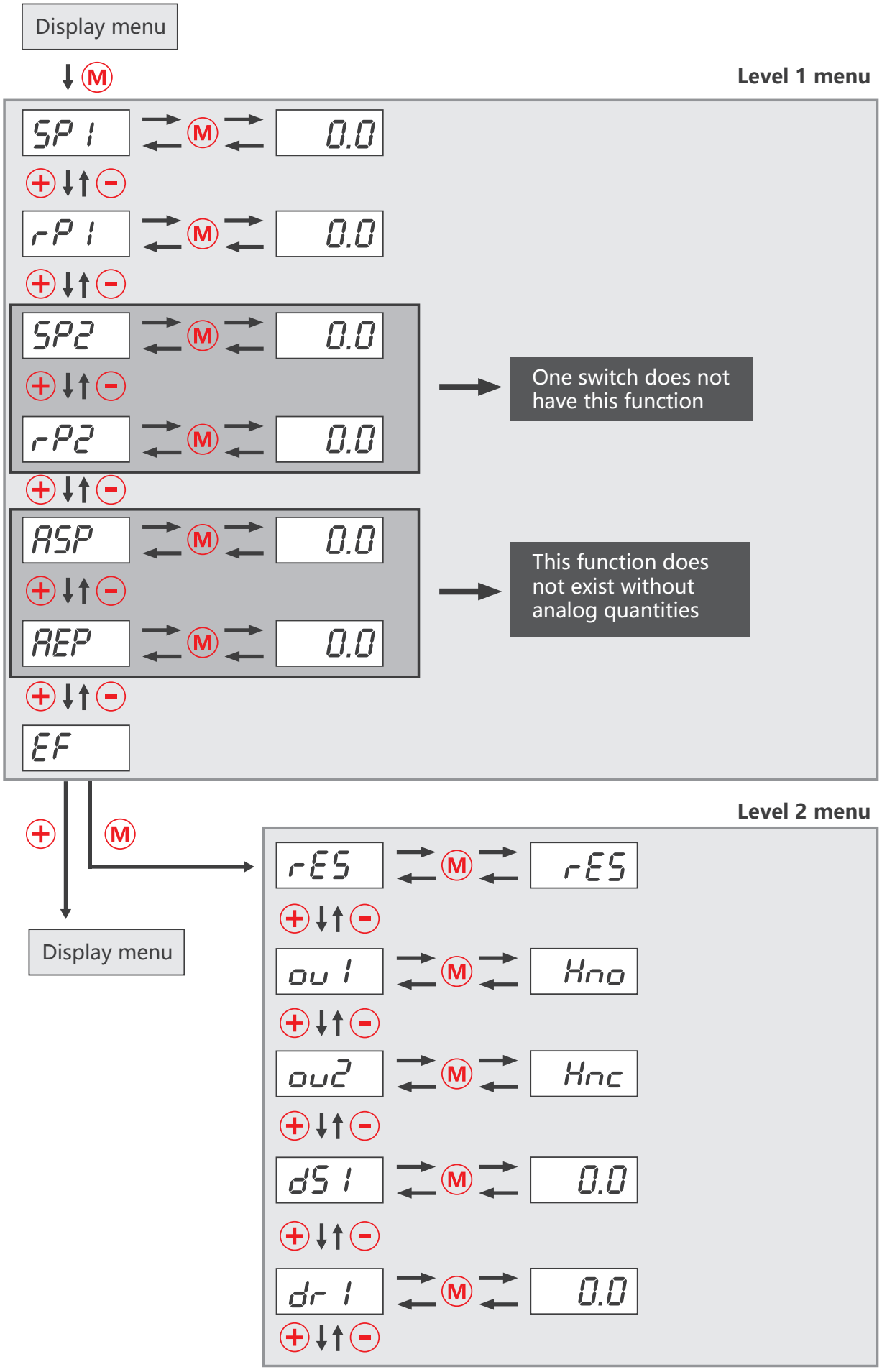
Note that the casing surface may become very hot if the operating temperature is high!

