

G0313 Modbus to FF Gateway User Manual



Warning

1. Please don't take off/install gateway at random.
2. Please check if the power of gateway meets the power request in the User Manual.

Version: V2.1

Disclaimer

The contents of this manual have been checked to confirm the consistency of the described hardware and software. Because the error can not be completely excluded, there is no guarantee of absolute consistency. However, we will regularly check the data in this manual and make necessary corrections in subsequent versions. Any suggestions for improvement are welcome.

Microcyber Corporation, 2021

Technical data changes at any time.

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Carrying employee ideal, creating customer value and promoting enterprise development.

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Chapter 1 Summary

G0313 Modbus to FF Gateway is a gateway device of Modbus protocol and FF protocol developed by Microcyber. As Modbus master station, G0313 Modbus to FF Gateway communicates with Modbus-RTU device via RS485 interface, and it can convert the data of Modbus-RTU device to FF device variable output. G0313 Modbus to FF Gateway is shown in Figure 1.1:



Figure 1.1 G0313 Modbus to FF Gateway

1. 1 Outer Size Diagram

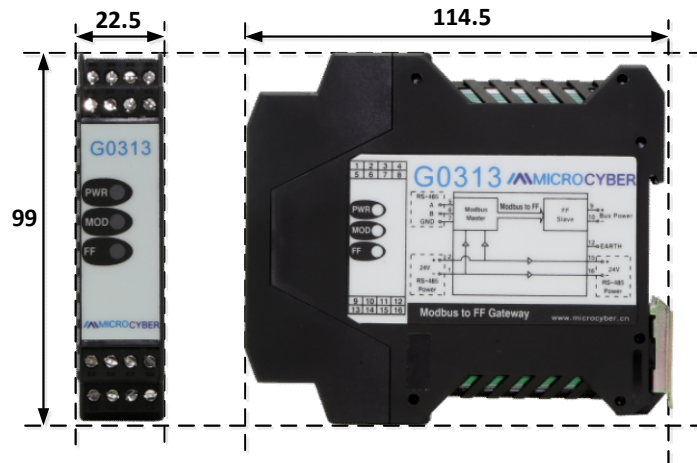


Figure 1.2 Outer Size of Gateway Device (Unit: mm)

1. 2 Structure Diagram

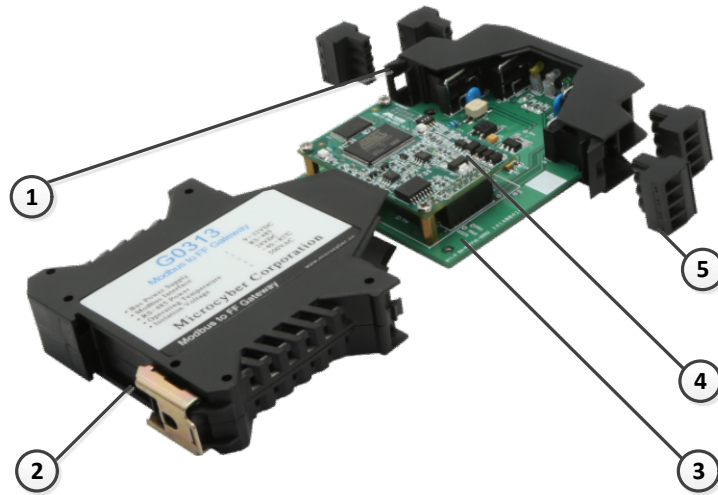


Figure 1.3 Whole Structure of Gateway Device

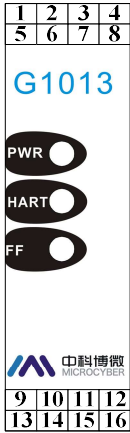
| | | | | | |
|---|------------|---|------------|---|-----------------------|
| 1 | Upper Case | 2 | Lower Case | 3 | FF Communication Card |
| 4 | Modbus | 5 | Terminal | | |

Chapter 2 Installation

G0313 Modbus to FF Gateway size is 99×22.5×114.5mm, and supports standard DIN rail installation.

2.1 Wiring

G0313 Modbus to FF Gateway's terminal distribution and meaning is shown in Figure 2.1.



| | | | |
|----|-------|----|-------|
| 1 | 24V- | 2 | 24V+ |
| 3 | NC | 4 | NC |
| 5 | HART+ | 6 | HART- |
| 7 | NC | 8 | EARTH |
| 9 | FF+ | 10 | FF- |
| 11 | EARTH | 12 | NC |
| 13 | NC | 14 | NC |
| 15 | 24V+ | 16 | 24V- |

Figure 2.1 Terminal Definition of G0313 Modbus to FF Gateway

G0313 Modbus to FF Gateway's power supply has two parts, FF bus power and 24V power of RS485 communication. Shielded twisted-pair cable is recommended, which can help device improve resistance to electromagnetic interference.

2.2 Configuration of DIP Switch

There is a 3-bit DIP switch for G0313 Modbus to FF Gateway, shown as Figure 2.2. SIM, WP and RST switches from top to bottom.

- SIM: Simulation switch, used for "simulation function".
- WP: Write protection, all the write operation for FF smart pressure transmitter shall be refused, which avoid data modification at random.
- RST: Reset, reset device date to factory original. Power off the device at first, and made the switch at ON, and then power on the device, the device shall be reset to factory original.

