Micro processor controller

FTA series 3 wires motor valve PID controller

INSTRUCTION MANUAL

FTA-631/632/633-V2.0

Carefully read all the instructions in this manual. Please place this manual in a convenient location for easy reference.

Specification

- FTA-632series instrument : 4 big LED display , 0-100%LED bar display output , Accuracy: (Max±0.2% fus or ±1)≤±1 digit
  RTD or TC input, the maximum resolution is 0.1 degree. Analog input ,the maximum resolution is 0.001 degree.
- Auto/Manual operation control function.
- PV transmission output , RS-485 communication (Modbus-RTU) optiona.
- Pleases make sure that the power and output types are right before using, there is a wire diagram beside the controller,
  Also please make sure whether the controller need position feedback input or not? In the product check code No9, you can check the mode.
- If the controller without position feedback, please setting the full run time of proportional motor before using , see manual "6.3 Level 3 parameters rUCY".
  If the controller need position feedback input, please check the following input mode, such as "3 wires resistance ,DC4-20mA,0-5VDC,0-10VDC, or others". If the controller with 3 wires resistance feedback input, please running automatic calibration valve position before using.
  See"9. automatic calibration valve position"
- Clients can set TC, RTD by keyboard ,please set the input type coincide with the sensor, Check details of the manual"6.3parameter INP1",If need analog signal inputs, please specified when order. (Except 0-20mV or 0-50mV input)
- when PID Control, we suggest adopt the Autotuning to improve the control effect. Check manual "8.Autotuning"

1. PRODUCT CHECK

MODEL (Size:wide*high)	FTA44-632 (48mmX48mm) FTA49-632 (48mmX96mm) FTA94-632 (96mmX48mm) FTA77-632 (72mmX72mm) FTA99-632 (96mmX96mm)

CODE

□□□□-M M∗□□□-□□□- N/N/N/N

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ (11) (12) (13) (14) (15)

(1) Control action

N: No action

F: ReversePID action (for Heating)

D: Direct PID action (for cooling)

(2) Input type , (3) Range code: See"11.INPUT RANGE TABLE"

(4) Valve open output [OUT1]

N: No action

M: Relay contact

(5) Valve close output [OUT2]

N: No action

M: Relay contact

(6) Alarm 1[AL1] (7) Alarm 2[AL2] (8) Alarm 3[AL3]

See "6.3.1 alarm mode"

N: No alarm

A: Deviation high alarm	G: Deviation high/low alarm with hold action
B: Deviation low alarm	M: Deviation band alarm with hold action
C: Deviation high/low alarm	H: Process high alarm
D: Deviation band alarm	J: Process low alarm
E: Deviation high alarm with hold action	K: Process high alarm with hold action
F: Deviation low alarm with hold action	L: Process low alarm with hold action

(9) Position feedback mode

N: No feedback

A: DC 4~20mA B: DC 0~20mA T: others input

C: DC 0~10mA D: 0~5VDC

E: 0~10VDC F: 1~5VDC

G: 2~10VDC R: resistance input for valve feedback

(10) Communication

N: No Communication 5: Rs485 communication Modbus-RTU

(11) Transmission

N:No transmission

C: PV transmission (4-20mA) E: SV transmission (4-20mA)

P: PV transmission (0-5V) R: SV transmission (0-5V)

Q: PV transmission (0-10V) S: SV transmission (0-10V)

(12) Remark code:N

(13) Remark code:N

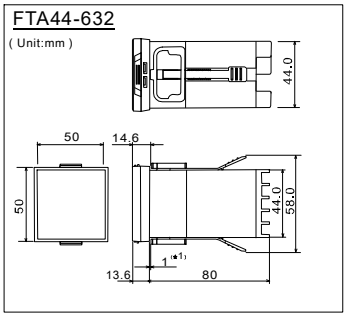
(14) Remark code:N

(15) Remark code:N

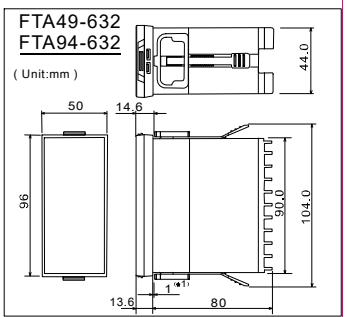
2. MOUNTING SIZE

* Rapid changes in ambient temperature which may cause condensation.
* Corrosive or inflammable gases.
* Direct vibration or shock to the mainframe.
* Water,oil,chemicals,vapor or steam splashes.
* Excessive induction noise, static electricity, magnetic fields or noise.
* Direct air flow from an air conditioner.
* Exposure to direct sunlight.
* Excessive heat accumulation.

