



BELZ digital display counter

Instruction Manual



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HEFEI JINGDA INSTRUMENT CO.,LTD

The enterprise has passed ISO9001 quality management system certification



Catalogue

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Dear customer: Hello!

Welcome to choose our company flow digital counter, please follow the following instructions wiring. To use the counter well, please read this manual carefully.

1. Summary

The BELZ series flow digital display counter can be matched with various volumetric flow meters to form advanced digital flow meters. The total cumulative flow, single cumulative flow, and instantaneous flow can be directly read on the flowmeter. Battery powered can achieve wireless remote transmission function, and with our company's platform, on-site data can be remotely read. After external power supply, it can also output flow pulses, analog currents of 4-20 milliamperes, and achieve Hart communication and RS485T communication modes, making it a very advanced flow digital display counter.

2. Characteristic

- 1、Advanced technology, high reliability, can form an integrated digital volumetric flow meter;
- 2、It can be powered by batteries or remotely transmitted to output pulses and analog signals through external power supply;
- 3、The minimum ambient temperature can reach -40 degrees;
- 4、Double row LCD display for instantaneous and cumulative flow, intuitive and convenient, clear at a glance;
- 5、Explosion proof and waterproof structure suitable for various application scenarios
- 6、Easy to operate, multiple output functions are convenient for users to choose from;

3. Main technical indicators

3.1. Display

Name	Digital examples	Unit
Single cumulative quantity	99999.999~99999999	Liter or cubic
Total cumulative quantity	999999999.999~999999999999	Liter or cubic
Instantaneous flow rate	999.99~99999	Liters or cubic meters per hour or minute

3.2. Performance index

Name	Parameter
Operating ambient temperature	-30~+55 °C (When the temperature is below -20 °C, the display's reaction will slow down) -40~+55 °C Other than BELZ-0/2/4, customizable
Power consumption	The overall power consumption (24V power supply) is less than 1W
Explosion proof signs	Exd II CT6 is suitable for BELZ-0 to BELZ-7 Exia II CT5 is suitable for BELZ-2 and BELZ-4
Protection level	IP66
Output nozzle size	Internal thread, G1/2 ", can pass through cable outer diameter Φ 7.5-10.5

3.3. Power supply and output

Model	Power supply voltage	Output signal
BELZ-0	Battery powered	Nothing
BELZ-T	Battery powered	Wireless data transmission
BELZ-1	DC12V/24V power supply	Voltage pulse signal
BELZ-2	DC24V power supply	Two wire 4-20mA current
BELZ-3	DC12V/24V power supply	Voltage pulse+three wire 4-20mA current
BELZ-3S	DC12V/24V power supply	Dual voltage pulse
BELZ-4	DC24V power supply	Two wires 4-20mA current+hart
BELZ-5	DC12V/24V power supply	Voltage pulse+RS485 communication
BELZ-6	DC24V power supply	Voltage pulse+3-wire 4-20mA current+RS485 communication
BELZ-7	DC24V power supply	Voltage pulse+three wire 4-20mA current+hart

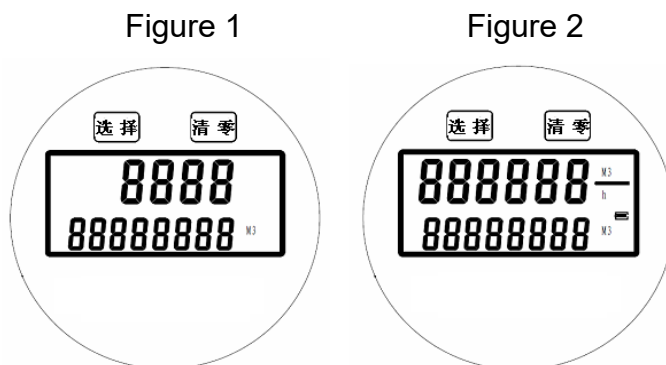
Note:

- 1、Regular product 24V, if 12V power supply is required, please place an order
- 2、Pulse output amplitude: Low level<1V High level>(supply voltage -3V)
- 3、Except for BELZ-0, if other models require dual power supply, add a Y symbol when ordering, such as BELZ-2Y
- 4、Except for BELZ-0/2/4, other low-temperature models can be customized, with the D mark added to orders, such as BELZ-1D.
- 5、Low temperature model (D) cannot simultaneously meet dual power supply model (Y)

4. Use and output wiring

4.1. Apply

Although the BELZ explosion-proof digital flow counter is divided into BELZ-0-BELZ-7 models based on power supply and output functions, the counter panel has the same function, with two display interfaces, as shown in Figure 1 and Figure 2 below.



The interface in Figure 1 displays the total cumulative flow, with the upper row displaying the high position of the total cumulative flow and the lower row displaying the low position of the total cumulative flow. The total cumulative flow cannot be reset to zero on the panel; The upper row of the



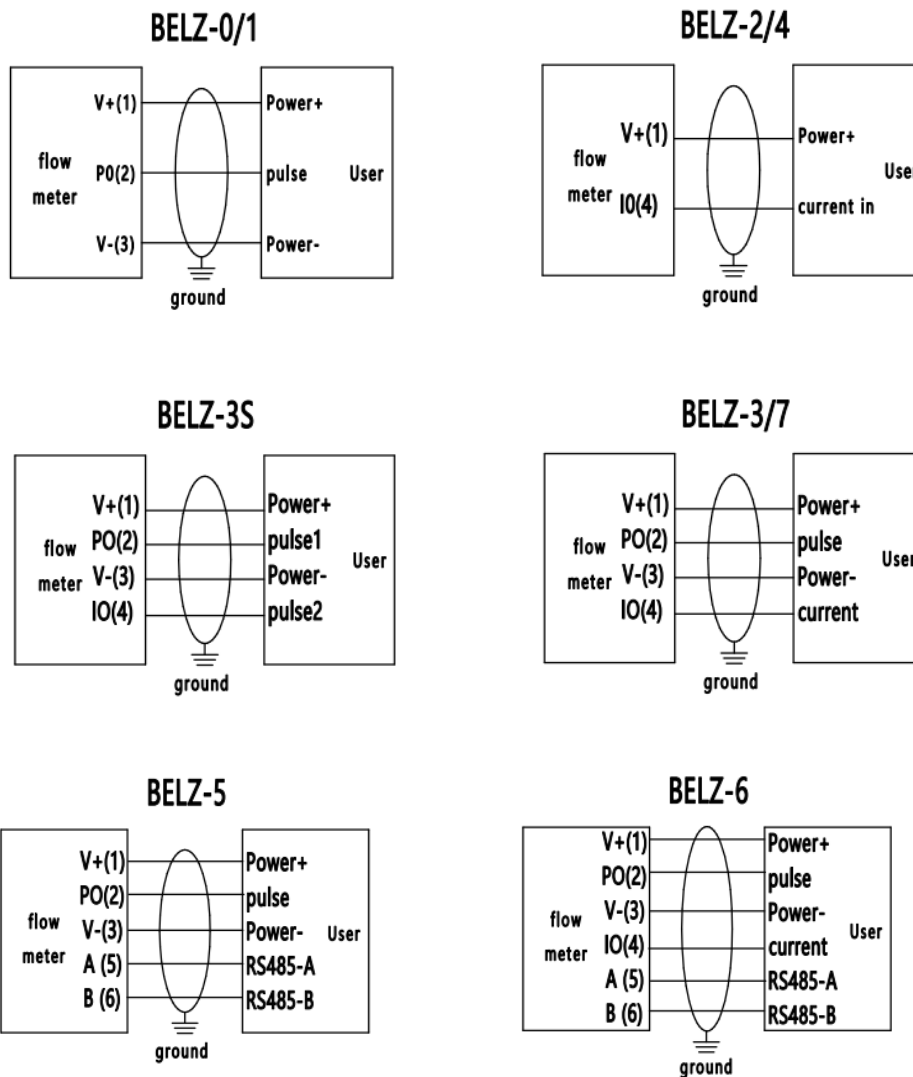
Figure 2 interface displays the size of the flow rate, while the lower row displays the single cumulative value of the flow rate. Under the Figure 2 interface, using the matching magnetic rod to touch and **reset** can complete the reset of the single cumulative value; By using the matching magnetic rod touch **selection**, the mutual conversion between the two interfaces in Figure 1 and Figure 2 can be carried out.

