

# CE KCM-XJ4W Multi-Loop Controller Instruction Manual

## 1. Features:

The temperature controller has 4 channels of sensors input and 4 channels of temperature controls. 4 kinds of combinations of temperature set value, PID constant, alarm set value, etc.

### 1.1. Input Sensor Types

Thermocouple (temperature input): K, J, T, E, S

Resistance thermometer (temperature input): Pt100, CU50

### 1.2. Control Outputs

a. Relay output: relay contact: 250 V AC, 3 A (Resistive load)

b. SSR output: DC 0/10v voltage output (for driving SSR)

depending on the controller model.

### 1.3. Adjusting PID Constants

Can be easily set the optimum PID constants by performing AT (auto-tuning) with the limit cycle method.

### 1.4. Standard Alarms (OPTIONAL)

Relay contact: 250 V AC, 3 A (Resistive load).

Can be output an alarm when the deviation, process value, set point, or manipulated value reaches a specified value.

### 1.5 Sampling Time: 2 sec

### 1.6. Use this controller within the following allowable range:

Allowable ambient temperature: -0 to +55 °C

Allowable ambient humidity: 5 to 85 % RH.

## 2. Dimensions:

M: 160x80mm panel cutout : 152x76mm (horizontal)

MA: 96x96mm panel cutout : 92x92mm

MD: 72x72mm panel cutout : 68x68mm

MR: 88x107x59mm DIN 35 rail mounting socket

## 3. Parts Description:



**1 ALM:** lamp Lights when Event occurs

### 3 Channel key:

Press 'CH1~4' for 3 seconds to enter into corresponding channel menu.

### 5 Up key:

**2 Output lamp:** Lights when output is turned on

### 4 PV display:

Displays Measured value (PV)

### 6 Down key:

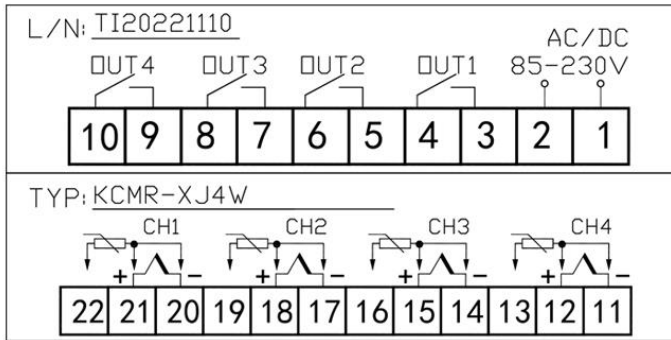
Increase numerals.

**7Shift key:** Shift digits when settings are changed.

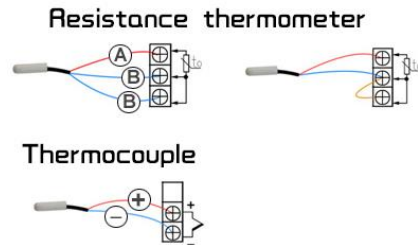
Decrease numerals

**8 Set (SET) key:** Used for parameter calling up and set value registration.

#### 4. Terminal Arrangement:



INPUT TYPE:



OUTPUT:

Relay contact:24-250 V AC/DC, 3 A (Resistive load)

This wiring diagram is offered for example purposes only.

*Tip: Correct terminal arrangement depending on the actual model.*

#### 5. Parameters

Table 5.1

ID	Symbol	Name	Manual	Setting range	Ex-Factory
The public parameters(First level)					
0	<i>LoCK</i>	Set data lock	LOCK=18, Set data unlock LOCK≠18, Set data lock.	0~50	18
1	<i>IS</i>	Input type	Refer to Table 5.2	-	-
2	<i>ALP</i>	Alarm Output Define	0: Alarm function OFF; 1:Process high alarm; 2:Process low alarm; 3: Deviation High alarm ; ... Refer to the next subsection 9. Alarm function	0-6	0
3	<i>LT</i>	PID control cycle time	PID control response time	_____	120
4	<i>dP</i>	Decimal point Selection	0: No decimal point 1: 1 decimal digit	0-1	1
5	<i>PS-H</i>	Lower Limit	Lower Limit of SP and AL set value		0
6	<i>PS-L</i>	High Limit	High Limit of SP and AL set value		9999
7	<i>oP-b</i>	Communication	0:OFF: No communication 1:RS: RS485 MODBUS-RTU	0-1	off
8	<i>Addr</i>	Address	Communication address can be set from 1 to 255	1~255	1
9	<i>bAud</i>	Baud Rate	1200; 2400; 4800; 9600;	-	9600


