KCM- 91WRS Temperature Controller Instruction Manual

1. Features:

1.1 Input Sensor Types

Can be connect the following sensors and signals to the universal input.

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

Resistance thermometer (temperature input): Pt100, CU50

Current input (analog input): 4 ~ 20 mA DC, 0 ~ 10 mA DC

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)

c. Current output : 4-20mA or 0-10v

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

-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 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:160×80mm panel cutout :152×76mm(horizontal)

MA:96×96mm panel cutout :92×92mm

MF:96×48mm panel cutout :92×44mm(horizontal)

MG:48mm panel cutout :44×44mm

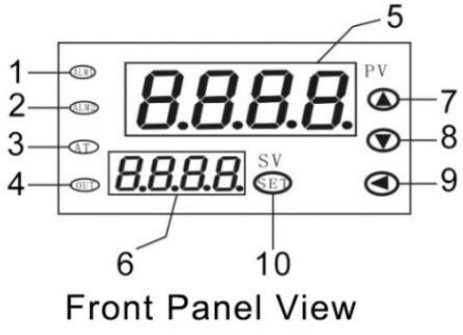
MS:80×160mm panel cutout :76×152mm(vertical)

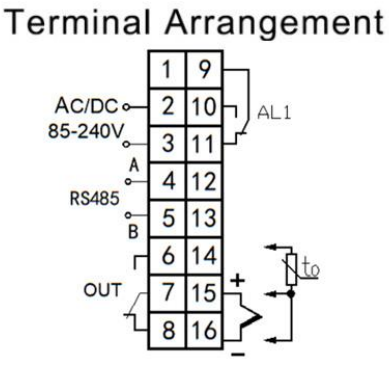
MD: 72×72mm panel cutout :68×68mm

ME:48×96mm panel cutout :44×92mm(vertical)

MR:88×72×59mm DIN 35 rail mounting socket

3. Parts Description:





This wiring diagram is offered for example purposes only.

Tip: Correct terminal arrangement depending on the actual model.

1 ALM1: lamp Lights when Event occurs

2 ALM2 lamp: Lights when Event occurs

3 AT lamp: Flashes during Auto-tuning (AT)

4 Output lamp: Lights when output is turned on

5 PV display: Displays Measured value (PV) or various Parameter symbols

6 SV display: Displays segment level, Set value (SV), Manipulated output value (MV) or various Parameter set

values.

7 Up key:

−Increase numerals.

8 Down key:

−Decrease numerals

− To scroll through numbers faster, press and hold the Up key.

9Shift key: Shift digits when settings are changed.

10 Set (SET) key: Used for Parameter calling up and set value registration.

4. Parameters

Table 4.1

ID	Code	Name	Manual	Setting range	Ex-Factory
0	SP	Setting value	Set the temperature set value (SV) which is the target value for control	Determined by P-SL P-SH	100
1	AL 1	Alarm 1	Refer to ALP for the alarm mode suitable.	Determined by P-SL, P-SH	300
2	AL2	Alarm 2			100
3	Pb	PV Bias	The value set in the PV bias is added to the actual input value to correct the input value.	±20.0	0.0
4	Hp	Proportional Band	Set when PI or PID control is performance. For heating / cooling PID action. **When P=0,the controller is ON/OFF control**	1～9999	100
5	HI	Calculus time	Eliminates offset occurring in proportional control.	0～3000	500
6	Hd	Differential time	Prevents overshoot and/or undershoot caused by integral action effect..	0～2000S	100S
7	Ht	PID control cycle.	Control response time	2～120	20S
8	FC	Digital Filter	This is a 1st-order lay filter by software prepared in order to reduce fluctuations of measured value (PV) by noise.	0～99	20
9	HY	Hysteresis Band	When the control is ON/OFF control（P=0） Relay contact may repeat its turning ON and OFF due to input fluctuation if measured value (PV) is near the alarm set value. the differential gap setting can prevent the relay contact from ON or OFF repetition. Refer to table 4.3	0.1～50.0	0.5
10	dP	Decimal point position selection	Set the position of the decimal point for the measured value to be displayed.	0～3	0
11	outH	Output limiter high	The min value and max value of output current.	outL～200	200
12	outL	Output limiter low		0～outH	0
13	At	Auto tuning	1: Auto tuning (AT) with learning start 0: Auto tuning (AT) with learning stop Turns OFF automatically when the AT with learning function is completed.	0～1	0
14	LocY	Set data lock	LOCK=0, Set value (SV) and Parameter can be set. LOCK=1,Only set value (SV) can be set. LOCK＞1, Set value (SV) and Parameter cannot be set.	0～50	0
15	tS	Input type	Refer to table 4.2	____	Y
16	oP_A	Main output define	0:no output 1:Relay output 2:Voltage output (for driving SSR) 3:Zero-cross output(for driving Triac) 4:PID linear current output(4-20mA /0-10v) depending on the controller model	0～7	READ ONLY
17	oP_b	Communication	No: off	RS	RS

