

# 10 DIGITAL MICRO-PROCESS Watt & Watt-Hr (Var & Var-Hr) Meter with ALARMS / ANALOG OUTPUT / RS-485

# AM5P-F

## FEATURES

- Accuracy:  $\pm 0.25\%$
- Measuring AC Watt / Var / Watt-Hour / Var-Hour
- High brightness 0.4" LED; Watt (Var) display range: 0~19999; decimal point selectable
- Time parameters programmable (1 or 60 or 3600 sec)
- Reset for Watt-Hour (Var-Hour) by external control input
- Individual alarm setting for Watt (Var) & Watt-Hour (Var-Hour)
- 2 Alarms for Watt (Var) / 1 alarm for Watt-Hour (Var-Hour) / Pulse Output / Analog Output (15 bit resolution) / RS-485 communication optional (The above options can exist together)
- High stability, non-flammable case (PC), high safety
- CE approval



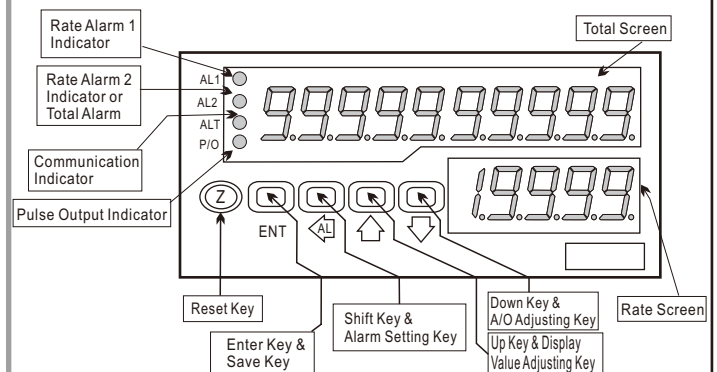
## ORDER INFORMATION: AM5P-F - Code 1 Code 2 Code 3 Code 4 Code 5 - Code 6 - Code 7 Code 8 Code 9

Code 1	Input Type	Code 2	Connection	Code 3	Input Volt	Code 4	Input Amp	Code 5	Frequency	Code 6	Aux. Power	Code 7	Alarm Output	Code 8	Analog Output	Code 9	RS-485
W	Watt / Watt-Hr	1	1 $\phi$ 2W	1	0~120V	1	0~1A	4	400Hz	A	AC/DC 100~240V	N	None	N	None	N	None
V	Var / Var-Hr	2	1 $\phi$ 3W	2	0~240V	2	0~5A	5	50Hz	D	AC/DC 22~60V	R1	Rate Alarm x 1	A	4~20mA	Y	Yes
		3	3 $\phi$ 3W	3	0~480V	O	Option	6	60Hz			R2	Rate Alarm x 2	V	0~10V		
		4	3 $\phi$ 4W	O	Option			O	Option			RT	Rate & Total Alarm x 1	O	Option		
												T1	Total Alarm x 1				
												RP	Rate Alarm x 1 & 1P / Count				
												TP	Total Alarm x 1 & 1P / Count				

