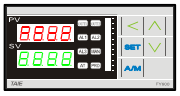
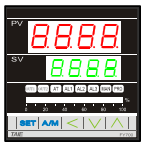
User's Manual

Digital Controller

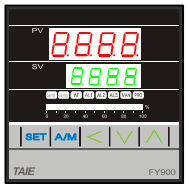
FY400/600/700/800/900


FY400


FY600


FY700


FY800


FY900

1 Notice

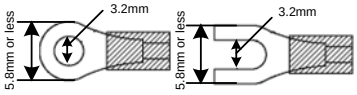
Please confirm the specification of controllers is to totally with your requirement before using it, also read this user's manual in detail.

⚠ Danger

1. Danger! Electric Shock!
   DON'T touch AC power wiring terminal when controller has been powered!
   Keep the power off until all of the wiring are completed!

⚠ Warning

1. Please confirm the AC power wiring to controller is correct, otherwise it would be caused aggravated damage on controller. (FY400 connecting with Pin 1 and 6,FY600/700/800/900 with Pin 1 and 2).
2. Be sure to use the rated power supply(AC85~265V or DC24V), otherwise it would be caused aggravated damage on controller.
3. Please confirm wires are connected with correct terminal (Input, Output).
4. Use M3 screw-compatible crimp-on terminals with an insulation sleeve, as shown below

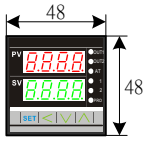


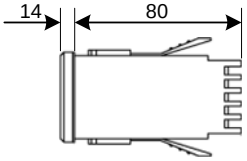
Torque : 0.4 N.m (4kgf.cm)

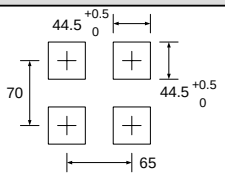
5. Avoid to install controller in following spaces :
   I. A place where the ambient temperature may reach beyond the range from 0 to 50℃
   II. A place where the ambient humidity may reach beyond the range from 50 to 85% RH.
   III. A place where the the controller likely to come into contact with water ,oil , chemicals ,steam and vapor.
   IV. A place where the controller is subject to interface with static electricity ,magnetism and noise.
6. For thermocouple(TC) input ,use shield compensating lead wire.
7. For RTD input ,use shield wires which have low resistance and no resistance difference between the 3 wires.

2 External Dimension and Panel Cutout 〈Unit：mm〉

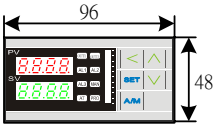
FY400

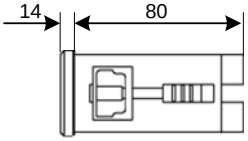


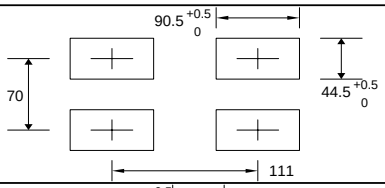




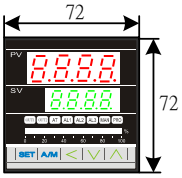
FY600

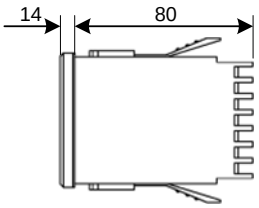


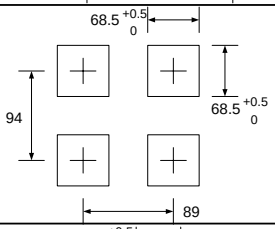




FY700







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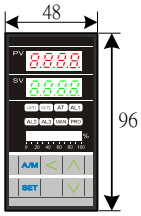
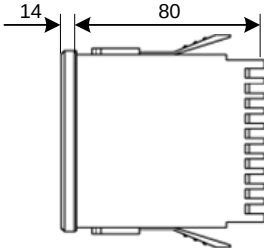
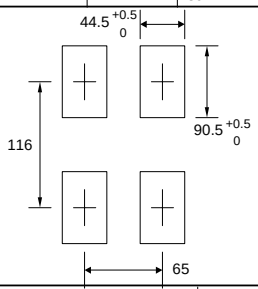
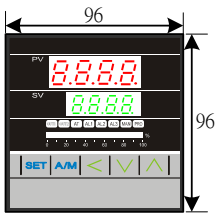
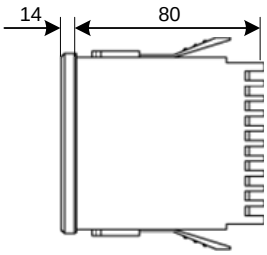