			rS: RS485 BS:		
18	ALP	Alarm output define	0: Alarm function OFF; 1: Process high alarm; 2:Process low alarm; 3:Process high and low alarm Refer to the next subsection 7. Alarm function	0～10	1
19	CooL	Hot/Cold	'0':reverse control(heating) '1':positive control(cooling) Refer to table 4.3	0～1	0
20	P_SH	Range high	Limit of SP and AL set value	P-SL～9999	1300
21	P_SL	Range low		-1999～P-SH	0
22	Addr	Address	Communication address can be set from 0 to 255	0～63	1
23	bAud	Baud Rate	1200; 2400; 4800; 9600;	____	9600
24	HY1	AL1 Hysteresis Value	The Hysteresis Value can prevent the relay contact from ON or OFF repetition. Refer to the next subsection 7. Alarm function	0.1～50.0	0.5
25	HY2	AL2 Hysteresis Value		0.1～50.0	0.5

4.2 Input type list

Table 4.2

MODEL	Input type list		
KCM-91W	Cu50(Cu50) –50.0～150.0℃	Pt100(Pt 1) –199.9～200.0℃	Pt100(Pt2) –199.9～600.0℃
	K(K) -30.0～1300℃	E(E) -30.0～700.0℃	J (J)-30.0～900.0℃
	T(t) -199.9～400.0℃	S(S) -30～1600℃	R(r)-30.0～1700.0℃
	WR25(r25) -30.0 ～2300℃	N(n) -30.0～1200.0℃	
KCM-91A	0～50mV(0_50);	10～50mV(A_50)	0～5V/0～10mA(0_5u)
	1～5V/4～20mA(1_5u)		
	DC input is single-option, depending on the actual mode.		
KCM-91M	Above-mentioned input type：KCM-91W&KCM-91A		

4.3 OUT Relay contact On/Off mode

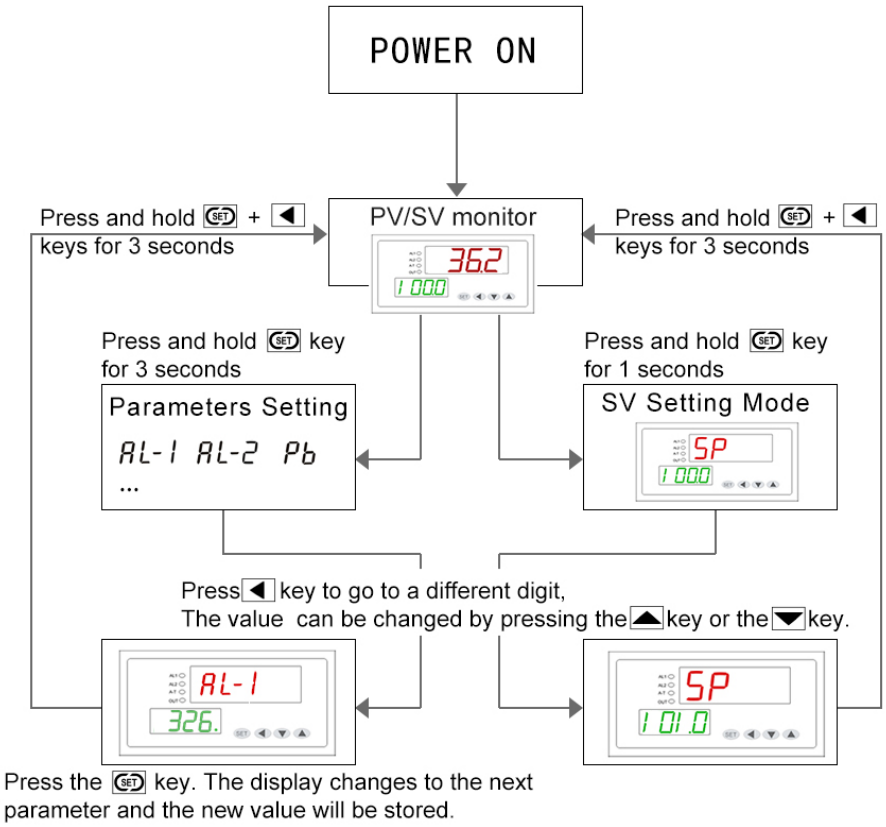
set the parameter of p(Proportional Band)=0, When P=0,the controller is ON/OFF control.

Table 4.3

OUT function	OUT status[ON]	OUT status[OFF]
CooL=1, P =0	PV ≥ SP + HY	PV≤ SP − HY
CooL=0, P =0	PV ≤ SP − HY	PV ≥ SP + HY

The parameters of SP , P , CooL, HY refer to 4. Parameters

5. Operation



5.1 Parameters Setting Level:

Press the SET key for 3 seconds to enter into the Parameters Setting mode, the controller will display the Parameter symbols (1～25) on the first LED display, and display the Parameter value on the second LED display.

Press ◀ key to go to a different digit.

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

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

All the Parameters can be revised when LocU=0; Only the "SP" can be revised when LocU=1.