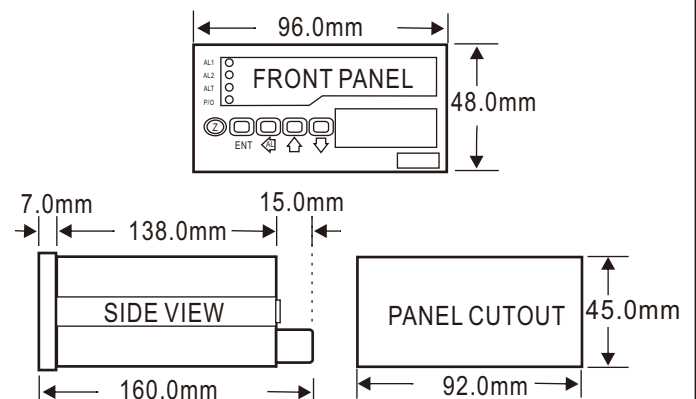
## SPECIFICATION

- ◆ Accuracy:  $\pm 0.25\%$  F.S.  $\pm 1$  digit
- ◆ Display Screen: High brightness red LED; 10.16mm(0.4")
- ◆ Sampling Time: 16 cycles / sec
- ◆ Display Range: Rate: 0~19999  
Total: 0~9999999999
- ◆ Zero Adjustment: Rate: 0~19999
- ◆ Over Range Indication: doFL / ioFL or -doFL / -ioFL
- ◆ Polarity Indication: Automatic with "-" indication
- ◆ Parameters Setting: Push buttons
- ◆ Back Up Memory: EEPROM
- ◆ Alarm Action: Rate: " $\geq$  (Hi) on" or "< (Lo) on"  
Total: " $\geq$  (Hi) on"
- ◆ Alarm Run Delay Time: 0~99 sec
- ◆ Relay Contact: AC 277V / 7A; DC 30V / 7A
- ◆ Analog Output Resolution: 15 bit
- ◆ Output Response Time: <250 msec (0~90%)
- ◆ Output Capability: Voltage Output: <20mA  
Current Output: <10V
- ◆ Communication: RS-485 Modbus RTU mode
- ◆ Baud Rate: 38400 / 19200 / 9600 / 4800 bps
- ◆ Temperature Coefficient: 100ppm /  $^{\circ}$ C (0~60 $^{\circ}$ C)
- ◆ Operating Temperature: 0~60 $^{\circ}$ C
- ◆ Operating Humidity: 20~90% RH (non-condensing)
- ◆ Storage Temperature: -10~70 $^{\circ}$ C
- ◆ Storage Humidity: 20~90% RH (non-condensing)
- ◆ Power Supply: AC/DC 100~240V; AC/DC 22~60V
- ◆ Power Consumption: 8.5VA (all functions output)
- ◆ Surge Test: 1.5kVac / 1min (Input / Power)
- ◆ Input Impedence: Voltage:  $>2V$  for  $20k\Omega / V$ ;  $\leq 2V$  for  $>200M\Omega$   
Current:  $\geq 0.2A$  at 100mV;  $<0.2A$  at 1V
- ◆ Safety: IEC 61000-4-2  
IEC 61000-4-3  
IEC 61000-4-4  
IEC 61000-4-5  
IEC 61000-4-6  
IEC 61000-4-8  
IEC 61000-4-11

## FRONT PANEL & KEY FUNCTIONS



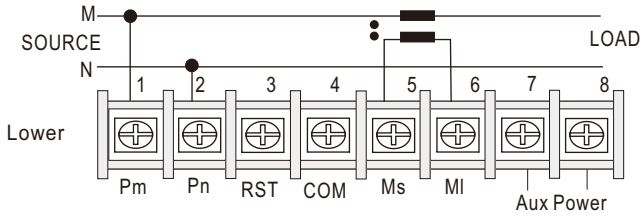
## DIMENSION



# WIRING CONNECTION

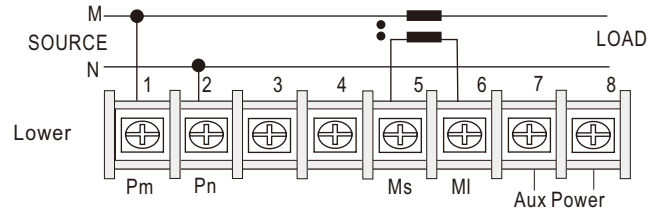
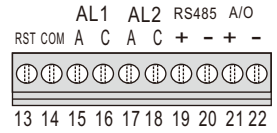
## Display Function Only

