

Patton

Ultrasonic Flowmeter Instructions Manual

Model:UF200



www.mixgauge.com

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Updated Information:

1 Overview

UF200 ultrasonic flowmeter adopts the measurement principle of transit-time method, relies on high-reliability signal processing circuits, and accurately measures flow rate through complex algorithms such as sampling, calculation, and correction. The product is designed with an integrated external clamping structure for quick and easy installation and operates without direct contact with the fluid medium, effectively avoiding interference with existing production processes. Accurate flow measurement can be realized in just a few simple steps. For small pipe diameter flow measurement needs, UF200 clamp-on ultrasonic flowmeter is undoubtedly the best choice.

2 Product Features

- Easy installation, No breaking pipeline
- No need to adjust, Clip on to measure
- LCD color display screen
- 360° rotatable display screen

3 Technical Parameter

3.1 Dimension



GFCL Dimension

Pipe Size Comparison Table							Unit: mm
Model	Nominal Inner Diameter of Pipe	W1	W2	L1	L2	H1	
GFCL	DN15	42	42	96	110	63	22.5
	DN20	42	59.5	96	110	69.5	29
	DN25	42	59.5	96	110	76	35.5
	DN32	42	64.5	96	110	83	42.5
	DN40	42	76.5	96	110	95	54.5
	DN50	42	85.5	96	110	104	63.5

3.2 Product Categories

Model	Specifications	Description		
		Output	Application Industry	Pipe Size
GFCL	EM -DNxx	4~20mA	Equipment Matching	DN15~DN50
	HC -DNxx	4~20mA	Healthcare	DN15~DN50
	AQC -DNxx	4~20mA	Aquaculture	DN15~DN50
	AGC -DNxx	4~20mA	Agriculture	DN15~DN50



Noted:

Products have been configured with application industry options at the factory, please refer to the table above.

3.3 Technical Index

Performance Index	
Flow Velocity	0.03m/s ~5.0m/s
Accuracy	! 2%,” 0.3m/s ~5m/s#
Repeatability	0.4%
Pipe Size	DN15\$ DN20\$ DN25\$ DN32\$ DN40\$ DN50
Medium	Water
Pipe Material	Stainless Steel, PVC, Copper, PPR
Functional Index	
Communication Interface	RS485, Support MODBUS Protocol
Output	4~20mA
Power Supply	10% 36VDC/500mA
Keyboard	3 touch keys
Display Screen	1.54"LCD color screen, resolution 240*240
Temperature	Transmitter: 14& to 122& (-10’ ~ 50’) Transducer: 32& to 140& (0’ ~ 60’)
Humidity	Relative humidity 0~99%, No condensation
IP	IP54
Physical Characteristics	
Casing Material	PC engineering plastic
Clamp Material	Please choose one: aluminum alloy material or PC (Polycarbonate) engineering plastic
Transmitter	All-in-one
Transducer	Clamp on
Cable	5 black six-core shielded cable with self-locking connectors, standard length: 4m

- The accuracy is obtained by Gentos flow calibration facilities. Errors may occur due to the type of pipeline, fluid type, temperature, etc. used by the customer.

