

XMT62X series Intelligent PID regulator



XMT62X instrument is a combination of a number of new technologies developed by the automatic adjustment of a new generation of intelligent instruments, instruments using advanced microcomputer chips and technology, only through the button panel can be set so that all types of instrumentation and sensors, transmitters, etc. Supporting the use of. The regulator to adopt a long-term maturity and optimize the use of intelligent PID control algorithm, for the majority of the control object to have a stronger ability to adapt, the new fault control strategy will further enhance the security of control systems, Can be widely used in petrochemical, heat exchange, heating, water supply, metallurgy, food industry, such as temperature, pressure, liquid level, flow and other process parameters to measure, display, precise control, this instrument has a transmission output and communication functions, can make it easier with a computer or PLC networking, remote control.

Chapter one The summary

一、Main features

- ☞ There are 19 kinds of input type (RTD、TC and analog) which can be arbitrary set.
- ☞ Accurate zero adjustment, 0 ~ 60 °C in the range of automatic thermocouple cold junction compensation (error ± 2 °C).
- ☞ WATCHDOG circuit used, software traps and redundancy, power-down protection, such as digital filtering technology, so that the overall instrument greatly improved anti-interference ability.
- ☞ The use of intelligent control theory and the traditional PID control method combining with high-precision auto-tuning function, so that process control and fast response, small overshoot, steady-state high precision, it is difficult for the conventional PID control of the large time delay has obvious target control.
- ☞ Dular design of the output interface, convenient and flexible function deployment.
- ☞ Add a variety of fault control strategy, making the process more secure control.
- ☞ Inhibiting power alarm relay functions, can eli-

minate the power-meter relay in the disturbance.

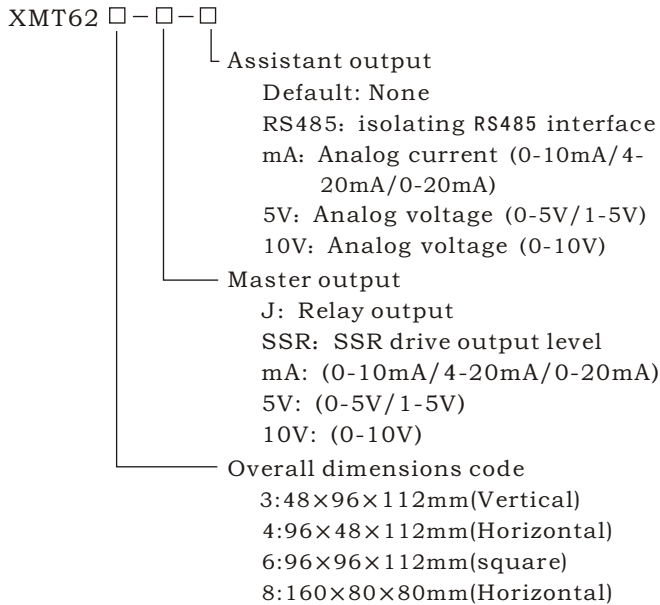
- ☞ With automatic transfer switch manually Bumpless.
- ☞ PID power with ease-start.

二、Specification

1. Power supply: AC/DC85~260V
2. Environment: 0~60°C; 85%RH
3. Accuracy: 0.2%FS \pm 1d
4. Display method: Double over the four LED digital display
5. Sample rate: 5 times/s
6. Display cycle: 0.6s
7. Feed output: DC24V/30mA
8. Master output: (1) Relay contact output
(2) SSR output
(3) Analog output: 4~20mA、0~10mA、0~20mA/1~5V、0~5V、0~10V
9. Output capacity: (1)SSR accuracy: AC 220V/3A、DC 24V/5A(Resistive load)
(2) SSR trigger signals: 12 \pm 3V;30mA
(3) Rs485 Communication
10. Communication output: Photoelectric Isolation Interface for master-slave asynchronous serial RS-485 communication interface, baud rate 1200~9600bps
11. XMT62X series models and outline a list of instruments