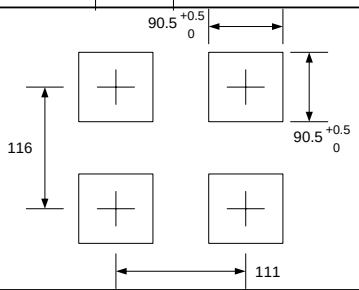




FY900

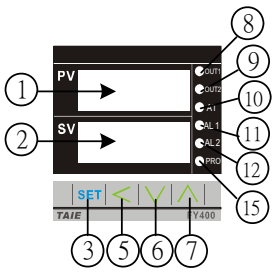




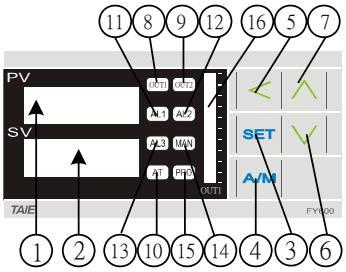


3 Parts Description

FY400



FY600



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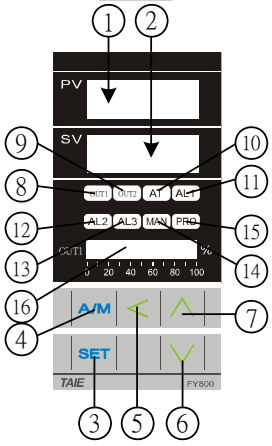
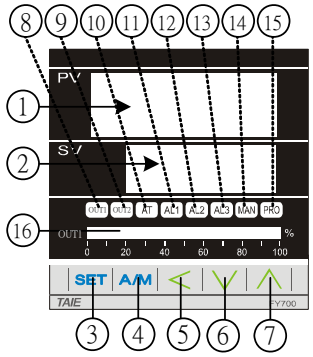


FY700/FY900

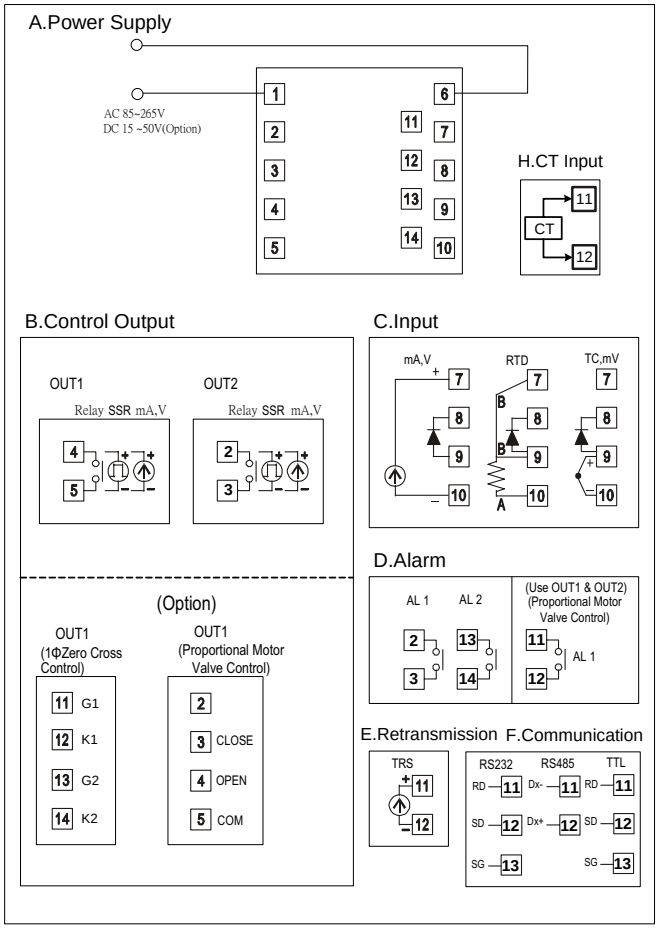


SYMBOL	NAME		FUNCTION
PV	①	Measured value (PV)display	Displays PV or various parameter symbols (Red)
SV	②	Setting value (SV)display	Displays SV or various parameter set values (Green)
SET	③	Set key	Used for parameter calling up and set value registration
A/M	④	Auto/Manual key	Switches between Auto(PID) output mode and Manual output
<	⑤	Shift key	Shift digits when settings are changed
V	⑥	Down key *(*Program Hold)*	Decrease numbers *(*Only for programmable controller)*
∧	⑦	Up key *(*Program Run)*	Increase numbers *(*Only for programmable controller)*

