



Digital PID

Temperature/Process Controllers

FU Series

Integrated Mold

Technology Leadership

High Light LED New feelings



Best comparison of price and function



Match to RoHs System

V B Electronics & Controls

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BEST CHOICE FOR PROCESS AND TEMPERATURE CONTROL

Application: Control temperature, humidity, pressure, flow and PH.



FU series controllers are microprocessor based controllers. Which have been designed with high accuracy input, various output selection, useful options and good reliability at a competitive price.

FU series use "PID+FUZZY" algorithm to implement excellent control.

The output status is displayed on the built in "Bar-Graph" display.

FU series also provide "Programmable RAMP/SOAK" function and has 2 patterns by 8 segments, to elevate or decrease temperature.

FU series support MODBUS protocol. Communication with HMI is more convenient.

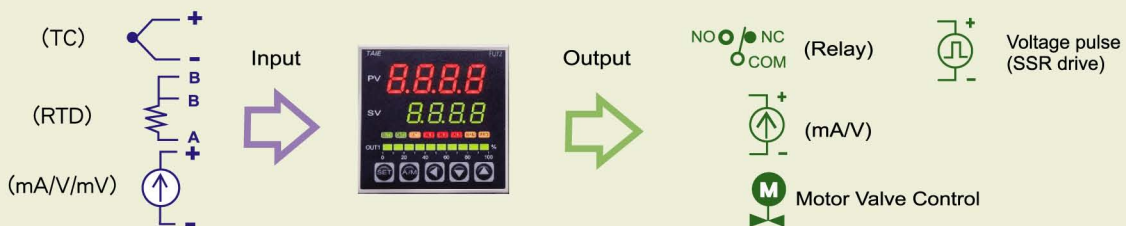
Available in 4 sizes, the models and sizes are as below:

FU48: 48X48mm (DIN 1/16) FU86: 48X96mm (DIN 1/8)

FU72: 72X72mm (DIN 3/16) FU96: 96X96mm (DIN 1/4)

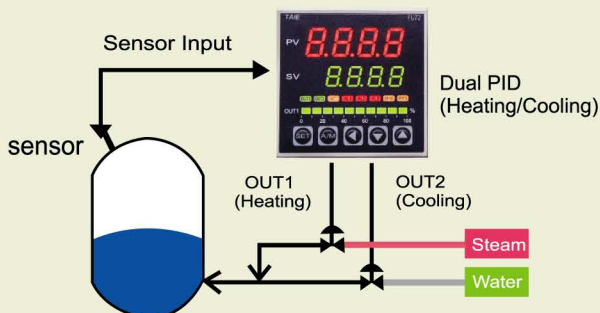
Multi-Option of input & output

- Completely correspond to any kinds of input signal like Thermo couple, RTD PT100, and DC4~20mA. 0~5V.etc.
- Satisfy any requests for output mode like DC4~20mA, 0~5V Voltage, Current & the relay output of capacity 8A
- It provides with 3 features of Controller, Signal converter and Alarm monitor. It can be changed the signal of mV, V, RTD to the output of Voltage & Current 4~20mA instead of the signal converter.
- Separately design for signal circuit and power circuit on PC board, effectively restrain the external interference of electric wave.



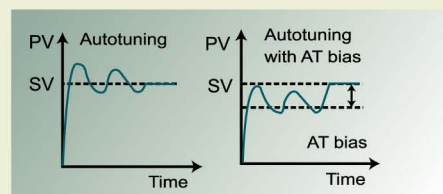
Optimize function

Heating and Cooling Control



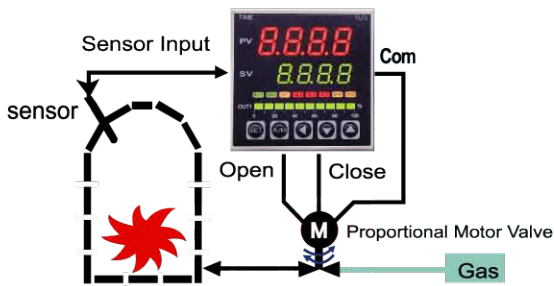
PID autotuning control

It will make to calculate optimize PID value.