Symbol	DIN Size(inch)		Dimension (mm)	Panel cutout dimension(mm)
	Top	Bottom		
XMT623	0.36	0.36	48×96×112	44 ⁺¹ ×92 ⁺¹
XMT624	0.56	0.36	96×48×112	92 ⁺¹ ×44 ⁺¹
XMT626	0.80	0.56	96×96×112	92 ⁺¹ ×92 ⁺¹
XMT628	0.80	0.39	160×80×80	152 ⁺¹ ×76 ⁺¹

三、 Model description



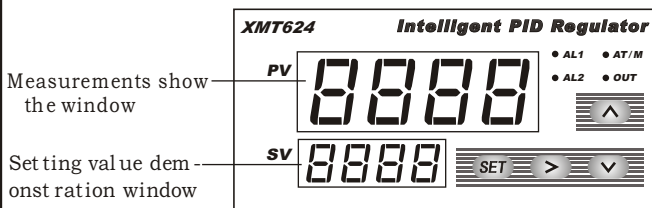
Note: The master control output is SSR or the relay output when only then the coca elects to change delivers the function.

Chapter two The operation explained

一、 Panel Description

1. Panel

Take XMT624 for example(XMT62X series of instruments with different specifications is the same setup).



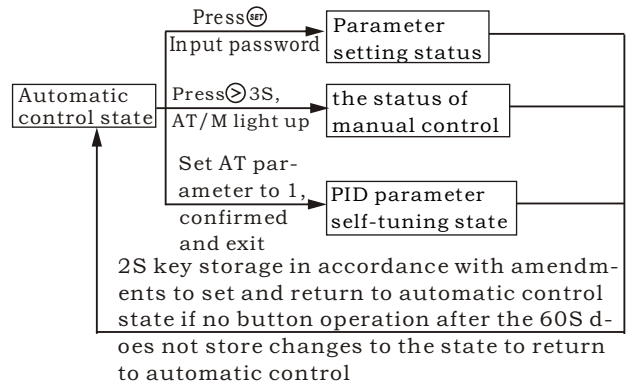
- AL1:Relay J1 output lamp
- AL2:Relay J2 output lamp
- AT/M:Self-tuning indicator/hand control indicator
- Out:Control output indicator
- Ⓢ Set key:Used for parameter registration/calling up
- Ⓣ Digital election key /Manual cut key
- Ⓤ Down key:Used for selecting previous parameter and used to increase numerals
- Ⓦ Up key:Used for selecting next parameter or increase numerals

2.condition explanation

The XMT62X series instrument has four kinds of active statuses

- (1) Parameter setting status
- (2) automatic control state
- (3) manual control state
- (4) PID parameter self-tuning state

3.Between various conditions cut



Note:

1) In automatic control mode, if press Ⓣ key once, to see the percentage of automatic control output, the left row of instruments for the prompt the first "o", after the three shows the percentage of control output, and then Ⓣ key once to return to automatic control status of instrumentation.

2) In automatic control mode, if press Ⓣ key 3S the instrument enter manual control state, then the first left SV window does not show the "o", at the same time AT / M lamp light up always, this time may through Ⓦ key and Ⓠ key to come the manual regulation measuring appliance the output size. And press Ⓣ key to confirm revises, press Ⓢ key measuring appliance to return to the automatic control condition.

4.Display window description

PV window: Automatic input signal when the display of real-time measurements show that the current state set parameter prompt.

SV window: When hypothesis condition the demonstration next parameter prompt symbol, after the election decides the parameter, demonstrated is designated the parameter the setting value. When automatic control condition demonstrates the goal setting value. (Press Ⓣ key, display control output percentage)

When hand control condition demonstrates the output percentage

When self-tuning display settings target

5.Pressed key explanation

The following table gives the key in the dashboard when the function of different

