Ultrasonic Flow Meter For Fuel Gas and Factory Air
AS-WE series
MODBUS RTU Communication Specifications

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1. Communication Specifications

Interface	EIA RS485 compliant
Communication method	Half-duplex
Synchronization method	Asynchronous
Connection topology	1: N (Unbalanced bus connection)
Communication mode	Modbus RTU
Transmission speed [bps]	Selectable from the following by parameter setting: 4800, 9600
Bit length [bits]	8
Stop bit [bits]	1
Parity	N/A
Sending/receiving buffer size [bytes]	100
Response time [s]	3 (max)

2. Message frame configuration

Start	Address	Function code	Data	CRC check	End
Silent interval *	1 byte	1 byte	n bytes	2 bytes	Silent interval *

* Silent communication for 3.5 characters or more

<Address>
Specify the RTU address set for the flowmeter. 01H is set at the time of shipment.

<Function code>
The following function codes are available. Other codes are not available.

Code (Hex)	Function
03	Reading of parameters, flowmeter information, and history information
06	Writing of a single parameter
10	Writing of multiple parameters

Note that the broadcast function is not available by all of the function codes.
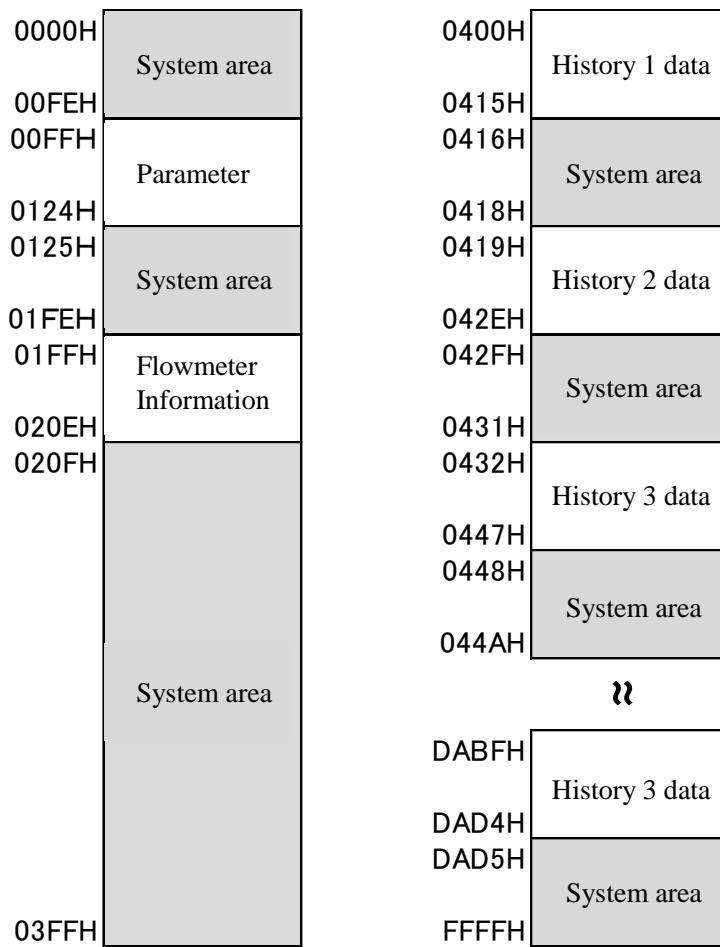
<Data>
Used to transmit date associated with a function code. The data length is variable and there is no data if it's not associated with a function code.

<CRC check>
Error check is performed in the CRC method. CRC is 16-bit binary value and is calculated and added by the sender side. The receiver calculates the CRC value from the sent message and compares with the sent CRC value. An error is declared if these two values do not match.

