www.goldenrules.co.kr

Manuel

N-FN-Mass Flow meter

KC-7730

The nation's development item, 100% domestic goods,Patent **NO.** 10-1606497

Golden Rules

- Before installing the FN-MASS, foreign substances in the bureaucracy must be removed, check that the flow direction and the installation direction match, and check that the FN-MASS connection is fully tightened and there is no leakage.
- Check that the power input 24V DC connection terminal is correct, the output terminal connection 4 ~ 20mA DC is correct, and the control cable is used as a shielding wire.
- Make sure the high and low pressure valves and equivalent valves of the FN-MASS 3-way block valve are open. However, if the pipe is flushed to remove foreign substances from the pipe, close the high and low pressure valve to prevent foreign substances from entering the pipe before performing flushing.
- The flow meter uses a pressure tube, so be careful not to damage it. In particular, do not move or transport the product by holding only the pressure tube.
- When moving or installing, fix the eyebolt (refer to the figure below) on the flange with a rope.
- Do not install in a place subject to vibration such as a truck.
- Transport the FN-MASS so that its indicator is in the forward direction.
- Since the life of FN-MASS is affected by the ambient temperature, make sure that the ambient temperature of the installation site does not exceed the allowable temperature (-20 ~ +60℃).
- Make sure the flow meter power is off before making any wiring.

- Opening the mass flow meter cover with power applied in an explosion-proof area may cause an explosion. Be careful.

- The rated power supply of FN-MASS is DC 24V, and to prevent device damage and breakdown, use a power suitable for the rated power.

- The wiring terminal has a low risk of electric shock, but it may cause damage or fire due to incorrect contact with the human body and electric current.
  Please pay attention to wiring.

- To prevent malfunction due to external electrical signals, connect the ground wire to the ground terminal (M4) of the lug part of the FN_MASS enclosure.
  Be sure to install and use ring-type crimp terminals with insulation caps.

- When removing or removing the device, be sure to cut off the power before working, which may cause abnormal operation or malfunction.

■ Ground

The power and ground wire of the device should be connected with 4㎟ (AWG11) or more.

For grounding, connect external earth and internal earth at the same time.

In the case of internal ground, it is wired by our company and shipped.

	When checking the indicator, connect a 250Ω resistor in series to the (+) of the flow signal output terminal.

Golden Rule's KC-7730 series high-precision mass flow meter senses the flow of fluid in industrial sites, and is applied to places such as adjustment and measurement of flow rate.
It is a fixed sensor installation type and uses a microprocessor to measure flow, adjust flow, and diagnose at the same time.
It can be applied according to the instantaneous value of mass flow rate, accumulated quantity and environment setting, and is displayed on a 2 x 16 LCD panel.
It is a programmable transmitter and can be easily set through RS-485S communication port and Golden Rule high-performance interface software or instrument panel display.
In the KC-7730 series of Golden Rule Co., Ltd., instantaneous flow rate, accumulated flow rate, response speed, electric potential cut-off, flow correction factor, etc. are initially protected by password and can be changed by the user.
You can check the performance of the instrument through the Smartinterface TM Software guide of Golden Rule,
Input power, output, installation, and packaging methods can be selected according to the user's request.

How to use the manual

This manual provides necessary information for installing and
operating a smart differential pressure mass flow meter.
The chapters in the five parts of this manual cover the following areas:

. Chapter 1: Overview
. Chapter 2: Installation and wiring instructions
. Chapter 3: How to operate (Explain system operation and programming)
· Chapter 4: RS-485 Protocol
. Chapter 5: Diagnosis and A/S of fault
· Chapter 6: Area of Use and Quality Assurance

Please refer to the catalog for product specifications.

warning!
This reference represents important information to prevent damage to people and products.

caution!
This reference represents important information for the protection of products and performance.

Reference
This statement is presented to inform you of important details.

Takeover of the product

When you receive the Golden Rule FN-mass flow meter, carefully check the exterior of the packaging box for damage that occurred during shipping. If the box is damaged, notify the domestic shipping company and notify the factory or agent. Remove the packing list and check that all components ordered are present. It is important to ensure that no spare parts or accessories are discarded along with the packaging material.

We do not return any products without initial contact with Golden Rule's customer support department.

technical support

If a problem is found with the customer's flow meter, please refer to each step of installation, operation and setup.

Check the configuration. Verify that the customer's settings and adjustments are free of disruptions as recommended by the factory.

For specific information and recommended actions, refer to Chapter 5 Diagnosis of Failure.

If the problem persists despite the troubleshooting procedures outlined in Chapter 5, please contact us by email.

E-mail: goldenrules2014@naver.com

When contacting the technical support team, please provide the following information:

- Product serial number, model name (indicated on the product name plate)
- Problems caused and correct actions taken
- Application information (fluid, pressure, temperature and piping status)

N-FN-Mass Flow Meter(KC-7730)

■FN - Mass Flow Sensing

(KC-7730)Series measuring sensor

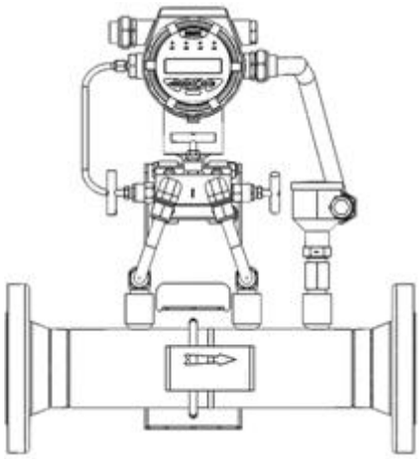
Golden Rule's unique FN-Mass Flow meter guarantees exceptional accuracy, robustness, and reliability for industrial flow meters.This mass flow meter utilizes a differential pressure measurement method, utilizing a flow nozzle to minimize pressure loss while measuring flow rate using proprietary, patented calculations.This innovative mass flow transmitter derives flow rate through sophisticated calculations under the variable physical properties of real-world fluids.It is capable of engineering demanding industrial conditions and, developed with proprietary domestic technology, minimizes industrial losses and ensures technological freedom. It boasts superior accuracy and stability, and has received New Technology Certification.Furthermore, it can be used with a variety of fluids. The straight pipe length required by existing differential pressure flow meters has been supplemented through various experimental data to maintain the desired accuracy even in short straight pipe sections.A communication network (RS-485) allows monitoring of the mass flow meter's progress, and an automatic valve can be installed for user-defined mass flow control. Flow Nozzles are manufactured in compliance with ISO-5167 standards and under ISO-9001 quality management system.

Installation overview

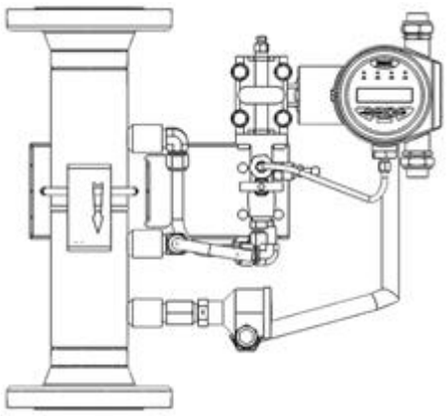
The KC-7730 series flowmeters are factory calibrated to the specified pipe size as specified in the product's calibration certificate.
Factory calibration suggests calculating the average flow rate through which the flow passes through the pipe in order to determine the correct insertion depth.
(If the pipe size is different from the calibrated size of the flow meter, the changed setting value must be re-entered.)

warning!