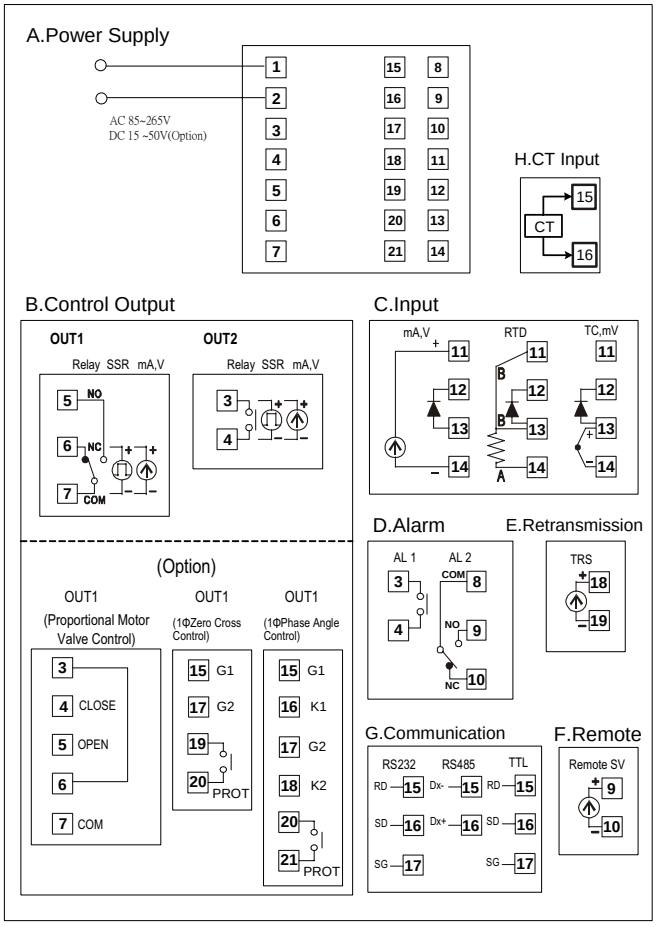
SYMBOL	NAME		FUNCTION
OUT1	⑧	OUT1 lamp	Lights when OUT1 is on (Green)
OUT2	⑨	OUT2 lamp	Lights when OUT2 is on (Green)
AT	⑩	Autotuning lamp	Lights when Autotuning is activated (Orange)
AL1	⑪	Alarm 1 lamp	Lights when Alarm 1 is activated (Red)
AL2	⑫	Alarm 2 lamp	Lights when Alarm 2 is activated (Red)
AL3	⑬	Alarm 3 lamp	Lights when Alarm 3 is activated (Red)
MAN	⑭	Manual output lamp	Lights when manual output is activated (Red)
PRO	⑮	**Program Running lamp*	**Flashes when program running (Only for programmable controller)*
OUT1%	⑯	Output% Bar-Graph display	Output% is displayed on 10-dot LEDs

