

MG900 Series BI-MODE output - AR Digital Controller

Instruction Manual

V4.0

Thank you for purchasing (A) MG900 series controller.

This manual mainly explains some necessary attention in installation and wiring. Before operation, please read this manual first to fully understand the operation of this product. Please take this manual with you for reference at any time.

1. Attention



Caution

1. Attention! Electrical hazard!
Do not touch the AC power terminal after the controller is electrified to avoid electric shock.
When implementing controller power wiring, make sure the power is off first!



Warning

1. Please do not use this product in places full of explosive and combustible gases.
2. Before connecting the power supply, please confirm whether the voltage is within the rated range and whether the wiring terminals are correct, or the controller may be seriously damaged after the power supply.
3. The maximum torque of the terminals should not exceed 8KG.
4. It is strictly forbidden to decompose, modify or repair the product.
5. Please do not use in the following circumstances:
 - where the temperature changes dramatically.
 - places where humidity is too high and water is produced.
 - a place where the vibration or impact is very strong Where corrosive gases or dust are present.
 - splash of water, oil and chemicals.
6. Wiring should be kept away from high-voltage, high-current power lines to avoid interference.
7. Please note that the outer shell of the body is eroded by organic solutions, strong acids, strong alkalis.

2. Functions and Performance

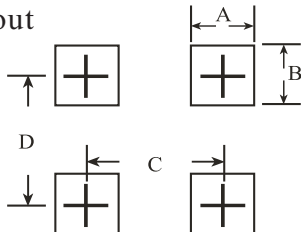
Power and Voltage	AC85-265V,50/60Hz(DC power is optional)	Display Precision	±0.2%FS
Power Consumption	6VA Max	Input	Universal input (T/C、PT100、Analog signal)
Control Mode	PID、PD、PI、P、Fuzzy(OPAD)	Output	Relay, SSR, 4-20mA
Environment temperature	-10~50℃		
Environment Humidity	0~85%RH	Sampling time	150ms

Specification

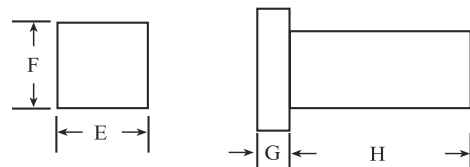
- (1) Signal Input: Thermocouple and thermal resistance can be switched at will (no hardware modification required)
- (2) Adopt the slope value to compensate the temperature
- (3) Add artificial intelligence [OPAD] anti-overshoot coefficient
- (4) The controller can transmit PV, SV and MV in 6 ways to positive or negative side, and it has [KV] a menu of ratio coefficient to form a double output ratio control system
- (5) The controller has parameter running specifications RUN to choose the Work or Stop.
- (6) Output soft start function

3. Panel cutout and Dimension

● Panel cutout

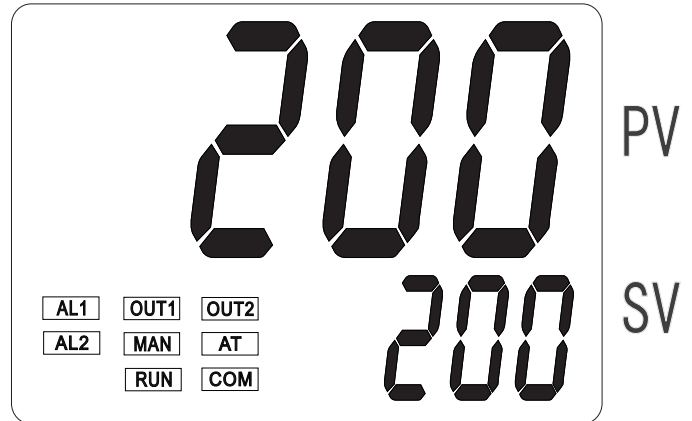
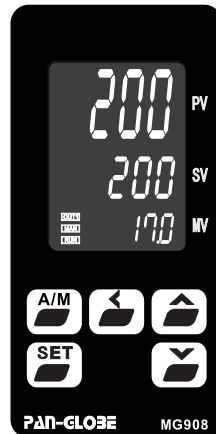


● Dimension



Size Model	A	B	C	D	E	F	G	H
MG904	45+0.6	45+0.6	≥60	≥60	48	48	4.1	71
MG907	68+0.6	68+0.6	≥80	≥80	72	72	4.1	71
MG908	45+0.6	92+0.8	≥60	≥130	48	96	4.1	71
MG909	92+0.8	92+0.8	≥130	≥130	96	96	4.1	71

4. Operation Instruction



MG907/MG904 Window

Symbol	Name	Function
SET	Loop/confirmation key	When changing parameter, confirm parameter
A/M	Auto/Manual	Switch between automatic and manual control
←	Shifting key	Moving set point digit(thousand,hundred, ten ,digit)
▲	Up key	Add SV
▼	Down key	1.Reduce SV 2.For the back button function(in the parameter flow)
PV	PV/Parameter display	1.Display PV 2.Display parameter name when parameter setup 3.Display type of error for error display
SV	SV/Parameter display/	1.Display SV 2.Display parameter settings for parameter setup
MV	Output Value	Output/percentage
COM	COM indiator	Display when communicating connection

