JIDE
Electromagnetic Flowmeter onverter
Modbus Communication Protocol

V103

2023-04-15

Catalogue

Chapter 1 Overview

The L-mag electromagnetic flowmeter has a standard RS-485 communication interface and adopts the Modbus-RTU standard protocol,which can collect parameters such as instantaneous flow,instantaneous flow rate,cumulative flow, etc.

1.1 Technical parameters

The Modbus protocol of the L-mag electromagnetic flowmeter uses function code 03 to read parameter data and function code 04 to read variable data, supporting the baudrate of 1200,2400,4800,9600,19200.

The serial port parameters are: 1 bit start bit,8 bit data bit, 1 bit stop bit,none parity bit.

1.2 Networking instructions

The standard MODBUS communication network of L-mag electromagnetic flowmeter is a bus type network structure, which supports the networking of 1 to 99 electromagnetic flowmeter. The standard communication connection medium is shielded twisted pair. The electromagnetic flowmeter at the farthest end of the network usually needs to be connected in parallel with a 120 ohm terminal matching resistance at both ends of the communication line (as shown in Figure 1-1).

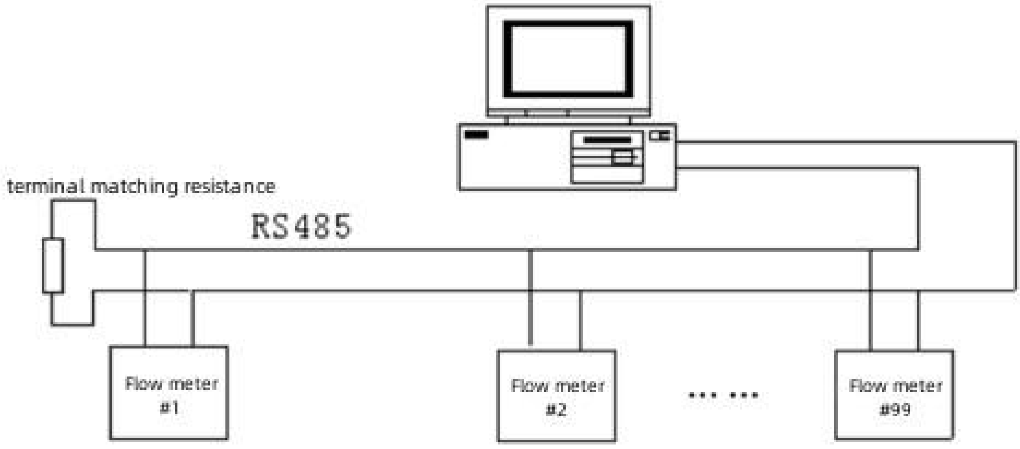


Figure 1-1 Modbus Communication Network Structure

1.3 Data Frame

The Mobus-RTU format (hexadecimal format) is a master slave structure, which means that the master station sends a frame of data first, and the slave station receives it before giving a response.

Master station command frame structure (as shown in Figure 1-2):

Frame Start	Device Address	function code	Register address	register length	crc check	Frame End
T1-T2-T3-T4	8Bit	8Bit	16Bit	16Bit	16Bit	T1-T2-T3-T4

Figure 1-2 Main Station Command Frame Structure

Main station command frame description: The device address is the communication address set by the flow meter, the function code is the Modbus function code (usually 04 here), the register address is the register address of the data to be read (see Chapter 2 for details), the register length is the number of registers to be read, and CRC verification can be calculated using relevant software.

Slave response frame structure (as shown in Figures 1-3):

Frame Start	Device Address	function code	Length	data	crc check	Frame End
T1-T2-T3-T4	8Bit	8Bit	8Bit	n 个 8Bit	16Bit	T1-T2-T3-T4

Figure 1-3 Slave Response Frame Structure

Slave response frame description: The device address is the communication address set by the flowmeter (i.e. the address sent by the master station), and the function code is also consistent with the one sent by the master station. The data length is the number of data replied by the slave station.

Chapter 2 Variable Register Address Table

The Modbus variable address table of the L-mag electromagnetic flowmeter (as shown in Table 1), including the register addresses of instantaneous flow, cumulative flow, and other data, needs to be read using the modubs04 function code. The provided address is a register address, which means that some PLC, KingView, and other register addresses require an additional 1 (see appendix for details).

Table 2-1 L-mag Electromagnetic Flowmeter Modbus Variable Address Table

Protocol Addresses (Decimal/ HEX)	PLC Addresses (Base 1)	data format	register definition
4112/0x1010	34113	Float Inverse	Instantaneous flow floating-point representation
4114/0x1012	34115	Float Inverse	Instantaneous flow rate floating-point representation
4116/0x1014	34117	Float Inverse	Floating-point representation of flow percentage
4118/0x1016	34119	Float Inverse	Floating point representation of fluid conductivity ratio
4120/0x1018	34121	Long Inverse	Positive accumulation of integer parts of numerical values
4122/0x101A	34123	Float Inverse	Fractional part of positive cumulative value
4124/0x101C	34125	Long Inverse	Reverse accumulation of integer parts of numerical values
4126/0x101E	34127	Float Inverse	Reverse accumulation of decimal parts of numerical values
4128/0x1020	34129	Unsigned short	Instantaneous flow unit (Table 3-1)
4129/0x1021	34130	Unsigned short	Accumulated Total Units (Table 3-2)

4130/0x1022	34131	Unsigned short	Upper limit alarm
4131/0x1023	34132	Unsigned short	Lower limit alarm
4132/0x1024	34133	Unsigned short	Air traffic control alarm
4133/0x1025	34134	Unsigned short	System alarm

Chapter 3 Data Analysis Methods

The Modbus communication slave response data of L-mag electromagnetic flowmeter can be roughly divided into three formats: Float Inverse (instantaneous flow), Long Inverse (forward cumulative integer part), and Unsigned short (flow unit). The specific parsing method is as follows.

3.1 Instantaneous flow rate

1. Data transmission and reception

Master station sends commands:

equipment address	function code	register Address High	register Address Low	register length High	register length Low	CRC Low	CRC high
01	04	10	10	00	02	74	CE

Master station received data:

equipment address	function code	data length	4-byte floating point number (Instantaneous flow rate)				CRC Low	CRC high
01	04	04	C4	1C	60	00	2F	72

2. data analysis

Instantaneous traffic data is in Float Inverse format, using IEEE754 32-bit floating point format, and its structure is as follows:

0X1010(34113)		0x1011(34114)	
BYTE1	BYTE2	BYTE3	BYTE4
S EEEEEEE	E MMMMMMM	MMMMMMMM	MMMMMMMM

S- Mantissa symbol; 1=negative, 0=positive.
E- Exponent; expressed by the difference with decimal number 127.
M- Mantissa; low 23 bits and the decimal part.

When not all of the E is “0” and “1”, the conversion formula between float and the decimal number is:

$$V = (-1)^{S} 2^{(E-127)}(1 + M)$$

Instantaneous delivery :

Float	C4	1C	60	00
	1100 0100	0001 1100	0110 0000	0000 0000
	float byte 1	float byte 2	float byte 3	float byte 4

S=1: if mantissa symbol is 1, it is a negative.

E = 10001000: Exponent is 136

M= 001 1100 0110 0000 0000 0000,The mantissa is :

$$V = (-1)^{1} 2^{(136-127)}\left(1 + \frac{1}{8} + \frac{1}{16} + \frac{1}{32} + \frac{1}{512} + \frac{1}{1024}\right)$$

= -625.5

Therefore C4 1C 60 00 instantaneous delivery :-625.5.

3.2 Instantaneous velocity

1. Data transmission and reception

Master station sends commands:

equipment address	function code	register Address High	register Address Low	register length High	register length Low	CRC Low	CRC high
01	04	10	12	00	02	D5	0E

Master station received data:

equipment address	function code	data length	4-byte floating point number (Instantaneous flow rate)				CRC Low	CRC high
01	04	04	C1	B0	80	00	A6	5F

2. data analysis

Instantaneous flow rate data is in Float Inverse format, using IEEE754 32-bit floating point format. The analytical method is consistent with the analytical instantaneous flow rate.

Float: C1 B0 80 00

1100 0001 1011 0000 1111 1000 0000 0000

S = 1

E = 10000011

M = 011 0000 1111 1000 0000 0000

$$V = (-1)^{1} 2^{(131-127)} \left(1 + \frac{1}{4} + \frac{1}{8} + \frac{1}{256}\right)$$

$$= -22.0625$$

Therefore,the instantaneous flow velocity value represented by C1 B0 80 00 is -22.0625.

Note: All data in the Float Inverse format can be analyzed by referring to the methods of instantaneous flow rate and instantaneous flow rate,including floating point representation of flow rate percentage,floating point representation of fluid conductivity ratio, decimal part of forward cumulative value,and decimal part of reverse cumulative value.The following will not be explained in detail.

3.3 Positive cumulative integer part

1. Data transmission and reception

Master station sends commands:

equipment address	function code	register Address High	register Address Low	register length High	register length Low	CRC Low	CRC high
01	04	10	18	00	02	F5	0C

Master station received data:

equipment address	function code	data length	4-byte floating point number (Integral part of positive cumulant)				CRC Low	CRC high
01	04	04	01	23	45	67	78	C8

2. data analysis

The integer part of the forward cumulant data is in Long Inverse format and can be directly calculated for parsing.

$$0\times16^{7}+1\times16^{6}+2\times16^{5}+3\times16^{4}+4\times16^{3}+5\times16^{2}+6\times16^{1}+7\times16^{0}=19088743$$

Therefore, the integer value of the positive cumulative flow represented by 01, 23, 45, 67 is 19088743.

