ATO

Version: B6FHB

WPB6F Series User's Manual

It is essential to read the instructions carefully and ensure a full understanding of the content before installing or using the device. Please store this manual for future reference.

■ Safety Precautions

CAUTION ⚠

- ◆ Please always follow the instructions in this manual to avoid the risk of accident or damage.
- ◆ Please add external protection for the system if the fault of this product may cause major accident.
- ◆ Do NOT use this product in any situation that exceeds its specifications as this can result in a risk of electric shock, fire or fault.
- ◆ Do NOT use this product in the environment containing flammable or explosive gas.
- ◆ Do NOT touch the power supply terminals or any part of the device with high voltage as this can result in a risk of electric shock.
- ◆ Do NOT disassemble or modify the device as this can result in a risk of electric shock, fire or fault.

IMPORTANT

- ◆ This device is not intended for the use in nuclear facilities or any life-related medical devices.
- ◆ Surge protector units are essential for the input and output lines of the device.
- ◆ This is a panel-mounted device; thus essential measures should be taken in end products to prevent users from approaching any high-voltage part such as power supply terminals
- ◆ To avoid damage to the device or device fault, suitable circuit breakers such as fuses are essential for the power supply lines or lines carrying high currents which are connected to the device.
- ◆ Do NOT insert metal strip or wire debris into the product as it can result in a risk of electric shock, fire or fault.
- ◆ ENSURE all the terminal screws are tightened as a loose screw can result in electric shock or fire.
- ◆ The device must be powered off before cleaning.
- ◆ Wipe the surface of the device with a dry and clean cloth to remove the dust. Do NOT use any hygroscopic agent in cleaning as it can result in deformation and discolor.
- ◆ Do NOT scrape or hit the display unit of the device with hard objects.
- ◆ The installation, debugging and maintenance of the product should be performed by qualified engineers or technicians.

BEFORE USE

- ◆ Routine maintenance is essential to ensure the safety and long-term use. Due to the limit of lifespan, the features of some parts of the device might change with time.
- ◆ This manual could be subject to change. In case of any changes, we will not make notifications. Please update the manual to the latest version and always refer to the latest version. If you have any questions, please feel free to contact us.
- ◆ We will NOT be held responsible for any direct or indirect loss resulting from the use of or faults in the use of our products.

1. INSTALLATION

CAUTION ⚠

To avoid electric shock or device fault, installation and uninstall should ALWAYS be conducted after the power is cut off.

1.1 Installation precautions and warnings

(1) This device is designed to be used in the following ambient conditions:

- Ambient temperature: -30~60°C, avoid exposure to direct sunlight
- Ambient humidity: 35~85%RH, no condensation (absolute humidity: MAX. W. C 29.3 g/m^3 dry air at 101.3kPa)
- Intended environmental conditions: Indoor use only, altitude <2000m

(2) Avoid installing the device in places:

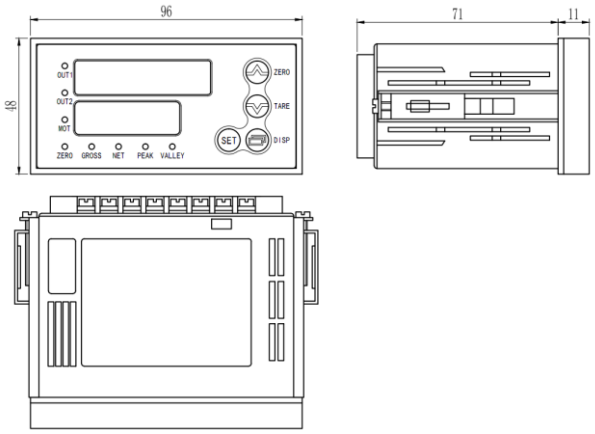
- where the ambient temperature could suddenly change and cause condensation;
- where corrosive or combustible gas might be generated;
- where direct vibration and impact would affect the device;
- that contain significant dust, salt or metal powder;
- where interference is significant and electrostatic field, magnetic field and other noise might be produced;
- that is exposed directly to the flow from air conditioner or heater;
- that is exposed to the direct sunlight;
- where heat accumulation caused by thermal radiation might occur.

(3) Considerations for installation location:

- In order not to impede heat dissipation, do NOT cover the product, the air inlet and outlet must not be blocked, and leave enough space for ventilation.
- Leave at least 50mm space above and below the device for wiring and future maintenance.
- Avoid installing the device right above any device which gives off significant heat (such as heater, voltage transformer, power semiconductor devices, or high-power resistors) .
- Use a fan or air cooler to cool the device when ambient temperature is over 50°C. However, the device shouldn't be exposed to the direct cold air flow.
- To improve the noise resistance and safety, the device shouldn't be installed close to any high-voltage machine, motive power supply line, or motive power machine.

1.2 External structure and dimensions

All the dimensions are in mm.



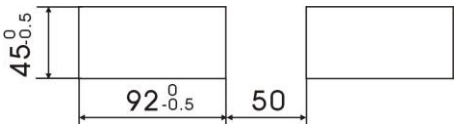
1.3 Mounting type

■ Panel mounting

1. Cut out a hole in the panel;
2. Insert the device into the hole from the front of the panel;
3. Fix the bracket of the device to the panel and tighten the screws to keep it stable.

■ Panel cutout size

All the dimensions are in mm.



➧ For dense installation, please take into account the strength of the panel.

2. WIRING

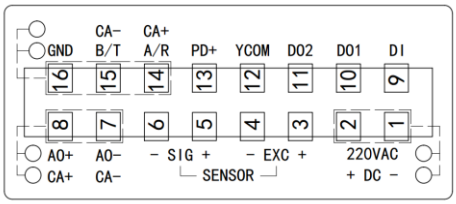
CAUTION ⚠

- ◆ To avoid electric shock or device fault, please always keep the power supply disconnected before the wiring is completed and make sure all the wiring is done correctly.

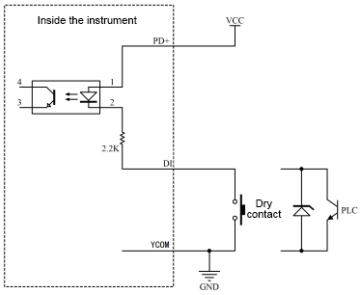
2.1 Precautions in wiring

- In order to prevent interference, please separate input lines from device power supply lines, motive power lines, and load lines.
- Ensure that the power supply of the device will not be affected by the noise from motive power lines. In situations susceptible to noise, noise filters are strongly recommended.
  - − Twist the wires into a braided shape. The shorter the twisted cable lay, the better the noise reduction is.
  - − Noise filter should always be installed on the grounded panel and make sure that the wire connecting its output and power supply terminal is the shortest.
  - − Do NOT fit fuse or switch to the output wire of the filter, as it might decrease the effectiveness of noise reducing.
- The device has no fuse. In case external fuse is needed, the recommended specifications of the fuse are:
  - − Time-delay fuse with rated voltage at 250V and rated current at 1A
- Always use the power supply unit that meets the power supply specifications.
- Avoid introducing any interference into the measuring circuit:
  - − Separate the measuring circuit from power supply lines (power supply circuit) or grounded circuit.
  - − It is effective to eliminate electrostatic interference by using shielding wire.
- To avoid any faulty operations, do NOT connect wires to any unused terminals.

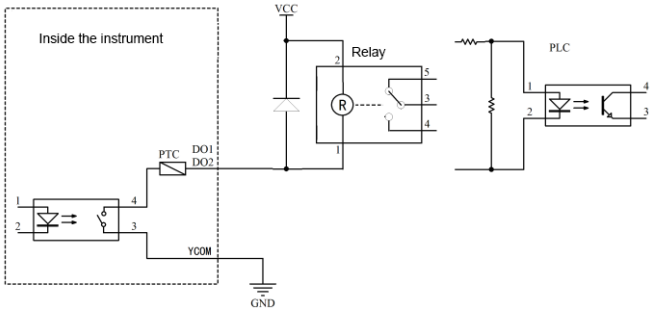
2.2 External terminals



Wiring diagram of digital input:



Wiring diagram of digital output:



Note 1: A/R、B/T、GND——Communication Interface, AO+、AO- ——Analog output

Note 2: PD+ and YCOM are the terminals (+ and – respectively) of external power supply (between 9V and 32V) for digital input.

Note 3: DI and YCOM are the terminals for digital input, Under the condition that PD + and ycom have provided power supply, the short circuit can realize effective input.

Note 4: DO1, DO2 and YCOM are the terminals for digital output, which can be connected to the positive or negative end of the digital input of common-cathode or anode PLC. YCOM is the common terminal.

Note 5: CA+、CA-——Intelligent Module.

Note 6: Analog output, communication and intelligent module can only be selected from two out of three, , so the terminal diagram of optional function shall be subject to the instrument model and terminal diagram on the body.

2.3 Connection of load cell

➧ A Wheatstone bridge type load cell is required for this device with a 4-wire connection.

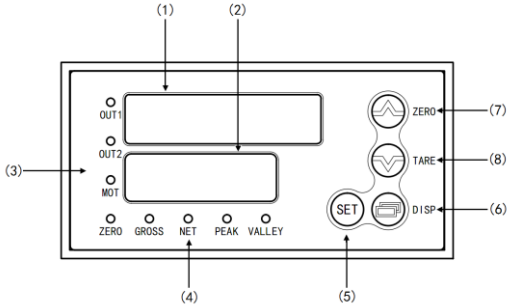
Please refer to the diagram of Terminals in the previous part of this manual to complete the connection.

Port	Excitation power supply +	Excitation power supply -	signal+	signal -
Wiring	EX+	EX−	SG+	SG−

★ For parallel connection of multiple load cells, essential measures should be taken to ensure that the sensitivities (mV/V) of all the load cells are adjusted to the same value.