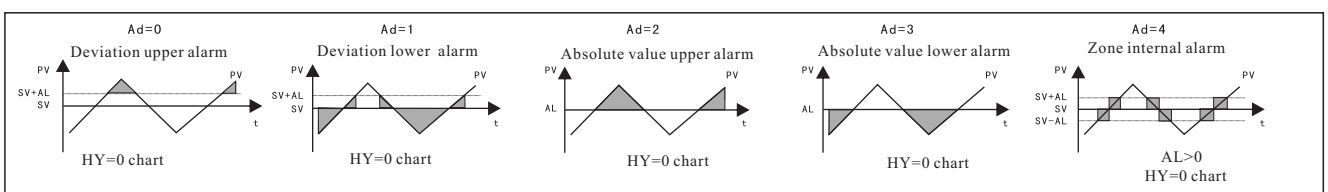
Symbol	Name	Function
↗	Rampup indicator	When lit Rampup light,it indicates that the program to rampup.
→	Soak indicator	When lit Soak light,it indicates that the program to soak
↘	Ramp down indicator	When it ramp down light,it indicates that the program torampdown
AL1	Alarm1 indicator	Alarm1 perform
AL2	Alarm2 indicator	Alarm2 perform
OUT1	Output1 indicator	When lit the Output1,it indicates output1 running
OUT2	Output2 indicator	When lit the Output2,it indicates output2 running
MAN	Manual indicator	When Manual indicator on,it indicates manual controlrunning.
AT	AT indicator	When lit AT indicator ,it indicates Auto-tuning
RUN	Run indicator	When lit Run indicator ,it indicates meter running

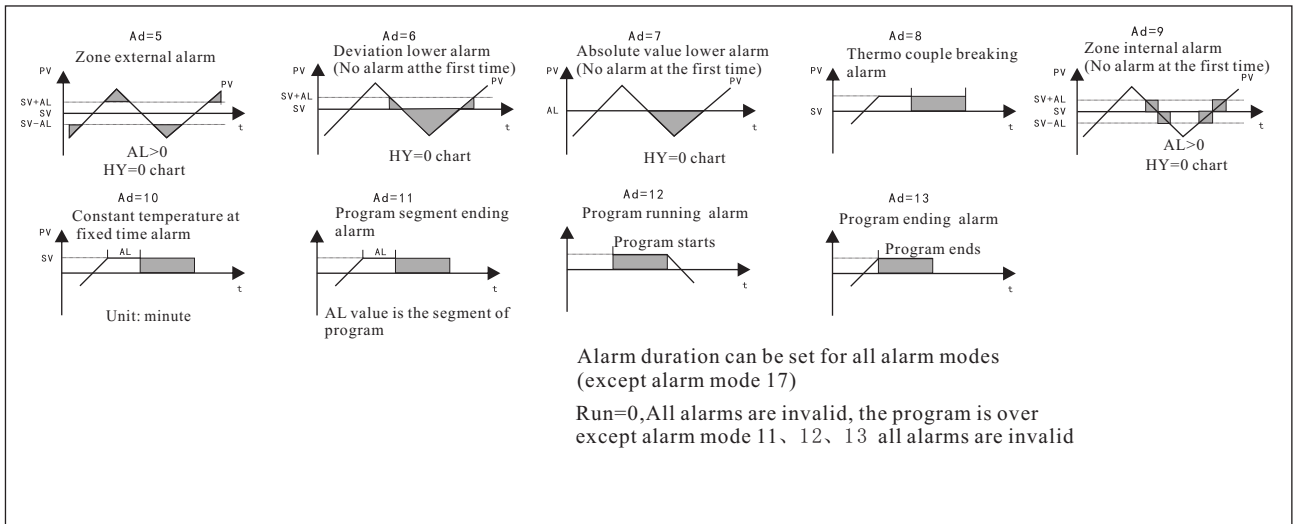
5. Input Type/Alarm Mode

Type	Display code	Measurement Range
K	\mathcal{K}	-270-1370°C/0-2498°F
T	\mathcal{t}	-270-600.0°C/0-1112°F
PT100	\mathcal{Pt}	-199.9-600.0°C/-327.8-1112°F

	AL1、AL2Mode
0	Deviation upper alarm
1	Deviation lower alarm
2	Absolute value upper alarm
3	Absolute value lower alarm
4	Zone internal alarm
5	Zone external alarm
6	Deviation lower alarm(No alarm at the first time)
7	Absolute value lower alarm(No alarm at the first time)
8	Thermo couple breaking alarm
9	Zone internal alarm(No alarm at the first time)
10	Constant temperature at fixed time alarm
11	Program segment ending alarm
12	Program running alarm
13	Program ending alarm