● 1 $\phi$  2 W Watt & Watt-Hour

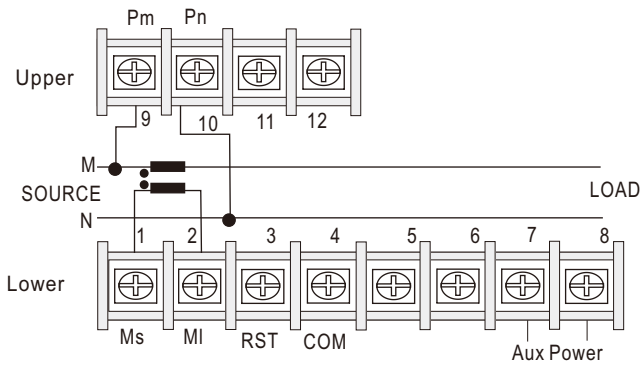


## Alarms / Analog / RS-485 Output

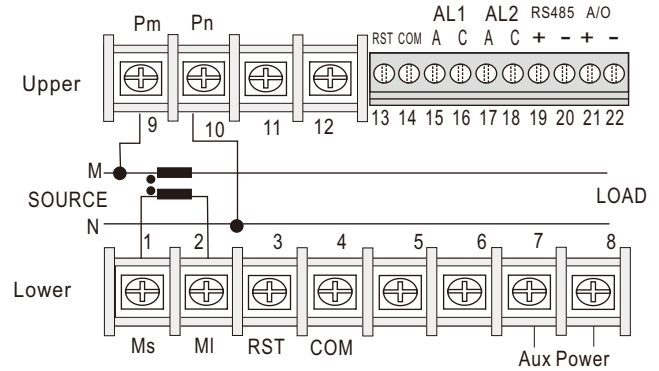
● 1 $\phi$  2 W Watt & Watt-Hour



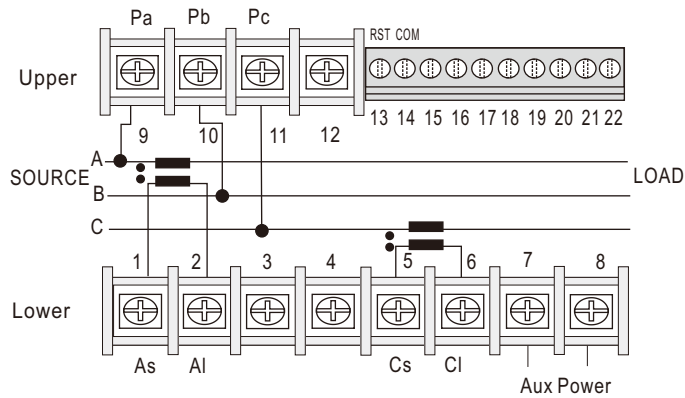
● 1 $\phi$  2 W Var & Var-Hour



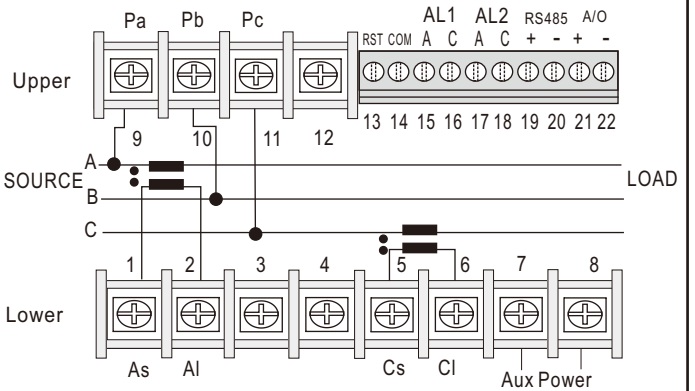
● 1 $\phi$  2 W Var & Var-Hour



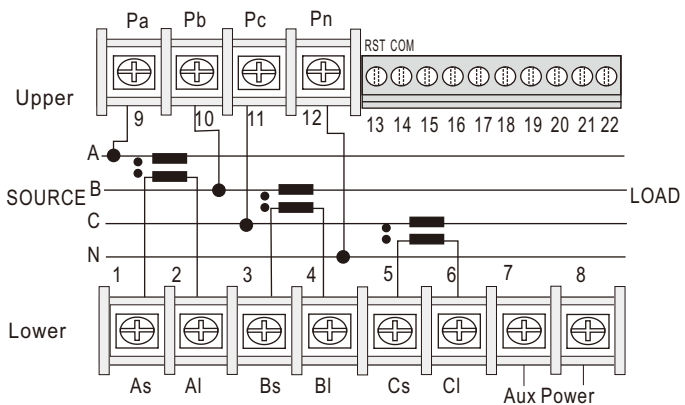
● 3 $\phi$  3 W (1 $\phi$  3W) Watt & Watt-Hour (Var & Var-Hour)



