

# YSB Pressure Transmitter

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## Operating Manual



**Sunstrand Fluid Handling Co., Ltd.**

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# 1 Summarize

## 1.1 Summarize of transmitter

YSB series pressure transducer is applied to industrial processes, in measurement of liquid, steam and gas pressure. It uses intelligent full isolated conversion technology and advanced digital compensation technology for super anti-jamming capability. And it has good resistance to vibration. The range of measurement can meet all conditions of usage. The options of medium material is variety such as SUS316L, hastelloy, tantalum etc. It is widely used in petroleum, chemical, electric power, metallurgy etc.



## 1.2 Key spareparts

The sensor of YSB series digital pressure transmitter adopts highly stable stainless steel diffused silicon sensor and single crystal silicon sensor to ensure the excellent performance of the transmitter.

## 1.3 Application

- Oil and gas field automation control remote transmission system
- Electricity and energy systems
- Industrial site process control
- Liquid level measurement and water supply system
- Hydraulic pneumatic control system

## 2 Technical Description

### 2.1 Working principle

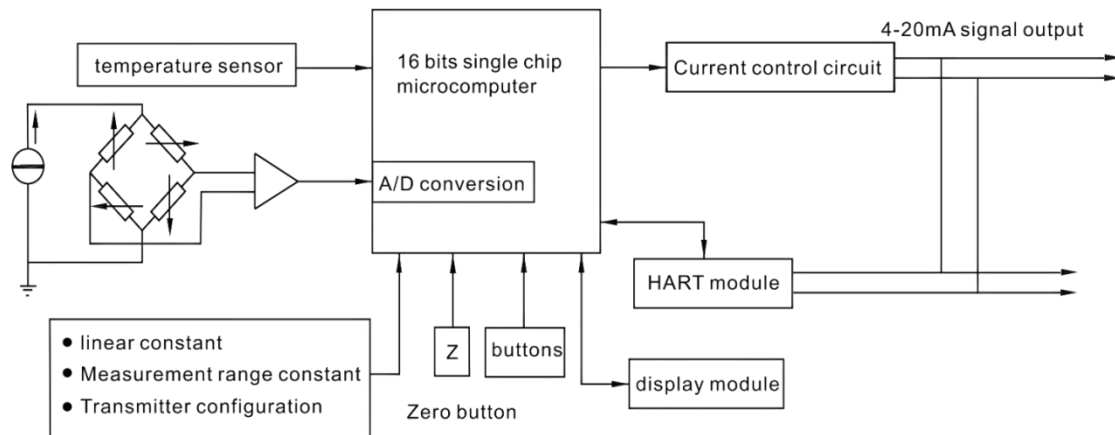


Fig. 1

As shown in Fig. 1 of the working principle, the externally introduced pressure will change the resistance of the sensor, causing the voltage output of the bridge to change. After A/D conversion, it becomes a digital signal. The microprocessor calculates and outputs a current control. The signal is sent to the current control circuit and converted into 4-20mA analog current output. At the same time, the microprocessor is responsible for interaction and other operations (display and setting). The HART module realizes the HART communication of the transmitter.

### 2.2 Advantages

- High precision, high stability, high reliability.
- Wide temperature range, excellent temperature properties.
- Excellent accuracy and long-term stability.
- Reverse polarity protection and current limit protection.
- Zero and span continuously adjustable.
- LOW copper cast aluminum alloy shell with polyurethane paint, compact design for easily install.
- More than 15 years planned durability.