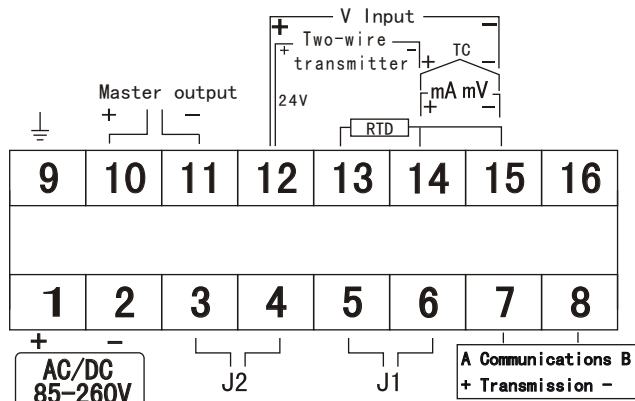
State Button	automatic control state	Parameter setting state	manual control state	PID parameter self-tuning state
Ⓢ	Cut to parameter setting states	Selected parameters, confirmed that changes to long to switch to automatic control by the state of 3S	Automatically switch to the state	Switch to the automatic control state
Ⓣ	The demonstration output percentage, cuts the manual condition a-	Select settings-bit	Confirms the manual output percentage	
Ⓦ	Increase the set value	Add set-bit values	Increase the percentage of output	
Ⓠ	Decrease the set value	Reduce the set-bit values	Reduce the percentage of output	

6.Indicator Description

State Indicator	Relay J1 alarm	Relay J2 alarm	Manual state	Self-tuning state	Control output
AL1	Light up				
AL2		Light up			
AT/M			Light up	Flashing	
OUT					Light up

二、Terminal Wiring

All XMT62X the wiring are the same. (Wiring to instrument, whichever is the wiring diagram attached)



Master output:	Assistant Output:
1. SSR	1. Analog (0-10mA /4-20mA/0-20mA)
2. Relay	2. Analog (0-5V/1-5V)
3. Analog (0-10mA /4-20mA/0-20mA)	3. Analog (0-10V)
4. Analog (0-5V/1-5V)	4. RS485 interface
5. Analog (0-10V)	

Wiring Note:

1) The instrument in the use of DC power supply is negative, regardless of when, instrument can automatically adapt to

2) When the instrument in a strong interference with other equipment occasions or when you work together ,please connected the earth wire to the ground

3) TC input Which should be used the same degree of compensation for its wire

4) Enter the RTD should be the use of low resistance (less than 5 ohms) and the three non-wire

5)The input signal lines in order to avoid the effects of noise interference, please try to stay away from instrument power supply, power supply and other wiring.

6) If there is noise interference noise filter can be installed and grounded, and reduce the noise filter output and the instrument power wiring from the terminal.

7) When the meter access voltage (V) signals, then the two terminals 12,15, then adjust instrument should be a short circuit within the block, as follows:



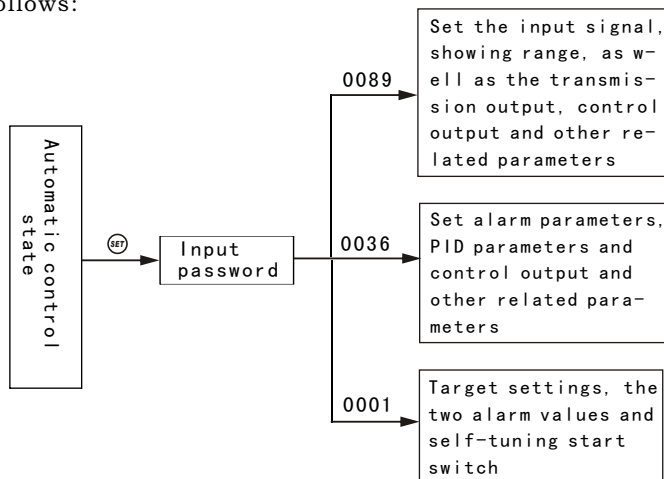
Instrument power supply to the transmitter



Instrument voltage (V) input

Chapter Three Instrument settings

Instrument factory XMT62X series has set some parameters, but some parameters of the actual situation requires the user to set or modify, XMT62X series of instrument parameters is divided into functional parameters, operating parameters, control parameters of the three groups, three sets of parameters from three 0089,0036,0001 latch passwords, the user can enter a different password to enter the parameters of the corresponding group, as follows:

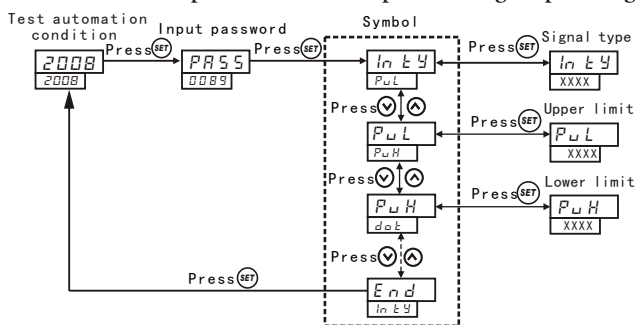


一、Function parameter setting guide

1. Detail of function parameter (Password is "0089")

Symbol	Definication	Address	Range	EX-factory value	
PR55	PASS	Input password	0089	0000	
In t Y	In ty type	2000H	See note 3	Pt100	
PwL	PvL	Range lower limit	2001H	-1999~9999	0.0
PwH	PvH	Range Upper limit	2002H	-1999~9999	100.0
dot	dot	Decimal point position	2003H	0-bit, 1 10, 2 100, 3 1000	1
rd	rd	Fore/Back role	2004H	1:Fore role;0: Back role	0
ob t Y	ob ty	Analog output type	2005H	0-10 4-20 0-20 mA	0-20
obL	obL	output lower limit	2006H	-1999~9999	0
obH	obH	Output Upper limit	2007H	-1999 ~9999	100.0
oAt y	oAt y	PID output mode	2008H	0 ~10mA 4 ~20mA 0 ~20mA 3 ~100 for the proportion of cycle time(s)	3
EL	EL	Wurzeln	2009H	ON=Square;OFF=None	OFF
SS	SS	The small signal excises	200AH	0 ~100%	0
rES	rES	On electricity slow start	200BH	0 ~120S	0
Id	Id	Mailing address	200CH	1 ~64	5
bAud	bAud	Baud Rate	200DH	1200 2400 4800 9600	9600
End	End				

2. Functional parameters of the process of group settings



3. The function parameter explains

(1) Inty:Input type

Input signal code table

Symbol	Sensor type	Range	Resolution
t	T TC	0~400°C	1°C
r	r TC	0~1600°C	1°C
J	J TC	0~1200°C	1°C
W r E	WRe3-WRe25 TC	0~2300°C	1°C
b	B TC	350~1800°C	1°C
S	S TC	0~1600°C	1°C
K	K TC	0~1300°C	1°C
E	E TC	0~900°C	1°C
P 100	PT100TC	200.0~600.0°C	1°C
C u 50	Cu50 TC	-50.0~150.0°C	1°C
r 375	0~375Ω	In the scope of -1999~9999 arbitrary set	Relate with range of upper limit, lower limit and decimal point
0-75	0~75mV		
0-30	0~30mV		
0-5	0~5V		
1-5	1~5V		
10u	0~10V		
0-10	0~10mA		
0-20	0~20mA		
4-20	4~20mA		

(2) PvH/PvL:On the RTD,TC can not be set up, instrument in accordance with the standard value of the sub-display.

PvH:Input signal to the maximum value when the corresponding display value;PvL:Input signal to zero when the corresponding display value.

(3) rd:It is used for choosing PID control role.When it is Back action (rd=0),with the increase in the measured value, the output was gradually decreased, mainly used for heating in this way, pressure and so on.When Fore role (rd=1), with the measured value decreases, the measured value and set value of the deviation between the smaller, gradual increase in output, in this way mainly for refrigeration, and so on decompression.

(4) ObH: obh is the display value when transmission output 20mA;obL: obl is the display value when transmission output 0mA or 4mA.

Users who need the output voltage signal can be customized from the factory or on their own in the two output terminals and the access resistance of 250Ω or 500Ω to obtain 1 ~ 5V,0 ~ 5V or 0 ~ 10V voltage output.

(Note: And then a direct impact on the accuracy of resistance transmission output voltage accuracy.) OAty option at this time 4 ~ 20mA,0 ~ 10mA and 0 ~ 20mA will correspond to 0 ~ 5V or 1 ~ 5V, 0 ~ 10V voltage output.