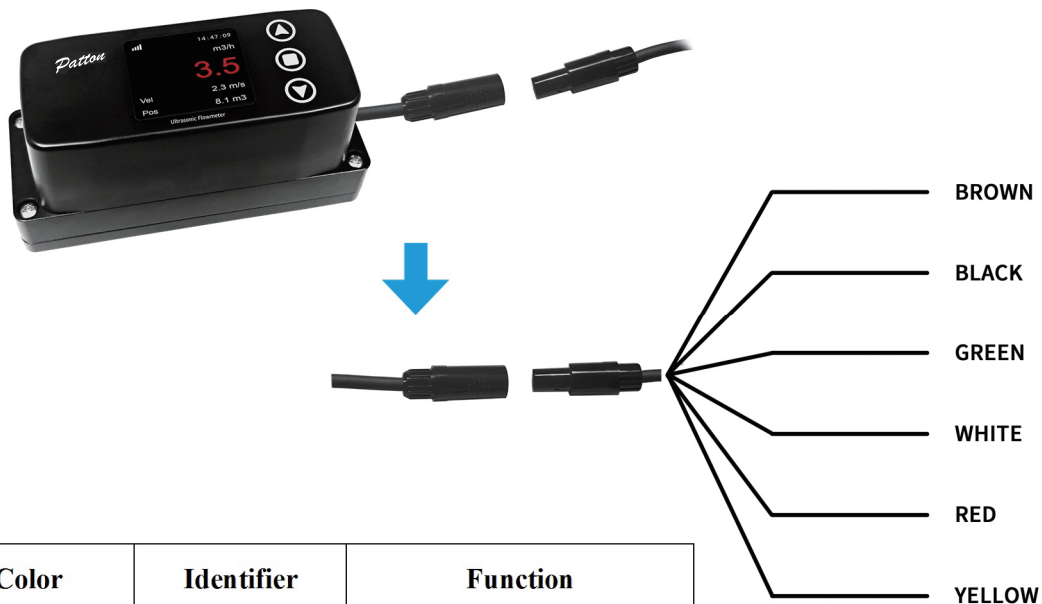
4 Installation and Wiring

4.1 Installation Description

1. Carefully read "Section 7. Choose Measurement Point". After the designated location is selected, the area outside the pipe to be installed must be cleaned, and select the dense part of the pipe for installation.
2. The special coupling sticker of the company is pasted on the center of the sensor, the sensor will be coupling paste extrusion to the pipe wall, so that the sensor and the pipe wall between the tight fit, no air bubbles exist.
3. The direction of the arrow on the nameplate of the instrument should be consistent with the direction of the fluid in the pipeline.

4.2 Meter Wiring





Refer to the following diagram for meter wiring



Color	Identifier	Function
Brown	+	10~36VDC power supply
Black	-	Power ground
Green	A	RS485+
White	B	RS485-
Red	I+	4~20mA+
Yellow	I-	4~20mA-

4.3 Fast installation steps

This flowmeter adopts integrated design. It is easy to install and set parameters in a few steps. It can be directly clamped on the pipe section. After connected to the power supply, the flowmeter can realize flow measurement.

<p>Step 1 Cleaning pipes</p> <p>Perform pipe surface treatment to remove impurities such as paint, rust, dirt, etc. that are easily removed from the surface.</p>	
<p>Step 2 Installation of Pipe Clamp</p> <p>Snap the upper and lower pipe clamps to the selected location on the pipe. If looseness is found, adhesive pads may be applied to the inside of the lower clamps to enhance the tightening effect.</p>	
<p>Step 3 Tighten the screws.</p> <p>Tighten the 4 screws connecting the upper and lower hose clamps securely to ensure stability and no looseness.</p>	
<p>Step 4 Power on and start measurement</p> <p>Set the actual pipe outer diameter, wall thickness and pipe parameters through the "Pipe Parameter Setting" menu item to make the measurement more accurate.</p>	



- If the pipe clamp is still loose after locking, the black rubber pad (2mm thick) attached to the accessory bag can be pasted on both sides of the inner wall of the pipe clamp.