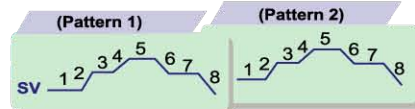


When autotuning acts, it will make PV hunting 1~2 cycle to calculate optimize PID value. To protect user's device, **FU** series controller can perform PV hunting below SV by setting AT bias value(ATVL).

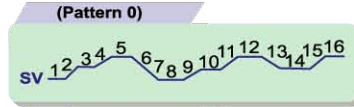
Motor Valve Control



Ramp/Soak Program

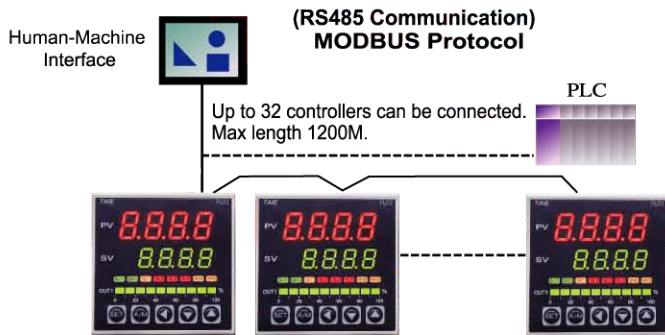


There are 2 patterns by 8 segments can be used in ramp/soak program.



There are 2 patterns can be linked together as 16 segments in ramp/soak program.

RS-485 Communication



TTL Communication

(TTL Communication)

Up to 10 controllers can be connected. Max length 1M.



The SV value of slave controllers will be remotely by master controller, and reached to max value at the same time

Operations

1. Power ON: Controller will display as the 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 < Key: To store the new set value.

3. Auto Tuning (AT):

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



Press < Key: To display parameter AT.
 Press < Key: To change AT setting.
 Press < Key: Change AT to 'YES'.
 Press < Key: Start Autotuning process (AT lamp will be lighted on).
 AT light on: Auto Tuning started.
 AT light off: Auto Tuning finished.

4. Change the Alarm value:

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



Press < Key: To display parameter AL1
 Press < Key: To change AL1 value
 Press < Key: Increase AL1 value
 Press < Key: Store the new value of AL1

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

Alarm Types

Alarm types list as below:

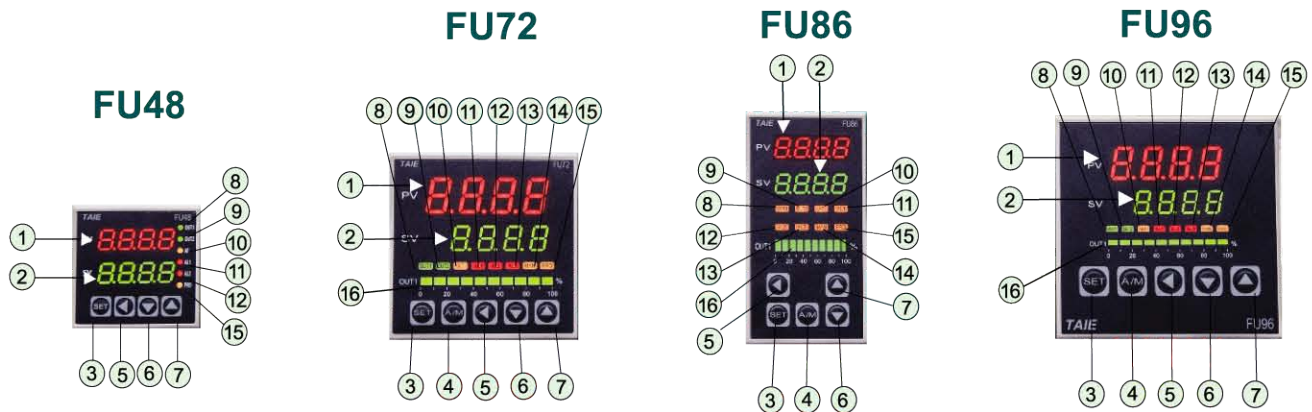
Deviation	System
Deviation High Alarm	System Failed Alarm System Normal Alarm
Deviation Low Alarm	
Deviation High/Low Alarm	
Band Alarm	
PV	Program
PV High Alarm	Program Run Alarm
PV Low Alarm	Program End Alarm Segment End Alarm

