



## Principle characteristics

FM500 gear flow sensor built-in double gear operation, through the high precision gear wheel volume to calculate the medium through the volume, to achieve the micro fluid medium measurement. Is a new type of positive displacement flow sensor, used for precision continuous or intermittent measurement of liquid flow in the pipeline or instantaneous flow.

- Analog switch dual output
- PNP/NPN Switchover is optional
- Color crystal display unit
- Withstand pressure (10~400bar)
- High and low temperature resistance (-30°C~140°C)
- Can measure various viscous media
- High precision and repeatability
- The range is wider than that
- Support communication function
- Strong anti-corrosion and anti-fouling ability (acid and alkali)

## Product application

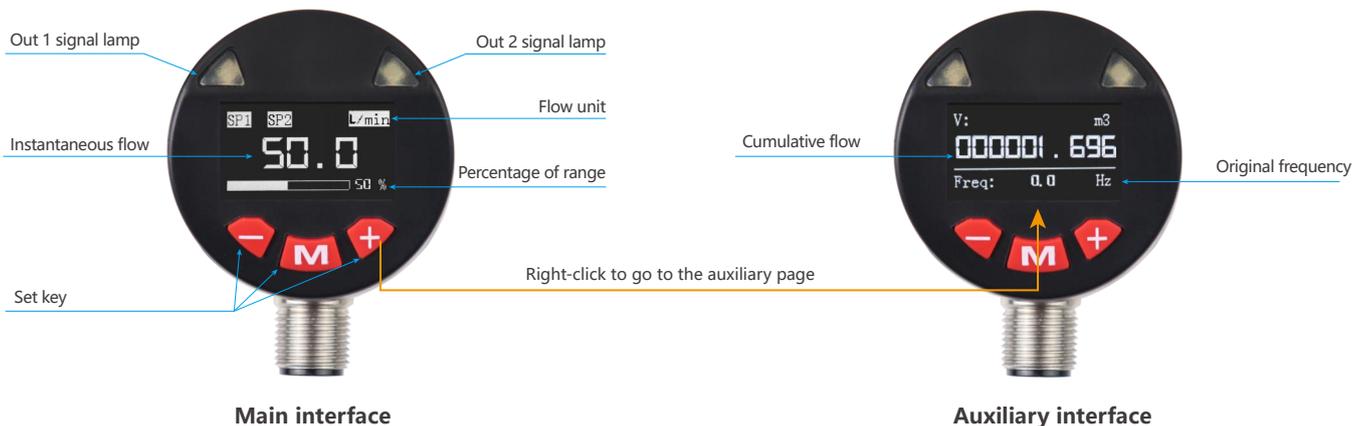
The FM500 gear flow sensor is widely used for precise low-flow measurement in various industries. It is suitable for media such as additive fuels, flotation cells in water treatment, corrosion inhibitors, catalysts, emulsifiers, oils, fats, fragrances, adhesives, solvents, inks and insecticides, as well as some high-viscosity media. The application industries include automobiles, aviation, mining, power, chemical engineering, pharmaceuticals, food, coatings, petroleum, environmental protection, printing and other industries. It is particularly suitable for heavy oil. Flow measurement of media with high viscosity such as polyvinyl alcohol and resin. (Capable of measuring fluids with viscosity up to 10,000 pa.s) Small in volume, light in weight, low vibration and noise during operation, and stable in operation. It can also be used for measuring the tiny flow rate of small pipe diameters. It has a small starting flow rate, a wide range ratio, and is suitable for measuring the flow of liquids with large fluctuations. The measurement accuracy is not affected by pressure and flow rate changes. It features stable performance, long service life, and large flow capacity.

- Resin and glue measurement
- Measurement of hydraulic oil, lubricating oil and grease
- Fuel oil measurement
- Ink and asphalt measurement
- Measurement of liquid nitrogen, refrigerant and solvent
- Edible oil, fish oil
- Fluid measurement for chemical and anti-corrosion requirements

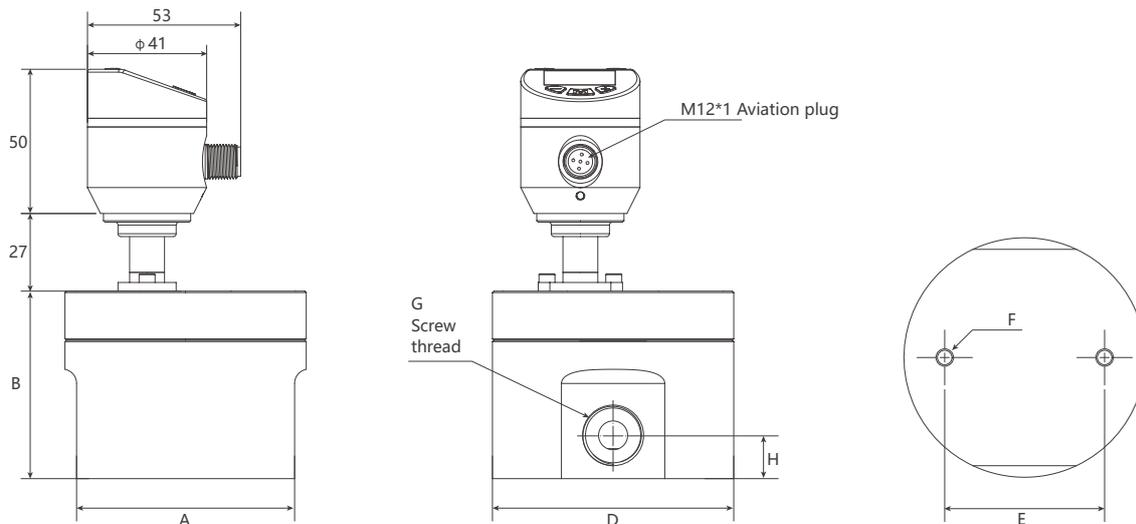
## Technical parameter

- ◇ Measuring range: See range table
- ◇ Output signal: 4-20mA, PNP/NPN
- ◇ Measuring accuracy: 0.5%F.S
- ◇ Repeatability: 0.2%F.S
- ◇ Power supply: 12~30VDC
- ◇ Medium temperature: -30~120°C  
(high temperature customized 140°C)
- ◇ Pressure resistance: Aluminum (40bar)  
stainless steel (100bar/250bar/400bar),  
PP/PE (pressure 10bar)
- ◇ Material  
Housing: aluminum, stainless steel,  
display: stainless steel/engineering plastic

## Panel diagram

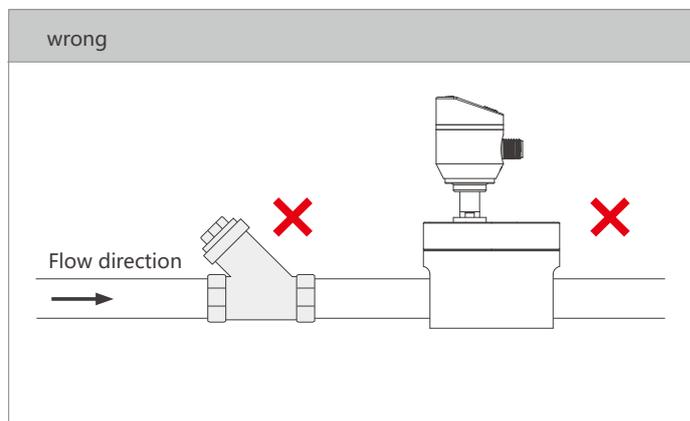
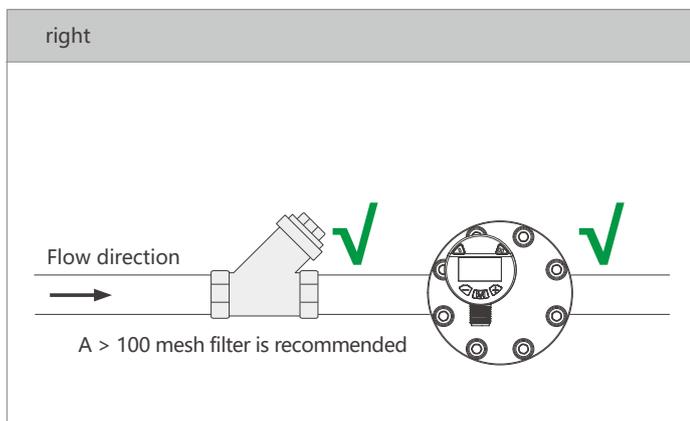


## Dimension drawing (mm)

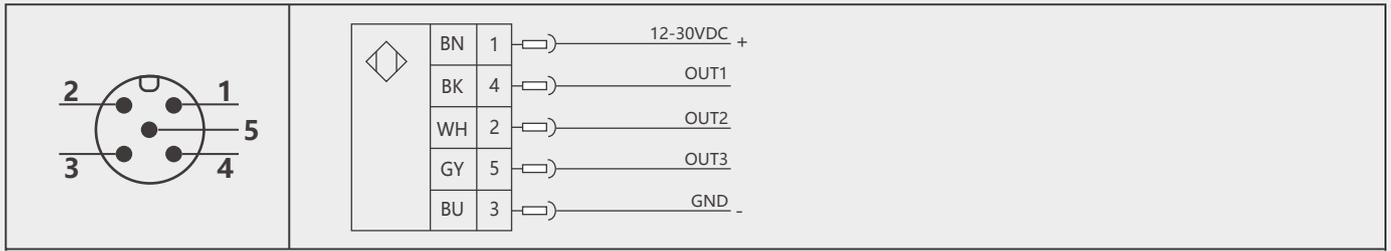


Model number	A	B	D	H	E	F	G	Measuring range	Reference coefficient (P/L)
M2	83	45	88	15	40	2*M6	G1/4	50-2000mL/min	≈ 3500
M2S	83	43	88	10	44	2*M5	G1/4	5-2000mL/min	≈ 34000
M4	80	55	83	15	55	2*M6	G3/8	0.1-4L/min	≈ 2450
M6	80	55	83	15	55	2*M6	G1/2	0.15-8L/min	≈ 1650
M10	80	55	83	15	55	2*M6	G1/2	0.5-20L/min	≈ 1500
M15	110	65	113	28	90	2*M6	G3/4	2-50L/min	≈ 430
M25	124	70	138	29	100	2*M8	G1"	5-150L/min	≈ 70

## Filter installation diagram (for reference only)



## Wiring diagram



A3: Two switches + one analog								
colour	stitch	instructions	Colour	stitch	instructions	Colour	stitch	instructions
BN	1	power supply (+)	BU	3	power supply (-)	GY	5 (OUT3)	Flow: 4-20mA (factory default) Flow: 1-5v Flow : 0-10v
BK	4 (OUT1)	Flow switch PNP (Factory default) Flow switch NPN Linear pulse (full scale 100Hz) Original pulse Quantitative pulse (full scale *0.1)	WH	2 (OUT2)	Flow switch PNP (Factory default) Flow switch NPN			