### 3 Equipment Specification Sheet

|                        |                                                                           |
|------------------------|---------------------------------------------------------------------------|
| Measuring range        | 0~6kPa~70MPa (optional)                                                   |
| Accuracy               | ±0.25%, ±0.5%                                                             |
| Operating voltage      | 24V DC ±10%                                                               |
| Output & communication | 4~20mA DC (2 line)                                                        |
|                        | 4~20mA with HART protocol                                                 |
|                        | 4~20mA with RS485 protocol (MODBUS RTU)                                   |
| Measurement type       | gauge pressure, absolute pressure                                         |
| Conduit connections    | M20×1.5 or 1/2NPT internal thread, Wire diameter Φ9                       |
| Display                | LCD(-30℃~80℃)                                                             |
| Shell material         | low copper cast aluminum alloy with polyurethane paint or stainless steel |
| Wetted part material   | SUS316L, Hastelloy Alloy, Tantalum                                        |
| Medium temperature     | -40℃~120℃                                                                 |
| Operating temperature  | -40℃~85℃, -30℃~85℃ (with LCD)                                             |
| Environment humidity   | 5~100%RH@40℃                                                              |
| Enclosure protection   | IP65, IP67                                                                |
| Explosion proof        | Ex ia II C T6, Ex d II C T6                                               |
| Certificate            | SIL, CE, EAC                                                              |
| Process connection     | Pipe connections form : 1/2NPT internal thread                            |
|                        | Direct connection: M20x1.5 or 1/2NPT external thread                      |
|                        | Electrical connection: M20x1.5 or 1/2NPT internal thread                  |
| Weight                 | 1.65kg (without mounting bracket)                                         |