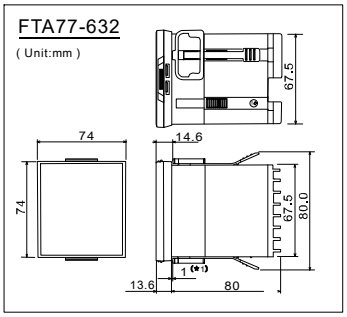
FTA44-632 (Unit:mm)



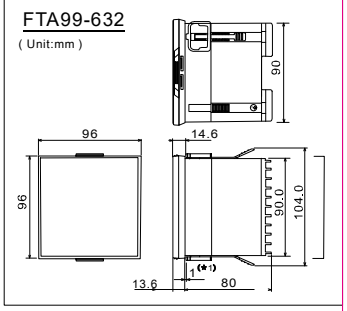
FTA49-632
FTA94-632 (Unit:mm)



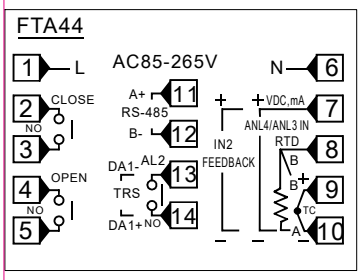
FTA77-632 (Unit:mm)

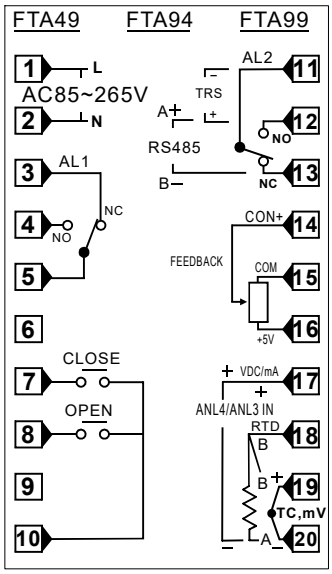


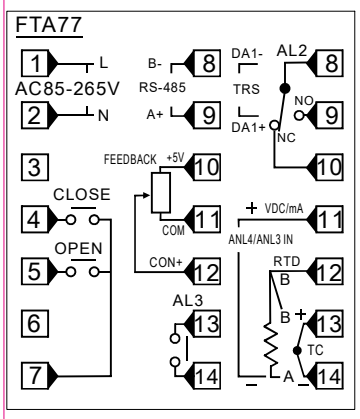
FTA99-632 (Unit:mm)



3. WIRING

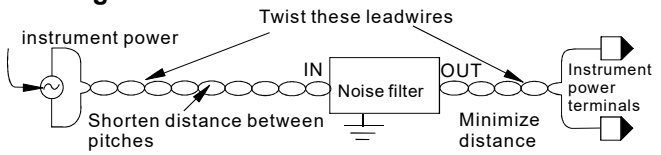




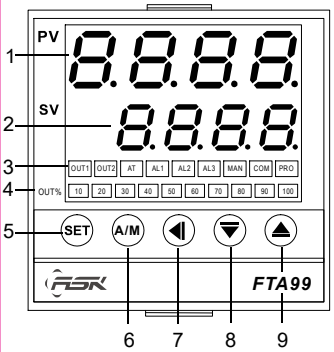


Alarm output rated:
Relay contact output: 250V AC, 3A (Resistive load)
Control output rated :
Relay contact output: 250V AC,5A(Resistive load)
Voltage pulse output: 0/12 V DC or 0/24V DC (Load resistance 600 ohm or more)
Current output: 4 to 20mA DC (Load resistance 500 ohm or less)
Triac single phase zero crossing: 100A or less

