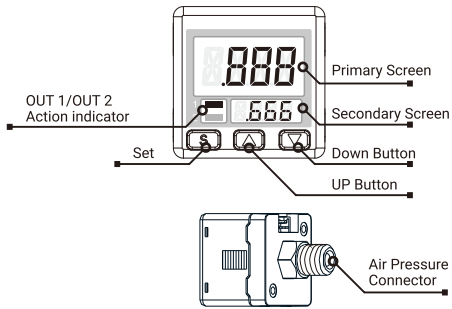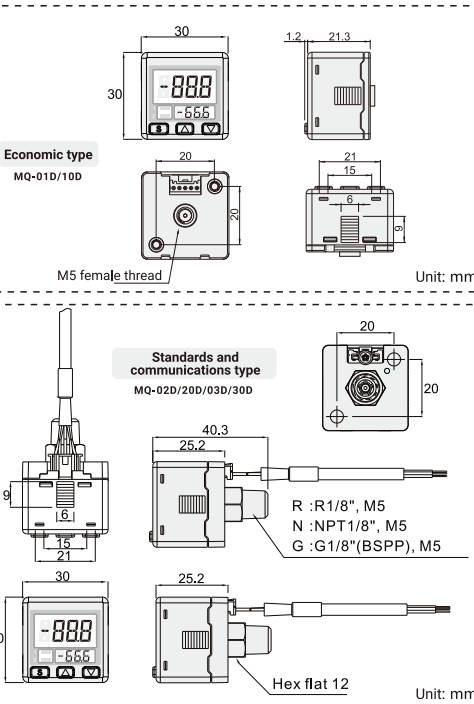# AKUSENSE

Digital Air Pressure Gauge
MQ SERIES

User's manual

Thank you for choosing AKUSENSE .Please read the manual carefully before using this product.

- The product should be applied by someone with a certain level of electrical knowledge.
- Please read and make sure that you understand how to operate the product before using it.
- Please keep this manual readily accessible for future reference when needed.
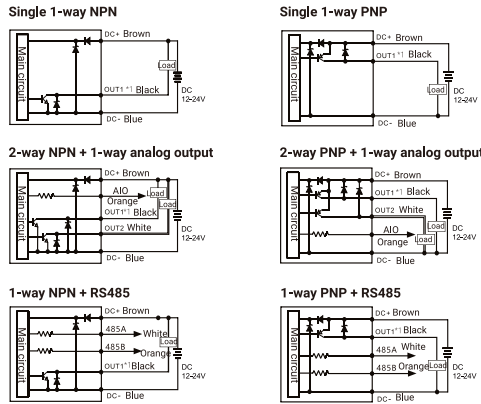
■ Product Image

OUT 1/OUT 2 Action indicator
Primary Screen
Secondary Screen
Set
Down Button
UP Button
Air Pressure Connector

■ Appearance Dimensions

Economic type
MQ-01D/10D

M5 female thread
Unit: mm

Standards and communications type
MQ-02D/20D/03D/30D

R :R1/8", M5
N :NPT1/8", M5
G :G1/8"(BSPP), M5

Hex flat 12
Unit: mm

■ Wiring

Please use the matching cable and take care to avoid pulling the cable with excessive force.

① ② ③ ④ ⑤
Cable connector
Connect cable
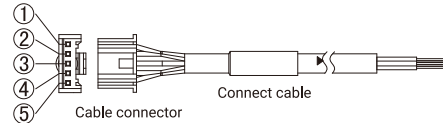
Cable Plug	Wiring Definition(Standard)	Wiring Definitions (Economy)	Wiring Definitions (Wiring)
① Brown	DC+ Positive power	DC+	DC+
② Black	Switching output 1 or parameter copy	OUT1	OUT1
③ White	OUT2 Switching output		485A
④ Blue	AIO Analog output		485B
⑤ Orange	DC- Negative power supply	DC-	DC-

■ Output wiring instructions

Single 1-way NPN
DC+ Brown
OUT1 *1 Black
DC- Blue

Single 1-way PNP
DC+ Brown
OUT1*1 Black
DC- Blue

2-way NPN + 1-way analog output
DC+ Brown
AIO Orange
OUT1*1 Black
OUT2 White
DC- Blue

2-way PNP + 1-way analog output
DC+ Brown
OUT1*1 Black
OUT2 White
AIO Orange
DC- Blue