## 4 Notice for use

### 4.1 Outline and dimension

Length/ width/ height: 110mm/ 134mm/ 146mm

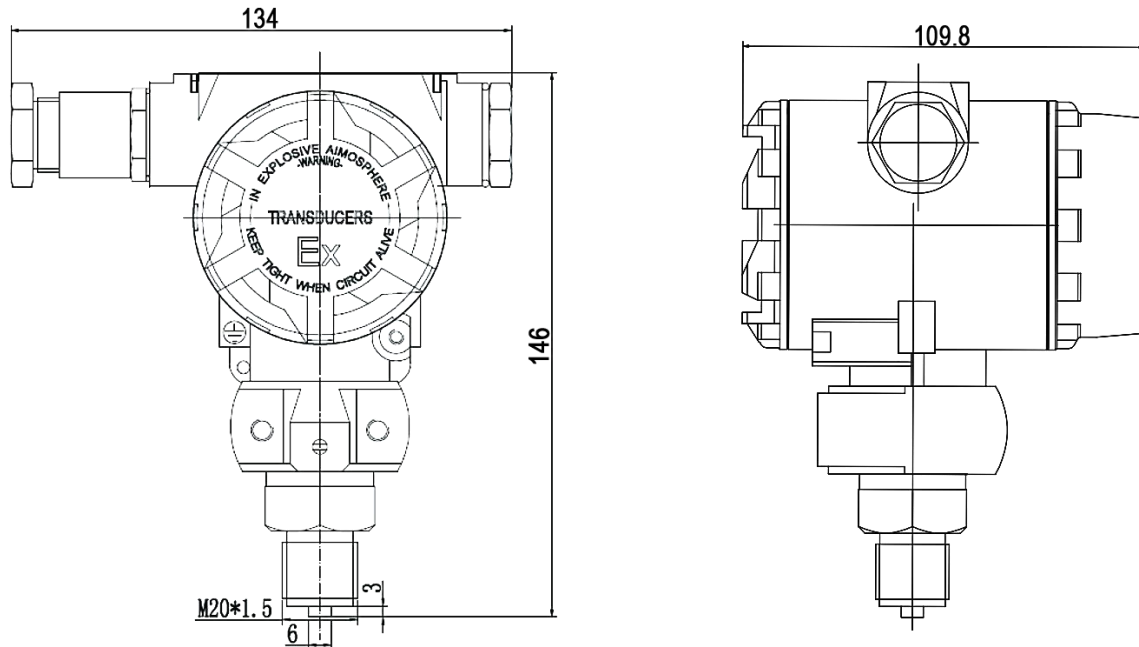


Fig. 2

### 4.2 Notes for Installation

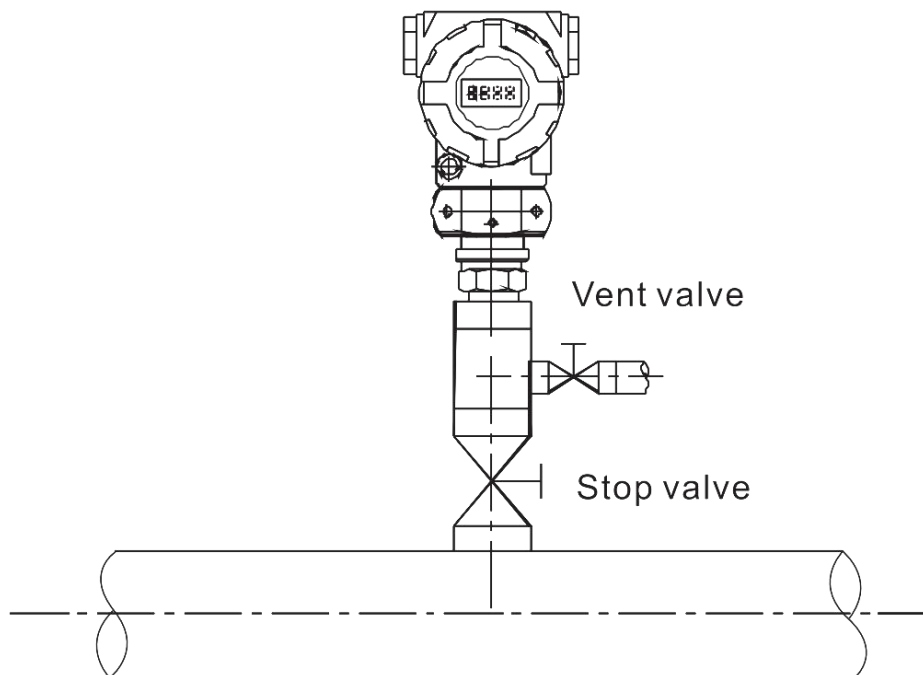


Fig. 3

- 1) Protect transmitter from measured medium with corrosivity or high temperature ( $\geq 90^{\circ}\text{C}$ ).
- 2) Prevent sediment from depositing in the pressure tube.
- 3) The pressure tube should be as short as possible.
- 4) The liquid column pressure heads in the pressure tubes on both sides should be balanced.
- 5) The pressure tube shall be installed where the temperature gradient and temperature fluctuation is low.
- 6) Prevent crystallization or freezing at low temperature in the tube.

### 4.3 Notes for Measurement

#### 1) Measurement of liquid

When the measured medium is liquid, the pressure outlet should be opened on the side of the flow pipe to avoid sediment deposition, and the transmitter shall be installed next to or under the pressure outlet, so that bubbles can be discharged into the flow line.

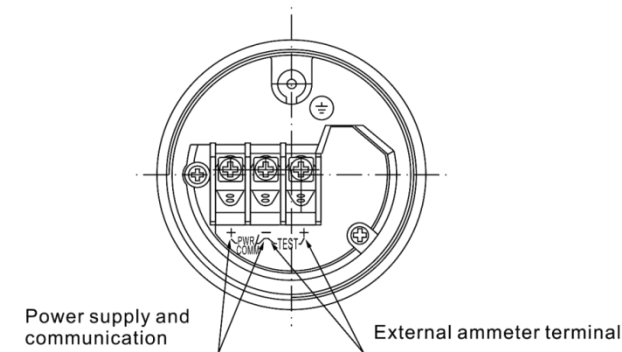
#### 2) Measurement of gases

When the measured medium is gas, the pressure outlet should be opened on the top or side of the flow pipe, and the transmitter shall be installed next to or above the flow pipe, so that accumulated fluids can flow easily into the flow line.

#### 3) Measurement of steam

- When the measured medium is steam, the pressure outlet should be opened on the side of the flow line, and the transmitter installed below the pressure outlet, so that the cold polymer can be filled in the pressure pipe.
- It should be noted that when measuring steam or other high-temperature media, the temperature should not exceed the operating limit temperature of the transmitter.
- When the measured medium is steam, the pressure guiding tube should be filled with water to prevent the steam from directly contacting the transmitter, so that the volume change of the transmitter is very negligible when the transmitter is working, and there is no need to install a condenser.

#### 4.4 Electrical installation



|              |                                  |
|--------------|----------------------------------|
| DC24(4~20mA) | Power supply and output terminal |
| TEST         | External ammeter terminal        |
| ⏏            | Earth terminal                   |