3. Internal Address and Data

3-1. Internal address and data structure

0000H	System area
00FEH	
00FFH	Parameter
0124H	
0125H	System area
01FEH	
01FFH	Flowmeter Information
020EH	
020FH	System area
03FFH	

0400H	History 1 data
0415H	
0416H	System area
0418H	
0419H	History 2 data
042EH	
042FH	System area
0431H	
0432H	History 3 data
0447H	
0448H	System area
044AH	

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DABFH	History 3 data
DAD4H	
DAD5H	System area
FFFFH	

3-2. Internal address and data details

Function code (Hex)	Address (Hex)	Area name	Function	Details
	0000-00FE		System region	
03 or 06 or 10	00FF	Parameter	Gas type	0x0000: AIR 0x0001: NG
	0100		Working pressure set value valid/invalid	0x0000: Invalid 0x0001: Valid
	0101		Working pressure for usual mode [abs]	0x0000 to 0x2710 (0.0 to 1000.0 [kPa], Set value multiplied by 10)
	0102		Output pulse constant	0x0000: 1L/P 0x0001: 2.5L/P 0x0002: 4.5L/P 0x0003: 10L/P 0x0004: 100L/P 0x0005: 1000L/P 0x0006: 10000L/P
	0103		Flow-rate compensation selection	0x0000: Without compensation (Actual flow) 0x0001: With compensation
	0104		Selection of flow value for pulse output	0x0000: Instantaneous flow-rate without compensation. 0x0001: Instantaneous flow-rate with compensation.
	0105		Instantaneous flow-rate moving average number of times	0x0001 to 0x0010 (1 to 16 [times])
	0106		Compressibility factor compensation value	0x0320 to 0x04B0 (0.800 to 1.200, Set value multiplied by 1000)
	0107		Communication baud rate	0000: 4800bps 0001: 9600bps
	0108		RTU address	0x0000 to 0x00FF (0 to 255)
	0109		Low flow cutoff value	AS-WE-40: 0x0000 to 0x0010 (0.0 to 1.6m3/h) AS-WE-50: 0x0000 to 0x001E (0.0 to 3.0m3/h) AS-WE-80: 0x0000 to 0x003C (0.0 to 6.0m3/h) (0 to Qmin, Set value multiplied by 10)
	010A 010B 010C		Unusable due to maintenance telegram	
	010D		Atmospheric pressure setting	0x01F4～0x07CF (50.0～199.9[kPa], Value multiplied by 10)
	010E		Time setting (year)	0x0000～0xFFFF (Set in A.D.)
	010F		Time setting (month)	0x0001～0x000C (January to December)
	0110		Time setting (day)	0x0001～0x001F (1st to 31st)
	0111		Time setting (hour)	0x0000～0x0017 (0 to 23)
	0112		Time setting (minute)	0x0000～0x003B (0 to 59)

Function code (Hex)	Address (Hex)	Area name	Function	Details
03 or 06 or 10	0113	Parameter	History storage interval	0x0001～0x0120 （5 minutes to 24 hours） （Set value×5 minutes ＝Storage interval）
	0114		Unusable due to maintenance telegram	
	0115		Pulse output method and ON time at one-shot pulse	0x0000：One-shot pulse and ON time 1000ms 0x0001：One-shot pulse and ON time 500ms 0x0002：One-shot pulse and ON time 250ms 0x0003：One-shot pulse and ON time 125ms 0x0004：One-shot pulse and ON time 50ms 0x0005：duty50
	0116		Pressure value moving average number of times	0x0001～0x0004 (1～4[times])
	0117		Unusable due to maintenance telegram	
06 or 10	0118		Accumulated forward flow volume (upper 4 digits) Actual flow specifications：Accumulated forward actual flow volume Compensated specifications：Accumulated forward compensated flow volume	Set upper 4 digits of accumulated display digits in decimal system. Refer to the following when set value 4 digits are shown as WXYZ |	Digit position	| | | 25A～80A | 100A～200A | | W | 0 | 0 | | X | 0 | 0 | | Y | 0 | 10^9 digits | | Z | 10^7 digits | 10^8 digits |
	0119		Accumulated forward flow volume (middle 4 digits) Actual flow specifications：Accumulated forward actual flow volume Compensated specifications：Accumulated forward compensated flow volume	Set middle 4 digits of accumulated display digits in decimal system. Refer to the following when set value 4 digits are shown as WXYZ |	Digit position	| | | 25A～80A | 100A～200A | | W | 10^6 digits | 10^7 digits | | X | 10^5 digits | 10^6 digits | | Y | 10^4 digits | 10^5 digits | | Z | 10^3 digits | 10^4 digits |
	011A		Accumulated forward flow volume (lower 4 digits) Actual flow specifications：Accumulated forward actual flow volume Compensated specifications：Accumulated forward compensated flow volume	Set lower 4 digits of accumulated display digits in decimal system. Refer to the following when set value 4 digits are shown as WXYZ |	Digit position	| | | 25A～80A | 100A～200A | | W | 10^2 digits | 10^3 digits | | X | 10^1 digits | 10^2 digits | | Y | 10^0 digits | 10^1 digits | | Z | 10^{-1} digits | 10^0 digits |
	011B		Accumulated forward flow volume (upper 2 bytes) Actual flow specifications：Accumulated forward volume compensated flow volume Compensated specifications：Accumulated forward actual flow volume	Unsigned 4-byte data, Value multiplied by 10