Agency approvals for hazardous area installations vary by flow meter model. Refer to the flow meter nameplate for specific flow meter approvals prior to installation in hazardous areas.



<Horizontal installation>



<Vertical installation>

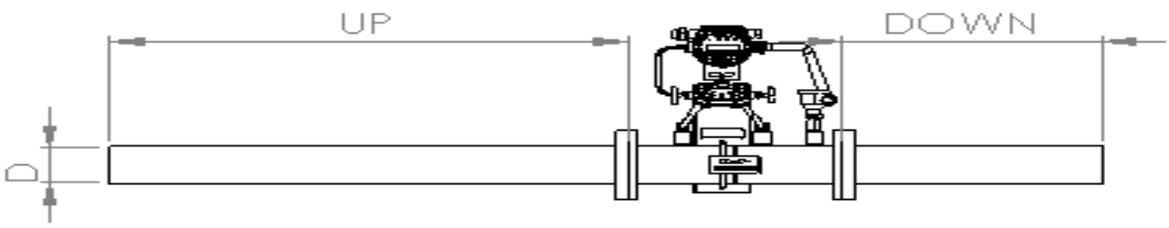
- In order to prevent deterioration of the life or performance of the flow meter, install it correctly, taking into account the installation location, installation direction, and surrounding space.
- When installing the product, align the arrow with the direction of fluid flow in the pipe, and install the FN-MASS so that the differential pressure sensor is horizontal (the display is horizontal at the time of shipment), and can be used for piping in either vertical or horizontal direction.
- It is recommended to avoid places subject to vibration or shock as much as possible. If there is a pulsation of the fluid, install a device that can absorb the pulsation and install the FN-MASS. In particular, when installing the FN-MASS, be careful as errors and operating errors may occur if the gasket is smaller than the inner diameter of the pipe.

Requirements for normal flow measurement

- This flow meter is a mass flow meter using a precision sensor. Be careful as it may be affected by impact.
- Secure the distance between the front and rear ends of the flow meter as much as the specified distance. If there are bends such as valves or elbows, secure an additional distance. In the case of built-in flow rectifier, the required straight pipe part can be reduced.

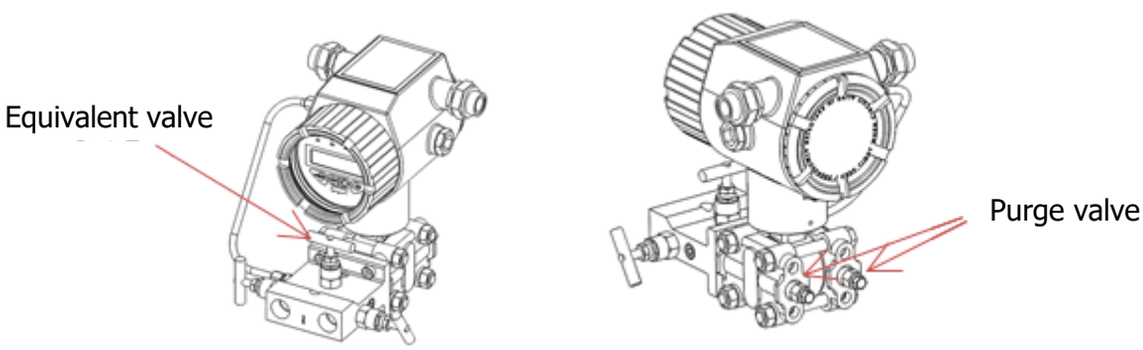
	Normal	Bend	Conditioner
UP	10D	15D	5D
DOWN	4D	5D	3D

* D: Flow meter inner diameter



During initial installation, follow the procedure below.

Open all 3-way manifold valves to equalize the influence of the pressure sensor by fluid pressure. The equivalent method is to close only the equivalent valve in the center direction after a certain period of time has passed with all three-way valves open.



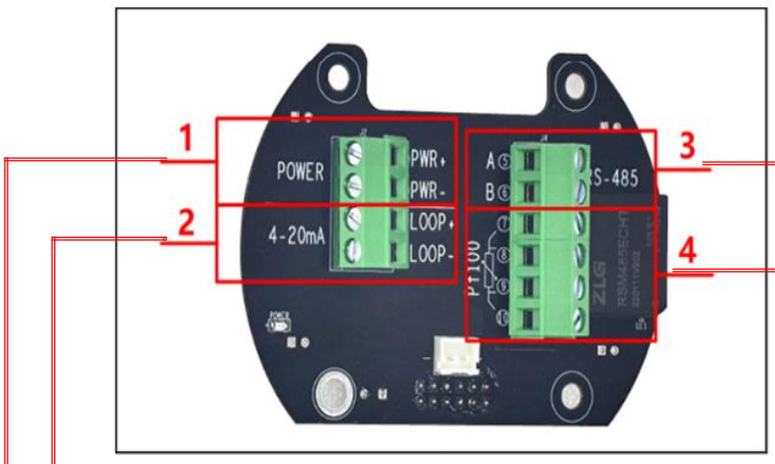
① If there is an offset value of the differential pressure sensor that may occur during movement and installation after opening the equivalent valve, complete the zero point setting through the manual sensor auto zero setting method.

② Open the rear purge valve of the differential pressure sensor to remove impurities. In the case of liquids, in particular, use after completely removing the gas (air) stagnant inside the sensor.

③ If fluid flows, close the equivalent valve for normal use.

Wiring

Terminal block wiring



Power

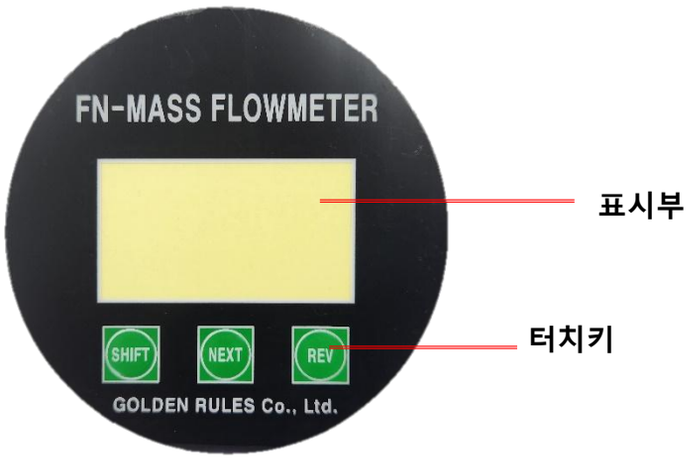
DC	
1	DC 24V Input (+)
2	DC 24V Input (-)
3	4-20mA (+)
4	4-20mA (-)

Output signal

1	RS-485 (+)
2	RS-485 (-)
3	PT100ohm
4	PT100ohm

- The analog output is wired for a 2-wire loop, marked with I (+) and I (-) on the top of the terminal block.Connect the 4-20mA flow signal to I (+) and I (-). The rated power supply is DC 24V unless otherwise specified. Connect to the P (+) and P (-) terminals on the power supply. If using a power supply less than DC 12V, please specify this on the order form or contact us.
- Keep the total wiring length within 200m, if possible.
- Ensure that no wire fragments remain inside the flow meter during wiring, as this may cause malfunctions, failures, or other problems.

