

# Clip-on Ultrasonic Flowmeter Instructions Manual

Model: F3CL\F3RO



**pFlow**

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Updated Information:

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## 1 Overview

pFlow F3CL\F3RO clip-on ultrasonic flowmeter adopts the measurement principle of ultrasonic transit-time method, is combined with Gentos' ultrasonic flow algorithm technology, and achieves accurate measurement of fluid flow in the pipeline. The product is designed with an integrated clamp-on structure, which is simple and convenient to install. It can be energized and measured after four steps of operation. During the installation process, there is no need to contact the fluid medium, and there is no need to stop production.

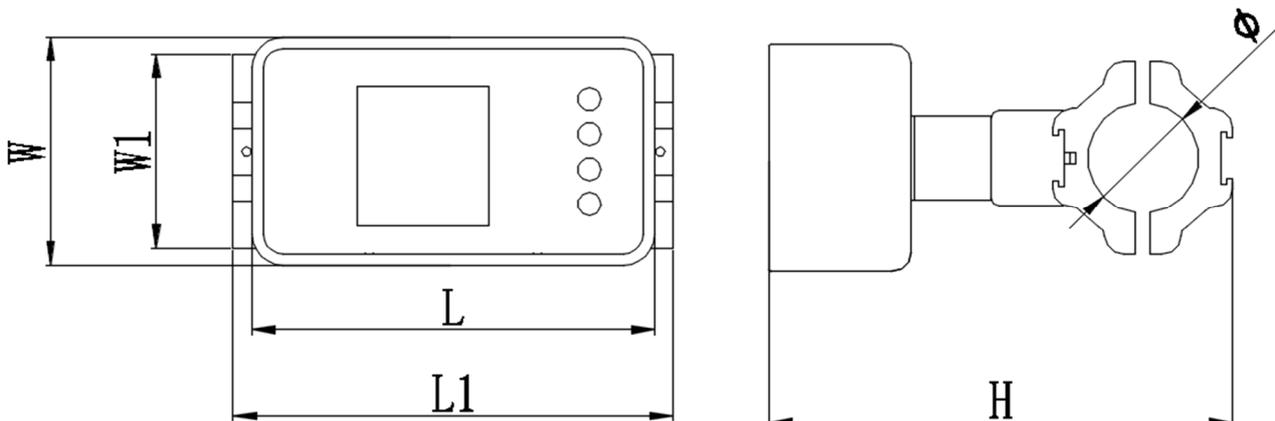
## 2 Product Features

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

## 3 Technical Parameter

### 3.1 Dimension

#### 3.1.1 Transmitter dimension



Pipe Size Comparison Table							Unit: mm
Model	Nominal Bore Diameter	W	W1	L	L1	H	$\phi$
F3 Series	DN20	60	51	105	118	121	29
	DN25	60	56	105	118	128	36
	DN32	60	63	105	118	135	43
	DN40	60	74	105	118	146	54
	DN50	60	89	105	153	159	67
	DN65	60	102	105	153	172	80
	DN80	60	113	105	153	183	91

### 3.2 F3 Series Model Comparison Table

Model	Port Configuration	
F3CL	RS485	4~20mA
F3RO	RS485	OCT & Relay

Note: As per the needs of customers, F3RO can provide three port configuration methods, namely RS485+OCT, RS485+relay and OCT+relay.

### 3.3 Technical Index—F3 Series Clip-on Ultrasonic Flowmeter

Performance Index	
Flow Velocity	0.1~16ft/s (0.03~5.0m/s)
Accuracy	± 2%, ( 1.0~16ft/s )
Repeatability	0.2%
Pipe Size	DN20~DN80
Medium	Water
Pipe Material	Carbon Steel, Stainless Steel, Copper, PVC
Functional Index	
Communication Interface	RS485(standard); Support FUJI Protocol and MODBUS Protocol
Output	4-20mA (for F3CL), OCT&Relay (for F3RO)
Power Supply	10~36VDC/500mA
Keyboard	4 physical keys
Display Screen	1.44 " LCD color screen, resolution 128 * 128
Temperature	Transmitter: 14 °F to 122 °F ( -10°C ~ 50°C ) Transducer: 32 °F to 140 °F ( 0°C ~ 60°C ).
Humidity	Relative humidity 0~99%, No condensation
IP	IP54
Physical Characteristics	
Transmitter	Integrated
Transducer	Clamp on
Cable	φ 5 six core cable, standard length: 2m

- I 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.