(5) oAty:PID Control output 4 ~ 20mA, 0 ~ 10mA and 0 ~ 20mA current output signal of the three.Select the type of when the output value between 3-100, the instrument for the time proportional control output, said in a control dashboard control output cycle time share,Users who need the output voltage signal can be customized from the factory or on their own in the two output terminals and the access resistance of 250Ω or 500Ω to obtain 1 ~ 5V,

0 ~ 5V or 0 ~ 10V voltage output.OAty option at this time 4 ~ 20mA,0 ~ 10mA and 0 ~ 20mA will correspond to 0 ~ 5V or 1 ~ 5V, 0 ~ 10V voltage output.

(6) EL: When the input differential signal measurement instrument flow, if the differential pressure signal transmitter done on prescription, it is this parameter to be set to On. If the differential input signal is not a measurement of the flow, this parameter must be set to OFF.

(7) rES:In some control system does not allow the system at boot time to the maximum output of PID control, but the actual instrument of power by the PID output operations may be after the maximum, so this parameter by setting the PID output to the maximum delay time, such as: When rES set 80S, said that after the power meter computing come PID output at 100% full power output, the instrument will go through 80S output to reach 100%, so that after the system reached by the 80S full power of work.

(8) SS:When the flow signal input need for prescribing, If resection of the small signal parameters can be removed SS.For example: the instrument for the input signal 4-20mA, SS is set to 3, that the $[4 + (20-4) X 3\%] = 4.48\text{mA}$, that is, when the input signal in the time between 4 to 4.48mA, instruments by processing the input signal is 4mA.

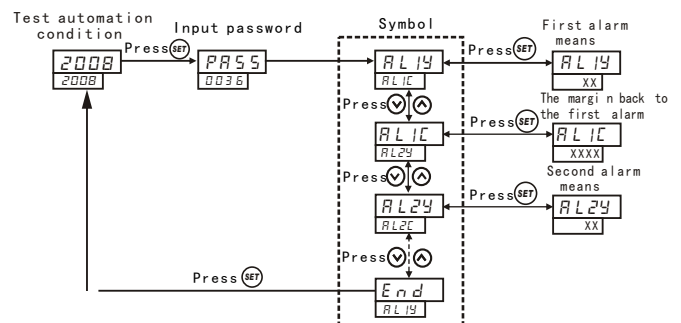
(9) bAud: This parameter is used to select the communication baud rate between instrument and the PC .

二、 Working Group set up parameters

1.Parameter table (Parameter is "0036")

Symbol	Definication	Address	Range	EX-factory value
PR55	Pass Input password		0036	
AL14	AL14 First alarm means	1000H	00~06 11~16	01
AL1C	AL1C The margin back to the first alarm	1001H	0~9999	00
AL24	AL24 Second alarm means	1002H	00~06 11~16	02
AL2C	AL2C The margin back to the second alarm	1003H	0~9999	00
P	P Proportional band	1004H	0.1~300.0	20.0
I	I integral time	1005H	0~2000	100
d	d derivative time	1006H	0~999	0
Ct	Ct PID calculation cycle	1007H	0~100S	1
SF	SF Integral range	1008H	0~999	50
Pd	Pd Limiting differential	1009H	0.1~0.9%	0.5
bb	bb PID working range	100AH	0~9999	1000
ouL	ouL Lower limit of control output	100BH	0~100.0%	0.0
ouH	ouH Upper limit of control output	100CH	0~100.0%	100.0
nou	nou Abnormal output value	100DH	0~100%	0
Psb	Psb Against the value of error correction	100EH	-1999~9999	0.0
FILt	FILt Filter coefficients	100FH	0~3	2
End	End			

2.Functional parameters of the process of group settings



3.Detail of operating parameters group

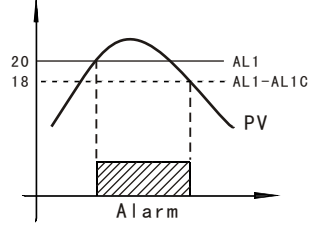
(1) AL1y/AL2y: There are six kinds of alarm ways. when it is set to 00, Cancel alarm