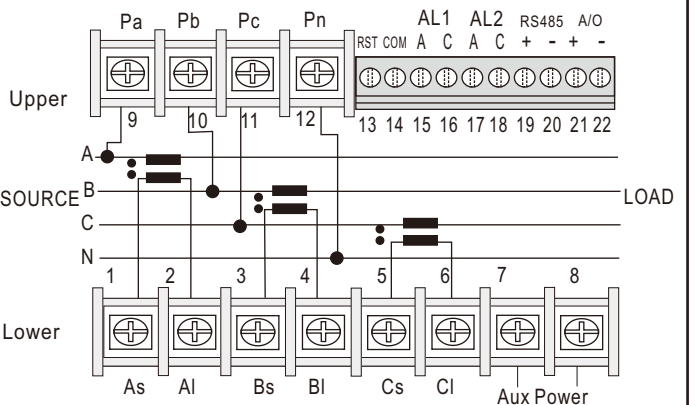
● 3 $\phi$  3 W (1 $\phi$  3W) Watt & Watt-Hour (Var & Var-Hour)



● 3 $\phi$  4 W Watt & Watt-Hour (Var & Var-Hour)

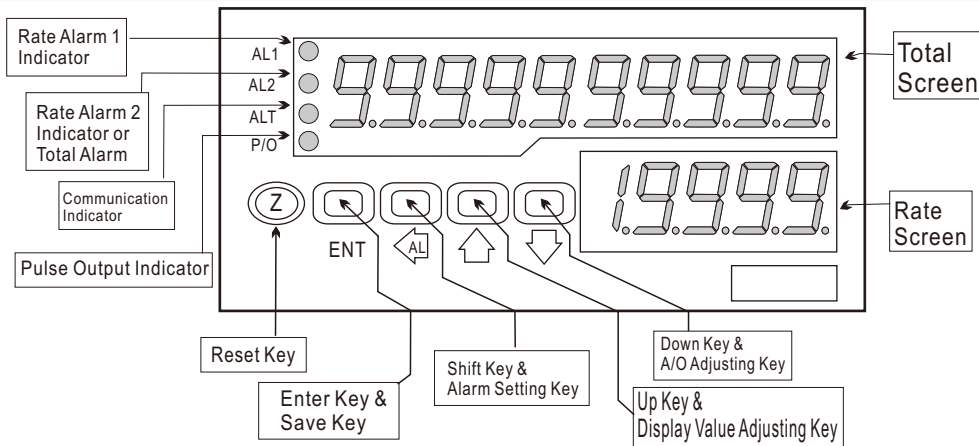


● 3 $\phi$  4 W Watt & Watt-Hour (Var & Var-Hour)



\* Please understand key indicators & functions at the first operation.

**FRONT PANEL & KEY FUNCTIONS**



Key Name	Symbol	Descriptions
Reset Key	Ⓩ	1. Press this key to enable the reset function & reset indicator (Z) is light; press this key again to disable the reset function & reset indicator (Z) is dark.
Enter Key & Save Key	ENT	1. In the measuring status, press this key can enter to parameter pages. 2. In the parameter setting, press this key can save the value & go to next parameter.
Shift Key & Alarm Setting Key	←AL	1. In the measuring page, press this key for 3 sec can enter to alarm setting page (The selecting digit will be flashed) 2. In the parameter setting, press this key can move the cursor left.
Up Key & Display Value Adjusting Key	↑	1. In the measuring status, press this key for 3 sec can enter to display value adjustment of "ZERO" & "SPAN" 2. In the parameter setting, press this key can increase the digits.
Down Key & A/O Adjusting Key	↓	1. In the measuring status, press this key for 3 sec can enter to analog output adjustment. 2. In the parameter setting, press this key can decrease the digits.

- \*\*1. The following block charts are parameters codes, parameter codes & parameters will alternate flashing if the parameters can be modified.  
 2. To modify the parameters, please press ←↑↓, and press ENT to save the parameter after the modification.  
 3. Please don't forget the new pass code after modification.  
 4. In any pages, press ↑&↓, or don't press any keys for 2 minutes that will back to measuring status.