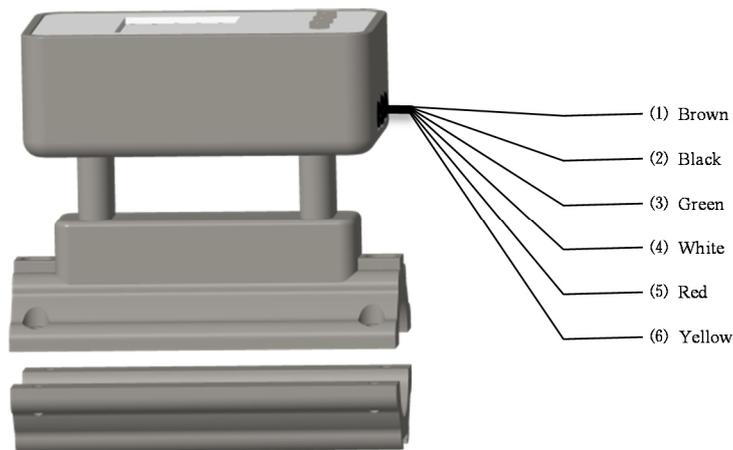
## 4 Installation and Wiring

### 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, which will be squeezed during installation to ensure that the sensor and the pipe wall are closely fitted without bubbles.
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



Function	Identifier	Color
Power Supply (10~36VDC)	+	Brown
	-	Black
RS485	A	Green
	B	White
<b>Optional</b> (4-20mA \OCT&Relay)	+	Red
	-	Yellow

For specific models and port configurations, please check section 3.2 F3 Series Model Comparison Table

### 4.3 Fast installation steps of F3 series clip-on ultrasonic flowmeter

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

<p>Step 1</p> <p>Take out this device from the package and clip upper and lower pipe clamp on the selected position of the pipe.</p>	
<p>Step 2</p> <p>Tighten the screws.</p>	
<p>Step 3</p> <p>Install the transmitter part into the slot of the upper pipe clamp and tighten the screws.</p>	
<p>Step 4</p> <p>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.

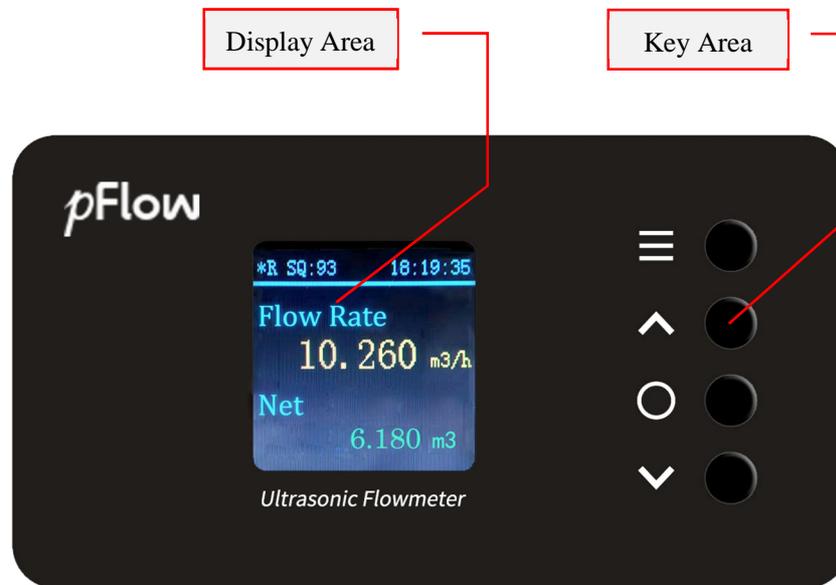


Paste rubber pad

## 5 Display and Setting

### 5.1 Display Description

Upper part of display area	*R	Indicates the measurement status (*R indicates normal measurement, *I indicates no signal, *G indicates searching for signal)
	SQ	93 indicates signal quality. It is consistent with Section 6.1 "Display Interface V".
	18:19:35	The display is the current time, which is consistent with Section 6.1 "Display Interface III".
Lower and middle part of display area	/	See Section 6.1 "Display Interface I~Interface V" for details.