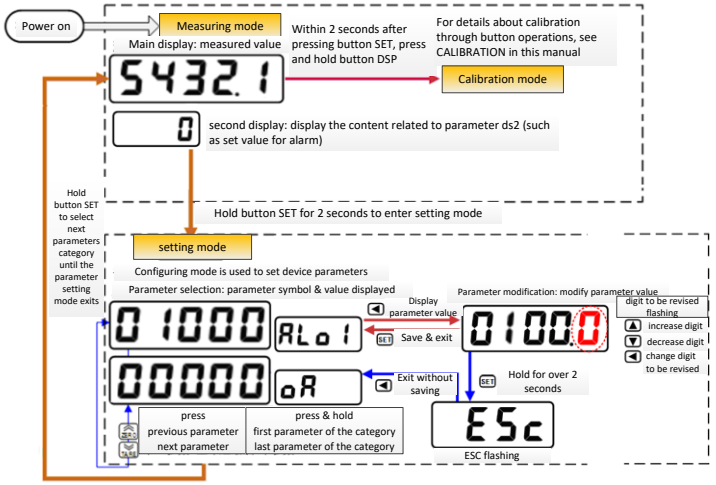
3. BASIC OPERATIONS

■ Panel board and buttons



No.	Name	Description
1	Main Display	Display measured value in the measuring mode; Display parameter value during configuration.
2	Second Display	In the measuring mode, display content set by parameter dS2 (such as alarm, peak/valley value) In the configuration mode, display the symbol of parameter.
3	Indicators for alarm output and change	OUT1 OUT2: Status of alarm output MOT: When it is on, it means the value of the force is changing. ZERO: When it is on, it means gross weight is zero.
4	Status indicators	GROSS / NET / PEAK / VALLEY: It is an indicator for the current status of displayed value. In the measuring mode, press DISP to switch the display to: Gross weight: Indicator GROSS on Net weight: Indicator NET on Peak value: Indicator PEAK on Valley value: Indicator VALLEY on Peak-to-valley value: Indicators PEAK and VALLEY are both on
5	SET SET	**In the measuring mode**, hold this button for over 2 seconds, and it will enter the configuration mode. **In the configuration mode**: When parameter symbol is on the display, press this button to select the parameter; When editing parameter value, press this button to save the value.
6	DISP	**In the measuring mode**: press this button to switch the content on display (see the description of status indicators for details) ; hold this button for over 2 seconds to clear the peak/valley value. **In the configuration mode**: When parameter symbol is on the display, press this button to view the original value of the parameter; When editing parameter value, press this button to select the digit to be changed.
7	ZERO	**In the measuring mode**: press this button for nulling and clear peak/valley value; **In the configuration mode**: When parameter symbol is on the display, press this button to select the previous parameter; When editing parameter value, press this button to increase the parameter value.
8	TARE	**In the measuring mode**: press this button for taring; **In the configuration mode**: When parameter symbol is on the display, press this button to select the next parameter; When editing parameter value, press this button to reduce the parameter value.

4. PARAMETERS CONFIGURATION



■ General operations of buttons

1. Hold **SET** for over 2 seconds to enter configuration mode, with the symbol of the first parameter on the display.
2. Press **ZERO** or **TARE** to select the previous/latter parameter to be revised.
   Hold **ZERO** or **TARE** , the first or last parameter in this category will be selected.
3. Press **DISP** to view the original value of current parameter; the flashing LED indicates the digit to be revised.
4. Press **DISP** to change the digit to be revised and **ZERO** to increase or **TARE** to reduce the value.
5. Press **SET** to save the changes and switch to the next parameter.
   (To quit parameter modification without saving the changes, hold **SET** until ESc is displayed, and then press **DISP** to quit without saving any changes; the system will return to the parameter selection state, displaying the symbol of next parameter)
6. Hold **SET** to enter the next parameter category sequentially and the symbol of the first parameter in the category will be displayed.
7. How to quit the configuration mode: When displaying parameter symbol, hold button **SET** until the parameter configuration mode is quitted.

■ Parameters categorization & password verification

- The parameters of the device are classified into multiple categories, which are presented in the next section of the manual.
- Password verification: Parameters listed in Category 2 and subsequent categories are subject to password protection and no entry will be allowed without setting a password.

  To enable or disable the revision of the parameters in Category 1, please set parameter oA1 (Category 2) first.

  When oA1 is set to on, revision of parameters in Category 1 is allowed;

  When set to oFF, they are allowed to be viewed; however, revision is not allowed.
- **How to Set Password**: Select parameter oA (the last parameter in Category 1) . For details, please refer to GENERAL OPERATIONS OF BUTTONS in the previous part of this manual.

  Correct password is 1111 (for parameters in Category 2 to 6) or 2027 (for parameters in Category 7) .

  Parameters protected by passwords can only be viewed and modified when correct password has been entered.
- The device will quit from parameter configuration mode, if no button has been pressed for over 1 minute.

5. PARAMETERS LIST

Category 1: Set value for alarm output

To enable or disable the revision of the parameters in this category, please set the parameter oA1 (See category 2) .

When oA1 is set to on, parameter revision is allowed; When set to oFF, revision is not allowed.

Symbol	Name	Parameter	Address	Range	Default
ALo1~2	ALo1~2	alarm mode	02H, 08H	0~11	-HH-
out1~2	oUt1~2	Alarm threshold	03H, 09H	-19999~99999	1000/ 2000
HYA1~2	HYA1~2	Alarm hysteresis	04H, 0AH	0~99999	0
dLY1~2	dLY1~2	Alarm delay	05H, 0BH	0~60 (s)	0
Au1~2	AV1~2	Alarm deviation	06H, 0CH	-19999~99999	0
ALS1~2	ALS1~2	Alarm source	07H, 0DH	0~7	Gross
inv1	inv1	Output inverse of alarm 1	28H	0: oFF/1: on	oFF
inv2	inv2	Output inverse of alarm 2	29H	0: oFF/1: on	oFF
99oA	99oA	Password	01H	0~9999	0

Category 2: Display parameters

Subject to the protection of password "1111" and entry will be rejected until password has been set.

No.	Symbol	Name	Parameter	Address	Range	Default
00	dS2	dS2	Content for second display	32H	0~10	OUT1
01	ind	ind	Decimal point position	33H	0~4	00000.
02	trd	trd	Zero tracking range	34H	-200~200 (scale interval)	0
03	Zor	Zor	Nulling range	35H	-0.99~0.99	0.99
04	FLt	FLt	Digital filter time constant	36H	1~20	1
05	not	not	Motion/Variation detection	37H	0~200 (scale interval)	0
06	Arn	Arm	Moving averaging filter constant	38H	1~20	1
07	not	Mot	Measurement correction threshold	39H	-19999~99999	0
08	Mov	Mov	Measurement correction value	3AH	-19999~99999	0
09	At	At	Refresh rate of display	3BH	10、20	10
10	SPS	SPS	Measuring/sampling rate	3CH	15/120/240/480/960/1920 (sampes/s)	15
12	mAt	mAt	Peak threshold	3EH	-19999~99999	-19999
13	mAb	mAb	Peak hysteresis	3FH	-19999~99999	0
14	mit	mit	Valley threshold	40H	-19999~99999	99999
15	mib	mib	Valley hysteresis	41H	-19999~99999	0
16	di0	di0	Digital input function	42H	0~10	Zero
17	oA1	oA1	Password for modifying alarm parameters	43H	0: oFF/1: on	on
18	Poc	Poc	Data reset at power-on	101H	0: oFF/1: on/2: DELAY	oFF
20	trS	trS	Zero tracking time	103H	0.0~10.0	00.0

Category 3: Retransmitted analog output parameters (only available when corresponding hardware is adopted)

Subject to the protection of password 1111 and entry will be rejected until password has been set

No.	Symbol	Name	Parameter	Address	Range	Default
30	AoS	AoS	Output data source	44H	0~7	Gross
31	Aot	Aot	Output type	45H	0~5	4~20 mA
32	AtH	AtH	Output upper range	46H	-19999~99999	10000
33	AtL	AtL	Output lower range	47H	-19999~99999	0

Category 4: communication parameters (only available when corresponding hardware is adopted)

Subject to the protection of password 1111 and entry will be rejected until password has been set

No.	Symbol	Name	Parameter	Address	Range	Default
40	Add	Add	Local address	48H	1~255	1
41	bAu	bAu	Baud rate selection	49H	0~6	9.6K
42	oES	oES	Parity (for Modbus only)	4AH	0~2	N
43	ctd	ctd	Alarm output controlled externally	4BH	0: oFF/1: on	oFF
44	ctA	ctA	Analog output controlled externally	4CH	0: oFF/1: on	oFF
45	Pro	Pro	Communication protocol	4DH	0: tcASC/1: Mod	Mod
46	Act	Act	Active communication data source (for tc-ASC only)	4EH	0~8	NONE
47	Sto	Sto	Stop bit selection (for tc-Modbus only)	4FH	1~2	1
48	dLY	DLY	Delay before the device sends the response to the controller (unit: us)	105H	-2~127	-1

Category 5: Linearization parameters

Subject to the protection of password 1111 and entry will be rejected until password has been set

No.	Symbol	Name	Parameter	Address	Range	Default
50	FnU	FnU	number of linearization points	4FH	0~10	0
51	F1	F1	measured value at point 1	50H	-19999~99999	1
52	S1	S1	standard value at point 1	51H	-19999~99999	1
53	F2	F2	measured value at point 2	52H	-19999~99999	2
54	S2	S2	standard value at point 2	53H	-19999~99999	2
55	F3	F3	measured value at point 3	54H	-19999~99999	3
56	S3	S3	standard value at point 3	55H	-19999~99999	3
57	F4	F4	measured value at point 4	56H	-19999~99999	4
58	S4	S4	standard value at point 4	57H	-19999~99999	4
59	F5	F5	measured value at point 5	58H	-19999~99999	5
60	S5	S5	standard value at point 5	59H	-19999~99999	5
61	F6	F6	measured value at point 6	5AH	-19999~99999	6
62	S6	S6	standard value at point 6	5BH	-19999~99999	6
63	F7	F7	measured value at point 7	5CH	-19999~99999	7
64	S7	S7	standard value at point 7	5DH	-19999~99999	7
65	F8	F8	measured value at point 8	5EH	-19999~99999	8
66	S8	S8	standard value at point 8	5FH	-19999~99999	8
67	F9	F9	measured value at point 9	60H	-19999~99999	9
68	S9	S9	standard value at point 9	61H	-19999~99999	9
69	F10	F10	measured value at point 10	62H	-19999~99999	10
70	S10	S10	standard value at point 10	63H	-19999~99999	10
71	FnV	FmV	Physical quantity selection	80H	0: oFF/1: on	oFF

Category 6: Calibration parameters

Subject to the protection of password 1111 and entry will be rejected until password has been set.