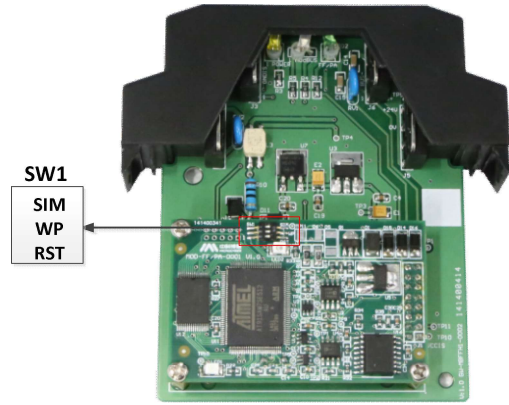


Figure 2.2 DIP Switch of G0313 Modbus to FF Gateway

Chapter 3 Working Principle

Modbus to FF gateway is a gateway device supporting Modbus and FF protocol. As FF device, it can communicate with Modbus devices, read Modbus data to FF device by simply configuration, and transfer data to control system through FF bus. System Wiring Diagram of Modbus to FF Gateway is shown in Figure 3.1:

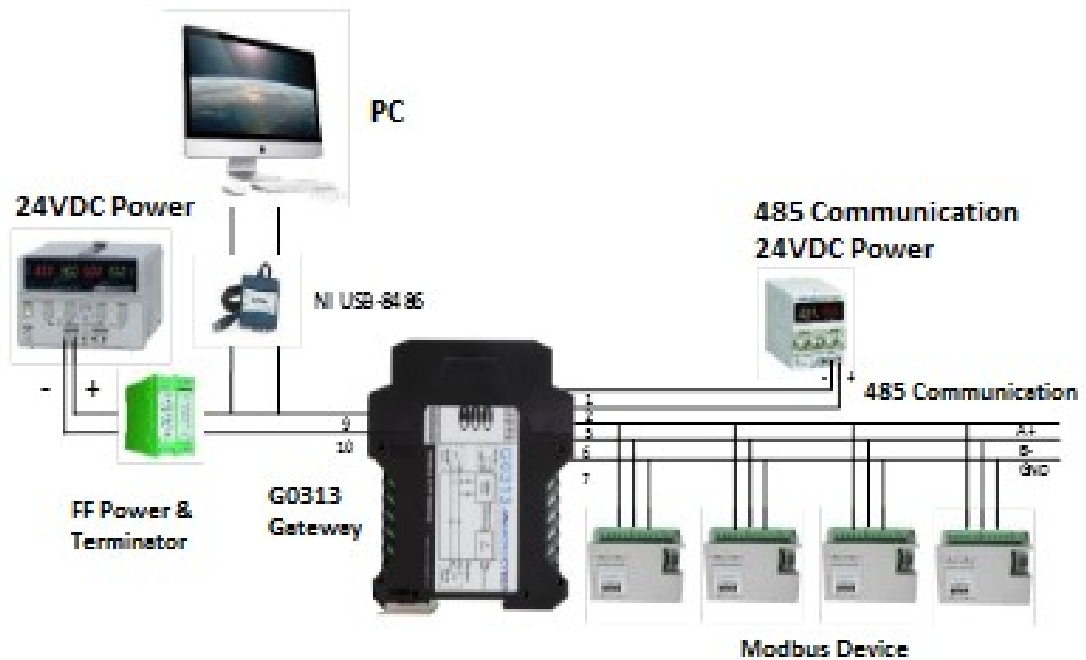


Figure 3.1 System Wiring Diagram of Modbus to FF Gateway

Modbus to FF Gateway supports 4 Modbus slave devices, 8 groups of analog input output and discrete input output parameters, totally 32 channels provided. It configures Modbus device's data into transducer block's parameters via Modbus register, and provides data support for FF system via channels between variables and AI, AO, DI and DO function blocks. Principle Diagram for MODBUS to FF Gateway is shown in Figure 3.2.