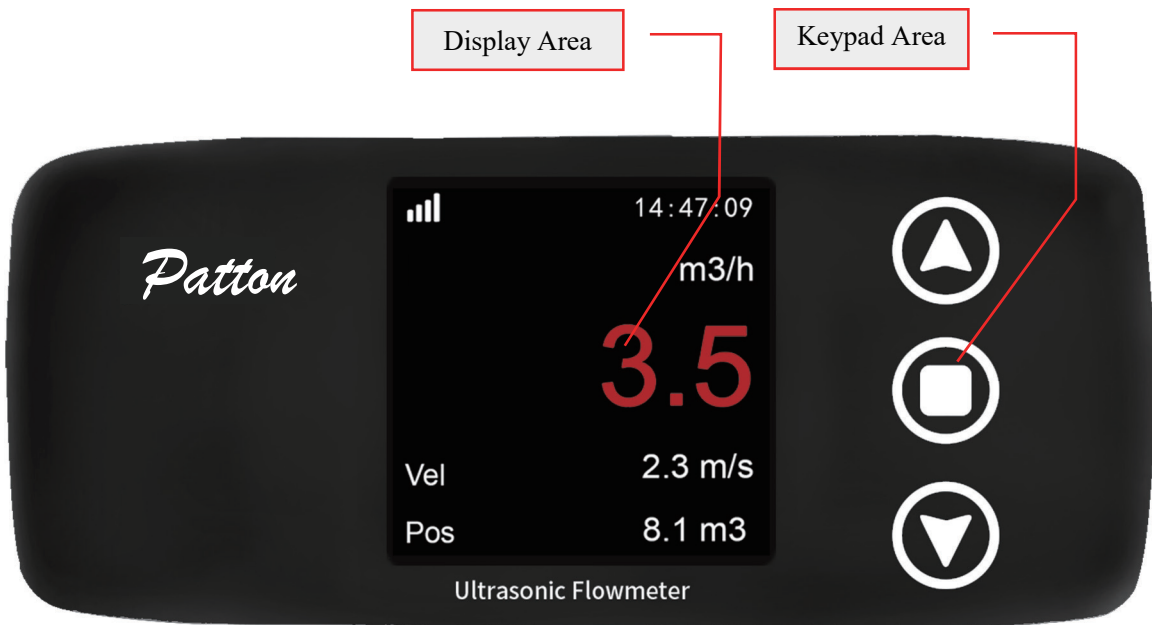


Paste rubber pad

5 Display and Setting

5.1 Display Description

Display Type	Display Content	Description
Upper part of display area		Indicates measurement status (Display  : Indicates normal measurement Display) : Indicates that the signal is being searched
	18:19:35	Display the current time
Central part of the display area	Flow rate	Display instantaneous flow rate
Lower part of the display area	Flow velocity	Display of instantaneous flow velocity
	Cumulative amount	Display cumulative flow rate Automatically clears when the cumulative flow value reaches 999999999.9.



5.2 Key Description

The UF200 flowmeter has three buttons, and the operation instructions are shown in the following table:

Key	Main menu	Main menu interface	Sub-menu interface	Setting interface		
				Option Setting	Digital Setting	Calibration Setting interface
▲	/	Press up to select main menu item	Press up to select Sub-menu menu item	Press up to select sub-menu item	Press to increase the number	Press to increase value
■	Press and hold to enter the main menu screen	1.Press to enter the secondary menu 2.Press and hold to return to the display interface	1.Press to enter the setting interface 2.Press and hold to return to the main menu interface	1.Press to enter the option setting interface 2.In the sub-menu items, press to save settings and return to the previous level. 3.Press and hold to save settings and return to the previous level.	1.Press to enter the digital setting interface 2.Press in the digital interface and move the cursor bit. 3.Press and hold to confirm and return to the previous level	1.Press and hold to confirm and return to the previous level
▼	/	Press down to select main menu item	Press down to select sub-menu item	Press down to select sub-menu item	Press to reduce the number	Press to decrease the value

6 Menu Window Description

6.1 Menu Interface

Main menu interface	Sub-menu interface	Setting interface	Description
1. Pipe Setup	1.Pipe Material	1.Stainless Steel 2.PVC. 3.Copper 4.PPR	Select the pipe material. In the setting interface, there will be a check mark on the right side of the selected item. The same goes for the following.
	2. Outside Diameter	Different pipe diameter specifications correspond to different pipe outer diameter ranges.	Enter the outer diameter of the pipe and set the pipe diameter parameters of the purchased product. The pipe outer diameter range has been set at the factory. For more details, please refer to Appendix 1—Pipe Diameter Comparison Table. For example: if you select DN32 steel pipe, the effective input range of the pipe outer diameter is (36~42.5) mm.