No.	Symbol	Name	Parameter	Address	Range	Default
80	cAn	cAm	Calibration method	64H	0：norm / 1：tEmP / 2：Auto	norm
81	cAt	cAt	Calibration time allowed	65H	1~120 (min)	20
82	mvv	mvv	Load cell sensitivity (for tEmP only)	66H	0.1000~5.0000 (mV/V)	2.0000
83	cA0	cA0	mV value for zero-point calibration	67H	Displayed measured value	
84	cAF	cAF	mV value for gain calibration (for norm only)	68H		
85	cAP	cAP	Weight for gain calibration	69H	1~99999	10000
86	inA	inA	Zero point correction value (for tEmP only))	6AH	-19999~99999	0
87	Fi	Fi	Full scale correction factor (for tEmP only)	6BH	-1.9999~9.9999	1.0000
88	Fd	Fd	Display scale interval	6CH	1,2,5,10,20,50	1
89	Fr	Fr	Measuring range	6DH	1~99999	15000
	LocK	LocK	Calibration parameters locked	6EH	0: oFF/1: on	oFF
	rAnG2	rAnG2	The input range is halved	6FH	0：oFF / 1：on	oFF

Category 7: user parameters

Subject to the protection of password 2027 and entry will be rejected until password has been set

No.	Symbol	Name	Parameter	Address	Range	Default
	burn	burn	Sensor break threshold	1FEEH	FrEE、1500Ω、1400Ω、1300Ω、1200Ω、1100Ω、1000Ω、900Ω、800Ω、700Ω、600Ω、500Ω、400Ω、300Ω、NONE	FrEE
	burnc	burnc	View the current detection code corresponding to the impedance of the current connected sensor	1FEFH	unmodifiable	
90	SAv	SAv	Backup parameters	1FF1H	0: oFF/1: on	
91	LoA	LoA	Restore backup parameters	1FF2H	0: oFF/1: on	
92	dEF	dEF	Restore factory parameters	1FF3H	0: oFF/1: on	
93	VER	VER	Firmware version	1FF5H		
94	AcP	AcP	Read or store calibration parameters on the intelligent module	1FF6H	0：nonE / 1：cSAuE / 2：cLoAd	nonE
95	tEd	tEd	Communication mode for intelligent module	1FF7H	0：oFF / 1：on	on

★: The two digital LED indicators on the left are used to display the serial number (No.) of the parameter, while the three on the right are for the symbol of the parameter.

6. CALIBRATION

Calibration should be performed when the device is to be used for the first time, or any part of the measuring system has been changed, or the previous calibration doesn't meet the requirement any more.

Calibration parameters are listed in Category 6 (one or more calibration parameters can be modified).

6.1 Enter calibration parameters

Refer to【错误!未找到引用源。】 to enter the calibration parameters (Parameter Category 6).

Or use the shortcut buttons to enter these parameters:

Use shortcut buttons to enter calibration

① Press button SET and then release it.

② Within 2 seconds after the above operation, press and hold DISP until 0000 is displayed.

③ Enter password 111 and then press SET; meanwhile cAn will be displayed, which means calibration parameters (Category 6) have been accessed.

6.2 Description of calibration parameters

The calibration parameters are explained in the following part.

The details of parameters and their symbols, ranges and addresses are listed in【5. 】.

◆ cAn (cAm) —— calibration mode selection

0: norn (norm): calibration with weight 1: tEmP (tEmP): calibration without weight

2: Auto (Auto): automatic calibration

◆ cAt (cAt) —— maximum calibration time allowed (minutes)

When timing out, the device will return to measuring mode automatically (all the parameters in Category 6 are subject to the control of this parameter).

◆ mvv (mvv) —— load cell sensitivity (mV/V)

Only applicable to calibration without weight (default value: 2.0000 mV/V)

◆ cA0 (cA0) —— mV value of zero point

◆ cAF (cAF) —— mV value for gain calibration

Only applicable to calibration with weight. When calibration with weight has been finished, the device will display the corresponding value of cAP (cAP) at cAF

◆ cAP (cAP) —— Displayed weight when gain calibration has been done.

This value is smaller than the measuring range Fr (Fr). It is recommended to set this value at about 80% of Fr (Fr).

◆ Fd (Fd) —— display scale interval

◆ Fr (Fr) —— maximum measuring range

➡ Due to the possible errors during calibration without weight, manual correction can be done through the parameters of inA (inA) and FL (Fi) (only applicable for calibration without weight).

◆ inA (inA) —— zero point correction value (factory setting: 0)

◆ FL (Fi) —— full scale correction factor (factory setting: 1.0000)

Displayed value= (measured value before correction ×full scale correction factor) – zero point correction value

◆ LocK (LocK) —— Lock calibration parameters (factory setting: OFF)

When set to ON, calibration parameters are locked, which means cA0 and cAF are read only and cannot be calibrated automatically

◆ rAnG2 (rAnG2) —— The input range is halved,Applicable to less sensitive sensor.

6.3 Calibration procedure

■ 6.3.1 Calibration method and process

There are two calibration methods, which are calibration with weight and calibration without weight.

Calibration with weight: use a weight to calibrate the gain.

Calibration without weight: gain will not be calibrated. However, the gain is estimated through the sensitivity of the load cell.

Automatic calibration: calibration is done through intelligent sensor automatically.

➡ When calibration with weight is impracticable, calibration without weight should be adopted. If the load cell or instrument has been replaced or the weighing system has been altered, calibration should be re-done.

Steps for calibration

1. Enter the display parameters (category 2) and set the decimal point position and unit as needed.
   (This step is to ensure the correct decimal point position for the parameters of cAP and Fr in the following steps)
2. Enter the calibration parameters through the shortcut buttons as described in 6.1, and the symbol cAn (cAm) of the first parameter in Parameter Category 6 (Calibration Parameters) will be displayed.
3. Select this parameter (cAm) to set the calibration mode: calibration with or without weight. Then press SET to save the setting.
4. **Set the scale interval and maximum measuring range:**
   Press SET until the symbol of Fd (Fd, display scale interval) is displayed. Enter this parameter and select the minimum display scale interval 1(or 2, 5, 10, 20, 50). Then press SET to save the selection.
5. When the above parameter setting has been saved, the next symbol of parameter "maximum measuring range Fr (Fr) will be displayed. Press DISP to enter this parameter, and set its value to the maximum weighing range of the current load cell. Then press SET to save the value.
   (★ Note: The display resolution for this device is 1/100000, so the maximum measuring range Fr≤Fd×100000)
   Then the first parameter (cAn (cAm)) in category 6 will be displayed.
   Note 1: If the display range of the device is within Fr, settings for parameter Fr (step 5) can be skipped.
   Note 2: The factory setting of parameter Fd is 1. Settings for parameter Fd (step 4) are usually not required unless in exceptional circumstance.
   For different calibration methods, the next parameter to be set is also different.
   The details of calibration steps for calibration with and without weight will be illustrated in the following part.
   Example: Range of the load cell is between 0 and 10000kg and sensitivity is 2.00010 mV/V

Calibration with weight(Following Step 5)

6. **Conduct zero point calibration first:**
   When the previous parameter setting has been saved, the symbol of next parameter cA0 (cA0, mV value for zero-point calibration) will be displayed. Press DISP to enter this parameter, and the device will display the real-time mV (which is refreshing constantly).
7. Empty the weighing platform. When the display is stable, press SET to save the mV value for zero point.
   (If the display is instable, MOT indicator will be on; after it becomes stable, the indicator will go off)
8. **Conduct gain calibration:**
   Press DISP to enter parameter cAF (cAF), and the device will display the real-time mV (which is refreshing constantly). Put an 8000kg weight (approximately 80% of the upper measuring range Fr(Fr). When the display becomes stable, press SET to save the mV value for gain calibration.
9. **Set the value of the weight used for gain calibration:**
   When the previous parameter setting has been saved, the symbol of next parameter cAP (cAP, value of weight for gain calibration) will be displayed. Press DISP to enter this parameter, and change its value to the weight used for gain calibration. Press SET to save the parameter.

Calibration without weight(Following Step 5)

6. **Input the sensitivity value of load cell:**
   When the previous parameter setting has been saved, the symbol of next parameter mvv (mvv) will be displayed. Press DISP to enter this parameter, and change its value to the nominal value 2.00010 mV/V. Press SET to save the parameter.
7. **Conduct zero point calibration:**
   When the previous parameter setting has been saved, the symbol of next parameter cA0 (cA0, mV value for zero-point calibration) will be displayed. Press DISP to enter this parameter, and the device will display the real-time mV (which is refreshing constantly).
8. Empty the weighing platform. When the display is stable, press SET to save the mV value for zero point.
   (If the display is instable, MOT indicator will be on; after it becomes stable, the indicator will go off)

   Set the value of the weight used for gain calibration:
9. When the previous parameter setting has been saved, the symbol of next parameter cAP (cAP, value of weight for gain calibration) will be displayed. Press DISP to enter this parameter, and change its value to the maximum range of the load cell. Press SET to save the parameter.
10. When the previous parameter setting has been saved, the symbol of next parameter inA (inA, zero point correction value) will be displayed. Press DISP to skip parameter inA (inA) and FL (Fi). These two parameters don't need to be edited in calibration. Only when there is error in actual measurement, these two parameters will be modified for secondary correction.

How to check the effectiveness of calibration without weight: put an 800kg object on the weighing platform; if the measured value is 800kg, which means no further correction is needed. If the measured value is 801kg, full range correction value 0.9987 (Fi) should be set to 800/80c1=0.99875.