4 Terminal Arrangement

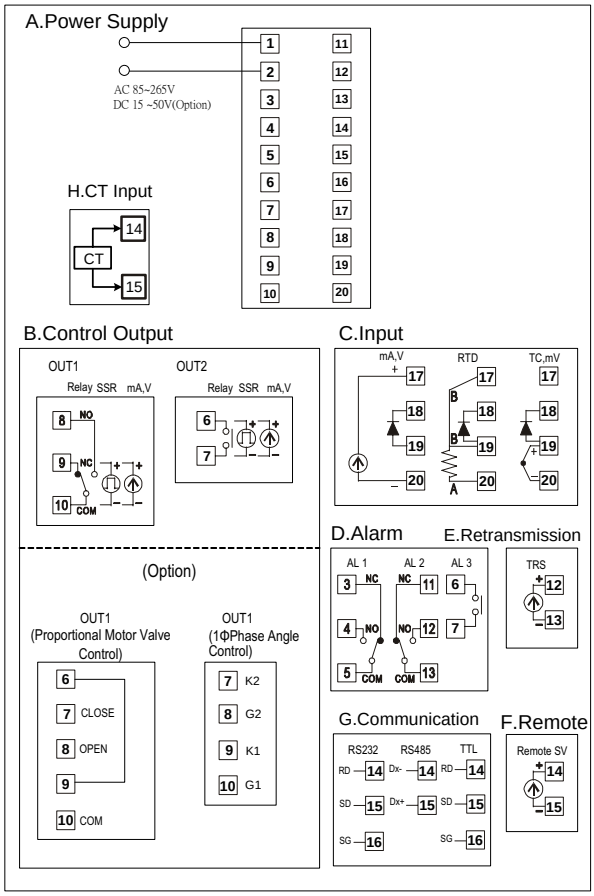
FY400



FY700



FY600/FY800



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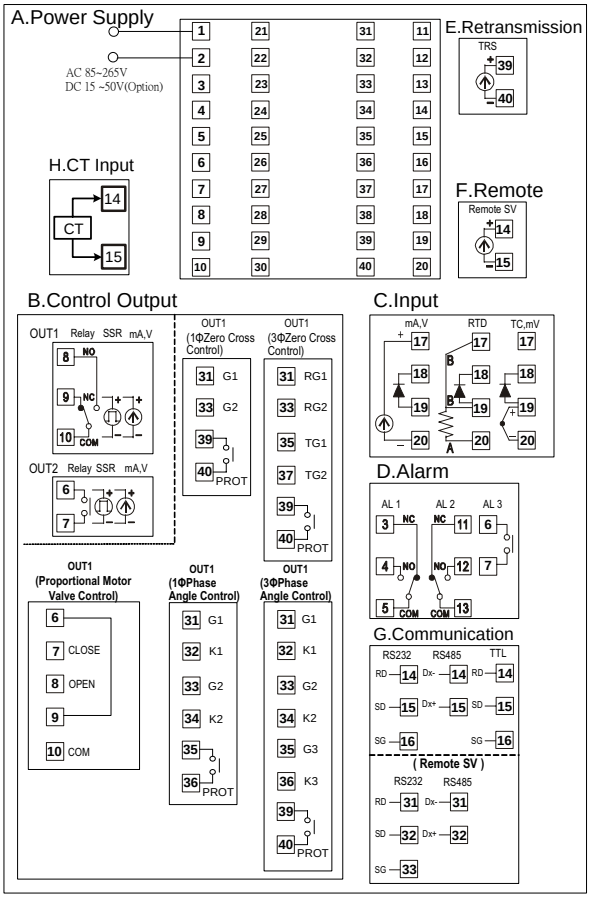
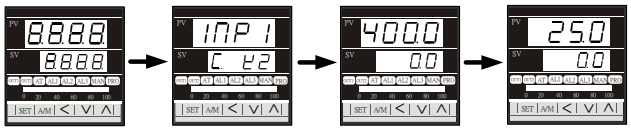


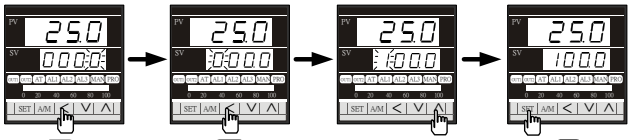
5 Operations

1.Power ON: Controller wiil display as following



Light all LEDs and all 7 segment displays | Display input type | Display range (0.0 ~ 400.0) | Ready for use

2.Change the Set Value(SV): Change SV from 0.0 to 100.0



Press ≪ Key — The SV number started to flash.The flashing digit indicates which digit can be set.

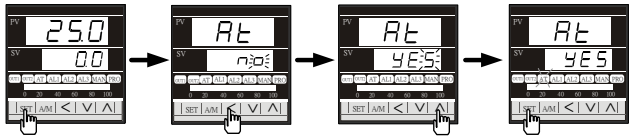
Press ≪ Key — To select the hundreds digit.

Press ∧ Key — To change the number to 1.

Press SET Key — To store the new set value.

3.Autotuning (AT):

Use AT function to autimatically calculate and set the optimize PID value for your system.



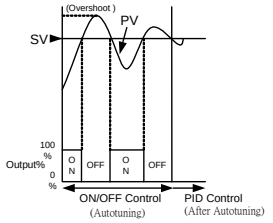
Press SET Key — To display parameter AT.

Press ≪ Key — To change AT setting.

Press ∧ Key — Change AT to "YES"

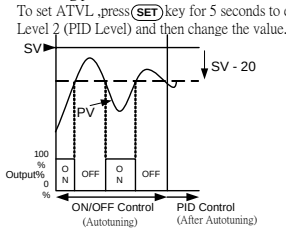
Press SET Key — Start Autotuning process (AT lamp will be lighted on)

Autotuning
ATVL=0



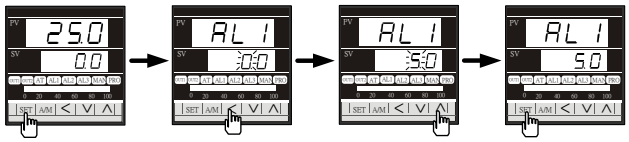
Autotuning
ATVL=20

*Set ATVL to prevent overshoot occurred during autotuning process.
To set ATVL ,press SET key for 5 seconds to enter Level 2 (PID Level) and then change the value.