Main menu interface	Sub-menu interface	Setting interface	Description
	3.Wall Thickness	0.5mm~1/3 pipe outer diameter	The minimum value is 0.5mm, and the maximum value cannot exceed 1/3 of the outer diameter of the pipe. (Different pipe diameter specifications correspond to different pipe wall thickness ranges.) Please enter the actual pipe wall thickness parameters. Inaccurate parameter input will affect the measurement accuracy.
2.Output Setup	1.4~20mA	1. Mode	1.Flow mode: Set the current loop output to 4~20mA corresponding to the flow rate 2.Flow rate mode: Set the current loop output to 4~20mA corresponding to the flow rate
		2. Current Loop 4mA	Set the corresponding value of the current loop 4mA output
		3. Current Loop 20mA	Set the corresponding value of the current loop 20mA output
	2.RS485 Setup	1. Baud rate	There are 8 baud rates to choose from, 4800, 9600, 19200, 38400, 50400, 57600, 76800, 115200
		2.Network ID	The network identification address code is taken from 1 to 247
3.Unit Setup	1. System units	1.Metric unit , 2.imperial unit	Select metric, imperial units
	2. Flow unit	1.m ³ /h, 2.m ³ /m, 3.L/h, 4.L/m, 5.Gal/h, 6.Gal/m	Select instantaneous flow units
	3. Total unit	1.m ³ , 2.L, 3.Gal	Select cumulative flow units
4.System Setup	1. Clear Totalizer	1. No, 2. Yes	Clear the accumulation, select "Yes" to clear the accumulation.
	2.Damping Factor	1~99 seconds	Enter the damping coefficient, which acts as a smoothing factor for the displayed data. Usually a value between 3 and 10 is entered in the application.
	3.Low Flow Cut Off	* 0.25m/s	Cut out for low flow rates. This allows the system to display a "0" value at low flow rates to avoid ineffective accumulation. The factory default cutout value is 0.03m/s.
	4.Date- time	1. Date 2. Time	Set current time, year-month-day, hour:minute:second
	5. Language	1.English 2.Chinese	Chinese-English Selection

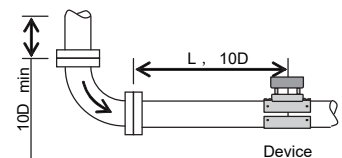
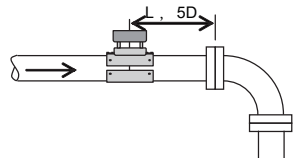
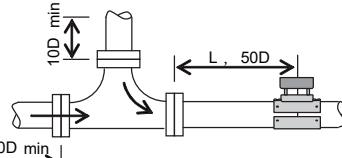
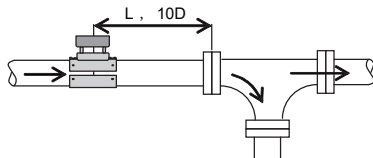
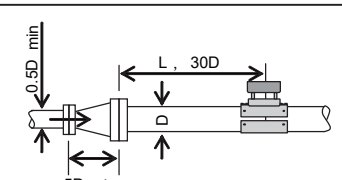
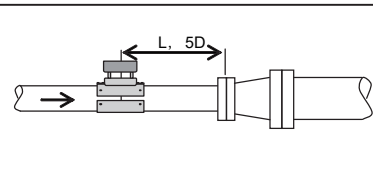
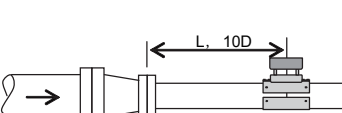
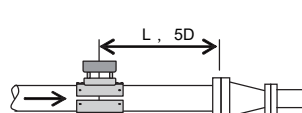
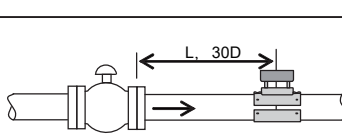
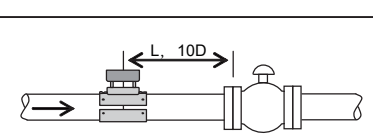
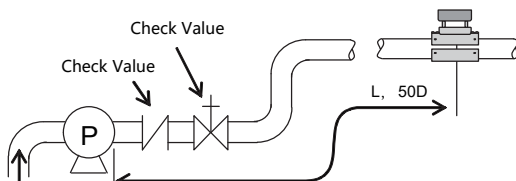
Main menu interface	Sub-menu interface	Setting interface	Description
	6.Screen Orientation	1. 0+ .2. 90+ . 3. 180 + .4. 270+	Rotate the screen to set the direction of the screen display, and the key functions will automatically adapt with the screen direction change
	7.System Lock	xxxxxx	Enter the new password, prompted to close the system lock or open the system lock, choose to open the system lock, the system is locked, prohibit any modification of the parameters of the operation, can only view the main interface parameters, thus protecting the normal operation of the instrument. The only way to "unlock" is to enter the original password correctly. The password is a 6-digit number. "000000" is invalid password.
	8.Buzzer Switch	1. Close, 2. Open	Setting the on/off state of the buzzer
	9. Factory Data Reset	1. No 2. Yes	Clear all setup parameters and restore them to the original factory defaults. Select "Yes", this operation will erase all user data (except cumulative amount) and change them to the factory defaults, so please be careful with this operation.
5.Calibration Setup	1.4-20mA Calibration	1.4mA Calibration 2.20mA Calibration	Adjust the output current with the ▲ key and ▼ key. External precision ammeter to flow meter current output (red +, yellow -)
	2.Set Zero	1. No 2. Yes	When the fluid is static, the value of the instrument is called the "zero point". When the meter's "zero point" is not zero, at any moment the zero point will be superimposed on the true value of the flow rate, so that the measurement of the meter deviation. It must be removed. Select "Yes" and wait for the process to complete.
	3. Clear Zero	1. No 2. Yes	The set zero point is restored. Select "Yes" to clear the user-set "zero point".
	4. K Factor	0.5~1.5	Known as the meter K-factor, it is used to correct flow measurements. (Factory Calibrated)
6. Device information	1.Serial Number	vxxxxxxxx	Flowmeter Factory Number
	2.Firmware Number	V1.x.x	Software Version