3.1 Wiring cautions



4. PARTS DESCRIPTION

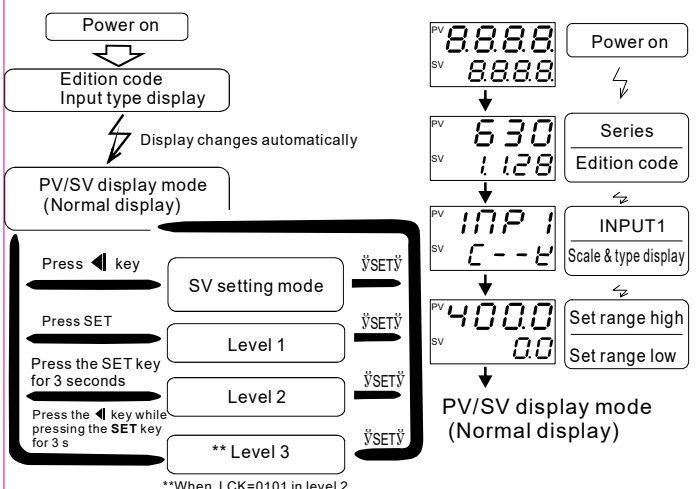


1 Measured value (PV) display [RED]
2 Set value(SV)display [GREEN]
3 OUT1lamp: Valve open indication
OUT2 lamp: Valve close indication
AT lamp: Autotuning indication
AL1 lamp: Alarm 1 output indication
AL2 lamp: Alarm 2 output indication
AL3 lamp: Alarm 3 output indication
MAN lamp: Manual mode indication
COM lamp: Communication indication
PRG lamp: Remark lamp
4 LED bar: Position feedback indication
5 SET key: Used for parameter calling up and set value registration
6 A/M key: Auto/Manual key or set value registration
7 ◀ : Shift key and setting SV key
8 ▼ : Down key, decrease numbers
9 ▲ :Up key ,increase numbers

CAUTION To avoid damage to instrument, never use a sharp object to press keys.

5. SETTING

5.1 Calling up procedure of each mode



**When LCK=0101 in level 2

Display	P1	P2	E1	E2	J1	J2	n	u
Input	K	K	E	E	J	J	N	Wu3_Re25
Range	400.0 ℃	1300 ℃	300.0℃	600℃	400.0℃	800 ℃	1300℃	2000℃

Display	S	t	r	b	AN4	AN3	AN2	AN1	Pt1	Pt2
Input	S	T	R	B	2-10VDC 1-5VDC 4-20mA	0-10VDC 0-5VDC 0-20mA	0-50mV	0-20mV	Pt100	Pt100
Range	1600℃	400.0℃	1700℃	1800℃					-199.9~200.0℃	-200~800℃

5.2 Setting set value(SV)

Example: Following is an example of set value(SV) to 200Ÿ

(1)Set to the SV setting mode — In the normal display modePress ◀ key to enter the SV setting mode. The digit which flashingis settable.

(2)Shift of the digit brightly lit — Press the shift key ◀ to shift the digit which lights brightly up to the hundreds dights

(3) Numeric value change — Press the UP key ▲ to set "2". Pressing the UP key increase numerals, and pressing the DOWN key ▼ decrease numerals.

(4) Set value entry — After finishing the setting, Press the SET key, All of the set value digits stop flash and as a result the instrument return to PV/SV display mode.

*In any time you can press A/M key to save value and exit to PV/SV mode.

5.3 Setting parameters other than set value (SV)

The setting procedures are the same as those of example (2) to (4) in the above "Setting set value (SV)". Press the SET key after the setting end shifts to the next parameter. When no parameter setting is required, return the instrument to the PV/SV display mode.

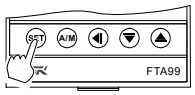
6. LEVEL

In any level you can press the SET key for 3 seconds to return the instrument to the PV/SV display mode, and register the value.

6.1 Level 1

Press the SET key to level 1:

The following parameter symbols are displayed one by one every time the SET key is pressed.



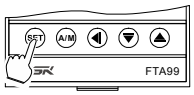
1# Factory set value

Symbol	Name	Range	1#	Description
AT	Autotuning	NO or YES	NO	YES: Autotuning on,NO: Autotuning off
AL1	Alarm 1	-1999 to 9999	10	Set the alarm value for alarm 1 . Alarm differential gap=AH1
AL2	Alarm 2	-1999 to 9999	10	Set the alarm value for alarm 2 Alarm differential gap=AH2
AL3	Alarm 3	-1999 to 9999	10	Set the alarm value for alarm 3 Alarm differential gap=AH3
UAd	Device address checking		1	Communication device address, only for checking. Except V6.4

6.2 Level 2

Press the SETkey for 3 seconds to level 2

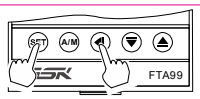
The following parameter symbols are displayed one by one every time the SET key is pressed.