Function code (Hex)	Address (Hex)	Area name	Function	Details
	011C		Accumulated forward flow volume (lower 2 bytes) Actual flow specifications： Accumulated forward compensated flow volume Compensated specifications： Accumulated forward actual flow volume	Unsigned 4-byte data, Value multiplied by 10
	011D		Accumulated reverse compensated flow volume (upper 2 bytes)	Unsigned 4-byte data, Value multiplied by 10
	011E		Accumulated reverse compensated flow volume (lower 2 bytes)	
03	011F		Unusable due to maintenance telegram	
03 or 06 or 10	0120	Parameter	Unusable due to maintenance telegram	
	0121			
	0122			
	0123		Compensated standard temperature	0xFF9C～0x0258(+/-Signed data) (-10.0～+60.0[℃]、Value multiplied by 10)
	0124		Compensated standard pressure (Gauge pressure)	0x0000～0x03E8 (0.00～10.00kPa, Value multiplied by 100)
	0125～ 01FE		System area	

Function code (Hex)	Address (Hex)	Area name	Function	Details
03	01FF	Flowmeter information	Instantaneous actual flow-rate (upper 2 bytes)	+/- signed 4-byte data (long type) Value multiplied by 100
	0200		Instantaneous actual flow-rate (lower 2 bytes)	
	0201		Instantaneous compensated flow-rate (upper 2 bytes)	+/- signed 4-byte data (long type) Value multiplied by 100
	0202		Instantaneous compensated flow-rate (lower 2 bytes)	
	0203		Pressure (upper 2 bytes)	+/- signed 4-byte data (long type) Valued multiplied by 100
	0204		Pressure (lower 2 bytes)	
	0205		Temperature (upper 2 bytes)	+/- signed 4-byte data (long type) Valued multiplied by 100
	0206		Temperature (lower 2 bytes)	
	0207		Accumulated forward actual flow volume (upper 2 bytes)	Unsigned 4-byte data (unsigned long type) Value multiplied by 10 (Value multiplied by 1 for bigger size than AS-WE-100)
	0208		Accumulated forward actual flow volume (lower 2 bytes)	
	0209		Accumulated forward compensated flow volume (upper 2 bytes)	Unsigned 4-byte data (unsigned long type) Value multiplied by 10 (Value multiplied by 1 for bigger size than AS-WE-100)
	020A		Accumulated forward compensated flow volume (lower 2 bytes)	
	020B		Accumulated reverse compensated flow volume (upper 2 bytes)	Unsigned 4-byte data (unsigned long type) Valued multiplied by 10 (Value multiplied by 1 for bigger size than AS-WE-100)
	020C		Accumulated reverse compensated flow volume (lower 2 bytes)	
	020D		Error information (2 bytes)	Unsigned 2-byte data (unsigned int type)
	020E		Sound velocity information (2 bytes)	Unsigned 2-byte data (unsigned int type) Valued multiplied by 100
	020F～03FF	System area		