By adding the decimal part, the forward cumulative quantity can be calculated.

Note: All data in Long Inverse format can be parsed using the method of referring to the integer part of the forward cumulant, that is, the integer part of the flow reverse cumulant can be parsed using the integer part of the forward cumulant. The following will not provide too much explanation.

3.4 flow unit

1. Data transmission and reception

Master station sends commands:

equipment address	function code	register Address High	register Address Low	register length High	register length Low	CRC Low	CRC high
01	04	10	20	00	01	34	C0

Master station received data:

equipment address	function code	data length	2-byte integer (Instantaneous flow unit)		CRC Low	CRC high
01	04	02	00	05	79	33

2. data analysis

The integer part of the forward cumulant data is in unsigned short format, and the meaning of the received data needs to be found by looking up the table.

The table of instantaneous flow units is as follows:

Table 3-1 Instantaneous Flow Units

code	Instantaneous unit	code	Instantaneous unit	code	Instantaneous unit
0	L/S	3	M3/S	6	UKG
1	L/M	4	M3/M	7	USG
2	L/H	5	M3/H		

The received data is 00 05, and according to the table, the current instantaneous flow rate is m3/h.

The unit analysis method for cumulative flow is consistent with that for instantaneous flow. There will be no excessive explanation here. The table of cumulative flow units is as follows:

Table 3-2 Accumulated Flow Units

code	0	1	2	3
Cumulative unit	L	M3	UKG	USG

3.5 Air traffic control alarm

1. Data transmission and reception

Master station sends commands:

equipment address	**function code**	**register Address High**	**register Address Low**	**register length High**	**register length Low**	**CRC Low**	**CRC high**
01	04	10	24	00	01	75	01

Master station received data:

equipment address	**function code**	**data length**	**2-byte integer (Alarm)**		**CRC Low**	**CRC high**
01	04	02	00	01	78	F0

2. data analysis

The air traffic control alarm data is in unsigned short format, where 1 is an alarm and 0 is not an alarm. As shown in the example, when data bit 00 01 is received, the flow meter's empty pipe alarm is triggered.

Note: All alarm data can be analyzed by referring to the method of air traffic control alarm, and the following will not provide too much explanation.

Chapter 4 Parameter Register Address Table

The Modbus parameter address table of the L-mag electromagnetic flowmeter (as shown in Table 1) includes readable and rewritable parameter data. Read using modbus03 function code and rewrite using 06 function code.

Note: To rewrite parameters, you need to first write the password, otherwise the modification will not be successful. Additionally, the total reset function is included in the final section of this chapter.

Table 4-1 L-mag Electromagnetic Flowmeter Modbus Parameter Address Table

Protocol Addresses（Decimal）	Protocol Addresses（HEX）	data format	register definition
000	0x0000	Unsigned short	Language
0001	0x0001	Unsigned short	CommAddres
0002	0x0002	Unsigned short	Baud Rate
0003	0x0003	Unsigned short	Snsr Size
0004	0x0004	Unsigned short	Flow Direct
0005	0x0005	Unsigned short	Flow Range
0006	0x0006	Unsigned short	Flow Unit
0007	0x0007	Unsigned short	Flow Rspns
0008	0x0008	Unsigned short	Flow Cutoff
0009	0x0009	Unsigned short	Cutoff Ena
0010	0x000A	Unsigned short	Total Unit
0011	0x000B	Unsigned short	SegmaN Ena
0012	0x000C	Unsigned short	Analog Type
0013	0x000E	Unsigned short	AnalogZero

0014	0x000E	Unsigned short	Anlg Range
0015	0x000F	Unsigned short	Pulse Type
0016	0x0010	Unsigned short	Pulse Fact
0017	0x0011	Unsigned short	reserve
0018	0x0012	Unsigned short	Freque Max
0019	0x0013	Unsigned short	Alm Hi Ena
0020	0x0014	Unsigned short	Alm Hi Val
0021	0x0015	Unsigned short	Alm Lo Ena
0022	0x0016	Unsigned short	Alm Lo Val
0023	0x0017	Unsigned short	Mtsnsr Ena
0024	0x0018	Unsigned short	MtsnsrTrip
0025	0x0019	Unsigned short	reserve
0026	0x001A	Unsigned short	Field Type
0027	0x001B	Unsigned short	Flow Zero
0028	0x001C	Unsigned short	Sensor Fact
0029	0x001D	Unsigned short	reserve
0030	0x001E	Unsigned short	reserve
0031	0x001F	Unsigned short	Meter Fact
0032	0x0020	Unsigned short	PlsntLmtVal
0033	0x0021	Unsigned short	Plsnt Delay
0034	0x0022	Unsigned short	PlsntLmtEna
0035	0x0023	Unsigned short	reserve
0036	0x0024	Unsigned short	Sys Alm Ena
0037	0x0025	Unsigned short	Lineary CRC1
0038	0x0026	Unsigned short	LinearyFact1
0039	0x0027	Unsigned short	Lineary CRC2
0040	0x0028	Unsigned short	LinearyFact2
0041	0x0029	Unsigned short	Lineary CRC3

0042	0x002A	Unsigned short	LinearyFact3
0043	0x002B	Unsigned short	Lineary CRC4
0044	0x002C	Unsigned short	LinearyFact4
0045	0x002D	Unsigned short	Line Crc Ena
0046	0x002E	Unsigned short	reserve
0047	0x002F	Unsigned short	Check Mode
0048	0x0030	Unsigned short	reserve
0049	0x0031	Unsigned short	reserve
0050	0x0032	Unsigned short	Snsr Code1
0051	0x0033	Unsigned short	Snsr Code2
0052	0x0034	Unsigned short	MeterCode1
0053	0x0035	Unsigned short	MeterCode2
0063	0x003F	Unsigned short	Write password register
0071	0x0047	Unsigned short	Total Zeroing Register

Table 4-2 Language Codes Comparison Table for L-mag Electromagnetic Flowmeter

code	option
2	ENGLISH

Table 4-3 Comparison Table of Baud Rate Codes for L-mag Electromagnetic Flowmeter

code	option	code	option
0	300	1	600
2	1200	3	2400
4	4800	5	9600
6	19200	7	38400

Table 4-4 Comparison Table of Snsr Size Codes for L-mag Electromagnetic Flowmeter

code	option	code	option
0	3mm	1	4mm
2	5mm	3	6mm
4	8mm	5	10mm

6	15mm	7	20mm
8	25mm	9	32mm
10	40mm	11	50mm
12	65mm	13	80mm
14	100mm	15	125mm
16	150mm	17	200mm
18	250mm	19	300mm
20	350mm	21	400mm
22	450mm	23	500mm
24	550mm	25	600mm
26	650mm	27	700mm
28	750mm	29	800mm
30	900mm	31	1000mm
32	1050mm	33	1100mm
34	1200mm	35	1300mm
36	1400mm	37	1500mm
38	1600mm	39	1800mm
40	2000mm	41	2200mm
42	2400mm	43	2500mm
44	2600mm	45	2800mm
46	3000mm		

Table 4-5 Comparison Table of Flow Direct Codes for L-mag Electromagnetic Flowmeter

code	option	code	option
0	FORWARD	1	REVERSE

Table 4-6 Comparison Table of Flow Unit Codes for L-mag Electromagnetic Flowmeter

code	option	code	option
0	L/S	1	L/M
2	L/H	3	M3/S
4	M3/M	5	M3/H
6	UKG	7	USG

Table 4-7 Comparison Table of Flow Rspns Codes for L-mag Electromagnetic Flowmeter

code	option	code	option
0	01 SEC	1	02 SEC
2	03 SEC	3	04 SEC
4	06 SEC	5	08 SEC
6	10 SEC	7	15 SEC
8	30 SEC	9	50 SEC

Table 4-8 Comparison Table of Display Codes for L-mag Electromagnetic Flowmeter's Permissible Removal

code	option	code	option
0	DISABLE	1	ENABLE

Table 4-9 Comparison Table of Total Unit Codes for L-mag Electromagnetic Flowmeter

code	option	code	option
0	0.001 L	1	0.01 L
2	0.1 L	3	1 L
4	0.001 M3	5	0.01 M3
6	0.1 M3	7	1 M3
8	0.001 UKG	9	0.01 UKG
10	0.1 UKG	11	1 UKG
12	0.001 USG	13	0.01 USG
14	0.1 USG	15	1 USG

Table 4-10 Comparison Table of SegmaN Ena Codes for L-mag Electromagnetic Flowmeter

code	option	code	option
0	DISABLE	1	ENABLE

Table 4-11 Comparison Table of Analog Type Codes for L-mag Electromagnetic Flowmeter

code	option	code	option
0	4-20mA	1	4-20mA
2	4mA		

Table 4-12 Comparison Table of Pulse Type Codes for L-mag Electromagnetic Flowmeter

code	option	code	option
0	FREQUENCY	1	PULSE

Table 4-13 Comparison Table of Flow Pulse Fact Codes for L-mag Electromagnetic Flowmeter

code	option	code	option
0	0.001 L	1	0.01 L
2	0.1 L	3	1 L
4	0.001 M3	5	0.01 M3
6	0.1 M3	7	1 M3
8	0.001 UKG	9	0.01 UKG
10	0.1 UKG	11	1 UKG
12	0.001 USG	13	0.01 USG
14	0.1 USG	15	1 USG