G0313 Gateway

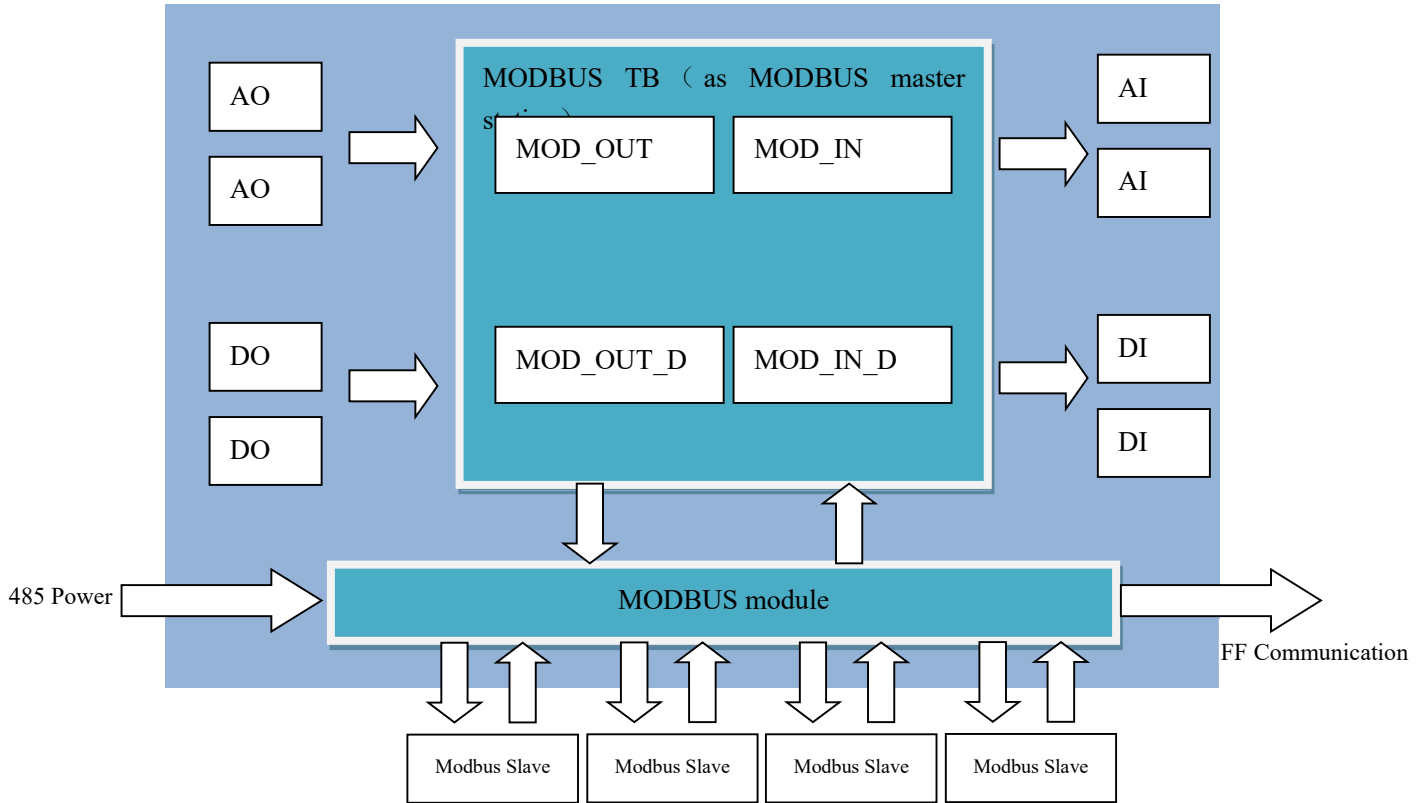


Figure 3.2 Principle Diagram for MODBUS to FF Gateway

Chapter 4 Configuration of Gateway

4.1 Topologic Connection

FF transmitter supports many net topologies shown as Figure 4.1. shows the bus connection of FF instrument is shown in Figure 4.2, in order to ensure the bus signal quality,the terminal matching resistances should be connected to the 2 ends of the bus. The bus maximum length is 1900m, with a repeater, the length can be extended to 10 kilometers.

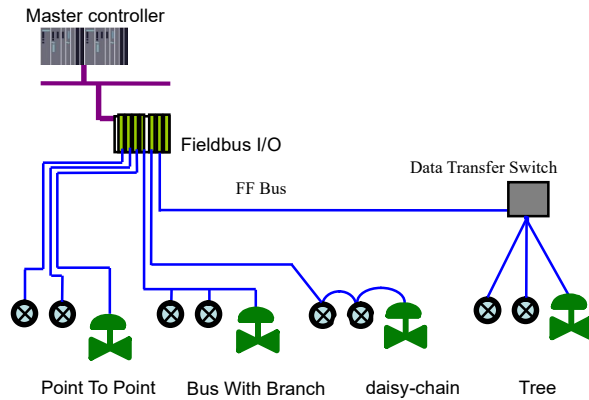


Figure 4.1 Topology of FF Bus

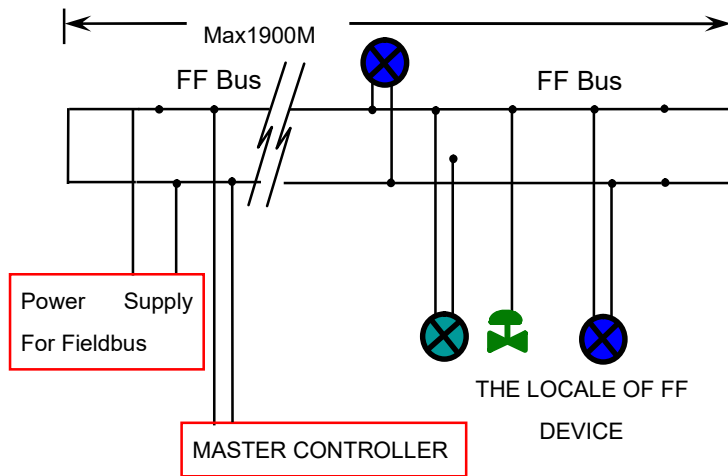


Figure 4.2 FF Bus Connection

4.2 Introduction for Function

Default configuration of Modbus to FF Gateway has 1 RES function block, 4 for each AI, AO, DI, DO, PID function block and Modbus transducer block (Modbus_TB) complying to FF specifications. AI, AO, DI, DO respectively supports 8 channels (CHANNEL), each channel is corresponding to analog/discrete input and output parameters of Modbus transducer block.

| Function Block name | Description |
|---------------------|-------------|
|---------------------|-------------|

| | |
|--|---|
| Resource (RES) | Resource block is used to describe the device identity in the field, such as device name, manufacture, serial number. There is no input or output parameter in the resource block. Generally, there is only one resource block for each device. |
| Modbus_TB (MTB) | Configure Modbus communication parameters via transducer block, such as baud rate, stop bit, communication overtime, etc., Modbus communication configuration parameter. |
| Analog Input (AI) | Analog input function block is used to achieve transducer block input data and transfer to other function blocks, has the function of range conversion, filtration, square root, etc. |
| Analog Output (AO) | Analog output function block is used to transfer output data to transducer block, then to operate physical device. |
| Discrete Input (DI) | Discrete input function block, achieve transducer block input data and transfer to other functions blocks. |
| Discrete Output (DO) | Discrete output function block is used to transfer discrete output data to transducer block, then to operate physical device. |
| Proportional Integral Derivative (PID) | PID function block is a position automatic control module, which magnifies or shrinks the deviation in proportion, and adds and sums it up. It has the function of PID control and setting point adjustment, process value(PV) filtering and alarm, output tracking, etc. |