AR: RS485 communication/analog								
colour	stitch	instructions	colour	stitch	instructions	colour	stitch	instructions
BN	1	power supply (+)	BU	3	power supply (-)	GY	5 (OUT3)	Flow: 4-20mA (factory default) Flow: 1-5v Flow : 0-10v
BK	4 (OUT1)	RS485(B)	WH	2 (OUT2)	RS485(A)			

SA: Analog (flow/temperature)/switch/pulse/frequency /IO-Link								
colour	stitch	instructions	Colour	stitch	instructions	Colour	stitch	instructions
BN	1	power supply (+)	BU	3	power supply (-)	GY	5 (OUT3)	Temperature: 4-20mA (Factory default) Temperature: 1-5v Temperature: 0-10v
BK	4 (OUT1)	Flow switch PNP Flow switch NPN Temperature switch PNP Temperature switch NPN Linear pulse (full scale 100Hz) Original pulse Quantitative pulse (full scale *0.1) IO-Link	WH	2 (OUT2)	Flow: 4-20mA (factory default) Flow: 1-5v Flow: 0-10v			

## Selection list

FM500-	M2	A3	F	L	-	Instructions
FM500-						High precision gear flowmeter
	M2					Measurement range: 50-2000mL/min
	M2S					Measurement range: 5-2000mL/min
	M4					Measurement range: 0.1-4L/min
	M6					Measurement range: 0.15-8L/min
	M10					Measurement range: 0.5-20L/min
	M15					Measurement range: 2-50L/min
	M25					Measurement range: 5-150L/min
		A3				Output signal: Two way switch/pulse/frequency + analog
		SA				Output signal: Analog (flow/temperature)/switch/pulse/frequency /IO-Link
		AR				Output signal: RS485 communication + analog
			F			Sealing material FKM (Standard type) Only used for pressure ≤200bar
			P			Sealing material: PTFE polytetrafluoroethylene (anti-corrosion) Used for > 200bar
				L		Body material: Alumina (pressure 40bar)
				S		Body material: 304SS (pressure 100bar)
				S1		Body material: 304SS (pressure 250bar)
				S2		Body material: 304SS (pressure 400bar)
				S3		Body material: 316SS (pressure 100bar)
				S4		Body material: 316SS (pressure 250bar)
				S5		Body material: 316SS (pressure 400bar)
				P		Body material: PP (pressure 10bar)
					-	Medium temperature < 120°C
					T	Medium temperature < 140°C Note: Aluminum /PP material does not support high temperature option

### Flow calculation method

K-factor of FM500 gear flow sensor

(Flow coefficient) precisely defines the number of pulses per liter per unit flow.  $Q=f \times 60 / K$

Q= instantaneous flow liters per minute

F= output pulse frequency HZ

K= Coefficient pulse/min of gear flowmeter

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

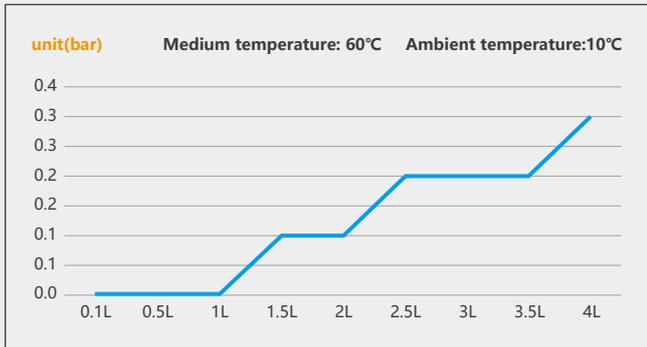
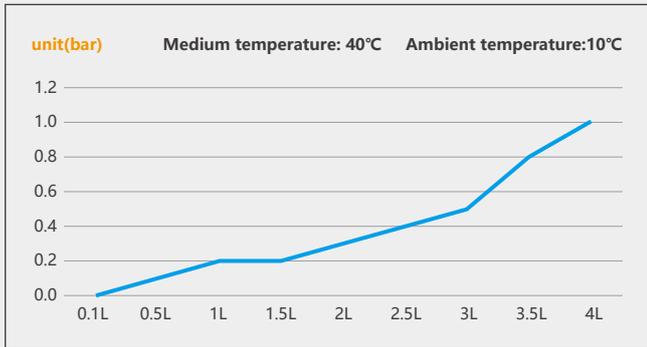
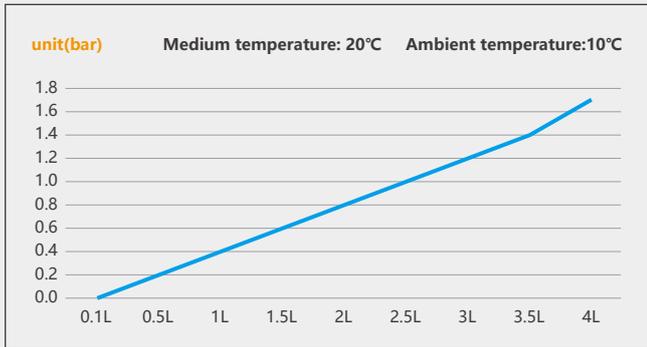
name	Outline drawing/dimension drawing (unit :mm)	material	Model number	Shielded wire	M12*1-4Pin/5Pin self-connector/Dimensions (Unit :mm)	Model number
M12*1-5Pin (2m cable)		PUR	ZL05-PU02G	-P		GL04 (4 Pin connector)
M12*1-5Pin (5m cable)			ZL05-PU05G			GL05 (4 Pin connector)
M12*1-5Pin (10m cable)			ZL05-PU010G			
		PVC	ZL05-PC02G			
M12*1-5Pin (2m cable)			ZL05-PC05G			WL04 (4 Pin connector)
M12*1-5Pin (5m cable)			ZL05-PC010G			WL05 (5 Pin connector)
		PVC	ZL05-PC02W			
M12*1-5Pin (10m cable)			ZL05-PC05W			
			ZL05-PC010W			

## Optional accessories - Protective cover

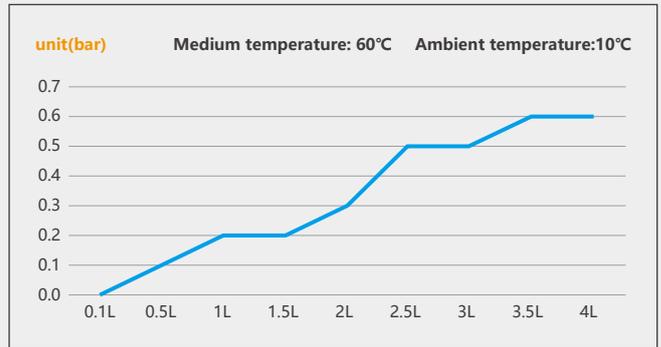
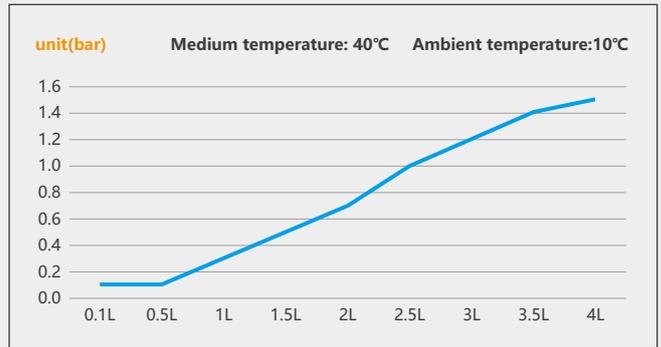
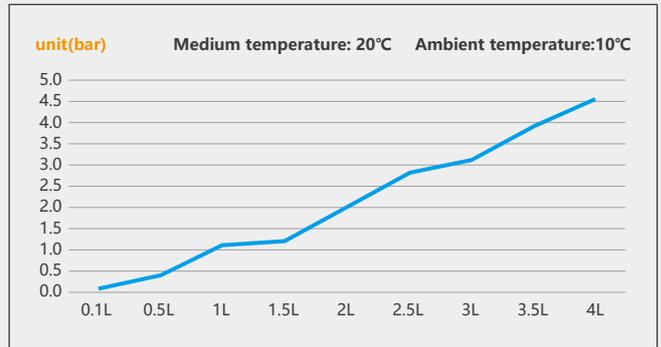
**Color crystal screen series (switch) sensor**

Order number: KTC533661

### M4 pressure loss meter (medium: 46# oil)



### M4 pressure loss meter (medium: 320# oil)



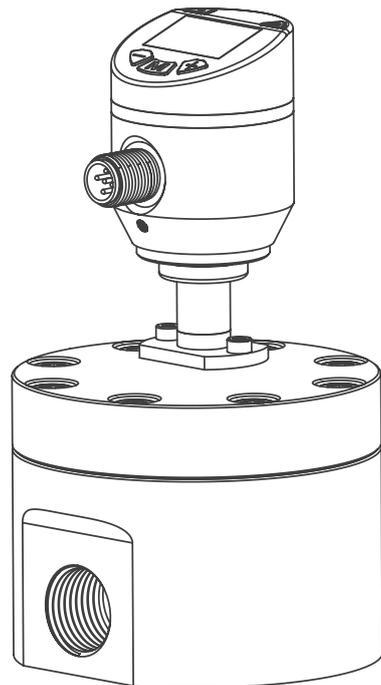
- Sensor and controller ——
- Flow
  - pressure
  - temperature
  - level
  - position

**KATU** 卡图

# Operation instruction

## gear flowmeter

### 500 Series



## ————— **Safety statement** —————

- Before installing this device, please read this document to ensure that the product is suitable for your application and is not limited in any way;
- Failure to follow the operating instructions or technical data may result in personal injury or property damage;
- Check the compatibility of the product material with the medium to be tested in all applications;
- The equipment is only used as the medium to be tested, and it must only be ensured that the equipment is used correctly for long-term stable operation. Ensure that the tested medium will not cause damage to the tested part of the product;

! The responsibility for determining whether the measurement sensor is suitable for the application lies with the operator, and the manufacturer accepts no responsibility for the consequences of improper use by the operator. Improper installation and use of the sensor results in invalid claims under warranty.

Flow sensors monitor the medium flow of fluids

**Precautions: Beware of personal injury, overpressure danger!**

# catalogue

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## **1.1 Product profile**

FM500 gear flow sensor built-in double gear operation, through the high precision gear wheel volume to calculate the medium through the volume, to achieve the micro fluid medium measurement. Is a new type of positive displacement flow sensor, used for precision continuous or intermittent measurement of liquid flow in the pipeline or instantaneous flow.