Table 4-14 Comparison Table of Alm Hi Ena Codes for L-mag Electromagnetic Flowmeter

code	option	code	option
0	DISABLE	1	ENABLE

Table 4-15 Comparison Table of Alm Lo Ena Codes for L-mag Electromagnetic Flowmeter

code	option	code	option
0	DISABLE	1	ENABLE

Table 4-16 Comparison Table of Sys Alm Ena Codes for L-mag Electromagnetic Flowmeter

code	option	code	option
0	DISABLE	1	ENABLE

Table 4-17 Comparison Table of Field Type Codes for L-mag Electromagnetic Flowmeter

code	option	code	option
0	TYPE 1	1	TYPE 2
2	TYPE 3		

Table 4-18 Comparison Table of PlsntLmtVal Codes for L-mag Electromagnetic Flowmeters

code	option	code	option
0	0.800 m/s	1	0.500 m/s
2	0.300 m/s	3	0.200 m/s
4	0.100 m/s	5	0.080 m/s
6	0.050 m/s	7	0.030 m/s
8	0.020 m/s	9	0.010 m/s

Table 4-19 Comparison Table of Plsnt Delay Codes for L-mag Electromagnetic Flowmeters

code	option	code	option
0	400 ms	1	500 ms
2	600 ms	3	700 ms
4	800 ms	5	900 ms
6	1000 ms	7	1500 ms
8	2000 ms	9	2500 ms

Table 4-20 Comparison Table of PlsntLmtEna Codes for L-mag Electromagnetic Flowmeters

code	option	code	option
0	DISABLE	1	ENABLE

Table 4-21 Comparison Table of Excitation Alarm Allowable Codes for L-mag Electromagnetic Flowmeter

code	option	code	option
0	DISABLE	1	ENABLE

Table 4-22 Comparison Table of Line Crc Ena Codes for L-mag Electromagnetic Flowmeter

code	option	code	option
0	DISABLE	1	ENABLE

Table 4-23 Comparison Table of Check Mode Codes for L-mag Electromagnetic Flowmeter

code	option	code	option
0	No Parity Stop 1	1	Odd Parity Stop 1
2	Even Parity Stop 1	3	No Parity Stop 2
4	Odd Parity Stop 2	5	Even Parity Stop 2

For example, modify the flow unit to M3/H, and the operation format is as follows:

a) Send password (default password 19818/0x4D6A) Host command format (8 bytes in total)

0	1	2	3	4	5	6	7
Device Address	function code	Address 1	Address 0	Data 1	Data 0	CRC	CRC
1~99	0x06	0x00	0x3F	0x4D	0x6A	XX	XX

b) Slave response format (8 bytes in total)

0	1	2	3	4	5	6	7
Device Address	function code	Address 1	Address 0	Data 1	Data 0	CRC	CRC
1~99	0x06	0x00	0x3F	0x4D	0x6A	XX	XX

c) Send modification unit command host command format (8 bytes in total)

0	1	2	3	4	5	6	7
Device Address	function code	Address 1	Address 0	Data 1	Data 0	CRC	CRC
1~99	0x06	0x00	0x06	0x00	0x05	XX	XX

d) Slave response format (8 bytes in total)

0	1	2	3	4	5	6	7
Device Address	function code	Address 1	Address 0	Data 1	Data 0	CRC	CRC
1~99	0x06	0x00	0x06	0x00	0x05	XX	XX

The total amount reset function has the following operation format:

a) Send total reset command (password 42330/0XA55A) Host command format (8 bytes in total)

0	1	2	3	4	5	6	7
Device Address	function code	Address 1	Address 0	Data 1	Data 0	CRC	CRC
1~99	06	0	47	A5	5A	XX	XX

b) Slave response format (8 bytes in total)

0	1	2	3	4	5	6	7
Device Address	function code	Address 1	Address 0	Data 1	Data 0	CRC	CRC
1~99	06	0	47	A5	5A	XX	XX

The specific operation is shown in Figure 4-1.

Figure 4-1 Total Zeroing Frame Structure

Chapter 5 Application Examples

This chapter is an application example section that requires the use of some tool software, which can be downloaded from the internet.

The software required includes a serial debugging assistant, 16 to 10 (IEEE754), and a programmer's calculator.

5.1 Sending and receiving commands

Open the serial port debugging assistant, adjust the baud rate 9600, data bit 8, check bit N, stop bit 1, set the COM port, and select the verification method CRC16 ModbusRTU. Set the communication address of the flowmeter to 1 and the baud rate to 9600. After connecting the serial port, the test can be conducted.

Enter 01 04 10 10 00 16 74 C1 in the sending area (the last two CRCs are automatically generated by the software) to receive the corresponding data of the flowmeter in the receiving area (as shown in Figure 5-1).

Figure 5-1 Communication Diagram of Serial Port Debugging Assistant

5.2 Meaning of Received Data

As shown in the above figure, the data received from the flowmeter response is:

01 04 2C C3 36 D9 9A C0 CE F1 AA 42 81 51 EC 42 64 00 00 00 00 00 4C 3E 17 8D 50 00 00 00 28 3D 71 A9 FC 00 05 00 01 00 00 00 00 00 00 00 00 C7 D2

According to the register table of the flow meter, it can be seen that the meaning of the received flow meter response data is (as shown in Figure 5-2):

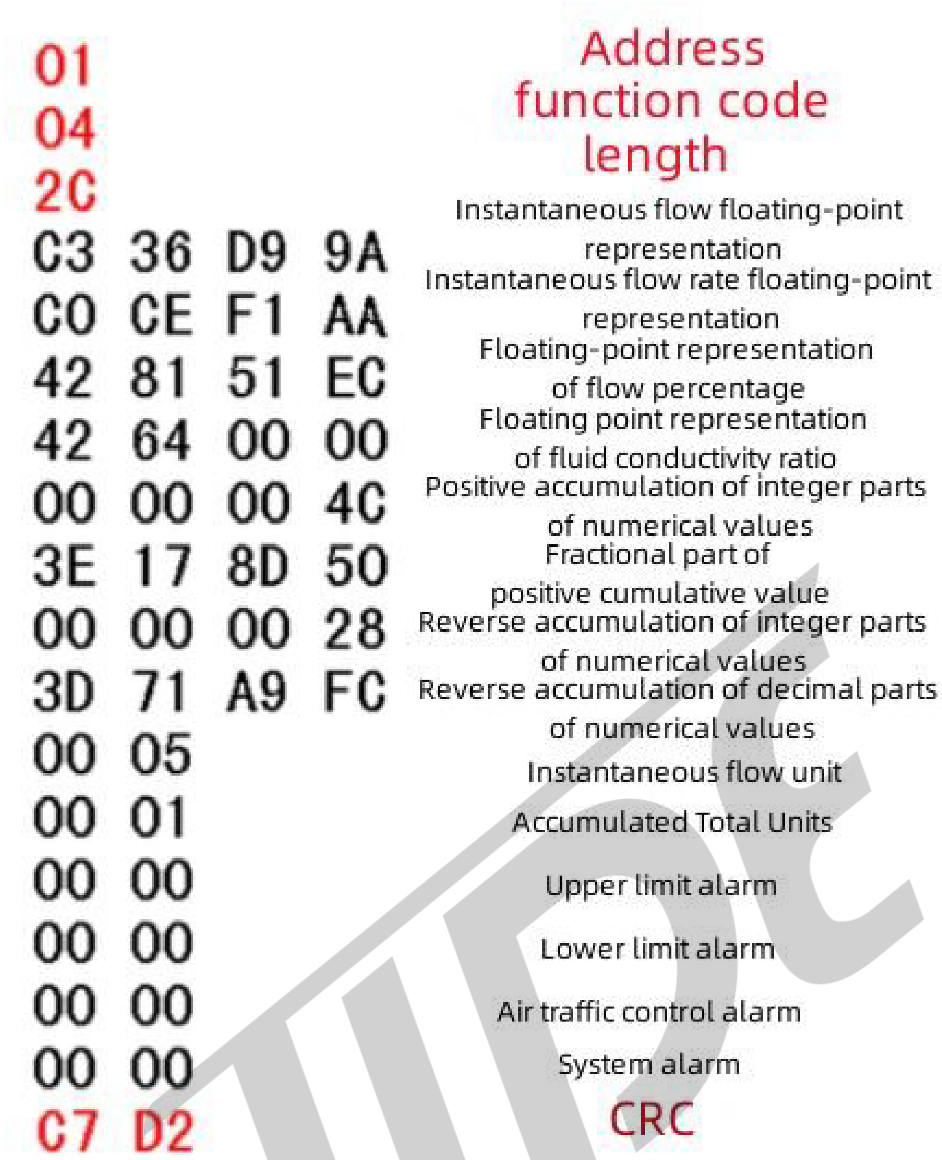


Figure 5-2 Meaning diagram of received data

5.3 Analysis of received data

Based on the received data, it can be analyzed using tool software.

