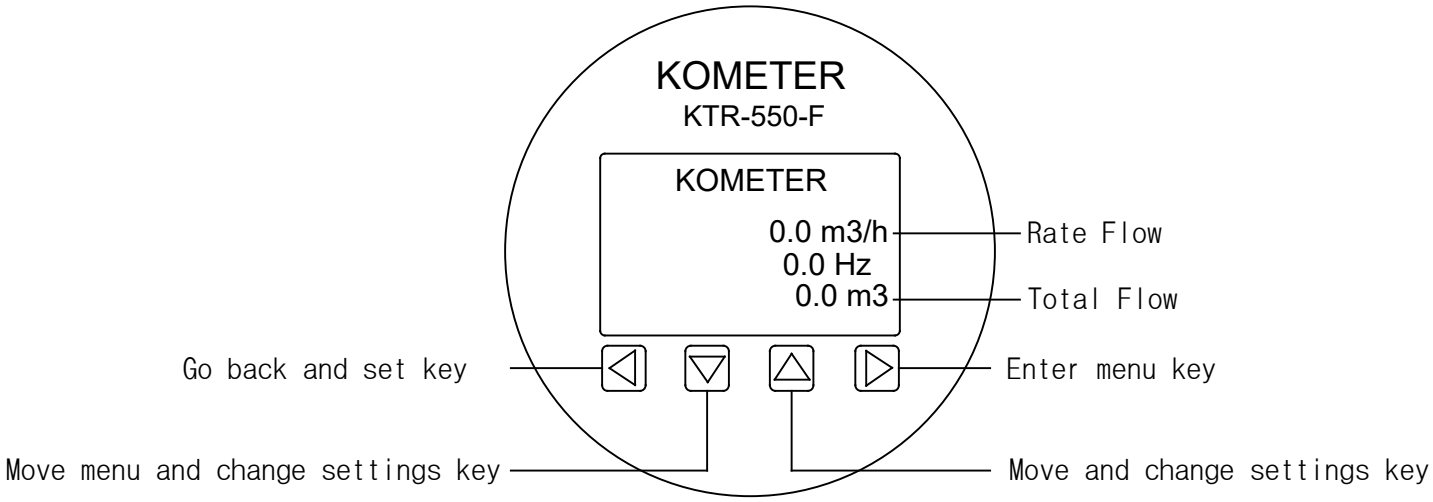
www.kometer.co.kr

Positive-Displacement Flowmeter

KTP-Series

- Contents -

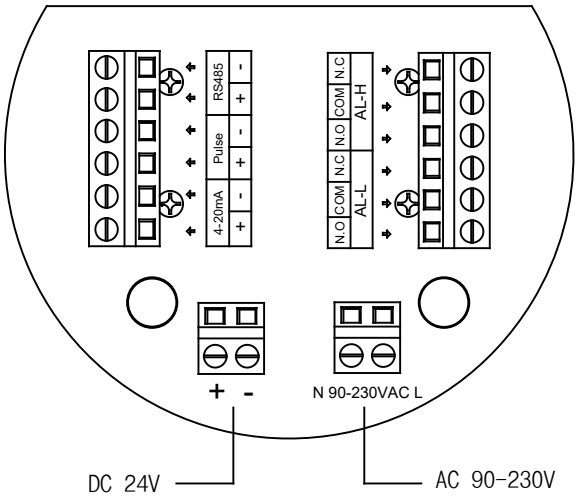
1. Display Information

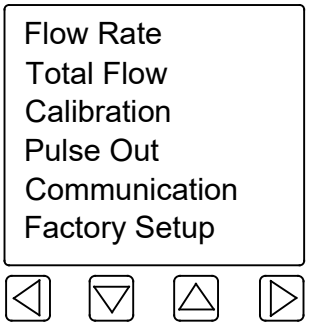


Input Signal Type	INTERNAL Terminal			Switch Setting							
	V out	+	-	1	2	3	4	5	6	7	8
1. Open Collector	1	2	3	off	off	off	off	on	off	off	on
2. TTL Logic Pulse	1	2	3	off	off	off	off	off	off	off	on
3. Reed Switch	1	2	3	off	off	off	on	on	off	off	on
4. Coil(20mVp- p min)	1	2	3	off	off	off	off	off	on	off	off
5. Coil(low Impedance)	1	2	3	off	on	off	off	off	on	off	off
6. Current Pulse	1	2	3	on	off	off	off	off	off	off	on
7. Namur Proxlmity	1	2	3	off	off	on	off	off	off	on	on

* factory setup password : 909100

2. Wiring



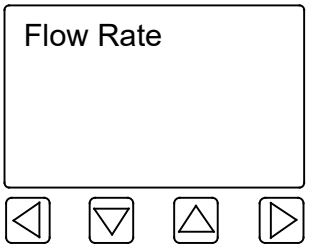


key Move menu and change settings key

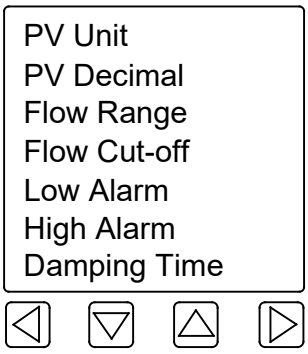
key Enter menu key

key Go back and set key

3. Rate Flow Setup

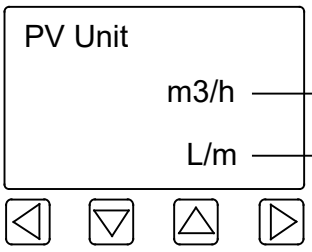


key Enter menu key



Flow Rate Sub menu

3.1 PV Unit Setup



key로 Enter menu key

Current unit

Setting unit

key **Unit selection**

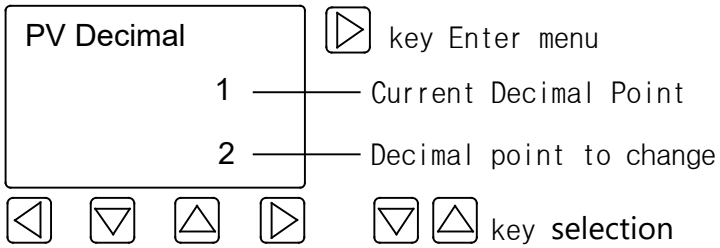
(L/s, L/m, L/h, m3/s, m3/m, m3/h, USG/s,
USG/m, USG/h, kg/s, kg/m, kg/h, t/s, t/m, t/h)