Alarm mode Index



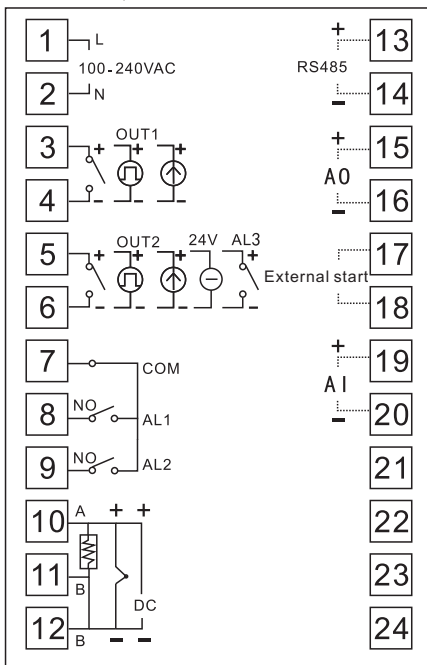


6. Error code index

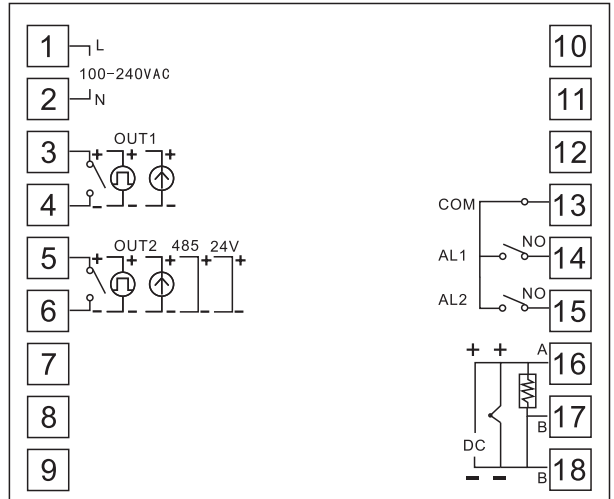
Screen Display	Instructions	Elimination method
uuu!	First set sensor is disconnected, of the polarity is opposite or out of the range. First set input signal is upper than USP	Please check whether the signal input errors Please check if the input is reasonable
nnn!	First set input signal is lower than LSP	Please check if the input range is reasonable
CUCE	Cold junction compensation failure	Please check whether the temperature compensation diode is junction
uuuu	Thermal couple circuit disconnected	Please check if the thermal couple or the compensation conductor is disconnected

7. Connecting (Screws functions are subject to the label on the back of the controller)

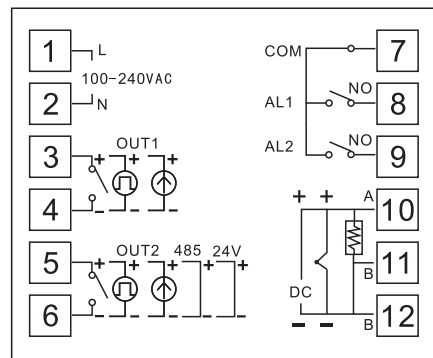
1、MG909与MG908



2、MG907



3、MG904



4、Connecting Instruction



- Power must be off before wiring, or else, electric shock may occur.
- Do not touch terminal or other electric parts after wired, or else, electric shock may occur

- Check carefully and ensure wiring is correct according to the terminal arrangement on the temperature controller.
- For thermal couple input, use correct compensation lead that matches the thermal couple.
- For platinum resistance input, each lead resistance should be less than 5ohm, and three leads should have the same resistance.
- Input signal should not be connected to the heavy current within the same lead or cable.
- Shielded cable (single-point grounding) is effective in resistance static induction noise.
- For power supplies, use a 600V insulated conductor with a cross-sectional area greater than 1mm

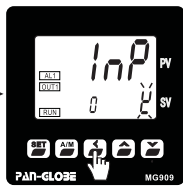
8. Operation Instructions

1. Basic Operation

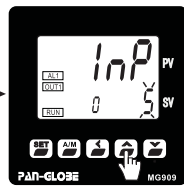
Step1: Measure the types of the input signal



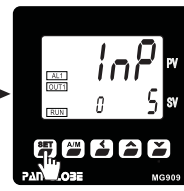
Press **SET** + **←** enter lever2



In the INP option, press **←**, SV monitor will flash



Press **▲** or **▼** to choose the input signal (refer to 5. Input Type table)

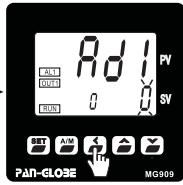


Press **SET** to confirm amend

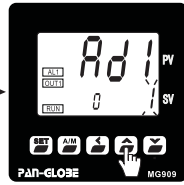
Step2: Alarm mode setting Ad1(Ad2)



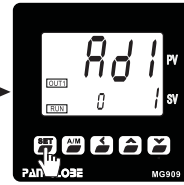
Press **SET** + **←** enter lever2



Under Ad1 option, press **←**, SV monitor will flash



Press **▲** or **▼** to choose the needed mode (refer to 5. Alarm mode table)

