

MULTI-CHANNEL PROCESS INDICATOR

— User Manual —

TSM-160



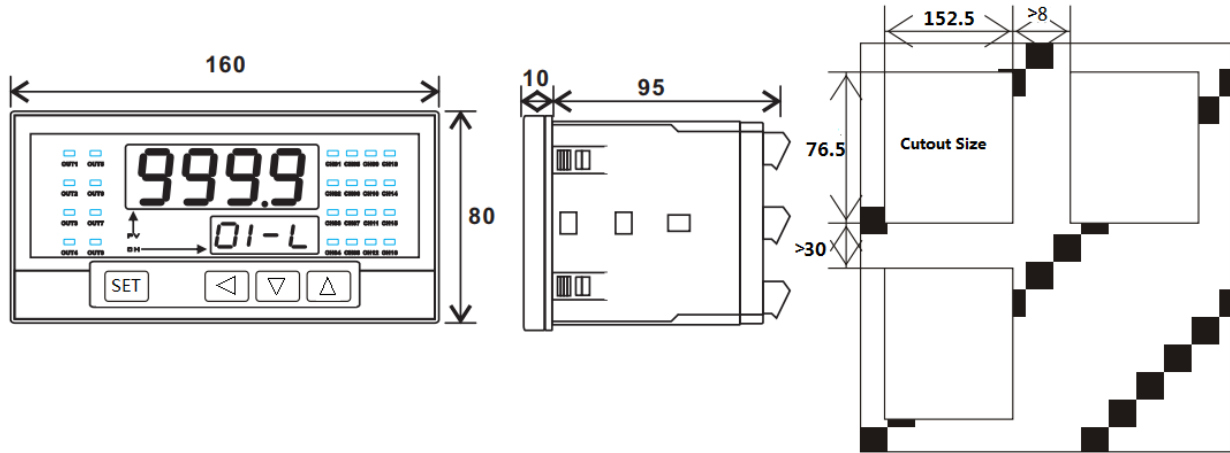
User Manual

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⚠️ Notice: Please read this user manual carefully before using.

- 1) Please kindly check the meter is same as what you ordered when you receive the unit. Please contact us immediately if there are any errors on meters to offer you our technical support.
- 2) Please read and check all connections and operation carefully before testing and installing the meter.
- 3) Please ensure the meter is working in its required working conditions. Please do not open the meter arbitrarily in order to avoid danger. Please contact us to open the meter under our instruction and approval if the meter has errors.
- 4) Please do not clean its LCD screen with organic solutions in order to avoid destroying the meter's screen.
- 5) Please connect the meter with ground in order to guarantee the safety of the meter and the operator.
- 6) Please calibrate the meter once per year. If the measurement error is beyond its range, it is usually caused by moisture, dust and corrosive gas, please clean and dry the inner parts of the meter. Please contact us if there are still any problems.

1. Installation and Dimension (unit: mm)



Installation Ambient

- Ambient temperature : 0 - 50°C, Ambient humidity: 10%-85% (No dew)
- Keep away from places with sunlight, steam, caustic gas and electromagnetism.
- The thickness of steel plate of the panel must be no less than 1mm in order to avoid shaking
- Please keep good venting around meters to make sure the meter can stay cool.

