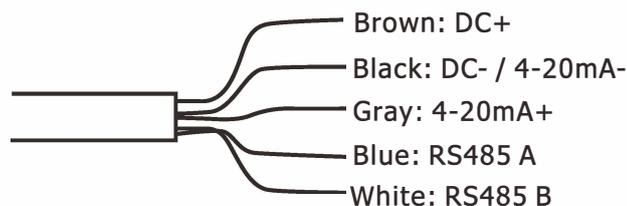# Communications Protocol

Protocol Specification

The flow meter has communications protocol. Its hardware directly supports a modem, a composition of flow data monitoring system that is economical, reliable and based on telephone line transmission. It can also be connected to a RS-485 bus through a RS232-RS485 change-over panel.

Two basic schemes can be chosen for networking, i.e. the analog current output method only using the flow meter or the RS232 communication method via serial port directly using the flow meter. The former is suitable to replace dated instruments in old monitoring networks. The later is used in new monitoring network systems. It has advantages such as low hardware investment and reliable system operation.

The output cable wiring is:

Brown: DC+
Black: DC- / 4-20mA-
Gray: 4-20mA+
Blue: RS485 A
White: RS485 B

The host device requests the flow meter to answer by sending a "command". The baud rate of asynchronous communications (Primary station: computer system; Secondary station: ultrasonic flow meter) is generally 9600bit/s. A single byte data format (10 bits): one start bit, one stop bit and 8 data bits. Check bit: none.

Communications Protocol

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

Function Code	Performance Data
0x03	Read Register
0x06	Write Register

1.MODBUS Protocol function code 0x03 usage

The host sends out the read register information frame format:

Slave Address	Operation Function Code	First Address Register	Register Number	Verify Code
1 byte	1 byte	2 bytes	2 bytes	2 bytes
0x01~0xF9	0x03	0x0000~0xFFFF	0x0000~0x7D	CRC(Verify)

N* = Data register number.

The range of flow meter addresses 1 to 249 (Hexadecimal: 0x01 ~ 0xF9), and can be checked in the Menu Network addr. For example, decimal number "12" displayed on Menu Network addr means the address of the flow meter in the MODBUS protocol is 0x0C.

The CRC Verify Code adopts CRC-16-IBM (polynomial is X16+X15+X2+1, shield character is 0xA001) which is gained by the cyclic redundancy algorithm method. Low byte of the verify code is at the beginning while the high byte is at the end.

2.MODBUS Register Address List

The flowmeter MODBUS Register has a read register and a write single register.

a)Read Register Address List (use 0x03 function code to read)

Register Address	Register	Read	Write	Type	No. registers*
$0000	40001	Velocity—low word	32 bits real	2	
$0001	40002	Velocity—high word			
$0002	40003	Flow/h—low word	32 bits real	2	
$0003	40004	Flow/h—high word			
$0004	40005	Net total—low word	32 bits real	2	
$0005	40006	Net total—high word			
$0006	40007	Net total int—low word	32 bits int.	2	
$0007	40008	Net total int—high word			
$0008	40009	Net total dec—low word	32 bits real	2	
$0009	40010	Net total dec—high word			
$000A	40011	Day total int—low word	32 bits int.	2	
$000B	40012	Day total int—high word			
$000C	40013	Day total dec—low word	32 bits real	2	
$000D	40014	Day total dec—high word			
$000E	40015	Month total—low word	32 bits real	2	
$000F	40016	Month total—high word			
$0010	40017	Year total—low word	32 bits real	2	
$0011	40018	Year total—high word			
$0012	40019	4-20mA analog output —low word	32 bits real	2	
$0013	40020	4-20mA analog output —high word			

$0014	40021	Runtime - low word	32 bits int.	2	Unit: h
$0015	40022	Runtime - high word			
$0016	40023	Serial number – char 1,2	String	4	
$0017	40024	Serial number – char 3,4			
$0018	40025	Serial number – char 5,6			
$0019	40026	Serial number – char 7,8			
$001A	40027	Date Time		3	Year, month, day, hour, minute, second
$001B	40028				
$001C	40029				
$001D	40030	Quality	16 bits int	1	
$001E	40031	Running state	16 bits int	1	
$001F	40032	Flowmeter address (1-249)	16 bits int		
$0020	40033	Communication Baud Rate 0 =2400, 1 = 4800, 2 = 9600, 3 = 19200	16 bits int		
$0021	40034	Velocity unit	String		m/s or f/s
$0022	40035				
$0023	40036	Flow unit	String		
$0024	40037				
$0025	40038	Total unit	String		

b)Single Write Register Address List (use 0x06 performance code to write)

Register Address	Register	Description	Read/Write	Type	No. registers*
$1003	44100	Flowmeter address(1-249)	R/W	16 bits int.	1
$1004	44101	Communication Baud Rate 0 =2400, 1 = 4800, 2 = 9600, 3 = 19200	R/W	16 bits int.	1
$1005	44102	Flow unit	R/W	16 bits int.	1
$1006	44103	Total unit	R/W	16 bits int.	1

Notes:
1.The following flow rate units are available: 0— m3/h; 1— LPM; 2— GPM
2.The following Total flow rate units are available: 0 — m3; 1— L; 2 — GAL
3.When the flowmeter address or communication baud rate change, the meter will work under the new address or communication baud rate after the communication baud rate responded with returned primary address and communication baud rate.
16 bits int—short integer, 32 bits int – long integer, 32 bits real—floating point number,
String—alphabetic string.BCD-represents decimal numbers.