The Parameters of each channels (Second level)					
eg: SP of the first channel show as $SP_1$ , SP of the second channel show as $SP_2$					
10	$SP$	Setting Values Of channel N, (N=1-4)	Set the temperature set value (SV) which is the target value for control	Determined by P-SL P-SH	100
11	$AL$	Alarm setting	Refer to the next subsection 9. Alarm function		0
12	$Pb$	PV Bias	The value set in the PV bias is added to the actual input value to correct the input value.	$\pm 20.0$	0.0
13	$EP$	Proportional band	Set when PI or PID control is performance. For heating / cooling PID action. <b>When P=0,the controller is ON/OFF control</b>	1~100	100
14	$EI$	Integral time	Eliminates offset occurring in proportional control.	0~3000	500
15	$Ed$	Derivative time	Prevents overshoot and/or undershoot caused by integral action effect.	0~2000S	100S
16	$HY$	Hysteresis Band	Output and alarm Hysteresis Value Refer to the next subsection: 8. OUT Relay contact On/Off mode 9. Alarm function	0.1~50.0	1.0
17	$At$	Auto tuning	1: AT with learning start 0: AT with learning stop	0~1	0
18	$CoL$	Hot/Cold	'0':reverse control(heating) '1':positive control(cooling)	0~1	0

Table 5.2

MODEL	Input type list		
KCM-XJ4W	Cu50( $CU50$ ) -50.0~150.0°C		Pt100( $Pt100$ ) -199.9~600.0°C
	K( $K$ ) -30.0~1300°C	E( $E$ ) -30.0~700.0°C	J( $J$ )-30.0~900.0°C
	T( $T$ ) -199.9~400.0°C	S( $S$ ) -30~1600°C	R( $R$ )-30.0~1700.0°C

## 6. Operation

### 6.1 First level menu setting

Press and hold the  key for 3 seconds to go to the first level menu, the controller will display the parameter symbols (0~9) on the first LED display, and display the parameter value on the second LED display.

### 6.2 Second level menu setting.


Press and hold the CH1/ CH2/ CH3 /CH4 key for 3 seconds to go to one of the channel menu level.

The controller will display the parameter symbols (10~18) on the first LED display, and display the parameter value on the second LED display.

### 6.3 Parameter value setting

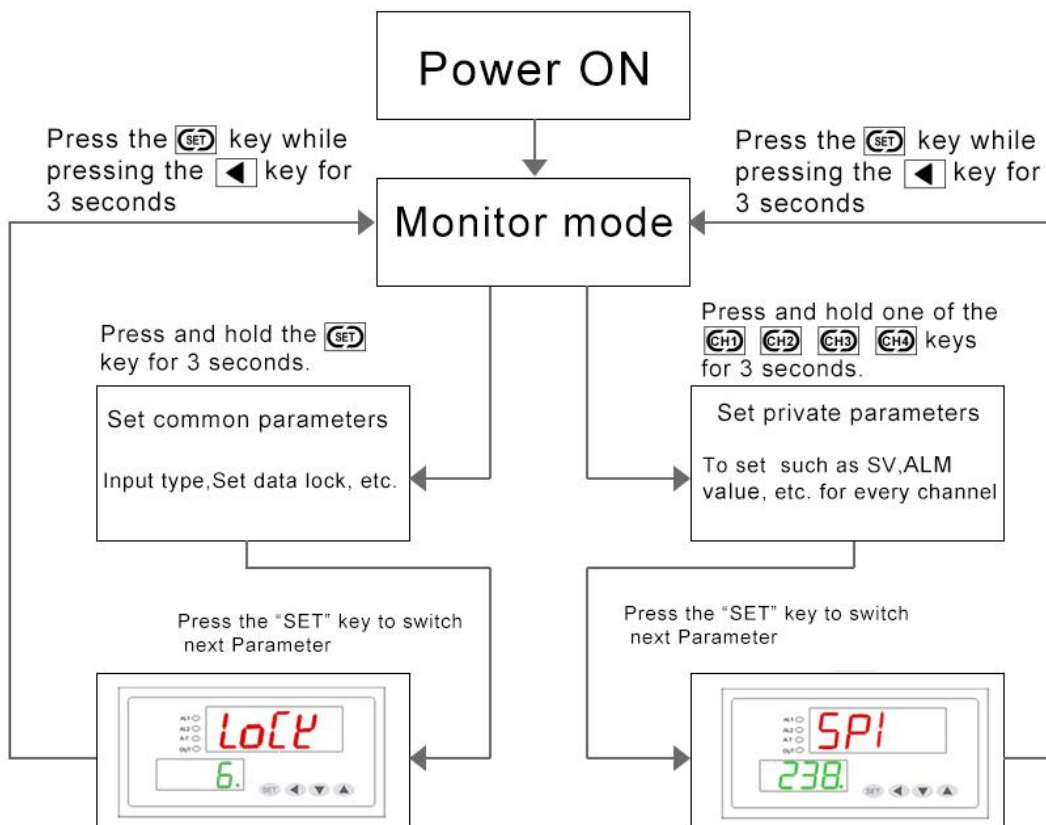
Press ◀ key to go to a different digit.