Function code (Hex)	Address (Hex)	Area name	Function	Details
03	0400	History 1 data	Instantaneous compensated flow-rate (upper 2 bytes)	+/- signed 4-byte data (long type) Value multiplied by 100
	0401		Instantaneous compensated flow-rate (lower 2 bytes)	
	0402		Pressure (upper 2 bytes)	+/- signed 4-byte data (long type) Value multiplied by 100
	0403		Pressure (lower 2 bytes)	
	0404		Temperature (upper 2 bytes)	+/- signed 4-byte data (long type) Valued multiplied by 100
	0405		Temperature (lower 2 bytes)	
	0406		Accumulated forward flow volume (upper 2 bytes)	Unsigned 4-byte data (unsigned long type) Value in accordance with the flow compensation selection, multiplied by 10
	0407		Accumulated forward flow volume (lower 2 bytes)	
	0408		Error information (2 bytes)	Unsigned 2-byte data (unsigned int type)
	0409		Instantaneous actual flow-rate (upper 2 bytes)	+/- signed 4-byte data (long type) Value multiplied by 10 (Value multiplied by 1 for bigger size than AS-WE-100)
	040A		Instantaneous actual flow-rate (lower 2 bytes)	
	040B		Accumulated forward actual volume (upper 2 bytes)	+/- signed 4-byte data (long type) Value multiplied by 10 (Value multiplied by 1 for bigger size than AS-WE-100)
	040C		Accumulated forward actual volume (lower 2 bytes)	
	040D		Storage time (year)	Unsigned 2-byte data
	040E		Storage time (month/ day)	Unsigned 2-byte data Upper 1 byte: Month Lower 1 byte: Day
	040F		Storage time (hour/ minute)	Unsigned 2-byte data Upper 1 byte: Hour Lower 1 byte: Minute
	0410		Accumulated forward compensated volume of the acquisition interval (upper 2 bytes)	+/- signed 4 byte data (long type) Value multiplied by 10 (Value multiplied by 1 for bigger size than AS-WE-100))
	0411		Accumulated forward compensated volume of the acquisition interval (lower 2 bytes)	
	0412		Accumulated forward actual volume of the acquisition interval (upper 2 bytes)	+/- signed 4 byte data (long type) Value multiplied by 10 (Value multiplied by 1 for bigger size than AS-WE-100))
	0413		Accumulated forward actual volume of the acquisition interval (lower 2 bytes)	
	0414		Accumulated reverse compensated volume (upper 2 bytes)	+/- signed 4-byte data (long type) Value multiplied by 10 (Value multiplied by 1 for bigger size than AS-WE-100)
	0415		Accumulated reverse compensated volume (lower 2 bytes)	
	0416～0418	System area		
03	0419	History 2 data	Instantaneous compensated flow-rate (upper 2 bytes)	+/- signed 4-byte data (long type) Value multiplied by 100
	041A		Instantaneous compensated flow-rate (lower 2 bytes)	
	041B		Pressure (upper 2 bytes)	+/- signed 4-byte data (long type) Valued multiplied by 100
	041C		Pressure (lower 2 bytes)	
	041D		Temperature (upper 2 bytes)	+/- signed 4-byte data (long type) Valued multiplied by 100
	041E		Temperature (lower 2 bytes)	
	041F		Accumulated forward flow volume (upper 2 bytes)	Unsigned 4-byte data (unsigned long type) Value in accordance with the flow compensation selection, multiplied by 10
	0420		Accumulated forward flow volume (lower 2 bytes)	
	0421		Error information (2 bytes)	Unsigned 2-byte data (unsigned int type)