**GENERAL MODE OPERATING PROCEDURES**

Block Charts	Display	Descriptions	Default
<b>Alarm Setpoint</b>			
Power ON	10000	Measuring Status	Present value for measurement.
Press ← for 3 sec	AL1	Rate Alarm 1 Setpoint (AL1)	Press ←↑↓ to modify rate alarm 1 setpoint.
Press ENT	AL2	Rate Alarm 2 Setpoint (AL2)	Press ←↑↓ to modify rate alarm 2 setpoint.
Press ENT	ALt	Total Alarm Setpoint (ALt)	Press ←↑↓ to modify total alarm setpoint.
Press ENT		<b>Display: "ZERO" &amp; "SPAN" Adjustment</b>	
Power ON	10000	Measuring Status	Present value for measurement.
Press ↑ for 3 sec	dPEro	Display Zero Adjustment (dZEro)	Press ← to select adjusting speed rate, press ↑ ↓ to modify the zero value. PS: To use this function to adjust the real zero value.
Press ENT	dSPAN	Display Span Adjustment (dSPAN)	Press ← to select adjusting speed rate, press ↑ ↓ to modify the span value. PS: To use this function to adjust the real span value.
Press ENT		<b>Analog Output: "ZERO" &amp; "SPAN" Adjustment</b>	
Power ON	10000	Measuring Status	<b>The following steps are only available for analog output.</b>
Press ↓ for 3 sec	APEro	A/O Zero Adjustment (AZEro)	Press ← to select adjusting speed rate, press ↑ ↓ to modify the A/O zero. PS: To use this function to adjust the real A/O zero.
Press ENT	ASPAAn	A/O Span Adjustment (ASPAAn)	Press ← to select adjusting speed rate, press ↑ ↓ to modify the A/O span. PS: To use this function to adjust the real A/O span.

- Remark: 1. There are 4 parameter groups of "System Setting Group(SYS)", "Alarm Setting Group(roP)", "Analog Output Setting Group (AoP)" & "RS485 Setting Group(doP)" for modification.  
 2. Press ← to select each group page, and press ENT to enter each group or parameter page for modification or saving the parameters.  
 3. Some of optional functions of parameter pages still exist, but the functions are disable.

**PROGRAMMING MODE OPERATING PROCEDURES**

Block Charts	Display	Descriptions	Default
<b>Parameter Group Setting Procedures</b>			
Power ON	10000	Measuring Status	Present value for measurement.
Press ENT	P.Cod	Pass Code (P.Cod)	Press ←↑↓ to enter pass code.
Press ENT			Pass code is correct that will enter to parameter groups. Pass code is wrong that will back to measuring status.
P.Code Correct			
NO			
YES	SYS	System Setting Group	
Press ←	roP	Alarm Setting Group	
Press ←	AoP	A/O Setting Group	
Press ←	doP	RS485 Setting Group	

Display	Descriptions	Default
<b>System Setting Group Procedures</b>		
	System Setting Page (SYS)	
Decimal Point of Rate Setting (dPr)	Press $\uparrow$ $\downarrow$ to select rate decimal point (0, 1, 2, 3, 4).	00000
Display Hi Scale Setting (dSPH)	Press $\leftarrow$ $\rightarrow$ to modify present value high scale (1~19999). Display Hi Scale Calculation: (If there are no PT & CT ratio, they can be omitted.) DSPH = Basic Watt x PT ratio x CT ratio	Customers specify
Display Average Setting (AvG)	Press $\leftarrow$ $\rightarrow$ to modify display average (1~99). PS: Please use this function for stable display value when input signal is unstable.	00005
Decimal Point of Total Setting (dPt)	Press $\uparrow$ $\downarrow$ to select total decimal point (0, 1, 2, 3, 4).	00000
Time Parameter Setting (C.ti.nE)	Press $\leftarrow$ $\rightarrow$ to modify time parameter (1/60/3600sec).	0000 1
Total Scale Setting (SCALE)	Press $\uparrow$ $\downarrow$ to modify total scale (0.001~9.999)	1.000
Pass Code Setting (CodE)	Press $\leftarrow$ $\rightarrow$ to modify pass code (0~19999). PS: Please don't forget the new pass code after modification.	00000
Key Lock Setting (LoCK)	Press $\uparrow$ $\downarrow$ to lock the keys, using key lock function only can view the parameters, but cannot modify any values. PS: no (unlock), YES ("ENT" unlock, others lock).	no
<b>Alarm Setting Group Procedures</b>		
Alarm Setting Page (roP)	<b>The following steps are only available for alarm output.</b>	
Alarm 2 Indicator Setting (indi)	Press $\uparrow$ $\downarrow$ to modify alarm 2 indicator for AL2 or ALT.	AL2
Alarm 1 (ACT1)	Alarm Action Setting	Hi
Alarm 2 (ACT2)		
Alarm T (ACTt)		
Delay Time 1 (dEL1)	Alarm Run Delay Setting	00000
Delay Time 2 (dEL2)		
Alarm Start Band Setting (Sb)	Press $\leftarrow$ $\rightarrow$ to modify the value (-99~+99), if the display value don't over this range; the alarm will not be act.	00000
Alarm Start Band Time Setting (Sdt)	Press $\leftarrow$ $\rightarrow$ to modify the value (0~99 sec), if the display value reach alarm start band value; the alarm will be act after this value (sec).(The function is used with "Sb" function.)	00000