2. Front panel

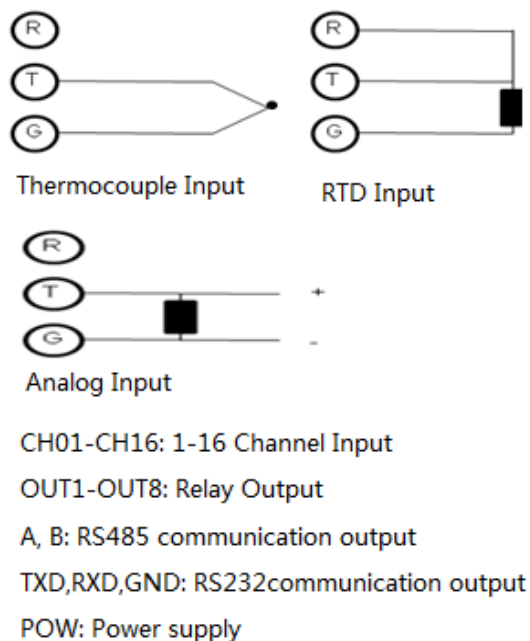
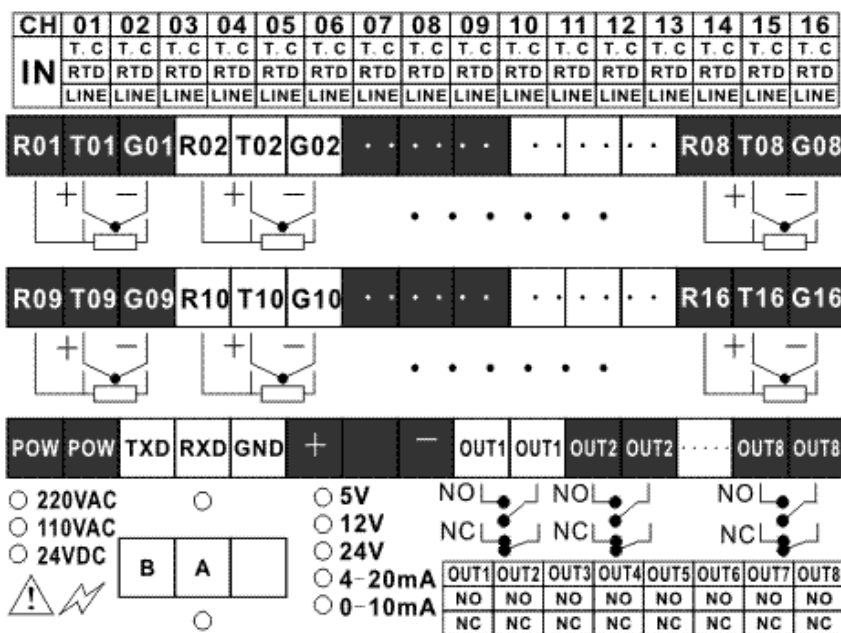


PV: PV value, 4 digits 7 segments LED
CH: Channel no+ Alarm statue display: 01-H
 H: High Limit Alarm
 L: Low Limit Alarm

OUT1-OUT8: Output indicating light
CH01-CH16: Channel indicating light

LED	Meaning	LED	Meaning	LED	Meaning	LED	Meaning
	0		8		G		o
	1		9		H		P
	2		A		i		q
	3		b		J		r
	4		C		K		S
	5		d		L		t
	6		E		M		u
	7		F		n		y

3. Diagram



Terminal Description

Type	Description	Type	Pin No.
Power supply		Input	
Relay Output No.	OUT1, OUT2.....OUT8	Channels No.	CH01, CH02, CH03, CH04.....CH16
Output Type	Relay, 4-20mA, RS485, RS232, Print	Power	POW, POW, 100-240VAC or 24VDC
Relay	NO, COM; NC, COM; 0.8A/220VAC/24VDC	Thermocouple Input	CH01: T01, G01; CH16: T16, G16
Communication	RS485: A, B; RS232: TXD, RXD, COM	RTD Input	CH01: R01, T01, G01; CH16: R16, T16, G16
Print	RS232, TXD, RXD, COM	Analog Input	CH01: T01, G01; CH16: T16, G16
Retransmission	+, - (4-20mA), 0-10mA		
Feed	+, - (24VDC, 12VDC, 5VDC)		
Input Type Range			
Thermocouple	K (-50 ~ 1300°C), S (-50 ~ 1700°C), T (-200 ~ 350°C)、E (0 ~ 800°C), J (0 ~ 1000°C), B (300 ~ 1800°C), N (0 ~ 1300°C)		
RTD	Cu50 (-50 ~ 150°C)、Pt100 (-200 ~ 600°C)、Cu100 (-50 ~ 150°C)		
Analog Input	0—5V, 1-5V, 0-10VDC; 0—10mA, 4—20mA		
Note:			
When 4-20mA input, please connect 250ohm resistor in parallel connection on input terminals			
When 0-10mA input, please connect 500ohm resistor in parallel connection on input terminals			