1. 디스플레이 전면 및 화면 표시



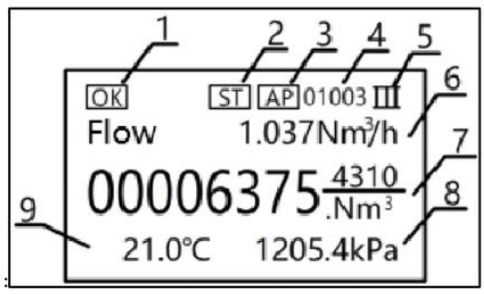
전송기의 파라미터는 키로 설정합니다. 일반적으로 일부 매개변수는 설치 중에 키로 수동으로 설정해야 합니다.
전송기에는 왼쪽에서 오른쪽으로 버튼 1, 버튼 2, 버튼 3의 세 개의 버튼이 있습니다.
일반적으로 버튼 1은 변경 버튼이고, 버튼 2는 확인 버튼이며, 버튼 3은 수정 버튼입니다.
특수 키 기능이 있는 경우 키 기능이 다릅니다.
사용 시 화면의 키 기능 설명을 참조하십시오.
전송기가 작동 중일 때 키 3을 눌러 수동으로 데이터 세부 정보 인터페이스로 전환할 수 있습니다.
데이터 세부 정보 인터페이스는 작동 조건과 순간 유량, 차압 값과 밀도 값을 동시에 표시합니다.
천연 가스를 측정할 때 압축 계수가 표시됩니다.

시작

기기에 전원이 켜지면 셀프 테스트가 수행됩니다.
셀프 테스트가 비정상적이면 셀프 테스트 오류 인터페이스가 표시되고(셀프 테스트 인터페이스 설명은 셀프 테스트 메뉴 참조) 약 1~2초 후에 메인 인터페이스로 점프합니다.
그렇지 않으면 메인 인터페이스로 바로 점프합니다.

2. Model connector symbols and descriptions

After the main interface starts as shown in the following figure:



1: The instrument's operating status is displayed in real time."OK" is displayed normally, and "ERR" is displayed in the event of an error. Abnormal communication between the differential pressure sensor and another board displays "DP!"

2: Temperature identification: If the temperature collected by the instrument is abnormal or manually set to the set temperature,"ST" is displayed. If the sensor and the collected data are normal,"SP" is displayed.

3: If the pressure collected by the instrument is abnormal or manually set to the set pressure,"SP" is displayed. If the sensor and the collected data are normal,"SP" is displayed.

Instrument operating parameter overflow: "OV" is displayed if the instrument operating parameter overflows.(Overflow includes a non-negative parameter being negative, a non-zero parameter being zero,and the data being out of range.)This location can also indicate the type of pressure sensor: "AP" indicates the displayed pressure is an absolute pressure value,"GP" indicates the displayed pressure is a gauge pressure value. If multiple variables are displayed simultaneously, the positions will flash alternately.

4: Table number required for RS485 communication.

5: Power supply symbol. II indicates 2-wire connection mode, with pulse, equivalent output, and no 485 communication in a 2-wire system. III indicates 3-wire connection mode.

6: Instantaneous flow rate display, maximum value is 99999999.

7: Cumulative flow rate display. Maximum displayable value is 8 digits.If 8 digits are exceeded, 99999999 will be displayed.

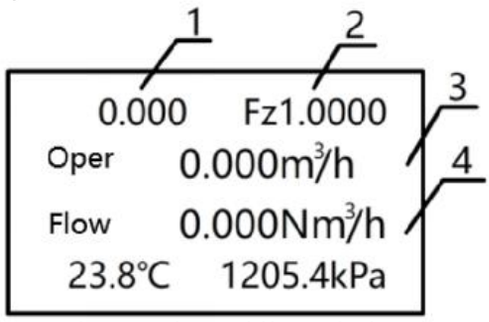
8: Current sensor collection pressure display.If the device is internally set to the set pressure, the set pressure is displayed.If not, the sensor collection pressure is displayed.

9: Current sensor collection temperature display.If the device is internally set to the set temperature, the set temperature is displayed.Otherwise, the sensor collection temperature is displayed.

Configure menu settings

3.1 Data Details Interface

Press the REV key on the main interface to enter the data details interface.



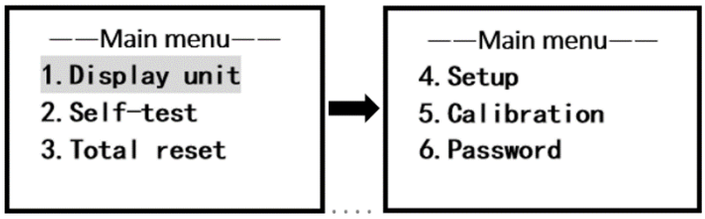
1: Displays the current operating differential pressure, with a maximum display value of 999999 (kPa).

2: Displays the media density/compressibility coefficient (if the media is natural gas, the supercompressibility coefficient is displayed; otherwise, the media density is displayed).

3: Displays the instantaneous flow rate under operating conditions, with a maximum value of 99999999.

4: Displays the standard temperature and pressure instantaneous flow rate, with a maximum value of 99999999.

3.2 Parameter setting menu



Press the SET key on all main interfaces (Main Interface 1 and Main Interface 2) to enter the main menu interface.

You can select a menu item using the SHT Shift key and press the SET key to enter.The following sections briefly describe the operation of each menu item.

Self Check: Checks the instrument's operating status.

Display: Changes the display units for instantaneous, operating conditions, cumulative, temperature, and pressure.

Clear: Clears the cumulative flow rate and operating hours.

Setting: Sets the instrument's operating parameters.

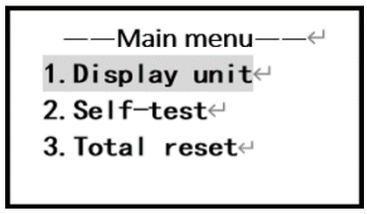
Calibration: Sets flow rate parameters, temperature channels, pressure channels, current output, and zero calibration for the flow coefficient and differential pressure transmitter.

Password: Modifies settings, clears the password, and calibrates.

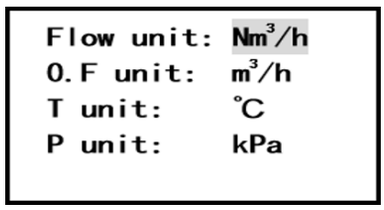
Query: View information such as timing records, daily records, monthly records, and yearly records, and configures the log content..

3.3 Display menu

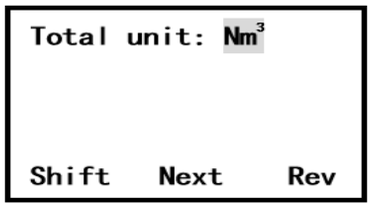
The display menu has three pages, allowing you to set parameters such as standard temperature a nd pressure units, operating condition units, and screen contrast.This menu is accessed through th e Parameter Settings menu.