4.3 Modbus Transform Block Parameters

| Index | Parameter Name | Data Type | Valid Range | Default Value | Save | Mode | Function Description |
|-------|-----------------|---------------|----------------------|---------------|------|------|---------------------------------------|
| 1 | ST_REV | Unsigned16 | | 0 | S/RO | | Static Version |
| 2 | TAG_DESC | OctString(32) | | Spaces | S | | Bit Number |
| 3 | STRATEGY | Unsigned16 | | 0 | S | | Strategy |
| 4 | ALERT_KEY | Unsigned8 | 1 to 255 | 0 | S | | Alarm |
| 5 | MODE_BLK | DS-69 | | O/S | S | | Mode |
| 6 | BLOCK_ERR | Bitstring(2) | | | | D/RO | Failure |
| 7 | UPDATA_EVT | DS-73 | | | | D | Static Data Update Event |
| 8 | BLOCK_ALM | DS-72 | | | | D | Function Block Alarm |
| 9 | TRANSDUCER_TYPE | Unsigned16 | | 65535 | N/RO | | Transducer Block Type |
| 10 | XD_ERROR | Unsigned8 | | 0 | D/RO | | Transducer Block Failure Descriptionj |
| 11 | SENSOR_TYPE | Unsigned16 | | 65535 | D/RO | | Sensor Type |
| 12 | MEDIA | Unsigned8 | 0: RS232 1: RS485 | 0 | S | O/S | Physical Transmission |

| | | | | | | | |
|----|-----------------|--------------|--|-----|---|------|--|
| | | | | | | | Medium, the present round card supports RS232 |
| 13 | BAUD_RATE | Unsigned8 | 0:9600 1:19200 2:15625 3:31250 4:62500 5:125000 | 0 | S | O/S | MODBUS Communication Baud Rate |
| 14 | STOP_BITS | Unsigned8 | 0: 1bit 1: 2bit | 0 | S | O/S | MODBUS Communication Stop Bit |
| 15 | PARITY | Unsigned8 | 0: None, 1: Even 2: Odd | 0 | S | O/S | MODBUS Communication Calibration Bit |
| 16 | CRC_ORDER | Unsigned8 | 0:No swap 1:Swap | 0 | S | O/S | CRC High and low bit exchange, the high bit is first in default. |
| 17 | TIME_OUT | Unsigned16 | 0-65535 | 300 | S | O/S | After sending MODBUS request, the maximum time waiting for slave station response. The unit is ms, default 1000ms. |
| 18 | NUMBER_OF_RETRY | Unsigned8 | 0-255 | 1 | S | O/S | When the waiting response is timeout, the number for resending the request. |
| 19 | SLVAE_ADDRESS | Unsigned8 | 0-255 | 1 | S | O/S | MODBUS slave address |
| 20 | BAD_STATUS | Bitstring(4) | | | | D/RO | Communication Status for 32 input output commands. When certain bit is 1, it means the related command doesn't receive the response. Please refer to the following table for the parameter |

| | | | | | | | |
|----|-----------------|-----------|-------|---|------|-----|---|
| | | | | | | | description. |
| 21 | EXP_CODE_NUMBER | Unsigned8 | 0-31 | 0 | D | | Code address of 32 input output negative response in abnormal. E.g. 0 represents the negative response code of MOD_IN1. |
| 22 | EXP_CODE_VALUE | Unsigned8 | 0-255 | 0 | D/RO | | Abnormal code of 32 input output command negative response, which is indicated by EXP_CODE_NUMBER indicated index. |
| 23 | MOD_IN1 | DS-65 | | | D/RO | | Analog input1 |
| 24 | SCALE_LOC_IN1 | DS-256 | | | S | O/S | Analog input 1 Configure |
| 25 | MOD_IN2 | DS-65 | | | D/RO | | Analog input2 |
| 26 | SCALE_LOC_IN2 | DS-256 | | | S | O/S | Analog input 2 Configure |
| 27 | MOD_IN3 | DS-65 | | | D/RO | | Analog input3 |
| 28 | SCALE_LOC_IN3 | DS-256 | | | S | O/S | Analog input 3 Configure |
| 29 | MOD_IN4 | DS-65 | | | D/RO | | Analog input4 |
| 30 | SCALE_LOC_IN4 | DS-256 | | | S | O/S | Analog input 4 Configure |
| 31 | MOD_IN5 | DS-65 | | | D/RO | | Analog input5 |
| 32 | SCALE_LOC_IN5 | DS-256 | | | S | O/S | Analog input 5 Configure |
| 33 | MOD_IN6 | DS-65 | | | D/RO | | Analog input6 |
| 34 | SCALE_LOC_IN6 | DS-256 | | | S | O/S | Analog input 6 Configure |
| 35 | MOD_IN7 | DS-65 | | | D/RO | | Analog input7 |
| 36 | SCALE_LOC_IN7 | DS-256 | | | S | O/S | Analog input 7 Configure |
| 37 | MOD_IN8 | DS-65 | | | D/RO | | Analog input8 |
| 38 | SCALE_LOC_IN8 | DS-256 | | | S | O/S | Analog input 8 Configure |
| 39 | MOD_OUT1 | DS-65 | | | D/RO | | Analog output1 |
| 40 | SCALE_LOC_OUT 1 | DS-256 | | | S | O/S | Analog output 1 Configure |