<- ENT ESC ->

key (**Press twice**) Apply selection

key Not Applicable

3.2 PV Decimal Setup

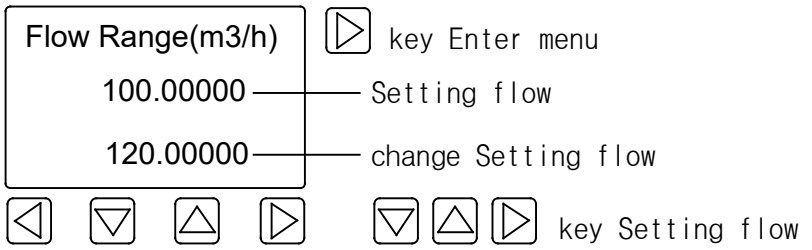


<- ENT ESC ->

key (Press twice) Apply selection

key Not Applicable

3.3 Flow Range Setup

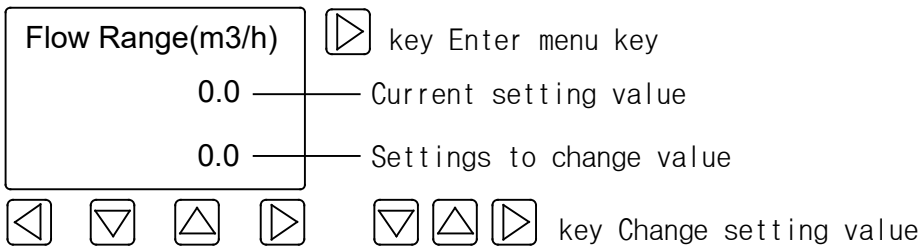


<- ENT ESC ->

key (Press twice) Apply selection

key Not Applicable

3.4 Flow Cut-off Setup

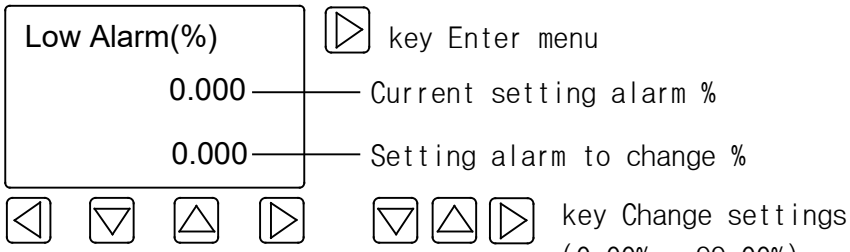


<- ENT ESC ->

key (Press twice) Apply selection

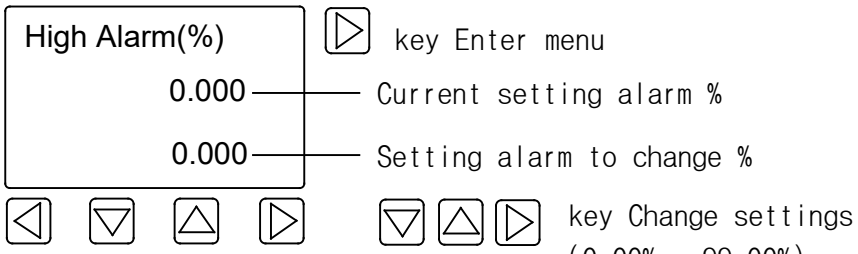
key Not Applicable

3.5 Low Alarm Setup



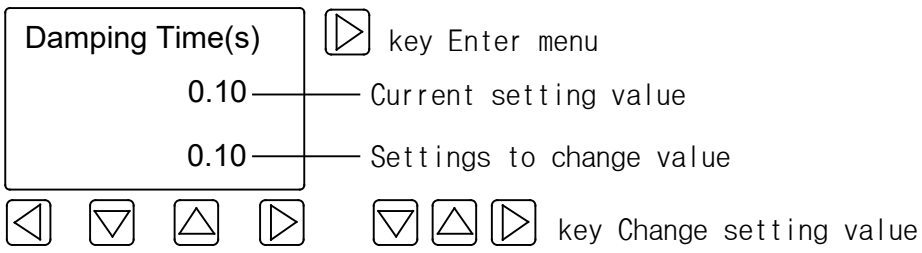
<- ENT ESC ->
key (Press twice) Apply selection
key Not Applicable

3.6 High Alarm Setup

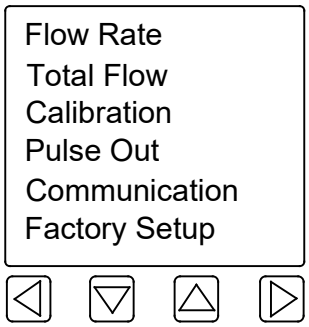


<- ENT ESC ->
key (Press twice) Apply selection
key Not Applicable

3.7 Damping Time Setup



<- ENT ESC->
key (Press twice) Apply selection
key Not Applicable

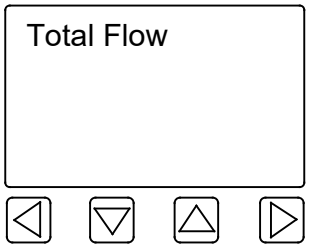


key Move menu

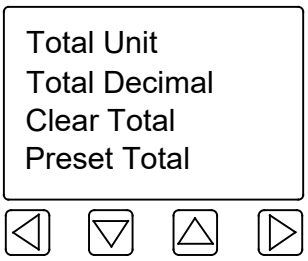
key Entering the menu

key Move backward (Change settings)