## **1.2 Product characteristics**

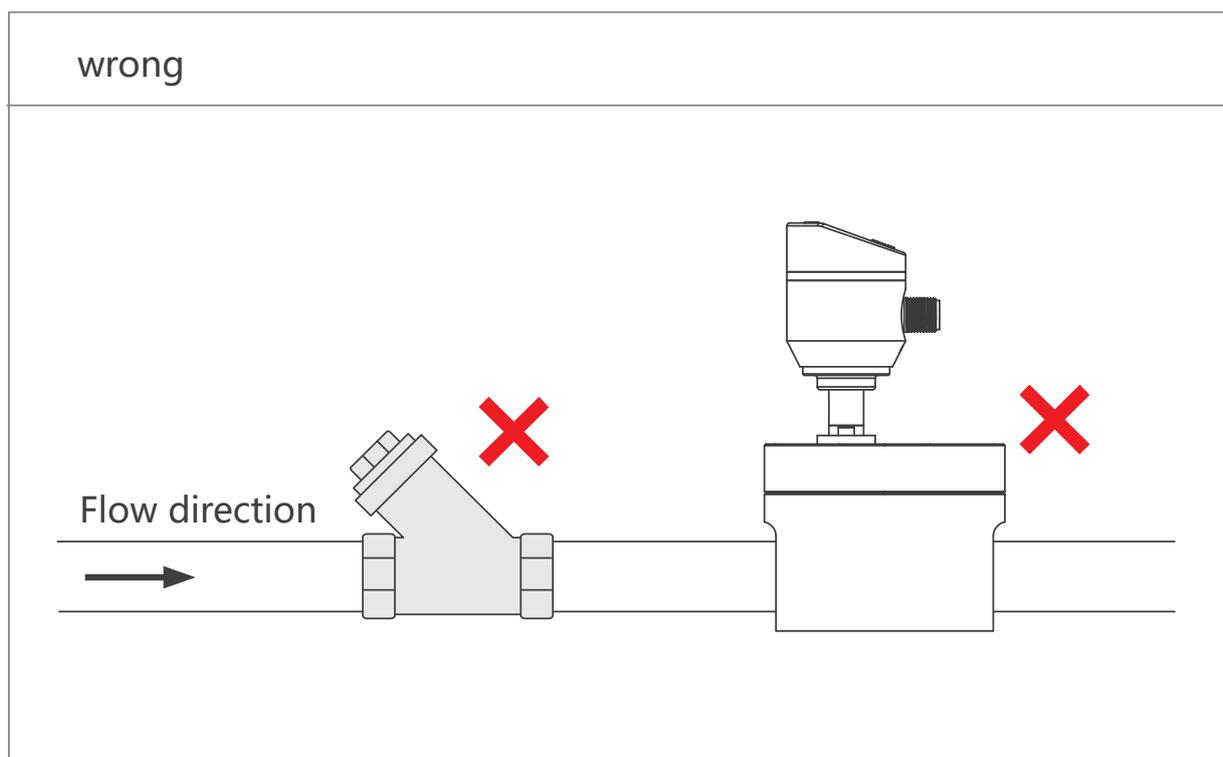
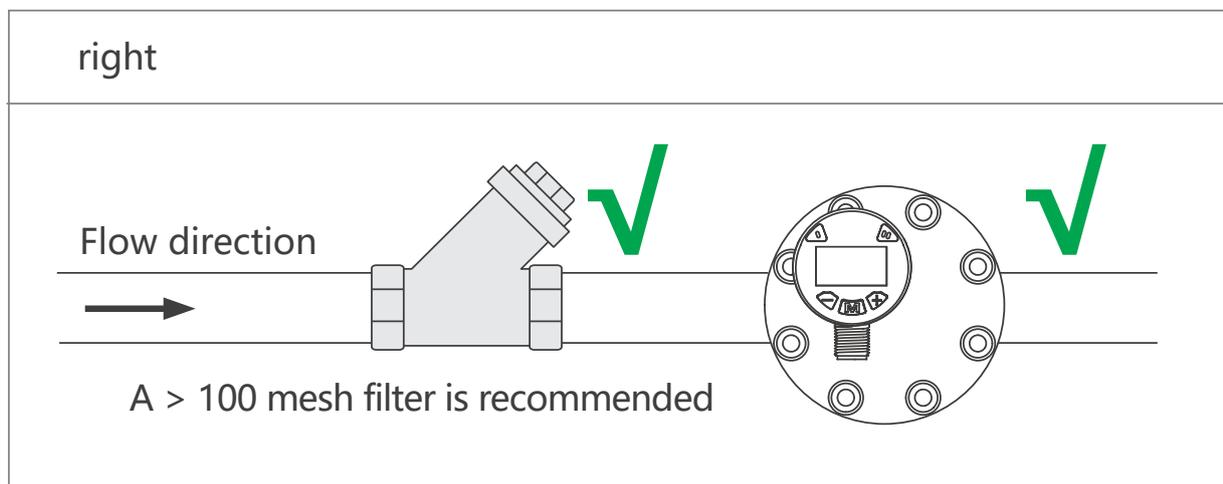
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- High precision and repeatability
- The range is wider than that
- Support communication function
- Strong anti-corrosion and anti-fouling ability (acid and alkali)

## **1.3 Product application**

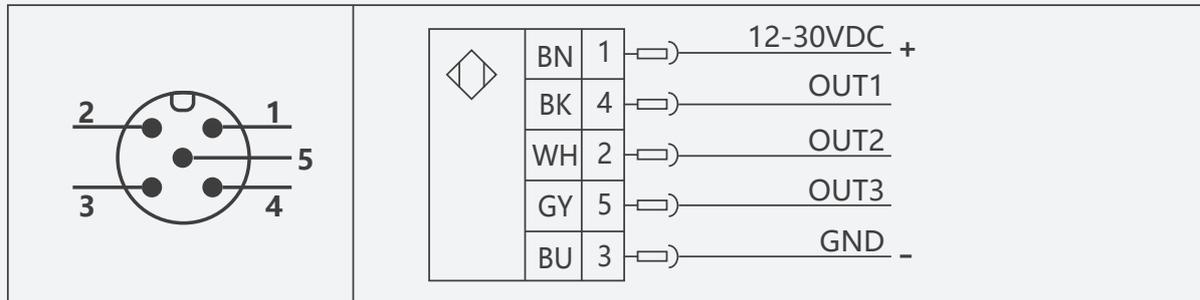
- Resin and glue measurement
- Measurement of hydraulic oil, lubricating oil and grease
- Fuel oil measurement
- Ink and asphalt measurement
- Measurement of liquid nitrogen, refrigerant and solvent
- Edible oil, fish oil
- Fluid measurement for chemical and anti-corrosion requirements

## 2.1 Installation diagram (For reference only)

### Flow meter installation diagram



### 3.1 Wiring diagram



A3: Two switches + one analog		
color	stitch	Instructions
BN	1	power supply (+)
BU	3	power supply (-)
BK	4 (OUT1)	Flow switch PNP (Factory default) Flow switch NPN Linear pulse (full scale 100Hz) Original pulse Quantitative pulse (full scale *0.1)
WH	2 (OUT2)	Flow switch PNP (Factory default) Flow switch NPN
GY	5 (OUT3)	Flow: 4-20mA (factory default) Flow: 1-5v Flow: 0-10v

### 3.2 Panel diagram



Output 1 signal lamp

Output 2 signal lamp

Instantaneous flow

Flow unit

Percentage of range

Set key

Main interface

Right-click to go to the auxiliary page



Cumulative flow

Original frequency

Auxiliary interface

### 3.3 Menu description

Level 1 menu	
SP1 Set	Switch 1 sets the value
RP1 Set	Switch 1 resets the value
SP2 Set	Switch 2 sets the value
RP2 Set	Switch 2 resets the value
F-URV	range
Menu 2 Set	Menu 2 Enter

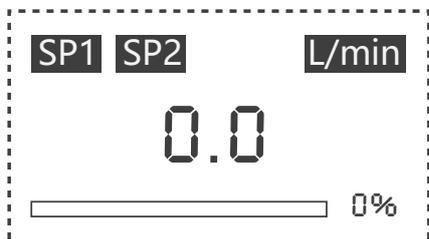
  

Level 2 menu	
Factory Reset	factory data reset.
out1 Set	OUT1 Output mode
	W-NC: The window is always closed
	W-NO: The window is always open
	H-NC: hysteresis normally closed
	H-NO: normally open with hysteresis
	S-Hz-OUT: sets the pulse output
	F-Hz-OUT: indicates the original pulse output
out2 Set	OUT2 output mode
	W-NC: The window is always closed
	W-NO: The window is always open
	H-NC: hysteresis normally closed
	H-NO: normally open with hysteresis
ds1 Set	Switch 1 output delay
dr1 Set	Switch 1 Reset delay
ds2 Set	Switch 2 output delay
dr2 Set	Switch 2 Reset delay