4. Operation

4.1. Keys Description



- : set and enter key for parameters setting and confirm key
 : move key, shift the cursor in left
 : Down key, shift to next parament or decrease value key
 : UP key, shift to the pre-parament, or increase the value key

4.2 Working Statuses Display

Normal Working Statue	System Error Statue	
		when the input signal is out of the measured range or the thermocouple or RTD circuit is broken (all output is invalid)
System Error Statue	System initialization statue when power on	
		System initialization statue when power on: PV: model no.; SV: display software version no. L580: D580; 3.0: Software version is 3.0

Display values: When power on, the PV window shows PV value under the normal working condition. When the input signal is out of the measured range, or thermocouple or RTD input circuit is broken, or the signal input is wrong, the PV window shows “OPEN” as above Open statuses; When there is error in the inner system of the meter, the PV shows” SYS”, the SV window shows “ERR” as above System error statue. If the indicator display ERR, please kindly contact us.

4.3. How to Configure and Set

In below picture, the number in black means LED display in normal working statue, the number in grey means flashing display.

1.Power on /off: Please connect or disconnect power terminals to power on or off the indicator.

2. In normal working statue screen, PV display screen, some functions’ operation as follows:

- Shift between multi-channel display in turn and single channel fixed display:** please press key to shift display type
- Shift channel manually:** please press or key to shift the channel display manually
- To print the PV value by serial printing port (this function is specified, which should advise this function when order)**



3. SV value setting: SV value setting:

When power on, please press key, the cursor will go to SV display window. When Value is flashing, it means start to set SV value. Please press or to set SV value, press key to move the flashing point to the modified number to set as required. After setting ok, press key again to exit SV setting to PV window

4.Configuration Setting

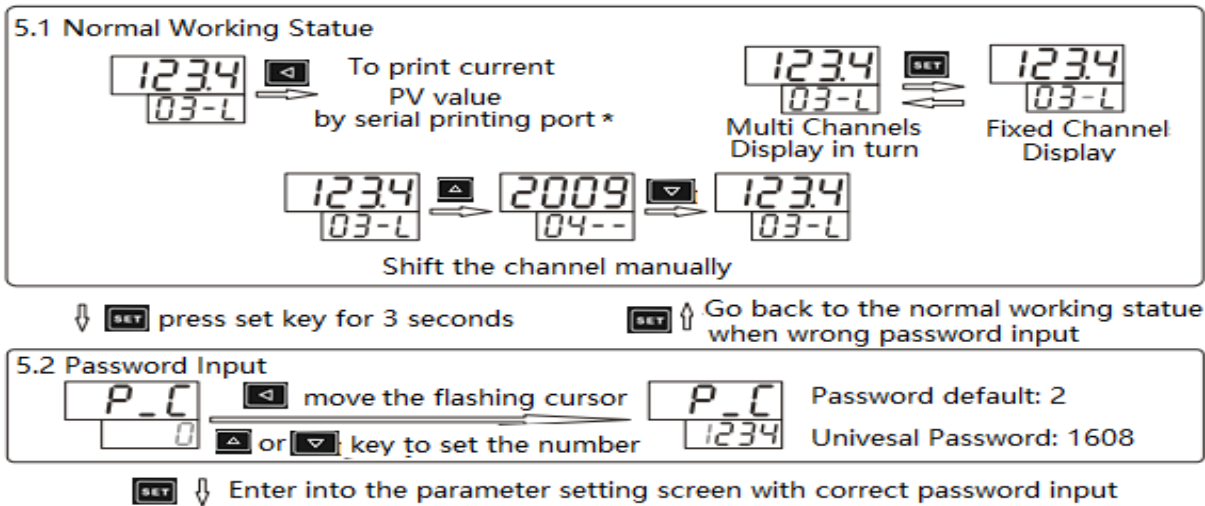
When power on and it is in normal display state, please press and hold key for 3 second to access the parameters menu for parameters configuration