01, 11: The more the upper limit alarm

Alarming when $PV \geq AL1$

Remove alarm when $PV < (AL1 - AL1C)$

(SV=100, AL1=20, AL1C=2)



01: Cross upper limit and has not inhibited

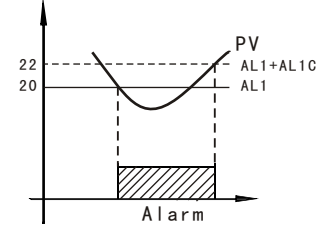
11: Cross upper limit and has inhibited

02, 12: The more the lower limit alarm

Alarming when $PV \leq AL1$

Remove alarm when $PV > (AL1 + AL1C)$

(SV=100, AL1=20, AL1C=2)



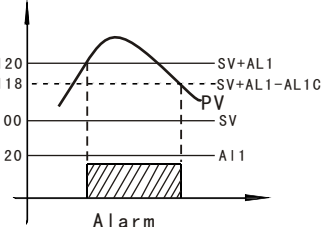
02: Cross lower limit and has not inhibited

12: Cross lower limit and has inhibited

03, 13: Deviation alarm

Alarming when $PV - SV \geq (AL1)$

(SV=100, AL1=20, AL1C=2)



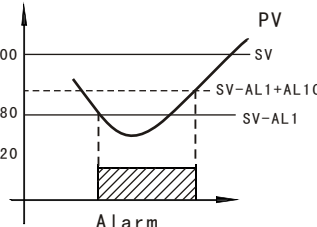
03: Deviation alarm and has not inhibited

13: Deviation alarm and has inhibited

04, 14: Negative deviation alarm

Remove alarming $PV \leq (SV - AL1)$

(SV=100, AL1=20, AL1C=2)



04: Negative deviation alarm and has not inhibited

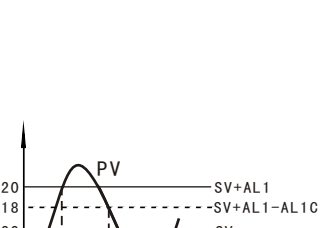
14: Negative deviation alarm and has inhibited

05, 15: Relative alarm

Alarming when $|PV - SV| \geq (AL1)$

Remove alarm when $|PV - SV| < (AL1 - AL1C)$

(SV=100, AL1=20, AL1C=2)



05: Relative alarm without inhibit

15: Suppress relative alarm

(AI>0)

06, 16: Alarm in the scope of Deviation

SV=100, AL1=20, AL1C=2

Increase in PV value range

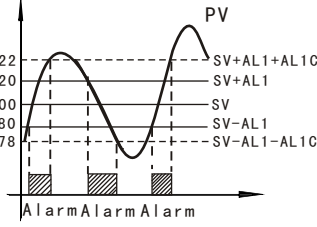
$80 \leq PV < 122$ when the alarm,

$PV \geq 122$ without alarm;

Decrease in PV value range

$120 > PV \geq 78$ when the alarm,

$PV < 78$ without alarm



06: The scope of the alarm without inhibition

16: Inhibit the scope of the alarm (AI>0)

(2) Detail of PID parameter

P: P is the relationship between the ratio of bias and output control variable, Set the value of the greater control of low sensitivity; smaller settings, the higher sensitivity.

I: The purpose of computing points is to eliminate static error, as long as the deviation of the existence of the role will be integral to control the volume so that the

direction of deviation of the elimination of moving points is that the integral strength of the unit, instrument set for the shorter integration time, the role of instrumentation points stronger.

D: proportional action and Integral role are to control the outcome of the amendment in response to slow movements, differential role is to eliminate the deficiencies and to add, have a differential effect based on the rate of deviation of the output of an amendment to control the process of control as soon as possible to the original state is that the differential differential intensity units, the differential instrument settings the longer the role of that instrument to control the amount of differential the stronger of the amendment.

Ct: Instrument completed by a control cycle time, Control cycle, the shorter the control of the instrument more carefully refined.