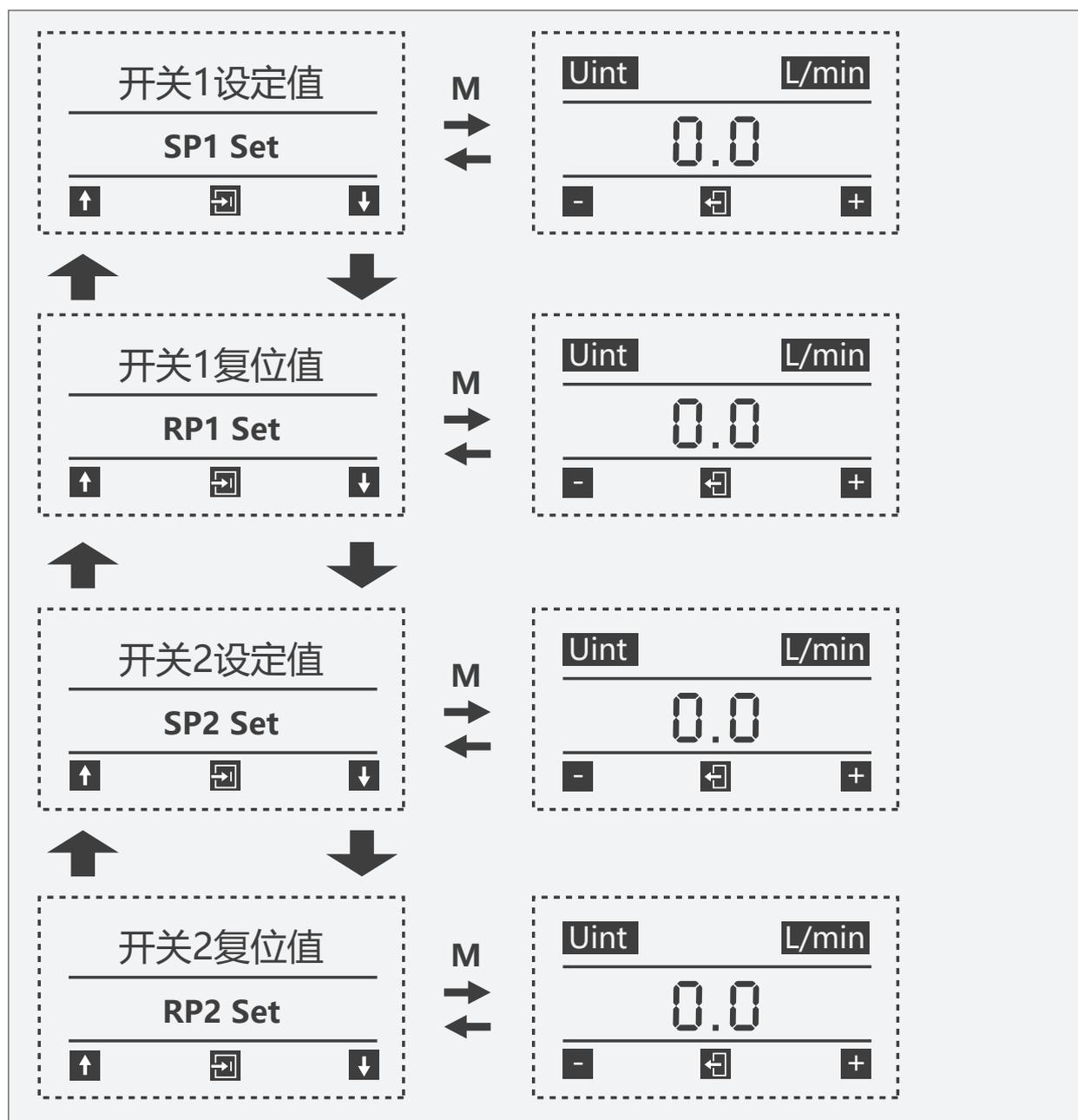
unit Set	Unit setting
	L/min, mL/min, m <sup>3</sup> /h
PNP/NPN Set	PNP/NPN Settings
F-L-data	Historical minimum
F-H-data	Historical maximum
P-PACE	Filter damping
Low flow cut	Lower flow rate excision
A0-Mode	Analog output
	4-20mA
	0-20mA
	1-5V
	0-5V
	0-10V
d-P-set	Decimal place
digit colour	Master data color
BG colour	Main background color
SCRN-Set	Screen off setting value