- When the cursor is flashing on PV window, please press or key to go to next or preceding parameter required
- When the cursor is flashing on SV window, please press or key to set parameter code or value as correct.
- Please press key to move the cursor to the correct digit expected to be modified in SV window.
- After finishing all the parameters configuration, please press and hold key for 3 seconds to exit from the parameter menus back to normal display statue

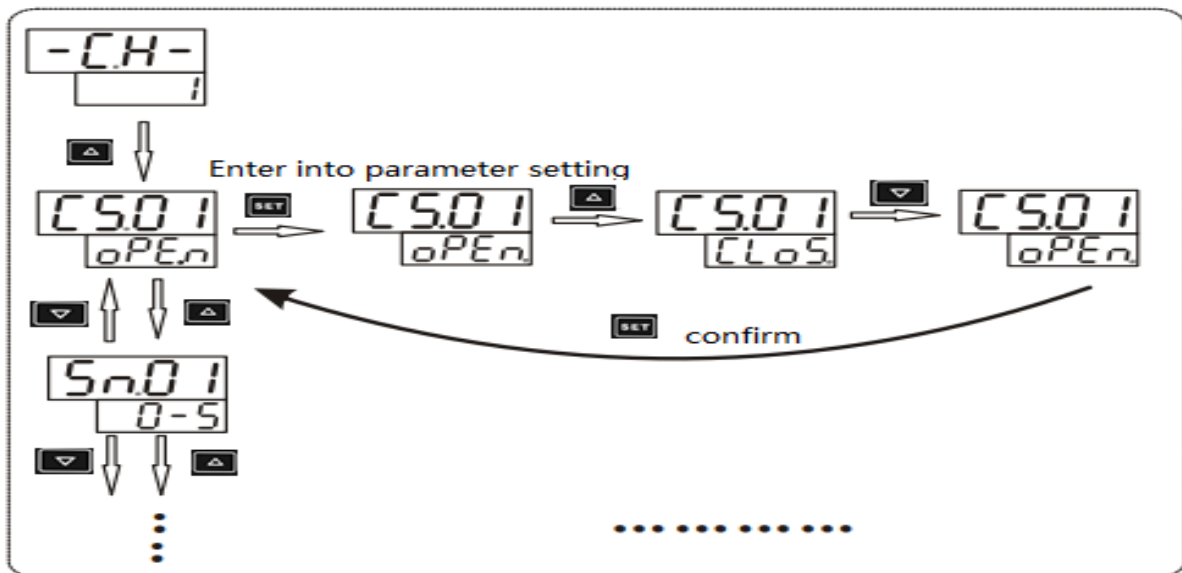
*There are 2 types of parameter menus and 2 types parameters type setting: character and number parameter setting

*Channels parameter setting: individual channel setting each channel

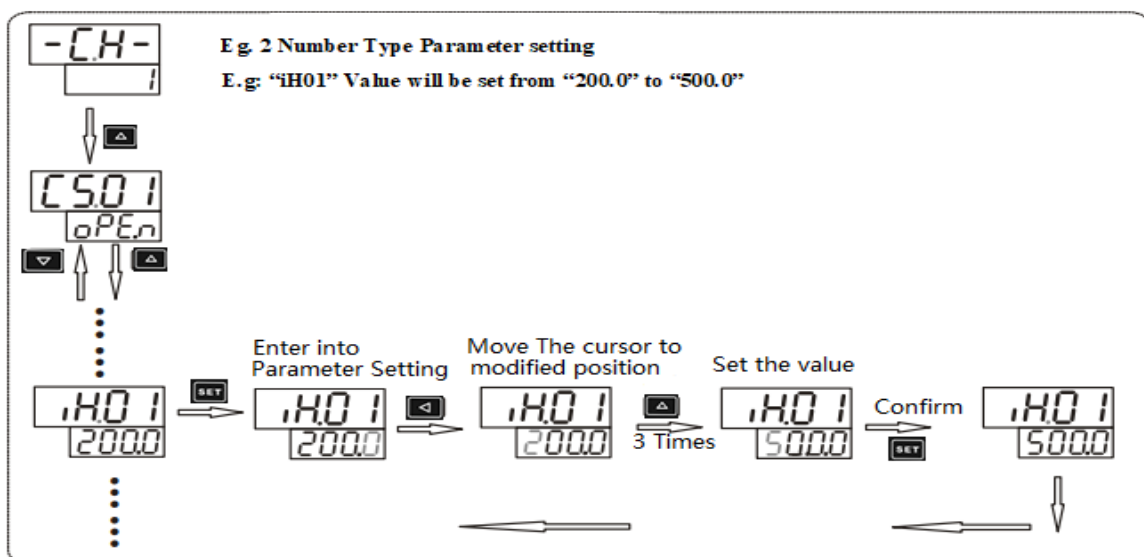
*Public parameter setting: public parameters setting for all channels