	0422		Instantaneous actual flow-rate (upper 2 bytes)	+/- signed 4-byte data (long type) Value multiplied by 10 (Value multiplied by 1 for bigger size than AS-WE-100)
	0423		Instantaneous actual flow-rate (lower 2 bytes)	
	0424		Accumulated forward actual volume (upper 2 bytes)	+/- signed 4-byte data (long type) Value multiplied by 10 (Value multiplied by 1 for bigger size than AS-WE-100)
	0425		Accumulated forward actual volume (lower 2 bytes)	
	0426		Storage time (year)	Unsigned 2-byte data
	0427		Storage time (month/ day)	Unsigned 2-byte data Upper 1 byte: Month Lower 1 byte: Day
03	0428	History 2 data	Storage time (hour/ minute)	Unsigned 2-byte data Upper 1 byte: Hour Lower 1 byte: Minute
	0429		Accumulated forward compensated volume of the acquisition interval (upper 2 bytes)	+/- signed 4 byte data (long type) Value multiplied by 10 (Value multiplied by 1 for bigger size than AS-WE-100)
	042A		Accumulated forward compensated volume of the acquisition interval (lower 2 bytes)	
	042B		Accumulated forward actual volume of the acquisition interval (upper 2 bytes)	+/- signed 4 byte data (long type) Value multiplied by 10 (Value multiplied by 1 for bigger size than AS-WE-100)
	042C		Accumulated forward actual volume of the acquisition interval (lower 2 bytes)	
	042D		Accumulated reverse compensated volume (upper 2 bytes)	+/- signed 4-byte data (long type) Value multiplied by 10 (Value multiplied by 1 for bigger size than AS-WE-100)
	042E		Accumulated reverse compensated volume (lower 2 bytes)	
	042F～0431		System area	
03	0432	History 3 data	Instantaneous compensated flow-rate (upper 2 bytes)	+/- signed 4-byte data (long type) Value multiplied by 100
	0433		Instantaneous compensated flow-rate (lower 2 bytes)	
	0434		Pressure (upper 2 bytes)	+/- signed 4-byte data (long type) Valued multiplied by 100
	0435		Pressure (lower 2 bytes)	
	0436		Temperature (upper 2 bytes)	+/- signed 4-byte data (long type) Valued multiplied by 100
	0437		Temperature (lower 2 bytes)	
	0438		Accumulated forward flow volume (upper 2 bytes)	Unsigned 4-byte data (unsigned long type) Value in accordance with the flow compensation selection, multiplied by 10
	0439		Accumulated forward flow volume (lower 2 bytes)	
	043A		Error information (2 bytes)	Unsigned 2-byte data (unsigned int type)
	043B		Instantaneous actual flow-rate (upper 2 bytes)	+/- signed 4-byte data (long type) Value multiplied by 10 (Value multiplied by 1 for bigger size than AS-WE-100)
	043C		Instantaneous actual flow-rate (lower 2 bytes)	
	043D		Accumulated forward actual volume (upper 2 bytes)	+/- signed 4-byte data (long type) Value multiplied by 10 (Value multiplied by 1 for bigger size than AS-WE-100)
	043E		Accumulated forward actual volume (lower 2 bytes)	
	043F		Storage time (year)	Unsigned 2-byte data
	0440		Storage time (month/ day)	Unsigned 2-byte data Upper 1 byte: Month Lower 1 byte: Day
	0441		Storage time (hour/ minute)	Unsigned 2-byte data Upper 1 byte: Hour Lower 1 byte: Minute

	0442		Accumulated forward compensated volume of the acquisition interval (upper 2 bytes)	+/- signed 4-byte data (long type) Value multiplied by 10 (Value multiplied by 1 for bigger size than AS-WE-100))
	0443		Accumulated forward compensated volume of the acquisition interval (lower 2 bytes)	
	0444		Accumulated forward actual volume of the acquisition interval (upper 2 bytes)	+/- signed 4-byte data (long type) Value multiplied by 10 (Value multiplied by 1 for bigger size than AS-WE-100))
	0445		Accumulated forward actual volume of the acquisition interval (lower 2 bytes)	
	0446		Accumulated reverse compensated volume (upper 2 bytes)	+/- signed 4-byte data (long type) Value multiplied by 10 (Value multiplied by 1 for bigger size than AS-WE-100)
	0447		Accumulated reverse compensated volume (lower 2 bytes)	
	0448~044A		System area	

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	DABF		Instantaneous compensated flow-rate (upper 2 bytes)	+/- signed 4-byte data (long type) Value multiplied by 100
	DAC0		Instantaneous compensated flow-rate (lower 2 bytes)	
	DAC1		Pressure (upper 2 bytes)	+/- signed 4-byte data (long type) Valued multiplied by 100
	DAC2		Pressure (lower 2 bytes)	
	DAC3		Temperature (upper 2 bytes)	+/- signed 4-byte data (long type) Valued multiplied by 100
	DAC4		Temperature (lower 2 bytes)	
	DAC5		Accumulated forward flow volume (upper 2 bytes)	Unsigned 4-byte data (unsigned long type) Value in accordance with the flow compensation selection, multiplied by 10
	DAC6		Accumulated forward flow volume (lower 2 bytes)	
	DAC7		Error information (2 bytes)	Unsigned 2-byte data (unsigned int type)
	DAC8		Instantaneous actual flow-rate (upper 2 bytes)	+/- signed 4-byte data (long type) Value multiplied by 10 (Value multiplied by 1 for bigger size than AS-WE-100)
	DAC9		Instantaneous actual flow-rate (lower 2 bytes)	
03	DACA	History 2200 data	Accumulated forward actual volume (upper 2 bytes)	+/- signed 4-byte data (long type) Value multiplied by 10 (Value multiplied by 1 for bigger size than AS-WE-100)
	DACB		Accumulated forward actual volume (lower 2 bytes)	
	DACC		Storage time (year)	Unsigned 2-byte data
	DACD		Storage time (month/ day)	Unsigned 2-byte data Upper 1 byte: Month Lower 1 byte: Day
	DACE		Storage time (hour/ minute)	Unsigned 2-byte data Upper 1 byte: Hour Lower 1 byte: Minute
	DACF		Accumulated forward compensated volume of the acquisition interval (upper 2 bytes)	+/- signed 4 byte data (long type) Value multiplied by 10 (Value multiplied by 1 for bigger size than AS-WE-100)
	DAD0		Accumulated forward compensated volume of the acquisition interval (lower 2 bytes)	
	DAD1		Accumulated forward actual volume of the acquisition interval (upper 2 bytes)	+/- signed 4 byte data (long type) Value multiplied by 10 (Value multiplied by 1 for bigger size than AS-WE-100)
	DAD2		Accumulated forward actual volume of the acquisition interval (lower 2 bytes)	