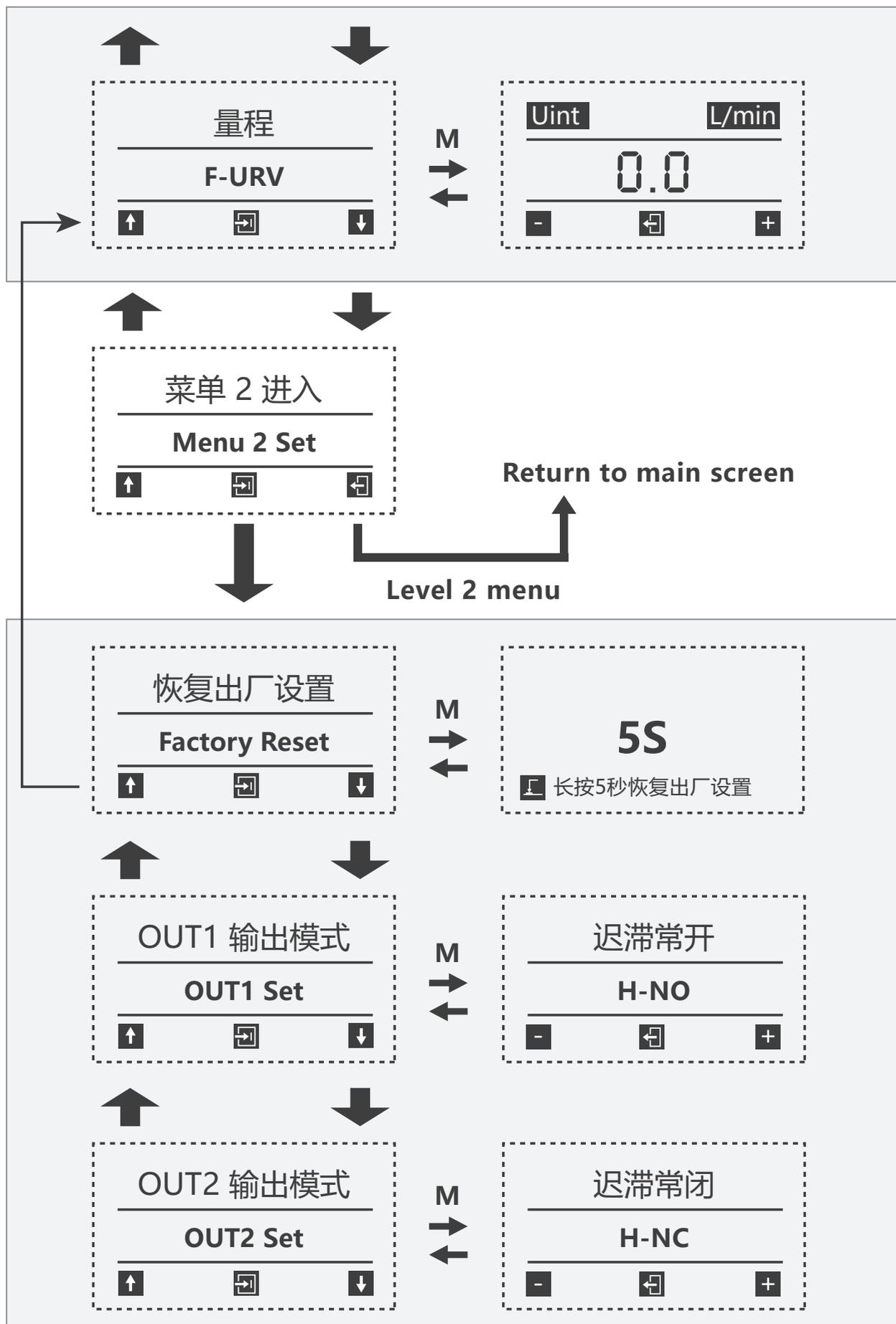
### 3.4 Menus and Settings

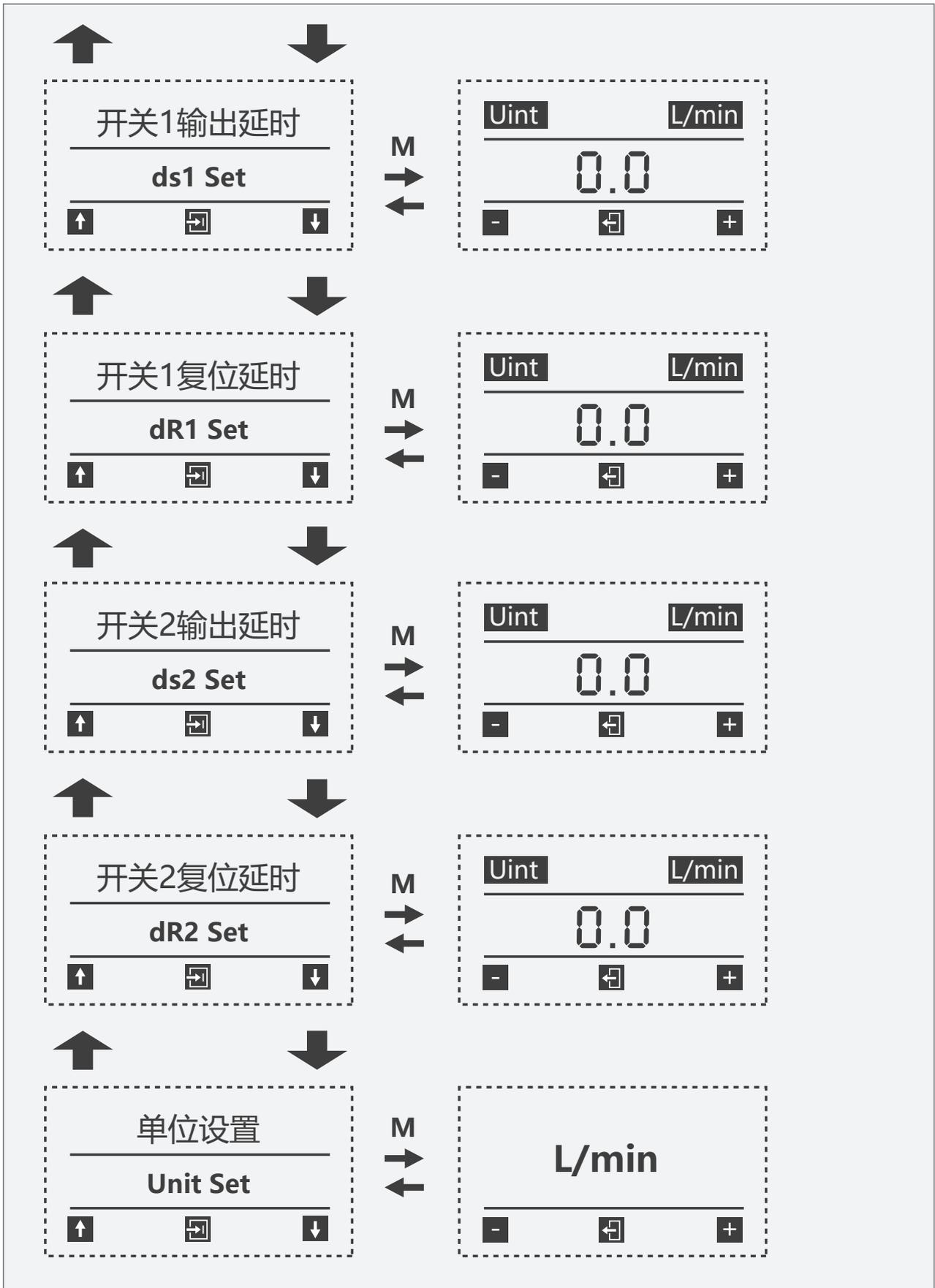
#### ► Main interface

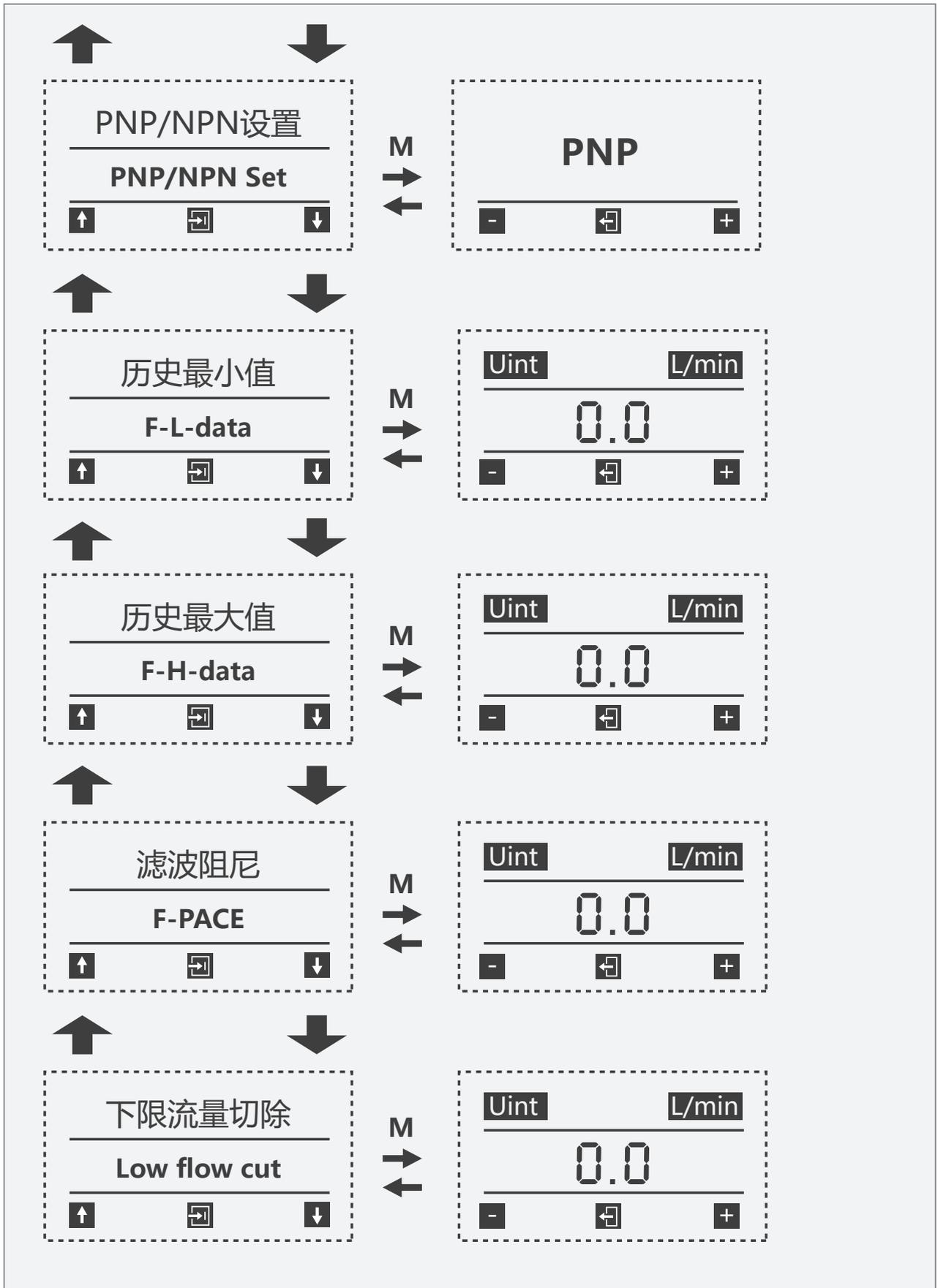


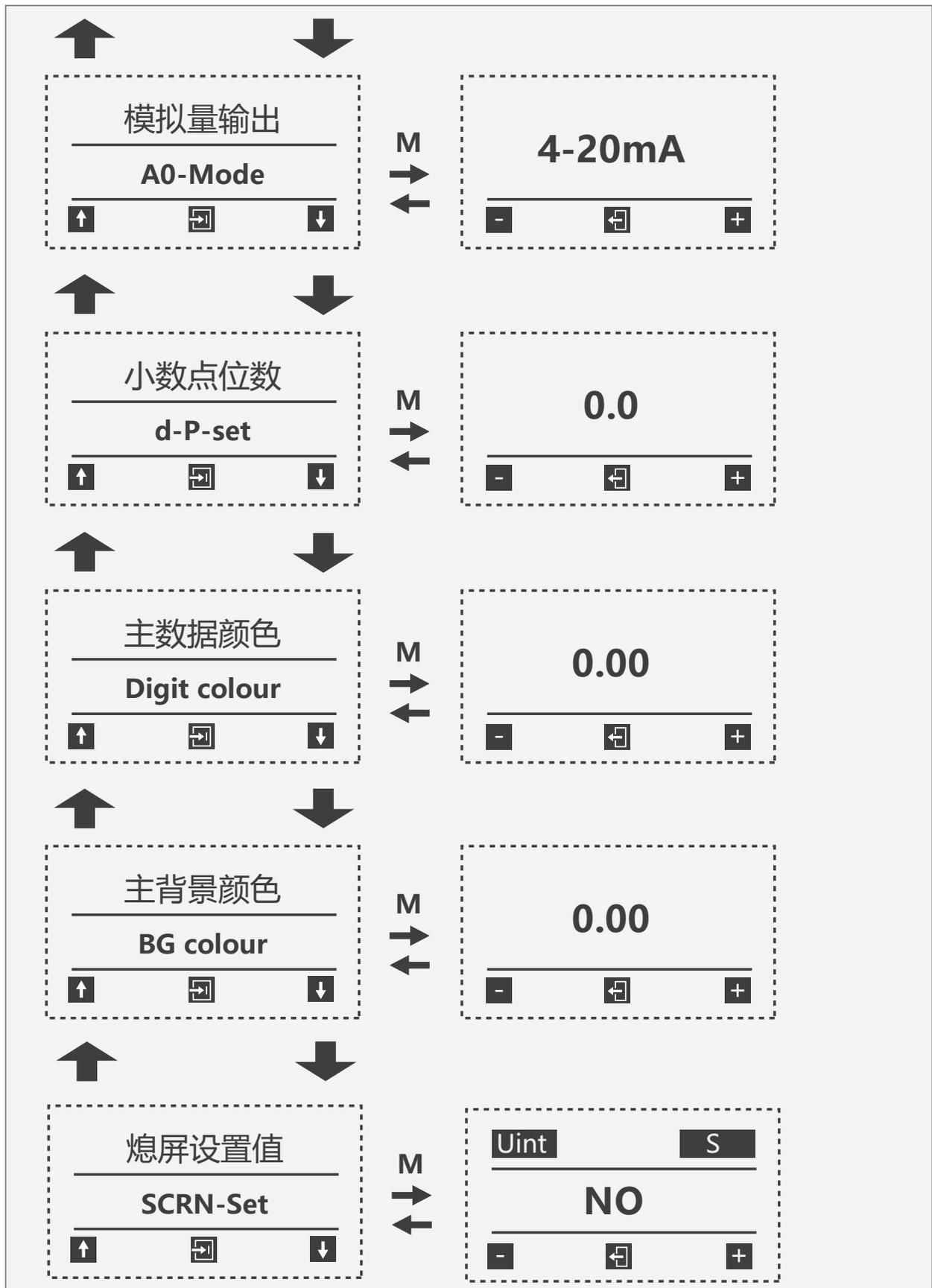
↑ ↓ M Level 1 menu





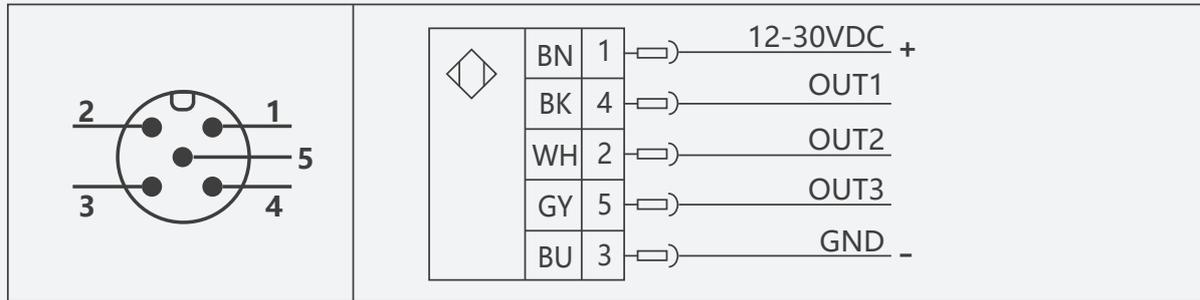






↓ > Main interface

## 4.1 Wiring diagram



AR: RS485 Communication/analog		
color	stitch	Instructions
BN	1	power supply (+)
BU	3	power supply (-)
BK	4 (OUT1)	RS485(B)
WH	2 (OUT2)	RS485(A)
GY	5 (OUT3)	Flow: 4-20mA (factory default) Flow: 1-5v Flow: 0-10v

## 4.2 Panel diagram



**Main interface**

Right-click to go to the auxiliary page



**Auxiliary interface**

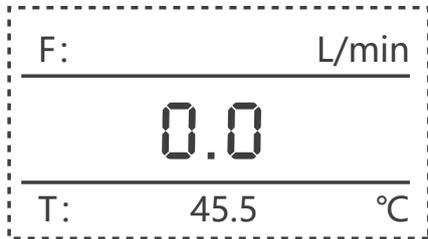
## 4.3 Menu description

Level 1 menu	
485 ID	485 address
Baud set	Baud rate setting
parity set	Check bit setting
stop bit set	Stop bit setting
F-URV	range
Menu 2 set	Menu 2 Enter

