

Precision pressure calibrator-CWY300

Operating Manual



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1 Product overview

The intelligent digital pressure calibrator (Model CWY300) is developed and manufactured by Shaanxi Creat Wit Technology Co., Ltd with independent intellectual property right. It is mainly used to calibrate pressure transmitters, pressure switches (controllers), the general pressure gauges, precise pressure gauges, blood pressures, or other pressure instruments, and it can also be widely used in the precise measurement of pressure.

It can be used with CWY automatic pressure calibrator as its external pressure module, communicate with TMMS2000 and automatically print calibration report.

Main component: sensor

2 Specification

- ◆ Pressure measuring range: -100kPa~60MPa; accuracy: 0.02, 0.05, 0.1, 0.2
- ◆ Current measuring range: (0~22)mA; accuracy: 0.02, 0.05
- ◆ Voltage measuring range: (0~5.5)V; accuracy: 0.05
- ◆ Resistance measuring range: (0~20)Ω, accuracy: 1
- ◆ 24V power transmitting: Max: 30mA.
- ◆ Functions: Calibrating pressure transmitters, pressure switches, pressure indicators.
- ◆ Memory function of calibration data: 28/56 files in total, 40pcs log/file, including current log: 20pcs, after adjustment log: 20pcs.
- ◆ Clock function.
- ◆ Pressure unit: kPa, psi, inHg, inH₂O, mmHg, mmH₂O, MPa, bar, mbar, atm, kg/cm², Pa. (According to the full range to judge which unit can be converted to display, because the display is not more than 5-digit)
- ◆ Pressure overload: When the pressure measurement value exceeds 110%FS, overpressure and alarm are displayed.
- ◆ Ambient condition: a. Ambient temperature (-5~50) °C; b. Relative humidity: < 95%; c. Atmospheric pressure: (86~105) kPa.
- ◆ Compensated temperature: (-5~50) °C (guarantee accuracy) .
- ◆ Storage temperature: (-30~80) °C;
- ◆ Display: LCD screen, white backlight, 5-digit display;
- ◆ Power supply: 3.7V/3500mAH Lithium battery.
- ◆ Auto power-off: Auto power-off occurs when no keyboard is pressed and pressure changes within 1 minute less than 1% of the range.
- ◆ Communication series port configuration:
Baud rate: 57600; Calibration bits: no; Data bits: 8 bits; Stop bits: 1 bit;

It can be used for CWY automatic pressure calibrator as its external pressure module and be connected

with TMMS2000 to print calibration report automatically.

- ◆ Dimension: head $\Phi 108\text{mm} \times 43\text{mm}$, total length: 170mm
- ◆ Weight: approx. 0.6kg
- ◆ Connection: M20 \times 1.5 (or user defined e.g. NPT); $\Phi 4\text{mm}$ Quick internal jack (differential pressure type)
- ◆ Power connection: $\phi 4$ standard banana plug.
- ◆ Additional function: temperature measurement: resolution is $\pm 0.1^\circ\text{C}$

3 Model selection

Gauge pressure range

Pressure range	Accuracy	Medium	Burst pressure
(-2.5~0) kPa	0.05	gas	3x
(0~2.5) kPa	0.05	gas	3x
(-3.5~0) kPa	0.05	gas	3x
(0~3.5) kPa	0.05	gas	3x
(-4~0) kPa	0.05	gas	3x
(0~4) kPa	0.05	gas	3x
(-6~0) kPa	0.05	gas	3x
(0~6) kPa	0.05	gas	3x
(-7~0) kPa	0.05	gas	3x
(0~7) kPa	0.05	gas	3x
(-10~0) kPa	0.05	gas	3x
(0~10) kPa	0.05	gas	3x
(-16~0) kPa	0.05	gas	3x
(0~16) kPa	0.05	gas	3x
(-25~0) kPa	0.05	gas	3x
(0~25) kPa	0.05	gas	3x
(-35~0) kPa	0.05	gas	3x
(0~35) kPa	0.05	gas	3x
(-40~0) kPa	0.05	gas	3x
(0~40) kPa	0.05	gas	3x
(-50~0) kPa	0.02 (0.05)	gas	3x
(0~50) kPa	0.02 (0.05)	gas	3x