4. Total Flow Setup

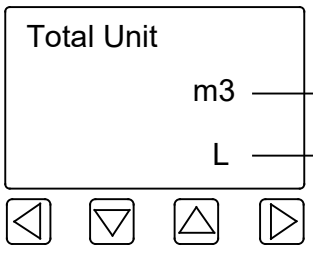


key Enter menu



Total Flow Sub menu

4.1 Total Unit Setup



key Enter menu

Current setting value

Setting Units to Change

key Change setting

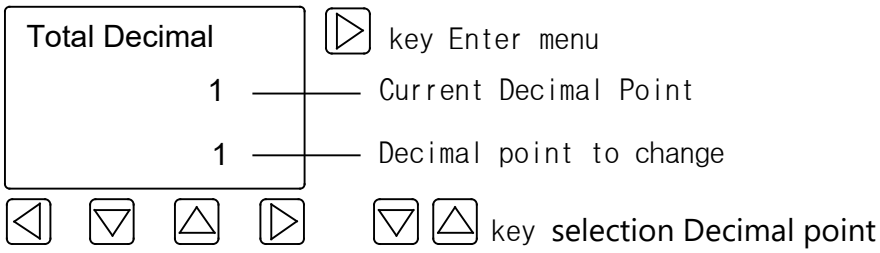
(L, m3, USG, kg, t)

<- ENT ESC ->

key (Press twice) Apply selection

key Not Applicable

4.2 Total Decimal Setup

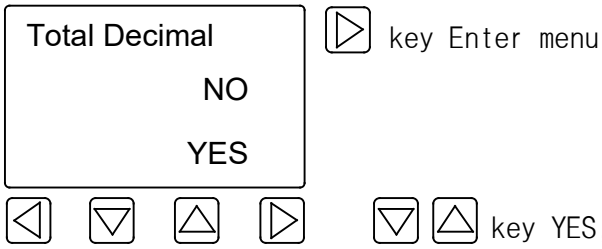


<- ENT ESC ->

key (Press twice) Apply selection

key Not Applicable

4.3 Clear Total Setup

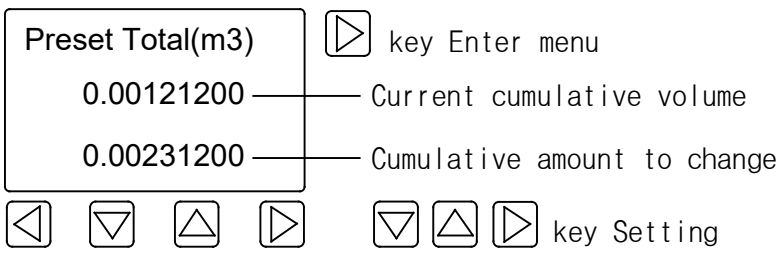


<- ENT ESC ->

key (Press twice) Apply selection

key Not Applicable

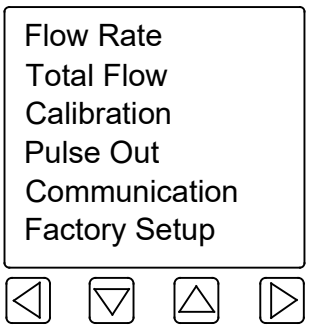
4.4 Preset Total Setup



<- ENT ESC ->

key (Press twice) Apply selection

key Not Applicable

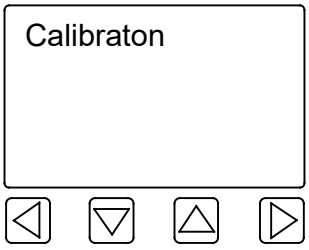


key Move menu

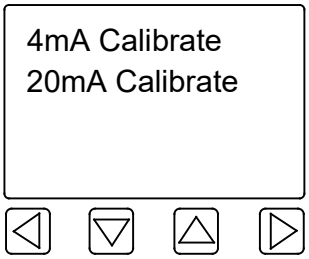
key Entering the menu

key Move backward (Change settings)

5. Calibration Setup(4-20mA)

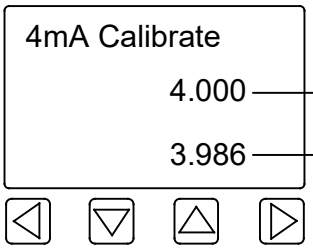


key Enter menu



Calibration Sub menu

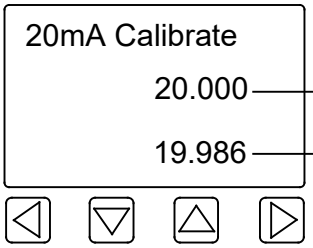
5.1 4mA, 20mA Setup



key Enter menu

4mA value

Change value 4mA



20mA value

Change value 20mA

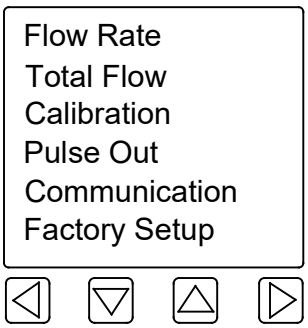
key Enter a value

(ex: If the output value is 3.95mA, input 3.95mA will be adjusted close to 4mA.)