■ 6.3.2 Additional information for calibration

➡ displayed mV value:

During calibration, the displayed mV value of cA0 (cA0) and cAP (cAP) is the actual measured value of load cell. This value is used to check whether the load cell works properly, test the

positioning error in the force transfer structure and linearity of the load cell:

◆ check whether the load cell works properly:

If the mV value changes with the weight, it means the load cell is properly connected and the force transfer structure works correctly;

If the mV value is oL (or -oL), it means ADC overflows, indicating the force on the load cell is too bigger (or smaller). After reducing (or increasing) the weight, if it still displays oL (or -oL), check:

a) whether there is fault in the force transfer structure

b) whether the connection of load cell is appropriate

c) whether the load cell has been damaged; if so, it needs a replacement

◆ Test the positioning error in the force transfer structure:

Put the load at four corners of the weighing platform (or weighing hopper) respectively and record the corresponding mV values. If there is significant difference between these values, adjust the force transfer structure.

7. FUNCTIONS & PARAMETERS

7.1 Display settings

Display related parameters are listed in parameter category 2.

■ 7.1.1 Display content and decimal point position

◆ dS2 (dS2) —— content for the second display

Parameter value	source	Parameter value	source
0	out 1	6	vALL (valley value)
1	out2	7	P-v (peak-to-valley value)
2	Au 1	8	Pu IS (switch between peak and valley value once a second)
3	Au2	9	tP (tP)
4	nEt (net weight)	10	tu (tv)
5	PEAK (peak value)		

◆ Ind (ind) —— decimal point position for displayed value

Parameter value	Decimal point position	Parameter value	Decimal point position	Parameter value	Decimal point position
0	00000.	2	000.00	4	0.0000
1	0000.0	3	00.000		

■ 7.1.2 zero tracking and nulling

➡ zero tracking: used to overcome zero drift of load cell.

If the measured value is always within the range of zero tracking for no less than 1 second, it will be set to 0.

➡ nulling: In the measuring mode, if the measured value is within the nulling range, press button **ZERO** (or through digital input) to set the displayed value to 0 (To perform nulling via digital input, the parameter of digital input function dCO(di0) should be set to Zro (Zro))

★ variation detection: If the variation in measured value within 1 second is larger than the threshold of variation detection, it is regarded that force is still changing. In this situation, zero tracking or nulling is not allowed.

◆ trd (tr-d) —— zero tracking range (unit: scale interval). When set to zero, zero tracking is disabled.

◆ trS (trS) —— zero tracking time (unit: second)

If zero tracking range is positive, the above parameters are used for zero tracking, which means if the weight is less than zero tracking range (tr-d) and remains stable within zero tracking time (trS), the weight will be set to zero.

If zero tracking range is negative, the above parameters are used for small signal cutoff. For example, when tr-d is set to -100 and trS to 1.0, if the measured value is always between -100 and 100 within 1.0 second, cutoff operation will be executed and the measured value will be cut to 0.

◆ Zor (Zor) —— nulling range (unit: proportion of the measuring range). It is usually set to a proportion of maximum measuring range of the device. If the absolute value of the measured value is always within the nulling range, by pressing button **ZERO** (or through external digital input), the displayed value will be set to zero. The settings of nulling function will not be held after power down.

If the the measured value is not within the nulling range, by pressing button ZERO (or through external digital input), the displayed value will not be set to zero, and ALr2 will be displayed, which means nulling is invalid.

If this parameter is set to 0, nulling is disabled.

If the parameter is set to -99~-1%, the actual nulling range will be -1*(-99~-1%). In this situation, nulling cannot be done through the button and ALr6 will be displayed. However, nulling can still be done through digital input or communication and is subject to the nulling range.

◆ not (not) —— threshold for variation detection (unit: scale interval). If the variation in the measured value within 1 second exceeds this parameter, nulling and zero tracking will not be allowed. If this parameter is set to 0, variation detection is disabled.

➡ Display scale interval: See【6. 】for details.

➡ Nulling is applicable to both the gross and net value.

➡ Zero-tracking is not applicable to net value.

■ 7.1.3 Filtering, display refresh rate and measuring speed

◆ FLt (FLt) —— time constant of the digital filter

Force measuring device is susceptible to random vibration due to its inherent frequency and the transmission of external vibration, which can cause instability in the displayed value. Therefore, based on the intensity of the vibration, a suitable digital filter is introduced to make the displayed value stable. 。

When the vibration is weak, a lower-order digital filter can be adopted; when the vibration is strong, a higher-order digital filter should be used.

The larger this parameter is, the more effective the filtering is, but consequently, its response time to the change of input signal will become longer. This parameter ranges between 1 and 20 with factory setting at 1.

$$\text{Measured value after filtering} = \text{Current Measured value} \times \frac{1}{\text{Time constant}} + \text{Previous Measured value} \times \left(1 - \frac{1}{\text{Time constant}}\right)$$

ArA (Arm) —— Moving averaging filter constant

Consecutive sampling values (number of samples: n) are used to form a series. The length of the series (n) is the value of this parameter.

When a new value is sampled, it will be placed at the end of the series while the first value of the series will be discarded (FIFO). The average value of this series will be used as the filtering output.

The advantage of moving averaging filter is its good performance in suppressing periodic interference and high evenness. The range of this parameter: 1~10 (factory setting: 1, disabled).

➡ (FLt) The device will perform moving averaging filtering (ArmA) first and then digital filtering (Fltr).

◆ Mot (Mot) —— Measurement correction threshold

◆ Mov (Mov) —— Measurement correction value

If measured value＜MotH, gross value= raw value before correction

If measured value≥MotH, gross value= raw value + Mov

◆ SPS (SPS) —— measuring rate selection,the sampling rate of ADC can be set to 15 or 120 samples/second (**for B6 series product**), or 15, 120, 240, 480, 960 or 1920 samples/second (**for B6F series product**)

◆ At (At) —— display refresh rate,This parameter defines the display refresh times within one second, which can be set to 10 times/s or 20 times/s (factory setting: 10 times/s).

➡ The device will perform moving averaging filtering (ArmA) first to overcome the influence of periodic vibration, and then digital filtering (Fltr) will be done to overcome the influence of abrupt noise. However, if the displayed value is still instable, the refresh rate (At) can be reduced to obtain a more stable display and the averaging operation can be done afterwards.

★ Peak, valley, and peak-to-valley values will not be displayed.

★ The frequency of alarm output is only subject to measuring speed (SPS), which is irrelevant to the display refresh rate.

■ 7.1.4 Peak/valley value

◆ mAt, mAb, mLt, mLb (mAt / mAb / mit / mib) —— peak/valley threshold and hysteresis

This device is able to retain the peak, valley and peak-to-valley values. Relevant parameters are as follows:

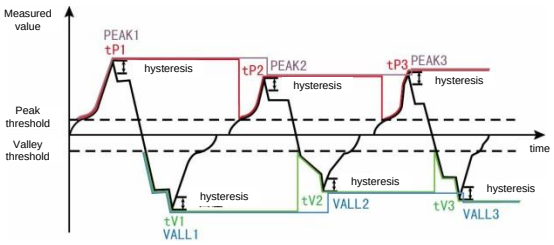
mAt (mAt) : peak threshold: when displayed value rises above mAt, peak detection will be activated.

mAb (mAb) : peak hysteresis: when the drop of displayed value is larger than mAb, peak detection will halt.

mLt (mit) : valley threshold: when displayed value drops below mint, valley detection will be activated.

mLb (mib) : valley hysteresis: when the increase in displayed value is bigger than minb, valley detection will halt.

📖 Detection process



1. As shown in the above figure, if measured value rises above peak threshold, peak detection will be activated; if the drop in the measured value is larger than peak hysteresis (B1=PEAK1- peak hysteresis), peak detection will be completed. Thus PEAK 1 is obtained.
2. When a peak value has been obtained, peak detection will only be activated again after the measured value drops below peak threshold and then rises above it again.

★ PEAKn and VALLn on the above figure are peak value and valley value respectively, and tPn and tVn are peak transition value and valley transition value.

★ Peak detection will not be activated if measured value is smaller than peak threshold.

★ When a peak value has been obtained, peak detection will only be activated after the measured value drops below peak threshold and then rises above it again. If a new peak value is obtained, it will overwrite the older peak value。

★ Valley detection is similar to peak detection, which will not be repeated here.

★ When peak hysteresis be set to negative, peak hysteresis is invalid. If measured value rises above peak threshold, peak detection will be activated; if measured value drops below peak threshold, peak detection will be completed.

Detection of the maximum and minimum value:

1. Set peak threshold (or valley threshold) to -19999 (or 99999), peak value (or valley value) is actually the maximum value (or minimum value), which will keep increasing (or decreasing). The result can only be cleared by resetting them or powering on the device again.

Clear the pea/valley value manually:

Press and hold **DISP** for 2 seconds, then peak/valley and their transition values will be cleared.

◆ Poc (Poc) —— data reset & peak/valley value reset. When it is set to OFF, automatic data reset, peak/valley value reset, and transition value reset at power-on will be disabled;

when set to ON, if measured value is within the nulling range, these values will be reset at power-on; when set to delay, the reset of above values will only happen until the condition has been met.

◆ dI0 (di0) —— digital input function

Digital input can be defined by user:

Parameter value	symbol	description
0	nonE (nonE)	Disabled
1	ZEro (ZEro)	When digital input is active, reset data, peak/valley value and peak/valley transition value; in measuring mode, when the measured value is within the nulling range, displayed value, peak/valley value and peak/valley transition value will be reset
2	tArE (tArE)	Taring: in the measuring mode, taring function can be used at any time
3	ALrm (ALrm)	Enable alarm output: when it is enabled, only if the digital input is active, the real-time comparing result will be used as the output, otherwise the current status of alarm output will be locked. ★ when it is disabled, the unit indication LED will blink.
4	HoLd (HOLD)	Lock display: in the measuring mode, it can be used to lock the current state of display
5	cLPu (cLPu)	Peak/valley value and transition value can be reset when the digital input is active.
6	cLPun (cLPun)	Peak/valley value and transition value can be reset when the digital input is deactivated.
7	ZEron (ZEron)	In the measuring mode, if the measured value is within the nulling range, displayed value, peak/valley value and transition value can be reset when the digital input is deactivated.
8	ZEroc (ZEroc)	In the measuring mode, if the measured value is within the nulling range, displayed value, peak/valley value and transition value will be reset as long as the digital input is active.
9	ZErod (ZErod)	In the measuring mode, when the digital input has been activated, displayed value, peak/valley value and transition value will only be reset after the nulling conditions are met.
10	ZEroE (ZEroE)	In the measuring mode, when the digital input has been deactivated, displayed value, peak/valley value and transition value will only be reset after the nulling conditions are met.