Pressure range	Accuracy	Medium	Burst pressure
(-60~0) kPa	0.02 (0.05)	gas	3x
(0~60) kPa	0.02 (0.05)	gas	3x
(-70~0) kPa	0.02 (0.05)	gas	3x
(0~70) kPa	0.02 (0.05)	gas	3x
(-100~0) kPa	0.02 (0.05)	gas	3x
(0~100) kPa	0.02 (0.05)	gas	3x
(0~160) kPa	0.02 (0.05)	gas	3x
(0~200) kPa	0.02 (0.05)	gas	3x
(0~250) kPa	0.02 (0.05)	gas	3x
(0~350) kPa	0.02 (0.05)	gas	3x
(0~400) kPa	0.02 (0.05)	gas	3x
(0~600) kPa	0.02 (0.05)	gas	3x
(0~700) kPa	0.02 (0.05)	gas	3x
(0~1000) kPa	0.02 (0.05)	gas	3x
(0~1600) kPa	0.02 (0.05)	gas	3x
(0~2000) kPa	0.02 (0.05)	gas	3x
(0~2500) kPa	0.02 (0.05)	gas	3x
(0~3.5) MPa	0.02 (0.05)	gas /liquid	3x
(0~4) MPa	0.02 (0.05)	gas /liquid	2x
(0~6) MPa	0.02 (0.05)	gas /liquid	2x
(0~7) MPa	0.02 (0.05)	gas /liquid	2x
(0~10) MPa	0.02 (0.05)	gas /liquid	2x
(0~16) MPa	0.02 (0.05)	gas /liquid	2x
(0~20) MPa	0.02 (0.05)	gas /liquid	2x
(0~25) MPa	0.02 (0.05)	gas /liquid	2x
(0~35) MPa	0.02 (0.05)	gas /liquid	2x
(0~40) MPa	0.02 (0.05)	gas /liquid	1.5x
(0~60) MPa	0.02 (0.05)	gas /liquid	1.5x
(0~70) MPa	0.02 (0.05)	gas /liquid	1.1x

Compound pressure range

Pressure range	Accuracy	Medium	Burst pressure
±1kPa	0.05	gas	10x
±2kPa	0.05	gas	10x
±2.5kPa	0.05	gas	10x
±3.5kPa	0.05	gas	10x
±4kPa	0.05	gas	5x
±6kPa	0.05	gas	5x
±7kPa	0.05	gas	5x
±10kPa	0.05	gas	3x
±16kPa	0.05	gas	3x
±20kPa	0.05	gas	3x
±25kPa	0.05	gas	3x
±35kPa	0.02 (0.05)	gas	3x
±40kPa	0.02 (0.05)	gas	3x
±50kPa	0.02 (0.05)	gas	3x
±60kPa	0.02 (0.05)	gas	3x
±70kPa	0.02 (0.05)	gas	3x
±100kPa	0.02 (0.05)	gas	3x
(-100~160) kPa	0.02 (0.05)	gas	3x
(-100~200) kPa	0.02 (0.05)	gas	3x
(-100~250) kPa	0.02 (0.05)	gas	3x
(-100~350) kPa	0.02 (0.05)	gas	3x
(-100~400) kPa	0.02 (0.05)	gas	3x
(-100~600) kPa	0.02 (0.05)	gas	3x
(-100~700) kPa	0.02 (0.05)	gas	3x
(-100~900) kPa	0.02 (0.05)	gas	3x
(-100~1000) kPa	0.02 (0.05)	gas	2x
(-100~1600) kPa	0.02 (0.05)	gas	2x
(-100~2000) kPa	0.02 (0.05)	gas	2x
(-100~2500) kPa	0.02 (0.05)	gas	2x

Double-range

Pressure range	Accuracy	Medium	Burst pressure
±100kPa/±50kPa	0.02 (0.05)	gas	3x
-100kPa/-50kPa	0.02 (0.05)	gas	3x
100kPa/50kPa	0.02 (0.05)	gas	3x
160kPa/80kPa	0.02 (0.05)	gas	3x
200kPa/100kPa	0.02 (0.05)	gas	3x
250kPa/120kPa	0.02 (0.05)	gas	3x
350kPa/160kPa	0.02 (0.05)	gas	3x
400kPa/200kPa	0.02 (0.05)	gas	3x
600kPa/300kPa	0.02 (0.05)	gas	3x
700kPa/350kPa	0.02 (0.05)	gas	3x
1000kPa/500kPa	0.02 (0.05)	gas	3x
1600kPa/800kPa	0.02 (0.05)	gas	3x
2000kPa/1000kPa	0.02 (0.05)	gas	3x
2500kPa/1200kPa	0.02 (0.05)	gas	3x
3.5MPa/1.6MPa	0.02 (0.05)	gas/liquid	3x
4MPa/2MPa	0.02 (0.05)	gas/liquid	2x
6MPa/3MPa	0.02 (0.05)	gas/liquid	2x
7MPa/3.5MPa	0.02(0.05)	gas/liquid	2x
10MPa/4MPa	0.02(0.05)	gas/liquid	2x
16MPa/8MPa	0.02(0.05)	gas/liquid	2x
20MPa/10MPa	0.02(0.05)	gas/liquid	2x
25MPa/12MPa	0.02(0.05)	gas/liquid	2x
35MPa/16MPa	0.02(0.05)	gas/liquid	2x
40MPa/20MPa	0.02(0.05)	gas/liquid	1.5x
60MPa/30MPa	0.02(0.05)	gas/liquid	1.5x
70MPa/35MPa	0.02(0.05)	gas/liquid	1.1x

Differential pressure range

Pressure range	Accuracy	Medium	Burst pressure
±100Pa	0.5	gas	5x
±160Pa	0.5	gas	5x
±250Pa	0.2	gas	5x