1# Factory set value

Symbol	Name	Range	1#	Description
P1	Proportional band for out1	0.0~200.0	20.0	Proportional band in PID with unit Ÿ for OUT1 P1=0.0, ON/OFF control for ouput1 Please set P1=2.0 when analog input.
I1	Integral time for out1	0-3600sec	210	Set the time of integral action to eliminate the offset occurring in proportional control.
d1	Derivative time For out1	0-3600sec	10	Set the time of derivative action to improve control stability by preparing for output changes.
AtuL	Auto tuning offset value (AtVL)	0-199	0	Set ATVL to prevent overshoot occurred during autotuning process.
CyC1	Proportioning cycle for out1	0 to 999sec	20	Proportioning cycle time for PID control Only for out1 output
HYS1	Control Hysteresis For out1	0.0 to 100.0	1.0	Control out differential gap=HYS1 For out1 output. Only for ON/OFF action when P1=0.0
rE	Spare	0.0 to 100.0	10.0	Spare
r-St1	Proportional reset For out1	-30 to 30	-5	Proportional reset for overshoot protection only for out1 output. (Auto setting after autotuning)
OPL	Output1 limit (Low)	0.0 to 100.0%	0.0	Output manipulated variable lowest limit For out1 output.
OPH	Output1 limit (High)	0.0 to 100.0%	100.0	Output manipulated variable highest limit For out1 output.
PAo	Initial output value for OUT1	0.0 to 100.0%	0.0	Setting initial output value for manual operation with Power-on Manual function
LCK	Set data lock	0000-0255	0	LCK=0000:Allow to modify any parameter and SV LCK=0001:Only allow to modify SV LCK=0010:Only allow to modify SV and Level1 LCK=0011:Not allow to modify any parameter and SV LCK=0101:Allow to setting Level3

6.3 Level 3



6.3.1Go to level 3:

1,Press the SET key for 5 seconds to PID level, then change LCK to 0101.

2,Press the ◀| key while pressing the **SET** key for 3 s to Level3

The following parameter symbols are displayed one by one every time the SET key is pressed.

1# Factory set value

Symbol	Name	Range	1#	Description
INP1	Main input type select			

Setting	Y1	Y2	E1	E2	J1	J2	N	U
Input	K	K	E	E	J	J	N	Wu3_Re25
Range	400.0 ℃	1300 ℃	300.0℃	600℃	400.0℃	800 ℃	1300℃	2000℃

Setting	S	t	r	b	AN4	AN3	AN2	AN1	Pt1	Pt2
Input	S	T	R	B	2-10VDC 1-5VDC 4-20mA	0-10VDC 0-5VDC 0-20mA	0-50mV	0-20mV	Pt100	Pt100
Range	1600℃	400.0℃	1700℃	1800℃					-199.9~200.0℃	-200~800℃

Note: AN4,AN3 input type can not setting by keyboard, because of without calibration .(Custom - made)