SF: The role of SF is the introduction of the separation points, suppressor overshoot, SF decreased, inhibited the overshoot in response to slow, steady-state error may occur.

Pd: Mutation to reduce the measured value of output interference. When the $Pd = 0.9$, the strongest effect; when $Pd = 0.1$, the role of the weakest.

bb: $SV \pm bb$ in the framework of instruments for the PID control output, which is outside the two position output control; bb bigger, PID greater scope of work, the more precise control, but more frequent interference system will respond to slower; bb smaller, the two smaller-type control, the system the quicker the response to disturbance, However, smaller interference, and require more sophisticated control system, is not quite appropriate, so bb different systems need to be to meet the needs of different systems to control the speed and control accuracy requirements.

(3) outL/outH: Lower limit, upper limit of control output

(4) nout: When abnormal input instrument, the instrument can be as a percentage of output, the user should set the value to the system to normal, stable, secure work output percentage.

(5) FilT: The instrument approach using first-order filtering, 0 to give up the digital filter function, 1 weak, 2 slightly, 3 the most, setting the value of the greater, indicating more stable, but the dashboard display lag.

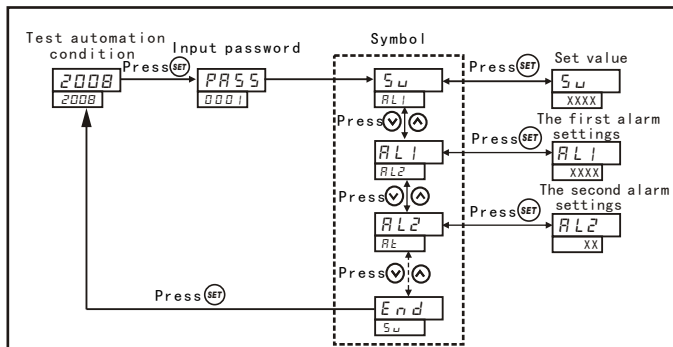
三、 Settings of control parameter

1. Detail of control parameter (password is "0001")

Symbol	Description	Address	Range	EX-factory value	
Pass	Pass	Input password	0001	0000	
SV	SV	Set value	0000H	-1999~9999	250.0
AL1	AL1	The first alarm settings	0001H	-1999~9999	500.0
AL2	AL2	The second alarm settings	0002H	-1999~9999	100.0
At	At	Self-tuning start switch	0003H	0~1	0
End	End				

2. Parameter definition

AT: AT is set to 0, after setting this group of parameters, instrument status to automatic measurement, AT is set to 1, setting the state of instruments carried over.



ay of manual control to automatic control mode before, by manually adjusting the output of the measuring instrument makes the percentage of value of goal setting value, and then manually controlled by the instrument to automatically

三、PID Self-tuning

PID control, setting P, I, D parameters will have a direct impact on the effect of PID control, which has a number of parameters and control system is closely related to itself, it is difficult to give an application of any system of fixed value, in order to reduce the number of parameters users set this difficulty, XMT62X instrument optimized use of digital self-tuning algorithm. through the self-tuning operations can be instruments for a set of control parameters of the system, after the self-tuning parameters to fit the requirements of the majority of control systems, self-tuning instrument automatically go after the automatic control state.

Start self-tuning: the instrument alarm parameters of AT group home for 1, the parameters from the alarm group, at this time AT instrument lights flash, the instrument enter the self-tuning state.

Self-tuning status, instrument SV value must be set in the vicinity of common values.

Self-tuning status, from time to time the use of digital instrumentation control system at this time there would be any significant shocks, shocks to the system does not allow substantial self-tuning to be used with caution.

A state of self-tuning, there should be no unusual disturbance, such as load disconnect, sensors, external device, executing agency and so on.

Self-tuning the timing and control system, from a few minutes to several hours ranging system, according to SET button to cancel the self-tuning, instrument control parameters are not modified

四、Intelligent PID control parameters debugging method

As the self-tuning PID control parameters obtained are not necessarily the best value, so after the self-tuning control instrument is not necessarily the best. If the control system can not meet the precision requirements can be manually set, fine-tuning of these parameters value, allowing the system to achieve satisfactory control.