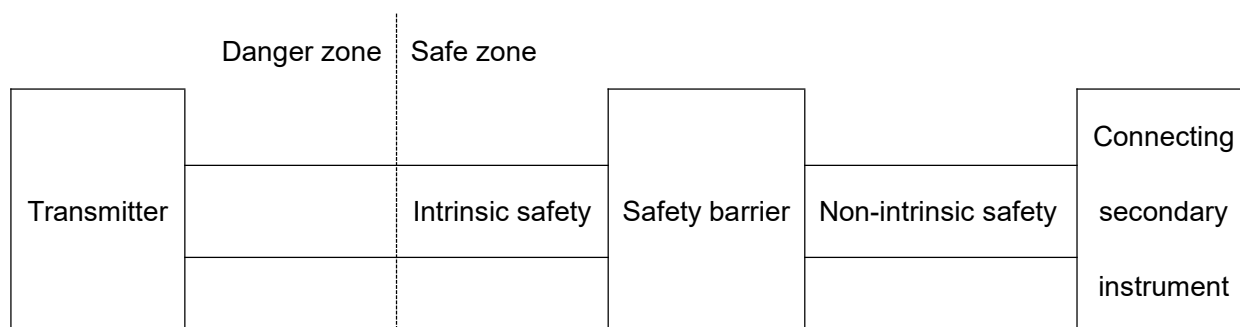
- The power supply voltage of the transmitter is 12-36VDC, and the ripple of the DC power supply is less than 2%.

- Maximum load =  $50 \times (\text{supply voltage} - 12) \Omega$ .

It is recommended to select the lead-in terminal of explosion-proof cable, cable diameter  $\Phi 8 \sim \Phi 12$ .

- Signal wire do not need to be shielded, but use stranded lines for better results. Do not place signal wire in line with other power lines or close to heavy power equipment.
- The threading hole in the transmitter housing should be sealed or inserted with a sealant plug to prevent moisture from accumulating in the housing. If the wiring is not sealed, install the transmitter with the threading hole down to drain water.
- The signal wire may be ungrounded or grounded at any point in the signal loop. The transmitter housing may be grounded or ungrounded, the power supply does not have to be stable, even if the peak value of the power supply ripple is 4V, the ripple output by the transmitter is negligible, because the transmitter is grounded by capacitance coupling, high voltage megohm meters are not used to check the insulation resistance.
- The voltage used to check the line should not exceed 500V.
- The transmitter circuit is designed to be intrinsically safe and the output current is limited to 22mA DC (28mA DC at high temperature or high supply voltage).

## 4.5 Wiring diagram of intrinsically safe explosion-proof transmitter



$U_i$ : 28V DC     $U_o \leq 28V$  DC

$I_i$ : 118mA     $I_o \leq 118mA$

$P_i$ : 3.3W     $P_o \leq 3.3W$

$L_i$ : 0mH     $L_o \leq 1.5mH$

$C_i$ : 0.0011uF     $C_o \leq 0.083uF$

Intrinsically safe system parameter matching must follow the following principles:

$U_o \leq U_i$ ;  $I_o \leq I_i$ ;  $P_o \leq P_i$ ;  $C_c \leq C_o - C_i$ ;  $L_c \leq L_o - L_i$

$C_c$ 、 $L_c$ : The maximum distributed capacitance and inductance allowed by the cable (or wire) between the safety barrier and the transmitter.

Notes: GB 3836.4-2010 standard defined by  $U_i$ ,  $I_i$ ,  $P_i$ ,  $L_i$ ,  $C_i$ ,  $U_o$ ,  $I_o$ ,  $P_o$ ,  $L_o$ ,  $C_o$ .

## 5 Function of transmitter

### 5.1 Warning

#### Warning

An explosion can cause serious injury:

Do not open the cover of the transmitter during use in dangerous situations.

The transmitter cover must be tightened during use in explosion-proof situations.

Be sure that the instrument is installed in an inductive free loop before use in explosive gas situations.

## 5.2 Calibration instructions of transmitter

Besides the remote adjustment function, the transmitter can also adjust the zero and range of the instrument on-site. Actual pressure may or may not be added to the on-site adjustment process.

The on-site adjustment function of the instrument is accomplished by the button configuration

Zero setting button (Z)

Full button (S)

Function button (M)

|                               |                                                                                                                                     |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| "88" in the lower left corner | set the variable                                                                                                                    |
| 0 or blank                    | normal display                                                                                                                      |
| 1                             | Input opcode (You can directly enter the number corresponding to the following function to directly set the corresponding function) |
| 2                             | Set the units                                                                                                                       |
| 3                             | Set the lower limit of the range                                                                                                    |
| 4                             | Set the upper limit of the range                                                                                                    |
| 5                             | Set the damping                                                                                                                     |
| 6                             | Zero adjustment of main variable                                                                                                    |
| 7                             | Zero and range shift (zero and full)                                                                                                |
| 8                             | Transfer function                                                                                                                   |

Notes: By entering the corresponding opcodes of each function, you can quickly enter the corresponding function. For example, enter "5" to directly enter the set damping function.