| | | | | | | | |
|----|-----------------|--------|--|--|------|-----|-------------------------------|
| 41 | MOD_OUT 2 | DS-65 | | | D/RO | | Analog output 2 |
| 42 | SCALE_LOC_OUT 2 | DS-256 | | | S | O/S | Analog output 2 Configure |
| 43 | MOD_OUT 3 | DS-65 | | | D/RO | | Analog output 3 |
| 44 | SCALE_LOC_OUT 3 | DS-256 | | | S | O/S | Analog output 3 Configure |
| 45 | MOD_OUT 4 | DS-65 | | | D/RO | | Analog output 4 |
| 46 | SCALE_LOC_OUT 4 | DS-256 | | | S | O/S | Analog output 4 Configure |
| 47 | MOD_OUT 5 | DS-65 | | | D/RO | | Analog output 5 |
| 48 | SCALE_LOC_OUT 5 | DS-256 | | | S | O/S | Analog output 5 Configure |
| 49 | MOD_OUT 6 | DS-65 | | | D/RO | | Analog output 6 |
| 50 | SCALE_LOC_OUT 6 | DS-256 | | | S | O/S | Analog output 6 Configure |
| 51 | MOD_OUT 7 | DS-65 | | | D/RO | | Analog output7 |
| 52 | SCALE_LOC_OUT 7 | DS-256 | | | S | O/S | Analog output 7 Configure |
| 53 | MOD_OUT 8 | DS-65 | | | D/RO | | Analog output8 |
| 54 | SCALE_LOC_OUT 8 | DS-256 | | | S | O/S | Analog output8 Configure |
| 55 | MOD_IN_D1 | DS-66 | | | D/RO | | Discrete input 1 |
| 56 | LOC_IN_D 1 | DS-257 | | | S | O/S | Discrete input 1 Configure |
| 57 | MOD_IN_D 2 | DS-66 | | | D/RO | | Discrete input 2 |
| 58 | LOC_IN_D 2 | DS-257 | | | S | O/S | Discrete input 2 Configure |
| 59 | MOD_IN_D 3 | DS-66 | | | D/RO | | Discrete input 3 |
| 60 | LOC_IN_D 3 | DS-257 | | | S | O/S | Discrete input 3 Configure |
| 61 | MOD_IN_D 4 | DS-66 | | | D/RO | | Discrete input 4 |
| 62 | LOC_IN_D 4 | DS-257 | | | S | O/S | Discrete input 4 Configure |
| 63 | MOD_IN_D 5 | DS-66 | | | D/RO | | Discrete input 5 |
| 64 | LOC_IN_D 5 | DS-257 | | | S | O/S | Discrete input 5 Configure |
| 65 | MOD_IN_D 6 | DS-66 | | | D/RO | | Discrete input 6 |
| 66 | LOC_IN_D 6 | DS-257 | | | S | O/S | Discrete input 6 Configure |
| 67 | MOD_IN_D 7 | DS-66 | | | D/RO | | Discrete input 7 |
| 68 | LOC_IN_D 7 | DS-257 | | | S | O/S | Discrete input 7 |

| | | | | | | | |
|----|-------------|--------|--|--|------|-----|--------------------------------|
| | | | | | | | Configure |
| 69 | MOD_IN_D 8 | DS-66 | | | D/RO | | Discrete input 8 |
| 70 | LOC_IN_D 8 | DS-257 | | | S | O/S | Discrete input 8 Configure |
| 71 | MOD_OUT_D1 | DS-66 | | | D/RO | | Discrete output 1 |
| 72 | LOC_OUT_D 1 | DS-257 | | | S | O/S | Discrete output 1 Configure |
| 73 | MOD_OUT_D 2 | DS-66 | | | D/RO | | Discrete output 2 |
| 74 | LOC_OUT_D 2 | DS-257 | | | S | O/S | Discrete output 2 Configure |
| 75 | MOD_OUT_D 3 | DS-66 | | | D/RO | | Discrete output 3 |
| 76 | LOC_OUT_D 3 | DS-257 | | | S | O/S | Discrete output 3 Configure |
| 77 | MOD_OUT_D 4 | DS-66 | | | D/RO | | Discrete output 4 |
| 78 | LOC_OUT_D 4 | DS-257 | | | S | O/S | Discrete output 4 Configure |
| 79 | MOD_OUT_D 5 | DS-66 | | | D/RO | | Discrete output 5 |
| 80 | LOC_OUT_D 5 | DS-257 | | | S | O/S | Discrete output 5 Configure |
| 81 | MOD_OUT_D 6 | DS-66 | | | D/RO | | Discrete output 6 |
| 82 | LOC_OUT_D 6 | DS-257 | | | S | O/S | Discrete output 6 Configure |
| 83 | MOD_OUT_D 7 | DS-66 | | | D/RO | | Discrete output 7 |
| 84 | LOC_OUT_D 7 | DS-257 | | | S | O/S | Discrete output 7 Configure |
| 85 | MOD_OUT_D 8 | DS-66 | | | D/RO | | Discrete output 8 |
| 86 | LOC_OUT_D 8 | DS-257 | | | S | O/S | Discrete output 8 Configure |

4. 3. 1 Communication Parameter for Modbus Transducer Block

The user is able to configure the Modbus communication parameter, such as baud rate, stop bit, communication timeout, etc. The Modbus communication configuration parameters are shown as following:

| Parameter Name | Data Type | Function Description |
|------------------|-----------|---|
| MEDIA | USIGN8 | Physical transmission medium, 0: RS232, 2: RS485 |
| BAUD_RATE | USIGN8 | Baud rate, 0:2400, 1:4800, 2: 9600 (默认), 3:14400, 4:19200 |
| STOP_BIT | USIGN8 | Stop bit, 0: one stop bit, 1: two stop bits |
| PARITY | USIGN8 | Calibration bit, 0: no calibration bit, 1: even calibration, 2: odd calibration |
| CRC_ORDER | USIGN8 | CRC calibration byte order, 0: high byte first, 1: low byte first |

| | | |
|------------------------|---------|---|
| TIME_OUT | USIGN16 | After sending MODBUS request, the maximum time waiting for slave station response. The unit is ms, default 300ms. |
| NUMBER_OF_RETRY | USIGN8 | When the waiting response is timeout, the number for resending the request. The range is 0-255. |
| SLAVE_ADDRESS | USIGN8 | Support 4 Modbus slave stations, Modbus slave address. The range is 0-255(0 not used). |

4. 3. 2 Register Parameter for Modbus Transducer Block

The MODBUS transducer block provides 8 couples of Analog input output and 8 couples of discrete input output parameters. The parameters are related to MODBUS register, and realized data exchange according to specified data type. MODBUS register configure parameters are divided into analog parameter configure and discrete parameter configure. Comparing with discrete one, the analog one has the range conversion (also called linear conversion) function.