Pressure range	Accuracy	Medium	Burst pressure
± 600Pa	0.1	gas	5x
± 1kPa	0.05	gas	5x
± 2kPa	0.05	gas	5x
± 2.5kPa	0.05	gas	5x
± 3.5kPa	0.05	gas	5x
± 4kPa	0.05	gas	5x
± 6kPa	0.05	gas	5x
± 7kPa	0.05	gas	5x
± 10kPa	0.05	gas	5x
± 16kPa	0.05	gas	3x
± 20kPa	0.05	gas	3x
± 25kPa	0.05	gas	3x
± 35kPa	0.02 (0.05)	gas	3x
± 40kPa	0.02 (0.05)	gas	3x
± 50kPa	0.02 (0.05)	gas	3x
± 60kPa	0.02 (0.05)	gas	2x
± 70kPa	0.02 (0.05)	gas	2x

Absolute pressure range

Pressure range	Accuracy	Medium	Burst pressure
(0~110) kPa.a	0.1	gas	3x
(0~160) kPa.a	0.05(0.1)	gas	3x
(0~200) kPa.a	0.05(0.1)	gas	3x
(0~250) kPa.a	0.05(0.1)	gas	3x
(0~350) kPa.a	0.05(0.1)	gas	3x
(0~400) kPa.a	0.05(0.1)	gas	3x
(0~600) kPa.a	0.05(0.1)	gas	3x
(0~700) kPa.a	0.05(0.1)	gas	3x
(0~1000) kPa.a	0.05(0.1)	gas	3x
(0~1600) kPa.a	0.05(0.1)	gas	3x
(0~2000) kPa.a	0.05(0.1)	gas	3x
(0~2500) kPa.a	0.05(0.1)	gas	3x



Pressure range	Accuracy	Medium	Burst pressure
(0~3.5) MPa.a	0.02(0.05)	gas/liquid	3x
(0~4) MPa.a	0.02(0.05)	gas/liquid	3x
(0~6) MPa.a	0.02(0.05)	gas/liquid	3x
(0~7) MPa.a	0.02(0.05)	gas/liquid	3x
(0~10) MPa.a	0.02(0.05)	gas/liquid	2x
(0~16) MPa.a	0.02(0.05)	gas/liquid	2x
(0~20) MPa.a	0.02(0.05)	gas/liquid	2x
(0~25) MPa.a	0.02(0.05)	gas/liquid	2x
(0~35) MPa.a	0.02(0.05)	gas/liquid	2x
(0~40) MPa.a	0.02(0.05)	gas/liquid	1.5x
(0~60) MPa.a	0.02(0.05)	gas/liquid	1.5x
(0~70) MPa.a	0.02(0.05)	gas/liquid	1.5x



Caution: It is forbidden to enter liquid, especially the high viscosity oil for gas medium calibrator, or it will affect return difference and accuracy.


4 Operating notice


- Installation should comply with the relevant provisions of electrical installations (except coal mines) in hazardous sites.
- Low power warning: if there is an automatic shutdown, please replace new battery; Replacement of the battery should be carried out in a well ventilated and free gas leak, and use the same type of battery.
- It is prohibited to connect RS232 communication in the explosive gas environment.
- Forbidden to change or remove any components and structures which may affect the safe explosion-proof, such as the electronic batteries and the related components.
- It should not be used for long period if overload, in order to avoid pressure sensor damage.
- In order not to damage CWY series mechanical part, don't apply torque between the shell and pressure connection.





5 Button description




“” Power on/off: Press  for 3 seconds to power on/off the calibrator; short press the button to turn on/ off backlight;


“” Calibration key: Long press “” to enter “calibration”, then correct pressure accuracy; under this status, short press the key to calibrate the pressure, current; In measuring status, short press to connect computer to transmit data.


“” 24V/HART : In current mode, short press 24V to switch 24V power supply and 24V is closed when starting up; Long press into the HART function, in the HART function, there are 24V output, long press the button to exit HART function.

“” confirm: In “calibration status”, short press the key to do calibration;

“” : Long press  button into the storage mode, in the storage mode, long press  to exit storage mode. In storage mode, reduce memory address and calibration point sequence; In "calibration status", press  to decrease the set value; In the modified state, the value is reduced by 1.


“” : In measuring mode, press  to switch units; in the storage mode, press  to increase memory address and calibration point sequence; In "calibration status", press the button to increase the set value; In the modified state, press the button to increase value by 1.

“” : Press this button to switch the display module (the pressure display mode and the basic parameter display mode);

“” : Press the key to clear the pressure data; in the modification state, press the key to change modification digits.

6 Basic function description

6.1 Startup/Shutdown

First, turn on the power switch of instrument back. Long press “” for 3 seconds to power on; In the state of power-on, long press it for 3 seconds to power off. The gauge will buzz when it powers on or off. Turn off the power switch of instrument back and cut off power if long term storage.

6.2 Wiring method

According to the different instruments, there are different wire connection modes.

For pressure gauge calibration, no wire is required.

For 4-wire current transmitter calibration, positive end of the transmitter is connected to the mA socket (yellow), and the negative end is connected with the 0V socket (black).

For 4-line voltage transmitter calibration, positive end of the transmitter is connected with the v-jack (green), and the negative end is connected with the 0V jack (black).

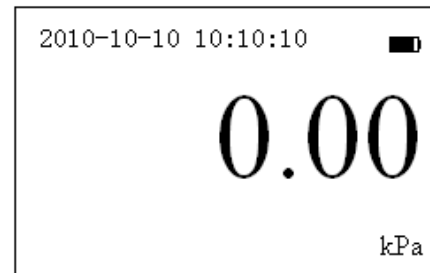
For 2-line voltage transmitter calibration, positive end of the transmitter is connected with 24V jack (red), and the negative end is connected with the mA jack (yellow).