4.2. Output wiring

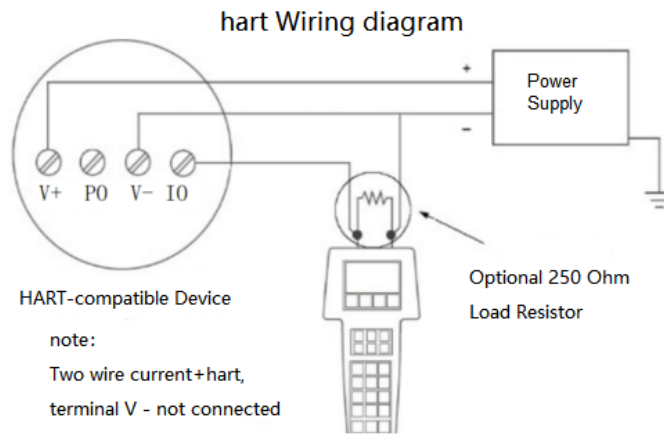
When it is necessary to wire the BELZ flow digital display counter, use a hex wrench to unscrew the four inner hexagon bolts on the cover of the digital display counter, remove the cover, and wire it in the following way:

Terminal Description: (Wiring port facing downwards, from left to right)

V+	PO	GND	IO	A	B	—
1	2	3	4	5	6	7
Power supply positive	Pulse output	Power supply negative	Current+	RS485-A	RS485-B	Ground



4.3. HART communication wiring diagram

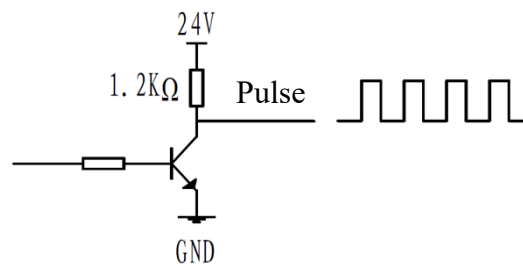


4.4. Wireless series

The BELZ-T series uses high-energy batteries, which can reach a maximum lifespan of 10 years depending on the upload interval.

4.5. Pulse output interface

The output type is NPN type, with an pull-up resistance of 1.2K Ω . Please refer to the following diagram for system design.



5. Parameter settings

Warning!!! The following is the parameter setting method for the BELZ flow digital display counter. When the counter needs to be changed, it must be done carefully by professional personnel responsible for the user unit. Incorrect parameter settings can cause the instrument to malfunction, measurement to exceed the tolerance, and output errors. Please be cautious!

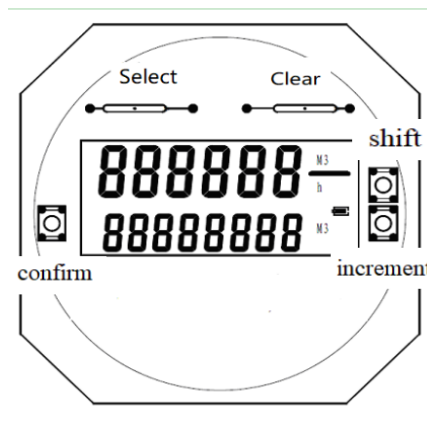
When it is necessary to reset the parameters of the BELZ flow digital display counter, use a hex wrench to unscrew the four inner hexagon bolts on the digital display counter cover and remove the digital display counter cover, as shown in the following figure .