	DAD3		Accumulated reverse compensated volume (upper 2 bytes)	+-/ signed 4-byte data (long type) Value multiplied by 10 (Value multiplied by 1 for bigger size than AS-WE-100)
	DAD4		Accumulated reverse compensated volume (lower 2 bytes)	
	DAD5~ FFFF		System area	

◎Address for history storage

As for history information, there are 1 to 2200 data, and the initial data address (instantaneous compensated flow-rate (upper 2 bytes)) is calculated with the following formula.

Initial data address (instantaneous compensated flow-rate (upper 2 bytes)) = (N-1) x 25 + 1024 (N = History data number)

EX1) In case of history data 1
   Initial data address = (1-1) x 25 + 1024 = 1024d = 400h
EX2) In case of history data 2200
   Initial data address = (2200-1) x 25 + 1024 = 55999d = DABFh

4.   Function Codes

   4-1. Reading of parameters, flowmeter information, and history information (03H)

   Reads parameters, flowmeter information, and history information.

   The following shows an example of reading the communication baud rate (0x0107) and RTU address.

<Query configuration>

Field name	Data example (Hex)
Start	N/A
Slave address	05
Function code	03
Start address (upper)	01
Start address (lower)	07
Number of registers (upper)	00
Number of registers (lower)	02
Error check	(CRC) (lower)
Error check	(CRC) (upper)
End	N/A

<Response configuration>

Field name	Data example (Hex)
Start	None
Slave address	05
Function code	03
Number of data bytes	04
Data at address 0x0107 (upper)	00
Data at address 0x0107 (lower)	01
Data at address 0x0108 (upper)	00
Data at address 0x0108 (lower)	05
Error check	(CRC) (lower)
Error check	(CRC) (upper)
End	N/A

*1 Details of flowmeter information and history information
    ○ Instantaneous actual flow-rate: +/- signed 4-byte value, multiplied by 100
        (Example) 0x00003039 -> 123.45 [m3/h], 0xFFFE7E33 -> -987.65 [m3/h]
    ○ Pressure: +/- signed 4-byte value, multiplied by 100
        (Example) 0x00003039 -> 123.45 [kPa] (abs)
    ○ Temperature: +/- signed 4-byte value, multiplied by 100
        (Example) 0x000004D2 -> 12.34 [℃], 0xFFFFFC50 -> -9.45 [℃]
    ○Accumulated forward actual volume, accumulated forward compensated volume, and accumulated
      reverse compensated volume: Unsigned 4-byte value, multiplied by 10
        (Example) 0x075BCD15 -> 12345678.9 [m3]
    ○ Error information: 2-byte value and each bit have error information. "1" is indicated for error
                condition, and "0" is indicated for normal condition. B0～B1 and B8～B15 are
                not used and are always read as "0."

B15～8	B7	B6	B5	B4	B3	B2	B1～0

Not used: Read as 0

EEPROM error (0: Normal, 1: Error)

Low battery voltage (0:   Normal, 1:   Low battery)

Pressure measurement failure (0:   Normal, 1:   Error)

Temperature measurement failure (0:   Normal, 1:   Error)