Display	Descriptions	Default
<b>A/O Setting Group Procedures</b>		
	A/O Setting Page (AoP)	<b>The following steps are only available for analog output.</b>
A/O Polarity Setting (PoLARr)	Press $\uparrow$ $\downarrow$ to select output for positive or negative pole. PS : Voltage output ,NO: positive pole output (0~+10V) YES: positive & negative pole output (-10~+10V)	no
A/O Low Scale Setting (AnLo)	Press $\leftarrow$ $\rightarrow$ to adjust A/O low scale to correspond to the display value (programmable). EX : A/O is 0~10V, the display is 10.0 to output 0V, this value must be set for 10.0.	00000
A/O Hi Scale Setting (AnHi)	Press $\leftarrow$ $\rightarrow$ to adjust A/O hi scale to correspond to the display value (programmable). EX : A/O is 0~10V, the display is 90.0 to output 1 0V, this value must be set for 90.0.	99999
<b>RS485 Setting Group Procedures</b>		
	RS485 Setting Page (doP)	<b>The following steps are only available for RS-485.</b>
Address Setting (Addr)	Press $\leftarrow$ $\rightarrow$ to modify address (0~255).	00000
Baud Rate Setting (bAUd)	Press $\uparrow$ $\downarrow$ to select baud rate (38400/19200/9600/4800).	19200
Parity Setting (PAri)	Press $\uparrow$ $\downarrow$ to select parity (n.8.2/n.8.1/even/odd).	n8.2

<b>Error Code of Self-Diagnosis</b>	
Display	Descriptions
1. oFL	Input signal is over 120% of input range.
-1. oFL	Input signal is under -20% of input range.
AdEr	Input signal is over 180% of input range or meter error.
doFL	Input signal is over display range (99999)
-doFL	Input signal is under display range (-19999)
E-00	EEPROM reading/writing suffers the interference (about 1 million times).

\*\*Please check the wiring connection is correct first, if the problem still exist, please return the meter to the factory.



## Modbus RTU Mode Protocol Address Table

Data: 16Bit/32Bit, +/- is 8000~7FFF (-32768~32767), 80000000~7FFFFFFF(-2147483648~2147483647)