5.1. Key functions

Key Name	Function
Confirm key	Enter the parameter setting state; Enter the settings submenu, confirm the modified values, and exit the submenu
Shift key	Move the cursor to the right to indicate a digit that can be incrementally increased by 1
Incremental key	Add 1 to the number at the cursor or 1 to the menu number
Exit key	Press the <u>incremental key</u> first, then press the <u>confirm key</u> to exit the menu setting. Exiting from the browsing menu interface will save all modified data

5.2. Menu Description

Press the **confirm** button on the normal display interface to enter the password input interface. Enter the 4-digit password by pressing the **shift** and **increment** keys, and then press **confirm** to enter the settings submenu FXX. Press the increment key to select the menu number, which is F01 → F02 → F03 → F0X. When displaying a certain number, press the **confirm** button to enter this menu and perform specific parameter settings.



Attention: F51~F65 require professional personnel to operate to prevent errors.

Menu	Show contents	Function definition	Remarks
Password input interface	F XXXX	Frequency	Read-only
	CXX	Software version	Read-only
	XXXX	Password	Correct password can modify parameters Password 1111: F01~F09 Password 8421: F01~F09, F51~F65
F01		Unit	Modify unit L or M3/hour (h) or minute (m) Pay attention to switching units, and reset all total and single accumulations to zero
F02	XXXXXX XX	20mA corresponds to flow rate	The unit is the same as the set unit
F03	XX	Damping coefficient	It can effectively eliminate the impact of instantaneous flow pulsation on the display and output of instantaneous flow. A number between 1 and 99 can be set, and the larger the number, the better the effect, but the output response time will slow down
F04	Nine thousand nine hundred and ninety-nine	Zero total cumulative amount	Set to 0000, and after confirmation, the total cumulative value will be reset to zero
F05	Four	4mA fine tuning	Connect the ammeter to the power circuit. In any case, after entering this menu, check if the ammeter reading is 4mA. If not, enter the current value and press the confirm button to correct it. Repeat the adjustment until the current shows 4mA
F06	Twenty	20mA fine tuning	20ma fine adjustment: Connect the ammeter to the power circuit. In any case, after entering this menu, check if the ammeter reading is 20ma. If not, enter the current value and press the confirm button to correct it. Repeat the adjustment until the current shows 20MA.
F07	One	Adjustment coefficient K setting	Refer to Attachment 1 for default value: 1
F08	CN-XXX	485 communication address	1-255 default 1
F09	FC - X	Communication verification mode	0: No verification (default) 1: Odd check 2: Parity check
F51	X. XXXX	Discharge coefficient	Unit: P/L Default: 1
F52	OPD-X	Pulse output mode	0: Pulse output turned off 1: Pulse output on (default)



F53	XX XXX XXX	Number Output equivalent	Unit: L/P Select the output equivalent value by adding the key, and refer to Attachment 3 for the table corresponding to the serial number and output equivalent
F54	NP-X	Signal acquisition rate	1: 1/2 times 2: 1x 4: 2x
F55	XXX	Simulated pulse width	Unit 0.1ms
F56	XXXX	Simulated pulse quantity	1~9999
F61~65	X. XXXX	Instrument coefficient for the Nth segment	
	XXX X	Segmented frequency	Below this frequency, use this instrument coefficient for this segment

6. Communication protocol

6.1. RTU mode

Baud rate 9600bps: 1 start bit, 8 data bits, parity not checked (modifiable), 1 stop bit, frame check domain: cyclic redundancy check (CRC), performs a check on all message contents.

Frame description: (Except for CRC verification, when sending words, the high byte is first followed by the low byte)

Slave address	Function code	Data	CRC
1 byte	1 byte	0 to 252 bytes	2 bytes, low bit first and then high bit

Note: The slave address is from 00 to FF in hexadecimal.

6.2. Register address and definition description:

Number	Register Address (Decimal)	Parameter Name	Data format	Type	Remarks
1	1-2	6 digits higher in total quantity	Float	Read-only	Unit m3/T
2	3-4	6 digits lower in total quantity	Float	Read-only	Unit m3/T
3	5-6	Total 6 decimal places	Float	Read-only	Unit m3/T
4	7-8	Instantaneous flow rate	Float	Read-only	The current unit is the same
5	9-10	Single cumulative height of 4 digits	Float	Read-only	Unit m3/T
6	11-12	Single accumulated low 6 bits	Float	Read-only	Unit m3/T
7	13-14	Single accumulated 6 decimal places	Float	Read-only	Unit m3/T

Explanation: Floating point numbers comply with the IEEE754 standard.