4.Change the Alarm value:

Change AL1 value to "5.0" (AL1 active ,if PV exceeds SV over 5.0)



Press SET Key — To display parameter AL1

Press ≪ Key — To change AL1 value

Press ∧ Key — Increase AL1 value

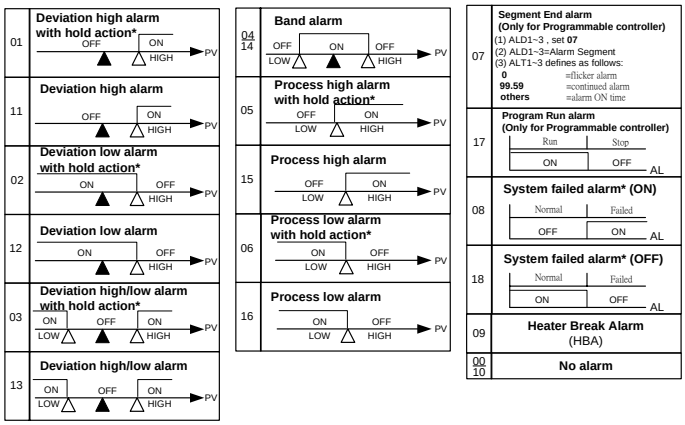
Press SET Key — Store the new value of AL1

* There are total 16 alarm mode types ,referenced as below:

* To change Alarm mode ,press SET + ≪ key 5 seconds to enter Level 3(Input Level) and then change the value of ALD1/ALD2/ALD3.

5.Alarm mode type (Referenced for ALD1/ALD2/ALD3)

(▲ :SV △ :Alarm set value)

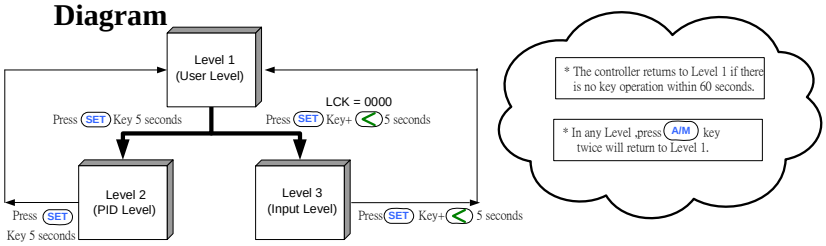


***Hold action:**
When Hold action is ON ,the alarm action is suppressed at start-up until the measured value(PV) enters the non-alarm range.

***System failed:**
It means that the controller display error message with one of following :
"UUU1" or "NNN1" or "CJCE"

6 Parameter List

Levels Diagram



Parameter / Default Value — Description

Level 1 (User Level)

Process Value / Set Value	P.V / S.V	
Output Limt	OUtL / 100.0	
Autotuning	At / YES/no	
Alarm 1 set value	AL1 / 0.0	
Heater current display (HBA set value)	c.00 / 0.0	Display If P1=0
Alarm 2 set value	AL2 / 0.0	
Alarm 3 set value	AL3 / 0.0	

Display if output2 is provided

Level 2 (PID Level)

P1 / 3.0	Proportional band 1 (For output 1)	Range：0.0~200.0% ON/OFF control if set to 0 (0.0)
I1 / 240	Integral time 1 (For output 1)	Range：0~3600 seconds PD control if set to 0
d1 / 60	Derivative time 1 (For output 1)	Range：0~900 seconds PI control if set to 0
db1 / 0	Dead-band time	Don't care
AtvL / 0	Auto tuning offset value	Range：0~USPL
CYt1 / 10	Output 1 cycle time	Range：0~150 seconds Relay output : 10 Voltage pulse output : 1 , mA output: 0
HYS1 / 1	Hysteresis for output 1 ON/OFF control	Range：0~1000
P2 / 3.0	Proportional band 2 (For output 2)	The same with P1
I2 / 240	Integral time 2 (For output 2)	The same with I1
d2 / 60	Derivative time 2 (For output 2)	The same with D1
CYt2 / 10	Output 2 Cycle time	The same with CYT1
HYS2 / 1	Hysteresis for output 2 ON/OFF control	The same with HYS1
GAP1 / 0	Control gap 1 (For output 1)	Set point of output 1 (Heating side) =SV - GAP1
GAP2 / 0	Control gap 2 (For output 2)	Set point of output 2 (Cooling side) =SV + GAP2
LCY / 0000	Function lock	

Display If P2=0

Return to "P1"

LCK	Levels entering available			Parameters which can be changed
	Level 1 (User Level)	Level 2 (PID Level)	Level 3 (Input Level)	
0000	◎	◎	◎	All parameters (Factory set value)
1111	◎	◎	-----	All parameters
0100	◎	◎	-----	All parameters except Level 3
0110	◎	◎	-----	Parameters in Level 1
0001	◎	◎	-----	SV" and "LCK"
0101	◎	◎	-----	Only "LCK"