### 5.2 Key Description

The clip-on flowmeter has four buttons, and the operation instructions are shown in the following table:

Menu Key	Up Key	Down Key	Confirm Key
☰	^	v	○
1. Switch between display interface and menu interface; 2. Exit to the main interface	1. Used to select menu items; 2. When inputting a value, the ^ key is for increasing the value number, and the v key moves the position to the right.	1. Used to confirm menu items; 2. Data input confirmation and exit	

## 6 Menu Window Description

### 6.1 Display Interface

Press  key on the instrument panel to switch between the display interface and the menu interface. After switching to the display interface, press the  key and the  key to display interface I ~interface V in sequence.

Display Type	Display Content	Description
Display Interface I	Instantaneous Flow Accumulative Flow	Display instantaneous flow and accumulative flow When accumulative flow accumulates to 99999999m <sup>3</sup> , it will be zero clearing automatically.
Display Interface II	Instantaneous Velocity Accumulative Flow	Display instantaneous velocity and accumulative flow When accumulative flow accumulates to 99999999m <sup>3</sup> , it will be zero clearing automatically.
Display Interface III	Date Time	Display current date and time
Display Interface IV	Serial Number Version Number	Display the instrument factory serial number and software version number
Display Interface V	Measurement Status Signal Quality	Display measurement status: *R: Normal measurement; *G: Search for signal; *I: No signal Display signal quality: The signal quality is represented by 00~99. 00 represents the worst and 99 represents the best. The normal working condition is that the signal quality is greater than 60.

### 6.2 Menu Interface

Select  key on the instrument panel to switch between display interface and menu interface. After switching to the menu interface, press the  key and the  key to display 5 items of the first level menu in sequence. Press  key to enter the corresponding secondary menu to display or set relevant parameters. After setting, select Back to exit or press  key to exit to the display interface.

When inputting the value, the  key increases the number, the  key shifts the number to the right, and the  key confirms the data input and exit.

First Menu	Secondary Menu	Function Description	Remark
1. Pipe parameters	1.Pipe diameter	Input outer diameter of pipe	20mm $\leq$ outer diameter of pipe $\leq$ 99.99mm
	2.Wall thickness	Input wall thickness of pipe	1.0mm $\leq$ wall thickness of pipe $\leq$ 9.99mm
	3.Pipe material	Choose pipe material	carbon steel, copper, PVC, stainless steel
	4.Back		
2.Output settings (for F3CL)	1.Curr Loop Mode	Select flow mode or flow rate mode	
	2.Curr Loop 4mA	After selecting the current loop mode, set the corresponding flow or flow rate of 4mA	Flow mode :0~14400m <sup>3</sup> /h Flow rate mode :0~5m/s
	3.Curr Loop 20mA	After selecting the current loop mode, set the flow or flow rate corresponding to 20mA	Flow mode :0~14400m <sup>3</sup> /h Flow rate mode :0~5m/s
	4.Curr Loop Check	Check the actual current of 0, 4, 8 and 16mA through the ammeter	
	5.Curr Loop Value	Current current loop value	
	6.Back		
2.Output settings (for F3RO)	1.OCT Mode	Current OCT Mode Freq Output Net Int Pulse	Select Net Int Pulse: 1 pulse is output when each flow unit of yield is accumulated. Options of the flow unit: m <sup>3</sup> , L, Gal.
	2.OCT Freq Range	Set OCT frequency range	0~9999
	3.Lowest Flow	Set flow rate in the lowest frequency range	0~9999 m <sup>3</sup> /h
	4.Highest Flow	Set flow rate at highest frequency range	0~9999 m <sup>3</sup> /h
	5.Relay Mode	Relay switch	On: the relay acts once when each accumulated flow unit of yield is accumulated. The flow unit can be m <sup>3</sup> , L, Cal.  Off: Do not perform any action
	6. Back		