6.3. Function code

Main station request frame:

Address	1 byte	
Function code	1 byte	0x03
Starting address	2 bytes	1~12
Number of registers	2 bytes	1~125 (0x7D)
CRC verification	2 bytes	

Slave response frame:

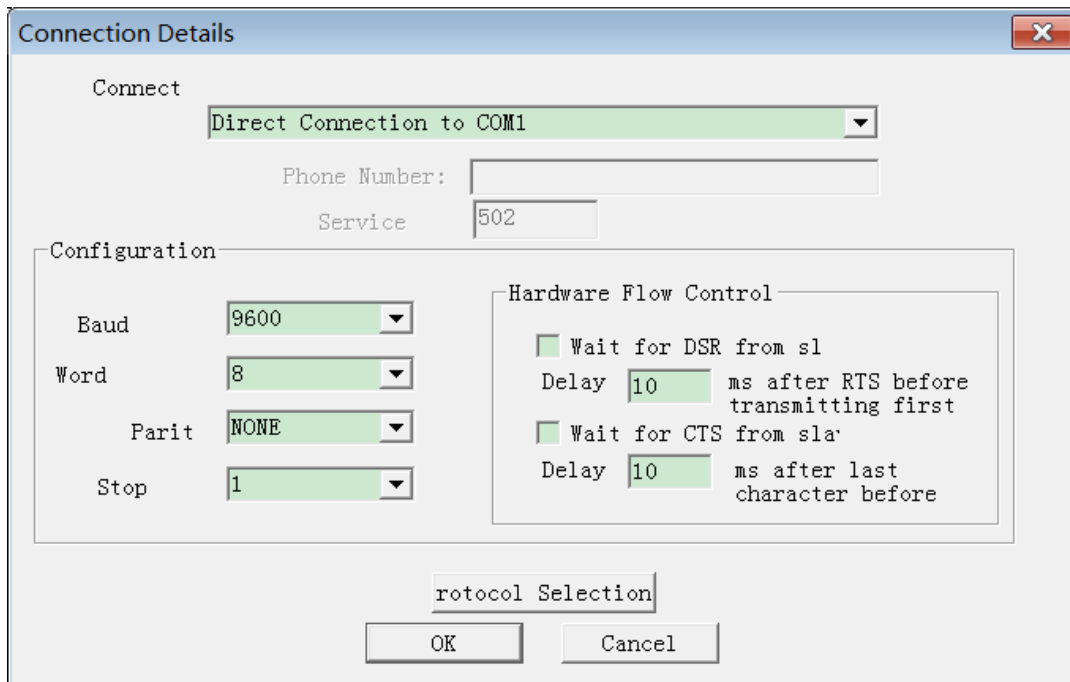
Address	1 byte	
Function code	1 byte	0x03
Byte count	1 byte	2×N (number of registers)
Register value	2xN bytes	
CRC verification	2 bytes	