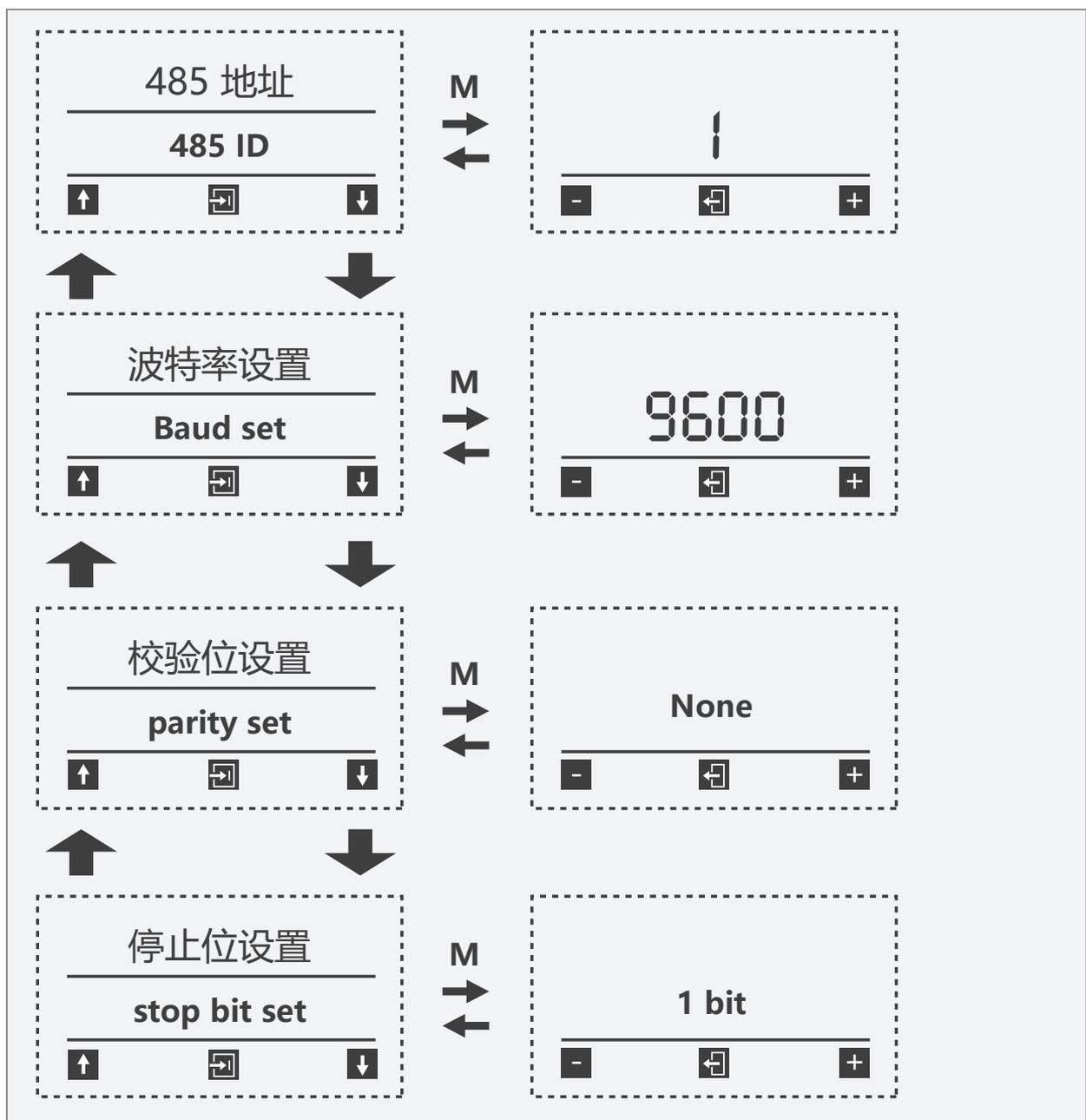
Level 2 menu	
factory reset	factory data reset.
unit set	Unit Settings (L/min, ml/min, m <sup>3</sup> /h)
F-L-data	Historical minimum
F-H-data	Historical maximum
F-PACE	Filter damping
Low flow cut	Lower flow rate excision
A0-Mode	Analog output
	4-20mA
d-P-set	Decimal place
digit colour	Master data color
BG colour	Main background color
SCRN-Set	Screen off setting value