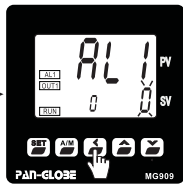


Press **SET** to confirm amend

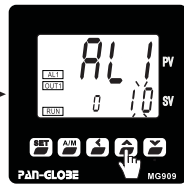
Step3: Alarm value setting Ad1(Ad2)



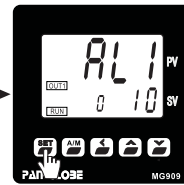
Press **SET** for a few time to AL1



Under Ad1 option, press **←**, SV monitor will flash



Press **▲** or **▼** to choose the needed mode



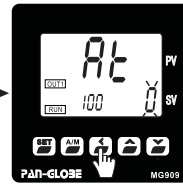
Press **SET** to confirm amend

Notice: In the alarm mode 0,1,4,5,6; AL1 and AL2 value is the SV variation value. In mode 2,3,7, AL1 and AL2 value is the resolution of the temperature alarm value. There is no rules in mode 8. In mode 10, AL1 and AL2 value is time, and the unit is minute. AL1 and AL2 can choose the alarm mode 11, to act as the ending alarm for any group. In mode 12,13, no value is needed to act as the starting or ending alarm.

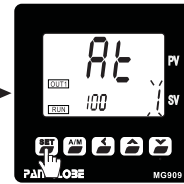
Step4: Auto Tuning



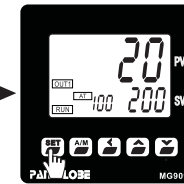
Set up SV value
Press **SET** to AT parameter



Under AT option, press **←**, SV monitor will flash



Set AT is 1, confirm AT ON

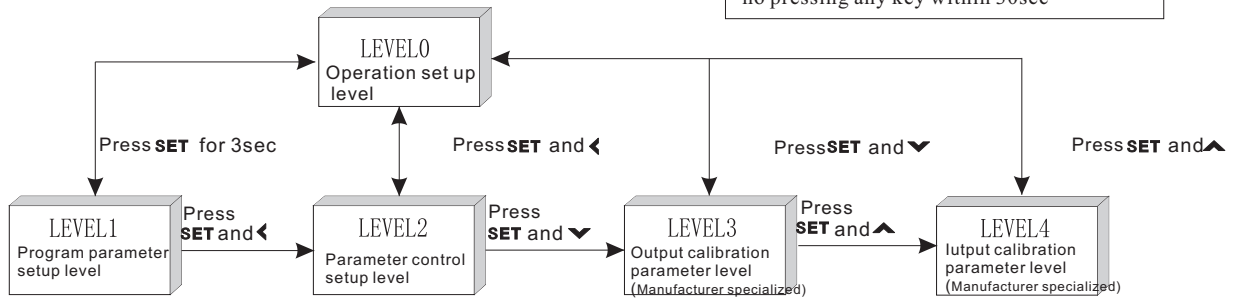


Output for a few time on/off
Wait for AT off (AT light off)

9. Access Parameter Menu

Schematic diagram of each level (how to switch levels)

*Return to level 0(operation setting level if no pressing any key within 30sec



LEVEL0 Operation setup level (general operation level)

power ON

self-diagnosis (all lights turn on)

INP TYPE Input signal type display

5s Lower limit Upper limit Input signal range display

5s PV SV PV/SV value

MV Output percentage monitor Only for MG904、MG907

0:Stop 1:Run (when power off and then power on return to "0", when running set "1") 2:Run (Not return to "0" when power off and then power on, still as "2")

AT Auto Tuning 1:ON 2:None

AL1 Alarm 1 setting LSP-USP

AL2 Alarm 2 setting LSP-USP

GAP refer to Example 1 -50-50

PC Cold controlled proportional band (0.0-50.0) 4.0

CYTC Cold control output cycle(s) 0-60

LEVEL2 Control Program setup level (Engineer operation level)

LCK Data lock LCK=0001, only allow changes SV, RUN LCK=0010, allow level0 process modification

INP K-T set input type please refer to "5. Input Type Table"

LSP 0-400 PV1 lower limit

USP 0-400 PV1 upper limit

DP 0-3 decimal Set

CF 0/1 Temperature unit 0: °C 1: °F

SFT 80 Input filtering constant (0-99)