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

01	Deviation high alarm with hold action* OFF ON LOW HIGH PV	04	Band alarm OFF ON OFF PV LOW HIGH	07	Segment End alarm (Only for Programmable controller) (1)ALD1~3, set 07 (2)ALD1~3=Alarm Segment (3)ALD1~3 defines as follows: = 0 = flicker alarm = 99, 59 = continued alarm = others = alarm ON Delay time
11	Deviation high alarm OFF ON LOW HIGH PV	05	Process high alarm with hold action* OFF ON LOW HIGH PV	17	Program Run alarm (Only for Programmable controller) Run Stop ON OFF AL
02	Deviation high alarm with hold action* ON OFF LOW HIGH PV	15	Process high alarm OFF ON LOW HIGH PV	08	System failed alarm*(ON) Normal Failed OFF ON AL
12	Deviation low alarm ON OFF LOW HIGH PV	06	Process low alarm with hold action* ON OFF LOW HIGH PV	18	System failed alarm*(OFF) Normal Failed ON OFF AL
03	Deviation high/low alarm with hold action* ON OFF ON LOW HIGH PV	16	Process low alarm ON OFF LOW HIGH PV	09	Heater Break Alarm (HBA)
13	Deviation high/low alarm ON OFF ON LOW HIGH PV			00	No alarm
				10	

▲:SV △: Alarm set value

Parts Description



SYMBOL	NAME	FUNCTION	SYMBOL	NAME	FUNCTION
PV	① Measured value (PV)display	Displays PV or various parameter symbols(Red)	OUT1	⑧ OUT1 lamp	Lights when OUT 1 is on
SV	② Setting value (SV)display	Displays SV or various parameter values(Green)	OUT2	⑨ OUT2 lamp	Lights when OUT 2 is on
SET	③ Set Key	Used for parameter calling up and set value registration	AT	⑩ Autotuning lamp	Lights when Autotuning is activated
A/M	④ Auto/Manual key	Switches between Auto(PID) output mode and Manual output	AL1	⑪ Alarm 1 lamp	Lights when Alarm 1 is activated
<	⑤ Shift Key	Shift digits when settings are changed	AL2	⑫ Alarm 2 lamp	Lights when Alarm 2 is activated
∨	⑥ Down Key	Decrease numbers (*Only for programmable controller)	AL3	⑬ Alarm 3 lamp	Lights when Alarm 3 is activated
∧	⑦ Up Key (*Program Run)	Increase numbers (*Only for programmable controller)	MAN	⑭ Manual output lamp	Lights when manual output is activated
			PRO	⑮ *Program Running lamp	*Flashes when program running (Only for programmable controller)
			OUT1%	⑯ Output 1% Bar-Graph display	Output 1% is displayed on 10-dot LEDs