Modbus	HEX	Name	Descriptions	Act
40001	0000	ID	Model number identification; AM5P-F is "09"	R
40002	0001	STATUS	Current alarm output & external control input status display; range: 0000~00F0 (0~240) (0:OFF, 1:ON) (Bit7:P/O, Bit6: ALT, Bit5: AL2, Bit4: AL1)	R
40003	0002	ACT	Alarm act setting; range 0000~0007 (0~7) 0:Hi, 1:Lo; Bit0:AL1, Bit1:AL2, Bit2:ALT	R
40004	0003	POLAR	Analog output polarity setting; range: 0000~0001 (0~1) 0:NO, 1:YES	R/W
40005	0004	INDI	Alarm 2 indicator setting; range: 0000~0001 (0~1) 0:NO, AL1:ALT	R/W
40006	0005	LOCK	Key lock setting; range: 0000~0001 (0~1) 0:NO, 1:YES	R/W
40007	0006	DPR	Rate decimal point setting; range: 0000~0004 (0~4) 0:10 <sup>0</sup> , 1:10 <sup>-1</sup> , 2:10 <sup>-2</sup> , 3:10 <sup>-3</sup> , 4:10 <sup>-4</sup>	R/W
40008	0007	DPT	Total decimal point setting; range: 0000~0009 (0~9) 0:10 <sup>0</sup> , 1:10 <sup>-1</sup> ~ 9:10 <sup>-9</sup>	R/W
40009	0008	CTIME	Total time base setting, range: 0000~0002 (0~2) 0:1, 1:60, 2:3600 sec	R/W
40010	0009	BAUD	Baud rate setting; range: 0000~0003 (0~3) 0:38400, 1:19200, 2:9600, 3:4800	R/W
40011	000A	PARI	Parity setting; range: 0000~0003 (0~3), 0:N.8.2., 1:N.8.1., 2:EVEN, 3:ODD	R/W
40012	000B	AVG	Display average setting; range: 0001~0063 (1~99)	R/W
40013	000C	DEL1	Alarm 1 act delay time setting; range: 0000~0063 (0~99)	R/W
40014	000D	DEL2	Alarm 2 act delay time setting; range: 0000~0063 (0~99)	R/W
40015	000E	SB	Alarm start band setting; range: FF9D~0063 (-99~99)	R/W
40016	000F	SDT	Alarm start delay time setting; range: 0000~0063 (0~99)	R/W
40017	0010	ADDR	Address setting; range: 0000~00FF (0~255)	R/W
40018	0011	CODE	Pass code setting; range: 0000~4E1F (0~19999)	R/W
40019	0012	AZERO	Analog output zero setting; range: D8F1~270F (-9999~9999)	R/W
40020	0013	ASPAN	Analog output span setting; range: D8F1~270F (-9999~9999)	R/W
40021	0014	DSPH	Display hi scale setting; range: 0000~4E1F (0~19999)	R/W
40022	0015	ANLO	Analog output low scale setting; range: 0000~4E1F (0~19999)	R/W
40023	0016	ANHI	Analog output hi scale setting; range: 0000~4E1F (0~19999)	R/W
40024	0017	AL1	Alarm 1 setpoint setting; range: 00000000~0001869F (0~99999)	R/W
40025	0018	AL2	Alarm 2 setpoint setting; range: 00000000~0001869F (0~99999)	R/W
40026	0019	SCALE	Total scale setting; range: 0001~270F (1~9999)	R/W
40027	001A	RATE	Current rate display; range: 0000~4E1F (0~19999)	R
40028	001B	ALT	Total alarm setpoint setting; range: 0000000000000000~00000002540BE3FF (0~9999999999)	R/W
40029	001C		Total alarm setpoint setting; range: 0000000000000000~00000002540BE3FF (0~9999999999)	R/W
40030	001D		Total alarm setpoint setting; range: 0000000000000000~00000002540BE3FF (0~9999999999)	R/W
40031	001E		Total alarm setpoint setting; range: 0000000000000000~00000002540BE3FF (0~9999999999)	R/W

Modbus	HEX	Name	Descriptions	Act
40032	001F	TOTALIZE	Current total display; range: 0000000000000000~00000002540BE3FF (0~9999999999)	R/W
40033	0020		Current total display; range: 0000000000000000~00000002540BE3FF (0~9999999999)	R/W
40034	0021		Current total display; range: 0000000000000000~00000002540BE3FF (0~9999999999)	R/W
40035	0022		Current total display; range: 0000000000000000~00000002540BE3FF (0~9999999999)	R/W

## CALIBRATION OPERATING PROCEDURES

Display	Descriptions	Default
<b>Calibration</b>		
<p>Press ENT &amp; ← together for 3 sec</p> <p>Press ENT</p> <p>Press ENT</p> <p>Press ↑ &amp; ↓ together for 3 sec</p>	<p>Measuring Status: Present value for measurement Press ENT &amp; ← together for 3 sec will enter to calibration operating procedures.</p> <p>Input Low Scale Calibration (inLo): 1. Input standard low scale signal. 2. Press ← ↑ ↓ to calibrate input low scale.</p> <p>Input Hi Scale Calibration (inHi): 1. Input standard hi scale signal. 2. Press ← ↑ ↓ to calibrate input hi scale.</p> <p>System Setting Page(SYS): 1. Finish calibration operating procedures will enter to system setting group. 2. Press ↑ &amp; ↓ together to back to measuring status.</p>	

**Warning: Calibration of this meter requires a standard signal with 0.01% accuracy or better and an external meter with 0.005% accuracy or better.**