1. Analysis of Instantaneous Quantity

The instantaneous quantity can be analyzed using software 16 to 10 (IEEE754), as shown in Figure 5-3:

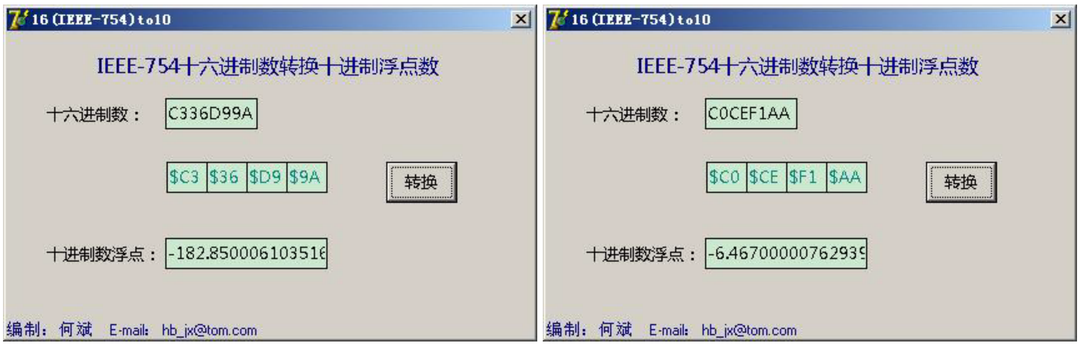
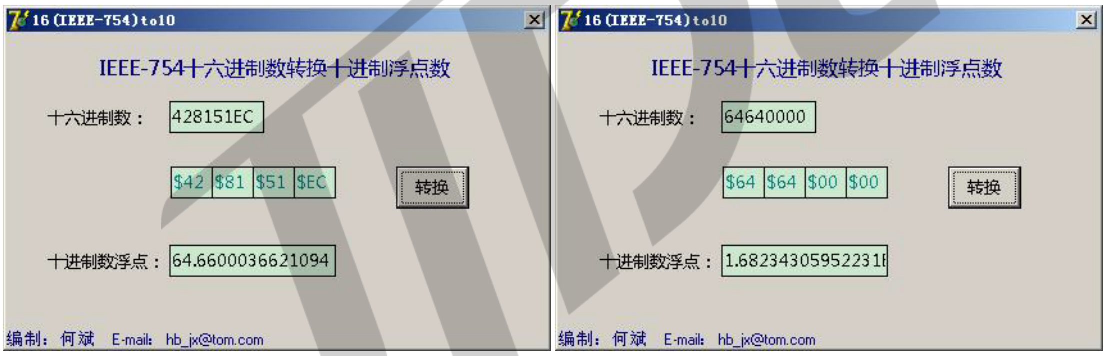


Figure 5-3 Analysis of Instantaneous Quantity

In summary, the instantaneous flow rate is -185.85, and the instantaneous flow rate is -6.46。

2. Analysis of percentage

The percentage can also be analyzed using 16 to 10 (IEEE754) software, as shown in Figures 5-4:



Analysis of percentages in Figures 5-4

In summary, the flow rate percentage is 64.66, and the fluid conductivity ratio is 1.68.

3. Analysis of Accumulated Quantity

The integer part of the cumulative quantity can be parsed by programmers using a calculator, as shown in Figures 5-5:

Original data:

Convert to:

Original data:

Convert to:

Analysis of the integer part of the cumulant in Figure 5-5

The fractional part of the cumulative quantity can be analyzed using software 16 to 10 (IEEE754), as shown in Figures 5-6：

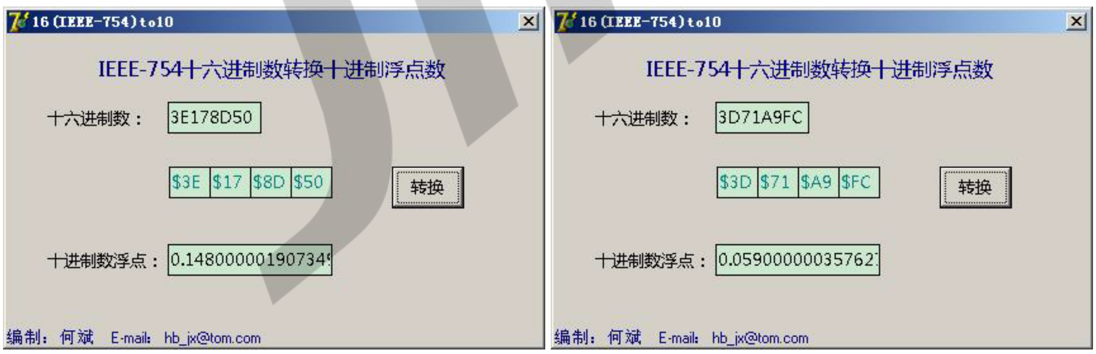


Figure 5-6 Analysis of the Fractional Part of the Accumulator

In summary, the flow rate percentage is 76.148, and the fluid conductivity ratio is 40.059.

4. Analysis of Flow Units

The flow unit can be directly analyzed through table lookup.

The received data has instantaneous flow units of 00 05 and cumulative flow units of 00 01. According to Tables 3-1, 3-2, and 3-3, the instantaneous flow unit is m3/h, and the cumulative flow unit is m3 (L for C-type tables).

5. Analysis of alarms

Alarm data can be parsed based on 1 being an alarm and 0 being no alarm.

Received data, with upper and lower limit alarms, as well as air traffic control and system alarms, indicating that the flow meter is operating normally and has no alarm status.

Chapter 6 Common Problem Handling Methods

There are two common problems. One is sending data to the master station, but the slave station does not respond. One is the data parsing exception corresponding to the slave station. If there is a communication issue, it is recommended to use our company's testing software for testing first.

6.1 Testing software usage methods

1. Set the baud rate of the flowmeter to 9600 and the communication address to 1.

2. Connect the computer and flow meter using USB (or 232) to 485 port (after successful connection, you can find the COM slogan in My Computer → Properties, as shown in Figure 6-1).

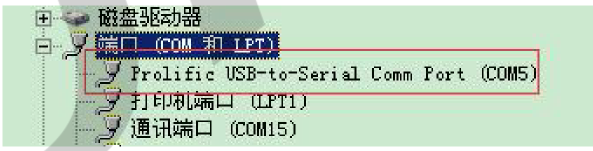


Figure 6-1 COM Port Prompt

3. Double click the icon 

to open the software, adjust the baud rate to 9600, the communication address to 1, and the COM is the same as Figure 6-1. After setting up, click

'Start Communication'. The successful communication screen is shown in Figure 6-2.

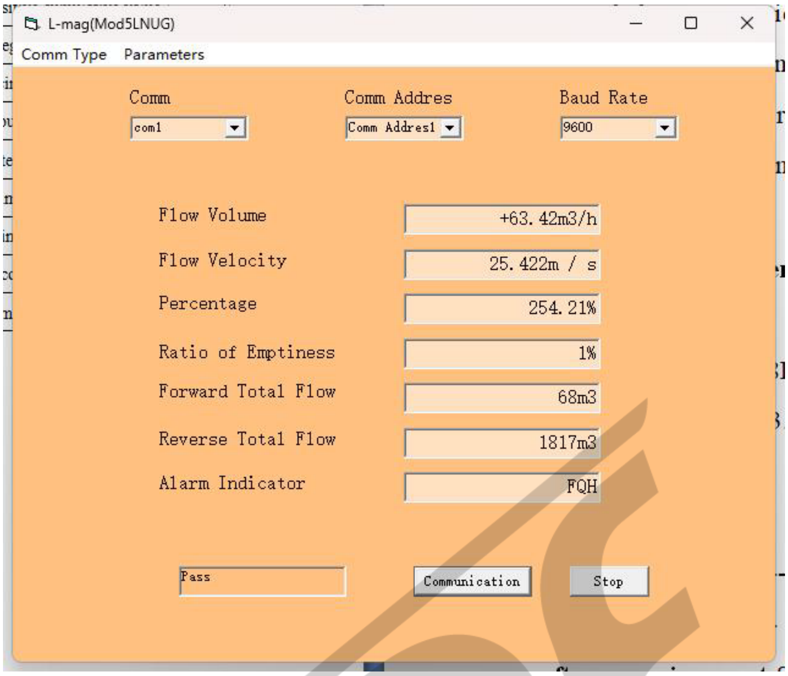


Figure 6-2 Test software communication success diagram

6.2 Slave not responding

If the master station sends data, the slave station will not respond. Consider parameter settings and physical wiring issues.

1. Determine if the flow meter has communication function:

Check the model of the flow meter and check if it has a communication board.

2. Determine if the communication line is connected correctly

Swap the communication line and try again.

3. Determine if the baud rate is correct:

Require the baud rate of the upper computer to be consistent with the baud rate set by the flow meter.

4. Determine if the communication address is correct:

Require the communication address of the upper computer to be consistent with the communication address of the flow meter.

5. Determine if there are any abnormalities in the COM port:

Check whether the serial port is available in My Computer Properties.

6. Check the communication board;

Open the upper cover of the instrument panel to check if the communication light on the communication board is flashing as shown in Figure (6-3), where the TXD light is for sending data and the RXD light is for receiving data.

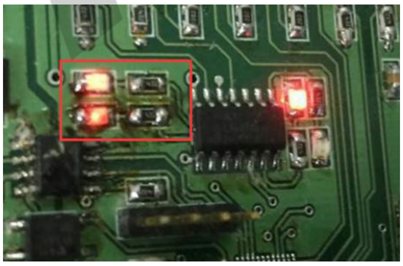


Figure 6-3 Example diagram of communication light flashing

6.3 Data parsing exceptions

Users can use the serial debugging assistant to detect the communication process, and the specific steps are as follows:

1. Connect the main station equipment to the flow meter correctly, and then connect it in parallel to the system using USB (or 232) to 485 port, as shown in Figure 6-4.