For pressure switch calibration, one termination of the switch is connected with Ω jack (blue), the other termination is connected with 0V jack (black).

6.3 Pressure measurement

After startup, pressure measurement interface will be displayed as following picture:

- Date
- battery icon
- pressure measured value
- pressure unit
- Pressure measuring range (Double-range calibrator indicates pressure range only, others not)



6.4 Pressure clearance

Place the pressure connection toward air, press "ZERO" button to clear the measured values.

6.5 Pressure unit conversion

Press "UNIT" button to convert pressure units.


- ① Precision digital pressure gauges (<2.5MPa), units are converted in the following order: kPa, psi, inHg, inH₂O, mmHg, mmH₂O, MPa, bar, mbar, atm, kg/cm², Pa.
- ② Precision digital pressure gauges(>4MPa), units are converted in the following order: MPa, psi, inHg, inH₂O, mmHg, mmH₂O, kPa, bar, mbar, atm, kg/cm², Pa.

The conversion between units is as following table




1	kPa	1	7	MPa	0.001
2	psi	0.1450377	8	bar	0.01
3	inHg	0.2953	9	mbar	10
4	inH ₂ O	4.01463	10	atm	0.0098692
5	mmHg	7.50061	11	kgf/cm ²	0.010197
6	mmH ₂ O	102.047	12	Pa	1000

Notice: In order to ensure that under each optional unit, pressure measurement is not shortage or overflow of digits in length, different range gauges have different pressure unit configuration, not all pressure units.


6.6 Backlight


Press “” button to turn on/off the backlight. The backlight will turn on automatically when it is regarded as external module connected to CWY automatic pressure calibrator.


6.7 Time modification


Long press the “” key, the year of the single digit flashing, enter the time changing mode, press “” button to increase the year, if you want to reduce the year, press “” to reduce the year.

In the time modification mode, the function of the key is as follows:

“” Swift key: switch the modifying place between year, month and date;

“” Up key: increase year, month or date value;

“” Down key: decrease year, month or date value;

“” Confirm key: time modification finished and enter measurement function.

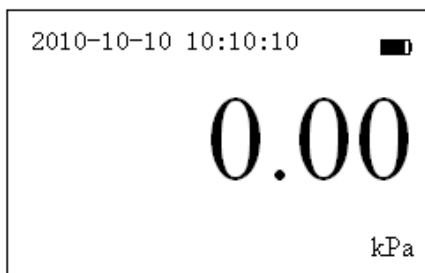
6.8 Operating mode

The instrument provides six modes for users, operating mode can be switched by pressing “”.

1) Pressure measuring mode

When CWY300 is used as a standard pressure gauge, this mode can be used to calibrate the pressure gauge. When it is connected with CWY1060 (automatic pressure calibrator), it will switch to measuring mode automatically if calibrator is under pressure gauge calibration mode.

Wiring: no



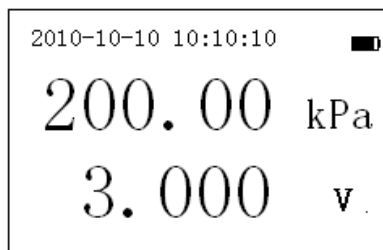
3) Current transmitter calibration mode

Under this mode, the standard pressure and current are displayed respectively, and no 24V power

2) Voltage transmitter calibration mode

The calibrator without HART function has this function. The voltage transmitter can be calibrated to display standard pressure and voltage.

Wiring: The voltage transmitter positive terminal is connected with the v-jack (green), and the negative terminal is connected with the 0V jack (black).

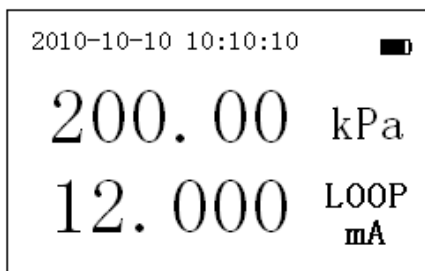
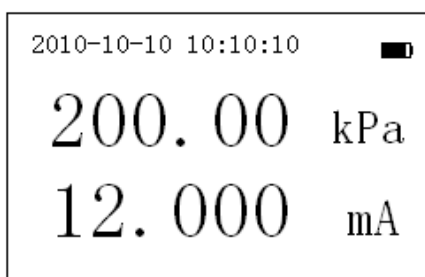


4) Pressure switch calibration mode

Under this mode, the screen displays standard pressure, operating value, resetting value and

supply is sent, if it is 4-wire current transmitter calibration. Connection: the positive terminal of the transmitter current is connected with the mA jack (yellow), and the negative terminal is connected with the 0V jack (black).

For 2-wire current transmitter, press the "24V" button to send the 24V power supply, and the screen switches to the LOOP mA mode. Wiring: voltage positive end of the transmitter should be connected to 24V jack (red), and the negative end to the mA jack (yellow).



5) Basic parameter display mode

It displays model, manufacturing number, manufacturing date, battery voltage.