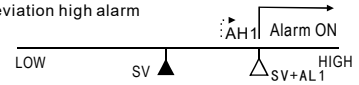
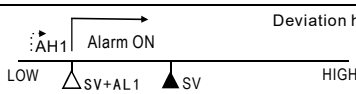
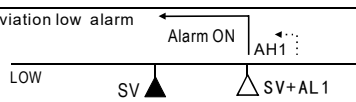
dP	Decimal point	0 ,1,2,3	0	0, 1, 2, 3 Only for Linear analog type input
LSPL	Low setting limiter	-1999 to 9999	0	Set lower setting limiter Lower point of transmission or remove SV
USPL	High setting limiter	-1999 to 9999	400	Set high setting limiter Higher point of transmission or remove SV
UNIt	Display scale	0 ,1,2	0	0: Centigrade, 1□Fahrenheit 2: without scale□for linear analog)
PVOS	PV bias	-199to 199	0.0	Sensor correction is made by adding bias value to measured value(PV).
PVFt	PV follow-up PV input filter	0 to 60	55	PV variable-value control, 0-30: for general, 31-60: for enhanced
ANL1	Lowest value of PV display	-199~9999	0	Lowest value display when linear analog inputs ,Such as 4-20mA input.
ANH1	Highest value of PV display	-1999~9999	2000	Highest value display when linear analog inputs ,Such as 4-20mA input.
ALd1	Alarm1 mode	00 to 16	11	Select the type of alarm1 See(**ALARM TYPE TABLE)
AH1	Alarm1 differential gap	0.0 to 100.0	0.4	Alarm1 differential gap setting
ALd2	Alarm2 mode	00 to 16	10	Select the type of alarm2 See(**ALARM TYPE TABLE)
AH2	Alarm2 differential gap	0.0 to 100.0	0.4	Alarm2 differential gap setting
ALd3	Alarm3 mode	00 to 16	10	Select the type of alarm3 See(**ALARM TYPE TABLE)
AH3	Alarm3 differential gap	0.0 to 100.0	0.4	Alarm3 differential gap setting
OUd	Control action	0 or 1	0	0: Reverse action (Heating) 1: Direct action (Cooling)
rUCY	Full run time of proportional motor	0-200sec Unit: second	60	The time from open to close of motor Please set the value when the controller is no feedback input mode.
IdNO	Device address setting	0-127	1	Communication device address setting.
bAUd	Band-rate setting	0,1,2,3	2	BAUd =0: 2.4K, =1: 4.8K, =2: 9.6K, =3: 19.2K

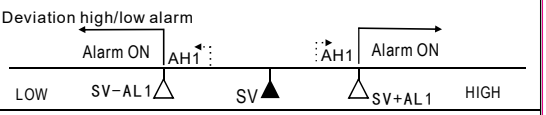
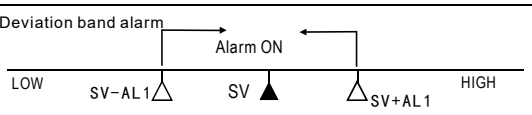
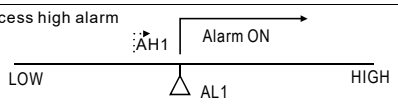
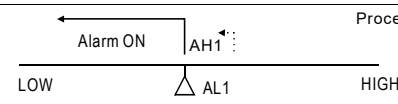
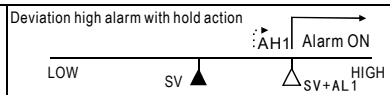
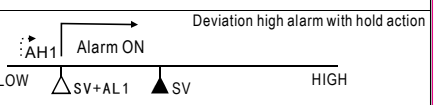
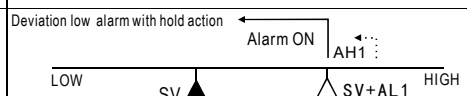
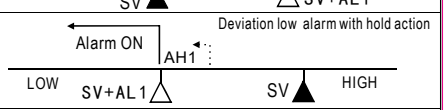
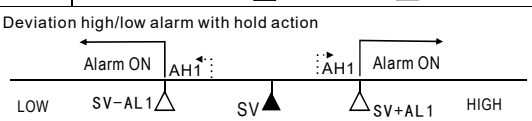
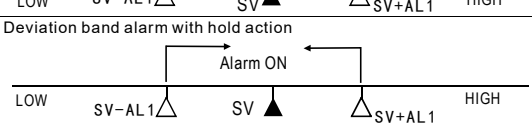
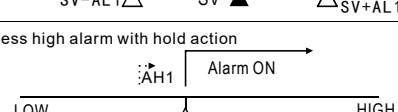
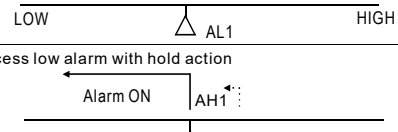
**ALARM TYPE TABLE (ALd_=00~16)

10: No alarm output
11: Deviation high alarm
12: Deviation low alarm
13: Deviation high/low alarm
14: Deviation band alarm
15: Process high alarm
16: Process low alarm