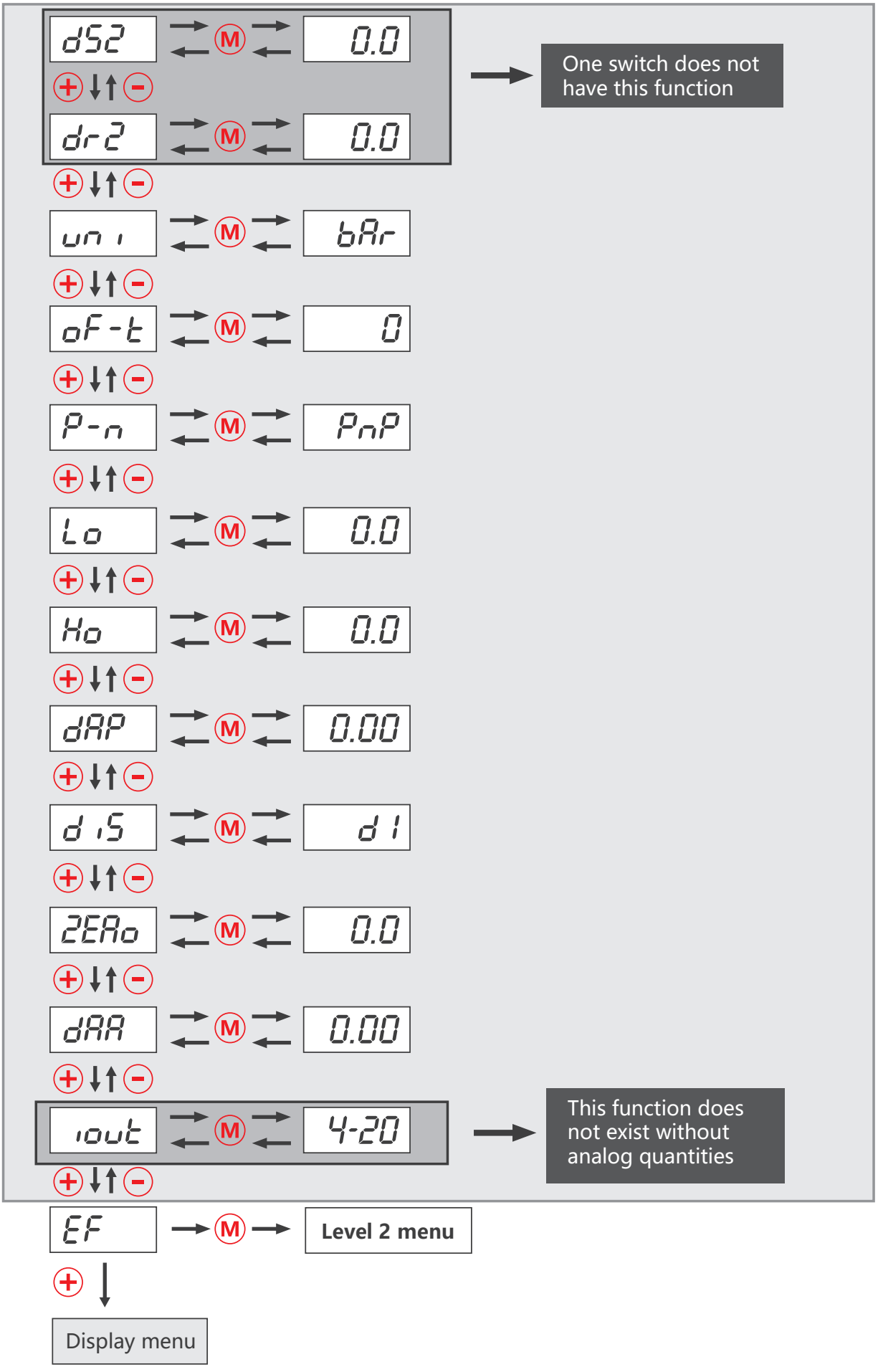
Level 1 menu		
sp1	Alarm value of switch 1 (factory default value is 30.0)	
	Hold down [+] or [-] for at least 1 second. 1 second later: The set value can be changed Press the button and the value will increase. Hold down the button and the value will keep changing.	
rp1	Reset value of switch 1 (factory default value is 29.5)	
	Hold down [+] or [-] for at least 1 second. 1 second later: The set value can be changed Press the button and the value will increase. Hold down the button and the value will keep changing.	
sp2	Alarm value of switch 2 (factory default value is 40.0)	One switch None of this.
	Hold down [+] or [-] for at least 1 second. 1 second later: The set value can be changed Press the button and the value will increase. Hold down the button and the value will keep changing.	
rp2	Reset value of switch 2 (factory default value is 39.5)	
	Hold down [+] or [-] for at least 1 second. 1 second later: The set value can be changed Press the button and the value will increase. Hold down the button and the value will keep changing.	
asp	Lower limit value of range (factory default is the lower limit of	Analog output Range (PLC corresponding range) No analog quantity None of this.
	Hold down [+] or [-] for at least 1 second. 1 second later: The set value can be changed Press the button and the value will increase. Hold down the button and the value will keep changing.	
aep	Upper limit value of range (factory default is upper limit of	
	Hold down [+] or [-] for at least 1 second. 1 second later: The set value can be changed Press the button and the value will increase. Hold down the button and the value will keep changing.	
EF	Expand functions/Open Level 2 menus	
	Press the [M] key to enter the extended Level 2 menu Press the [+] key to exit	