Level 3 (Input Level)

INP1 / J2	Input type selection	
ANL1 / 0	Analog input low limit calibration (Used for mA and V input)	Range：-1999 ~ 9999
ANH1 / 5000	Analog input high limit calibration (Used for mA and V input)	Range：0 ~ 9999
dP / 0000	Decimal point position (Available for mA and V input)	0000，000.0，00.00，0.000
LSPL / 0.0	Lower Set-Point Limit	Scaling Low Limit
USPL / 400.0	Upper Set-Point Limit	Scaling High Limit
ANL2 / 0	Remote input low limit calibration	Range：-1999 ~ 9999
ANH2 / 5000	Remote input high limit calibration	Range：0 ~ 9999
ALd1 / 11	Alarm mode of AL1	Range:00~19 Refer to "Alarm mode type"
ALt1 / 99.59	Alarm time of AL1	Range：0~99 Min 59 Secs 0=Flicker Alarm，99:59=Continued Others=On delay time (If ALD=07 , ALT means alarm on time)
ALd2 / 0	Alarm mode of AL2	The same with ALD1
ALt2 / 99.59	Alarm time of AL2	The same with ALT1
ALd3 / 0	Alarm mode of AL3	The same with ALD1
ALt3 / 99.59	Alarm time of AL3	The same with ALT1
HYSA / 0.0	Hysteresis of all Alarm	Range：0~1000
CLO1 / 230	Output 1 low limit calibration (Used for mA and V output)	Range：0 ~ 9999
CHO1 / 3600	Output 1 high limit calibration (Used for mA and V output)	Range：0 ~ 9999
CLO2 / 230	Output 2 low limit calibration (Used for mA and V output)	The same with CLO1
CHO2 / 3600	Output 2 high limit calibration (Used for mA and V output)	The same with CHO1
CLO3 / 0	Retransmission low limit calibration	The same with CLO1
CHO3 / 5000	Retransmission high limit calibration	The same with CHO1
r.Cy / 5	Full run time of proportional motor (Used for proportional motor valve control output)	Range：5~200 seconds
CAnt / 0.0	Used for programmable controller to wait continued operation	0=Not wait Others=Wait value
SEtA / 0000		
PSL / rtU	Communication Protocol Selection	MODBUS RTU / MODBUS ASCII / TAIE
bitS / 8_81	Communication Bits Configuration	O _ 81 / O _ 82 / E _ 81 / E _ 82
Id.nO / 1	ID number	Range：0 ~ 255
bAUd / 384	Baudrate	2400 / 4800 / 9600 / 19200 / 38400 bps
S.OS / 0.0	SV compensation	Range：-1000~1000
P.OS / 0.0	PV compensation	Range：-100.0~500.0
UNIt / C	Unit of PV & SV	C(℃) / F(℉) / A(Analog)
P.FiL / 200	PV Filter	PV will responese faster if PVFT is smaller.
CASC / 0.0	Reserved	
OUAd / HEAt	Action mode	Heat / Cool
OPAd / Pid	Control algorithm	PID / Fuzzy
Hz / 60Hz	Frequency	50 / 60HZ

Return to "INP1"

7 Error Displays

in 1E	IN1E : Input 1 Error
	Check whether input loop is opened or wiring incorrect.
CJCE	CJCE :Cold Junction Compensation Failed
	Check the compensation diode outside controller.
uuu 1	UUU1 : PV is above USPL
	Check whether the input value is correct or not.
nnn 1	NNN1 : PV is below LSPL
	Check whether the input value is correct or not.
AdCF	ADCF :A/D Convert Failed
	Controller needs to be repaired.
rAMF	RAMF :RAM Failed
	Controller needs to be repaired.

8 Specifications

Standard Spec.