00: No alarm output
01: Deviation high alarm with hold action
02: Deviation low alarm with hold action
03: Deviation high/low alarm with hold action
04: Deviation band alarm with hold action
05: Process high alarm with hold action
06: Process low alarm with hold action

6.3.2 Alarm mode specification

Code	ALdY	Specification (Example for alrm1)	
N	10 or 00	No alarm	
A	11	AL1Y0	Deviation high alarm 
		AL1<0	Deviation high alarm 
B	12	AL1Y0	Deviation low alarm 
		AL1<0	Deviation low alarm 

Code	ALdY	Specification (Example for alrm1)
C	13	Deviation high/low alarm 
D	14	Deviation band alarm 
H	15	Process high alarm 
J	16	Process low alarm 
E	01	AL1Y0: Deviation high alarm with hold action 
		AL1<0: Deviation high alarm with hold action 
F	02	AL1Y0: Deviation low alarm with hold action 
		AL1<0: Deviation low alarm with hold action 
G	03	Deviation high/low alarm with hold action 
M	04	Deviation band alarm with hold action 
K	05	Process high alarm with hold action 
L	06	Process low alarm with hold action 

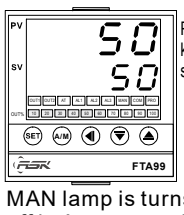
NOTE:
With hold action:
When Hod action is ON, the alarm action is suppressed at start-up until the measured value enters the non-alarm range.

7.MANUAL OPERATION

All instrument except FT44 with manual operation key (A/M)

Example: Following is an example of manual setting to 70% output.

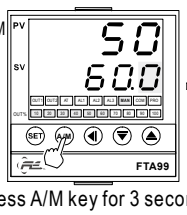
Auto control mode



MAN lamp is turns off in Auto control mode.

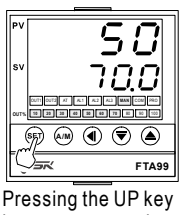
Press A/M key for 3 seconds

Manual setting mode



Press A/M key for 3 seconds to manual setting mode. In manual setting mode, MAN lamp light up,The digit which flashing is settable.

Manual control mode

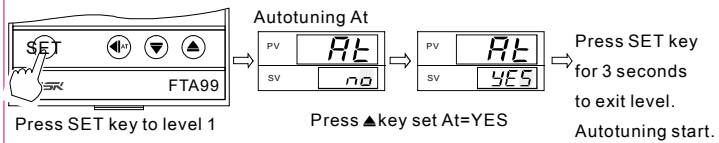


Pressing the UP key increase numerals, and pressing the DOWN key decrease numerals. Press SET key after set value to 70.0.

**In manual control mode ,press A/M key for 3 seconds to auto control mode.
**Power-on Manual function can be selected. Pko in level2 for initial output value.
**A/M key can also be used for SAVE and EXIT key.

8. AUTOTUNING

When controller's power are just on,it will be good to autotuning when the measured value is far lower than the set value



NOTE :

1, When begin to autotuning, AT light flash, which means to begin to autotuning,if you want to exit from autotuning, please enter into the AT menu, set AT=no

2,In the middle of the autotuning, it is ON/OFF control, according to the different systems, temperature may be have a big variance and the autotuning time is of a long short.

3,After finishing autotuning, AT light stops flashing, controller will automatically save P1、I1、d1、rE、rSt1 parameters,then automatic return to the normal control state, controller will continue to run with new P1、I1、d1、rE、rSt1 parameters value

4,In some special occasions, if you can not control by autotuning, or the autotuning effect is bad, please set parameters by manual.

5,.P1 is proportional band of the first group OUT1,the standard proportional band range is Set value=SV±P1/2,as usual,we set P1=10% to 15% of SV.

6,I1 is the integration time of the first group OUT1,as usual I1 is setted about 200 before leaving factory. If I1 is smalller, the integral action will be bigger, and the feedback to the temperature difference will be bigger. But if I1 is too small, it will lead to the temperature swinging up and down around the set value.

(1)If temperature is not up for a long time, and the output is still not increased more, can reduce the integration time I1

(2)If temperature is up overshoot for a long time and output is still heating, can reduce the integration time I1

(3)If temperature swings up and down around the set value for a long time, can increase the integration time I1

7,D1 is the differential time of the first group OUT1,which is equal to 20% to 30% of the integration time. Derivative action is main used to cause the inhibition of the overshoot (because of integral action).d1 is bigger, derivative action is stronger.