1-way NPN + RS485
DC+ Brown
485A White
485B Orange
OUT1*1 Black
DC- Blue

1-way PNP + RS485
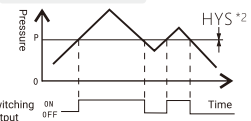DC+ Brown
OUT1*1 Black
485A White
485B Orange
DC- Blue

Note: Out1 is multiplexed for switching and parameter copying function, !!! please switch it by setting.
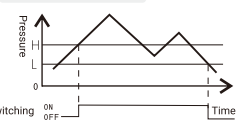
■ Output modes

OUT1 and OUT2 [Note] *1 Three modes are selectable: "Simple mode", "Hysteresis mode", and "Window mode". For details on the settings, refer to Section 1.

Simple Mode
HYS *2
Air pressure setting value P, output is ON when the air pressure is greater than P, otherwise it is OFF.

Lag Mode
Air pressure setting value H/L, the output is ON continuously, when the air pressure is greater than H, the output is OFF until the air pressure is less than L.

Window mode
HYS
Air pressure setting value H/L, output is ON only when the air pressure value is between L and H, otherwise output is OFF.

Note:
1. In simple mode, the sub-screen corresponds to ; in other modes, the sub-screen is displayed accordingly:
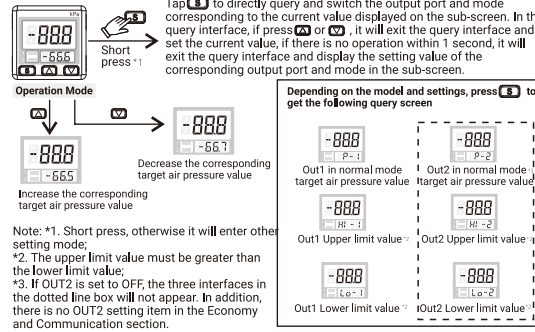2. HYS is the hysteresis value, and its size can be changed in the Expert Setup Mode.

■ Air Pressure Access

Universal connectors can be used to access the air pressure, the interface type can be male R1/8, G1/8 and NPT1/8, or female M5 size, depending on the actual needs of the choice. The torque should be controlled to be less than 9.8 NM for male threaded ports and less than INM for female threaded ports during fastening. In addition, to prevent air leakage, a suitable amount of packing tape can be wrapped around the threaded joint before tightening the pneumatic connector.
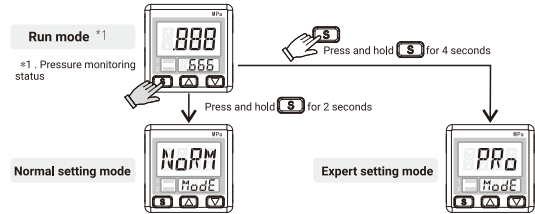
Hex flat 12   Hex flat 12
Raw material tape can be wrapped here
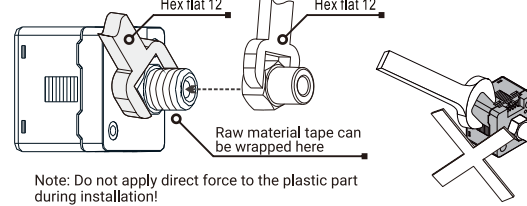
Note: Do not apply direct force to the plastic part during installation!

■ Basic operation under <Operation mode>

Tap (S) to directly query and switch the output port and mode corresponding to the current value displayed on the sub-screen. In the query interface, if press (▲) or (▼), it will exit the query interface and set the current value, if there is no operation within 1 second, it will exit the query interface and display the setting value of the corresponding output port and mode in the sub-screen.

Operation Mode
Short press *1

Increase the corresponding target air pressure value
Decrease the corresponding target air pressure value