1. Selection of proportion band P

Due to the size of P systems directly affects the amount of overshoot, transition time and steady-state error, so the selection of P is particularly important. Reduced the proportion with P, the system action sensitive and faster; but small, increase overshoot, increased frequency of oscillation to regulate the time; P increases, the system will be stabilizing; If P is too large will make the system slow. The size of the P was the inverse relationship between steady-state error. Reduce the proportion of the role, you can reduce the steady-state error and improve control accuracy.

2. Selection of integration time I

Integral action to eliminate steady-state error, integral time I with the integral role was the inverse relationship, I

四、Summary

The three parameters of the process of group settings, the summary will focus on the following

1. In the state of the automatic control, press SET button once, instrument display password prompt PASS, this time in the next row instrument input parameters of different groups corresponding password, press SET button again to confirm the password, instrument parameters can be set to enter the state.

2. End to confirm password, Instrumentation at the upper and lower two rows show the various parameters in order, Flashes on the schedule for the current parameters, shown in the next row for the next parameter, Use \odot/\ominus key down to choose the parameters, with \odot/\ominus up the selection of key parameters.

3. When a parameter in the last row shows flashes, press SET key parameters that have to view or edit, this time on the schedule still shows this parameter prompt, the next row shows the parameter settings, use \odot/\ominus button and \odot/\ominus key to reduce the modification of settings.

4. When a parameter modification, press set button to confirm changes to this parameter, when the dashboard shows the current ranking of parameters after modification, and then up, or down to choose the parameters to be amended.

5. Repeat these steps to complete the instrument to view or modify parameters.

Note: In the course of the parameters set, by set key long-3S changes the retention parameters and the parameters set in advance from the state, such as 60 seconds without key operation, the instrument does not save any changes and automatically return to the automatic control state.

Chapter four Function Description

一、Power alarm suppression

If you choose the function, instrumentation and re-power instrument power regardless of whether there are relay alarm, all relays are not alarm, when the instrument's measurement range to re-enter the alarm, warning meter relay only by setting the way the police action. Inhibitory function of power in the way of the relay alarm AL1y and select AL2y.

二、Auto / Manual switch Bumpless

When the instrument by means of automatic control to manual control mode, the instrument of control output unchanged (such as the instrument in the automatic control of the output when the percentage of 45 percent, when changed to manual control, the percentage of instrument output is still 45%). When the instrument by w-

smaller, integral role in the more intense and more stable system, oscillation frequency is also more, but I larger, weakening the impact on system performance, and can not eliminate the steady-state error.

3. Selection of the time differential d

Differential control can predict deviations, resulting in the role of lead correction, can be used to improve the dynamic characteristics. But, When d larger or smaller, the overshoot and settling time will increase. While controlling the quantity not basically lagging behind such as pressure, rotational speed etc., d should be possible small.

From the above analysis we can see that three parameters influence the selection of each other, mutual restraint, but also by the physical constraints of various factors, must be tailored to specific requirements of the operation and control to make a compromise choice.

五、 Communication protocol

XMT62X Series Instrument MODBUS_RTU universal adoption of international agreements, the instrument can be transmission standard RS485 computer communications, in support of Kingview, MCGS, Century Star, the configuration software, etc., such as the use of this instrument driver or user of the configuration software developed its own PC software, users can design their own under the agreement drivers, our company with the accompanying CD-ROM products on the communication protocol in detail and test software, guide, to help users design driver.

Communication speed: 1200, 2400, 4800, 9600bps

Stop bit: 1; Data bit: 8

Parity check: None

Function code 03: Reading parameter value

Function code 10: Write parameter value

Function mode 01: Read status bit (SV, A/M, R/D, setup, abnormality, AL2, AL1, AT)(This feature is instrumentation code for reading status bits function code-specific)

Function mode 05: Change Instrument control mode (the A / M to 0 or 1, AT to 0) (this feature code to change the instrumentation control function code-specific)

communication protocol detailed guidance please refer to the accompanying protocol random.