E.g.1 Character type parameter setting; E.g.: CS01 will be set from “oPen” to “Clos” then reset as “Open”



Eg. 2 Number Type Parameter setting E.g: “iH01” Value will be set from “200.0” to “500.0” as follows:



5.Parameters Menus Description

5.1 Channel Parameter Menu

Para. Code	Register Code	Parameter Meaning	Range	Description
CH	None	Channel No.	1,2,3,4,5...16	Current channel no.
CSXX	1	Channel working state	OPEn CLoS	OPEn: this channel is available to work CLoS: this channel is close not to work When channel is not used, please close it to improve scanning speed.
SnXX	2	Input type	K, S, B, T, E, J, N, Pt1b, Cu50,Cu1b, 0-5VDC,1-5VDC, 0-10mA, 4-20mA	Thermocouple: K, S, B, T, E, J, N RTD: Pt1b, Cu50, Cu1b Linear Vdc: 0-5V, 1-5V Linear mA: 0-10mA, 4-20mA
CCXX	3	Thermocouple Cold junction temperature compensation	null, diod	It will be set as diode when thermocouple type input only. Please refer to Point 6 on page7 for more details, Null: None diod: internal cold junction auto. compensation Cu50: external CU50 compensation
Poin	4	Decimal point	----. , ---.- --.- - , -.---	0-4: ----. ---.- --.- --.-. When thermocouple and RTD input, decimal =1 fixed: ---.- ,Point is not required to set
iLXX	5	Low limit range	-999 - 9999	a. Low limit range setting of analog input signal. E.g. 4-20mA input, range: 0-100.0, decimal: 1 required, so “Poin” =---.-, “LoL”=0.0, “Hil”=100.0. b.: Low limit range setting of retransmission output, this setting will be combined with parameter “Hil”, “trAn” and “Poin” to set retransmission output correctly.
iHXX	6	High Limit range	-999 – 9999	a. High limit range setting of analog input signal. E.g. 4-20mA input, range: 0-100.0, decimal: 1 required, so “Poin” =---.-, “LoL”=0.0, “Hil”=100.0. b.: limit range setting of retransmission output, this setting will be combined with parameter “Hil”, “trAn” and “Poin” to set retransmission output correctly.
AuXX	7	Offset	-999-9999	Used to compensate and modify the static error of the measured value (PV). “AdJu” =0 default Thermocouple and RTD input, decimal point is fixed as 000.0. E.g.: when “AdJu” =0.0, PV is 100.0C; when “AdJu” set as 10.0, PV will be 110.0C. when “AdJu” set as -10.0, PV will be 90.0C.
FiXX	8	Filter	0 - 99	Used for when there is digit fluctuation because of input interference. The Parameter “Fil” can be set as 0-99. Fil=0 is, it means without filter function. The higher when the value of “Fil” is set, the more stabilized the measured value is, but the slower the response rate is. When there is strong interference on site,“Fil” value can be set higher gradually thus making the momentary fluctuation of the measuring value less than 2-5 digits. Please set “Fil” =0 to increase the response rate