TM1 LSP-USP

TS1 -200-1000

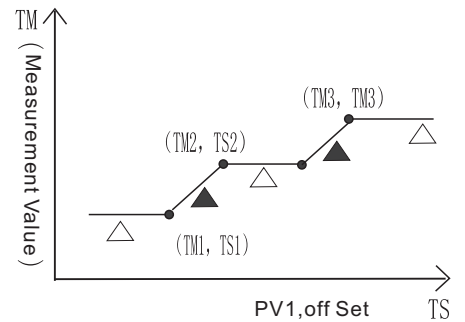
TM2 LSP-USP

TS2 -200-1000

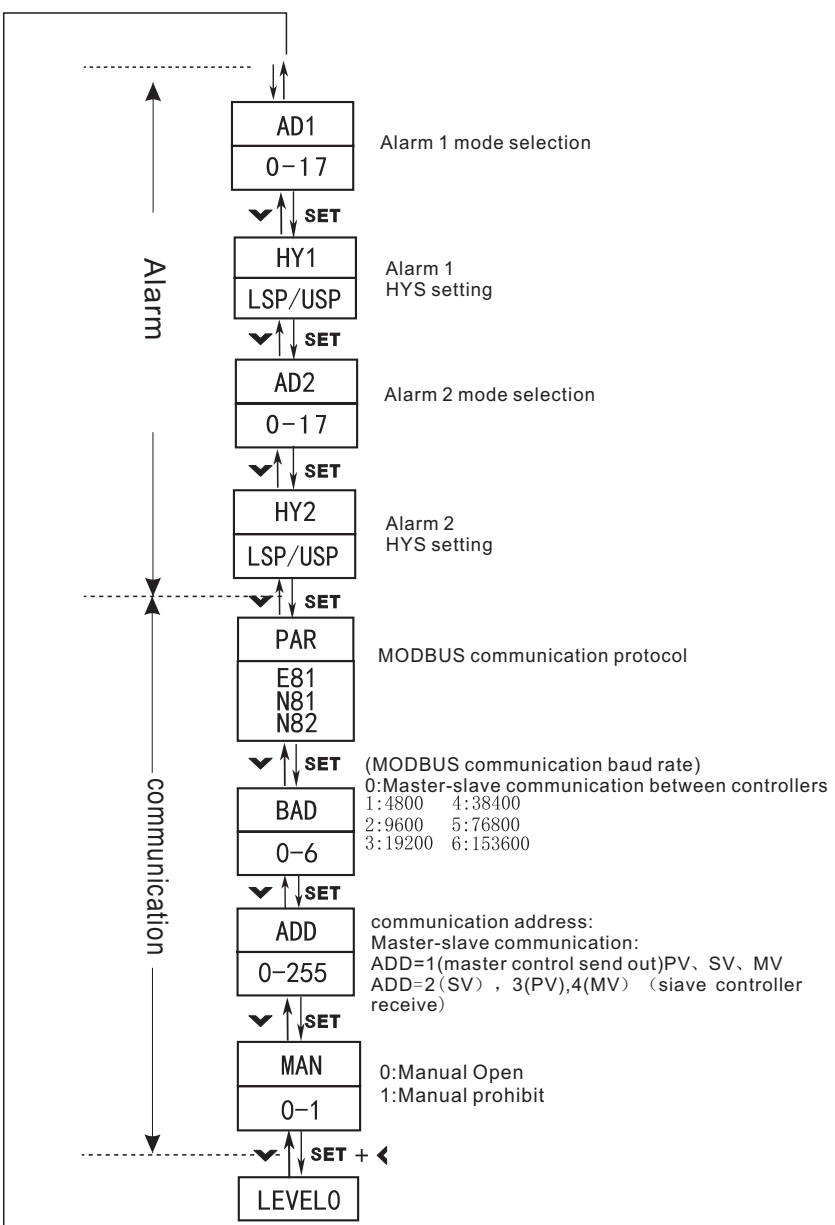
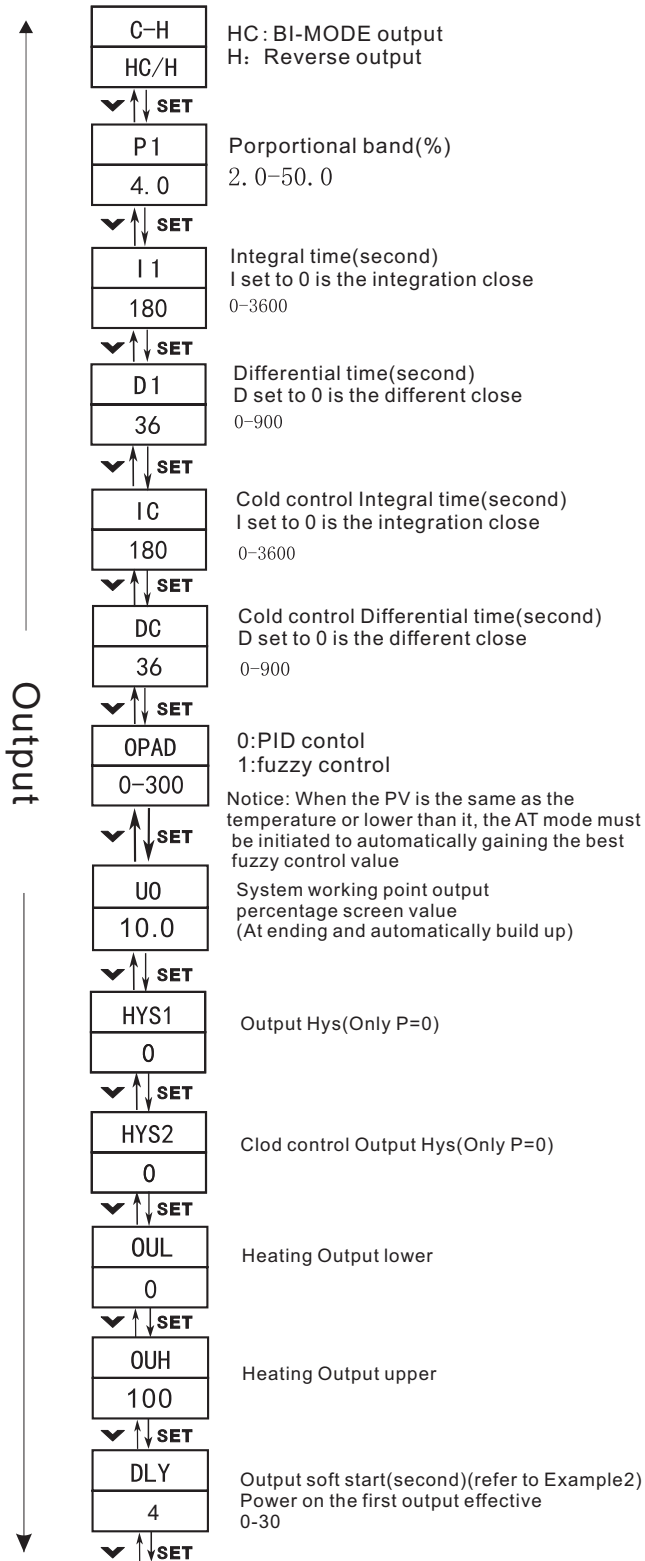
TM3 LSP-USP