🕮 Nulling and Taring

In the measuring mode, press button **TARE** (or through digital input) to achieve taring and press **ZERO** (or through digital input) to set gross weight to zero;

Net weight＝gross weight－tare weight

➧ Difference between nulling and taring:

Nulling: used to set the displayed value to zero when the zero point of the device has shifted.

Nulling is subject to the nulling range (only when displayed value is within this range)

Nulling data is volatile after power down.

Taring: gross weight and net weight should be both taken into account. Taring can be executed at any time, and isn't subject to any restrictions.

Taring data is volatile after power down.

🕮 Hold time for an effective digital input

➧ Hold time for an effective digital input:

When the digital input changed from invalid to valid, it has to hold for at least 5ms before it is regarded as an valid input, otherwise, it is regarded as invalid.

7.2 Alarm Output

Relevant parameters are listed in Parameter Category 1 (except oA1, which is among category 2).

For devices with the function of communication, if ctrl (external control of alarm output) is set to on, alarm output will be irrelevant to measured value.

Alarm output refers to the responses from device's indicator and the output signal when the measured value exceeds the range of set value.

Each alarm output can have its own independent alarm type, set value, hysteresis, delay, deviation and alarm source.

◆ ALS1 ~ ALS2 (ALS1~ ALS2) —— alarm source options

Parameter value	symbol	source
0	GroSS (GroSS)	GROSS weight
1	nEt (nEt)	NET weight
2	PEAK (PEAK)	PEAK value
3	vALL (vALL)	VALLEY value
4	P-v (P-v)	Peak-to-Valley value
5	tP (tP)	Peak transition value
6	tv (tv)	Valley transition value
7	diSP (diSP)	Displayed value

◆ ALo1 ~ ALo2 (ALo1~ ALo2) —— alarm type selection

value	symbols	mode	Output active condition
0	-HH- (HH)	upper limit alarm	weight value ＞ out
1	-LL- (LL)	lower limit alarm	weight value ≤ out
2	-AA- (AA)	deviation upper limit alarm	(weight value－Au) ＞ out
3	-bb- (BB)	deviation lower limit alarm	(weight value－Au) ≤ out
4	HLPS (HLPS)	absolute deviation upper limit alarm	| weight value－Au |＞ out
5	n-HL (n-HL)	absolute deviation lower limit alarm	| weight value－Au |≤ out
6	-EE- (EE)	Upper limit alarm under armed state	
7	-FF- (FF)	Lower limit alarm under armed state	
8	-qq- (QQ)	Upper limit deviation alarm under armed state	
9	-rr- (RR)	Lower limit deviation alarm under armed state	
10	-oL- (oL)	Input disconnection or abnormal measurement	If Line Break, measurement overflow or AD exception conditions are met, the output is closed. Otherwise output disconnect
11	oLEr (oLEr)		If the Line Break, measurement overflow or AD exception condition is met, the output is disconnected. Otherwise output closed

Note 1: When the alarm mode of -oL- or oLEr is selected, the instrument will automatically not display irrelevant parameters;

Note 2: When the oLEr alarm mode is selected, the instrument will automatically set inv to on and not display. If the alarm mode is adjusted to other ways again, the parameter inv needs to be reset to off

There are ten alarm types as listed in the table above, including 6 basic types and 4 standby types (when the alarm is activated by absolute deviation, the parameter of hysteresis will not be valid).

➧ Armed state: When powered on, if the value of the alarm source is within the output range, no alarm will be activated;

After the value of the alarm source is out of the output range, the armed state will be formed, and alarm will be activated if conditions are met.

◆ oUt1 ~oUt2 (oUt1~ oUt2) —— alarm threshold (set value)

◆ HYA1 ~ HYA2 (HYA1~ HYA2) —— alarm hysteresis

Alarm hysteresis is set to avoid the frequent action of the alarm relay caused by measured value's fluctuation around the alarm threshold

◆ dLy1 ~ dLy2 (dLy1~ dLy2) —— alarm delay (seconds)

Alarm delay is designed to prevent malfunction and protective interlocking caused by temporary signal instability associated output error, and the alarm delay of each alarm point can be set to 0 to 60 seconds. The alarm output will only be activated if the alarm signal has been valid for a time period of alarm delay. Alarm recovery is not subject to this function.

◆ Au1 ~ Au2 (Av1~ Av2) —— alarm deviation

◆ inv1 ~ inv2 (inv1~ inv2) —— alarm output inverse. When set to ON, alarm output is inversed; when set to off, alarm output inverse is invalid.

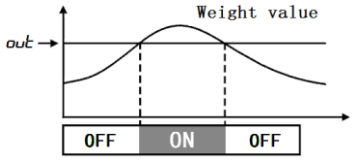
◆ oA1 (oA1) —— password setting for alarm output (see the settings of parameters in Category 2)

This parameter determines whether the parameters related to alarm output is allowed to be modified or not:

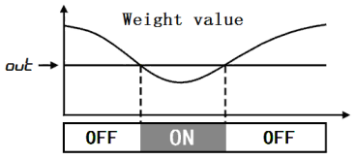
Value	Symbol	description
0	oFF	Modification not allowed
1	on	Modification allowed

Modification of parameters in Category 1 is only allowed when oA1 is set to on, otherwise "-oA1" will be displayed, which means modification quitted.

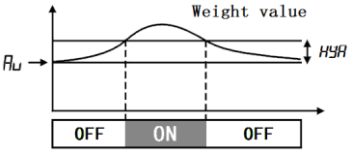
🕮 Upper limit alarm



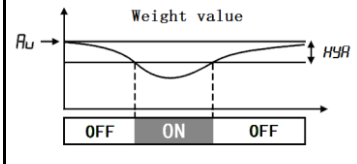
🕮 Lower limit alarm



🕮 Upper alarm with deviation

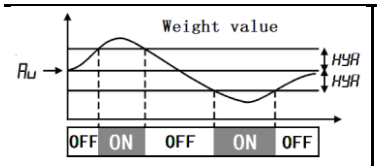


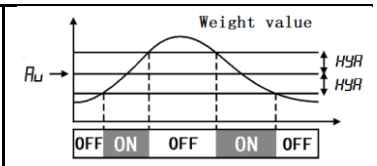
🕮 Lower alarm with deviation



🕮 Absolute upper limit alarm with deviation

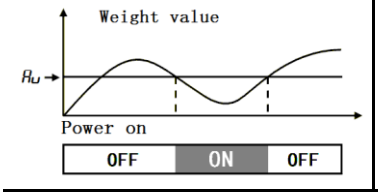
🕮 Absolute lower limit alarm with deviation





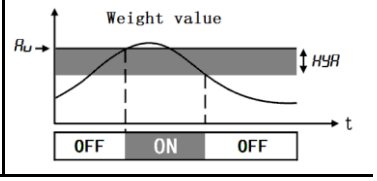
📖 Alarm under armed state

Illustrated with the lower limit alarm type



📖 Hysteresis

Illustrated with the upper limit alarm type



📖 Alarm output control through digital input

Digital input can be set to " Enable alarm output" (Alrm).

When digital input is closed, alarm output is enabled.

When digital input is open, alarm output is locked to current state until digital input is closed again (see details in【7.1.4】for the functions of digital input.

7.3 Analog output

This function is optional and relevant parameters are listed in Category 3.

Firstly, the output type of "analog output" is defined by the pre-ordered model (See Category -Specifications of Optional function-Analog output for details); furthermore, the output type is subject to the control of parameter **Aot**.

For device with communication functions, when **ctA** (analog output controlled externally) is set to on, analog output is not valid.

◆ **AoS** (AoS) —— analog output source

0:**GroSS** (GroSS): GROSS weight 1:**nEt** (nEt): NET weight
2:**PEAK**(PEAK): PEAK value 3:**uALL** (vALL): VALLEY value
4:**P-u**(P-v):Peak-Valley value 5:**tP** (tP): Peak transition value
6:**tu**(tv): Valley transition value 7:**diSP** (diSP): Displayed value

◆ **Aot** (Aot) —— signal type of analog output

0: **4-20mA**(4~20)mA 1:**0-10mA**: (0~10)mA 2: **0-20mA**: (0~20)mA
3: **1-5u**: (1~5)V 4:**0-5u**: (0~5)V 5: **Pn-u**(Pn-u): (±5)V or (±10)V

◆ **AtH、AtL** (AtH、AtL) —— upper and lower limit of analog output: H refers to the upper limit and L refers to the lower one.

➡ Signal type of analog output should be specified at the factory

Example: For analog output, weight ranges between 0 and 10000kg, which corresponds to 4-20mA or 0-5V

Symbol	Parameter	Settings for 4~20mA	Settings for 0-5V
30AoS	analog output source	GroSS weight	GroSS weight
31Aot	signal type of analog output	4-20	0-5u
32AtH	upper limit of analog output	10000	10000
33AtL	lower limit of analog output	0	0

7.4 Communication Interface

This function is optional. Relevant parameters are listed in Category 4.

◆ **Add** (Add) —— local communication address of the device, ranging from 1 to 255 (default: 1)

◆ **bAu** (bAu) —— communication baud rate, ranging from 0 to 6 which represent 2.4 / 4.8 / 9.6 / 19.2 / 38.4 / 57.6 / 115.2 (Kbps) respectively.

◆ **oES** (oES) —— parity option (valid for Modbus only)

This parameter will only display when Modbus protocol is adopted

0: **n** no parity (None) 1: **odd** odd parity (Odd) 2: **EuEn** even parity (Even)

◆ **ctd** (ctd) —— alarm output controlled externally

When set to oFF, alarm output is controlled by the device.

When set to on, alarm output is controlled externally by communication commands from computer instead of the device itself.

◆ **ctA** (ctA) —— analog output controlled externally

When set to oFF, analog output is controlled by the device.

When set to on, analog output is controlled externally by communication commands from computer instead of the device itself.