				when the meter is being calibrated.
1AXX	9	Alarm 1 value	-999 to 9999	A1 Alarm 1 setting value
2AXX	10	Alarm 2 value	-999 to 9999	A2 Alarm 2 setting value
3AXX	11	Alarm 3 value	-999 to 9999	A3 Alarm 3 setting value
4AXX	12	Alarm 4 value	-999 to 9999	A4 Alarm 4 setting value
HyXX	13	Hysteresis	0 -2000	“Hy” is the buffer of alarm output and used for avoiding frequent alarm on-off action because of the fluctuation of the measuring value. When thermocouple and RTD input, decimal point is fixed as 0: ----.
1MXX	14	A1 alarm type	LA, -LA, HA, -HA	<p>Alarm type setting for each relay output</p> <p>Each output can be configurable flexibly as follows: HHA, HA, LA, LLA.</p> <p>LA: Low limit alarm: alarm on when $PV < LA$, alarm off when $PV > LA + Hy$. When this alarm output is as public alarm with others, their public alarm principle is “or”.</p> <p>E.g.:A1=30,A2=40,A1-M=LA, A2-M=LA, A1-O=OUT1, A2-O=OUT1, so when $PV = 35$ or 25, OUT1 alarm.</p> <p>-LA: Low limit alarm: alarm on when $PV < LA$, alarm off when $PV > LA + Hy$. When this alarm output is as public alarm with others, their public alarm principle is “and”</p> <p>E.g.:A1=30,A2=40,A1-M=-LA,A2-M=LA,A1-O=OUT1, A2-O=OUT1, so when $PV = 35$, OUT1 not alarm, just when $PV < 30$, OUT1 alarm.</p> <p>HA: High limit alarm: alarm on when $PV > LA$, alarm off when $PV < LA + Hy$. When this alarm output is as public alarm with others, their public alarm mode is “or”.</p> <p>-HA: High limit alarm: alarm on when $PV > LA$, alarm off when $PV < LA + Hy$. When this alarm output is as public alarm with others, their public alarm mode is “and”</p>
2MXX	15	A2 alarm type		
3MXX	16	A3 alarm type		
4MXX	17	A4 alarm mode		
1OXX	18	A1 alarm output	NuLL, OUT1, OUT2, OUT3, OUT4, OUT5, OUT6, OU7, OUT8	A1, A2, A3, A4 Alarming output position. Null: None When there is in open circuit when thermocouple or RTD input, all output is invalid.
2OXX	19	A2 alarm output		
3OXX	20	A3 alarm output		
4OXX	21	A4 alarm output		
unXX	22	Engineer unit	0-53	0: °C1: °F please see the unit table below for other units, which will be printed in stick when ex-work for your sticking unit required to front panel.
KXX	23	Slope coefficient	-0.999-2.000	Used for modify the measured value slope. Modified measured value=original PV measured value * “K” value.
C1XX	24	Small signal cut	-999 to 9999	Small value cut when there is small signal value during measurement. When the measured value is lower than the setting value of “C1XX”, the measured value will be replaced as “C2” setting value. When “C1XX” =“0”, this parameter is not valid. There should be kept one decimal when T.C., RTD
C2XX	25	Cut replace	-999 to 9999	

				input. e.g.: C101=5, C201=0, when PV in CH01 is less than 5, PV=0
E1		Operator Para. 1	nuLL, CS, Sn, CC, Pn, iL, iH, Au, Fi, 1A, 2A, 3A, 4A, Hy, 1M, 2M, 3M, 4M, 1O, 2O, 3O, 4O, unxx, Kxx, C1xx, C2xx	Used specially for the operator, parameters set by engineer in advance. Eg, If setting E101=1A, E2102, E3/E4/D5=Null so operator will set these two parameters A1, AU in CH01. More parameters will be set by operation, please ask the engineer to release more for the operator.
E2		Operator Para. 2		
E3		Operator Para. 3		
E4		Operator Para. 4		
E5		Operator Para. 5		