Parameters value can be changed by pressing the ▼ key or the ▲ key.

Press the  key. The display changes to the next parameter and the new value will be stored.

All the Parameters can be modified when  $LoLk=18$ .

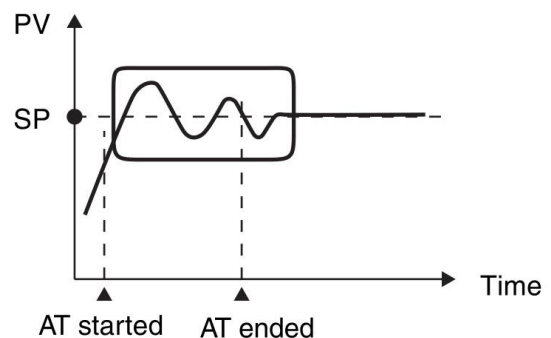
Display returns to the PV monitor if no key operation is performed within 10 seconds, and the set value will be saved.



### 7. Determining PID Constants (Auto-tuning)

When AT is executed, the optimum PID constants for the set point at that time are set automatically. A method (called the limit cycle method) for forcibly changing the manipulated variable and finding the characteristics of the control object is employed.

Set parameter  $HY$  as 0.5, if the output is relay set the  $LT$  as 10, then set the  $RT$  as 1, in this time the controller enter into **Auto-tuning**. PV window will alternately Display "AT" and PV value, control mode is on-off mode, after 3 times vibrating (3 control period) automatic save P, I, D parameter, the self-adjusting procession finished.



**Attentions:**

- The parameters of 16: *HY* ,3: *LT* ,17: *RL* refer to 5.Parameters
- when **Auto-tuning**, the controller should not change the set value.
- When the power off during **Auto-tuning**, it will restart **Auto-tuning** next time.
- When it need artificially exit during **Auto-tuning**, set the Parameter(AT) to 0 so that can exit, but the setting result will not be valid.

**8. OUT Relay contact On/Off mode**

set the parameter of kp(Proportional Band)=1, When kP=0,the controller is ON/OFF control.

OUT function		OUT status[ON]	OUT status[OFF]
positive control	$LP = 0; CoL = 1;$	$PV \geq SP + HY$	$PV \leq SP - HY$
reverse control	$LP = 0; CoL = 0$	$PV \leq SP - HY$	$PV \geq SP + HY$
The parameters of 10: <i>SP</i> ,13: <i>LP</i> ,16: <i>HY</i> ,18: <i>CoL</i> refer to 5.Parameters			

**9. Alarm function[OPTIONAL]**

Take example for channel 1 alarm		
Alarm function	Alarm status[ON]	Alarm status[OFF]
<i>ALP</i> =1	$PV1 \geq ALI$	$PV1 < ALI - HYI$
<i>ALP</i> =2	$PV1 \leq ALI$	$PV1 > ALI + HYI$
<i>ALP</i> =3	$PV1 \geq SPI + ALI$	$PV1 < SPI + ALI - HYI$
<i>ALP</i> =4	$PV1 \leq SPI - ALI$	$PV1 > SPI - ALI + HYI$
<i>ALP</i> =5	Alarm status[ON]	$PV1 \leq SPI - ALI - OR PV1 \geq SPI + ALI$
	Alarm status[OFF]	$SPI - ALI + HYI < PV1 < SPI + ALI - HYI$
<i>ALP</i> =6	Alarm status[ON]	$SPI - ALI \leq PV1 \leq SPI + ALI$
	Alarm status[OFF]	$PV1 < SPI - ALI - HYI - OR PV1 > SPI + ALI + HYI$
The parameters of 10: <i>SPI</i> , 11: <i>ALI</i> , 16: <i>HYI</i> , 2: <i>ALP</i> refer to 5.Parameters		

**10. Host communication based on MODBUS-RTU protocol [OPTIONAL]**

The master controls communication between master and slave. A typical message consists of a request (query message) sent from the master followed by an answer (response message) from the slave. When master begins data transmission, a set of data is sent to the slave in a fixed sequence. When it is received, the slave decodes it, takes the necessary action, and returns data to the master.