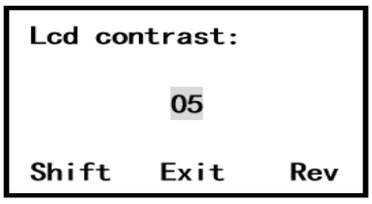
Standard Temperature and Pressure Units: Select standard temperature and pressure units.Volume units can display nm/d, nm/h, Nm³/min, NL/h, NL/m, SCFM, MMSCFD, and MSCFD.Volume units c an display t/d, t/h, t/min, kg/d, kg/h, kg/min, lb/d, lb/h, and lb/min.Operating condition units can display m/d, m/h, m/m, L/h, L/m, GPM, GPH, GPD, MGPD, CFH, and CFM.Select the operating cond ition flow unit.Deree-day: Select degree-day. ℃ can be displayed.Pressure Unit: Select the pressure unit. KPa, MPa, PSI, Bar, kg/cm, mmH2O, mmHg, ftH2O, and inH2O can be displayed.



Accumulated Units: When selecting the accumulated flow unit, mass units can be displayed in t, kg, or lb. Volume units can be displayed in m, l, SCF, or gal.

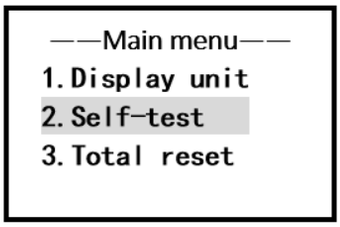


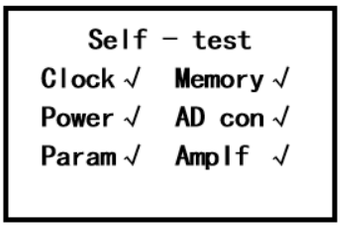
Contrast options allow you to adjust the screen contrast to select the best display condition depen ding on the site environment.



3. 4 Self – test

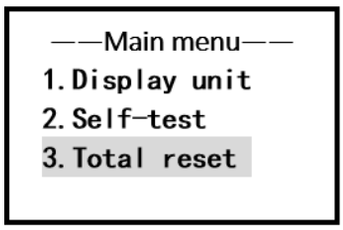
If the instrument is malfunctioning, enter this option to query for specific instrument execution errors and mark them as normal or as errors. The instrument also performs a self-test upon startup.If an error occurs, this interface will be displayed.You can also enter this option while the instrument is running to view its running status.

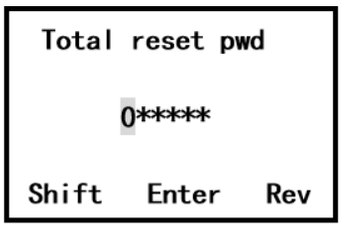


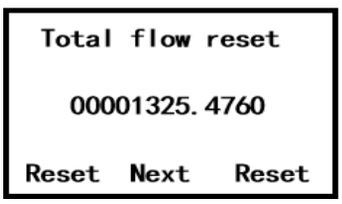


3. 5 Reset

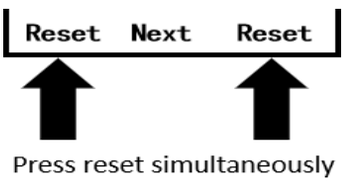
Accumulated values will be cleared. To prevent illegal clearing or malfunction of accumulated values, you must enter a password (the initial password is 000000, and can be changed in the password menu) to access the clear option.



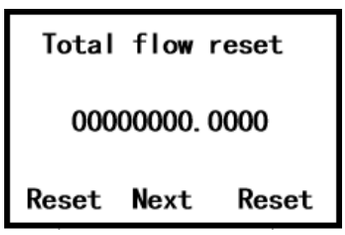




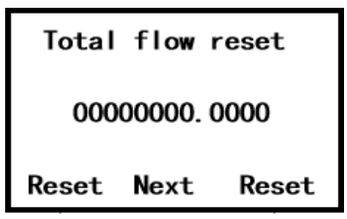
In the password reset interface, move the cursor with the SHT key, modify the value with the MODE key, enter the correct password, a nd press the SET confirmation key to enter the reset interface, and t he current accumulated flow value will be displayed.

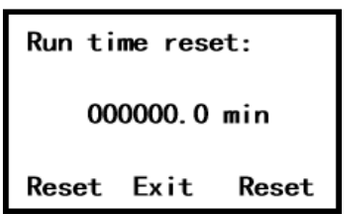


To prevent incorrect operation, perform the reset operation by simultaneously pressing the SHT and MODE keys with both han ds.



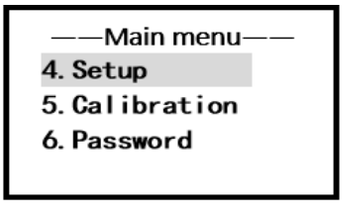
The zero clearing success screen displays 00000000.0000. Pres s the SET key to change the item to the Runtime Zero Clearin g interface.
The operation time is reset to 0. The operation time is in minu tes and records the device's initial operation time, with a maxi mum of 8 digits.(The reset steps are the same as the accumul ated flow reset operation.)

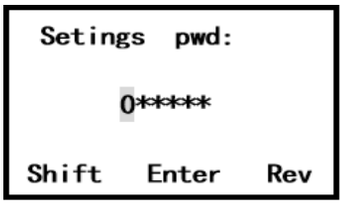




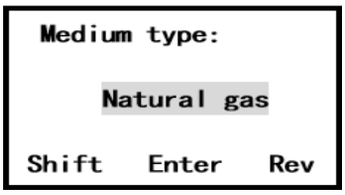
3.6 Setup

The Settings option configures some parameters required for device operation. To prevent user error, a password is required (the default password is 000000, which can be changed in the Password menu). Enter the correct password and enter the Settings interface.



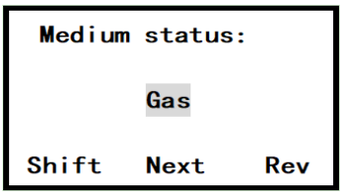


3.6.1 Fluid selection

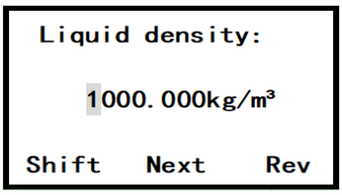


Modifying the instrument measurement fluid results in different selected instrument measurement media and different parameters to be set, which in turn results in different interfaces to be entered.
The table below shows the different pages to be set for each medium, and all interface elements outside the table are set exactly the same.
There are nine media to choose from:

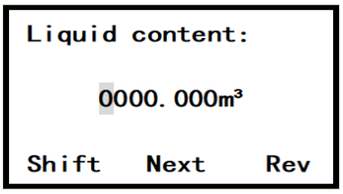
1. Saturated Steam Temperature Compensation
2. Saturated Steam Pressure Compensation
3. Superheated Steam
4. Automatic Steam Compensation
5. Standard Temperature and Gas Pressure Volume
6. Gas Quality
7. Liquid Quality
8. Liquid Volume
9. Natural Gas



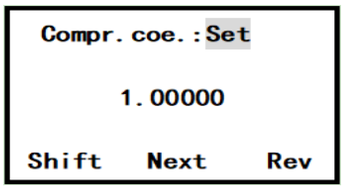
If the medium type is natural gas, the medium state, liquid density, and liquid content must be set.If the medium type is gas, the interface between liquid density and liquid content can be ignored.