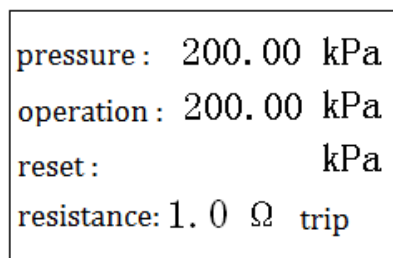
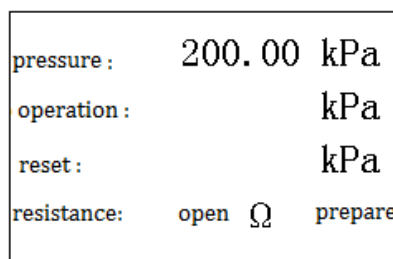
6.9 Pressure switch calibration

Under the pressure switch calibration mode, adjust the pressure controller to increase the pressure. If the pressure switch moves, the operating value, contact resistance will be displayed, and the "trip" will be also

resistance. When it is connected with CWY1060 (automatic pressure calibrator), it will switch to this mode automatically if calibrator is under pressure switch calibration mode.

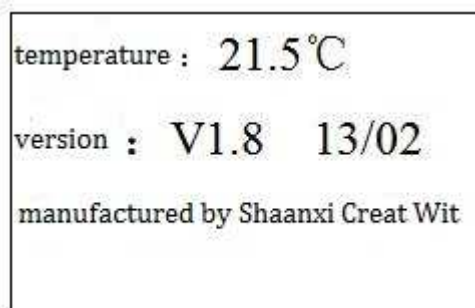
When the pressure switch moves and the resets, its value can be recorded and press "ENTER" to switch "prepare" to "trip".

Wiring: one terminal is connected with Ω jack(blue), the other terminal is connected with 0V jack(black).

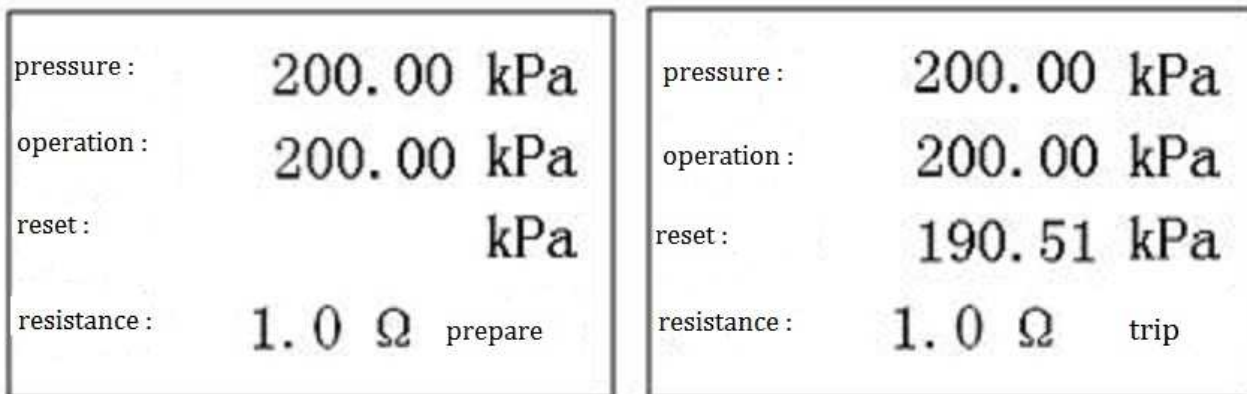


6) Ambient temperature display

Under this mode, it displays ambient temperature and software version, and then press "MODE" to enter measuring mode.



displayed. Then press the "ENTER" key, enter resetting values calibration, "ready" is displayed in the bottom right corner, adjust the pressure controller to decrease pressure, if the pressure switch moves, the calibrator will display operating value, resetting value, contact resistance, and "trip" is displayed in the bottom right corner. Now, press "ENTER", "Prepare" is shown in the bottom right corner, and then the pressure switch calibration is completed. If you want to recheck the pressure switch, start again and increase the pressure.



7 Usage as External Module of CWY Series Automatic Pressure Calibrator

The calibrator is installed on the left pressure connection of the automatic pressure calibrator (CWY1060), and the special communication line is connected with the external standard communication port on the left side of the calibration station. The calibrator will automatically start up and turn on backlight. The calibrator CWY300 will automatically shut down when the automatic pressure calibrator (CWY1060) is powered off.

1. When automatic pressure calibrator is in pressure gauge calibration status, it automatically switches to mode 1) pressure measuring mode.
2. When automatic pressure calibrator is in current transmitter calibration status, it automatically switches to mode 3) current transmitter calibration mode.
3. When automatic pressure calibrator is in voltage transmitter calibration status, it automatically switches to mode 2) voltage transmitter calibration mode.
4. When automatic pressure calibrator is in pressure switch calibration status, it automatically switches to mode 4) pressure switch calibration mode.