<- ENT ESC ->

key (Press twice) Apply selection

key Not Applicable

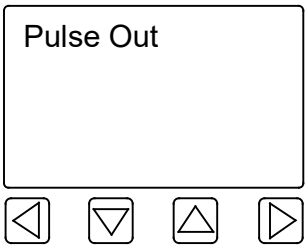


key Move menu

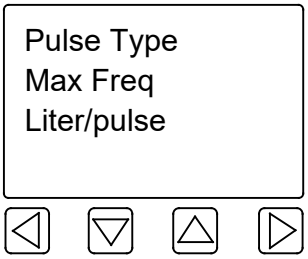
key Entering the menu

key Move backward (Change settings)

6. Pulse Out Setup

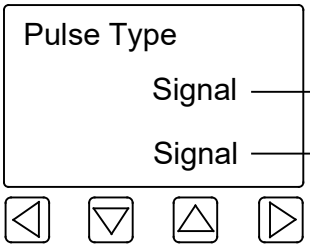


key Enter menu



Pulse Out Sub menu

6.1 Pulse Type Setup



key Enter menu

Current setting value

Settings to change

key Enter the value to change

(Factory set to pulse)

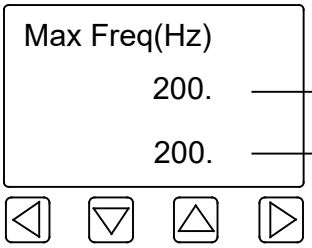
(Signal, Pulse, Freq)

<- ENT ESC ->

key (Press twice) Apply selection

key Not Applicable

6.2 Max Freq Setup



key Enter menu

Current setting value

Settings to change

key Enter a value

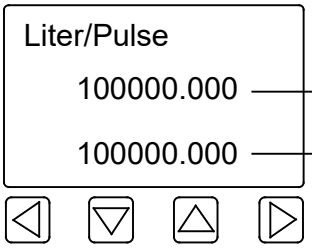
(100.0~5000 Hz)

<- ENT ESC ->

key (Press twice) Apply selection

key Not Applicable

6.3 Liter/Pulse Setup



key Enter menu

Current setting value

Settings to change

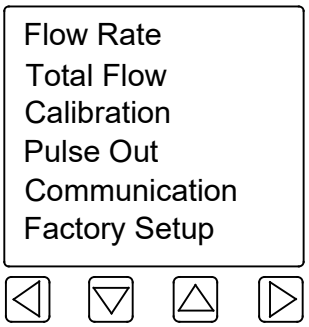
key Enter a value

(0.00000100~100000.000)

<- ENT ESC ->

key (Press twice) Apply selection

key Not Applicable

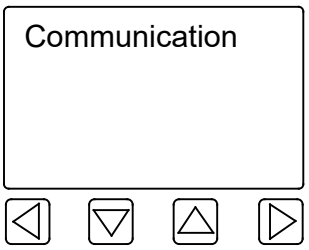


key Move menu

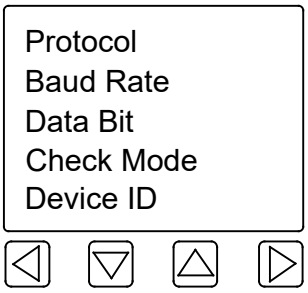
key Entering the menu

key Move backward (Change settings)

7. Communication Setup

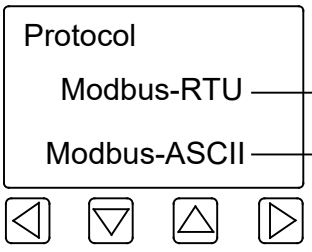


key Enter menu



Communication Sub menu

7.1 Protocol Setup



key Enter menu

Current setting value

Settings to change

key Enter a value

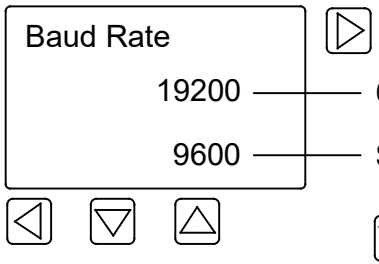
(Modbus-RTU, Modbus-ASCII)

<- ENT ESC ->

key (Press twice) Apply selection

key Not Applicable

7.2 Baud Rate Setup



key Enter menu

Current setting value

Settings to change

key Enter a value

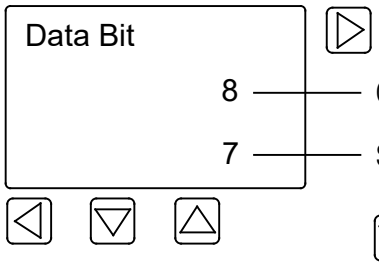
(1200, 2400, 4800, 9600, 19200, 38400)

<- ENT ESC ->

key (Press twice) Apply selection

key Not Applicable

7.3 Data Bit Setup



key Enter a value

Current setting value

Settings to change

key Enter a value

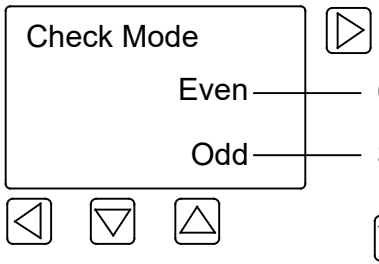
(7, 8)

<- ENT ESC ->

key (Press twice) Apply selection

key Not Applicable

7.4 Check Mode Setup



key Enter a value

Current setting value

Settings to change

key Enter a value

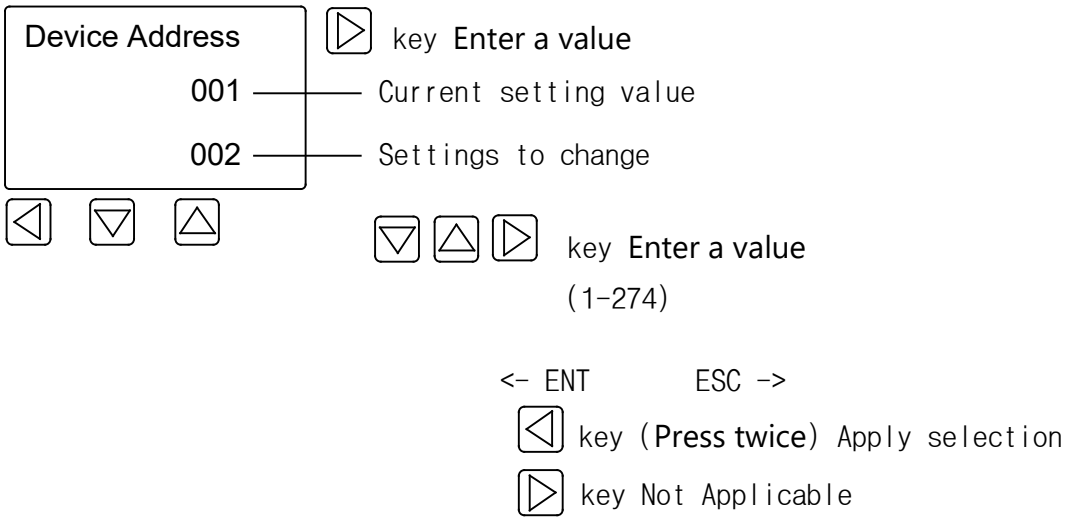
(Even, Odd)