TS3 -200-1000

信号输入



Constant Value Consumption Value
 △ 1. TM1=0, TM2=0 TM=3 none compensation
 ▲ 2. When TM1=USP, TS1 is constant consumption (whole measurement range PV1, off Set (refer to Example 3))



10. Application Example Illustration

Example 1, Output gap application

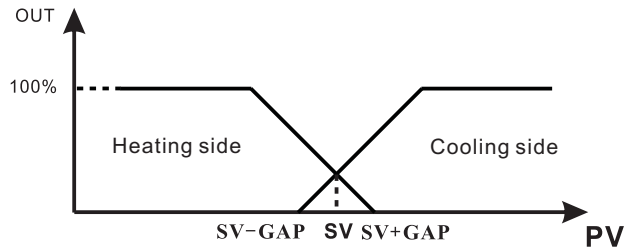
Parameter setting:

MG900 double output controller support double PID control, PID instruction are:

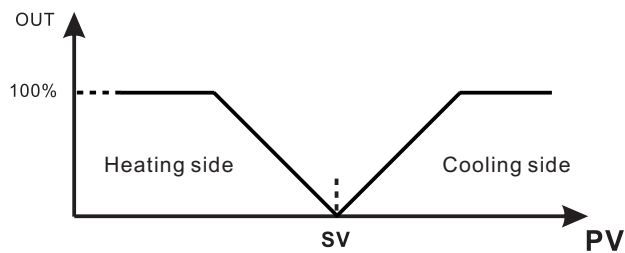
Heating side: proportion bandP1, integral timeI1, differential timeD1, working periodCTY1

Cooling side: proportion bandP2, integral timeI2, differential timeD2, working periodCTY2

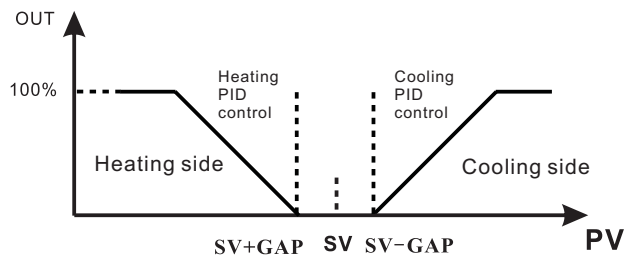
1、GAP>0, working mode



2、GAP=0, working mode



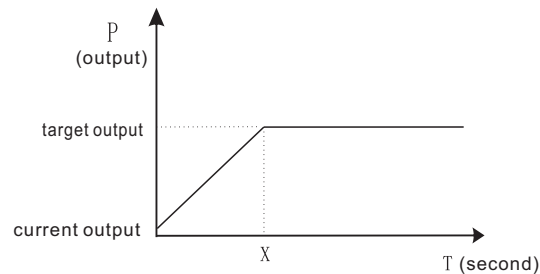
3、GAP<0, working mode



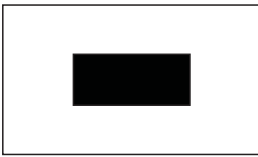
Example 2: Output soft starting

When your system require output soft starting, please go with the following process:

Under LEVEL2, press SET to find **[DLY]**, set output soft starting value X, change SV, The output cache is immediately executed



Example 3: Temperature offset



Blank area: surface temperature
(practical application area)
Black area: T/C measure temperature
(actual heating area)

There is a temperature difference between blank area: surface temperature and T/C measure temperature. Take the customer's equipment as an example, what the customer needs is the actual surface temperature (the actual application area), which is the blank area in the figure above. And T/C can only be placed in the actual heating area, which is the black area in the figure above. And there's some temperature error between them, because T/C can't be measured on the surface, how do you do that?