First Menu	Secondary Menu	Function Description	Remark
3.Communication	1.RS485 protocol	Choose MODBUS or FUJI	
	2.RS485 Baud Rate	There are 7 baud rates to choose from	4800、9600、38400、50400、57600、76800、115200
	3.Network IDN	Network ID address code is taken from 1~247	
	4.Back		
4.System Setting	1.System unit	Select metric and imperial units	Metric unit, imperial unit
	2.Flow unit	Select the flow unit and time unit of instantaneous flow	Optional flow unit: m <sup>3</sup> 、L、Gal Optional time unit: h、m
	3.Total unit	Select cumulative flow unit	Optional flow unit: m <sup>3</sup> 、L、Gal
	4.System Time	Set the current time	Year-Month-Day, Hour-Minute-Second
	5.Screen Mode	Set rotatable display direction	Optional 0 ° , 90 ° , 180 ° , 270 °
	6.Reset	Clear all setting parameters and restore to the original factory default values	Select "Yes", this operation will clear all the user's data and reset it to the factory default value. Please be cautious.
	7.Clear Cumulation	Clear cumulative flow	Select "Yes" to clear Cumulative Flow.
	8.Language	Chinese and English optional	
	9.About	View version information, version number, serial number, resolution and communication method	
	10.Back		
5. Select setting	1.Damping	Input the damping coefficient, and the damping plays a role in smoothing the data display.	The damping coefficient ranges from 0 to 99 seconds
	2.Low flow Cutoff	Cut off the low flow. To enable the system to display the "0" value when the flow is low, so as to avoid invalid accumulation.	Cut off value $\leq$ 0.25m/s, factory default is 0.03m/s

First Menu	Secondary Menu	Function Description	Remark
	3.Set zero	When the fluid is static, the indication of the instrument is called "zero". When the "zero point" of the flowmeter is not zero, the zero point will be superimposed on the true value of the flow at any time, so that there is a deviation in the measurement of the flowmeter, which must be removed.	Select "Yes" to wait for the process to complete.
	4.Reset zero	Reset the set zero point	Select "Yes" to clear the "zero point" set by the user.
	5.Manual Zero	Set zero shift	An offset superimposed on the measured value can be entered.
	6.Back		
6.Calibration (for F3CL)	1.Scale factor	Also known as the instrument K-factor, it is used to correct the flow measurement results.	Calibrated at the factory
	2.Current Loop 4mA	Adjust the output current with the $\wedge$ keys and $\vee$ key	Connect an external precision ammeter to the current output terminal of F3CL clip-on flowmeter (red+, yellow -)
	3.Current Loop 20mA	Adjust the output current with the $\wedge$ keys and $\vee$ key	
	4.Back		
6.Calibration (for F3RO)	1.Scale factor	Also known as the instrument K-factor, it is used to correct the flow measurement results.	Calibrated at the factory
	2.Back		

## 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:

- I 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.
- I 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.
- I Ensure that the temperature at the measuring point is within the working range.
- I 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 Upstream piping	Straight length of Downstream piping
90° bend		
Tee		
Diffuser		
Reducer		
Value		
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 FUJI Protocol

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

The basic command is represented by a data string, and the command ends with a carriage return newline character. The feature is that the data length is random. Common commands are shown in the following table:

Communication Command

Command	Command Meanings	Data Format
DQD(cr)(lf)注 0	Return daily instantaneous flow	±d.dddddE±dd(cr)Note 1
DQH(cr)(lf)	Return hourly instantaneous flow	±d.dddddE±dd(cr)
DQM(cr) (lf)	Return instantaneous flow per minute	±d.dddddE±dd(cr)
DQS(cr) (lf)	Return instantaneous flow per second	±d.dddddE±dd(cr)
DV(cr) (lf)	Return instantaneous flow velocity	±d.dddddE±dd(cr)
DI+(cr) (lf)	Return positive accumulative flow	±ddddddE±d(cr)Note 2
DI-(cr) (lf)	Return negative accumulative flow	±ddddddE±d(cr)
DIN(cr) (lf)	Return net accumulative flow	±ddddddE±d(cr)
DID(cr) (lf)	Return instrument identification code (address code)	dddd(cr)5 bits in length
DL(cr) (lf)	Return signal strength	UP:dd.d, DN:dd.d, Q=dd(cr)
ESN(cr) (lf)	Return electronic serial number	dddddd(cr)(lf) Note 3
W	Digital string address networking command prefix	Note 4
P	Prefix of back haul command with verification	
&	Function sign of Command "Add"	

Note:

1. (cr) means carriage return, and its ASCII code value is 0DH. (lf) means line feed, and its ASCII code value is 0AH.
2. “d” is a number ranging from 0 to 9, and the 0 value is +0.000000E+00.  
“d” is a number ranging from 0 to 9, and there is no decimal point in the integer part before "E".
3. dddddddd eight digits represent the electronic serial number of the machine, and “t” represents the machine code.
4. If there are more than one flow meters in the data network at the same time, the basic command cannot be used alone. It must be prefixed with W before used. Otherwise, multiple flow meters will respond at the same time, which causes system disorder.