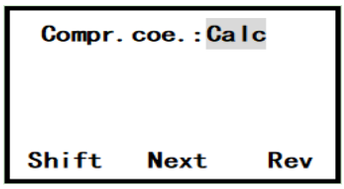


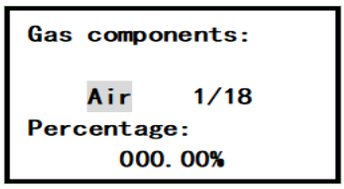
When the medium state is a gas-liquid mixture, there are two interfaces:



3.6.2 Density setting



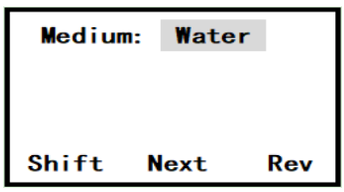


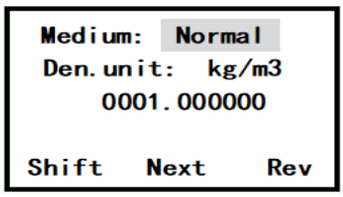


If you select the medium as the gas standard temperature and pressure volume and gas mass, you must set the compressibility of the gas. Setting the compressibility coefficient allows you to directly enter the compressibility coefficient value for operation. If you select "Calculastion" as the compressibility coefficient, you must set the ratio of each component.

If you select "Calculation" for the compression factor, you must set the ratio of each component in the gas, and the system will automatically calculate the compression factor.If the percentage content of a single item is 100%, you cannot select other components. If the percentage content of a single item is less than 100%, you must switch to setting the ratio of other components to achieve a total of 100%. If the percentage content is insufficient, the system will display the message "Media composition error!"

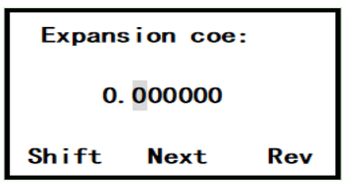
3.6.3 Density setting





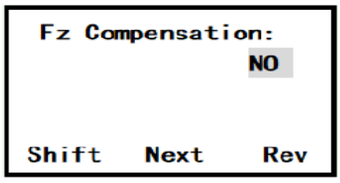
When selecting the liquid volume and liquid quality for the medium, a medium selection interface will appear, allowing you to select other liquids and liquid CO2. When selecting other liquids, set the medium density. Be sure to specify the units when setting.If you select "liquid CO2," the device calculates the density of "liquid CO2" at different temperatures without setting the density. This parameter is only applicable to the liquid mass and liquid volume.Media Standard Temperature and Pressure Density: Set the density of the measured medium to 20°C and 1 atm (0.1325 kPa). Be sure to specify the units when setting.This parameter is only applicable to the gas standard temperature and pressure volume and gas quality.

3.6.4 coefficient of volume expansion



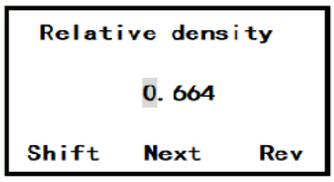
Volumetric coefficient of expansion, a parameter used to compensate for density when measuring liquids.

3.6.5 Modify the compression coefficient



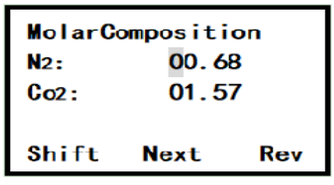
A parameter used in natural gas measurement that sets whether to compensate using the overcompression coefficient.

3.6.6



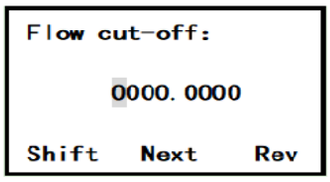
Relative density is a parameter used in natural gas measurements. The density of natural gas relative to air (at standard temperature and pressure) is dimensionless.This parameter is provided in the gas analysis report.

3.6.7



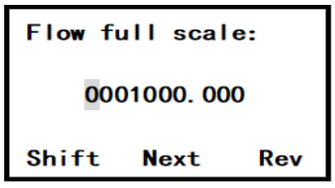
Sets the mole percentages of nitrogen and carbon dioxide.This is the mole percentage of nitrogen and carbon dioxide contained in natural gas.This parameter is provided in the gas analysis report.

3.6.8



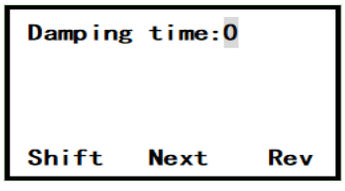
The low-frequency cutoff is used to prevent interference. If the interference signal flow is less than this setting, the meter automatically sets the flow to zero, allowing for better suppression of low-frequency interference.

3.6.9



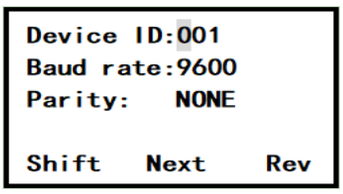
Flow range, sets the maximum range of the meter corresponding to a 20mA value of current output.

3.6.10



The input range for filtering time is 0-9.If the field flow display fluctuates too much to affect the reading, increase the filtering time to stabilize the reading.

3.6.11 RS485 communication related settings

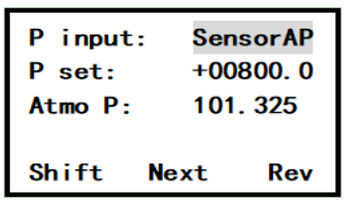


RS485 communication requires setting the meter number, communication speed, and communication check bit.Table number setting range: 001-254,Baud rate: 1200, 2400, 4800, 9600, 19200, 38400, Check: Unchecked,Odd check, Even check

3.6.12 Temperature signal collection mode and temperature setting

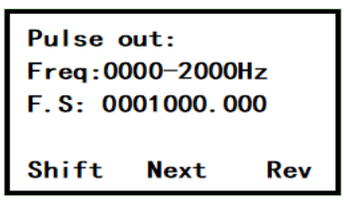
Temperature signal acquisition mode and set temperature.The valid range for temperature input is -999.9 to 999.degree-day:°C.When the temperature signal acquisition mode is set to: Set, the instrument compensates according to the set temperature. Standard temperature and pressure temperature: Calculated data for gas measurements.Temperature parameter settings: Temperature input has two options: Sensor and Set.When the temperature input is Set, the instantaneous flow is calculated and the sensor is not called to collect the temperature.The temperature input is the sensor, and the instantaneous flow calculation uses the temperature data collected by the sensor.If the data collected by the temperature sensor is abnormal, the instrument calls the set temperature for flow calculation. Standard temperature and pressure temperature are temperature parameters for gas standard temperature and pressure volume and gas mass conversion.