(1)When go into the proportional band, if the output heating is bigger, temperature will overshoot,you can increase the derivative time. If the temperature decrease more, which will lead to the undershoot, then you can increase the derivative time.

(2)In some control situation, if the system feedback is very sensitive. which means that the output slight variations will lead to a big variations in the goal Value, then you can reduce the derivative time, or close the derivative time (d1=0).Using this,control is stable,such as in the constant-pressure water supply system.

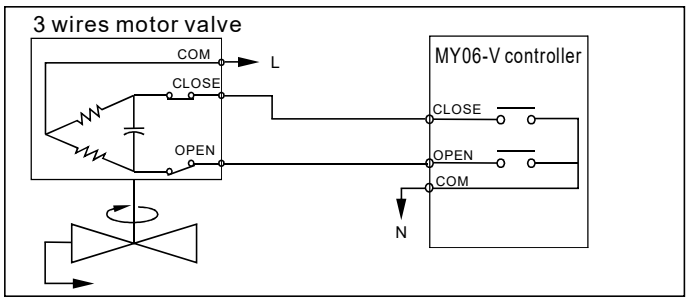
8,rSt1 is the reset of the OUT1 proportion, which is used to eliminate static errors in the pure time proportion control, in PID control,rSt1 can be used to adjust the proportion band to reach the system stability quickly.

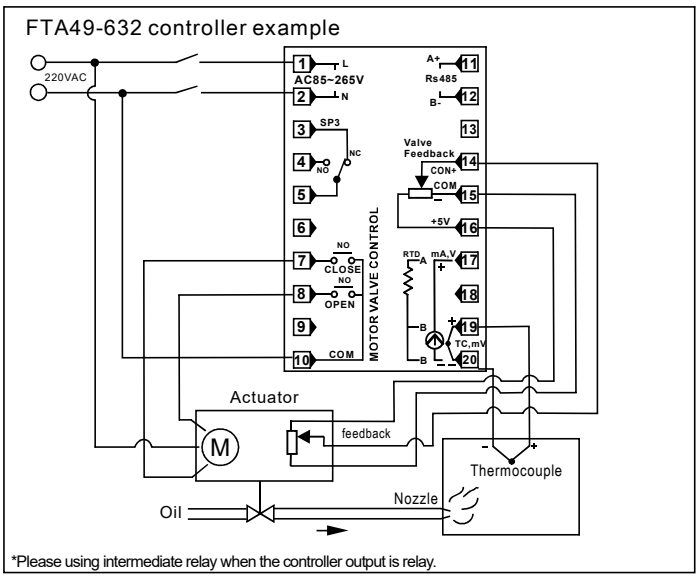
(1)when the thermal inertia is big in the heating system, usually rSt1 is negative, pls note this value can not be too small(when rst1 > -P1/2,e.g P1=30.0 , rSt1≥-15).usually rSt1=0, in the heating system, the value is smaller, the heating will be slower

(2)While in the PID cooling system,rSt1 is positive, if this value is bigger, the colling will be slower.

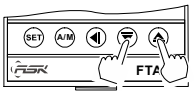
9.Automatic calibration valve position

9.1 3 wires motor valve example





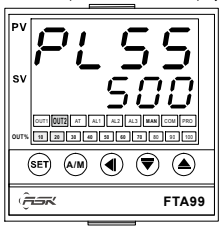
9.2 Valve position automatic calibration



1.Correct wiring connected valve and the feedback signal.

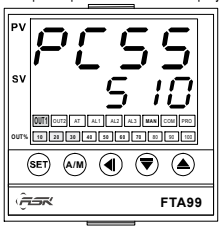
2.Press the ▲ key while pressing the ▼ key for 3 s to PASS interface. Setting PASS=0111,then press the SET key to run automatic calibration program.

Full closed position calibration display



Auto

Full opened position calibration display



Auto

Normal display

The upper display PLSS , OUT2 lamp light, valve auto closing. The lower display data number decreases with the valve closing, some time later, full closed position automatic calibration is end. Display auto jump to the right Fig.

Note: In this process if the date increases slowly, it means feedback wiring error.

If feedback is 3 wire resistance input ,please switch the +5V terminal and COM terminal.