Level 2 menu		
res	factory data reset	
	Long press [+] to restore factory Settings	
ou1	Switch 1 signal: (Factory default is HNO) Hysteresis function: HNO (Normally Open) /HNC (Normally Closed) Window function: FNO (Normally Open) /FNC (Normally Closed) IO-Link: (S2/SA signal output only)	
	Hold down [+] or [-] for at least 1 second. 1 second later: The set value can be changed Press the button and the value will increase. Hold down the button and the value will keep changing.	
ou2	Switch 2 signal: (Factory default is HNC) Hysteresis function: HNO (Normally Open) /HNC (Normally Closed) Window function: FNO (Normally Open) /FNC (Normally Closed)	One switch None of this.
	Hold down [+] or [-] for at least 1 second. 1 second later: The set value can be changed;Press the button and the value will increase. Hold down the button and the value will keep changing.	
ds1	The activation delay of OUT1. (Factory default is 0s)	
	Hold down [+] or [-] for at least 1 second. 1 second later: The set value can be changed Press the button and the value will increase. Hold down the button and the value will keep changing.	
dr1	The shutdown delay of OUT1. (Factory default is 0s)	
	Hold down [+] or [-] for at least 1 second. 1 second later: The set value can be changed Press the button and the value will increase. Hold down the button and the value will keep changing.	
ds2	The shutdown delay of OUT1. (Factory default is 0s)	One switch None of this.
	Hold down [+] or [-] for at least 1 second. 1 second later: The set value can be changed;Press the button and the value will increase. Hold down the button and the value will keep changing.	
dr2	The shutdown delay of OUT2. (Factory default is 0s)	
	Hold down [+] or [-] for at least 1 second. 1 second later: The set value can be changed； Press the button and the value will increase. Hold down the button and the value will keep changing.	

uni	System standard measurement units (display)
	Hold down [+] or [-] for at least 1 second. 1 second later: The set value can be changed Press the button and the value will increase. Hold down the button and the value will keep changing.
of-t	Temperature offset correction (Factory default 0)
	Hold down [+] or [-] for at least 1 second. 1 second later: The set value can be changed Press the button and the value will increase. Hold down the button and the value will keep changing.
p-n	PNP/NPN switching (Factory default is PNP)
	Hold down [+] or [-] for at least 1 second. 1 second later: The set value can be changed Press the button and the value will increase. Hold down the button and the value will keep changing.
L0	The system measures the historical minimum value.
	Hold down [+] or [-] for at least 1 second. 1 second later: The set value can be changed Press the button and the value will increase. Hold down the button and the value will keep changing.
H0	The system measures the historical maximum value
	Hold down [+] or [-] for at least 1 second. 1 second later: The set value can be changed Press the button and the value will increase. Hold down the button and the value will keep changing.
dap	Signal damping. (Factory default is 0.06)
	Hold down [+] or [-] for at least 1 second. 1 second later: The set value can be changed Press the button and the value will increase. Hold down the button and the value will keep changing.
dis	The update rate and direction of the display screen. (Factory default is d1)
	Hold down [+] or [-] for at least 1 second. 1 second later: The set value can be changed Press the button and the value will increase. Hold down the button and the value will keep changing. [d1] : Update the measurement value every 100ms [d2] : Update the measurement value every 500ms [d3] : Update the measurement value every 1000ms

zeao	Zero position removal value (full scale %) (factory default is 0.5)	
	Hold down [+] or [-] for at least 1 second. 1 second later: The set value can be changed Press the button and the value will increase. Hold down the button and the value will keep changing.	
daa	Signal filtering value (factory default is 99)	
	Hold down [+] or [-] for at least 1 second. 1 second later: The set value can be changed Press the button and the value will increase. Hold down the button and the value will keep changing.	
iout	Output analog quantity switching Current type 4-20: (4-20mA 0-20: (0-20mA) 20-4: (20-4mA) 20-0: (20-0mA) 5V voltage type 1-5F: (1-5V 0-5F: (0-5V 10V voltage type 210F: (2-10V 110F: (1-10V 010F: (0-10V	No analog quantity None of this.
	Hold down [+] or [-] for at least 1 second. 1 second later: The set value can be changed Press the button and the value will increase. Hold down the button and the value will keep changing.	
EF	Expand functions/Open Level 2 menus	
	Press the [M] key to enter the extended Level 2 menu Press the [+] key to exit	


Display menu
Level 1 menu
SP1
0.0
rP1
0.0
SP2
0.0
rP2
0.0
One switch does not have this function
ASP
0.0
AEP
0.0
This function does not exist without analog quantities
EF
Level 2 menu
rES
rES
ou1
Hno
ou2
Hnc
dS1
0.0
dr1
0.0
Display menu


dS2
0.0
dr2
0.0
One switch does not have this function
uni
bAr
oF-t
0
P-n
PnP
Lo
0.0
Ho
0.0
dAP
0.00
diS
d1
ZERo
0.0
dAA
0.00
iout
4-20
This function does not exist without analog quantities
EF
Level 2 menu
Display menu

Maintenance/cleaning

Sensors (switches) do not require maintenance.

warning

Periodically check whether the switch is working properly.

