



**Thermal Digital Mass Flow Controller**  
**EX-201C SERIES**

**RS-485 Communications**  
**Instruction Manual**  
**(Modbus RTU)**

**KOFLOC Corp.**

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## 1. Foreword

This document describes the specifications and handling of the Modbus (RTU) function. With reference to the Modbus (RTU) standard, please prepare for it by yourself. The wiring, installation and operating procedures, other than communications, are presented in a separate instruction manual. Prior to use, please read it also.

## 2. Switching to “control by digital communications”

EX-201S has been set to “control by analog input” in the factory.

When you require “control by digital communications”, first change the flow rate setting method to “digital (0)” in accordance with the procedure described below. To return to “control by analog input”, change it to “analog (1)” again.

When the valve open/close input (analog signal) is “CLOSE” (fully close) or “OPEN” (fully open), the equipment follows it regardless of the setting of the flow rate setting method. Only when “CONTROL”, the action is switched over according to the setting of the flow rate setting method as shown on the next page. The flow rate control range is 2% to 100% of the full scale. The setting less than 2% is “CLOSE”.

			Valve open/close input (analog signal)		
			Fully close (0V)	Control (OPEN)	Fully open ( +5~24V )
<i>The valve status (digital)</i>	Fully open (0)		Fully close	<b>Controlled by flow rate setting voltage/current inputs (analog signals)</b>	Fully open
	Control (1)				
	Fully close (2)				

*Flow rate setting method “Analog (1)”*

			Valve open/close input (analog signal)		
			Fully close (0V)	Control (OPEN)	Fully open ( +5~24V )
<i>The valve status (digital)</i>	Fully open (0)		Fully close	<b>Controlled by the set flow rate [significand] (digital setting)</b>	Fully open
	Control (1)				
	Fully close (2)				

*Flow rate setting method “Digital (0)”*

## 2. RS-485 Specification

Synchronization	Start-stop
Transmission speed※	9600 bps
Start bit	1 bit
Data length	8 bits
Stop bit	1 bit
Parity※	Even
Transmission system	3-wire half-duplex
Insulation	Communication – control circuit: Uninsulated Communication – power supply: Uninsulated
Communication ID setting	By use of rotary switch on top of equipment

※ If there is a specific note in the OPTION column of the label attached to the main unit, it will be taken into consideration.

Using the switch SW1 and 2 on the top of the equipment, set a communication ID (01 – 99) for each piece of the equipment. When setting an ID, ensure that IDs do not overlap among the equipment and are unique ones.

With the user system such as a PC and PLC as the master and this equipment as the slave, sending a command message from the master begins communications and returning a response message from the slave ends communications. Since the master and each slave share the message send/receive path, follow this procedure to ensure that messages do not collide.

### 3. Supported Modbus Function Code

Read Coil Status	0x01
Read Input Status	0x02
Read Holding Register	0x03
Read Input Register	0x04
Force Single Coil	0x05
Preset Single Register	0x06
ZERO Adjustment	0x41

Vendor definition function (Zero Adjustment) details

Query

Communication ID	8bit
Function Code	0x41
Error Check	CRC (16bit)

Response

Communication ID	8bit
Function Code	0x41
Error Check	CRC (16bit)

Operation: Sensor zero adjustment

## 4. Data Address

Classification	Address	Operation	Range
Coli	00001	Operating differential pressure	0: Standard differential pressure 1: Low differential pressure
	00002	Flow rate setting	0: Digital 1: Analog
	00003	0-0.5% range flow rate indication	0: 0-0.5% range flow rate indication 1: No 0-0.5% range flow rate indication (compulsion 「0」 indication)
	00004	Auto zero	0: Sensor auto zero adjustment invalid 1: Sensor auto zero adjustment valid
Input Status	10001	Flow rate unit	0: cc 1: L
Input Register	30001	Max. full scale flow rate [mantissa]	Mantissa of max. full scale flow rate this instrument owns for the gas used to this instruments calibration. 1~9999
	30002	Flow rate decimal point [number of decimal places]	0: No, 1: 1 number 2: 2 number 3: 3 number
	30003	Full scale flow rate [mantissa]	Mantissa of full scale setting and operating at this present. 1~9999
	30004	Flow rate standard temperature condition	0: 20°C, 1: 0°C, 2: 25°C
	30005	Calibration gas	0: Unknown (except for the following), 1: N2 (nitrogen),
	30006	Setting gas at this present	0: Unknown (except for the following), 1: N2 (nitrogen), 2: AIR, 3: H2 (hydrogen), 4: He (Helium), 5, Ar (argon), 6: O2 (Oxygen), 7: CO2 (Carbon dioxide) 8: CH4 (Methane)
	30007	Calibration gas C.F.	1~9999 (N2 standard: 1000)
	30008	Current flow tare [mantissa]	-9999~9999
	30009	Valve status	0: Full open, 1: Control, 2: Close, 3: 50% open
	30010	Setting flow rate [mantissa]	0~9999

	30011	Alarm start condition	0: without Alarm (normal) 1: with Alarm (valve heat) 2: with Alarm (setting number storage circuit abnormal) ※in case of plural factors it is an addition of several value.
	30012	Degree of valve open	0~1000 (0.1% unit)
Holding Register	40001	Operation mode	1: Calibration gas mode 2: C.F. mode 4: Multi gas mode (Read only)
	40002	C.F.	200~1500 (N2 standard: 1000)
	40003	Valve status (digital)	0: Full open, 1: Control, 2: Close
	40004	Setting flow rate [mantissa] (digital)	0~9999 (depend on the specification)
	40005	Valve working in alarm start	0: Control continuation, 1: compulsion close 2: compulsion open, 3: 50% open stand



## 5. Flow Rate Expression

The maximum full scale flow rate, full scale flow rate, instantaneous flow rate, set flow rate (digital) and set flow rate are expressed by a combination of the significant and *flow rate decimal point position [number of decimal places]* and *flow rate unit*. Note that *flow rate decimal point position [number of decimal places]* and *flow rate unit* are used commonly for each flow rate and cannot be changed.

Examples are presented below:

<i>Maximum full scale flow rate [significant]</i>	1 0 0 0
<i>Flow rate decimal point position [number of decimal places]</i>	3 : 3 digits
<i>Flow rate unit</i>	1 : L
Maximum full scale flow rate	1 . 0 0 0 ( L )

<i>Full scale flow rate [significant]</i>	3 0 0 0
<i>Flow rate decimal point position [number of decimal places]</i>	1 : 1 digit
<i>Flow rate unit</i>	0 : c c
Full scale flow rate	3 0 0 . 0 ( c c )

<i>Instantaneous flow rate [significant]</i>	1 2 3 4
<i>Flow rate decimal point position [number of decimal places]</i>	2 : 2 digits
<i>Flow rate unit</i>	0 : c c
Instantaneous flow rate	1 2 . 3 4 ( c c )

<i>Set flow rate [significant] (digital)</i>	0 5 0 0
<i>Flow rate decimal point position [number of decimal places]</i>	3 : 3 digits
<i>Flow rate unit</i>	1 : L
Set flow rate (digital)	0 . 5 0 0 ( L )

<i>Set flow rate [significant]</i>	2 5 0 0
<i>Flow rate decimal point position [number of decimal places]</i>	1 : 1 digit
<i>Flow rate unit</i>	0 : c c
Set flow rate	2 5 0 . 0 ( c c )

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