7 Choose Measurement Point

The flowmeter is simple and convenient to install. As long as a suitable measuring point is selected, Clamp the product sensor surface on the pipe section directly and fix the pipe clamp, and then the power is turned on, the flow measurement can be realized.

When selecting measuring points, it is required to select pipe sections with uniform fluid flow field distribution to ensure measurement accuracy. The following principles shall be followed during installation:

- Select a pipe segment that is filled with fluid, such as the vertical part of the pipe line (the fluid is better to flow upward) or the horizontal pipe segment that is filled with fluid.
- The measuring point should be on a uniform straight pipe section with 10 times the diameter (10D) from the upstream and 5 times the diameter (5D) from the downstream. There are no valves, elbows, reducers and other devices interfering with the flow field within this range. The length of the straight pipe section is recommended to use the values shown in the following table.
- Ensure that the temperature at the measuring point is within the working range.
- Fully consider the scaling condition on the inner wall of the pipe, try to select the pipe section without scaling for measurement, and select the pipe section of uniform and dense pipes so as to make ultrasonic transmission easier.

Name	Straight length of U pstream piping	Straight length of Dow nstream piping
90° bend		
Tee		
Diffuser		
Reducer		
Value	 Flow controlled upstream	 Flow controlled downstream
Pump		

8 Communication Protocol

The flowmeter adopts response communication mode, and the upper computer sends "command" to request the lower flowmeter to respond. The baud rate of asynchronous communication (main workstation, computer system, ultrasonic flowmeter) is generally 9600bps. Single byte data format (10 bits): 1 start bit, 1 stop bit and 8 data bits. Check bit: NONE.

8.1 MODBUS Communication Protocol

The MODBUS protocol of the flowmeter uses RTU transmission mode, and its check digit is obtained by using CRC-16-IBM (polynomial is $X^{16}+X^{15}+X^2+1$, and the mask word is 0xA001) cyclic redundancy algorithm.

MODBUS RTU mode uses hexadecimal to transmit data.