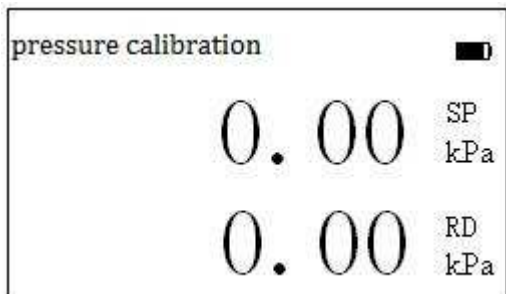
8 Operating Instruction of Calibration Function

Long press "SET" button to enter calibration state; press "MODE" button to switch pressure calibration, current calibration and resistance calibration.

8.1 Pressure calibration

The top line is set value. When the accuracy is 0.05%, 5 point calibration is adopted. Then press "increase

and decrease (UNIT, MEM) key to change the set value: 0%, 25%, 50%, 75% and 100%; When the accuracy is 0.1% or 0.2%, the compound pressure range is calibrated at 3 points, and the others are calibrated at 2 points. The " increase and decrease (UNIT, MEM) " key can be used to change the set value: 0%, (50%,) 100%. The bottom line is actual reading value.



Calibration process

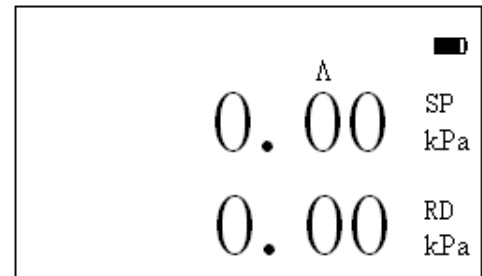
Example: The calibrated range is (0 ~ 400) kPa and the pressure calibration point is (0 ~ 100 ~ 200 ~ 300 ~ 400) kPa. The calibration will be completed only when the difference between output value and the setting value is 10 % of the full range.

- 1) **Preparation:** turn on the power to warm up for 30 minutes.
- 2) **Zero calibration:** Set the pressure setting value to "0.000kPa" and confirm the system pressure as "0", after the "SET" calibration key and "ENTER" confirm key, the " pressure set value "is 100.00kPa and" pressure output value "is 0.00kPa (It indicates that the system has saved zero information). After calibration, the pressure value is still 0.00kPa, indicating that the system does not accept calibration data. The error between pressure output value and pressure setting value may exceed 10% of the range, and the other points are the same condition.).
- 3) **Intermediate point calibration**
 - a) Use "UNIT MEM" increase/decrease button to change set value to the calibration value (e.g. 100kPa).
 - b) For adjusting system pressure to the calibrated point (It is 100.00kPa now), when the pressure is approaching calibrated point, please slow down the pressure rise to avoid overpressure. Observe the standard gauge to confirm if the system pressure is up to the calibrated point.
 - c) Press "SET", "ENTER" button to record current parameter record of the pressure module. Pressure set value is "200.00kPa", and current output pressure is 100.00 kPa.
 - d) Repeat step 3) to calibrate other points.
- 4) **Range calibration:** when pressure calibration point is max value (400.00kPa), repeat whole procedure to step 3, use "UNIT MEM" increase/decrease button to change set value to this point (eg.400.00kPa). Then press

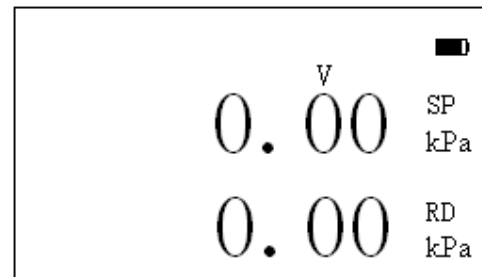
"SET", "ENTER", now, the "set value" is 300.00kPa, "output value" is 400.00kPa.

● **Set value modification**

When calibrating the pressure, sometimes it is necessary to modify the set value. For example, when the vacuum cannot be drawn to -100kPa in a place, it is impossible to calibrate the -100kPa, and the setting value must be set artificially.



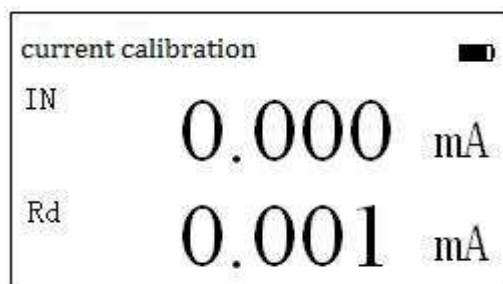
If you want to modify settings, long press "UNIT" button to enter modify Settings status, as the picture (right), where above the set value, there is "▲", "▲" indicating the digit can be modified, press "UNIT" button, the corresponding figures will add 1, if you want to minus 1, then press "MEM" button to change the corresponding figure, it will



minus 1, press "ZERO" key to change the modifying digit position, press "ENTER" button to complete modification, return to the calibration status, then adjust the standard pressure to the set value, press "SET", and "ENTER", The calibration data of the set value is saved.

8.2 Current calibration

The first line is required to input current value, which is calibrated at 3 points, 0mA, 12mA and 20mA respectively. Next line is the actual current value.



● **Calibration process**

1) **Wiring**

Positive terminal of the current generator is connected to the second banana jack (yellow) and negative terminal is connected to the third banana jack (black).

2) **Zero calibration**

Firstly, confirm the system is open. After pressing "SET" and "ENTER", screen shows "IN 12.000mA" and "Rd

0.000mA” (It indicates that the system has saved zero information).