◆ **Pro** (Pro) —— communication protocol selection

0: **tcASc** (TC ASCII) 1: **rtod** (Modbus-RTU)

◆ **dLY** (DLY) —— delay before the device sends the response to the controller (us). The response time of the device is very short, which might be too short for the controller (such as SCM) to receive the response. When this parameter is set to -1 and Modbus is adopted, the device will use the Modbus standard to adjust the response time; when this parameter is set to -2, this parameter is only applicable to RS232 interface in high-efficiency communication.

For active communication mode, this parameter is invalid.

◆ **Sto**（Sto）—— Stop bit selection

◆ **Act** (Act) —— active communication data source

value	Symbol	Description	value	Symbol	Description
0	nonE (nonE)	Standard communication mode: none active communication	5	P-u(P-v)	Active communication: sending peak-to-valley value
1	GroSS (GroSS)	Active communication: sending gross weight	6	tP(tP)	Active communication: sending peak transition value tP
2	nEt(nEt)	Active communication: sending net weight	7	tu(tv)	Active communication: sending valley transition value tv
3	PEAK (PEAK)	Active communication: sending peak value	8	diSP(diSP)	Active communication: sending displayed value DISP
4	uALL (vALL)	Active communication: sending valley value			

None active is the standard communication mode. In this mode, the device responds to each received command by sending corresponding data to the controller.

If the device is required to send data to the controller actively (not responding to the received command), the value of parameter **Act**(Act) should be set between 1 and 8.

➡ The device will stop responding to the received command once it has been set to the active communication mode. To allow the device to respond to the received command again, parameter **Act**(Act) should be set to **nonE**(nonE) first. The baud rate for active communication should be no less than 9600bps, otherwise error will occur (displaying Err)

➡ The frequency of active data sending is the same as the measuring speed of the device. Active communication is not applicable when using Modbus protocol.

➡ The details of communication commands will be presented in Part 8 of this Manual.

7.5 Linearization

Relevant parameters are listed in Category 5.

If the displayed value increases monotonically with input signal in a non-linear pattern and the relationship between them cannot be ascertained when placing the order, linearization function of the device can be used for this correction.

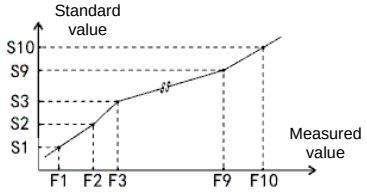
Monotonic increase refers to the displayed value always increases with the input signal in the full input signal range.

◆ **FnU** (FnU) —— number of linearization points. The value of this parameter determines the number of parameter sets available for users to configure. Its default value is 0, which means linearization is disabled.

◆ **FnV** (FmV) —— physical quantity selection (factory setting: OFF). When set to ON, linearization is done between input mv and displayed value.

◆ **F1~F10** (F1~F10) —— Measured value of each point 01~10

◆ **S1~S10** (F1~F10) —— Standard value of each point 01~10c



For measured value that is smaller than 1 (F1), linearization will be done based on the slope rate between F1 and F2.

For measured value that is larger than 10 (F10), linearization will be done based on the slope rate between F9 and F10.

📖 Linearization

Procedures to perform linearization

- Linearization can only be done after unit conversion and calibration.
- The number of linearization points (FnU) of the channel which needs linearization should be set to 0 first (linearization is disabled).
- When input signal is imposed, increase the value of input signal and record the measured value and standard value of each point.
- Set the number of linearization points (FnU) to the number of actual points that need to be corrected, and set the measured value and standard value of each point.

➡ The number of linearization points should always be set to 3 or more, otherwise, linearization will not be conducted due to inadequate points.

7.6 Parameter Backup and Restore

Acp tEd and Relevant parameters are listed in Category 7.

Intelligent interface - the module can automatically read relevant parameters of intelligent sensor calibration through power on or parameter ACP, which is commonly used in batch calibration module.

★ When TS function is selected, the module only has intelligent module interface,intelligent sensor not included。

★Intelligent sensor needs to write the parameters through the PC or module before it used。

➡ **AcP**（AcP）——Read or store calibration parameters on the intelligent module, this parameter is only visible when **cAn** is set to auto.

➡ **tEd**（tEd）——communication mode for intelligent module. When set to ON, TEDS mode is enabled; when set to OFF, TC-ASCII mode is enabled

★ Communication mode of intelligent module is standard TEDS mode。

1. In TEDS mode, "-TEDS-" will be displayed for 1 second while initializing the intelligent load cell after power on, otherwise, it will display "----" for 1 second.
2. TEDS 1.00 specification is supported, but earlier version is not supported.
3. Bridge type load cell TEDS ID=33 is supported. However, ID=40, 41 or 42 calibration is not supported.
4. If the load cell doesn't have self-defined parameters, the maximum measuring range will be displayed according to the settings of current decimal point position. Change in the settings of

current decimal point position needs power on again to take effect.

➡ Steps for parameter backup:

5. Enter the parameters in category 7 through password 2027;

6. Press the button and select **SAv** (SAv), and switch it to on. Press **SET** to confirm.

7. Once parameter backup has been started, "----" will be displayed. When the backup process has completed, "**oK**" (ok) will be displayed and the process will be quitted automatically.

★★ Please do NOT touch any button and cut the power off during parameter backup.

➡ Parameter restore is similar to parameter backup, selecting **LoA** (LoA) and **dEF** (dEF) to start the restore process.

7.7 Broken line recognition

◆ **burn**（burn）—— Sensor break threshold，You can choose the normal sensor automatic judgment (FrEE) or the fixed sensor to judge the resistance value, that is, when the impedance of the measured input exceeds the set resistance, the sensor input is considered disconnected

◆ **burnc**（burnc）—— View the current detection code corresponding to the impedance of the current connected sensor。

7.8 About the Display

➡ In normal measuring mode, display the value.

➡ If the measured value is abnormal:

ADC over flow caused by the over range of input signal:

For positive/negative overflow, display **oL**/**—oL**

When the value to be displayed is larger than 1.05 times of the maximum range **Fr**(Fr): display **oL**

Input the display when the line is broken:

When signal + or signal - is disconnected, the measured data shows **oL**.

When the excitation + or excitation - is disconnected, the measured data shows **oL-E** / **oL** / **-oL**

➡ For errors occur during the setting process, error message will only disappear after calibration:

- "**Err**" : Calibrated parameter is out of the range or the gain is too low

➡ For errors occuring during the measuring process, error message will only disappear after calibration:

- "**Err2**": CAF in gain calibration ≤ CA0 in zero calibration

➡ For warnings appearing during the measuring process, warning will disappear in 3 seconds or press any key to remove the message:

- "**ALr 1**" : when performing nulling operation, the current weight is instable, and ALr1 will be displayed, which means nulling operation is unsuccessful. The warning will disappear when the measured value is stable.
- "**ALr2**" : when performing nulling operation, the current weight exceeds the nulling range, instable, and ALr1 will be displayed, which means nulling operation is unsuccessful.
- "**ALr3**" : The maximum measuring range (Fr) is not properly set ((Fr/Fd)＜100 or (Fr/Fd)＞200000)
- "**ALr4**" : the gain is too low, which leads to instable display or significant error. The warning will only disappear after calibration.

  ALr4 warnings are often caused by:

  Low sensitivity of the load cell, or low proportion of Fr to the rated load of load cell, which leads to a very low mV output from the load cell.
- "**ALr5**" : The parameter "50FNU" is not 0 but also doesn't meet the requirements for linearization (at least 3 points are needed and the relation must be monotonic increase)
- "**ALr6**" : When the parameter "03Zero" is set to a negative value, if using the button to perform nulling operation, ALr6 will be displayed.

8. COMMUNICATION

IMPORTANT

- ◆ Multiple devices are allowed to connect to the RS485 network and the connection should be bus topology.
- ◆ The shielding layer of shielded twin-core cable is used as the ground in communication, which CANNOT be connected with the ground terminal used to protect the device. A 120Ω terminal resistance should be connected between 485+ and 485- at each end of the communication trunk line in case the communication distance is very long or there is significant interference.
- ◆ When more than one device is connected to one computer, a bus topology will be formed consequently. It must be noted that terminal resistance should be connected as close as possible to both ends of the communication trunk line to reduce the interference.
- ◆ A trunk module should be adopted when the communication distance is very long.
- ◆ Both TC ASCII and Modbus-RTU protocols are supported by the device, which should be specified when placing the order.
- ◆ Once the device has entered the configuration mode through buttons, it will no long respond to communication commands, which is to prevent the edited parameter values from being transmitted to the upper controller.
- ◆ Every device connected to the same computer should have its own unique address.
- ◆ When baud rate needs to be changed, please make sure that all the devices and the computer, which the devices are connected to, have the same baud rate.

8.1 TC ASCII Protocol

■ 8.1.1 About command set

- Command format:

  『delimiter』『address』『content』『coefficient』『data』『checksum』『terminator』

  Delimiter: :each command starts with a delimiter, which could be ＃, ＄, %, &, ' or "

  Address: it follows the delimiter and has 2 bits which are used to specify the destination address (denoted by "AA")

  Content: : it is used to specify the address of device channel or parameter (denoted by "BB")

  Coefficient: it is used to specify command related constant (denoted by "DD")

  Data: :it is only used to set up the data for command parameters (denoted by "data")

  Checksum: : :checksum are usually in 2 bits (denoted by "CC")

  Terminator: each command should end with a carriage return (↵) 0DH
- Command set:

  #AACC↵ read GROSS weight

  #AABBCC↵ read other measured value

  #AA0001CC↵ read analog output (retransmitted analog output)

  #AA0002CC↵ read the status of digital input

  #AA0003CC↵ read the status of digital output (alarm output)

  'AABBCC↵ or 'AA@@BBBBCC↵ read parameter symbol (name)

  $AABBCC↵ or $'AA@@BBBBCC↵ read parameter value

  %AABB(data)CC↵ or %AA@@BBBBCC↵ set parameter value

  %AA@@2302+000000CC↵ clear measured value and peak/valley values

  %AA@@2304+000000CC↵ clear peak/valley transition values

  &AA(data)CC↵ export analog value

  &AABBDDCC↵ export digital value

  ➡ "CC" in the above commands represents a 2-bit checksum. See【8.1.2】for details.
- Device response:

  ➡ three types of response delimiter: =、!、>

  For commands with # as the delimiter, the response delimiter is **=**;

  For commands with **'**, **$**, or **%** as the delimiter, the response delimiter is **!**;

  For commands with **&** as the delimiter, the response delimiter is **>.**

  ➡ the device will not respond to the following commands:

  ①. invalid delimiter or terminator ②. invalid device address

  ③. invalid baud rate ④. invalid checksum

  ➡the device will send "?AA" as the response in the following situations:

  ①. invalid command length ②. invalid data format in the command

  ③. operation not supported by device ④. try to obtain or set unspecified parameter

  ⑤. execute output command while **ctd** and **ctA** are set to oFF

■ 8.1.2 checksum

- Function:

  used to verify the command transmitted from computer to device or the response from device to computer.