Depending on the model and settings, press (S) to get the following query screen

Out1 in normal mode target air pressure value
Out2 in normal mode target air pressure value
Out1 Upper limit value *2
Out2 Upper limit value *2
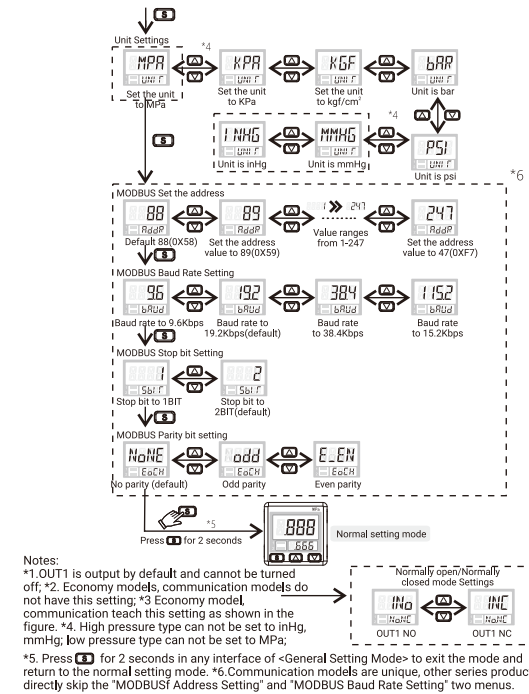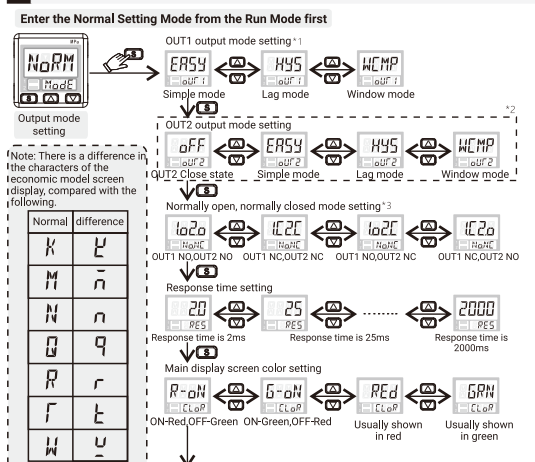Out1 Lower limit value *2
Out2 Lower limit value *2

Note: *1. Short press, otherwise it will enter other setting mode;
*2. The upper limit value must be greater than the lower limit value;
*3. If OUT2 is set to OFF, the three interfaces in the dotted line box will not appear. In addition, there is no OUT2 setting item in the Economy and Communication section.

■ Enter the Setup menu

Run mode *1
*1 . Pressure monitoring status

Press and hold (S) for 4 seconds
Press and hold (S) for 2 seconds

Normal setting mode
Expert setting mode

[Note] Press and hold (S) for 2 seconds to return to <Running Mode> in any interface of <Normal Setting Mode>; Press and hold (S) for 4 seconds to return to <Running Mode> in any interface of <Expert Setting Mode>.

■ Normal Setting Mode

Enter the Normal Setting Mode from the Run Mode first

NoRM ModE
Output mode setting

Note: There is a difference in the characters of the economic model screen display, compared with the following.

Normal	difference
K	ʞ
M	ɯ
N	n
O	q
R	r
Γ	ʇ
W	ʌ

OUT1 output mode setting *1
EASY ouT1 — Simple mode
HYS ouT1 — Lag mode
WCMP ouT1 — Window mode

OUT2 output mode setting *2
oFF ouT2 — OUT2 Close state
EASY ouT2 — Simple mode
HYS ouT2 — Lag mode
WCMP ouT2 — Window mode

Normally open, normally closed mode setting *3
Io2o NoNC — OUT1 NO,OUT2 NO
IC2C NoNC — OUT1 NC,OUT2 NC
Io2C NoNC — OUT1 NO,OUT2 NC
IC2o NoNC — OUT1 NC,OUT2 NO

Response time setting
20 RES — Response time is 2ms
25 RES — Response time is 25ms
2000 RES — Response time is 2000ms

Main display screen color setting
R-oN CLoP — ON-Red,OFF-Green
G-oN CLoP — ON-Green,OFF-Red
REd CLoP — Usually shown in red
GRN CLoP — Usually shown in green

■ Enter the Setup menu (Unit Settings)

MPA — Set the unit to MPa *4
KPR — Set the unit to KPa
KGF — Set the unit to kgf/cm²
bAR — Unit is bar
I NHG — Unit is inHg *4
MMHG — Unit is mmHg
PSI — Unit is psi *6

MODBUS Set the address
88 AddP — Default 88(0X58)
89 AddP — Set the address value to 89(0X59)
247 — Value ranges from 1-247
247 AddP — Set the address value to 47(0XF7)

MODBUS Baud Rate Setting
96 bRud — Baud rate to 9.6Kbps
192 bRud — Baud rate to 19.2Kbps(default)
384 bRud — Baud rate to 38.4Kbps
1152 bRud — Baud rate to 15.2Kbps