3) Intermediate point calibration

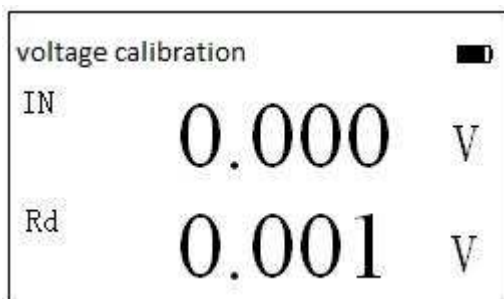
Input standard current 12.000 mA, and then press "SET" and "ENTER", screen displays "IN 20.000mA" "Rd 12.000mA" (It indicates that the system has saved intermediate point information).

4) Range value calibration

Input standard current 20.000mA, and then press "SET" and "ENTER", screen displays "IN 20.000mA" "Rd 20.000mA".

8.3 Voltage calibration

The upper line requires the input voltage value (IN), which is calibrated at 3 points, which is 0V, 3V and 5V respectively. The lower line (Rd) is the actual current value.



● Calibration process

1) Wiring

Positive terminal of the voltage generator is connected to the fourth banana jack (green) and negative terminal is connected to the third banana jack (black).

2) Zero calibration

Firstly, confirm the system is short circuit. After pressing "SET" and "ENTER", screen shows "IN 3.000V" and "Rd 0.000 V" (It indicates that the system has saved zero information).

3) Intermediate points calibration

Input standard voltage 3V, and then press "SET" and "ENTER", screen displays "IN 5.000 V", "Rd 3.000V" (It indicates that the system has saved intermediate point information).

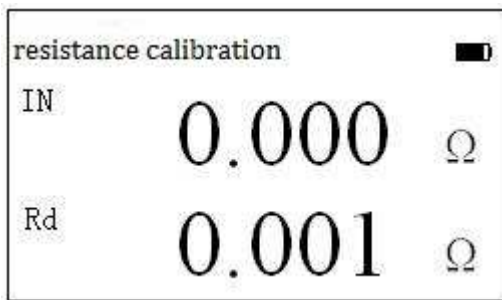
4) Range calibration

Input standard voltage 5V, and then press "SET" and "ENTER", screen displays "IN 5.000V" "Rd 5.000V".

8.4 Resistance calibration

The upper line requires the input resistance value (IN), which is calibrated at 2 points, which is 0 Ω and

20 Ω respectively. The lower line (Rd) is the actual resistance value.



● Calibration process

1) Wiring

One terminal of the standard resistance box is connected to the fifth banana jack (green) and the other terminal is connected to the third banana jack (black).

2) Zero calibration

Firstly, confirm the system is short circuit. After pressing "SET" and "ENTER", screen shows "IN 20.000" and "Rd 0.000 Ω " (It indicates that the system has saved zero information).

3) Range calibration

Input standard resistance 20 Ω , and then press "SET" and "ENTER", screen displays "IN 20.000 Ω ", "Rd 20.000 Ω ".

8.5 Exit calibration

Long press "ZERO" to exit the calibration status, and then enter the measurement.

8.6 Notice

This function is used to modify the measurement accuracy of pressure, current, voltage and resistance, and the random operation of the calibration function will affect the measurement accuracy, even lead to the failure of normal work in severe case. If the measurement accuracy is deviated during periodic calibration, it has to be calibrated by skilled calibration personnel. In calibrating the pressure measurement, the pressure should be pressurized to the full range, then directly reduced to zero and repeat the operation three times. Make the pressure measurements to the optimum and then calibrate them.

Caution: Calibration must be operated in permissible calibration condition!

8.7 Calibration conditions

1) Permissible ambient conditions:

Operating temperature: $20^{\circ}\text{C}\pm 2^{\circ}\text{C}$

Relative humidity: (45-85) %

Atmospheric pressure: (86-105) kPa

2) Standard pressure generator

Accuracy: at least 0.02

9 HART function

HART function: Only CHC or FHC model precision pressure calibrators are available.

9.1 Wiring

If there is power supply on site, the precision pressure calibrator is used as HART operator, the transmitter positive terminal is connected to the calibrator's V jack (green), negative terminal is connected to 0 V jack (black).

If the precision pressure calibrator is required to supply power, the transmitter is connected to the 24V (red) jack of the precision pressure calibrator, and the negative terminal connects the calibrator's mA (yellow) jack.

9.2 Parameter display

It is shown in the figure below, HART parameters are shown in 2 pages. Each page displays 4 rows as follows:

Upper limit H: The calibration upper limit of transmitter.

Lower limit H: The calibration lower limit of transmitter.

Upper limit M: The calibration upper limit of the transmitter's sensor.

Lower limit M: The calibration lower limit of the transmitter's sensor

Pressure H: transmitter input pressure value after communication with HART

Pressure H: transmitter output current value after communication with HART

Upper limit: the calibration upper limit of the transmitter to be set, which can be modified. Instructions please check "range operation" and "upper limit/lower limit modification";

Lower limit: the calibration lower limit of the transmitter to be set, which can be modified. Instructions please check "range operation" and "upper limit/lower limit modification";



Pressure: measured pressure value by calibrator;

Current: measured current value by calibrator;

The linear state of the transmitter: the relationship between the output and input of the transmitter can be either linear or square. The "L" after the current represents the linear transmitter, and "S" represents the flow transmitter in cubic root.