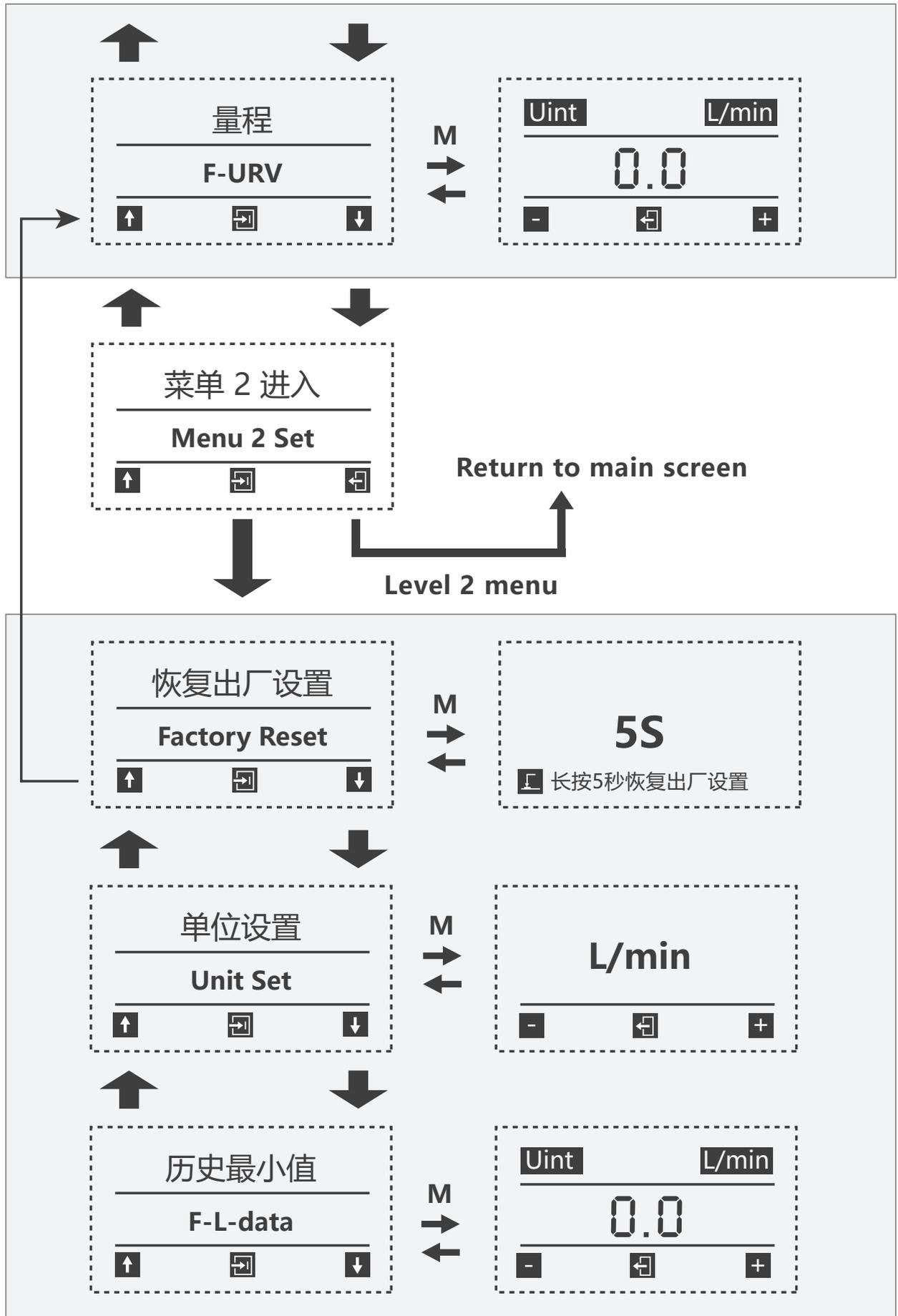
## 4.4 Menus and Settings

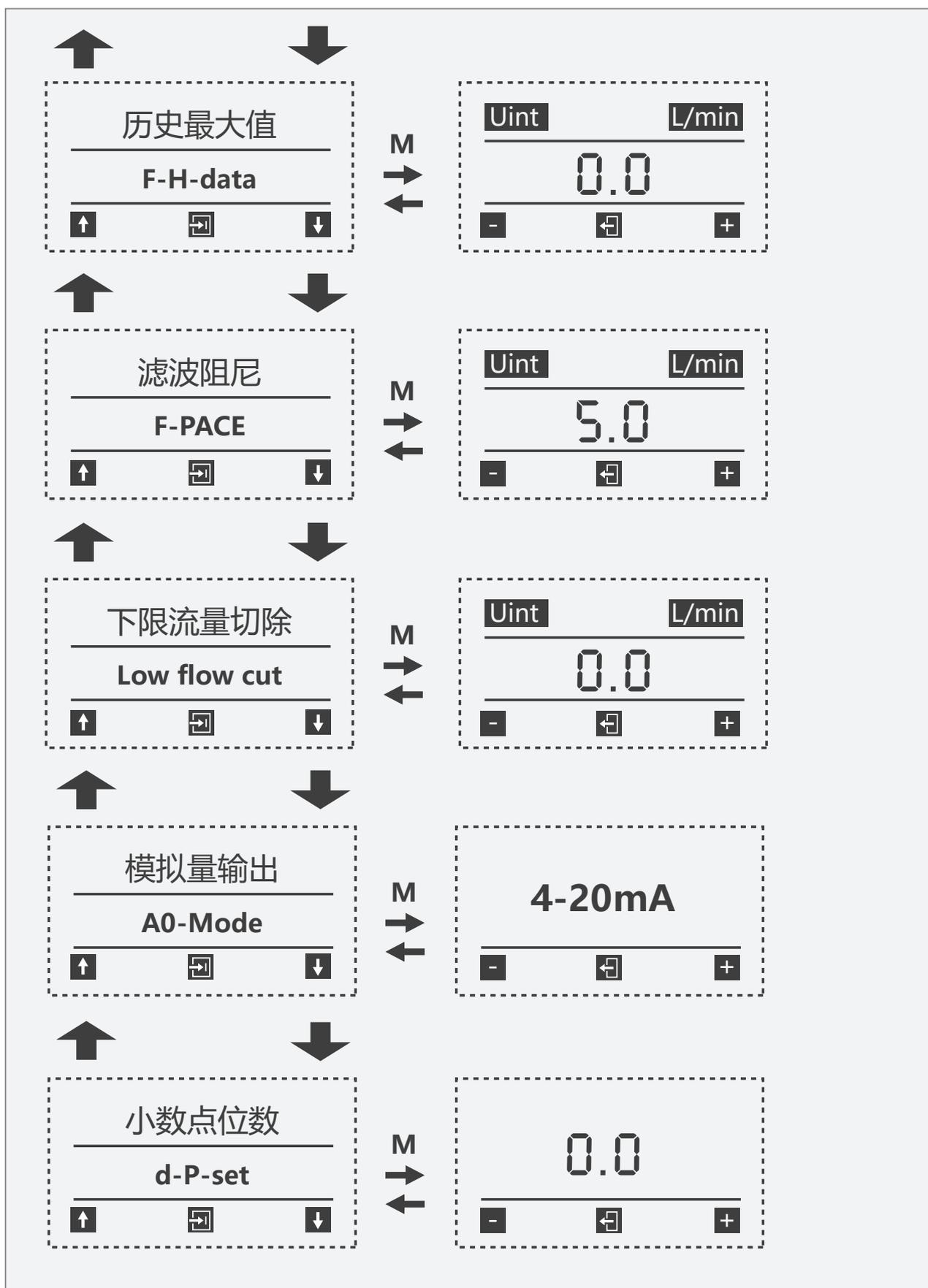
### ► Main interface

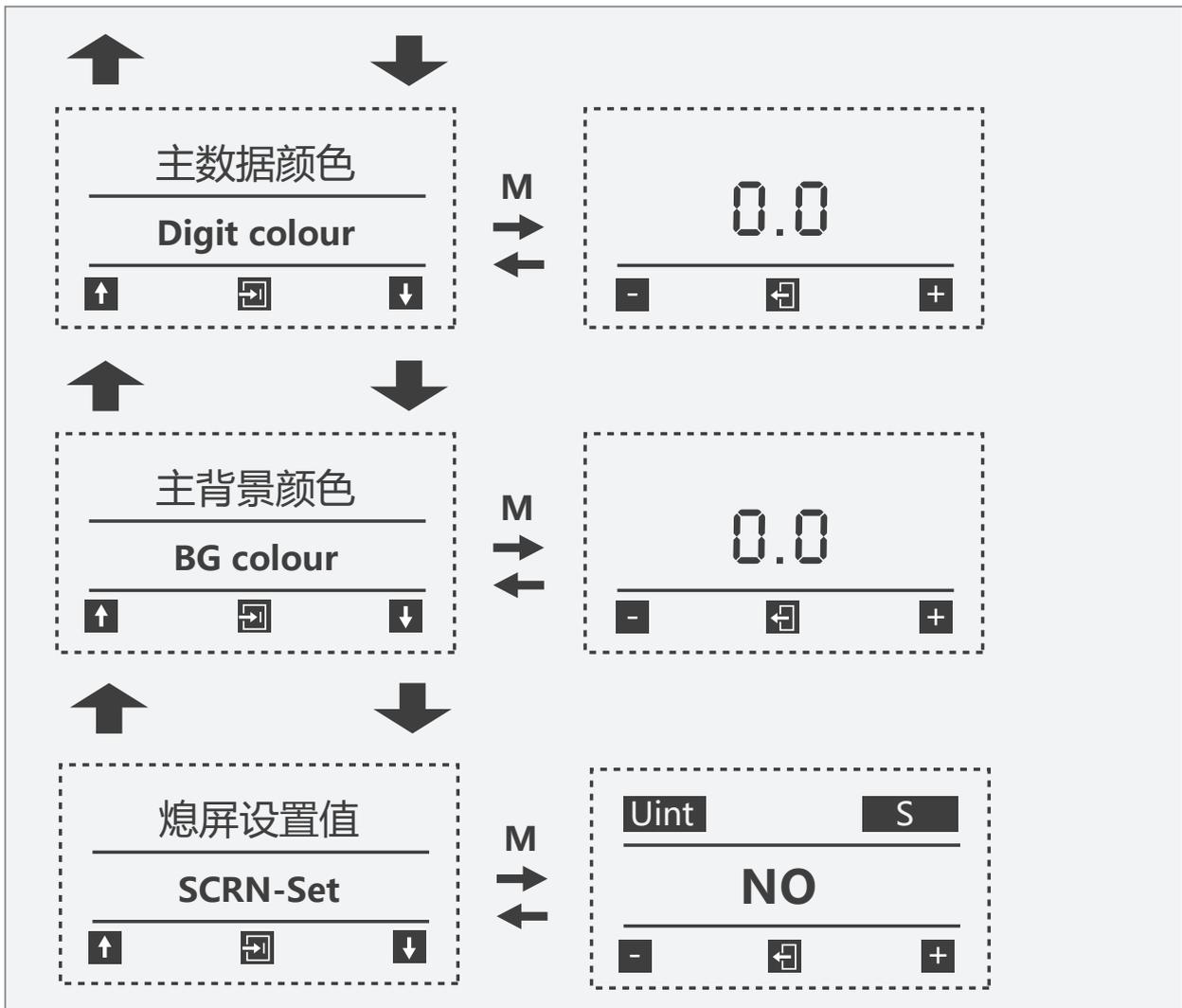


↑ ↓ M Level 1 menu



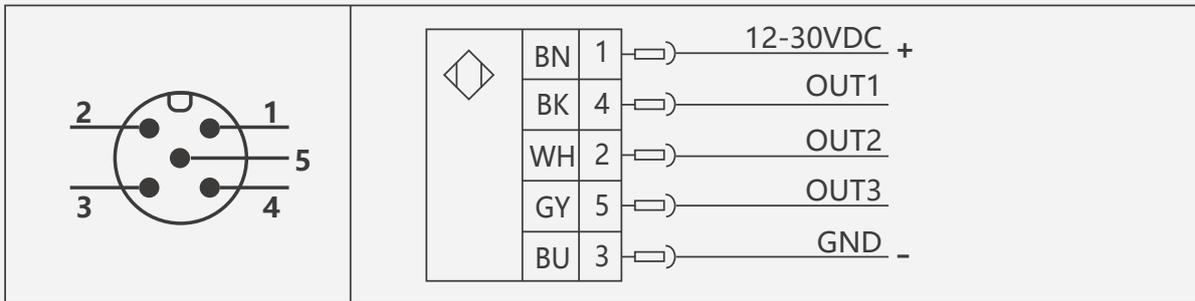






↓ > Main interface

## 5.1 Wiring diagram



SA: Analog (flow/temperature)/switch/pulse/frequency /IO-Link		
color	stitch	Instructions
BN	1	power supply (+)
BU	3	power supply (-)
BK	4 (OUT1)	Flow switch PNP Flow switch NPN Temperature switch PNP Temperature switch NPN Linear pulse (full scale 100Hz) Original pulse Quantitative pulse (full scale *0.1) IO-Link
WH	2 (OUT2)	Flow: 4-20mA (factory default) Flow: 1-5v Flow: 0-10v
GY	5 (OUT3)	Temperature: 4-20mA(Factory default) Temperature: 1-5v Temperature: 0-10v

## 5.2 Panel diagram



**Main interface**

Right-click to go to the auxiliary page



**Auxiliary interface**

## 5.3 Menu description

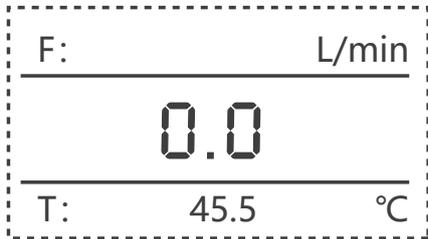
Level 1 menu	
SP1 Set	Switch 1 sets the value
RP1 Set	Switch 1 resets the value
T-LRV	Lower limit of temperature
T-URV	Upper temperature limit
F-URV	Flow range
Menu 2 Set	Menu 2 Enter

Level 2 menu	
Factory Reset	factory data reset.
out1 Set	OUT1 Output mode
	F-W-NC: The flow window is normally closed
	F-W-NO: The flow window is normally open
	F-H-NO: Flow hysteresis is normally open
	F-H-NC: Flow hysteresis is normally closed
	T-W-NC: The temperature window is normally closed
	T-W-NO: The temperature window is normally open
	T-H-NO: Temperature hysteresis is normally open
	T-H-NC: Temperature hysteresis is normally closed
F-Hz-OUT: Flow pulse output	
out2 Set	OUT2 Output mode
	F-A-OUT: Flow analog output
	T-A-OUT: Temperature analog output
ds1 Set	Switch 1 output delay
dr1 Set	Switch 1 Reset delay
T-ofst	Temperature offset
Flow-C	Flow coefficient value

unit Set	Unit setting
	L/min, mL/min, m <sup>3</sup> /h
PNP/NPN Set	PNP/NPN Settings
F-L-data	Historical minimum
F-H-data	Historical maximum
P-PACE	Filter damping
Low flow cut	Lower flow rate excision
A0-Mode	Analog output
	4-20mA
	0-20mA
	1-5V
	0-5V
	2-10V 0-10V
d-P-set	Decimal place
digit colour	Master data color
BG colour	Main background color
SCRN-Set	Screen off setting value