8.1.1 MODBUS Protocol Function Code and Format

The flowmeter protocol supports the following two function codes of the MODBUS protocol:

Function Code	Function Data Represented
0x03	Read Register
0x06	Write Single Register

8.1.2 MODBUS Protocol Function Code 0x03 Usage

The host sent a read register information frame format (

Slave Address	Function Code	Register First Address	Number of Register	Check Code
1 byte	1 byte	2 bytes	2 bytes	2 bytes
0x01~0xF7	0x03	0x0000~0xFFFF	0x0000~0x7D	CRC Check Code

Slave return data frame format (

Slave Address	Read Operation Function Code	Bytes of Data	Data	Check Code
1 byte	1 byte	1 byte	N*x2 bytes	2 bytes
0x01~0xF7	0x03	2xN*	N*x2 data	CRC Check Code

N*- Number of registers for data.

Flowmeter address (address of the flowmeter) ranges from 1 to 247 (hexadecimal: 0x01 to 0xF7), the address can be viewed in the menu "Communication Settings \ RS485 Address", such as the display of the network identification address of 11, then the flowmeter in the MODBUS protocol address is: 0x0B.

The CRC check code of this flowmeter is obtained by using CRC-16-IBM (polynomial is $X^{16}+X^{15}+X^2+1$, mask word is 0xA001) cyclic redundancy algorithm, and the low byte of the check code is in the front and the high byte is in the back.

Example 1: To read the instantaneous flow rate (m³/h) in hourly units of the flowmeter with address 1 (0x01) in RTU mode, i.e., to read the data in the two registers 40005 and 40006, the read command is as follows:

0x01 0x03 0x00 0x04 0x00 0x02 0x85 0xCA

Flowmeter Address Function Code Register First Address Number of Register CRC Check Code

The following data returned by meter (assuming current flow rate = 1.234567m³/h) (

0x01 0x03 0x04 0x06 0x51 0x3F 0x9E 0x3B 0x32
 Flowmeter Address Function Code Bytes of Data Data" 1.2345678# CRC Check Code

The four bytes of 3F 9E 06 51 four bytes is the IEEE754 format single-precision floating-point form of 1.2345678.

Please note the order in which the data is stored in the above example. For the use of C language interpretation of numerical values, you can use pointers to directly put the required data into the corresponding variable address, generally commonly used storage order for the low byte in the first, for example, the above example of 1.2345678m/s, 3F 9E 06 51 data storage order is 06 51 3F 9E.

Example 2. Reading the positive cumulative volume (m3) in m3 of the flowmeter at address 1 (0x01) in RTU mode, i.e., reading the data in the three registers at register addresses 0008, 0009 and 000A, the read command is as follows:

0x01 0x03 0x00 0x08 0x00 0x03 0x84 0x09
 Flowmeter Address Function Code Register First Address Number of Register CRC Check Code

The data returned by the meter is (assuming current positive accumulation = 2.46m3) (

0x01 0x03 0x06 0x00 0xF6 0x00 0x00 0xFF 0xFE 0x29 0x10
 Flowmeter Address Function Code Register First Address Data" 246*10-2# CRC Check Code

The four bytes of 00 00 00 F6 is 246 hexadecimal, which is directly convert hexadecimal data to decimal.

The two bytes of FF FE are -2 power of the 10. As shown in the table below:

MODBUS Data	Corresponding Index Unit	
FFFD	x0.001(1E-3)	10 ⁻³
FFFE	x0.01	10 ⁻²
FFFF	x0.1	10 ⁻¹
0000	x1	10 ⁰
0001	x10	10 ¹
0002	x100	10 ²
0003	x1000	10 ³
0004	x10000(1E+4)	10 ⁴
Positive, negative, net accumulation and energy accumulation are included.		

Example 3. Changing the address of a meter with address 1 (0x01) to 2 (0x02) in RTU mode, i.e., writing the data in the flowmeter 44100 register to 0x02, the write command is as follows:

0x01 0x06 0x10 0x03 0x00 0x02 0xFC 0xCB
 Flowmeter Address Function Code Register Address Register Data CRC Check Code

The data returned by meter (

0x01 0x06 0x10 0x03 0x00 0x02 0xFC 0xCB
 Flowmeter Address Function Code Register Address Register Data CRC Check Code

8.1.3 Error Handling

Only one error code will be returned by flowmeter, which is 0x02 indicating a data first address error.