9.3 Operation

9.3.1 Entry and Exit HART function

After wires are connected, turn on the calibrator, long press  button to enter HART parameter display as following left figure, showing upper limit, lower limit, pressure and current respectively. Press 

button to display max range value of sensor of the transmitter as following right figure.

upper limit	H	1600.0 kPa	upper limit	M	2068.0 kPa
lower limit	H	0.0 kPa	lower limit	M	-2068.0 kPa
pressure	H	0.0 kPa	pressure	H	0.0 kPa
current	H	4.000 mA	current	H	4.000 mA

Short press " **MODE** " key to enter the real-time parameter display screen; long press "HART" button to exit HART function.

9.3.2 Mandatory current

In the HART parameter display screen, the long press " **ENTER** " key enters the mandatory current function, each press " **ENTER** " key, the mandatory current values are switched between 4/12/20mA. The transmitter is returned to normal state after the power is reset.

9.3.3 Transmitter clearance

In the HART parameter display screen, press " **ZERO** " button to clear sensor of the transmitter. After clearance, pressure H is 0, current H is 4.000mA.

9.3.4 Expected range operation



Press " **MODE** " key to enter the real-time parameter display screen as follows:

upper limit : 1600.0 kPa
 lower limit : 0.0 kPa
 pressure : 0.0 kPa
 current : L 4.000 mA

upper limit : 1600.0 kPa
 lower limit : 0.0 kPa
 pressure : 0.0 kPa
 current : S 4.000 mA








upper limit : 1600.0 <kPa
 lower limit : 0.0 kPa
 pressure : 0.0 kPa
 current : L 4.000 mA

upper limit : 1600.0 <kPa
 lower limit : Λ kPa
 pressure : 0.0 kPa
 current : L 4.000 mA


Press “” “” button to change “upper limit/lower limit”. The single-range calibrator has 4 levels, and the double-range calibrator has 8 levels. For example, calibrator (range 0-1600kPa), it can be switched to “1600/1200/1000/800kPa” or “1600/1200/1000/800/600/ 400/300/250kPa”; calibrator (0-60) MPa, it can be switched to “60/40/30/25” or “60/40/30/25/20/16/14/12”.

Standard ranges are as following:

60/40/30/25/20/16/14/12/10/8/6/4/3MPa and 2500/1600/1200/1000/800/600/400/300/250/200/ 160/150/100/75 /50/20/10/5/2 /1kPa.

If the transmitter range is beyond the scope of the standard range, it need to be defined by users, you can follow the steps below to modify, long press “” button, enter the upper/lower limit modification model, if there is " < " symbol after the upper limit value, please modify the upper value, press the "” key to switch between the upper limit and lower limit, and now press “” button again to modify the upper or lower limit value. Please use the "”, "”, and “←→” to modify values.(Use "”and "” button to changes values. Use “←→”to change the digits.)

9.3.5 Range setting of transmitter

Set upper limit (such as: 1600 kPa), the lower limit (such as 0 kPa), short press the "” key, then the

settings will be set to the transmitter through HART. If users want to set a limit of transmitter (upper limit) is beyond the transmitter's own limit maximum (M), the upper limit is set to the largest range limit. After it is done, there will be "di" sound; meanwhile screen will be cut to HART parameters. Now please check upper limit H and lower limit H, if the display is wrong, and then please switch it to the real-time parameter display to reset. The range of the transmitter can be set without pressure. If the transmitter is new and the quality is good, the output of the transmitter (4 ma-20mA) and the input (0kPa ~ 1600kPa) should meet the accuracy requirement of the transmitter.

9.3.6 Transmitter calibration

After transmitter range Settings, due to the use of time problem or quality problem in the transmitter, the transmitter output mA (4-20 mA) and the relationship between input (pressure) should be often did not meet the requirements of the accuracy of the transmitter, cope with the transducer calibration range, the input pressure lower limit value, the output of 4.000 mA, make the pressure input threshold value, the output is 20.000 mA.

Upper limit calibration: Increase pressure accurately to the upper limit, long press "SET" button, to perform the function of setting, complete set, issued a "di" sound, then cut into HART parameter display screen, complete calibration and then issued a "di" sound, then loosen the key.

Lower limit calibration: adjust pressure to the lower limit and press the "SET" button.

9.3.7 Linearizing operation

In real time parameter display screen, long press "UNIT" key to switch linear and open square. The letter "L" after current means that the transmitter is a linear state, and letter "S" represents the square state.

9.3.8 Exit HART

Long press "HART" button to exit HART function.

10 Battery

Battery charging:

Charge the battery for 6 hours after full discharge of the battery and then remove the charger. The charger model is: CH24-7036T.

Battery replacement:

1. Turn off the instrument and lay it face down.
2. Loosen the two screws of the battery compartment,
3. Remove the battery cover.
4. Insert the new battery in correct polarity.
5. Put the battery cover on and screw it tight with the two screws.

Notes:

Battery replacement should be carried out in the case of good ventilation and no gas leakage.

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