DS-256 Analog Configure Parameter MOD_SCALE_LOC_PARM

The new data type DS-256 is configure parameter for analog input output, it can carry out the conversion between FF float data and MODBUS register data. DATA_TYPE data type parameter indicates the MODBUS register data type, and it does linear conversion to MODBUS register data and gives FF float data or converts FF float data to DATA_TYPE indicated data and writes into MODBUS register via FROM_EU100, FROM_EU0, TO_EU100 and TO_EU0.

| Data Member | Data Type | Function Description |
|-------------------------------|-----------|--|
| FROM_EU100 | FLOAT | Upper limit for input range |
| FROM_EU0 | FLOAT | Lower limit for input range |
| TO_EU100 | FLOAT | Upper limit for output range |
| TO_EU0 | FLOAT | Lower limit for output range |
| DATA_TYPE | USIGN8 | Data type parameter, please refer to the table of DATA_TYPE parameter description for detailed |
| FUNCTION_CODE | USIGN8 | MODBUS function code, indicates which function code is used for communication by the command. |
| REGISTER_ADR_OF_VALUE | USIGN16 | MODBUS register address related to analog value |
| REGISTER_ADR_OF_STATUS | USIGN16 | MODBUS register address related to analog status |

DS-257 Discrete Configure Parameter MOD_LOC_PARM

The new data type DS-257 is configuration parameter for discrete input output, it can carry out the conversion between FF discrete data and MODBUS register data. The data type DATA_TYPE only supports Unsigned8_0 and Unsigned8_1. For Unsigned8_0, the low 8-bit bytes of register data correspond to the FF discrete parameter, and for Unsigned8_1, the high 8-bit bytes of register data corresponds to the FF discrete parameter.

| Data Member | Data Type | Function Description |
|-------------|-----------|----------------------|
|-------------|-----------|----------------------|

| | | |
|-------------------------------|---------|---|
| DATA_TYPE | USIGN8 | Data type, show as the table followed |
| FUNCTION_CODE | USIGN8 | MODBUS function code, indicates which function code is used for communication by the command. |
| REGISTER_ADR_OF_VALUE | USIGN16 | MODBUS register address related to analog value |
| REGISTER_ADR_OF_STATUS | USIGN16 | MODBUS register address related to analog status |

The Relationship Between Parameter Status and REGISTER_ADR_OF_STATUS

When REGISTER_ADR_OF_STATUS is 0, it is configured as an invalid register address. Otherwise, it is a valid register address.

| Parameter | REGISTER_ADR_OF_STATUSConfigure invalid (default) | REGISTER_ADR_OF_STATUSConfigure valid |
|---------------|--|---|
| Input | If the MODBUS communication is normal, the parameter status is "GOOD NON-CASCADE", otherwise, it is "BAD NO COMMUNICATION WITH LAST VALUE" | The round card will read the related address data from instrument card via MODBUS communication, making the low 8 bits the parameter status and high 8 bits omitted. |
| Output | The round card won't send and data about parameter status to instrument card via MODBUS. | The round card will send the data to register related to instrument card address via MODBUS. The parameter will occupy the low 8 bits of register data, and the high 8 bits will be set as 0. |

Parameter Description for DATA_TYPE

| Index | Name | Data Type | Data Length | Valid Range | Others |
|-------|---------------|---------------------------|-------------|-------------|---|
| 1 | Float_0123 | Single Precision Float | 4 | | Only analog input output parameter supportive |
| 2 | Float_1032 | Single Precision Float | 4 | | Only analog input output parameter supportive |
| 3 | Float_3210 | Single Precision Float | 4 | | Only analog input output parameter supportive |
| 4 | Float_2301 | Single Precision Float | 4 | | Only analog input output parameter supportive |
| 5 | Unsigned8_0 | Unsigned int | 1 | 0 - 255 | |
| 6 | Unsigned8_1 | Unsigned int | 1 | 0 - 255 | |
| 7 | Unsigned16_01 | Unsigned short int | 2 | 0 - 65535 | Only analog input output parameter supportive |
| 8 | Unsigned16_10 | Unsigned short int | 2 | 0 - 65535 | Only analog input output parameter supportive |

| | | | | | |
|----|-----------------|-------------------|---|--------------------------------|---|
| 9 | Unsigned32_0123 | Unsigned long int | 4 | 0 - 4294967295 | Only analog input output parameter supportive |
| 10 | Unsigned32_1032 | Unsigned long int | 4 | 0 - 4294967295 | Only analog input output parameter supportive |
| 11 | Unsigned32_3210 | Unsigned long int | 4 | 0 - 4294967295 | Only analog input output parameter supportive |
| 12 | Unsigned32_2301 | Unsigned long int | 4 | 0 - 4294967295 | Only analog input output parameter supportive |
| 13 | Signed8_0 | Signed int | 1 | -128 - 127 | |
| 14 | Signed8_1 | Signed int | 1 | -128 - 127 | |
| 15 | Signed16_01 | Signed short int | 2 | -32768 - 32767 | Only analog input output parameter supportive |
| 16 | Signed16_10 | Signed short int | 2 | -32768 - 32767 | Only analog input output parameter supportive |
| 17 | Signed32_0123 | Signed long int | 4 | -2,147,483,648 - 2,147,483,647 | Only analog input output parameter supportive |
| 18 | Signed32_1032 | Signed long int | 4 | -2,147,483,648 - 2,147,483,647 | Only analog input output parameter supportive |
| 19 | Signed32_3210 | Signed long int | 4 | -2,147,483,648 - 2,147,483,647 | Only analog input output parameter supportive |
| 20 | Signed32_2301 | Signed long int | 4 | -2,147,483,648 - 2,147,483,647 | Only analog input output parameter supportive |

*** Only support analog input and output parameters**

Specification about Data Format

In the data type table above, the suffix of DataType_abcd, abcd means the data's serial number in MODBUS slave station. 0 represents the low 8 bits of data in the first register, 1 represents the high 8 bits of data in the first register, 2 represents the low 8 bits of data in the second register, 3 represents the high 8 bits of data in the second register. MODBUS_FF module memory selects little-end mode, so Unsigned32_0123 represents MODBUS slave station register data gives value to long int variable in MODBUS_FF module in original order, while Unsigned32_1032 represents MODBUS slave station register data after high and low bit bytes exchange gives value to long int variable in MODBUS_FF module.