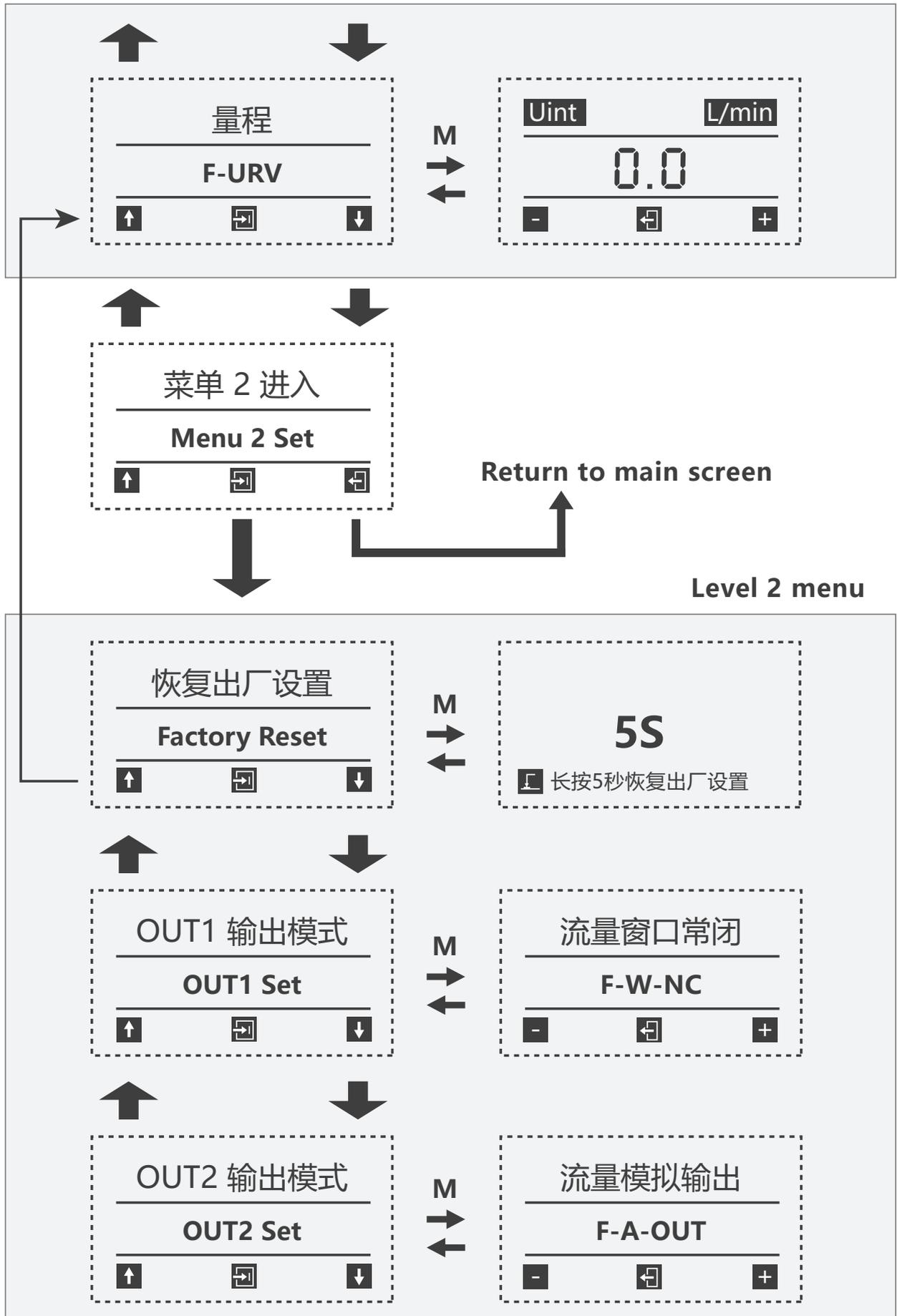
## 5.4 Menus and Settings

### ► Main interface

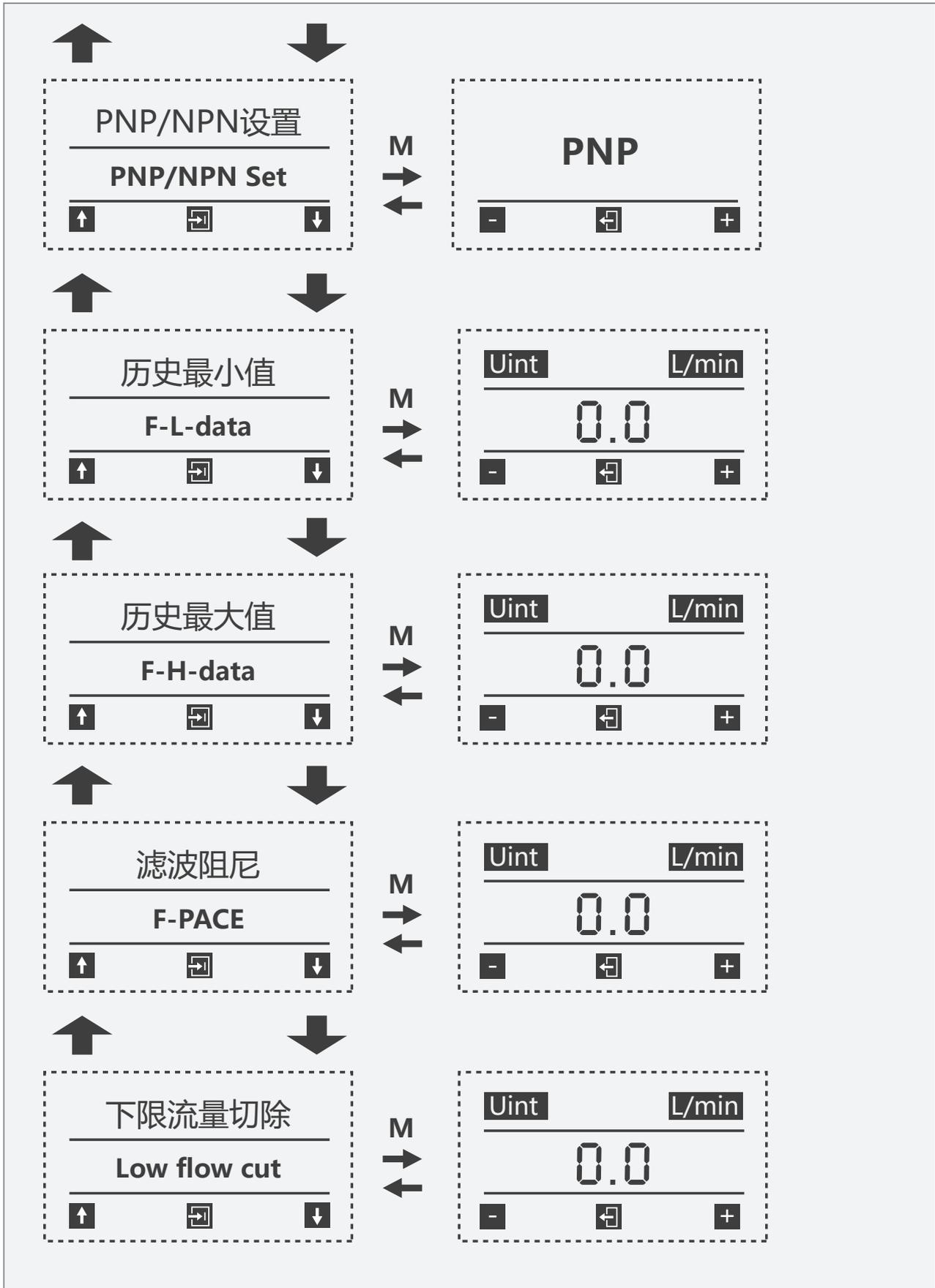


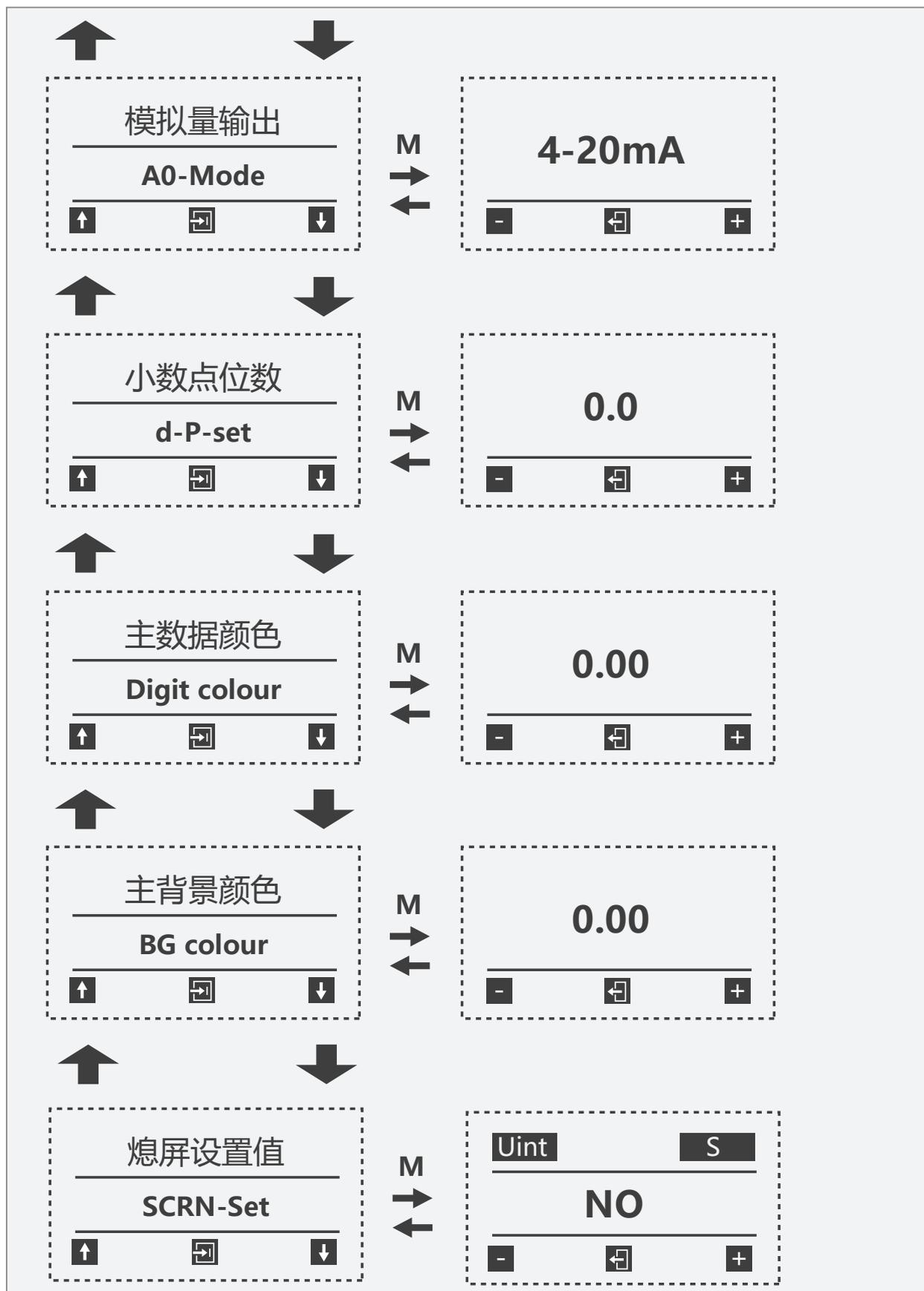
Level 1 menu











↓ > Main interface

## 6.1 Fault situation and handling method

Fault phenomenon	Possible cause	Elimination method
There is no output signal after the power is turned on	<ol style="list-style-type: none"> <li>1. No medium flow in the pipeline or the flow rate is lower than the starting flow rate;</li> <li>2. The power supply is incorrectly connected to the output cable.</li> <li>3. The display circuit is damaged</li> </ol>	<ol style="list-style-type: none"> <li>1. Increase the medium flow rate or change to a smaller diameter flowmeter to meet the requirements of the flow range;</li> <li>2. Connect cables correctly.</li> <li>3. Replace the flowmeter</li> </ol>
The flowmeter has signal output when there is no flow	<ol style="list-style-type: none"> <li>1. Poor grounding of the flowmeter and interference of strong electricity and other ground lines;</li> <li>2. The sensitivity of the amplifier is too high or produces self-excitation;</li> <li>3. The power supply is unstable.</li> </ol> Poor filtering and other electrical interference.	<ol style="list-style-type: none"> <li>1. Connect the ground correctly to eliminate interference;</li> <li>2. Replace the preamplifier;</li> <li>3. Repair and replace the power supply to eliminate interference.</li> </ol>
The instantaneous flow indicator is unstable	<ol style="list-style-type: none"> <li>1. The medium flow is unstable;</li> <li>2. The sensitivity of the amplifier is too high or too low, and there are multiple and missing pulse phenomena;</li> <li>3. There are debris in the shell;</li> <li>4. Poor grounding;</li> <li>5. The flow rate is lower than the lower limit;</li> <li>6. Foreign matter enters the pipe, forming a disturbance.</li> </ol>	<ol style="list-style-type: none"> <li>1. Test after the flow rate is stable;</li> <li>2. Replace the preamplifier;</li> <li>3. Remove dirt;</li> <li>4. Check the ground cable to ensure that it is normal</li> </ol>
The indicated cumulative flow does not match the actual cumulative flow	<ol style="list-style-type: none"> <li>1. Incorrect input of meter coefficient;</li> <li>2. The normal flow rate of the user is lower than or higher than the normal flow range of the selected flowmeter;</li> <li>3. The flow meter itself is out of tolerance</li> </ol>	<ol style="list-style-type: none"> <li>1. Enter the correct instrument coefficient after re-calibration;</li> <li>2. Adjust the flow rate of the pipeline to make it normal or choose a flowmeter of appropriate specifications;</li> <li>3. Recalibrate.</li> </ol>
Key exception	The converter key is in poor contact or locked.	Replace the display board.

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