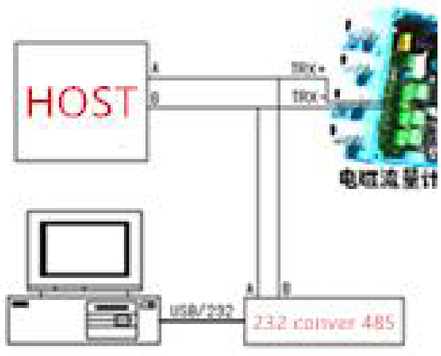


Figure 6-4 Example Connection Diagram of Serial Port Debugging Assistant

2. Open the serial port debugging assistant, set the baud rate of 9600, communication address 1, start bit 1, data bit 8, stop bit 1, and no verification.

3. Click on "Open Serial Port" and use the main station to start sending data and communicating with the flow meter. The communication process can be displayed through serial port debugging, as shown in Figure 6-5.

Figure 6-5 Example of Serial Port Debugging Assistant Listening

4. Based on the received data, search for the content sent by the main station and the corresponding content of the flow meter (as shown in Figure 6-6).

Figure 6-6 Example of Data Analysis for Serial Port Debugging Assistant

The data annotated in red represents the data sent by the master station, while the purple and yellow represent the data responded by the slave station. The purple part represents the data that the slave station responds to in accordance with the protocol format requirements (which may not be considered during parsing), while the yellow part represents the data part that the slave station responds to, used for parsing.

Based on the listening data, analyze whether the communication address, function code, register address, register length, and CRC verification code sent by the main station are correct (detailed methods can be found in Chapter 5).

Appendix

Appendix 1 Modbus poll communication example

Set the communication address of the flowmeter to 1 and the baud rate to 9600.

Double click 

to open the Modbus Poll software, as shown in Figure F1-1.

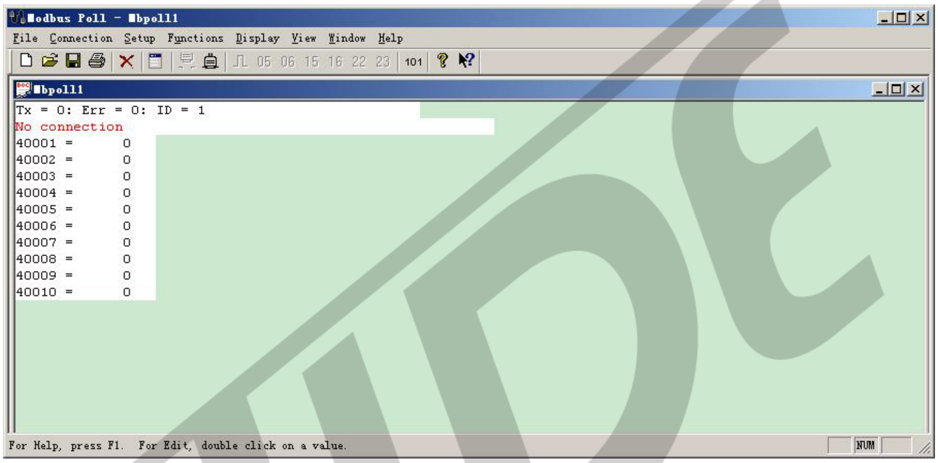


Figure F1-1

Click on Setup>Poll Definition to set the collection command including device address1. MODBUS function code 04, register address 4113, register length 22, and acquisition interval 1000 are shown in Figure F1-2。

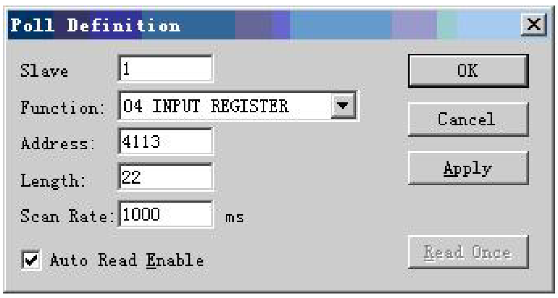


Figure F1-2

Click on Connection → Connection and set the serial port format of the flow meter: 1 bit start bit, 8 bits data bit, 1 bit stop bit, no verification, as shown in Figure F1-3。

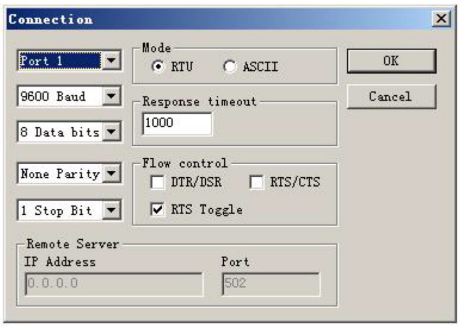


Figure F1-3

After clicking OK, communication can proceed.

After successful communication, you can click Display to select the data format according to Table 2-1 (as shown in Figure F1-4). The successful communication interface is shown in Figure F1-5。

Figure F1-4

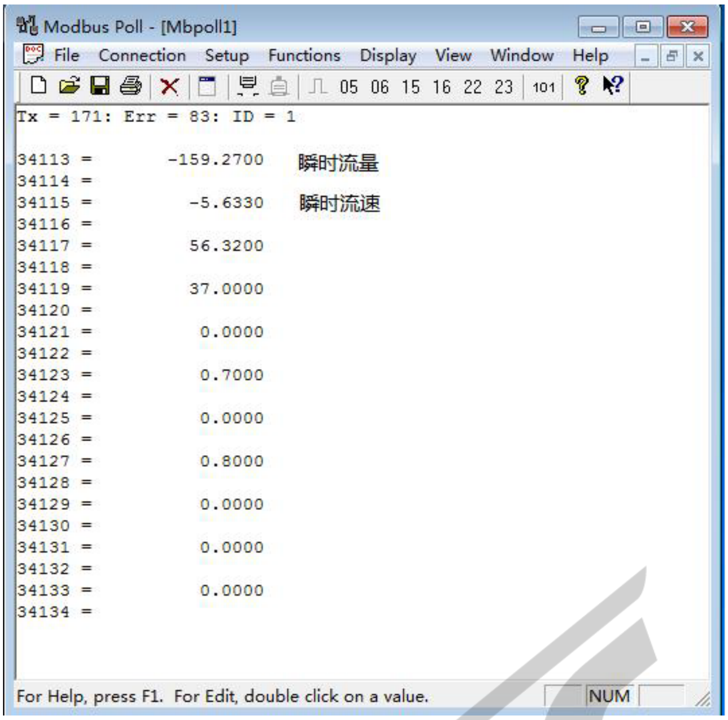

Modbus Poll - [Mbpoll1]
File Connection Setup Functions Display View Window Help
05 06 15 16 22 23 101
Tx = 171: Err = 83: ID = 1
34113 = -159.2700 瞬时流量
34114 =
34115 = -5.6330 瞬时流速
34116 =
34117 = 56.3200
34118 =
34119 = 37.0000
34120 =
34121 = 0.0000
34122 =
34123 = 0.7000
34124 =
34125 = 0.0000
34126 =
34127 = 0.8000
34128 =
34129 = 0.0000
34130 =
34131 = 0.0000
34132 =
34133 = 0.0000
34134 =
For Help, press F1. For Edit, double click on a value.
NUM

Figure F1-5

Appendix 2 Modscan32 Communication Example

Set the communication address of the flowmeter to 1 and the baud rate to 9600.

Click on Setup>Poll Definition to set the collection command including device address1MODBUS function code 04, register address 4113, register length 22, and acquisition interval 1000 are shown in Figure F2-1.

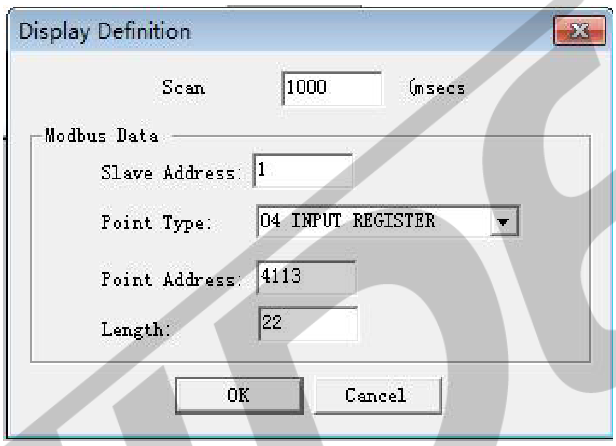


Figure F2-1

Click on Connection → Connection Details to set the serial port format of the flowmeter: 1 bit start bit, 8 bits data bit, 1 bit stop bit, no verification as shown in Figure F2-2.

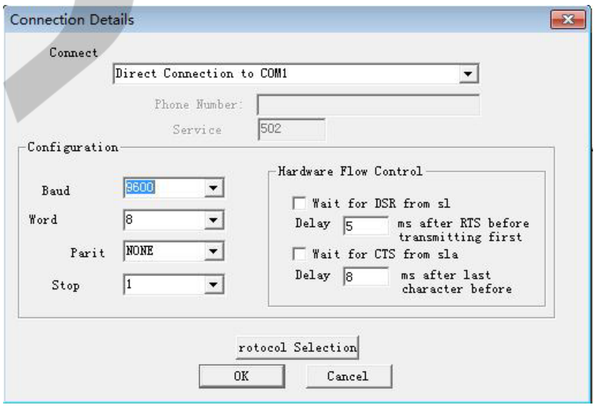


Figure F2-2

After clicking OK, communication can proceed.