MODBUS Stop bit Setting
1 SbiT — Stop bit to 1BIT
2 SbiT — Stop bit to 2BIT(default)

MODBUS Parity bit setting
NoNE EoCH — No parity (default)
odd EoCH — Odd parity
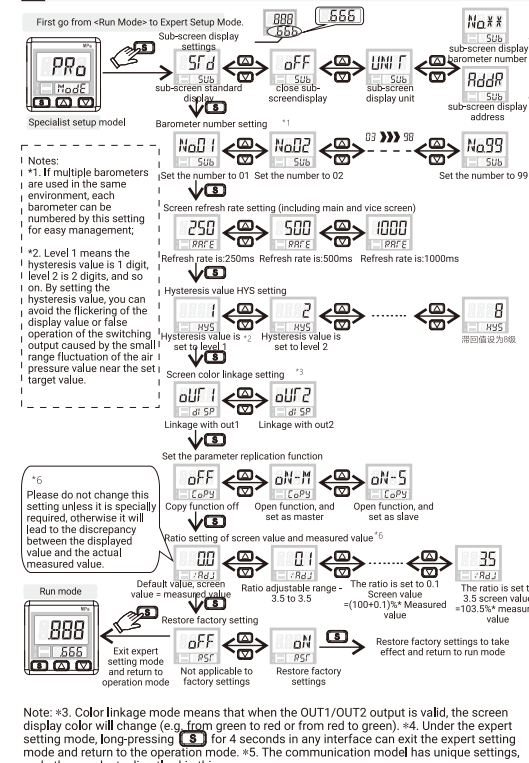E_EN EoCH — Even parity

Press (S) for 2 seconds *5
Normal setting mode

Notes:
*1.OUT1 is output by default and cannot be turned off; *2. Economy models, communication models do not have this setting; *3 Economy model, communication teach this setting as shown in the figure. *4. High pressure type can not be set to inHg, mmHg; low pressure type can not be set to MPa;
*5. Press (S) for 2 seconds in any interface of <General Setting Mode> to exit the mode and return to the normal setting mode. *6.Communication models are unique, other series products directly skip the "MODBUSf Address Setting" and "MODBUS Baud Rate Setting" two menus.

Normally open/Normally closed mode Settings
INO NoHC — OUT1 NO
INC NoHC — OUT1 NC

■ Enter the Setup menu

First go from <Run Mode> to Expert Setup Mode.
PRo ModE — Specialist setup model

Sub-screen display settings
SFd Sub — sub-screen standard display
oFF Sub — close sub-screendisplay
UNIT Sub — sub-screen display unit
No** Sub — sub-screen display barometer number *1
AddR Sub — sub-screen display address *5

Barometer number setting
NoOI Sub — Set the number to 01
NoO2 Sub — Set the number to 02
No99 Sub — Set the number to 99

Notes:
*1. If multiple barometers are used in the same environment, each barometer can be numbered by this setting for easy management;

*2. Level 1 means the hysteresis value is 1 digit, level 2 is 2 digits, and so on. By setting the hysteresis value, you can avoid the flickering of the display value or false operation of the switching output caused by the small range fluctuation of the air pressure value near the set target value.

Screen refresh rate setting (including main and vice screen)
250 RATE — Refresh rate is:250ms
500 RATE — Refresh rate is:500ms
1000 RATE — Refresh rate is:1000ms

Hysteresis value HYS setting
1 HYS — Hysteresis value is set to level 1 *2
2 HYS — Hysteresis value is set to level 2
8 HYS — 滞回值为8

Screen color linkage setting *3
oUT1 di SP — Linkage with out1
oUT2 di SP — Linkage with out2

Set the parameter replication function
oFF CoPY — Copy function off
oN-M CoPY — Open function, and set as master
oN-S CoPY — Open function, and set as slave

*Please do not change this setting unless it is specially required, otherwise it will lead to the discrepancy between the displayed value and the actual measured value.