6.4. Example: Read register data

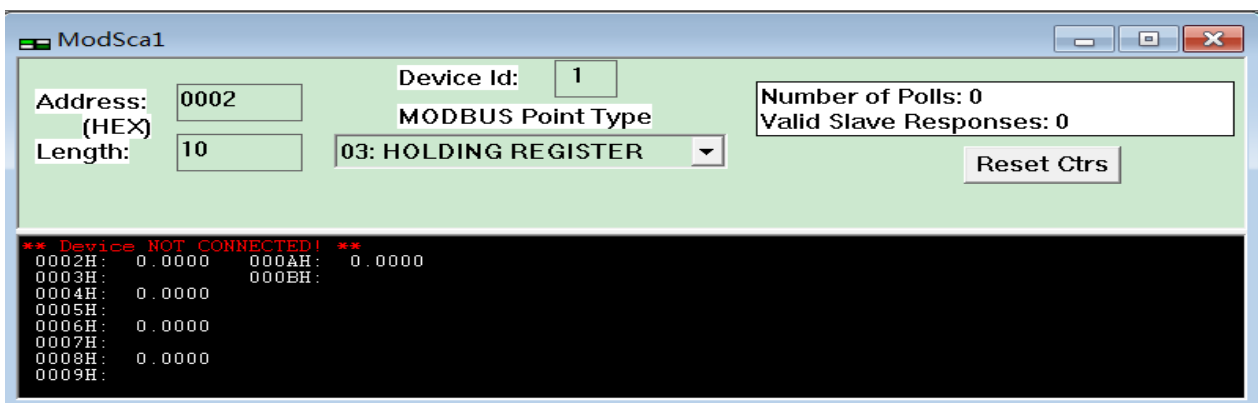
Master Station Request	01 03 00 01 00 08 15 CC; Starting quantity of address function code CRC
Slave response frame:	<u>01 03 10</u> ; Address, Function Code, Byte Count <u>49 06 47 00</u> ; Top 6 in total: 550000 <u>49 74 1E 70</u> ; Total 6 digits lower: 999911 <u>49 73 E5 80</u> ; Total decimal places: 999000 <u>41 45 85 1F</u> ; Standard volume flow rate 12.345 <u>C2 0D</u> ; CRC
Computing method	Total cumulative quantity= $550000 * 10^6 + 999911 + 999000/10^6 = 550000911999000$ M3
Master Station Request	01 03 00 01 00 0E 95 CE; Starting quantity of address function code CRC
Slave response frame:	<u>01 03 1C</u> ; Address, Function Code, Byte Count <u>00 00 00 00 00</u> ; Total 6 digits high: 0 <u>00 00 00 00 00</u> ; Total low 6 digits: 0 <u>48 6F 42 00</u> ; Total decimal places: 245000 <u>00 00 00 00 00</u> ; Standard volume flow rate 0 <u>00 00 00 00 00</u> ; Single cumulative height of 4 digits: 0 <u>00 00 00 00 00</u> ; Single accumulated low 6 bits: 0 <u>47 4F 08 00</u> ; Single accumulated decimal place: 53000 <u>EC F1</u> ; CRC
Computing method	Total cumulative quantity= $0 * 10^6 + 0 + 245000/10^6 = 0.245000$ M3 Single cumulative measurement= $0 * 10^6 + 0 + 53000/10^6 = 0.053000$ M3

6.5. Modscan software debugging methods

1、 Baud rate setting



2、 Parameter settings



Note: The starting address of the register is set to 0002, and there is no return when set to 0001

6.6. Solution to communication errors

The on-site slave does not respond, and the reasons for the error include the following:

1. The address is incorrect;
2. CRC verification error;
3. Data length error;
4. The data address for operation 4 exceeds the limit;
5. Data frames do not meet the requirements;
6. When testing with Modscan software, the starting register should start from 2;

7. Attachment 1: Adjustment Factor K Setting:

The flowmeter has been calibrated on our company's calibration device when it leaves the factory. When users recalibrate the flow meter and find errors, or wish to adjust it, they can use the K coefficient setting in F07.

**The steps for having a calibration device are as follows:**

1. Use standard equipment (standard container, standard scale, standard flow meter) to calibrate the flow meter, record the standard value V , and V_{display} the current volume value V of the flow meter; (V_{standard} is the volume value of a standard container or standard flow meter, and the weighing value of a standard scale needs to be converted into a volume value)

2. Obtain the newly adjusted coefficient K

$$K'' = K_0 \times (V_{\text{standard}} \div V_{\text{display}})$$

In the formula: K_0 - is the K coefficient calibrated at the factory or previously adjusted;

V_{standard} - V_{standard} is the volume value of a standard container or standard flow meter

V_{display} - V_{display} is the current volume value of the flow meter

3. Press the **shift** key and **increment** key to set K to the flow meter, press the **confirm** key to confirm. Then press the confirm key and increment key at the same time to exit the setting menu. Use the standard device again to verify the flow meter. If the error requirements are met, the flow meter verification is completed. If the error requirements are not met, follow steps 1-3 above again until the accuracy requirements are met.