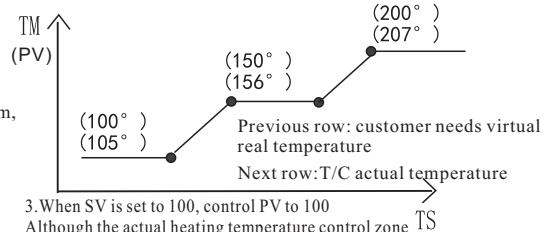
Assuming the customer's required surface temperature is between 100° 150° 200° please resolve

1. First the relation between surface temperature and T/C measure temperature are following:

T/C measure temperature	Surface temperature	Relation
105°	100°	Temperature is 5° higher than the actual
156°	150°	Temperature is 6° higher than the actual
207°	200°	Temperature is 7° higher than the actual

2. Using the PVOS three point complement function, set (TM=100° TS=-5°), (TM2=150° TS=-6°), (TM3=200° TS=-7°),

T/C measure temperature	Surface temperature	Relation
105°	100°	T/C temperature is 5° higher than the actual
156°	150°	T/C temperature is 6° higher than the actual
207°	200°	T/C temperature is 7° higher than the actual



3. When SV is set to 100, control PV to 100
Although the actual heating temperature control zone (T/C measured temperature) is 100+5=105°
However, the PV of 100° is the actual application area (surface temperature), which meets the customer's requirements.
Note: TS is not positive when the above conditions are reversed

11. (AMG)MG900 Series MODUS Communication Protocol

1. Protocol Introduction

- 1.1 Scope of selection: pan-globe M2000 series communication instrument
- 1.2 Work realization: data exchange between instrument and host computer (instrument can only be used as slave to receive interrogation and reply)
- 1.3 Serial transmission mode: RTU
- 1.4 Transmission interface: RS485
- 1.5 Communication medium: shielded twisted pair
- 1.6 Communication stack number: 1~255. The upper limit of the number of connecting meters is related to the load capacity of the host
- 1.7 Function code implementation: read hold register (03), write single register (06), write multiple registers (10)
- 1.8 Data length: 1) when writing data to the machine, a maximum of 16 consecutive menus (32 bytes) can be written at one time.
2) when reading the menu data inside the machine, the non-programmed menu can read 16 consecutive menus at a time (the unrealized address outside the parameter address table is 0), while the programmed menu can only read 16 consecutive menus at a time
- 1.9 Numerical format: signed 16-bit binary complement; The data read is 10.0 times larger; Before writing the data, enlarge the data 10.0 times before sending it; Notice the transition
- 1.10 serial port parameters: 1), baud rate :4800, 9600, 19200, 38400, 76800, 153600 2) start position: 1 3) data bit: 8
4) check bit: E(even check), N(no check) 5) stop bits: 1, 2
- 1.11 Frame check method: cyclic redundancy check (CRC16)
- 1.12 Message format (N=2 here)

Address	Function code	Data	CRC check
8 bits	8 bits	N*8 bits	16 bits

Note:

- 1、 read AM and AM1(cold control manual) menus,0 represents manual state,1 represents automatic state.
- 2、 RAP is the program control menu, read, return 0X0000 represents the program control close, return 0X0001 represents the program control start: write 0X0000 to close the program control, write 0X0001 to start the program control, write 0X0002 to stop the program control, write 0X0002 to end the suspension, continue to run the program control.
- 3、 Before writing the program-controlled menu, please write 0x0000 to RAP to close the program-controlled menu.
- 4、 Before writing MV/MV1 threshold, please first write 0x0000 to AM/AM1 to make the system switch to manual control.
- 5、 When the multiplier is 10, the returned data is magnified 10 times.
- 6、 PV1 and PV2 are read-only parameters.
- 7、 There should be a time interval between write parameter instructions, no matter the same address or not, which may cause instrument failure, and the time interval should be no less than 150 milliseconds.