### (1) P prefix

The character P can be added in front of each basic command, indicating that the returned data has CRC check. The checksum is obtained by binary addition.

For example, the data returned by the command DI+(CR) (corresponding binary data is 44H, 49H, 2BH, 0DH) is+1234567E+0m3 (CR) (corresponding binary data is 2BH, 31H, 32H, 33H, 34H, 35H, 36H, 37H, 45H, 2BH, 30H, 6DH, 33H, 20H, 0DH, 0AH), and the data returned by the command PDI+(CR) is+1234567E+0m3! F7 (CR) , “ ! ” Indicates that the character before it is the sum character, and the checksum of the next two bytes (2BH+31H+32H+33H+34H+35H+36H+37H+45H+2BH+30H+6DH+33H+20H=(2) F7H).

Pay attention to "!". There may be no data before, or there may be a space symbol.

### (2) W prefix

The use of W prefix is W+number string address code (must be 5 digits)+basic command. The number string value range is 0~65535, excluding 13 (0DH carriage return), 10 (0AH line feed), 42 (2AH \*), 38 (26H&). If user access the instantaneous flow velocity of No. 12345 flowmeter, user can issue the command W012345DV (CR), and the corresponding binary codes are 57H, 31H, 32H, 33H, 34H, 35H, 44H, 56H, 0DH.

### (3) & Functional Symbols

& The function symbol can add up to five basic commands (with prefix P) to form a composite command and send it to the flowmeter, which will respond at the same time. For example, 1. Instantaneous flow of No. 4321 flowmeter is required to be sent back at the same time; 2. Instantaneous flow velocity; 3. Positive cumulative flow; 4. Negative cumulative flow; 5. Net cumulative flow with verification, send the command as follows:

W04321PDQD&PDV&PDI+&PDI-&PDIN (CR)

The data returned at the same time may be as follows:

+0.000000E+00m3/d! AC (CR)

+0.000000E+00m/s! 88 (CR)

+1234567E+0m3! F7 (CR)

+0.000000E+0m3! DA (CR)

+0.000000E+0 m3! DA (CR)

## 8.2 MODBUS Communication Protocol

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

MODBUS RTU mode uses hexadecimal to transmit data.

### 8.2.1 MODBUS protocol function code and format

This instrument protocol supports the following two function codes of MODBUS protocol:

Function Code	Performance Data
0x03	Read register
0x06	Write single register

### 8.2.2 Use of MODBUS protocol function code 0x03

Format of read register information frame sent by the host:

Slave address	Function code	Register first address	Request number of registers	Check code
1 bytes	1 bytes	2 bytes	2 bytes	2 bytes
0x01~0xF7	0x03	0x0000~0xFFFF	0x0000~0x7D	CRC check code

Slave returned data frame format:

Slave address	Read operation function code	Number of bytes of data	Data	Check code
1 bytes	1 bytes	1 bytes	N*x2 bytes	2 bytes
0x01~0xF7	0x03	2xN*	N*x2 data	CRC check code

N\*=Number of registers for data.

The value range of instrument address (address of flowmeter) is 1~247 (hexadecimal: 0x01~0xF7), and the address can be viewed in Menu 46. If the decimal number displayed in Menu 46 is 11, the address of this instrument in MODBUS protocol is 0x0B.

The CRC check code of this instrument is obtained by using CRC-16-IBM (polynomial is  $X^{16}+X^{15}+X^2+1$ , shielded word is 0xA001) cyclic redundancy algorithm. The low byte of the check code comes first and the high byte comes last.

Example 1. In RTU mode, read the instantaneous flow (m<sup>3</sup>/h) of the meter with address 1 (0x01) in hours, that is, read the data of registers 40,005 and 40,006. The read command is as follows:

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

Instrument Address    Function Code    First Address of Register    Number of Registers    CRC Check Code

The data returned by the instrument is (assuming the current flow=1.234567 m<sup>3</sup>/h):

0x01 0x03 0x04                    0x06 0x51 0x3F 0x9E                    0x3B 0x32

Instrument Address    Function Code    Data Byte Number    Data (1.2345678)    CRC Check Code

The four bytes of 3F 9E 06 51 are the IEEE 754 format single accuracy floating-point format of 1.2345678.

Please note the order of data storage in the above example. When using C language to interpret values, users can use pointers to directly put the required data into the corresponding variable address. Generally, the storage order is low byte first. For example, in the above 1.2,345,678m/s example, the storage order of 3F 9E 06 51 data is 06 51 3F 9E.