Model		FY400	FY600	FY700	FY800	FY900
Dimension		48X48mm	96X48mm	72X72mm	48X96mm	96X96mm
Supply voltage		AC 85~265V , DC24V (Optional)				
Frequency		50/60 HZ				
Power Consumption		approx 3VA	approx 4VA	approx 3VA	approx 4VA	approx 4VA
Memory		Non-volatile memory E^2PROM				
Input		Measurement input. Sample time : 250ms,0.2% of FS				
	TC	K , J , R , S , B , E , N , T , W , PL2 , U , L				
	RTD	PT100 , JPT100 , JPT50				
	mA dc	4~20mA , 0~20mA				
	Voltage dc	0~1V , 0~5V , 0~10V , 1~5V , 2~10V , -10~10mV , 0~10mV , 0~20mV , 0~50mV , 10~50mV				
	DP Position	0000 , 000.0 , 00.00 , 0.000 (available for mA or Voltage dc input)				
Output 1		Main control output				
	Relay	SPST type	SPDT type	SPDT type	SPDT type	SPDT type
		3A , 220V , electrical life : 100,000 times or more(under the rated load).				
	Voltage Pulse	For SSR drive. ON:24V , OFF:0V , maximum load current:20mA.				
	mA dc	4~20mA , 0~20mA .Maximum load resistance:560 Ω				
	Voltage dc	0~5V , 0~10V ,1~5V ,2~10V. Maximum load current:20mA.				
Alarm 1		SPST type	SPDT type	SPST type	SPDT type	SPDT type
		A , 220V , electrical life : 100,000 times or more(under the rated load).				
Control algorithms		PID , P , PI , PD , ON/OFF(P=0) , FUZZY				
PID range		P:0~200% , I:0~3600 Secs , D:0~900 Secs				
Isolation		Output terminal (control output , alarm ,transmission) and Input terminal are isolated separately.				
Isolated resistance		10M Ω or more between input terminals and case(ground) at DC 500V ,10M Ω or more between output terminals and case(ground) at DC 500V				
Dielectric strength		1000V AC for 1 minute between input terminals and case(ground) ,1500V AC for 1 minute between output terminals and case(ground)				
Operating temperature		0~50℃				
Humidity range		20~90% RH				
Weight		FY400 approx 150g ,FY600/700/800 approx 225g , FY900 approx 300g.				
Display Height		PV:7mm SV:7mm	PV:7mm SV:7mm	PV:14mm SV:10mm	PV:7mm SV:7mm	PV:14mm SV:10mm

Optional Spec.

Model	FY400	FY600	FY700	FY800	FY900
Programmable RAMP/SOAK	2 Patterns with 8 segments each .				
	The 2 patterns can be linked together as 16 segments use.				
Output 2	For heating and cooling control use. Relay , SSR , 4~20mA , 0~20mA , 0~5V , 0~10V , 1~5V , 2~10V				
Alarm 2	SPST type	SPDT type	SPDT type	SPDT type	SPDT type
	3A , 220V , electrical life : 100,000 times or more(under the rated load).				
Alarm 3	Not available	Available	Available	Available	Available
		SPST type	SPST type	SPST type	SPST type
	3A , 220V , electrical life : 100,000 times or more(under the rated load).				
Heater Break Alarm (HBA)	Display range of heater current : 0.0~99.9A , Accuracy : 1%FS				
	Included CT : SC-80-T(5.8mm dia , 0.0~80.0A) or SC-100-T(12mm dia , 0.0~99.9A)				
	Alarm relay : AL1				
Transmission	Available for PV or SV transmission				
	4~20mA , 0~20mA , 0~1V , 0~5V , 0~10V , 1~5V , 2~10V				
Remote SV Input	4~20mA , 0~20mA , 0~1V , 0~5V , 0~10V , 1~5V , 2~10V				
Communication	Protocol : MODBUS RTU , MODBUS ASCII , TAIE				
	RS232 , RS485 , TTL				
	Baud rate: 2400 , 4800 , 9600 , 19200 , 38400 bps				
	Data bits : 8 , Stop bit : 1 or 2bit , Odd or Even parity.				
WaterProof/DustProof	IP65				

9 Order Information

Model & Suffix codes

Model

FY400 —

FY400 48x48mm
FY600 96x48mm
FY700 72x72mm
FY800 48x96mm
FY900 96x96mm
(STANDARD)

P FY400 48x48mm
P FY600 96x48mm
P FY700 72x72mm
P FY800 48x96mm
P FY900 96x96mm
(RAMP/SOAK Programmable)

Output1

0	None
1	Relay
2	Voltage Pulse (SSR Drive)
3	4~20mA
4	0~20mA
A	0~5V
B	0~10V
C	1~5V
D	2~10V
5	1 φ SCR *ZERO CROSS* CONTROL
6	3 φ SCR *ZERO CROSS* CONTROL
7	Motor valve control
8	1 φ SCR **PHASE ANGLE** CONTROL
9	3 φ SCR **PHASE ANGLE** CONTROL

Output2

0	None
1	Relay
2	Voltage Pulse (SSR Drive)
3	4~20mA
4	0~20mA
A	0~5V
B	0~10V
C	1~5V
D	2~10V

Alarm

0	None
1	1 Set
2	2 Sets
3	3 Sets
A	HBA *
B	HBA + AL2
C	HBA + AL2+AL3

TRS

0	None
1	4~20mA
2	0~20mA
A	0~5V
B	0~10V
C	1~5V
D	2~10V

Remote SV

0	None
1	4~20mA
2	0~20mA
A	0~5V
B	0~10V
C	1~5V
D	2~10V

Communication

0	None
1	RS232
2	RS485
3	TTL
A	RS232_MODBUS
B	RS485_MODBUS

Input Type — 02 — See Input Codes

Power

A	AC 85~265V
D	DC 24V

Water/Dust Proof

N	None
W	IP65

✻HBA:Heater Break Alarm(HBA must use AL1 as alarm relay)