4. 3. 3 Modbus Transform Block State Parameter

BAD_STATUS parameter description

If the communication fails, the corresponding bit is set to 1, otherwise 0.

| BIT | PARAMETER | BIT | PARAMETER |
|-----|-----------|-----|------------|
| 0 | MOD_IN1 | 16 | |
| 1 | MOD_IN2 | 17 | MOD_IN_D 2 |
| 2 | MOD_IN3 | 18 | MOD_IN_D 3 |

| | | | |
|----|-----------|----|-------------|
| 3 | MOD_IN4 | 19 | MOD_IN_D 4 |
| 4 | MOD_IN5 | 20 | MOD_IN_D 5 |
| 5 | MOD_IN6 | 21 | MOD_IN_D 6 |
| 6 | MOD_IN7 | 22 | MOD_IN_D 7 |
| 7 | MOD_IN8 | 23 | MOD_IN_D 8 |
| 8 | MOD_OUT1 | 24 | MOD_OUT_D 1 |
| 9 | MOD_OUT 2 | 25 | MOD_OUT_D 2 |
| 10 | MOD_OUT 3 | 26 | MOD_OUT_D 3 |
| 11 | MOD_OUT 4 | 27 | MOD_OUT_D 4 |
| 12 | MOD_OUT 5 | 28 | MOD_OUT_D 5 |
| 13 | MOD_OUT 6 | 29 | MOD_OUT_D 6 |
| 14 | MOD_OUT 7 | 30 | MOD_OUT_D 7 |
| 15 | MOD_OUT 8 | 31 | MOD_OUT_D 8 |

ERR_LOOK_SEL and ERR_LOOK_RESULT Parametric Description

The input and output parameters negative response data query function of ERR_LOOK_SEL and ERR_LOOK_RESULT. Users can query the response value of each input and output data and use the ERR_LOOK_SEL to select a certain input and output parameters to query, The communication response data of this parameter can be obtained by reading the ERR_LOOK_RESULT parameters. ERR_LOOK_RESULT,0 indicates no error ;0 x01-0x0B is Modbus standard negative response data; 0 xFF indicates master-slave communication failure.

The two parameters are described in detail as follows:

1) ERR_LOOK_SEL Parameters

| PARAMETER | PARAMETER | PARAMETER | PARAMETER |
|-----------|-----------|-----------|-------------|
| 0 | MOD_IN1 | 16 | MOD_IN_D1 |
| 1 | MOD_IN2 | 17 | MOD_IN_D 2 |
| 2 | MOD_IN3 | 18 | MOD_IN_D 3 |
| 3 | MOD_IN4 | 19 | MOD_IN_D 4 |
| 4 | MOD_IN5 | 20 | MOD_IN_D 5 |
| 5 | MOD_IN6 | 21 | MOD_IN_D 6 |
| 6 | MOD_IN7 | 22 | MOD_IN_D 7 |
| 7 | MOD_IN8 | 23 | MOD_IN_D 8 |
| 8 | MOD_OUT1 | 24 | MOD_OUT_D 1 |
| 9 | MOD_OUT 2 | 25 | MOD_OUT_D 2 |
| 10 | MOD_OUT 3 | 26 | MOD_OUT_D 3 |
| 11 | MOD_OUT 4 | 27 | MOD_OUT_D 4 |
| 12 | MOD_OUT 5 | 28 | MOD_OUT_D 5 |
| 13 | MOD_OUT 6 | 29 | MOD_OUT_D 6 |
| 14 | MOD_OUT 7 | 30 | MOD_OUT_D 7 |
| 15 | MOD_OUT 8 | 31 | MOD_OUT_D 8 |

2) ERR_LOOK_RESULT Parameters

| Figure | Parametric Description |
|--------|--|
| 0x00 | OK |
| 0x01 | Illegal Function |
| 0x02 | Illegal Data Address |
| 0x03 | Illegal Data Value |
| 0x04 | Slave Device Failure |
| 0x05 | Acknowledge |
| 0x06 | Slave Device Busy |
| 0x08 | Memory Parity Error |
| 0x0A | Gateway Path Unavailable |
| 0x0B | Gateway Target Device Failed To Response |
| 0xFE | Function Code Mismatch |
| 0xFF | Communication Failure |

4. 4 Example for Modbus Transducer Block Configuration

Take NI-Configurator Software as an example, this Chapter will show how to Configure MODBUS transducer block.