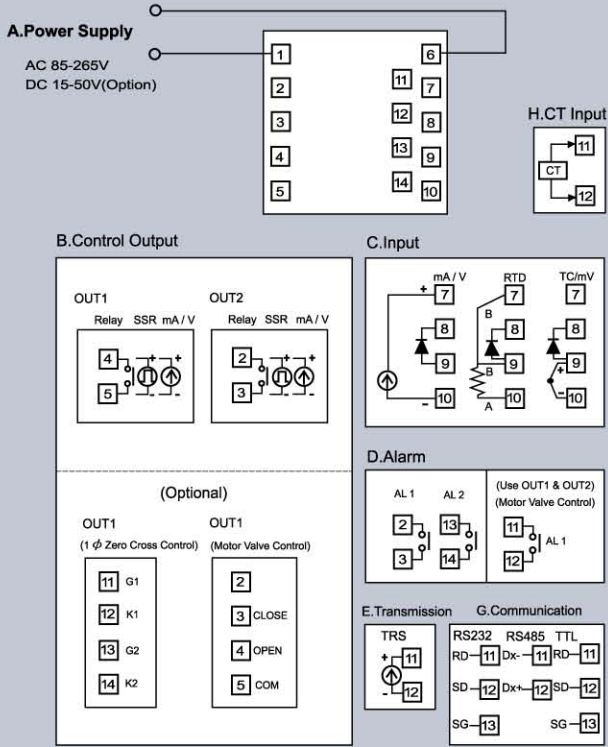
Unit : mm

External Dimension

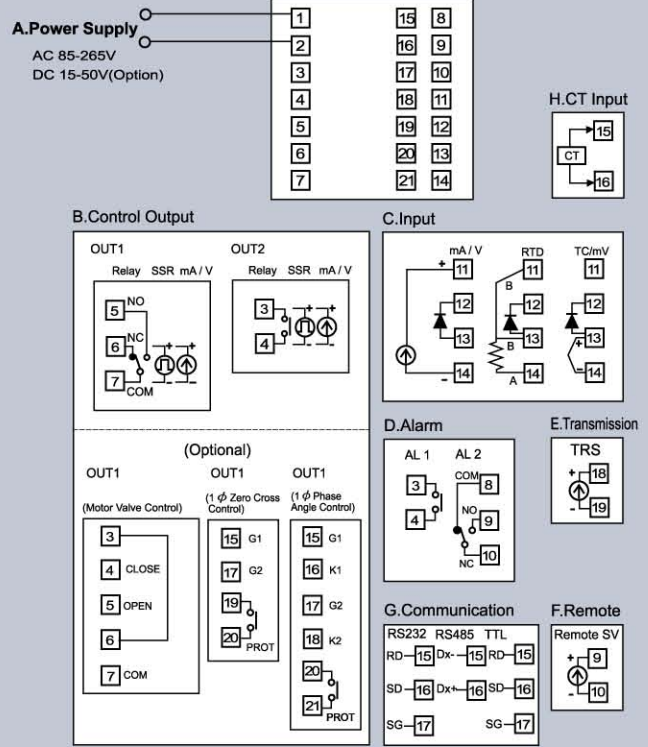
FU48			
FU72			
FU86			
FU96			

Terminal Arrangement

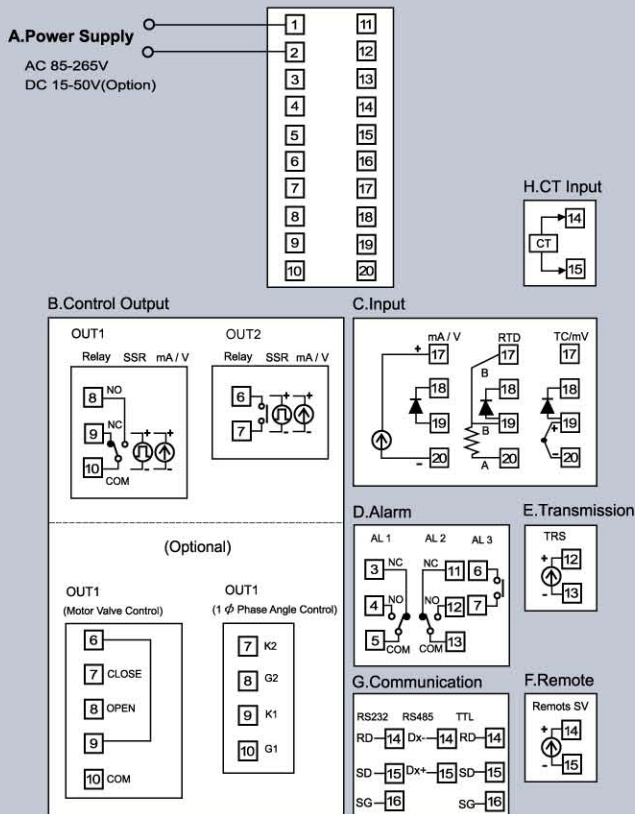
FU48



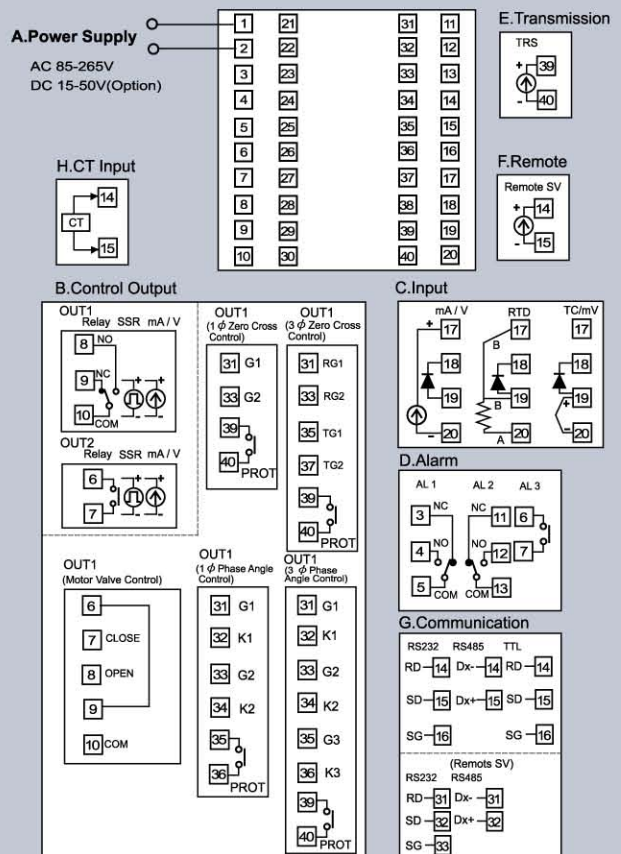
FU72



FU86



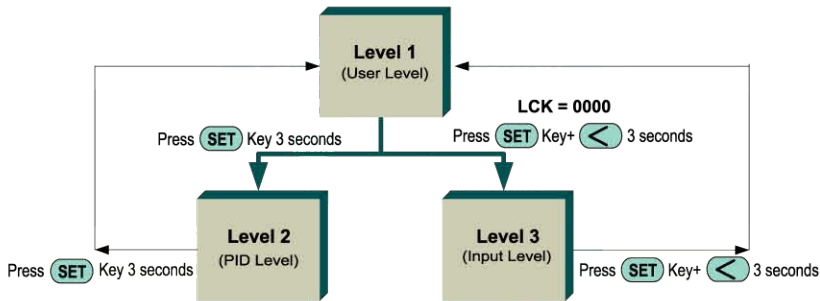
FU96



Levels Explanation

Levels Diagram

- When the power is on, it will stay at Level 1 (User Level) automatically.
 - The controller returns to Level 1 if there is no key operation within 60 seconds.
 - In any Level, press **A/M** key twice will return to Level 1.
- (FU48 don't have **A/M** key)



Level 1 (User Level)

Process Value	P V
Set Value	S V
Output Limit	OU L
Autotuning	AL
Alarm 1 set value	AL 1
Alarm 2 set value	AL 2
Alarm 3 set value	AL 3

Return to "P V"

Level 2 (PID Level)

P 1	Proportional band 1 (For output 1)	Range : 0.0~200.0% ON/OFF control if set to 0 (0.0)
I 1	Integral time 1 (For output 1)	Range : 0~3600 seconds PD control if set to 0
D 1	Derivative time 1 (For output 1)	Range : 0~900 seconds PI control if set to 0
DBT	Dead-band time	FU don't have this function
ATV	Auto tuning offset value	Range : 0~USPL
CYT 1	Output 1 cycle time	Range : 0~150 seconds Relay output : 10 Voltage pulse output : 1, mA output : 0
HYS 1	Hysteresis for output 1 ON/OFF control	Range : 0~1000 PV > (SV+HYS1), OFF PV ≤ (SV-HYS1), ON
P 2	Proportional band 2 (For output 2)	The same with P1
I 2	Integral time 2 (For output 2)	The same with I1
D 2	Derivative time 2 (For output 2)	The same with D1
CYT 2	Output 2 Cycle time	The same with CYT1
HYS 2	Hysteresis for output 2 ON/OFF control	The same with HYS1
GAP 1	Control gap 1 (For output 1)	Set point of output 1 (Heating side) =SV - GAP1 (Set when it has duel display)
GAP 2	Control gap 2 (For output 2)	Set point of output 2 (Cooling side) =SV + GAP2 (Set when it has duel display)
LCK	Function lock	

Return to "P V"

Level 3 (Input Level)