## 5.3 Operation instructions of buttons

### 1) Zero adjustment of main variable

In the real-time normal display state, press the "M" + "Z" buttons at the same time and hold for 5 seconds to directly enter the main variable zero adjustment function.

After entering the "Zero adjustment of main variable" function, the function code in the lower left corner displays "6", the middle displays the current main variable value, and the lower area displays "YES" or "NO".

- Press the "S" button to switch between "YES" and "NO".
- When "YES" is displayed, press the "M" or "Z" button to execute the "Zero adjustment of main variable" operation.

After executing this function, the output pressure is "0".

- When "NO" is displayed, press the "M" or "Z" button to end the "Zero adjustment of main variable" operation.

## 2) Set the units

The currently selected unit is displayed in the lower right corner of the LCD.

- Press "S" to select main variable unit in turn (kPa、Torr、atm、MPa、inHO、inHG、ftHO、mmHO、mmHG、psi、bar、mbar、gcm、kgcm、Pa etc.).
- Press "Z" or "M" to confirm the currently selected principal variable unit, and directly enter the "Set the lower limit of the range" function interface.

Description:

Display unit "l4H2O" means: 4 degrees Celsius inch water column.

Display unit "m4H2O" means: 4 degrees Celsius mm water column.

## 3) Set the range

When setting the range, you must first enter the "lower range" and then the "upper range". In the process of setting the range, the operation code in the lower left corner displays "03" or "04", which corresponds to the input of "lower limit" and "upper limit". After the input of the lower limit of the range is completed, it will automatically enter the setting of the "upper range".

#### 4) Set the damping

You can enter the damping setting page directly by entering the operation code "5", or directly enter the damping setting page after setting the upper limit of the range.

When the operation code in the lower left corner displays "05", it means to set the damping value. The input range of the damping value is 0 to 32 seconds.

Special note: if the input damping is "05678", the "restore factory settings" operation will be performed automatically [the "data backup" operation needs to be performed before leaving the factory].

#### 5) Zero and range shift (zero and full)

In the real-time normal display state, press the "Z" button and the "S" button at the same time and hold for 5 seconds to enter the zero shift and range shift state. At this time, the operation code in the lower left corner displays "07", indicating that the zero and full operations can be performed.

"Zero shift", that is, "zero adjustment" operation: the current pressure is set to the lower limit of the range, and the transmitter output is adjusted to 4mA.

"Range shift", that is, "full adjustment" operation: the current pressure is set to the upper limit of the range, and the transmitter output is adjusted to 20mA.

During the setting process, if no button is pressed within 2 minutes, it will return to the normal display state.

## 6 Order Information

a. When ordering, users need to provide detailed technical parameters, such as pressure measurement range, accuracy requirements, output signal types and special requirements, etc., in order to choose a digital instrument that is more suitable for their requirements.

b. For detailed selection methods, please refer to the company's latest selection samples or visit the company's website for selection.

## 7 After-sales service

a. Under normal operating conditions, free repair or replacement is provided within two years for issues caused by product quality.

b. Paid software and hardware upgrade services, as well as accessory support, are available.

## 8 Maintain

### 8.1 Soft-maintenance

The pressure transmitter produced by our company is an intelligent product, and the parameters are open to the user. The user can adjust the zero point, set the range, and set the damping according to the actual situation. This will also cause confusion in parameter settings or modification of core parameters, causing soft faults. When the core parameter (factory calibration value) is changed, you must re-calibrate according to the operating instructions or reset the parameters by communication. When the core parameters are maintained, the soft fault can be readjusted according to the operating instructions to make the transmitter work normally.

### 8.2 Hard-maintenance

Generally speaking, the sensor components, main circuit board and meter head are not repairable on site. The user's hard fault repair items are limited to circuit connection inspection, transmitter cleaning, and meter head replacement.