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

5.2 Setting value Level:

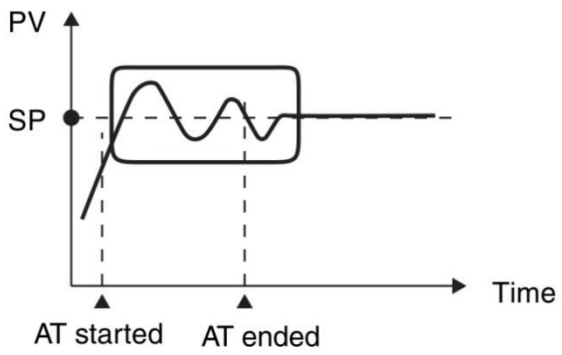
Press the SET key for 1 second to enter into the SV Setting Mode. During the Auto-tuning mode, the Set value (SV) can't be changed.

5.3 Manual Control Operation:

Press the ◀ key about 3S enter into the manual regulation, it will display "H" at the lower LED display, in this time can set the output value; press the ◀ key about 3S again it will exit the manual regulation.

6. 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 the HY is 0.5～1℃, if the output is relay set the t=10S, then set the AT=1, the lamp of AT will be flashed, in this time the controller enter into **Auto-tuning**. now meter's control way is on-off mode, after 3 times vibrating(3 control period) automaticlly save P, I, D parameter, the self-adjusting procession finished.

Operation will be as shown in the following diagram:

Attentions：

-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.

7. Alarm (ALM) function：

Alarm define	Alarm status[ON]	Alarm status[OFF]
ALP =1	PV ≥ AL1	PV ≤ AL1 − HY1
ALP =2	PV ≤ AL1	PV ≥ AL1 + HY1
ALP =3	PV ≥ AL1 (AL1 ON) PV ≤ AL2 (AL2 ON)	PV ≤ AL1 − HY1 (AL1 OFF) PV ≥ AL2 + HY2 (AL2 OFF)
ALP =4	PV ≥ SP + AL1	PV ≤ SP + AL1 − HY1
ALP =5	PV ≤ SP − AL1	PV ≥ SP − AL1 + HY1
ALP =6	PV ≥ SP + AL1 (AL1 ON) PV ≤ SP − AL2 (AL2 ON)	PV ≤ SP + AL1 − HY1 (AL1 OFF) PV ≥ SP − AL2 + HY2 (AL2 OFF)
ALP =7	PV ≥ SP + AL1 OR PV ≤ SP − AL1	SP − AL1 − HY1 ≤ PV ≤ SP + AL1 + HY1
ALP =8	SP − AL1 ≤ PV ≤ SP + AL1	PV ≥ SP + AL1 + HY1 OR PV ≤ SP − AL1 − HY1

8. 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.

8.1 Communication Mode:

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

8.2 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

8.3 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 **7.2. Message length of each function**
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

8.4 Read holding registers [03H]

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

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

8.5 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 0001H(AL-1) of slave address 1. Query message: 01 06 00 02 FF 38 68 28 Response message: 01 06 00 02 FF 38 68 28 When input ALM1 set value is -20.0,-20.0 is processed as -200,-200=0000H-00C8H=FF38H				

8.6 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.

8.7 Register address list:

Symbol	Decimal point	Real Register	Holding Register
Measured value(PV)	YES	1001H	44098
Manipulated output (MV):	NO	1101H	44354
Alarm output	NO	1201H	44610
Controller parameters *(Refer to 3. Parameters)*			
SP	YES	0000H	40001
AL-1	YES	0001H	40002
AL-2	YES	0002H	40003
Pb	NO	0003H	40004
... And so on			
HY-2	YES	0019H	40026

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:

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**
A	b	C	d	E	F	G	H	I	J	K	L	n
N	**O**	**P**	**Q**	**R**	**S**	**t**	**U**	**Y**	**T**			
n	o	P	q	r	S	t	u	y	T			

Model and Suffix Code:

Specifications	Model and Suffix Code							
Model	KC	☐	☐	☐	☐	☐	☐	☐
SIZE	160×80mm panel cutout :152×76mm (horizontal)	M						
	80×160mm panel cutout :152×76mm(vertical)	MS						
	96×96mm panel cutout :92×92mm	MA						
	96×48mm panel cutout :92×44mm(horizontal)	MF						
	48×96mm panel cutout :44×92mm(vertical)	ME						
	72×72mm panel cutout :68×68mm	MD						
	48×48mm panel cutout :44×44mm	MG						
	88×107×59mm DIN 35 rail mounting socket	MR						
Control method	PID control		9					
Alarm output	1 Alarm relay out			1				
	2 Alarm relays out			2				
Input Type	Thermocouple: K, E,J, R, S, T,WR25,N,RTD : Pt100, Cu50				W			
	DC voltage : 0-5V, 1 -5V or Current 0 -10 mA DC, 4-20 mA DC				A			
	Thermocouple, RTD, DC voltage(or Current)				M			
Control output	Relay output					☐		
	Voltage pulse(for driving SSR)					G		
	Analog output (DC current:4-20mA,0-10mA or Voltage 0 to 10 V DC)					A		
Power supply voltage	100 to 240V AC						☐	
	24V DC						1	
Communications	NONE							☐
	RS-485(2-wire system: MODBUS-RTU)							RS
	RS-232(3-wire system: MODBUS-RTU)							RX
	Measured value Transmission output							BS