3.6.13 Pressure Input



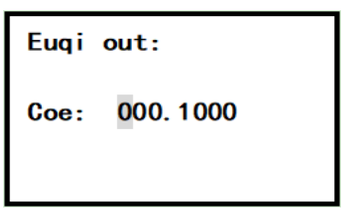
There are three pressure input modes: gauge pressure setting, absolute pressure setting, and absolute pressure/gauge pressure sensor. When the pressure signal acquisition mode is set to the following, the instrument compensates according to the set pressure, and the set pressure value is the absolute pressure value of the instrument operating parameter, in KPa, sensor: the instrument acquires the pressure signal through the pressure sensor, and atmospheric pressure: the local atmospheric pressure value, the parameter used for setting the local average atmospheric pressure and calculating the flow rate is kPa.

3.6.14 Pulse output settings



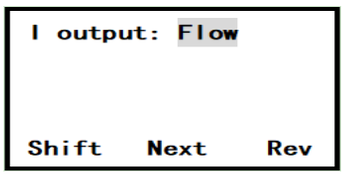
Pulse output settings, frequency and range settings, maximum frequency is 5000.

3.6.15 Equivalent output settings



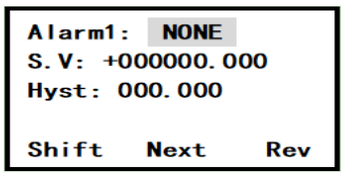
Equivalent output setting, maximum equivalent output frequency is 1000.

3.6.16 Current output



When selecting current output and variables for current output, you can select standard temperature and pressure flow and differential pressure.

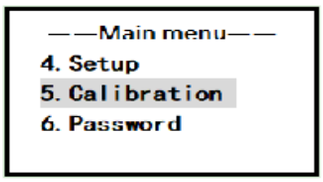
3.6.17 Alarm

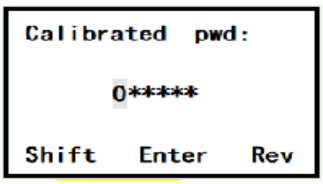


This device supports two alarms, allowing you to configure alarm content, alarm thresholds, alarm return differential, and other information. The main alarms include lower flow rate, upper flow rate, lower temperature, upper temperature, lower pressure, upper pressure, lower differential pressure, upper differential pressure, upper differential pressure, upper differential pressure, upper differential pressure, and no alarm.

3.7 correction

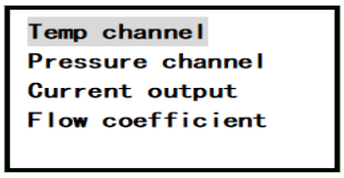
The Calibration option sets the parameters required to calculate the meter's flow rate. These parameters are engineer-level. Changing them will affect the accuracy of the flow measurement. Do not attempt to change them unless authorized by a non-expert.To prevent human error, you must set a password for this option (default password: 000000, changeable in the password menu). After entering the correct password, you can then enter the calibration parameter settings.

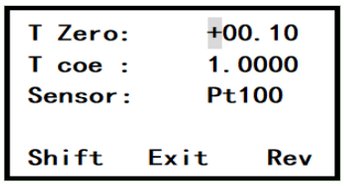




Calibration channel selection: Move the keys on this interface to select the channel to be set.

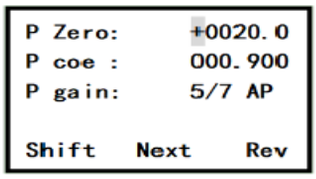
3.7.1 Temperature correction





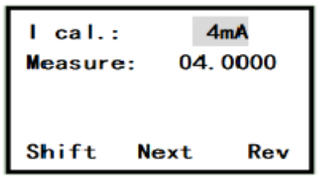
Temperature Zero Point: The temperature collected from the sensor plus zero is the operating temperature. This parameter is for temperature coefficient and multi-compensation. If no compensation is performed, this is set to 1.Temperature Coefficient: The current acquired temperature is compensated for by multi-compensation. If no compensation is performed, this value is set to 1.Sensor Type: You can now select Pt100 or Pt1000.

3.7.2 Pressure correction

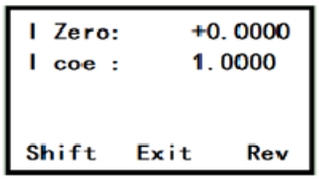


Selecting "Pressure Sensor" as the pressure input mode will enter the sensor calibration parameter setting interface. Entering the pressure calibration parameters will calibrate the pressure collected from the sensor. This setting is no longer required once the pressure is set.Pressure Zero: The current sensor acquisition pressure plus this value will be the current instrument operating pressure.Pressure Coefficient: The current acquisition pressure is compensated by multi-compensation. If no calibration is performed, this value is set to 1.Pressure Gain: This is the multiplier of the collected signal when collecting pressure sensor signals. Gauge Pressure/Absolute Pressure is set as the sensor type. Absolute Pressure indicates that the instrument is connected as an absolute pressure sensor, while Gauge Pressure indicates that the instrument is connected as a gauge pressure sensor.

3.7.3 Current output calibration



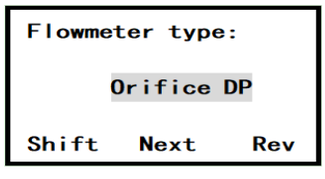
The measured current value is output to calculate the zero point and coefficient for current calibration.If 4mA is selected, the instrument outputs 4mA. Then, enter the measured data from the standard instrument into the measured current value field. Move the cursor to 4mA, press the 2 key to select 20mA, and output it. Then, enter the measured value into the measured current field and press the 2 key to view the current zero point and current coefficient in the following interface. If 4mA is input, the range is 3.5 to 4.5.



When 20mA is between 18 and 18-22mA, a new zero and coefficient are recalculated. If it exceeds 20mA, the original zero and coefficient are maintained. The correction is based on the original zero and coefficient.After the current output calibration is complete, press the SET key to confirm the current coefficient and current zero, and then enter the calibration parameters to adjust the full scale of the output zero and current.Note: Modifying this parameter will turn off the current output. Do not set this parameter if the system connected to the instrument is operating with the current output.

3.7.4 Flow correction

Setting Interface 1: Flowmeter Type Option



This option allows you to modify the type of flow sensor.Different parameters are required depending on the type of flow sensor, and therefore the interface for entering them varies.There are several differential pressure sensors to choose from:

1.Pore plate

2.V cone

3.A Niu ba

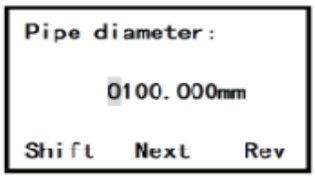
4.Angle pipe

5.K coefficient

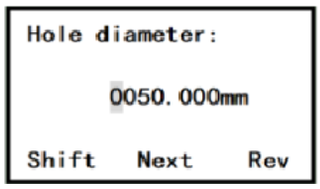
6.Differential pressure flow

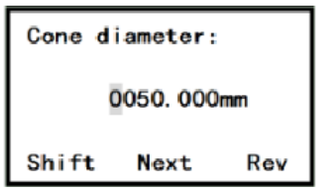
	Flowmeter type	Pipe diameter	Hole diameter	discharge coe.	BD ratio	Flow coe.	Stream exp.coe	Scale flow	Design denaity	Ratio of diame
	Interface 1	Interface 2	Interface 3	Interface 4	Interface 5	Interface 6	Interface 7	Interface 8	Interface 9	Interface 10
Flowmeter type	Orifice DP	√	√	√			√			
	V cone DP	√	√	√			√			
	Annubar DP	√		√			√			
	Elbow DP	√		√	√		√			
	K coe			√						
	DP Scale							√	√	
	Wedge DP	√		√			√			√