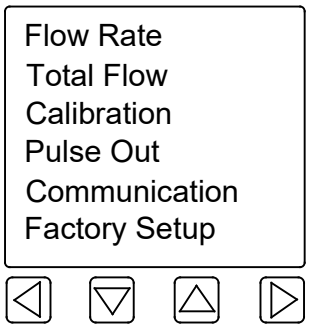
<- ENT ESC ->

key (Press twice) Apply selection

key Not Applicable

7.5 Device ID Setup



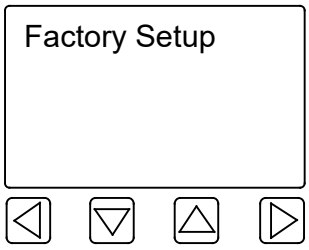


key Move menu

key Entering the menu

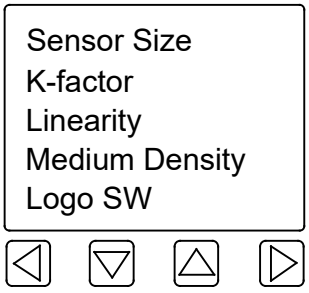
key Move backward (Change settings)

8. Factory Setup



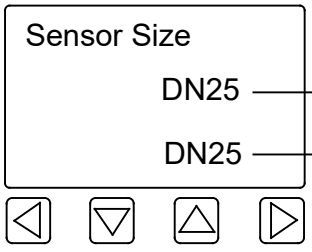
Factory Setup No change

Factory Setup Password : 909100 After input key



Factory Setup Sub menu

8.1 Sensor Size Setup



key Enter a value

Current setting value

Settings to change

key Enter a value

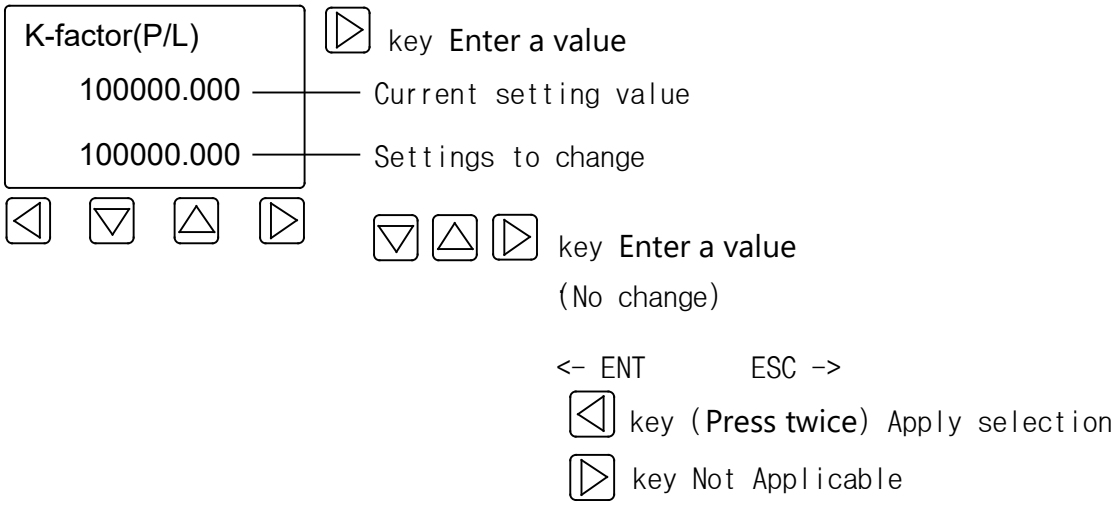
(No change)