The upper display PCSS , OUT1 lamp light, valve auto opening. The lower display data number increases with the valve opening, some time later, full opened position automatic calibration is end. Display return to normal display, all the calibration is finished.

10.COMMUNICATION SPECIFICATION

(1) Communication protocol is Modbus-RTU, support 03 read ommand,06 or 10 write command

(2) Communication mode: single-master RS485 asynchronous serial communication

baud rate:2400 , 4800 , 9600 , 19200(9600 baud rate is acquiesced)

Byte date format:1 start bits,+8 data bits+No parity checking+1 Stop bits

(3) Controllers support writing 36 data more, when writing data, if the address is beyond 0048H,the address will still write data as 0048H.

(4) Controllers support reading 37 data more, when reading data, if the address is beyond 0048H,then read data=0

(5) Parameter address please see "FTA series communication address list"

11. INPUT RANGE TABLE

Input type			Code	
K1	0.0 to 100.0	°C	2	D1
	0.0 to 200.0	°C	2	D2
	0.0 to 300.0	°C	2	D3
	0.0 to 400.0	°C	2	D4
K2	0 to 200	°C	K	A2
	0 to 400	°C	K	A4
	0 to 600	°C	K	A6
	0 to 1300	°C	K	B3
E1	0.0 to 100.0	°C	3	D1
	0.0 to 200.0	°C	3	D2
	0.0 to 300.0	°C	3	D3
E2	0 to 200	°C	E	A2
	0 to 400	°C	E	A4
	0 to 600	°C	E	A6
J1	0.0 to 100.0	°C	1	D1
	0.0 to 200.0	°C	1	D2
	0.0 to 300.0	°C	1	D3
	0.0 to 400.0	°C	1	D4
J2	0 to 200	°C	J	A2
	0 to 300	°C	J	A3
	0 to 400	°C	J	A4
	0 to 800	°C	J	A8
T	0.0 to 100.0	°C	T	D1
	0.0 to 200.0	°C	T	D2
	0.0 to 300.0	°C	T	D3
	0.0 to 400.0	°C	T	D4
S **	0 to 1000	°C	S	B0
	0 to 1600	°C	S	B6
R	0 to 1000	°C	R	B0
	0 to 1700	°C	R	B7
B	200 to 1000	°C	B	B0
	200 to 1800	°C	B	B8
N	0 to 1000	°C	N	B0
	0 to 1300	°C	N	B3
Wu3_Re25	600 to 2000	°C	W	B0

Input type			Code	
Pt1 (Pt100)	0.0 to 50.0	°C	P	06
	0.0 to 100.0	°C	P	07
	0.0 to 150.0	°C	P	11
	0.0 to 200.0	°C	P	08
	-50.0 to 50.0	°C	P	12
	-50.0 to 100.0	°C	P	13
	-100.0 to +100.0	°C	P	04
	-100.0 to +200.0	°C	P	05
	-199.9 to +200.0	°C	P	02
Pt2 (Pt100)	0 to 100	°C	D	A1
	0 to 200	°C	D	A2
	0 to 400	°C	D	A4
	0 to 600	°C	D	A6
	0 to 800	°C	D	A8
	-50 to 100	°C	D	C1
	-100 to 200	°C	D	C2
	-100 to 300	°C	D	C3
	-200 to 400	°C	D	C4
	-200 to 500	°C	D	C5
	-200 to 600	°C	D	C6
	-200 to 700	°C	D	C7
	-200 to 800	°C	D	C8

Input type			Code	
AN1	0 to 20mV	-1999 to 9999	V	01
AN2	0 to 50mV		V	02
AN3	0 to 5VDC	-199.9 to 999.9	V	03
AN3	0 to 10VDC		V	04
AN4	1 to 5VDC	-19.99 to 99.99	V	08
AN4	2 to 10VDC	-1.999 to 9.999	V	09
AN4	4 to 20mA		A	03
AN3	0 to 20mA		A	02
AN3	0 to 10mA		A	01

**S type input: 0-100°C range cannot guarantee the accuracy

Note: Clients can set TC, RTD by keyboard ,please set the input type coincide with the sensor. Check details of the manual"6.3"parameter INP1,If need analog signal inputs, please specified when order.(Except 0-20mV or 0-50mV input)

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