4. 4. 1 Configure for MODBUS Communication Parameter

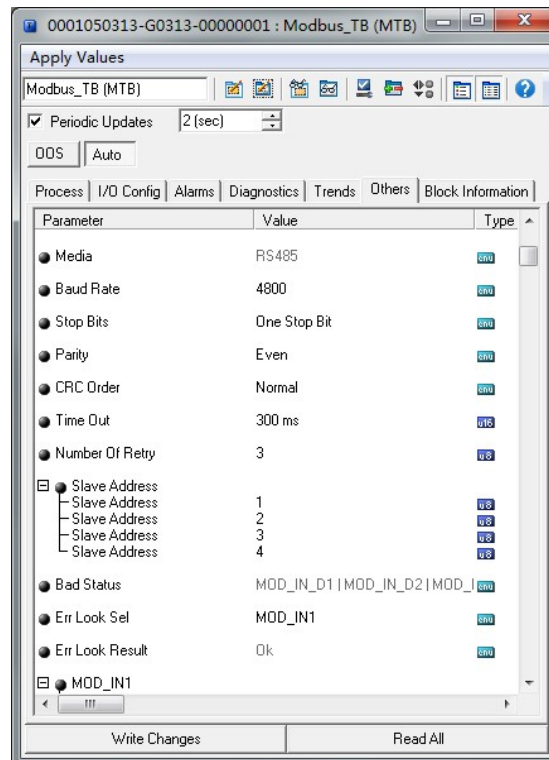


Figure 4.3 Modbus Communication parameter configuration

4. 4. 2 Configure for MODBUS Register

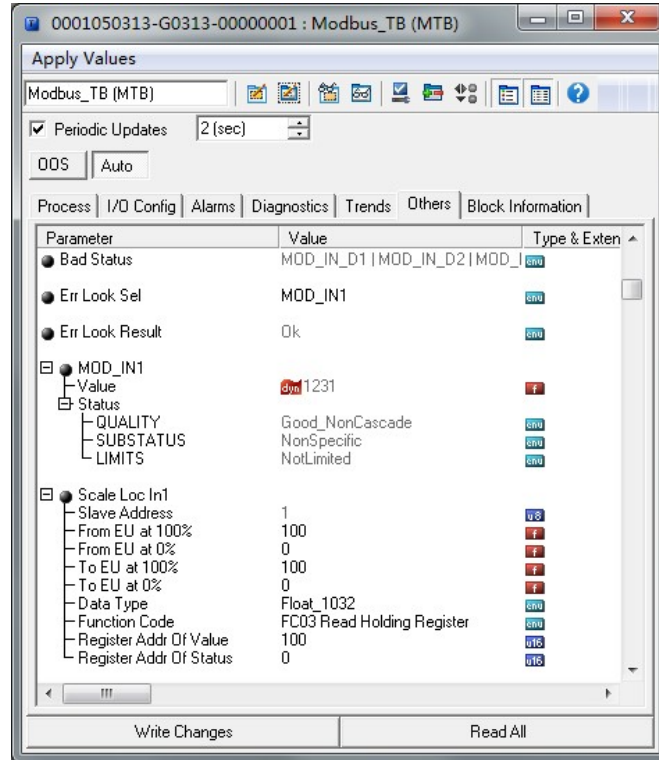


Figure 4.4 Modbus Register configuration

Now let's take analog input parameter MOD_IN1 as an example to describe MODBUS register configure. For analog input parameter, it is only needed to configure SCALE_LOC_IN_X. The X range is 0-8. The SCAL_LOC_IN_1 configure is shown as following:

```

FROM_EU100 = 4095
FROM_EU0 = 0
TO_EU100 = 100
TO_EU0 = 0
DATA_TYPE = "Unsigned16_01"
FUNCTION_CODE = "FC03 Read Holding Register"
REGISTER_ADDR_OF_VALUE = 14
REGISTER_ADDR_OF_STATUS = 0
    
```

The configure means that, the function code 3 is used to read MODBUS register, data register address is 14, status register address, set as 0, means the status is determined by transducer blocks automatically, rather than reading from MODBUS slave station. The data, read from MODBUS slave station is used as data rather than status. Data type Unsigned16_01 gives the data from slave station to transducer block, without high and low bytes exchange. When transducer block received the register data, after the range conversion, it will give the data result to MOD_IN1. For example, if register data is 0x0ABC, whose decimal is 2748, the value of MOD_IN1 is calculated as following:

$$\frac{2748 - 0}{4095 - 0} = \frac{\text{value} - 0}{100 - 0}$$

Chapter 5 Maintenance

- Simple Maintenance

| LED Indicator Light | Color | Normal Status | Abnormal Status | Abnormal Reason | Correction Method |
|---------------------|--------------|---------------|-----------------|--------------------------|-----------------------------------|
| FF Communication | Green | Flash | Light off | No FF communication | Check FF master and interface |
| | | | | Power fault | Check power supply and connection |
| | | | | Internal fault | Contact technical support |
| 485 Communication | Yellow-green | Flash | Light off | Not connect slave device | Connect slave device |
| | | | | Slave device fault | Check slave and connection |
| | | | | Internal fault | Contact technical support |
| 485 Power | Yellow | Light on | Light off | Power fault | Check power supply and connection |
| | | | | Internal fault | Contact technical support |

- Daily maintenance means cleaning device only.
- Fault maintenance: Please return to the factory if there's fault.

Chapter 6 Technical Specification

6.1 Basic Parameters

| | |
|--------------------|-------------------------------------|
| Measure Object | Modbus RTU slave device |
| Modbus Power | 24VDC |
| FF Bus Power | 9~32VDC |
| Bus Protocol | Two-wire, FF Protocol |
| Insulating Voltage | Modbus and FF bus interface, 500VAC |
| Temperature Scale | -40°C~85°C |
| Humidity Scale | 5~95%RH |
| Start Time | ≤5s |
| Refresh Time | 0.2s |

6.2 Performance Index

| | |
|-------------------------------|---|
| Protection Level | Housing protection level is IP20. |
| Electromagnetic compatibility | Meet GB/T 18268.1-2010 Test method for FF port meets GB/T 18268.23-2010. |

6.3 Physical Properties

| | |
|---------------------|---|
| Weight | 0.2kg |
| Structural Material | Housing: Polyamide PA6.6; Coating: Polyester epoxy resin |

6.4 Default Communication Parameters

| | |
|-----------------|----------------|
| Slave Address | 1, 2, 3, 4 |
| Baud Rate | 9600 |
| Data Bit | 8 |
| Stop Bit | 1 |
| Calibration | EVEN |
| CRC Calibration | Low byte ahead |

6.5 Supportive Modbus Function Code

| | |
|---|-----------------------------|
| 1 | Read loop status |
| 2 | Read discrete input status |
| 3 | Read keeping register value |
| 4 | Read input register value |

| | |
|----|--------------------------------|
| 5 | Write loop |
| 6 | Write single register values |
| 16 | Write multiple register values |

Appendix 1 Type Selection List

| | | | | | | |
|---------------------------|-------|-------|----------------------|----------------|--------------------|-------|
| Type Selection List | G0313 | | Modbus to FF Gateway | | | |
| | | | Code | | Hardware Interface | |
| | | | R4 (Omitting) | | RS485 | |
| | | | | Code | Software Interface | |
| | | | | MRM (Omitting) | Modbus RTU Master | |
| | | G0313 | - | (R4 | - | MRM) |



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