<- ENT ESC ->

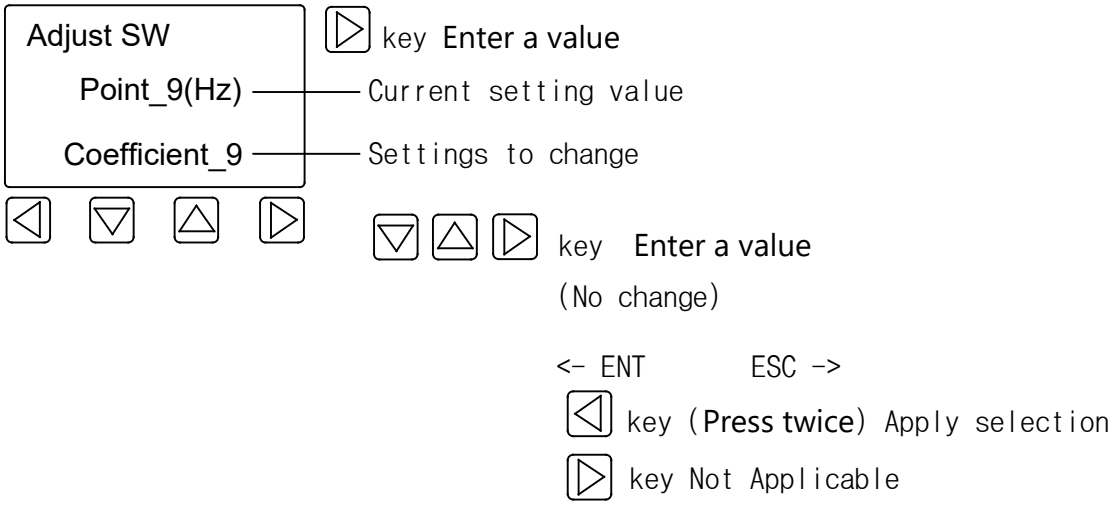
key (Press twice) Apply selection

key Not Applicable

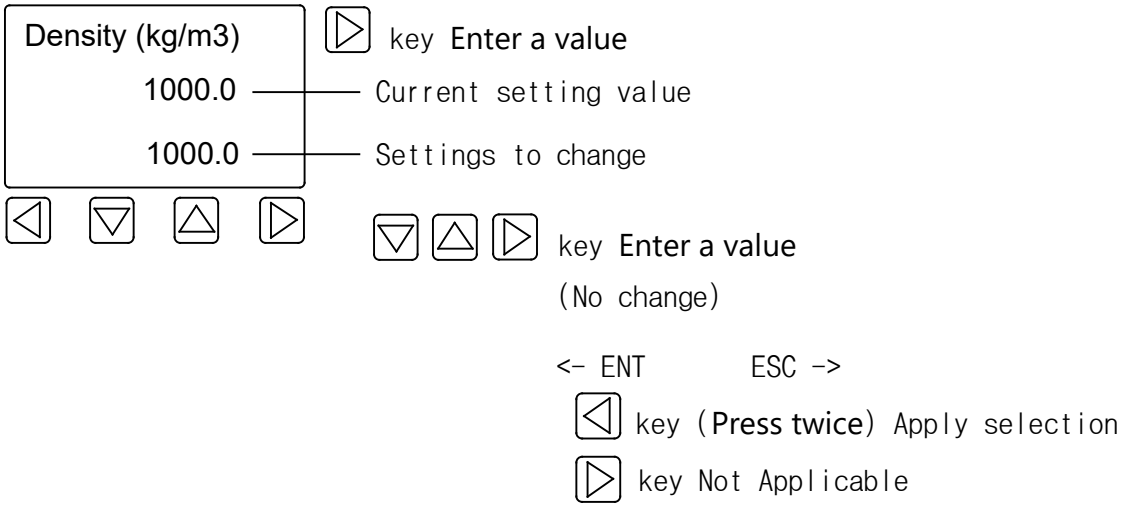
8.2 K-factor Setup



8.3 Linearity Setup



8.4 Medium Density Setup



KTR-550-F

MODBUS Protocol Manual

KOMETER

DIRECTORY

1 Data transfer mode

MODBUS for data transmission by two ways:RTU and ASCII.RTU mode use the 8 bits binary characters and ASCII mode use the 7 bits ASC characters.To be the ASCII mode transmission byte,it should separates the one byte of four highers and four lowers in RTU mode into two bytes.

RTU transmission mode of data frame adopts CRC check,and ASCII transmission mode adopts LRC check.

The difference of the two transmission modes:

Transfer mode	**ASCII (7 bit)**	**RTU (8 bit)**
Coding format	ASCII code (‘0’-‘9’ ‘A’-‘F’)	8bit binary (0x00 – 0xff)
Start bit Data bit Check bit Stop bit	1 7,8 Non,odd,even 1,2	1 8 Non,odd,even 1,2
The frame check	LRC	CRC16

2 Registers and Data types

Register type	length of the data	Register number	description
COIL	1 bit	-	Boolean variable(ON/OFF)
FLOAT	32 bit	2	32 bit floating point Numbers(IEEE754 format)
INT	16 bit	1	Unsigned integer(0x0–0xFFFF)
DOUBLE	64 bit	4	64 bit floating point Numbers(IEEE754 format)

2.1 COIL

Boolean variable 0xFF00 -> ON 0x0000 -> OFF

2.2 FLOAT

Using two registers to store the floating point number of single precision IEEE754 format.

Each float contains 4 bytes:

SEEEEEEE EMMMMMMM MMMMMMMM MMMMMMMM

S:The sign bit 0->anode 1->cathode (1 byte)

E:exponent (8 bytes)

M:The decimal part of tail (32bytes)

For example,0xC1480000 = -12.5

2.3 DOUBLE

Using four registers to store the floating point number of single precision IEEE754 format.

Each float contains 8 bytes:

S:The sign bit 0->anode 1->cathode (1 byte)

E:exponent (11 bytes)

M:The decimal part of tail (52 bytes)

2.4 INT

Using a storage register to store an unsigned integer.

For example,0x0025 = 37 0x1234 = 4660

3 Defination of data frame format

3.1 CMD=0x03(Read one or more registers)

This example data is the removed(address:0x0030) data frame of small signal to be read, instrument address = 1.

Request frame: PC - > instrument

Name of the data fields	**RTU** Sample	**ASC** Sample
Packet Header	NONE	3A
Instrument address	01	30 31
Function codes	03	30 33
Register starting address high	00	30 30
Register starting address low	30	33 30
Register the number of high	00	30 30
Register the number of low bytes	02	30 32
The frame check	C4 04	43 41
Packet Tail	NONE	0D 0A

Response frame: instrument - > PC

Name of the data fields	**RTU** Sample	**ASC** Sample
Packet Header	NONE	3A
Instrument address	01	30 31
Function codes	03	30 33
length of the data	04	30 34
Register 0x0030 data high bytes	00	30 30
Register 0x0030 data low bytes	00	30 30
Register 0x0031 data high bytes	3F	33 46
Register 0x0031 data low bytes	00	30 30
The frame check	EB C3	42 39
Packet Tail	NONE	0D 0A

The data of removed small signal returned to the response frame data is 0.5.

3.2 CMD=0x05(Write a COIL variable)

This example data is the removal of total data frames, instrument address = 1.