Setting Interface 2: Inner Diameter of Pipeline

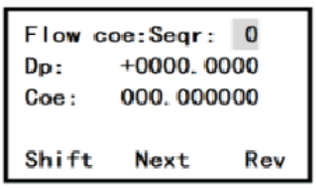


Setting Interface 3: Diameter of Opening



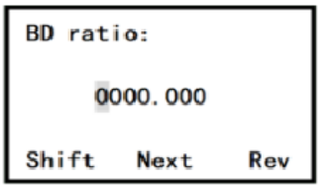


Setting Interface 4: Outflow Coefficient



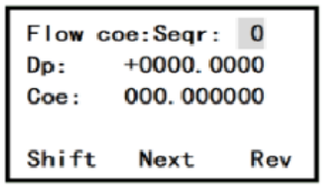
Because the discharge coefficient c is not necessarily constant, dividing C into 10 intervals for interval calculation improves measurement accuracy.This coefficient is applicable to orifice plate and V-cone flow meters.

Setting Interface 5: Bending Diameter Ratio



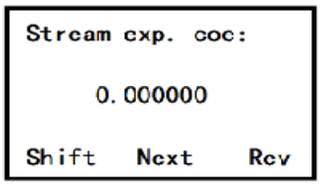
Bending diameter ratio of elbow flow sensor used only in elbow flow meters;

Setting Interface 6: Flow Coefficient



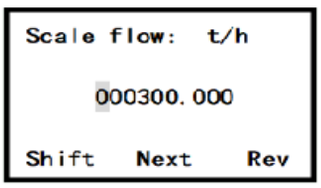
Because the flow coefficient k is not necessarily a constant, K is divided into 10 sections for subsection calculations to improve measurement accuracy.This coefficient is applicable to A Niu Bar and K-factor elbow flow meters.

Setting Interface 7: Flow Expansion Coefficient



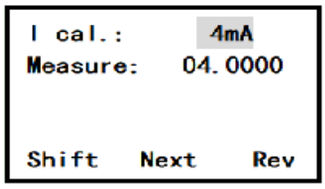
Beam expansion coefficients are used to calculate dimensionless flows.

Setting Interface 8: Scale Flow



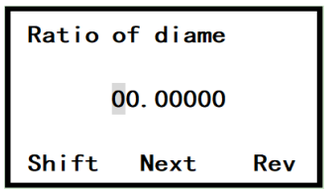
The flow rate corresponding to the maximum differential pressure when designing a flow sensor. This parameter is used only to scale the flow.

Setting Interface 9: Design Density



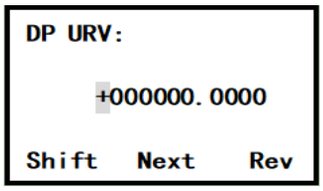
The intermediate density used when designing flow sensors.
This parameter is used only to compensate for flow rate.

Setting Interface 10: Ratio of Diameter



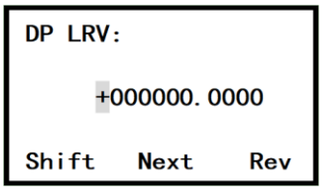
If the flow meter type is a Wedge flow meter, you must enter the diameter ratio.

Setting Interface 11: Upper Limit of Differential Pressure



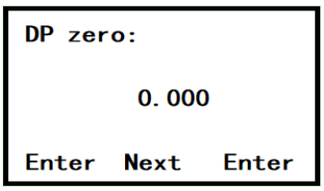
Upper differential pressure range limit of the differential pressure transmitter (in kPa);

Setting Interface 12: Lower Limit of Differential Pressure (차압 하한)



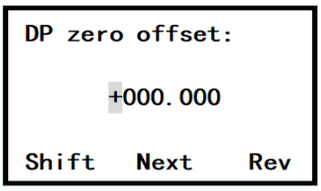
Lower differential pressure range limit (kPa) of multi-parameter transmitters

Setting Interface 13: Differential Pressure Zero Adjustment (차압 제로셋)



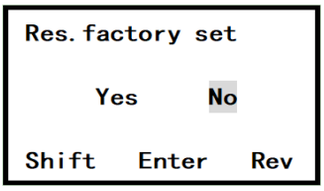
When the sensor input is 0, the lower limit does not become 0 due to changes in the measured value caused by some influence, so the differential pressure 0 must be transmitted, and the value displayed at this time is sensor 0. When adjusting, first confirm that the sensor input is 0, and then press the SHT key and INC key simultaneously to complete the setting.

Setting Interface 14: Differential Pressure Zero Offset (차압 제로 offset)



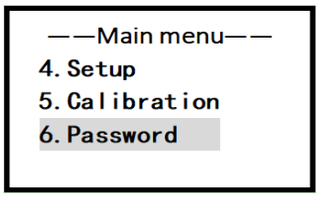
Due to differences in the installation of differential pressure transmitters, each transmitter has its own differential pressure zero offset, so you can enter this value for compensation.

Setting Interface 15: Restore factory parameters (출고시 매개변수 복원)

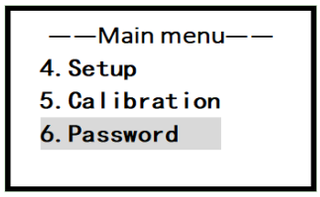


All parameters will be restored to factory defaults. To restore factory settings, press the SHT key to move the cursor to "Yes", and then press the SET Confirmation key to restore factory settings.

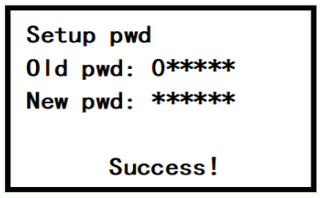
3.8 Password Settings



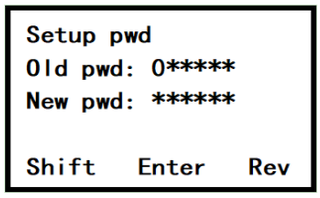
This option allows you to change the passwords for Clear, Settings, and Calibration, respectively (clearing, calibration, and settings are the same).Only changing the settings password is described here).Enter the password selection interface, select the item to be modified, enter the old password, then enter the new password in the New Password field. Then, press the SET key to confirm.If the old password is entered correctly, a message indicating successful modification will appear and you will automatically be taken back to the main interface. Otherwise, a message indicating unsuccessful modification will appear.



Password Modification Selection Interface: Select the password setting for the corresponding module using the SHIFT key.



Password modification interface: Enter the password, and if it is correct, you will be notified that the password has been successfully modified. Otherwise, you will be taken to the main interface.