Ratio setting of screen value and measured value *6
00 RAdJ — Default value, screen value = measured value
0.1 RAdJ — Ratio adjustable range - 3.5 to 3.5
35 RAdJ — The ratio is set to 3.5 Screen value =103.5%* measured value

The ratio is set to 0.1 Screen value =(100+0.1)%* Measured value

Run mode
Exit expert setting mode and return to operation mode

Restore factory setting
oFF PSr — Not applicable to factory settings
oN PSr — Restore factory settings
Restore factory settings to take effect and return to run mode

Note: *3. Color linkage mode means that when the OUT1/OUT2 output is valid, the screen display color will change (e.g. from green to red or from red to green). *4. Under the expert setting mode, long-pressing (S) for 4 seconds in any interface can exit the expert setting mode and return to the operation mode. *5. The communication model has unique settings, and other products directly skip this.
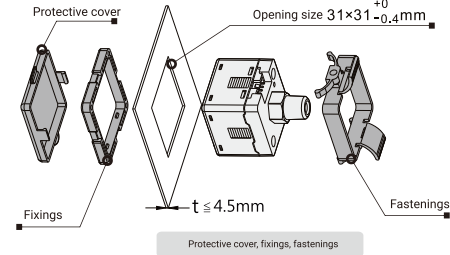
Installation

Mounting Method 1-Bracket Mounting

The mounting brackets (L-type and Z-type) are available for mounting in all four directions. Tightening torque <0.5N·m, screw size M3*6.

L-type   Z-type
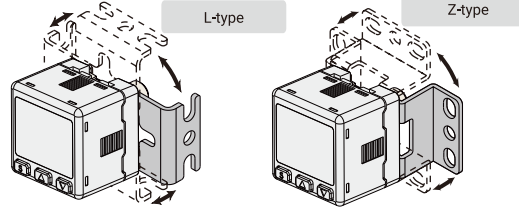
Mounting Method 2 - Panel Mount

The matching panel mounting bracket kit is available for assembly. The kit contains 3 types of accessories, including fixings, snap fasteners and panel protectors, which can be flexibly matched according to actual needs.

Protective cover

Opening size $31 \times 31^{+0}_{-0.4}$mm

Fixings

$t \leqq 4.5$mm

Fastenings

Protective cover, fixings, fastenings

Note. All of the above are optional accessories, and need to be selected separately when ordering.

SUPERSPEED Mode on and off

Turning on the mode can make the response speed faster, the fastest is 1ms!

Note: this function only supports the standard model products, the fastest response speed of economy and communication models is 2ms.

Press S and $\triangle$ at the same time in run mode until the display reads.

SUPERSPEED Mode on   SUPERSPEED Mode off
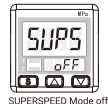
At this time, release the keys to complete the on and off operation.

Note: in order to ensure the response speed, the screen display update speed and key response speed will be appropriately reduced (in order to ensure that does not affect the normal use of the premise).

Explanation of the parameter copy function

❖ 1. The parameter copy function can copy the parameter setting values from (master) barometer to (slave) barometer.

❖ 2. Before using the parameter copy function, please make sure the barometer models are the same.*1

❖ 3. This function only supports one-to-one parameter copying.

Steps for use:
1. Consult this manual - J Expert Setting Mode, set the master barometer as the master and the slave barometer as the slave.

2. In the unpowered state, connect the wires according to the following diagram.

(Master) gauge   (Slave) gauge

Power

DC+(Brown)   DC+(Brown)
DC-(blue)   DC-(blue)
Copy function (black)
*2
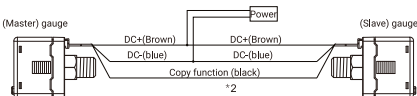
Note:
1. The Economy and Communication models do not have a single "parameter copy function".
2. The copy function is multiplexed with OUT1. When the copy function is enabled, the OUT1 output is invalid.

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3. Turn on the power*1 of the (master) and (slave) barometers at the same time, and the display will be as shown in Fig. on the right.

Please wait about 2 seconds until ⌐CoPy is displayed, or ⌐CoPy will be displayed if it fails.
If copying fails, please double check the settings and connections and try again.
4. After successful copying, the (slave) barometer will automatically revert to <Operation Mode> and turn off the "Parameter Copy Function".
5. Repeat steps 1-3 to copy the (master) barometer parameter settings to another (slave) barometer.
Note:
*2. If the two barometers are not synchronized, copying may fail.