After successful communication, you can click Display to select the data format according to Table 2-1 (as shown in Figure F2-3). The successful communication interface is shown in Figure F2-4.

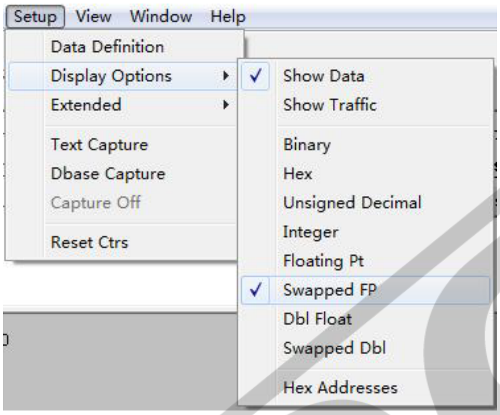


Figure F2-3

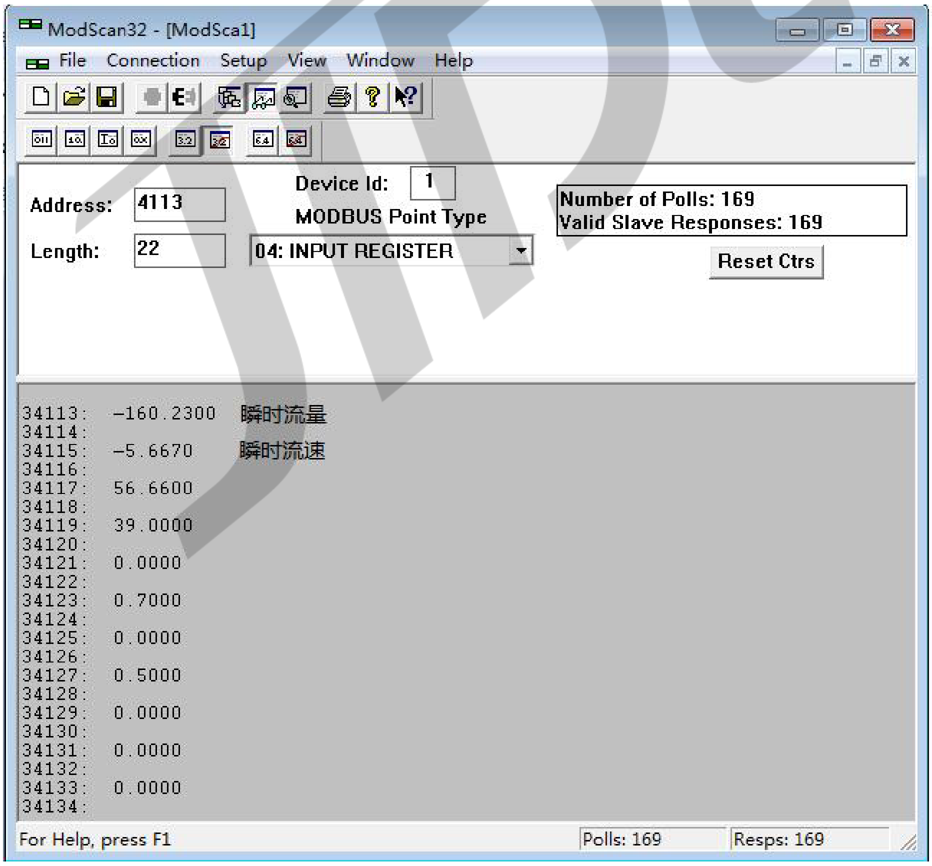


Figure F2-4

Appendix 3 Siemens 200 PLC Communication Example

The communication protocol of the V77 version of the B-series electromagnetic converter supports the standard MODBUS protocol and can communicate with PLCs that support MODBUS to read data. The following is an example of the communication setup method using Siemens' 200 series PLC: (The software is micro win V4.0)

Step 1: Find the library that supports MODBUS communication in the PLC. As shown in Figure F3-1:

If the library in Figure 1 cannot be found on the system, please download and install it from the Siemens website.

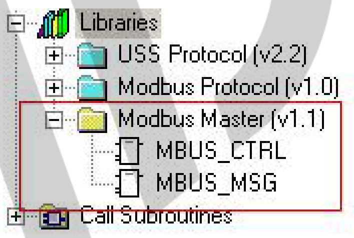


Figure F3-1 MODBUS Application Library

Step 2: Use MBUS_ CTRL initializes the MODBUS function of the PLC. As shown in Figure F3-2:

Baud: 9600 represents the default baud rate of the flowmeter as 9600.

Parity: 0 represents the use of flow meters without calibration.

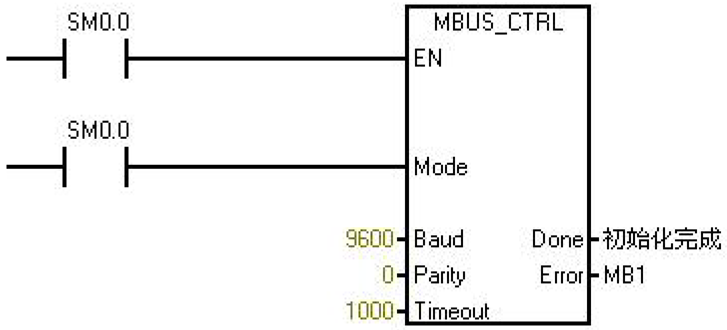


Figure F3-2 Initializing MODBUS

Step 3: Use MBUS_ MSG reads data from the flow meter. As shown in Figure F3-3:

Slave: 1 represents the communication address of the flowmeter as 1.

Addr: 34113 represents the communication starting address for reading instantaneous traffic. The detailed description of the address can be found in Table F3-1。

Count: 2 represents the length of 2 for reading instantaneous flow, as detailed in Table F3-1.

DataPtr:&VB1000 represents the internal address space of the PLC to which instantaneous traffic is transmitted.

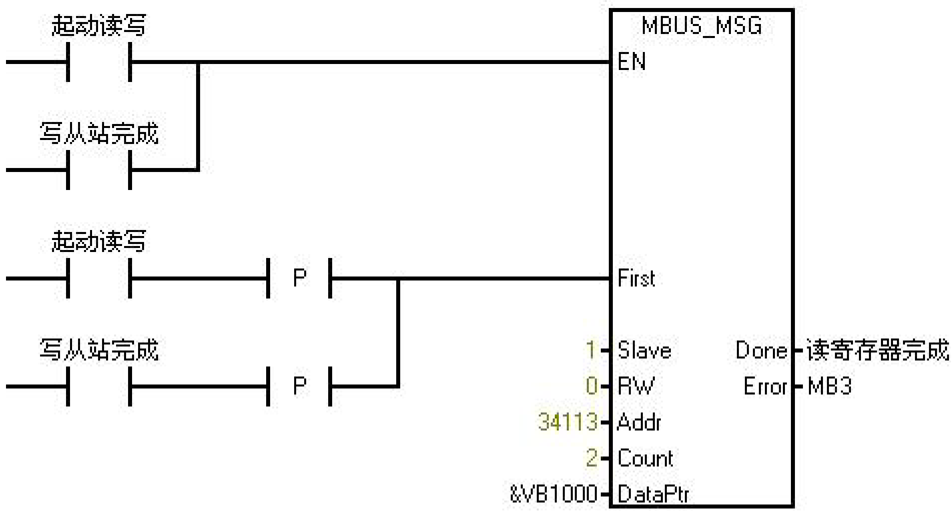


Figure F3-3 Reading Instantaneous Flow

Step 4: Check the data of the flow meter. As shown in Figure F3-4:

VD10000 corresponds to VB1000 in Figure F3-3, representing the internal address space of the PLC to which the instantaneous flow is transmitted.

Selecting Floating Point as the display format means floating point.

Please refer to Table F3-1 for other data settings.

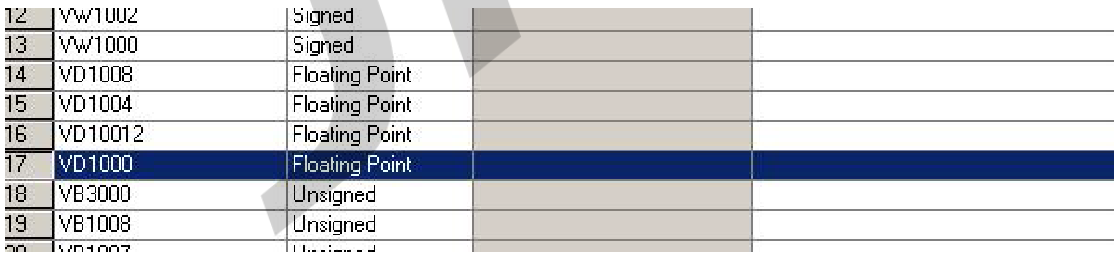


Figure F3-4 Viewing Data

Table F3-1 Siemens 200PLC Variable Correspondence Table

Addr	Count	data format	register definition
34113	2	Floating Point	Instantaneous flow floating-point representation
34115	2	Floating Point	Instantaneous flow rate floating-point representation

34117	2	Floating Point	Floating-point representation of flow percentage
34119	2	Floating Point	Floating point representation of fluid conductivity ratio
34121	2	Unsigned	Positive accumulation of integer parts of numerical values
34123	2	Floating Point	Fractional part of positive cumulative value
34125	2	Unsigned	Reverse accumulation of integer parts of numerical values
34127	2	Floating Point	Reverse accumulation of decimal parts of numerical values
34129	1	Unsigned	Instantaneous flow unit
34130	1	Unsigned	Accumulated total unit
34131	1	Unsigned	Upper limit alarm
34132	1	Unsigned	Lower limit alarm
34133	1	Unsigned	Air traffic control alarm
34134	1	Unsigned	System alarm

Appendix 4 Schneider PLC Communication Example

The communication protocol of the W803E series battery powered electromagnetic converter RS485 supports the standard MODBUS protocol and can communicate with PLCs that support MODBUS to read data. Below is an example of the communication setup method using Schneider's M218 series PLC.