2. Example

1、 Function code 03(read value SV=100.0)

Request		Reply	
Segment Number	Hexadecimal	Segment Number	Hexadecimal
Machine Number	01	Machine Number	01
Function code	03	Function code	03
Initiate Address Hi	00	Byte Count	02
Initiate Address Lo	04	Register Number Hi	03
Register Number Hi	00	Register Number Lo	E8
Register Number Lo	01	CRC Lo	B8
CRC Lo	C5	CRC Hi	FA
CRC Hi	CB		

2、 Function code 06(write value SV=100.0)

Request		Reply	
Segment Number	Hexadecimal	Segment Number	Hexadecimal
Machine Number	01	Machine Number	01
Function code	06	Function code	06
Initiate Address Hi	00	Initiate Address Hi	00
Initiate Address Lo	04	Initiate Address Lo	04
Register Number Hi	03	Register Number Hi	03
Register Number Lo	E8	Register Number Lo	E8
CRC Lo	C8	CRC Lo	C8
CRC Hi	B5	CRC Hi	B5

3、 Function code 10(write constant SV=100.0)

Request		Reply	
Segment Number	Hexadecimal	Segment Number	Hexadecimal
Machine Number	01	Machine Number	01
Function code	10	Function code	10
Initiate Address Hi	00	Initiate Address Hi	00
Initiate Address Lo	04	Initiate Address Lo	04
Register Number Hi	00	Register Number Hi	00
Register Number Lo	01	Register Number Lo	01
Byte Count	02	CRC Lo	40
Register Number Hi	03	CRC Hi	08
Register Number Lo	E8		
CRC Lo	A7		
CRC Hi	6A		

3. Parameter Address Distribution Table("NC" represent blank address)

Parameter Name	Address		Read write Status	Ratio	Scale (No override)
	Hexadecimal	Decimal			
MV1	00H	0	R/W	10	0~100
NC	01H	1	R/W		
PV1	02H	2	R	10	LSP~USP
SV	04H	4	R/W	10	LSP2~USP2
AM1	05H	5	R/W	1	0~1
RUN	07H	7	R/W	1	0~2
AT	08H	8	R/W	1	0~1
AL1	09H	9	R/W	10	-1999~9999
AL2	0AH	10	R/W	10	-1999~9999
A13	0BH	11	R/W	10	-1999~9999

CAL	OCH	12	R/W	1	0~90
SN	ODH	13	R/W	1	0~90
ST	OEH	14	R/W	1	0~3600
ALT1	11H	17	R/W	1	0~3600
ALT2	12H	18	R/W	1	0~3600
ALT3	13H	19	R/W	1	0~3600
STA	19H	25	R/W	1	0~2
WB	1AH	26	R/W	10	0~3600
NC	1BH	27	R/W		
NC	1CH	28	R/W		
RE	1DH	29	R/W	1	0~250
END	1EH	30	R/W	1	0~1
STB	1FH	31	R/W	1	0~2
C-T	20H	32	R/W	1	0~1
INP	28H	40	R/W	1	0~12
LSP	29H	41	R/W	10	-1999~9999
USP	2AH	42	R/W	10	-1999~9999
SVHL	2BH	43	R/W	10	LSP~USP
DP	2EH	46	R/W	1	0~3
CF	2FH	47	R/W	1	0~1
SFT	30H	48	R/W	10	0~99
TM1	31H	49	R/W	10	LSP~USP
TS1	32H	50	R/W	10	-200~1000
TM2	33H	51	R/W	10	LSP~USP
TS2	34H	52	R/W	10	-200~1000
TM3	35H	53	R/W	10	LSP~USP
TS3	36H	54	R/W	10	-200~1000
P	38H	56	R/W	10	0~3600
I	39H	57	R/W	10	0~3600
D	3AH	58	R/W	10	0~3600
OPAD	3BH	59	R/W	10	0~3600
UO	3CH	60	R/W	10	0~100
OUD	3DH	61	R/W	1	0~1
HYS	3EH	62	R/W	10	0~3600
OUL	3FH	63	R/W	10	0~100
OUH	40H	64	R/W	10	0~100
DLY	41H	65	R/W	1	0~30
AD1	42H	66	R/W	1	0~15
HY1	43H	67	R/W	1	LSP~USP
AD2	44H	68	R/W	1	0~15
HY2	45H	69	R/W	1	LSP~USP
AD3	46H	70	R/W	1	0~15
HY3	47H	71	R/W	1	LSP~USP
MAN	48H	72	R/W	1	0~1
TYP	52H	82	R/W	1	0~2
O-CY	53H	83	R/W	1	0~1
CYT	54H	84	R/W	10	0~3600
TH1	58H	88	R/W	1	0~8
KV	59H	89	R/W	10	0~3600
TRL	5AH	90	R/W	10	LSP~USP
TRH	5BH	91	R/W	10	LSP~USP
TOSV	61H	97	R/W	1	0~3
RAP(程序启动)	66H	102	R/W	1	0~2
SAL1	67H	103	R	1	Alarm1 Status
SAL2	68H	104	R	1	Alarm2 Status
SAL3	69H	105	R	1	Alarm3 Status

Program menu address: $CX=(X-1)*4+200$, X is segment number: C60, X=60, Input Range LSP~USP;

$TX=(X-1)*4+201$, Input Range (0~3600)

$OUX=(X-1)*4+202$, Input Range (0~100)

The override of CX is 10, the override of TX, OUX is 1

INP(INP2)Input reference Table

B	S	R	T	E	J	K	N	W1	W2	PT	CU	LN
0	1	2	3	4	5	6	7	8	9	10	11	12