Example 2. In RTU mode, read the positive cumulative flow (m3) in m3 of the instrument with address 1 (0x01), that is, read the data of three registers with register addresses 0008, 0009 and 000A. The read command is as follows:

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

The data returned by the instrument is (assuming the current positive cumulative flow=2.46m3):

0x01 0x03 0x06 0x00 0xF6 0x00 0x00 0xFF 0xFE 0x29 0x10  
 Instrument Address Function Code Data Byte Number Data (246 \* 10<sup>-2</sup>) CRC Check Code

The four bytes of 00 00 00 F6 are the hexadecimal of 246, that is, directly convert the hexadecimal data into decimal:

Two bytes of FF FE are 10 to the power of - 2. The following table:

MODBUS Data	Corresponding Index Unit	
FFFD	x0.001(1E-3)	10 <sup>-3</sup>
FFFE	x0.01	10 <sup>-2</sup>
FFFF	x0.1	10 <sup>-1</sup>
0000	x1	10 <sup>0</sup>
0001	x10	10 <sup>1</sup>
0002	x100	10 <sup>2</sup>
0003	x1000	10 <sup>3</sup>
0004	x10000(1E+4)	10 <sup>4</sup>
Including positive, negative, net accumulation and energy accumulation		

Example 3. In RTU mode, change the address of the instrument with address 1 (0x01) to 2 (0x02), that is, write the data in the 44100 register of the flowmeter to 0x02. The write command is as follows:

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

The data returned by the instrument is:

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

### 8.2.3 Error Handling

This instrument returns only one error code 0x02, indicating that the first address of the data is wrong.

For example, to read register data 40002 of the instrument with address 1 (0x01) in RTU mode, the instrument considers it as invalid data, and sends the following commands:

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

The error code returned by the instrument is:

0x01 0x83 0x02 0xC0 0xF1

Instrument Address   Error Code   Error Extension Code   CRC Check Code

### 8.2.4 MODBUS register address list

The MODBUS register of this instrument includes read-only register and single write register.

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

Register Address	Register	Data Description	Data Type	Register Number	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 unit.	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	Refer to "Error Analysis" for detailed codes meanings.
\$001E	40031	Error code - characters 3,4			
\$001F	40032	Error code - characters 5,6			
\$003B	40060	Flow velocity unit - characters 1,2	String	2	Currently support m/s only
\$003C	40061	Flow velocity unit - characters 3,4			
\$003D	40062	Instantaneous flow unit - characters 1,2	String	2	
\$003E	40063	Instantaneous flow unit - characters 3,4			
\$003F	40064	Cumulative flow unit - characters 1,2	String	1	

Note:

a) The units of cumulative flow are as follows

0. "m<sup>3</sup>" — Cubic meter
1. "l" — Litre
2. "gal" — Gallon

b) When changing the instrument address or communication baud rate, the instrument 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 - short integer, 32 bits int - long integer, 32 bits real - floating point, String - string.

## 9 Appendix 1 - Pipe Diameter Comparison Table of Clip-on Ultrasonic Flowmeter

Model	Pipe Material	Nominal Inner Diameter of Pipe	Applicable Range of Pipe Outer Diameter (mm)		Flow Measurable Range (0.03~5m/s) (m <sup>3</sup> /h)
			A Level	B Level	
F3 Series	PVC	DN20	25~29	21~25	0.04~6
		DN25	32~36	28~32	0.05~9
		DN32	39~43	35~39	0.09~15
	Stainless Steel	DN40	50~54	46~50	0.13~23
		DN50	63~67	59~63	0.20~35
	Carbon Steel	DN65	76~80	72~76	0.35~60
		DN80	87~91	83~87	0.55~90

Model	Pipe Material	Nominal Inner Diameter of Pipe	Applicable Range of Pipe Outer Diameter (mm)		Flow Measurable Range (0.03~5m/s) (m <sup>3</sup> /h)
			A Level	B Level	
F3 Series	Copper	DN20	25~29	21~25	0.04~6
		DN25			0.05~9
		DN32	32~36	28~32	0.09~15
		DN40	39~43	35~39	0.13~23
		DN50	50~54	46~50	0.20~35
		DN65	63~67	59~63	0.35~60
		DN80	76~80	72~76	0.55~90

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