Ultrasonic measurement failure (0:   Normal, 1:   Error)
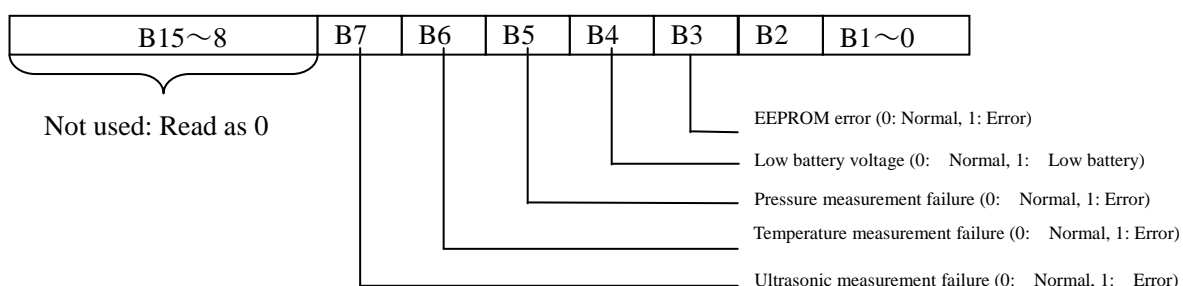
4-2. Writing of a single parameter (06H)
  Changes (i.e., writes) a single parameter.
  The following shows an example of changing the gas type to NG.

    <Query configuration>

Field name	Data example (Hex)
Start	N/A
Slave address	05
Function code	06
Start address (upper)	00
Start address (lower)	FF
Change data (upper)	00
Change data (lower)	01
Error check	(CRC) (lower)
Error check	(CRC) (upper)
End	N/A

  <Response configuration>

Field name	Data example (Hex)
Start	N/A
Slave address	05
Function code	06
Address (upper)	00
Address (lower)	FF
Change data (upper)	00
Change data (lower)	01
Error check	(CRC) (lower)
Error check	(CRC) (upper)
End	N/A

* Details of writing data
    Refer to "3-2. Internal address and data details" for the details of the writing data for the parameter area. The following gives special notes:

○ Working pressure
    The working pressure can be set within a range from 0.0 to 1000.0kPa [abs]. When the working pressure is 500.0kPa, the set value is 0x01F4.

○ Output pulse constant
    The pulse constant can be chosen from 100, 1000, and 10000L/P.

○ RTU address and communication baud rate
    In case of changing the RTU address or communication baud rate, the response message to the change order uses the parameter setting before the change and the new setting is used from the succeeding communication.

Example1) When changing the RTU address of the flowmeter from 1 to 2

Field name	Query	Response
	Data example (Hex)	
Start	N/A	N/A
Slave address	01	01
Function code	06	06
Start address (upper)	01	01
Start address (lower)	08	08
Change data (upper)	00	00
Change data (lower)	02	02
Error check	(CRC) (lower)	(CRC) (lower)
Error check	(CRC) (upper)	(CRC) (upper)
End	N/A	N/A

←─Response is returned with 0x01.

The succeeding messages operate with address = 2.

Example2) When changing the communication baud rate of the flowmeter from 9600bps to 4800bp

Field name	Query	Response
	Data example (Hex)	Data example (Hex)
Start	N/A	N/A
Slave address	01	01
Function code	06	06
Start address (upper)	01	01
Start address (lower)	07	07
Change data (upper)	00	00
Change data (lower)	00	00
Error check	(CRC) (lower)	(CRC) (lower)
Error check	(CRC) (upper)	(CRC) (upper)
End	N/A	N/A

←─Response is returned with 9600bps.

The succeeding messages are transmitted at 4800bps

○ Low flow cutoff value
    The low flow cutoff value can be set up to one decimal place in m3/h units. Use a value multiplied by 10 as the set value.
    To set the value to "1.2 [m3/h]," use 0x000C (hexadecimal representation of 12 (1.2×10)).
    The low flow cutoff value can be set within a range from 0 to Qmin [m3/h]. Qmin depends on the nominal diameter. The available range is as listed below.

	Nominal diameter					
	40	50	80	100	150	200
Qmin [m³/h]	1.6	3	6	0	24	40
Upper limit set value (Hex)	0×0010	0×001E	0×003C	0×0064	0×00F0	0×0190

○Pulse output method and ON time at one-shot pulse
As for each diameter, set regulation for the set pulse constant is as below.
This setting will be performed after pulse constant setting because this set value will be automatically set as duty50 output when pulse constant is changed.