  2 extra bits are added to the command and response as checksum, which will not change the baud rate.
- Setting:

  No extra settings are required to enable or disable checksum, as the device is able to automatically detect whether the command sent by the computer contains checksum.

  If the command contains checksum, a 2-bit checksum will be added to the response from the device, which allows the computer to introduce checksum to some specific devices in the network or add checksum to some specific commands.
- Format：

  Checksum ranges between 00~FFH, represented by 2 ASCII codes between 40H and 4FH.

  Checksum is before the terminator (↵) of the command or response.

  The device will not respond to the command with incorrect checksum.
- Calculation:

  Command checksum is derived by calculating the ASCII sum of all characters of the command. If the sum is out of the checksum range, keep the remainder as the checksum.

  Response checksum is derived by calculating the ASCII sum of all characters of the response and device address. If the sum is out of the checksum range, keep the remainder as the checksum.

Example: How to calculate checksum.

Command: ＃0102NF↵

Response: =＋123.5A@C↵

Command checksum is calculated as follows:

Checksum =23H＋30H＋31H＋30H＋32H＝E6H

The ASCII codes of ＃, 0, 1, 0 and 2 are 23H, 30H, 31H, 30H and 32H respectively, the sum of which is E6H. It is represented by two ASCII codes between 40 and 4FH, which are 4EH and 46H respectively, i.e. N and F.

Response checksum is calculated as follows (device address (Ad) is assumed to be 1):

Checksum= 3DH＋2BH＋31H＋32H＋33H＋2EH＋35H＋41H＋30H＋31H＝203H

The ASCII codes of =, ＋, 1, 2, 3, ●, 5 and A are 3DH, 2BH, 31H, 32H, 33H, 2EH, 35H and 41H respectively. The sum of these ASCII codes and the ASCII codes of device address (30H and 31H) is 203H. The remainder of this sum is 03H, represented by two ASCII codes 40H and 43H between 40H and 4FH, which are @ and C.

➡ A in the response string represents alarm status. See [8.1.3] for details.

■ 8.1.3 Command for reading GROSS weight

- Description: this command is used to read measured value and alarm status of a specific device
- Command:#AA↵

  # is the delimiter

  (between 00 and 99) is a 2-digit decimal number that defines device address.

  ↵ (0DH) is the terminator
- Response: = (data)↵

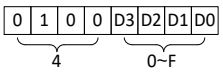
  = is the delimiter

  "data" is the main measured value (GROSS weight) and alarm status

  Gross weight consists of 9 bits, which represent for "+" or " —", decimal point, a 6-bit measured value, and alarm status.

The range for the data of alarm status is between 40 and 4FH, with its 2 LSBs (D0 and D1) related to the status of alarm 1 and alarm 2 (Note ★)

"1" means alarm is active.
"0" means alarm is not active.



↵ (0DH) is the terminator

★ Note 1: It should be noted that alarm 1 and 2 mentioned in the above alarm byte are not the corresponding ones in the device. Actually, they refer to the alarm outputs where data are to be read, which are determined by the activation signal source of each alarm.
For example, if GROSS weight is set as the activation signal source of alarm 2 (other alarm output is not related to GROSS weight), then D1 in the obtained alarm status will represent the status of alarm 2.

Example: This command is used to obtain the main measured value (GROSS weight) of the device with address at 01:
Command: #01↵
Response: =+01234.5A↵
The response indicates that the measured value is +1234.5↵ and alarm 1 determined by this value is activated.

■ 8.1.4 command for reading other measured values

- Description: this command is used to obtain the measured values and alarm status of a specified device.
- Command: #AABB↵
  # is the delimiter
  AA (between 00 and 99) is a 2-digit decimal number that defines device address.
  BB (between 00 and 07) represents the type of measured value to be read.

value	data source	value	data source
00	GROSS weight	04	Peak-to-valley(P-V)
01	NET weight	05	Peak transition value (tP)
02	PEAK value	06	Valley transition value (tV)
03	VALLEY value (VALL)	07	Displayed value (DISP)

  ↵（0DH）is the terminator
- Reponse: = (data)↵
  = is the delimiter
  "data" represents the measured value to be read and alarm status.
  "data" consists of 9 bits, which represent for "+" or " －", decimal point, a 5-bit measured value, and alarm status.
  The range for the data of alarm status is between 40H and 4FH, with its 2 LSBs (D0 and D1) related to the status of alarm 1 and alarm 2.

  ↵（0DH）is the terminator

Example: This command is used to obtain NET weight of the device with address at 01:
Command: #0101↵
Response: =+01234.5B↵
The response indicates that the measured value is +1234.5↵ and alarm 2 determined by this value is activated.

■ 8.1.5 command for exporting analog output, digital input and output

- Description: this command is used to read the current analog output, digital input and output. If the function is not available in the device, the obtained data are invalid.
- Command: #AABBDD↵
  # is the delimiter.
  AA (between 00 and 99) is a 2-digit decimal number that defines device address.
  The range of BB is defined by DD.
  DD (between 01 and 03) specifies the content to be obtained.
  DD = 01: read the current analogy output (retransmitted output);
  DD = 02: read the current digital input;
  DD = 03: read the current digital output (alarm output)
  ↵(0DH) is the terminator.
- Response: = data↵
  = is the delimiter
  ① when DD in the command is 01, BB will be 00, representing the only analog output.
  "data" represents the value of current analog output, which is given in percentage, between -6.3% and +106.3%. It consists of 6 bits, which represent for "+" or " －", decimal point, and a 4-bit analog value.
  ② when DD in the command is 02, BB will be 00.
  "data" represents current digital input, which consists of two characters between 40H and 4FH, representing for the status of one digital input.
  D0 of the first character represents the status of the digital input. "1" means active.
  ③ when DD in the command is 03, BB will be 00 or 01.
  "data" indicates the current status of digital output, which consists of two characters between 40H and 4FH, representing for the status of two digital outputs.
  The two LSBs (D0~D1) of the first character indicate the status of the digital output points 1 and 2. "1" means active.
  ↵(0DH) is the terminator

Example: This command is used to obtain the current analog output of the device with address at 01：
Command: #010001↵
Response: =+053.2↵
This response indicates that the output value is +53.2%.

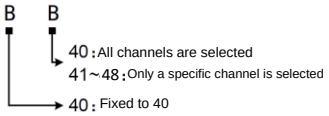
■ 8.1.6 command for exporting analog output

- Description: this command is only available for devices with analog output, which sends a value to a specific device. As soon as the device has received the value, it converts the value into an analog output.
  Note: Relevant parameters should be set first to ensure that analog output is controlled externally by the commands from computer instead of the device itself.
- Command: &AA(data)↵
  & is the delimiter.
  AA (between 00 and 99) is a 2-digit decimal number that defines device address.
  "data" is the value of output, consisting of 5 bits, which represent for "+" or " －", and a 4-bit analog value. The value is given in percentage, between -6.3% and +106.3% (maintain one digit after the decimal point). The absolute value of the output is defined by the device.
  ↵ (0DH) is the terminator.
- Response: >AA↵
  > is the delimiter
  AA is a 2-digit decimal number that defines device address.
  ↵ (0DH) is the terminator

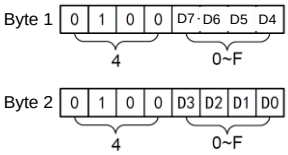
Example: Command: &01＋0500↵
Response: >01↵
This command sends a value of 50% to the device with address at 01. If the output range of the device is 4-20mA, the device will output 12mA (4mA＋0.50×16mA＝12mA).
The response signifies that the analog value has been successfully exported

■ 8.1.7 command for reading digital output

- Description: This command is only available for devices with digital output, which can be applied to one or all output channels.
  Note: Relevant parameters should be set first to ensure that digital output is controlled externally by the commands from computer instead of the device itself.
- Command: &AABBDD↵
  & is the delimiter
  AA (between 00 and 99) is a 2-digit decimal number that defines device address.
  BB is used to define one channel or all channels.



  When all channels are selected, DD consists of 2 ASCII codes (between 40H and 47H) which represent for the value of output;



  DD can only be 40H, 40H (the channel is OFF) or 40H, 41H (the channel is ON) when one single channel is selected.
  ↵ (0DH) is the terminator
- Response: >AA↵
  > is the delimiter
  AA is a 2-digit decimal number that defines device address
  ↵(0DH) is the terminator

■ 8.1.8 Command for reading parameter symbols

- Description: This command is used to obtain the value of specific device parameter.
- Command: 'AABB↵
  ' is the delimiter.
  AA (between 00 and 99) is a 2-digit decimal number that defines device address.
  BB (between 01H and 7EH) is used to define a 2-digit hexadecimal parameter address.
  See『5. 5. 』for details.
  ↵ (0DH) is the terminator.
- Response: ! AA ↵
  ! is the delimiter.
  "data" is the symbol of parameter, consisting of 4 characters
  ↵ (0DH) is the terminator.

■ 8.1.9 Command for reading parameters

- Description: This command is used to obtain the value of a specific device parameter.
- Command: $AABB↵
  $ is the delimiter.
  AA (between 00 and 99) is a 2-digit decimal number that defines device address.
  BB (between 01H and 6DH) is used to define a 2-digit hexadecimal parameter address.
  See 『5. 5. 』for details.
  ↵ (0DH) is the terminator.
- Response: ! (data) ↵
  ! is the delimiter.
  "data" is the value of parameter, consisting of 8 bits, which represent for "+" or " －", a decimal point, a 5-bit parameter value.
  ↵ (0DH) is the terminator.