If the switch does not work properly, stop the operation immediately.

caution

Use of improper cleaning agent may damage the switch.
The following cleaning agents can be used to clean polycarbonate: mild soap or detergent Isopropyl alcohol
Immediately after cleaning, rinse with water. Do not leave cleaner on the surface of the product. Do not clean products in high heat or direct sunlight.
The following cleaning agents are known to affect the integrity of polycarbonate components and should not be used: ZEP Fast 505, Pinesol, Formula 409
Halogenated solvents (benzene, gasoline, acetone or carbon tetrachloride)
Strong alkalinity
Methyl ethyl ketone
Abrasive substance

disassemble

danger

Only remove the switch in case of power failure (electrical, hydraulic/pneumatic).

Switch disconnection from pressure and power supply must be performed by trained or directed personnel in accordance with the most advanced standards.

warning

Be aware that the surface of the shell may become very hot if the operating temperature is higher!

500 Series temperature -RS485 Communication Protocol (MODBUS-RTU)

1.RTU data format description

1.1 Communication mode

The instrument adopts MODBUS RTU format. The protocol is used for data communication in master-slave query mode.

1.2 data format

The format of each byte (11 bits) in RTU mode is:
The encoding system is: 8-bit binary
Bits per byte: 1 start bit, 8 data bits (least significant bit sent first), 1 parity bit, 1 stop bit
note: When no check is used, you can select one stop bit or two stop bits.
Five baud rates are available: 2400, 4800, 9600, 19200, 115200

start	address	Function code	date	CRC check	end
≥3.5 character	8 bit	8 bit	n*8 bit	16 bit	≥3.5 character

note:

(1) in RTU mode,an idle interval of at least 3.5 characters separates the packet frames.
(2) The entire messsage frame must be sent in a continuous stream of characters.
(3) The idle interval between two characters should not exceed 1.5 character time.

1.3 address

In the protocol,the address of the instrument is “0-255”,and the “0” address is used for broadcasting,and the other addresses are reserved.

2. Command description

2.1 This instrument uses two instructions in the MOBUS protocol:

Command 03	Read a single hold register
Command 06	Write a single hold register

2.2 data format

The data format in the protocol is:floating-point number。Modbus sends the most significant word first。The protocol date encoding sequence is 3412,decoding sequence is 1234。

32 single-precision floating-point number the single format is IEEE754,equivalent to 4 bytes and the sequence is 3-4-1-2。After decoding into the 1-2-3-4 sequence, the 31st, 30th, 29th, ″, and 0 bits from the highest to the lowest are respectively.

The 31 bits are the sign bits(S),where 1 means the number is negative and 0 is positive;30-23 bits,a total of 8 bits is the level code;22-0 digits,a total of 23 digits is mantissa.

The format of command 03 is as follows: (read register command)

note:

MODBUS request

Instrument address	1 BYTE	01-255
Function code	1 BYTE	0x03
Start address	2 BYTE	0-FFFF
Read quantity	2 BYTE	1-12
CRC low-order	1 BYTE	
CRC high-order	1 BYTE	

MODBUS response

Instrument address	1 BYTE	01-255
Function code	1 BYTE	0x03
Byte count	1 BYTE	
Input state	N*2 BYTE	
CRC low-order	1 BYTE	
CRC high-order	1 BYTE	

Command 06 format is as follows (write register command):

Clears the value of total accumulated traffic

MODBUS request

Instrument address	1 BYTE	01-255	
Function code	06	0x06	
Byte count	1 BYTE		

MODBUS response

Instrument address	1 BYTE	01-255	
Function code	06	0x06	
Byte count	1 BYTE		

Description of communication:

Configuration instruction

sequence	Explain	value
Address (id)	Address(default is 1,can be modified)	example: 0001
baud	9600 (revisbility)	2400-115200

Baud=0 r485_baud= 2400
Baud=1 r485_baud=4800
Baud=2 r485_baud=9600
Baud=3 r485_baud=19200
Baud=4 r485_baud=115200

command: 03

sequence	Instructions
40001	Temperature plus or minus (0 is positive, 1 is negative)
40002	Temperature value (℃)
40003	Temperature decimal number

Katu Electronic （Kunshan）Co.,Ltd.

telephone：400-150-8815

Website: www.katusensor.com

Factory: Building 27B, Jingdong Intelligent Industrial Park,
No.9 Jinjie Road, Huaqiao Economic Development Zone,
Kunshan City, Suzhou