○: Selectable   × : Not selectable

⟨40A⟩

Pulse ON width [ms]	Pulse constant [L/P]		
	100	1000	10000
50	○	○	○
125	○	○	○
250	×	○	○
500	×	○	○
1000	×	○	○

⟨50A⟩

Pulse ON width [ms]	Pulse constant [L/P]		
	100	1000	10000
50	○	○	○
125	×	○	○
250	×	○	○
500	×	○	○
1000	×	○	○

⟨80A⟩

Pulse ON width [ms]	Pulse constant [L/P]		
	100	1000	10000
50	○	○	○
125	×	○	○
250	×	○	○
500	×	○	○
1000	×	×	○

⟨100A⟩

Pulse ON width [ms]	Pulse constant [L/P]		
	100	1000	10000
50	×	○	○
125	×	○	○
250	×	○	○
500	×	×	○
1000	×	×	○

⟨150A⟩

Pulse ON width [ms]	Pulse constant [L/P]		
	100	1000	10000
50	×	○	○
125	×	○	○
250	×	×	○
500	×	×	○
1000	×	×	○

⟨200A⟩

Pulse ON width [ms]	Pulse constant [L/P]		
	100	1000	10000
50	×	○	○
125	×	×	○
250	×	×	○
500	×	×	○
1000	×	×	×

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4-3. Writing of multiple parameters (10H)

Changes (i.e., writes) multiple parameters.

The following shows an example of changing the pulse output flow-rate to the instantaneous flow-rate value without compensation, and the instantaneous flow-rate moving average number of times to "3."

<Query configuration>

Field name	Data example (Hex)
Start	N/A
Slave address	05
Function code	10
Start address (upper)	01
Start address (lower)	04
Number of registers (upper)	00
Number of registers (lower)	02
Number of bytes	04
Change data (pulse output flow-rate value selection) (upper)	00
Change data (pulse output flow-rate value selection) (lower)	00
Change data (Instantaneous flow-rate moving average number of times) (upper)	00
Change data (Instantaneous flow-rate moving average number of times) (lower)	03
Error check	(CRC) (lower)
Error check	(CRC) (upper)
End	N/A

<Response configuration>

Field name	Data example (Hex)
Start	N/A
Slave address	05
Function code	10
Start address (upper)	01
Start address (lower)	04
Number of registers (upper)	00
Number of registers (lower)	02
Error check	(CRC) (lower)
Error check	(CRC) (upper)
End	N/A

Details of writing data for writing multiple parameters are the same as those for writing a single parameter as described in "4-2. Writing of a single parameter."

5. Communication Error

When following communication errors are detected, their contents are returned as response messages. No response will be returned for any other errors than listed below.

Code	Name	Meaning
0x01	Invalid function	The function is not supported.
0x02	Invalid data address	The address does not exist. An address exceeding the buffer size is specified.
0x03	Invalid data	The specified data is out of range.

A response returned upon error detection consisted of the function code with its uppermost bit changed to "1" and of the error code appended to the function code.

Example) When 0x0003 is set for the gas type. Since set data 0x0003 is out of the available range, an invalid data address is returned.

<Query configuration>

Field name	Data example (Hex)
Start	N/A
Slave address	05
Function code	06
Start address (upper)	00
Start address (lower)	FF
Change data (upper)	00
Change data (lower)	03
Error check	(CRC) (lower)
Error check	(CRC) (upper)
End	N/A

<Response configuration>

Field name	Data example (Hex)	
Start	N/A	
Slave address	05	
Function code	86	← The uppermost bit of 0x06 is set to "1."
Error code	03	← Returns the error contents.
Error check	(CRC) (lower)	
Error check	(CRC) (upper)	
End	N/A	

Handling at the time of invalid data detection

When invalid data is detected while writing a single parameter, the invalid data is not set.

When invalid data is detected while writing multiple parameters, values preceding the invalid data are set but the invalid data and the values following it are not set.

Example1) When writing the pulse output flow-rate value selection = 0x0001 (normal data), instantaneous flow-rate moving average number of times = 0x0011 (invalid data), and compression factor compensation value = 0x0320 (normal data) in a single operation, the pulse output flow rate value selection is set but the instantaneous flow-rate moving average number of times and compression factor compensation value are not set.

Example2) When writing the pulse output flow-rate value selection = 0x0002 (invalid data), instantaneous flow-rate moving average number of times = 0x0004 (normal data), and compression factor compensation value = 0x0320 (normal data) in a single operation, all parameters are not set.