Request frame: PC - > instrument

Name of the data fields	**RTU** Sample	**ASC** Sample
Packet Header	NONE	3A
Instrument address	01	30 31
Function codes	05	30 35
Register starting address high	00	30 30
Register starting address low	90	39 30
COIL variable high bytes	FF	46 46
COIL variable low bytes	00	30 30
The frame check	8C 17	36 42
Packet Tail	NONE	0D 0A

Response frame: instrument - > PC

Name of the data fields	**RTU** Sample	**ASC** Sample
Packet Header	NONE	3A
Instrument address	01	30 31
Function codes	05	30 35
Register starting address high	00	30 30
Register starting address low	90	39 30
COIL variable high bytes	FF	46 46
COIL variable low bytes	00	30 30
The frame check	8C 17	36 42
Packet Tail	NONE	0D 0A

3.3 CMD=0x06(Write a single register)

The example data is data frames of a flow unit=m3/h,instrument address = 1.

Request frame: PC - > instrument

Name of the data fields	**RTU** Sample	**ASC** Sample
Packet Header	NONE	3A
Instrument address	01	30 31
Function codes	06	30 36
Register starting address high	00	30 30
Register starting address low	00	30 30
Variable high bytes	00	30 30
Variable low bytes	00	30 30
The frame check	89 CA	46 39
Packet Tail	NONE	0D 0A

Response frame: instrument - > PC

Name of the data fields	**RTU** Sample	**ASC** Sample
Packet Header	NONE	3A
Instrument address	01	30 31
Function codes	06	30 36
Register starting address high	00	30 30
Register starting address low	00	30 30
Variable high bytes	00	30 30
Variable low bytes	00	30 30
The frame check	89 CA	46 39
Packet Tail	NONE	0D 0A

3.4 CMD=0x10(Write multiple register)

The example data is data frame of damping time = 0.1s ,Instrument address=1

Request frame: PC - > instrument

Name of the data fields	**RTU** Sample	**ASC** Sample
Packet Header	NONE	3A
Instrument address	01	30 31
Function codes	10	31 30
Register starting address high	00	30 30
Register starting address low	20	32 30
Register number high bytes	00	30 30
Register number low bytes	02	30 32
Length of the data	04	30 34
Written to register 0x0020 high	CC	43 43
Written to register 0x0020 low	CD	43 44
Written to register 0x0021 high	3D	34 44
Written to register 0x0021 low	CC	43 43
The frame check	4F DD	32 37
Packet Tail	NONE	0D 0A

Response frame: instrument - > PC

Name of the data fields	**RTU** Sample	**ASC** Sample
Packet Header	NONE	3A
Instrument address	01	30 31
Function codes	10	31 30
Register starting address high	00	30 30
Register starting address low	20	32 30
Register number high bytes	00	30 30
Register number low bytes	02	30 32
The frame check	40 02	43 44
Packet Tail	NONE	0D 0A

3.5 Fault return frame

Because of that can not be correctly complete the operation request frame, the instrument will return a report of fault code returns the frame, with the specific reason that can't complete the operation.

Such as the instantaneous flow unit will set to m3, but the instrument can't support the flow unit m3, so it will return the following fault response frame.

Fault response frame: instrument - > PC

Name of the data fields	**RTU** Sample	**ASC** Sample
Packet Header	NONE	3A
Instrument address	01	30 31
Function codes	86	38 36
Fault codes	43	34 33
The frame check	03 91	39 31
Packet Tail	NONE	0D 0A

Notes:1 Function codes of Fault response frame is the Function codes+0x80 of Request frame

2 Please refer to the specific fault code with Appendix 1: fault codes

4 Data frame calibration algorithm

4.1 LRC check

// LRC check range:from“Instrument address”to the byte before LRC frame check code

```
void LRC(unsigned char *buf, unsigned int len)
{
unsigned int i;
LRC = 0;
for (i=0; i<len; i++)
{
LRC += buf[i];
}
LRC = 0xff - LRC;
LRC++;
}
```

4.2 CRC16 check

```
const unsigned char    TAB_CRC_H[] = {
0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,
0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,
0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,
0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,
0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,
0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,
0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,
0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,
0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,
0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,
0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,
0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,
```

```
0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,
0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,
0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40,0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,
0x00,0xC1,0x81,0x40,0x01,0xC0,0x80,0x41,0x01,0xC0,0x80,0x41,0x00,0xC1,0x81,0x40
};
const unsigned char    TAB_CRC_L[] = {
0x00,0xC0,0xC1,0x01,0xC3,0x03,0x02,0xC2,0xC6,0x06,0x07,0xC7,0x05,0xC5,0xC4,0x04,
0xCC,0x0C,0x0D,0xCD,0x0F,0xCF,0xCE,0x0E,0x0A,0xCA,0xCB,0x0B,0xC9,0x09,0x08,0xC8,
0xD8,0x18,0x19,0xD9,0x1B,0xDB,0xDA,0x1A,0x1E,0xDE,0xDF,0x1F,0xDD,0x1D,0x1C,0xDC,
0x14,0xD4,0xD5,0x15,0xD7,0x17,0x16,0xD6,0xD2,0x12,0x13,0xD3,0x11,0xD1,0xD0,0x10,
0xF0,0x30,0x31,0xF1,0x33,0xF3,0xF2,0x32,0x36,0xF6,0xF7,0x37,0xF5,0x35,0x34,0xF4,
0x3C,0xFC,0xFD,0x3D,0xFF,0x3F,0x3E,0xFE,0xFA,0x3A,0x3B,0xFB,0x39,0xF9,0xF8,0x38,
0x28,0xE8,0xE9,0x29,0xEB,0x2B,0x2A,0xEA,0xEE,0x2E,0x2F,0xEF,0x2D,0xED,0xEC,0x2C,
0xE4,0x24,0x25,0xE5,0x27,0xE7,0xE6,0x26,0x22,0xE2,0xE3,0x23,0xE1,0x21,0x20,0xE0,
0xA0,0x60,0x61,0xA1,0x63,0xA3,0xA2,0x62,0x66,0xA6,0xA7,0x67,0xA5,0x65,0x64,0xA4,
0x6C,0xAC,0xAD,0x6D,0xAF,0x6F,0x6E,0xAE,0xAA,0x6A,0x6B,0xAB,0x69,0xA9,0xA8,0x68,
0x78,0xB8,0xB9,0x79,0xBB,0x7B,0x7A,0xBA,0xBE,0x7E,0x7F,0xBF,0x7D,0xBD,0xBC,0x7C,
0xB4,0x74,0x75,0xB5,0x77,0xB7,0xB6,0x76,0x72,0xB2,0xB3,0x73,0xB1,0x71,0x70,0xB0,
0x50,0x90,0x91,0x51,0x93,0x53,0x52,0x92,0x96,0x56,0x57,0x97,0x55,0x95,0x94,0x54,
0x9C,0x5C,0x5D,0x9D,0x5F,0x9F,0x9E,0x5E,0x5A,0x9A,0x9B,0x5B,0x99,0x59,0x58,0x98,
0x88,0x48,0x49,0x89,0x4B,0x8B,0x8A,0x4A,0x4E,0x8E,0x8F,0x4F,0x8D,0x4D,0x4C,0x8C,
0x44,0x84,0x85,0x45,0x87,0x47,0x46,0x86,0x82,0x42,0x43,0x83,0x41,0x81,0x80,0x40
};

// CRC check range:from“Instrument address”to the byte before CRC frame check
code
void CRC(unsigned char *buf, unsigned int len)
{
unsigned int i;
unsigned char CRC_H , CRC_L , index, ch;
```

```
    CRC_H = 0xff;
CRC_L = 0xff;
for (i=0; i<len; i++)
{
ch = buf[i];
index = CRC_H ^ ch;
        CRC_H = CRC_L ^ TAB_CRC_H[index];
CRC_L = TAB_CRC_L[index];
}
}
```