✻ ■ Block means option functions with additional charge

Combination of options and models O Available X Not available

Options / Model	RAMP/SOAK PROGRAM	Output 1					Output2	Alarm2	Alarm3	HBA	TRS	Remote SV	Communication	DC 24V Power
		1 φ SCR_Z	3 φ SCR_Z	Motor valve control	1 φ SCR_P	3 φ SCR_P								
FY400	O	O	X	O	X	X	O	O	X	O	O	O	O	O
FY600	O	X	X	O	O	X	O	O	O	O	O	O	O	O
FY700	O	O	X	O	O	X	O	O	O	O	O	O	O	O
FY800	O	X	X	O	O	X	O	O	O	O	O	O	O	O
FY900	O	O	O	O	O	O	O	O	O	O	O	O	O	O

✻HBA function and Remote SV function can not be specified in the same model

Input type table

		TYPE	CODE	RANGE	TYPE	CODE	RANGE	TYPE	CODE	RANGE
TC	K	K1	01	0.0~200.0℃(392.0℉)	K2	02	0.0~400.0℃(752.0℉)	K3	03	0~600℃(1112℉)
		K4	04	0~800℃(1472℉)	K5	05	0~1000℃(1832℉)	K6	06	0~1200℃(2192℉)
	J	J1	07	0.0~200.0℃(392.0℉)	J2	08	0.0~400.0℃(752.0℉)	J3	09	0~600℃(1112℉)
		J4	10	0~800℃(1472℉)	J5	11	0~1000℃(1832℉)	J6	12	0~1200℃(2192℉)
	R	R1	13	0~1600℃(2912℉)	R2	14	0~1769℃(3216℉)			
	S	S1	15	0~1600℃(2912℉)	S2	16	0~1769℃(3216℉)			
	B	B1	17	0~1820℃(3308℉)						
	E	E1	18	0~800℃(1472℉)	E2	19	0~1000℃(1832℉)			
	N	N1	20	0~1200℃(2192℉)	N2	21	0~1300℃(2372℉)			
	T	T1	22	0.0~400.0℃(752.0℉)	T2	23	0.0~200.0℃(392.0℉)	T3	24	0.0~350.0℃(662.0℉)
	W	W1	25	0~2000℃(3632℉)	W2	26	0~2320℃(4208℉)			
	PLII	PL1	27	0~1300℃(2372℉)	PL2	28	0~1390℃(2534℉)			
	U	U1	29	-199.9~600.0℃(999.9℉)	U2	30	-199.9~200.0℃(392.0℉)	U3	31	0.0~400.0℃(752.0℉)
	L	L1	32	0~400℃(752℉)	L2	33	0~800℃(1472℉)			
RTD	JPT 100	JP1	41	-199.9~600.0℃(999.9℉)	JP2	42	-199.9~400.0℃(752.0℉)	JP3	43	-199.9~200.0℃(392.0℉)
		JP4	44	0~200℃(392℉)	JP5	45	0~400℃(752℉)	JP6	46	0~600.0℃(1112℉)
	PT 100	DP1	47	-199.9~600.0℃(999.9℉)	DP2	48	-199.9~400.0℃(752.0℉)	DP3	49	-199.9~200.0℃(392.0℉)
		DP4	50	0~200℃(392℉)	DP5	51	0~400℃(752℉)	DP6	52	0~600℃(1112℉)
	JPT 50	JP.1	53	-199.9~600.0℃(999.9℉)	JP.2	54	-199.9~400.0℃(752.0℉)	JP.3	55	-199.9~200.0℃(392.0℉)
		JP.4	56	0~200℃(392℉)	JP.5	57	0~400℃(752℉)	JP.6	58	0~600℃(1112℉)

	TYPE	CODE	RANGE	
LINEAR	AN1	61	-10~10mV	-1999~9999 or -199.9~999.9 or -19.99~99.99 or -1.999~9.999
		62	-2~2V	
		63	-5~5V	
		64	-10~10V	
	AN2	71	0~10mV	
	AN3	76	0~20mV	
	AN4	81	0~50mV	
		82	0~20mA	
		83	0~1V	
		84	0~5V	
		85	0~10V	
		86	0~5KR	
		87	0~2V	
	AN5	91	10~50mV	
		92	4~20mA	
		93	1~5V	
		94	2~10mV	