10.1 Communication Mode:

Data bit length	Stop bits	Parity bit	Communication time interval
8-bit (Binary)	1,2	NONE	300ms

10.2 Message length of each function (Unit: byte):

Function code (Hexadecimal)	Function	Query message		Response message	
		Min	Max	Min	Max

03H	Read holding registers	8	8	7	7
06H	Preset single register	8	8	8	8

### 10.3 Message format

Slave address	The slave address is a number from 1 to 255 manually set at the front key panel of the controller.
Function code	Refer to <b>2. Message length of each function</b>
Data	The data to execute the function specified by the function code is sent to the slave and corresponding data returned to the master from the slave.
CRC-16	CRC-16: Cyclic Redundancy Check)

### 10.4 Read holding registers [03H]

The query message specifies the starting register address and quantity of registers to be read.

Slave address	Function code	Register address	Quantity	CRC16
	03H		The setting must be 1	

Example: The contents of the holding register 1001H are the read out from slave address 1.  
Query message: 01 03 10 01 00 01 D1 0A  
Response message: 01 03 02 **00 FD** 79 C5  
Explain: 00FD=253,is processed as 25.3

### 10.5 Preset single register [06H]

The query message specifies data to be written into the designated holding register. Only R/W holding registers can be specified. The controller EEPROM had a life span of data written to the EEPROM less than 1000,000 times

Slave address	Function code	Register address	Write data	CRC16

Example: Data is written into the holding register 0004H of slave address 1.  
Query message: 01 06 00 04 FF 38 88 29  
Response message: 01 06 00 04 FF 38 88 29  
When input set value(SV) is -20.0,-20.0 is processed as -200,-200=0000H-00C8H=FF38H

### 10.6 No response

The slave ignores the query message and does not respond when:

- The slave address in the query message does not coincide with any slave address settings.
- The CRC code of the master does not coincide with that of the slave.
- Transmission error such as overrun, framing, parity and etc., is found in the query message.
- Set the Response Timeout >200ms and Delay between polls>200ms.

### 10.7 Register address list:

Symbol	Decimal point	Real Register	Holding Register
Measured value(PV)	YES	1001H~1004H	44098~44101
Manipulated output (MV):	NO	1101H~1104H	44354~4357
Alarm output	NO	1201H~1204H	44610~44613

The first public parameters (Refer to 5. Parameters)

Lock	NO	0000H	40001
TS	NO	0001H	40002
... and so on			
Baud	NO	0009H	40010
The Parameters of channel 1 (Refer to 5. Parameters)			
SP1~ COL1	-	000AH~0012H	40011~40019
The Parameters of channel 2 (Refer to 5. Parameters)			
SP2~ COL2	-	0013H~001BH	40020~40028
The Parameters of channel 3 (Refer to 5. Parameters)			
SP3~ COL3	-	001CH~0024H	40029~40037
The Parameters of channel 4 (Refer to 5. Parameters)			
SP4~ COL4	-	0025H~002DH	40038~40046

Refer to this link for more information on MODBUS-RTU Communication Protocol:

<http://www.kcmeter.com/servicesread.asp?id=4>

Or scan QR code for more information:



## 11. Model and Suffix Code

Specifications	Model and Suffix Code									
Model	KC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SIZE	160×80mm panel cutout :152×76mm	M								
	96×96mm panel cutout :92×92mm	MA								
	72×72mm panel cutout :68×68mm	MD								
	88×107×59mm DIN 35 rail mounting socket	MR								
Number of channel	4 channels	XJ4								
Number alarm	No alarm	<input type="checkbox"/>								
	1 Alarm relay out for each channel	1								
Input Type	Thermocouple: K, E,J, R, S, T,RTD : Pt100, Cu50	W								
Control output	Relay output	<input type="checkbox"/>								
	Voltage pulse(for driving SSR)	G								
Power supply voltage	100 to 240V AC	<input type="checkbox"/>								
	24V DC	1								
Communications	RS-485(2-wire system: MODBUS-RTU)									RS
	RS-232(3-wire system: MODBUS-RTU)									RX

**Character Symbols :** This manual indicates 9-segment display characters as shown below.

A	B	C	D	E	F	G	H	I	J	K	L	M
<i>A</i>	<i>b</i>	<i>[</i>	<i>d</i>	<i>E</i>	<i>F</i>	<i>G</i>	<i>H</i>	<i>I</i>	<i>J</i>	<i>K</i>	<i>L</i>	<i>M</i>
N	O	P	Q	R	S	T	U	Y				
<i>n</i>	<i>o</i>	<i>p</i>	<i>q</i>	<i>r</i>	<i>s</i>	<i>t</i>	<i>u</i>	<i>y</i>				