1. Protocol overview

1.1 Communication protocol

This flowmeter uses MODBUS RTU protocol (Slave). Electrical Interface: RS485 2W
Serial communication of parameters: (baudrate=1200 /2400/4800/9600 bps
start bits=1, databits =8, parity= no, stopbits =1)

1.2 Frame format

Address	Function code	Data	CRC	End
8 bit	8 bit	n*8 bit	16 bit	T1-T2-T3-T4

Two frames are separated by a silent interval of at least 4 character times (T1-T2-T3-T4).

1.3 Address

Address range: "1-255"

2. Command

2.1 This flowmeter supply command

Function code 03 (Read-Only)	Read single or multiple hold registers

2.2 Data frame

Data fromat: Integer/Float:
32 Float of format is IEEE754 , Single precision(4 bytes), order of sequence is 3-4-1-2.
After conversion to 1-2-3-4 order , From high to low were 31, 30, 29, 0, etc.....

31	30-23	22-0
Sign	Exponent	Fraction

Laid out as bits, floating point numbers look like this:
Single: **SEEEEEEE EMMMMMMM MMMMMMMM MMMMMMMM**
The sign bit 0 denotes a positive number, and 1 denotes a negative number.

Function code 03 (Read single or multiple hold registers):

MODBUS Request For example

Address	1 BYTE	01-255
Function code	1 BYTE	03
Starting Address	2 BYTE	0x-0xFFFF
Quantity of Registers	2 BYTE	1-20
CRC Low-Order Byte	1 BYTE	
CRC High-Order Byte	1 BYTE	

MODBUS Reponse

Address	1 BYTE	01-255
Function code	1 BYTE	03
Byte count	1 BYTE	2*N (N = Quantity of Registers)
CRC Low-Order Byte	1 BYTE	
CRC High-Order Byte	1 BYTE	

For example

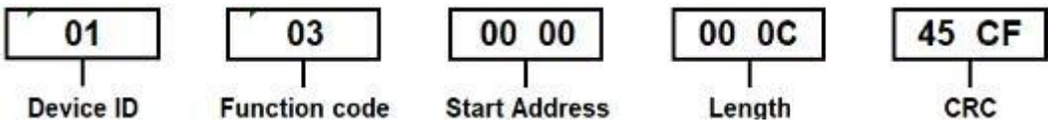
Request		Reponse	
Domain name	Data (HEX)	Domain name	Data (HEX)
	01	Address	01
Function code	03	Function code	03
Starting Address (High)	00	Byte count	08
Starting Address (Low)	00	Registers high (0001)	0C
Quantity of Registers (High)	00	Registers low (0001)	E8
Quantity of Registers(Low)	04	Registers high (0002)	C2
		Registers low (0002)	FB
		Registers high (0003)	C9
		Registers low (0003)	26
		Registers high (0004)	C3
		Registers low (0004)	7B
CRC Checking		CRC Checking	

2.3 Data item define

R/W	Registersad dress	Read a ddress (HEX)	Data length	Data type	Description
R	40001-2	0x00	2	SINGLE	Medium temperature (℃)
R	40003-4	0x02			Medium pressure (kPa)
R	40005-6	0x04			Differential pressure (kPa)
R	40007-8	0x06			Flow
R	40009-10	0x08			Total of more than one hundred
R	40011-12	0x0A			Total of less than one hundred

Read data register (in this case, the meter data read)

Master request:



Response frame from slave:

01 03 18 00 00 41 C8 00 00 41 70 00 00 40 80 00 00 41 F3 00 00 40 80 1B 11 42 86 D4 E2

01 03 18: Device ID, Function code, Number of bytes

00 00 41 C8: 25.0℃; Temperature

00 00 41 70: 15.0 kPa; Pressure

00 00 40 80: 4.0 kPa; Differential pressure

00 00 41 F3: 30.375 m^3/h;

00 00 40 80: 4.0 m^3, Total of more than one hundred; 67.0528 m^3, Total of less than one hundred;

1B 11 42 86: Cumulative flow=4.0*100+67.0528=467.0528 m^3;

D4 E2: CRC check

Protective Measures

- An internal fuse is installed to protect the circuit from overvoltage.
- While a circuit-breaker is provided to protect the flow meter from reverse voltage input, it does not operate.

Maintenance (A/S)

The FN-Mass Flowmeter's computing device is safely protected by a protective device. Do not disengage the interlock device to maintain the protective structure.

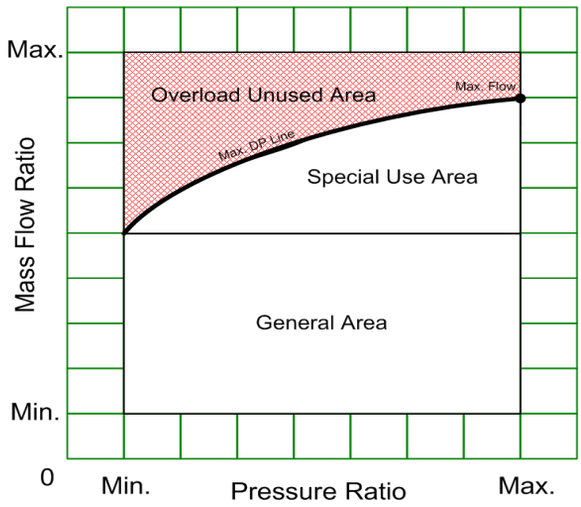
- Do not remove the blanking element that seals the opening.
- Do not open the protective device while the device is energized.
- Do not remove the protective device while the device is energized.
- Do not open the protective device when explosive gases may be present.
- When removing the FN-Mass Flowmeter, open the equalizing valve of the 3-way block valve to equalize the pressure. Then, completely close the valves on the low and high pressure sides and disconnect the FN-Mass Flowmeter from the block valve.
- Replacement of the FN-Mass Flowmeter must be performed only by our maintenance specialists.

Usage Areas

FN-MASS usage areas are divided into the general use area, special use area, and overload unused area. The general use area can be used across the entire pressure range. The special use area is the area outside the general use area where flow rate display is possible. The overload area is the area outside the flow rate display limit line.

Before installing the flow meter, the user should inform the supplier of the pressure range (minimum and maximum values) for flow rate use so they can set the general use area.

When the differential pressure sensor reaches the max. DP line, the alarm warning light A1 will flash.



Quality Assurance

Golden Rule's KC-7730 is thoroughly managed under the ISO 9001 quality assurance system.

Free service is limited to cases occurring under normal use within the warranty period (one year from shipment). The following cases will be subject to paid service:

① Failures occurring in products beyond the warranty period.

② Failures not repaired by the company or caused by arbitrary modifications to the product's structure, performance, or function.

③ Failures caused by user negligence or inexperience.

④ Failures caused by incorrect power connection or power supply failure.

⑤ Failures caused by defective peripheral devices.

⑥ Failures caused by natural disasters.For failures occurring after the warranty period or due to user negligence, we will provide repair support at the lowest possible cost, applying actual expenses.

Golden Rule's mass flow meters are tested and shipped in compliance with the certification requirements of the certification agency.

Golden Rules

www.goldenrules.co.kr

Air & Gas & Steam & Liquid
Mass Flowmeter
Specialized Manufacturer

Detailer

Certified in accordance with
KC Q ISO 9001 : 2015
KC Q ISO 14001 : 2015

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