Parameters Specifications

Model	MQ-10D	MQ-01D	MQ-20D	MQ-02D	MQ-30D	MQ-03D
	Economy model (high pressure type)	Economy model (low pressure type)	Standard model (high pressure type)	Standard model (low pressure type)	Communication model (high pressure type)	Communication model (low pressure type)
Rated Voltage Range	-0.101-1.000MPa	-101.3~101.3kPa	-0.101~1.000MPa	-101.3~101.3kPa	-0.101~1.000MPa	-101.3~101.3kPa
Set Pressure Range	-0.100~1.000MPa	-101.0~101.0kPa	-0.100~1.000MPa	-101.0~101.0kPa	-0.100~1.000MPa	-101.0~101.0kPa
Maximum Withstand Pressure	1.5MPa	500kPa	1.5MPa	500kPa	1.5MPa	500kPa
Applicable Gases	Non-corrosive gases, non-flammable gases, ISO compliant ISO 8573-1:2010[7:4:4]					
Supply Voltage	12~24V DC ± 10%					
Current Consumption	Up to 45mA (no load)					
Display Resolution in Different Pressure Units	kPa	—	0.1	—	0.1	—	0.1
	MPa	0.001	—	0.001	—	0.001	—
	kgf/cm²	0.01	0.001	0.01	0.001	0.01	0.001
	bar	0.01	0.001	0.01	0.001	0.01	0.001
	psi	0.1	—	0.1	0.01	0.1	0.01
	mmHg	—	0.1	—	0.1	—	0.1
	inchHg	—	1	—	1	—	1
Comparison Output [Note] *1	NPN open collector output, Maximum load current: 100mA, Maximum supply voltage: 30VDC, Internal voltage drop: 1.5V		PNP open collector output, Maximum load current: 100mA, Maximum supply voltage: 24VDC, Internal voltage drop: 1.5V			
Voltage-type Analog Output [Note] *1	Output voltage: 15V±2.5%F. S, linearity: +1%F. S., output impedance: 1KΩ	Output voltage: 15V±2.5%F. S, linearity: +1%F. S., output impedance: 1KΩ	None			
Current-type Analog Output	None	Output Current: 4~20mA±2.5%F. S., Linear: ±1%F. S., Load Resistance: Min: 50Ω, Max: 300Ω@12V;600Ω@24V	None			
MODBUS *2	None					Yes
Display Accuracy	±1%F. S. ±1digits (Operating Temperature: 25±10℃)					
Repeat Accuracy	±0.2%F.S. ±2digits					
Response Time	2.0ms, 50ms, 100ms 250ms, 500ms, 2000ms *4		1ms * 3, 2.0ms, 50ms,100ms, 250ms, 500ms, 2000ms		2.0ms, 50ms, 100ms 250ms, 500ms, 2000ms *4	
Display	3-color (red, orange, yellow-green) display, Sampling rate (4 times/sec.)					
Temperature Characteristics	1% F.S. or less, Comparison reference temperature 25℃ or less, 0-50℃ applicable range					
Operating Environment	0~50℃ (No condensation, no ice) ; 35~85%RH (no water dew)					
Storage Environment	-10~50℃ (No condensation, no ice) ; 35~85%RH (no water dew)					
Protection Level	IP40 / IP65*					
Receiver Caliber	Male thread: R1/8(Asian standard PT1/8), G1/8(European standard), NPT1/8(North American standard), Female thread: M5					
Weight	85g(Power cable included)					
Accessories	1 power cable with terminals, 1 instruction manual					

Note:
*1. Output type corresponds to the product model -;
Only the flood model supports MODBUS mode, please refer to the Product Instruction Manual for its operation.
3.Turn on the SUPERSPEED mode to support 1ms response speed, about the opening and closing of this mode, please refer to the "Product Instruction Manual"; *4.
*4. For the setting of response speed, please refer to the instruction manual of the product.

MODBUS communication instructions

This product communication is fully compliant with MODBUS protocol standard, if necessary, please contact our company for detailed instructions (including code examples).

Data format	Address	Funtion	Data	CRC
	8bit	8bit	n*8bit	16bit
single frame format	1 start bit, 8 data bits, 2 stop bits, no parity bit			