1、 Communication environment:

hardware：

PLC: Schneider TM218LDA24DRN.

485:W803E converter 3.6V power supply 485 module.

Connection method:

PLC terminal: 485terminal:

D1---------------------485-A

D0------------- -------485-B

software environment: SoMachine V4.1.

2、 Setting Steps：

1.Set Port Parameters：

As shown in Figure F4-1, set the baud rate and verification method of the serial port according to the actual settings.

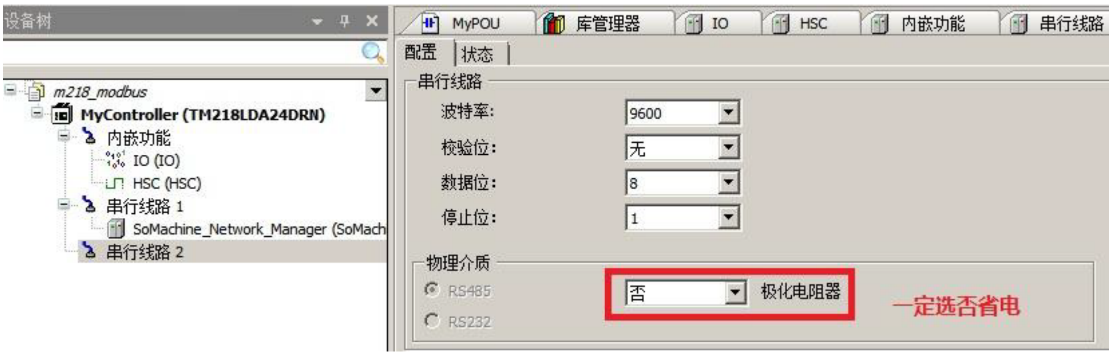


Figure F4-1

1. Add Master Station:

Add the "ModbusManager" device as shown in Figure F4-2.

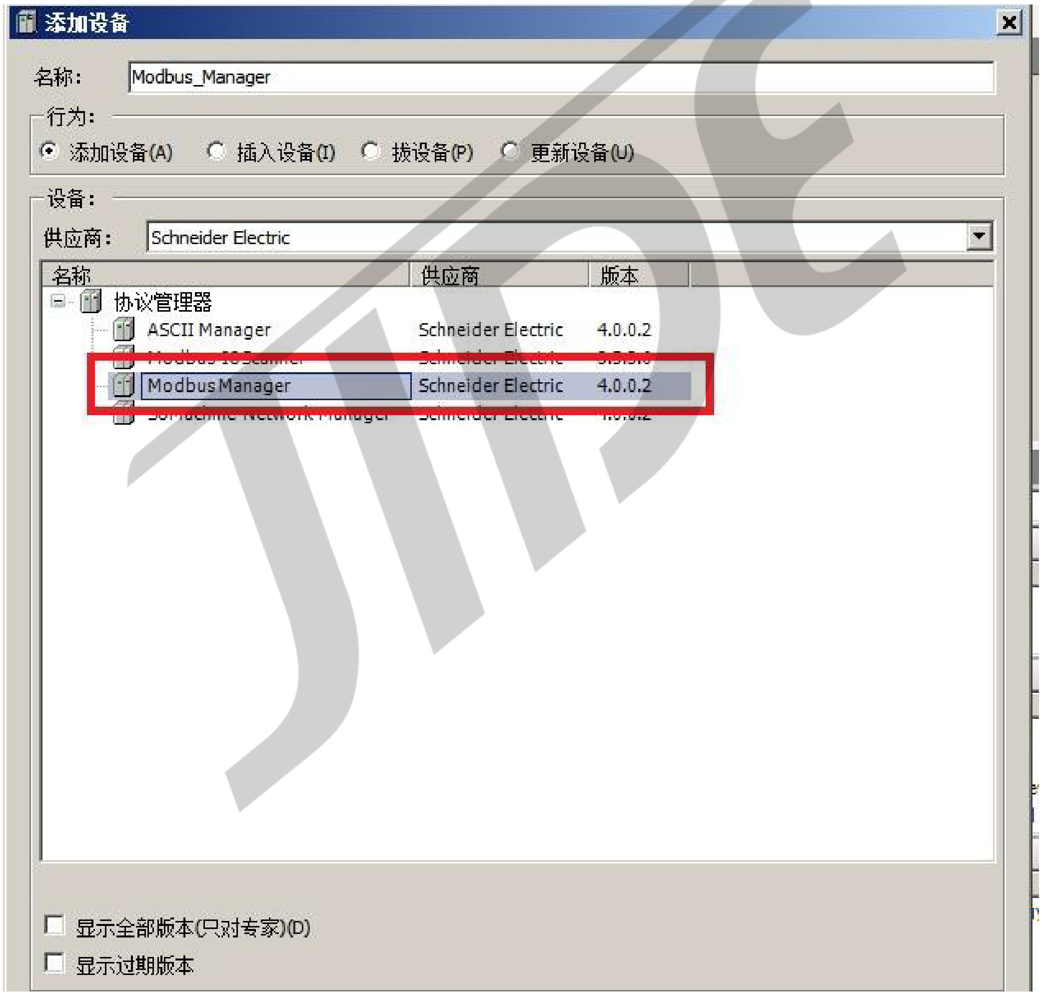


Figure F4-2

3.Set up the main station:

Set "ModbusManager" as shown in Figure F4-3.

Figure F4-3

4. Define variables:

Define variables as follows:

PROGRAM MyPOU

VAR

// TON Function Block for delaying the start of this program

TON_START : TON;

// Delayed Rising Edge signal for starting the program

v_xStartProgram : BOOL := FALSE;

(*********************)

(*** ADDM Variables ***)

(*********************)

// ADDM Function Block for formatting the address of the ATV12

Modbus Slave

ADDM_MODBUS_ATV12 : ADDM;

// ADDRESS structure for the address of the ATV12 Modbus Slave

v_addressModbusAtv12 : ADDRESS;

// "Done" result of the Address conversion

v_xAddressDone : BOOL := FALSE;

// "Error" result of the Address conversion

v_xAddressError : BOOL := FALSE;

// Result of the Address conversion: OK if "Done" without any "Error"

v_xAddressIsOK : BOOL := FALSE;

(******************************)

(*** ETA Register Variables ***)

(******************************)

// BLINK Function Block for periodic reading of the ETA register

BLINK_ETA : BLINK;

// "OUT" output of the BLINK Function Block: Clock

v_xClockReadETARegister : BOOL := FALSE;

// Command to read the ETA register

v_xReadETARegister : BOOL := FALSE;

// READ_VAR Function Block for reading the ETA register of the ATV12 Modbus device

READ_VAR_ETA : READ_VAR;

```
// Buffer for the value of the ETA register
v_wRegisterETA : ARRAY[0..49] OF WORD;
// "Done" result of the ETA register read operation
v_xReadETADone : BOOL := FALSE;
// "Busy" output of the ETA register read operation
v_xReadETABusy : BOOL := FALSE;
// "Error" result of the ETA register read operation
v_xReadETAError : BOOL := FALSE;
// "CommError" result of the ETA register read operation
v_bReadETACommError : BYTE :=
CommunicationErrorCodes.CommunicationOK;
// Result of the ETA register read operation: SUCCESS
v_xReadETASuccess : BOOL := FALSE;
// Result of the ETA register read operation: FAILURE
v_xReadETAFailure : BOOL := FALSE;
// Presence (TRUE) or absence (FALSE) of the ATV12 Modbus
device
v_xPresenceAtv12 : BOOL := FALSE;
// Communication error with the ATV12 Modbus device (Timeout
excluded)
v_xCommErrorAtv12 : BOOL := FALSE;
DWORD_TOTAL_D    : WORD_AS_DWORD;
```

DWORD_TOTAL_F : WORD_AS_DWORD;

DWORD_FLOW : WORD_AS_DWORD;

v_dwTotal_d : DWORD:= 0;

v_dwTotal_f : DWORD:= 0;

v_rTotal_f : REAL := 0;

v_dwFlow : DWORD:= 0;

v_rFlow : REAL := 0;

END_VAR

5.Program (LD):

①Initialize and define the port and address, as shown in Figure F4-4:

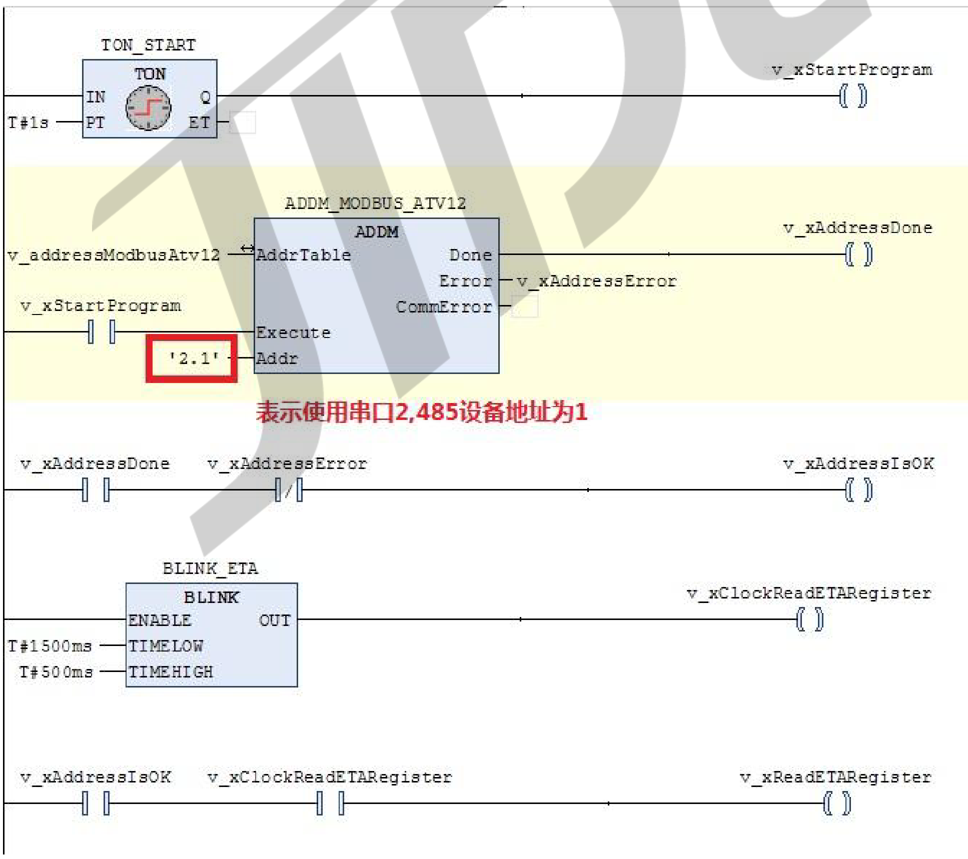


Figure F4-4

②Read 485 device data into memory, as shown in Figure F4-5,read 50 registers:

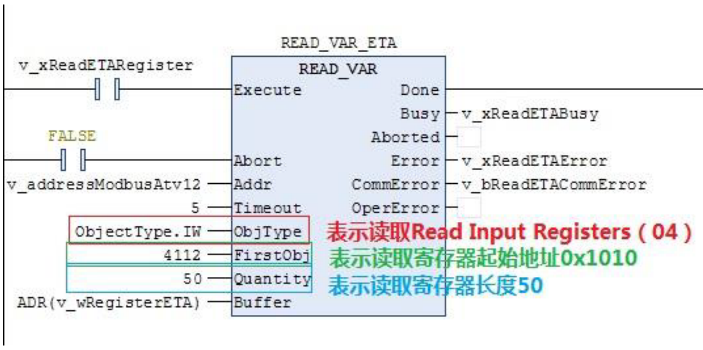


Figure F4-5

③Convert the read data into cumulative traffic, as shown in Figure F4-6,v_ dwTotal_ D is the integer part of the positive cumulative value:

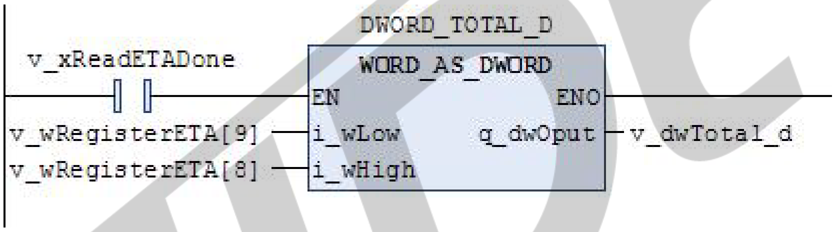


Figure F4-6

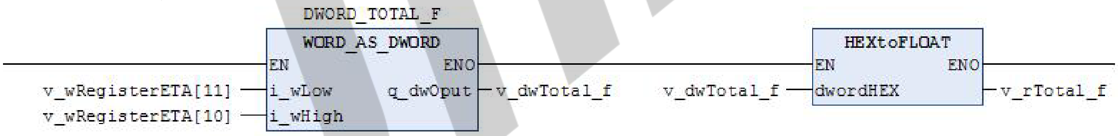


Figure F4-7

Explanation: M218 is a single precision floating-point format, so the integer and decimal parts were not added, otherwise it may cause errors.

④Convert the read data into instantaneous flow rate, as shown in Figure F4-8, v_ RFlow is the instantaneous flow rate：

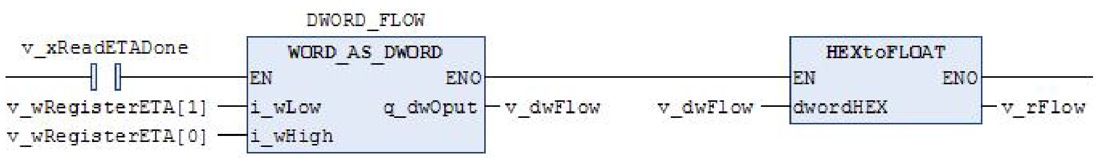


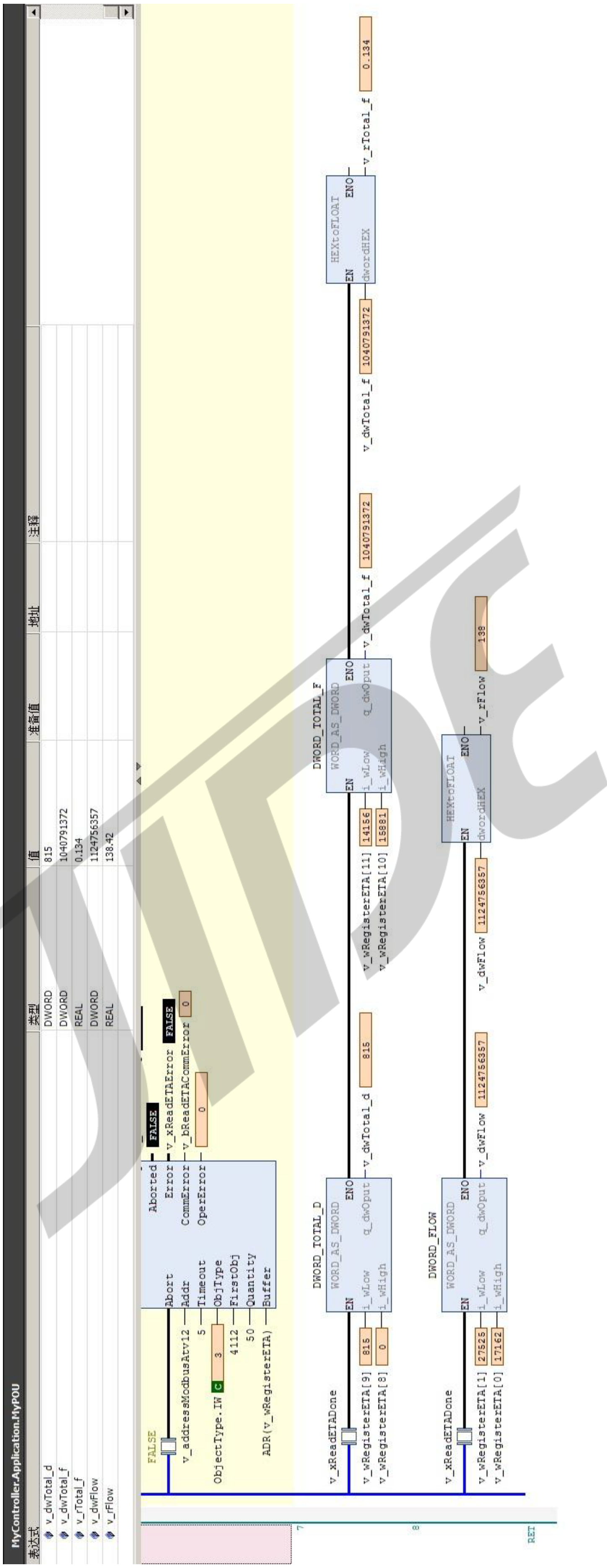
Figure F4-8

⑤After collecting data, the display is shown in the following figure:

The HEXtoFLOAT library used in the example can be downloaded from the following link:

https://pan.baidu.com/s/129ONEDDeN8SlYJUV8jpq3g

Extract code: nai0.



MyController.Application.MyPOU
表达式
类型
值
准备值
地址
注释
v_dwTotal_d
DWORD
815
v_dwTotal_f
DWORD
1040791372
v_rTotal_f
REAL
0.134
v_dwFlow
DWORD
1124756357
v_rFlow
REAL
138.42
Abort
Addr
Timeout
ObjType
FirstObj
Quantity
Buffer
Aborted
Error
CommError
OperError
v_xReadETAError
v_bReadETACommError
v_addressModbusAtv12
ObjectType.IW
ADR(v_wRegisterETA)
DWORD_TOTAL_D
DWORD_TOTAL_F
DWORD_FLOW
WORD_AS_DWORD
HEXtoFLOAT
v_xReadETADone
v_wRegisterETA[9]
v_wRegisterETA[8]
v_wRegisterETA[11]
v_wRegisterETA[10]
v_wRegisterETA[1]
v_wRegisterETA[0]
v_dwTotal_d
v_dwTotal_f
v_rTotal_f
v_dwFlow
v_rFlow
RET