For example, if you read only the 40002 register data of a flowmeter with address 1 (0x01) in RTU mode, the meter will think that the data integrity destroyed and send the command

0x01 0x03 0x00 0x01 0x00 0x01 0xD5 0xCA
 Flowmeter Address Function Code Register First Address Number of Register CRC Check Code

The error code returned by meter (

0x01 0x83 0x02 0xC0 0xF1
 Flowmeter Address Error Code Error Extension Code CRC Check Code

8.1.4 MODBUS Register Address List

The MODBUS registers of this flowmeter contain read-only registers and single write registers.

Read-only register address list (read with 0x03 function code)

Register Address	Register	Data Description	Data Type	Number of Register	Description
\$0000	40001	Instantaneous flow/sec - low byte	32 bits real	2	
\$0001	40002	Instantaneous flow/sec - high byte			
\$0002	40003	Instantaneous flow/minute - low byte	32 bits real	2	
\$0003	40004	Instantaneous flow/minute - high byte			
\$0004	40005	Instantaneous flow/hour - low byte	32 bits real	2	
\$0005	40006	Instantaneous flow/hour - high byte			
\$0006	40007	Flow velocity - low byte	32 bits real	2	
\$0007	40008	Flow velocity - high byte			
\$0008	40009	Positive accumulative flow - low byte	32 bits int.	2	
\$0009	40010	Positive accumulative flow - high byte			
\$000A	40011	Positive accumulative flow. index	16 bits int.	1	
\$0016	40023	Upstream signal strength - low byte	32 bits real	2	0% 99.9
\$0017	40024	Upstream signal strength - high byte			
\$0018	40025	Downstream signal strength - low byte	32 bits real	2	0% 99.9
\$0019	40026	Downstream signal strength - high byte			
\$001A	40027	Signal quality	16 bits int.	1	0% 99
\$001B	40028	4~20mA output current value - low byte	32 bits real	2	Unit: mA

\$001C	40029	4~20mA output current value - high byte			
\$001D	40030	Error code - characters 1,2	String	3	R=0x52 G=0x47 I=0x49
\$001E	40031	Error code - characters 3,4	Reserved		
\$001F	40032	Error code - characters 5,6	Reserved		
\$003B	40060	Flow velocity unit - characters 1,2	String	2	
\$003C	40061	Flow velocity unit - characters 3,4			
\$003D	40062	Instantaneous flow unit - characters 1,2	String	2	
\$003E	40063	Data Description			
\$003F	40064	Instantaneous flow/sec - low byte	String	1	

Note (

- a) a) The units of accumulation are available as follows:
 - 1. "m3" . Cubic Meter
 - 2. "L" . Litre
 - 3. "Gal" . Gallon
- b) When changing the address or communication baud rate of the flowmeter.the flowmeter will work according to the new address or communication baud rate immediately after returning the response with the original address or communication baud rate.
- c) 16 bits int-represents a short integer, 32 bits int-represents a long integer, 32 bits real-represents a floating point number and String-represents a string.

9 Appendix 1—Pipe Diameter Comparison Table

Pipe Material	Nominal Inner Diameter of Pipe	Applicable Range of Pipe Outer Diameter (mm)		Adapter pipe outer diameter (mm)	Measurable Flow Range [0.03~5m/s] (m3/h)
		Level A	Level B		
Stainless Steel PVC PPR Copper	DN15	18.5~22.5		18.5~ 22.5	0.02~3.5
	DN20	24~29	22.5~27.5	22.5~ 29	0.04~6
	DN25	30.5~35.5	29~34	29~ 35	0.05~9
	DN32	37.5~42.5	36~41	36~ 42.5	0.09~15
	DN40	49.5~54.5	48~53	48~ 54.5	0.13~23
	DN50	58.5~63.5	57~62	57~ 63.5	0.20~35

Note: B Level needs to be achieved by pasting attached rubber pads on both sides of the inner wall of the pipe clamp