Register address description

Address	Register pointing	Corresponding value high pressure type	Corresponding value low pressure type	corresponding barometer setting *6	read/write permission
0001H	OUT1 Pressure value	-100~1000 ⇕ -0.101~ 1.000MPa	-1013~1013 ⇕ -101.3kPa~ 101.3kPa	NC	R
0010H	OUT1 target value	-100~1000 ⇕ -0.100~1.000MPa	-1010~1010 ⇕ -101.0~101.0 kPa	-888 P-1 OUT1 in normal mode	R/W
0011H	OUT1 target upper limit value	upper lower value ~1000 ⇕ target upper lower value ~1.000MPa	upper lower value~1010 ⇕ target upper lower value ~101.0kPa	-888 Hi-1 OUT1 lower limit value in operation mode	R/W
0012H	OUT1 target lower limit value	-100 ~ upper limit value ⇕ -0.100MPa~ target upper limit value	-1010 ~ upper limit value ⇕ -101.0kPa~ target upper limit value	-888 Lo-1 OUT1 lower limit value in operation mode	R/W
0013H	output mode	0~2 ⇕ EASY,HYS, WCMP	0~2 ⇕ EASY,HYS, WCMP	EASY HYS WCMP oUF1 oUF1 oUF1 Simple Lag mode Window mode	R/W
0014H	display color setting value	0~3 ⇕ R_ON,G_ON, RED,GREEN	0~3 ⇕ R_ON,G_ON, RED,GREEN	R-oN/CLoP G-oN/CLoP ON-Red, ON-Green, OFF-Green OFF-Red REd/CLoP GRN/CLoP normally normally displayed displayed in red in green	R/W
0015H	unit setting value	0~4 ⇕ MPa,kPa, kgf/cm²,bar,psi	1~6 ⇕ kPa,kgf/cm², bar,psi,mmHg, inHg	MPA KPA KGF UNIT UNIT UNIT bAR PSI MMHG UNIT UNIT UNIT InHG UNIT	R/W
0016H	normally open and normally closed setting value	0~1 ⇕ NO. NC.	0~1 ⇕ NO. NC.	INO NoHE OUT1 NC INC NoHE OUT1 NC	R/W

MODBUS (function code table)

Function code	realized function	exception code	exception description
03H	Read value of multiple registers	01H	Function code error, code other than 03,04,06,10 is used
04H	read current air pressure value	02H	Illegal data address, out of address range or read/write permission
06H	write value of single register	03H	Illegal data, number of data exceeds the limit or error count
10H	write value of multiple registers	04H	Parameter setting error, parameter setting value is written out of the setting range

Note
*1. For wiring definition, please refer to "C. Wiring".
*2. Baud rate can be selected from 9.6kbps, 19.2kbps, 38.4kbps, 115.2kbps, default is 19.2kbps.
*3. Address setting range 1~247, default is 12H; *4.
*4. When the exception code is 01H, the response function code is 89H; *5.
*5. When the exception code is 02H\03H\04H, the response function code = request function code +80H.
Example: If the request function code is 03H, the response function code is 83H.
*6. For setting information, refer to "G. Basic Operation in 《Operation Mode》 and "1 Normal Setup Mode"

Zero calibration

Press the △ and ▽ keys simultaneously in Run Mode until the display reads

Release the keys at this time to complete the zero calibration operation.

Key lock

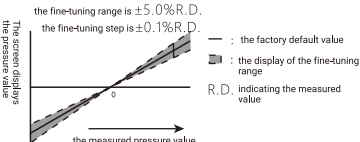Press the S and ▽ keys simultaneously in Run Mode until the display reads

key lock   key unlock

Release the key at this time to complete the key lock/unlock operation.

Display value fine-tuning function

Expert setting mode

the fine-tuning range is ±5.0%R.D.
the fine-tuning step is ±0.1%R.D.

: the factory default value
: the display of the fine-tuning range
R.D. indicating the measured value

Setting ratio by △ ▽

the measured pressure value

1. This function is designed to eliminate the very slight pressure error, do not change the default value when it is not necessary to avoid misunderstanding.
2. If there is analog output after the adjustment takes effect, it will be changed accordingly.

Error messages

realized function	error description
EER1	Abnormal current consumption of switching output port
EER2	zeroing call added air pressure on time
****	pressure value out of range
EER3	internal error
EER4	internal error
	for more information, please contact us, we will be happy to serve you!

Precautions for use

1. This product is suitable for non-corrosive gas, do not use in corrosive, flammable gas and any liquid.
2. Do not use this product on any testing device used for human protection.
3. Please use the product within the limited air pressure range, otherwise it will cause abnormal function or damage.
4. Please use this product within the rated voltage range and ensure that the voltage fluctuation does not exceed the rated range.
5. Please refer to the wiring method in the specification. Incorrect wiring may cause failure or damage to the product.
6. Connect and assemble with the power off.
Seven. Do not use this product in an environment with a lot of water vapor or dust.
8. Do not put this product in direct contact with water, grease, organic solvents, etc.
9. Do not tie the cable of this product with the power cord with high voltage to avoid interfering with the use of this product.