➡ Device parameters are dependent on its functions. For the functions that are not included in the ordered device, parameters related to these functions are not accessible. For commands to obtain the values of these inaccessible parameters, the response will be ?AA↵.

Example: The following command is to read the set value for alarm point 1 of the device with address at 01. The address of the parameter is 03H.

Command: $0103↵
Response: !+0100.0↵
The response gives the value of the parameter, which is +0100.0

■ 8.1.10 Command for setting parameters

- Description: This command is used to set device parameters.
  In order to set parameters, oA (oA) must be set to the correct password first.
  When parameter setting has completed, password should be set to 0.
- Command: %AABB(data)↵
  % is the delimiter.
  AA (between 00 and 99) is a 2-digit decimal number that defines device address.
  BB (between 01H and 6DH) is used to define a 2-digit hexadecimal parameter address. See『5. 5. 』 for details.
  "data" is the value of parameter, consisting of 7 bits, which represent for "+" or " －", and a 5-bit parameter value (no decimal point).
  Decimal point is omitted with its position remaining unchanged. For example, numbers of 0.137, 1.37, 13.7 and 137 are all denoted by ＋0137.
  ↵ (0DH) is the terminator.
- Response: ! AA↵
  ! is the delimiter
  AA is a 2-digit decimal number that defines device address.
  ↵ (0DH) is the terminator.

■ 8.1.11 command for nulling and clearing peak/valley value

- Description: This command is used to reset measured value, peak/valley value.
- Command: %AA@@2302+00000↵ clear measured value and peak/valley value
  %AA@@2304+00000↵ clear peak/valley value
  % is the delimiter
  AA (between 00 and 99) is a 2-digit decimal number that defines device address.
  @@2302+00000 is the command to clear measured value and peak/valley value
  @@2304+00000 is the command to clear peak/valley value
  ↵（0DH）is the terminator
- Response: ! AA↵
  ! is the delimiter
  AA is a 2-digit decimal number that defines device address.
  ↵（0DH）is the terminator

8.2 MODBUS RTU Protocol

■ 8.2.1 RTU RTU transmission mode

- Data format: each byte consists of 1 start bit, 8 data bits, 1 parity check bit and 1 or 2 stop bit(s).
- ModbusRTU message framing:

Start	Address	Function code	Data	CRC check	End
≥3.5 bytes	8 bit	8 bit	N×8 bit	16 bit	≥3.5 bytes

■ 8.2.2 command sets

Modbus commands supported by this device are listed as follows:

Command name	Modbus Command type	Function code (hex)	Start address (hex)
Read GROSS weight	Read input registers	04H (or 03H)	0000H(or 8000H)
Read NET weight			0002H(or 8002H)
Read PEAK value			00004H(or 8004H)
Read VALLEY value			0006H(or 8006H)
Read peak-to-valley (P-V)			0008H(or 8008H)
Read peak transition value (tp)			000AH(or 800AH)
Read valley transition value (tv)			000CH(or 800CH)
Read displayed value (disp)			000EH(or 800EH)
Read status of digital input	Read discrete input	02H	0000H
Read status of digital output	read coils	01H	0000H
Read percentage of analog output	Read multiple holding registers	03H	4402H
Read parameters	Read multiple holding registers	03H	Address in『5. 』×2
Edit parameters	Write multiple holding registers	10H	
Set analog output	Write multiple holding registers	10H	4402H
Clear measured value and peak/valley value	Write multiple holding registers	10H	0A00/4604
Clear peak/valley value	Write multiple holding registers	10H	0A00/4608
Export single digital value	Write single coil	05H	
Export multiple digital values	Write multiple coils	0FH	

If function code is 03H, 04H or 10H, data in Modbus communication is a 32-bit floating point number (IEEE-754).

If function code is 05H, write FF00 to enable the coil output and 0000 to disable coil output.

■ 8.2.3 illustration of command usage: read measured value

- command:

AA	04	BBBB	0002	CCCC
Communication address	Function code	Start address	Number of registers	CRC check

BBBB: 0000/0002/0004/0006/0008/000A/000C/000E

- response:

AA	04	04	Data	CCCC
Communication address	Function code	Number of bytes of measured value	measured value	CRC check

Note: all the values in the above tables are hexadecimal.

Example: read the gross weight from the device with address at 01
Command: 01 04 0000 0002 71CB
Response: 01 04 04 42F6CCCD 5A9B
The response indicates that the gross weight from the device is 42F6CCCDH, i.e. 123.4.

■ 8.2.4 illustration of command usage: read the status of digital input

- command:

AA	02	BBBB	DDDD	CCCC
Communication address	Function code	Start address of digital value	Number of digital input points	CRC check

BBBB: 0000 DDDD: 0001

- response:

AA	02	01	Data	CCCC
Communication address	Function code	Number of bytes of digital value	Status of digital input	CRC check

Note: all the values in the above tables are hexadecimal.

■ 8.2.5 illustration of command usage: read the status of digital output

- command:

AA	01	BBBB	DDDD	CCCC
Communication address	Function code	Start address of digital value	Number of digital output points	CRC check

BBBB: 0000~0001 DDDD: 0001~0002

- response:

AA	01	01	Data	CCCC
Communication address	Function code	Number of bytes of digital value	Status of digital output	CRC check

Note: all the values in the above tables are hexadecimal.

■ 8.2.6 illustration of command usage: read parameter value/percentage of analog output

- command:

AA	03	BBBB	0002	CCCC
Communication address	Function code	Start address of parameter	Number of registers	CRC check

- response:

AA	03	04	Data	CCCC
Communication address	Function code	Number of bytes of measured value	Measured value	CRC check

Note: all the values in the above tables are hexadecimal. Command for reading the percentage of analog output is similar to the above one with a different start address.

■ 8.2.7 illustration of command usage: set parameter value

- command:

AA	10	BBBB	0002	04	Data	CCCC
Communication address	Function code	Start address of parameter	Number of registers to be set	Number of bytes of the parameter	Parameter value to be written	CRC check

- response:

AA	10	BBBB	0002	CCCC
Communication address	Function code	Start address of the parameter	Number of registers to be set	CRC check

➧ password should be set to 1111 (decimal) first before setting the parameters.

📖 restrictions on parameter writing (for TC ASCII and MODBUS-RTU protocol)

★Parameter writing can only be executed for 100,000 times. Thus attention should be paid to avoid frequent parameter writing in programming!

★ When setting the parameter values, ensure they are within the measuring range.

■ 8.2.8 illustration of command usage: data reset

- command:

AA	10	BBBB	0002	04	Data	CCCC
Communication address	Function code	Start address of the parameter	Number of registers to be set	Number of bytes of the parameter	Parameter value to be written	CRC check

When BBBB is 4604 (for clearing measured value and peak/valley value) or 4608 (for clearing peak/valley value), "Data" will be 00000000.

When BBBB is 0A00, if 'Data" is 450AE000, it means to clear measured value and peak/valley value, and if 'Data" is 45505000, it means to clear peak/valley value.

- response:

AA	10	BBBB	0002	CCCC
Communication address	Function code	Start address of the parameter	Number of registers to be set	CRC check

9. TROUBLESHOOTING

➧ For warnings and errors displayed during the operation, see【7. 】 for details.

➧ Troubles & Solutions::

- Problem: During calibration, mV value is flickering or doesn't change, or oL (display overflow) is displayed.

Solution: Check the connection of the load cell.

- Problem: Device restarts frequently.

  Solution: 1. Check whether load cell excitations (EXC+ and EXC-) are short-circuited (long-time short circuit could damage the device permanently).

  2. Check whether the load connected between EXC＋ and EXC－ is too big. If so, use a smaller load.

  3. Check whether the excitation output has been damaged through pin test. If there is fault, contact the factory to repair it.

10. SPECIFICATIONS

■ Basic Specifications

Specification		Rating/Condition
Power supply voltage	V0	100~240 V AC 50/60 Hz
	V1	10~24V AC 50/60 Hz; 10~24V DC
Power consumption	V0	<10W
	V1	AC: <6 VA; DC: <5W
Allowed power supply voltage		90%~110% of rated voltage
Insulation resistance		≥100MΩ (Based on 500V DC MEGA)
Insulation strength		2000V AC (Testing condition: 50/60Hz, 1 minute)
Anti-interference		IEC61000-4-2 (ESD), level III IEC61000-4-4 (Electrical fast transient burst), level III IEC61000-4-5 (surge), level III
IP rating		IP65 (front panel) (GB/T42-2008)
Ambient environment	Temperature	−30~60℃ (-25~65℃ for storage)
	Humidity	35~85 %R•H, no condensation
	Installation	Indoor, altitude＜2000m
Alarm output		2 points OC output, 100mA (MAX)

■ Input Specifications

Specification		Rating/Condition
Power supply for load cell	P1	DC 10V±2%, 200mA (MAX) Note: P2 is recommended for this instrument .
	P2	DC 5V±2%, 100mA (MAX)
Input impedance		＞10MΩ
ADC type		Sigma－Delta
Sampling & measuring rate		**15, 120，240, 480, 960, 1920 samples/s**
Nonlinearity		±0.05%F•S (at 15bps) (the higher the sampling rate, the lower this performance)
Span drift		＜ 10 ppm/℃ （proper terminals are required when connecting the load cell, otherwise the temperature-drift feature will deteriorate）
Display range		-19999~9999
Accuracy		1/100000
Input signal		Scale measurement, 4-wire load cell
Digital input		One external digital input, which can be used for nulling, taring and enabling alarm output

■ Specifications of Optional Functions

Specification		Rating/Condition	
Analog output	M1F	Current output (4~20)mA, (0~10)mA, (0~20)mA	Photoelectric isolation; Resolution: 1/12000; Load: Current output ＜ 600Ω Voltage output ＞ 10KΩ
	M2F	Voltage output (0~5)V, (1~5)V	
	M3F	Voltage output（0-10）V	
	M4F	Voltage output（±5）V	
	M5F	Voltage output（±10）V	
Communication interface	R1	RS232, Modbus-RTU and TC ASCII protocol	Photoelectric isolation; Response time: 500μS (tested)
	R2	RS485, Modbus-RTU and TC ASCII protocol	
Intelligent module	TS	Intelligent module	

11. Contact Us

(Subject to update; please always refer to the latest version)

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