#### Inspection of meter head

Unscrew the meter head cover, use a Phillips screwdriver to unscrew the two M3 screws, take out the meter head by hand, and remove the cable plug and power plug to remove the meter head. You can check whether there is dirt on the meter head circuit board and whether there is any problem with the circuit connection seat. If there is a problem, it should be dealt with in time. Reinstall the meter head in the reverse order of removal.

### 8.3 Troubleshooting

| Fault description                                                                                    | Cause                                                                                                                      | Handling method                                                                                                                                                         |
|------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The instrument does not display zero without pressure                                                | The installation position is not vertical upwards.<br>(For small range instrument only)                                    | Adjust the instrument to zero according to the installation position at that time                                                                                       |
|                                                                                                      | The pressure measuring hole is blocked by sundries in the measuring medium                                                 | Clean with water or other organic solvent                                                                                                                               |
|                                                                                                      | The measurement medium and ambient temperature exceed the product measurement range                                        | Avoid working outside the temperature range of the instrument                                                                                                           |
|                                                                                                      | The measuring medium contains hard debris to damage the measuring diaphragm, or man-made damage to the measuring diaphragm | Return to factory for repair                                                                                                                                            |
|                                                                                                      | The pressure is held down during the installation process, causing the pressure diaphragm to deform                        | Adjust the instrument to zero first, and return to the factory for repair if it cannot be calibrated                                                                    |
|                                                                                                      | The zero point of the instrument drifts                                                                                    | Adjust the instrument to zero                                                                                                                                           |
| Display 3.900mA, 21.00mA with pressure<br>Or the instrument displays the pressure value is incorrect | The pressure measuring hole is blocked by sundries in the measuring medium                                                 | Clean with water or other organic solvent                                                                                                                               |
|                                                                                                      | The measuring medium contains hard debris to damage the measuring diaphragm, or man-made damage to the measuring diaphragm | Return to factory for repair                                                                                                                                            |
|                                                                                                      | The pressure source has an instantaneous impact                                                                            | Install pressure damper                                                                                                                                                 |
|                                                                                                      | The transient impact of the pressure source causes the pressure sensor to be damaged                                       | Return to factory for repair                                                                                                                                            |
|                                                                                                      | The pressure exceeds the range of the instrument                                                                           | Prevent the pressure from exceeding the range of the instrument or reselect the instrument with a suitable range                                                        |
|                                                                                                      | Pressure exceeding the maximum range of the instrument causes damage to the pressure sensor                                | Return to factory for repair                                                                                                                                            |
|                                                                                                      | Power supply voltage is too low or interference is too large                                                               | Check the power supply                                                                                                                                                  |
| No display                                                                                           | Excessive electromagnetic interference                                                                                     | Install in an environment with low electromagnetic interference                                                                                                         |
|                                                                                                      | The external power supply has no voltage or the voltage is too high                                                        | Disconnect the power supply and check whether the instrument is short-circuited. If short-circuited, return to the factory for repair, otherwise check the power supply |
|                                                                                                      | LCD screen is damaged                                                                                                      | Return to factory for repair                                                                                                                                            |
| No output signal                                                                                     | Wiring error                                                                                                               | Wire correctly according to the meter wiring diagram                                                                                                                    |

## Notes

1. Please connect the wires correctly according to the instructions.
2. This product is a precision measuring instrument. It is strictly forbidden to hit, impact, forcefully clamp, disassemble or poke the pressure hole or metal diaphragm with a sharp tool.
3. The transmitter should be installed in a ventilated, dry, non-corrosive, and cool place as much as possible.
4. If the measurement medium is a viscous or suspended particle liquid, it is necessary to prevent blockage and impact on the diaphragm.
5. It is strictly forbidden to overload exceeding the limit specified in this manual.
6. The cable joints must be sealed to prevent water or moisture from affecting the performance and life of the whole machine.
7. When the output is abnormal, please stop and check immediately. If it is a product quality problem, please return the product with the certificate to the company for repair or replacement.
8. With the continuous improvement of product technology, adjustments to product performance will no longer be notified.

# Sunstrand Fluid Handling Co., Ltd.

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Add: No. 515 Hualian Road, Lingxi Town, Cangnan County,

Wenzhou City, Zhejiang Province, China

Phone/WhatsApp/WeChat/Telegram: +8615869618315

Email: [bakufutrade@outlook.com](mailto:bakufutrade@outlook.com)

Web: [www.sfhmeter.com](http://www.sfhmeter.com)