5.2 Public Parameters

Parameter	Parameter Meaning	Range	Description
Addr	Communication address	1-255	<p>RS485 or RS232 Communication address setting. When there is multi-pcs of meters for communication, please set the different meter with different address.</p> <p>RS485, RS232 communication is based on standard MODBUS-RTU protocol, which should work with RS485/RS232 converter to PC , with read and write function to achieve DCS control. Standard MODBUS communication protocol is available with strong universality, good compatibility and high communication stability and so on performance.</p> <p>There is up to 255 pcs of the meters in a field bus when RS485 communication, which the repeater is required to work with together. The monitoring software can be programmed by user based on our standard MODBUS-RTU protocol and registered code, also purchase our DCS software for simple data monitoring and reading in PC.</p>
bAud	Baudrate	2400, 4800, 9600, 192b (19200)	RS485 or RS232 Communication baud rate setting. When When there are multi-pcs of meters for communication, please should set the baud rate same as the master (PC).
P_C1	Operator password	0-9999	It is used for operator, password=1 default
P_C2	Engineer password	0-9999	It is used for engineer, password=2 default
odt	Relay output delay	1-240second	It is used for delay time setting of relay output, range: 0-120; odt=0: without delay odt≠0, means delay time ; relay alarming keeping time, when relay is valid until there is output
Pr-t	Printing fixed time	0-9999	Interval time for fixed time printing, engineering unit: second; Pr-t=0, without printing
oFF	Input error handing	0-8	Input Error handling when there is in open circuit, in short circuit or input beyond the range value display “Err”. When meter is in short-circuiting, open-circuit and over-range, it displays “Err”, meanwhile please set parameter “Input.E” as follows:

			<p>0: All alarm outputs are not valid; the measured value is maximum (32751)</p> <p>1: All alarm outputs are not valid; the measured value keeps same.</p> <p>2: All alarm outputs are not valid, the measuring value is minimum (-20000)</p> <p>3: Alarm output is valid; the measured value is maximum (32751)</p> <p>4: Alarm output is valid; the measured value keeps same.</p> <p>5: Alarm output is valid; the measuring value is minimum (-20000)</p> <p>6: Input error and alarm output is not valid; the measured value is maximum (32751)</p> <p>7: Input error and alarm output is not valid; the measured value keeps same.</p> <p>8: Input error and alarm output is not valid; the measuring value is minimum (-20000)</p>
trCH	Retransmission output	1-16	<p>It is used to set the relative channel no. with 4-20ma retransmission output.</p> <p>e..g: trCH=2, means CH02 is with 4-20ma output</p>
CHEC	Even and odd check	Null, EvEn, odd	<p>Used when RS485 or RS232 communication.</p> <p>Null: None</p> <p>EvEn: Even check/parity when communication</p> <p>Odd: Odd check parity when communication</p>
yEAr	Year	00-99	<p>System real time date setting, please set it correctly when first using.</p>
Mon	MoTh	1-12	
dAtE	Date	1-31	
Hour	Hour	0-23	
Min	Minute	0-59	
SEC	Second	0-59	

6. Function Instruction

6.1 Printing Function

- The printing port is RS232 serial port, so communication and printing function can be not be selected at the same time.
- Please ensure to keep same the same baud rate of our TSM160 and the printer. Baud rate=9600 default
- If fixed time printing function is required, please set Pr-t≠0

6.2 Communication Function

- RS485 or RS232 communication based on standard MODBUS-RTU protocol
- the register code is decimal System. Please convert it as hexadecimal suitable
- PV register code is 0, The function code to read PV value=:03H; if the master needs to read the register code “1” in CH16, the order by the master can be 01 03 00 00 00 10 44 06