Direct adjustment method without calibration device:

① I hope the flow meter can provide more measurement value. For example, if the flow meter needs to increase the measurement amount by 0.25%, it should be taken as

$$K \text{ coefficient} = K_0 \times 1.0025$$

② I hope the flow meter can measure less, for example, if the flow meter needs to reduce its measurement by 0.35%, it should be taken as

$$K \text{ coefficient} = K_0 \times 0.9965$$

Then, press the **shift** key and **increment** key to set K to the flow meter, press the **confirm** key to confirm. Then, press the **confirm** key and **increment** key simultaneously to exit the setting menu.

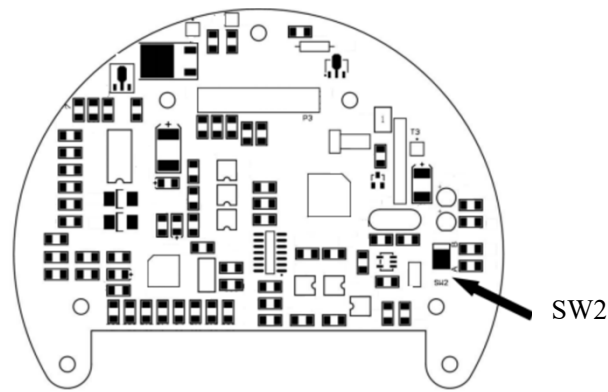
$$\text{Flow error} = \frac{V_{\text{display}} - V_{\text{standard}}}{V_{\text{standard}}} * 100\%$$

8. Attachment 2: Explanation on Adjustment of Measurement Direction

For high-resolution models (non battery powered), the measurement direction is fixed when leaving the factory. If on-site verification requires changing the measurement direction, the following methods are adopted:

1、 Open the front cover and locate the toggle switch SW2 (lower right side of the display screen), as shown in the following figure

2、 Gently move SW2 in the opposite direction with a tool



9. Attachment 3: Explanation of F53 Pulse Output Equivalent

Pulse output equivalent refers to the volume represented by each pulse flowing through the pipeline medium.

The first line of the F53 menu is the serial number, and the second line is the corresponding pulse equivalent value of the serial number. On site, the corresponding output equivalent value can be found by modifying the serial number value. The corresponding table for serial numbers and equivalent values is as follows:

Number	Pulse equivalent (L/P)	Number	Pulse equivalent (L/P)
0	0.0	7	0.08
1	0.005	8	0.1
2	0.008	9	0.2
3	0.01	10	0.4
4	0.02	11	0.5
5	0.04	12	1
6	0.05	13	2

Note: When the serial number is 0, the output equivalent is the original pulse equivalent.

If the instrument coefficient is 3.546 P/L, the output equivalent is $=1/3.546=0.282$ L/P.

■ Matters needing attention

1. Live wiring is strictly prohibited in explosion-proof use sites, otherwise it may cause explosions and damage the digital display counter.

2. Non professionals are not allowed to enter the instrument settings or modify internal parameters without authorization. Otherwise, the manufacturer will not be responsible for any measurement errors or losses caused by this.

3. When the selected flow counter has an output pulse function, the flow coefficient of the output pulse is shown on the nameplate of the flow counter.

4. Please read the user manual carefully before wiring and modifying the settings of the digital counter.

JINGDA service concept

- Ensure that customers rest assured to choose fine large products.
- The convenience of customers is the trust of enterprises.
- Every day a company loses a customer is another day it loses a market.
- Service first find their own problems, giving priority to the interests of customers.
- Customers will not use JINGDA products, it is not the customer's fault, but our service work is not done.

JINGDA service principle

- Process first, analyze later.
- Act first, talk later.
- Get it right the first time.



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