5 Instrument variable address definition

The following is support instrument data variable information list, the datas are for HEX type

The variable name	Register address	Length of the registers	Read the instructions	Written the instructions
COIL type				
Clear the total	0091	***	***	05
INT type				
The instantaneous flow unit(See appendix 2)	0000	0001	03	06
The instantaneous flow decimal digits(See appendix 3)	0008	0001	03	06
The total units(See appendix 2)	0010	0001	03	06
Amount of decimal digits(See appendix 3)	0018	0001	03	06
Impulse level	0050	0001	03	06
Device address	0078	0001	03	06
Communication protocol(See appendix 3)	0058	0001	03	***
Baud rate(See appendix 3)	0060	0001	03	***
Data bits(See appendix 3)	0068	0001	03	***
Check way(See appendix 3)	0070	0001	03	***
FLOAT type				
Damping time	0020	0002	03	10
Small signal to remove	0030	0002	03	10
Upper limit of the frequency	0038	0002	03	10
Pulse equivalent	0040	0002	03	10

Pulse width	0048	0002	03	10
Low emergency alarm (percentage)	00C0	0002	03	10
High emergency alarm (percentage)	00D0	0002	03	10
Fluid density	0098	0002	03	10
DOUBLE type				
Range (20 mA)	0028	0004	03	10
Coefficient of sensor	0088	0004	03	10
The total	0090	0004	03	10
The instantaneous flow rate	0700	0004	03	***

6 Appendix 1: fault codes

0x01	Invalid instruction code
0x02	Register address is invalid
0x30	Parameters of the ultra limit
0x31	Parameters of super lower limit
0x32	Parameter option error
0x40	Invalid register length
0x41	Register does not support the current instruction code
0x42	The function of register is not specified
0x43	The instantaneous flow unit does not exist
0x44	The total unit does not exist
0x45	The highest frequency output exceeds the upper limit
0x46	The lowest frequency output exceeds the limit
0x47	The highest velocity exceeds the upper limit
0x48	Duty ratio exceeds the upper limit
0xFE	Data frame chaos
0xFF	Data frame validation errors

7 Appendix 2: common units defination

The instantaneous flow rate	m3/h	0
	m3/m	1
	m3/s	2
	L/h	3
	L/m	4
	L/s	5
	USG/h	6
	USG/m	7
	USG/s	8
	kg/h	9
	kg/m	10
	kg/s	11
	t/h	12
	t/m	13
	t/s	14
cumulants	L	0
	m3	1
	USG	2
	kg	3
	t	4

8 The appendix 3: symbol definition

Modbus Communication mode	RTU	0
	ASCII	1
Check way	Odd check	0
	Even check	1
	Non check	2
Baud rate	1200bps	0
	2400bps	1
	4800bps	2
	9600bps	3
	19200bps	4
	38400bps	5
Data bits	7 bits	0
	8 bits	1
Decimal digits	0 decimal places	0
	1 decimal places	1
	2 decimal places	2
	3 decimal places	3

9 Appendix 4: diameter symbol definition

Diameter	Code	Diameter	Code
DN1	0	DN600	27
DN1.5	1	DN700	28
DN2	2	DN750	29
DN3	3	DN800	30
DN4	4	DN900	31
DN5	5	DN1000	32
DN6	6	DN1100	33
DN8	7	DN1200	34
DN10	8	DN1300	35
DN15	9	DN1350	36
DN20	10	DN1400	37
DN25	11	DN1500	38
DN32	12	DN1600	39
DN40	13	DN1700	40
DN50	14	DN1800	41
DN65	15	DN2000	42
DN80	16	DN2100	43
DN100	17	DN2200	44
DN125	18	DN2300	45
DN150	19	DN2400	46
DN200	20	DN2500	47
DN250	21	DN2600	48
DN300	22	DN2700	49
DN350	23	DN2800	50
DN400	24	DN2900	51
DN450	25	DN3000	52
DN500	26		

KOREA FLOWMETER IND.CO.,LTD
#40, Wonchang-ro 64 beon-gil, Seo-gu, Incheon Metropolitan-city, Korea
TEL:+82 32-584-5301 / FAX:+82 32-584-5351