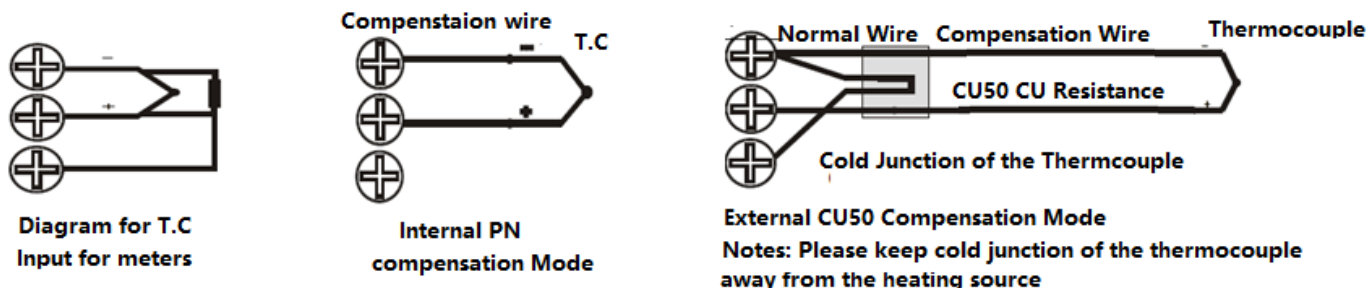
6.3 Thermocouple's Cold Junction Compensation

When thermocouple input, the T.C. cold-junction temperature compensation will be required according to its temperature measuring principle. There are three kinds of compensation modes: NULL(no compensation), diode (Internal auto. Cold junction temperature compensation of the meter),Cu50(external RTD Cu50 compensation).

When it is "diode" compensation the temperature value near terminals at the back of meters can be measured as the cold junction compensation of thermocouple. But because there is the error of measuring parts, heating of meters itself and other heating source near the meter, usually there is an accuracy error by the diode compensation, up to 2-4°C at worst. So it is suggested to use "Cu50" compensation mode if higher measuring accuracy required in your application.

Cu50 compensation method as follows:

Please connect an external box first, then put Cu50 Cu resistance and the thermocouple cold-junction together and keep them far away from kinds of heating sources, whose compensation error is less than 0.5°C. If the external Cu resistance is changed to the more accurate resistance, the compensation by the constant temperature bath can be achieved. E.g please connect 55Ω resistance externally (the relative temperature is 23.4°C in Cu50 index table), please put the cold junction of the thermocouple in the constant temperature bath in 23.4°C to get more accurate compensation, whose compensation' accuracy is higher than Cu resistance compensation mode. Please see the connection of the two methods of the cold-junction compensation as follows:



0	°C	10	m ³ /s	20	g	30	PH	40	KWh	50	m/s
1	F	11	Kg/h	21	kg	31	%	41	ppm	51	m/min
2	t/h	12	Kg/min	22	t	32	Hz	42	mg/m ³	52	m/h
3	t/min	13	Kg/s	23	Pa	33	KHz	43	lel	53	None
4	t/s	14	mV	24	KPa	34	MHz	44	mm/s		
5	L/h	15	V	25	MPa	35	r/s	45	mm/min		
6	L/min	16	KV	26	mm	36	r/min	46	mm/h		
7	L/s	17	mA	27	cm	37	r/h	47	cm/s		
8	m ³ /h	18	A	28	m	38	W	48	cm/min		
9	m ³ /min	19	KA	29	Km	39	KW	49	cm/h		

7. Order Code

TSM160 universal process indicator, 160x80x105mm							Description
TSM160	-X	-X	-X		-X	-X	MPD580 universal process indicator, 160x80x105mm
Channels No.	-06						6 channels input, universal input
	-08						8 channels input, universal input
	-12						12 channels input, universal input
	-16						16 channels input, universal input
Relay output no.							
	-1						1 relay output, common or individual for channels
	-2						2 relay output, common or individual for channels

Relay Output							None,
	- NO						Relay output (NO, 30VDC/0.8A,220VAC/0.8A)
	- NC						Relay output (NC, 30VDC/0.8A,220VAC/0.8A)
Retransmission output							
		-T					4-20mA retransmission output, 2 wire, 1 channel only
Communication output							None
		-C1					photoelectric- isolated RS485 communication output
		-C2					photoelectric- isolated RS232 communication output
		-C3					photoelectric- isolated Ethernet communication output
		-P					photoelectric- isolated RS232 print output
Isolation among input channels					-N		None, not isolated inputs for all channels
					-S		Yes, with isolated inputs for all channels
Power Supply					-N		100-240VAC
					-D		24VDC