IN P 1	Input type selection	
L 2	Analog input low limit calibration (Used for mA and V input)	Range : -1999 ~ 9999
RHL 1	Analog input high limit calibration (Used for mA and V input)	Range : 0 ~ 9999
DP	Decimal point position (Available for mA and V input)	0000, 000.0, 00.00, 0.000
LSPL	Lower Set-Point Limit	Scaling Low Limit
USPL	Upper Set-Point Limit	Scaling High Limit
RNL 2	Remote input low limit calibration	(FU don't have this function)
RNH 2	Remote input high limit calibration	(FU don't have this function)
ALd 1	Alarm mode of AL1	Range: 00~18 Refer to "Alarm mode type"
ALt 1	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)
ALd 2	Alarm mode of AL2	The same with ALd 1
ALt 2	Alarm time of AL2	The same with ALt 1
ALd 3	Alarm mode of AL3	(FU48 don't have AL3)
ALt 3	Alarm time of AL3	(FU48 don't have AL3)
HYS A	Hysteresis of all Alarm	Range : 0~1000
CLO 1	Output 1 low limit calibration (Used for mA and V output)	Range : 0 ~ 9999
CHO 1	Output 1 high limit calibration (Used for mA and V output)	Range : 0 ~ 9999
CLO 2	Output 2 low limit calibration (Used for mA and V output)	The same with CLO1
CHO 2	Output 2 high limit calibration (Used for mA and V output)	The same with CHO1
CLO 3	Retransmission low limit calibration	(FU don't have this function)
CHO 3	Retransmission high limit calibration	(FU don't have this function)
FR	Full run time of proportional motor (Used for proportional motor valve control output)	Range : 5~200 seconds
ARt	Used for programmable controller to wait continued operation	0=Not wait Others=Wait value
SEt A	Alarm forward / inverse action setting can force the use of a-contact into b-contact	Level 4 setting please ask distributor
PSL	Communication Protocol Selection	MODBUS RTU / MODBUS ASCII / TAIE
b.tS	Communication Bits Configuration	0_81 / 0_82 / E_81 / E_82
ID	ID number	Range : 0 ~ 255
BAUD	Baudrate	2400 / 4800 / 9600 / 19200 / 38400 bps
SV	SV compensation	Range : -1000~1000
PV	PV compensation	Range : -100.0~500.0
UNIT	Unit of PV & SV	C(°C) / F(°F) / A(Analog)
PVF	PV Filter	PV will response faster if PVFT is smaller.
CRSC	Reserved	FU don't use it
OUd	Action mode	Heat / Cool
OPAd	Control algorithm	PID / Fuzzy
H=	Frequency	50 / 60HZ

Return to "IN P 1"

LCK	Levels entering available			Parameters can be changed or not
	Level 1 (User Level)	Level 2 (PID Level)	Level 3 (Input Level)	
0000	Yes	Yes	Yes	All parameters (Factory set value)
1111	Yes	Yes	No	All parameters except Level 3
0100	Yes	Yes	No	All parameters except Level 3
0110	Yes	Yes	No	Parameters in Level 1
0001	Yes	Yes	No	SV" and "LCK"
0101	Yes	Yes	No	Only "LCK"

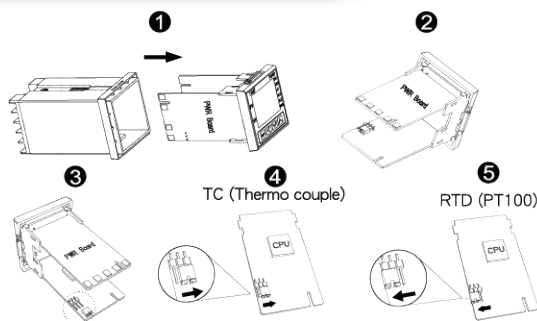
Specifications

	FU48	FU72	FU86	FU96
Model	FU48	FU72	FU86	FU96
Dimension	48X48mm	72X72mm	48X96mm	96X96mm
Supply voltage	AC 85~265V / DC 24V (option)			
Frequency	50/60 HZ			
Power Consumption	approx 4VA			
Memory	Non-volatile memory E ² PROM			
Input	Accuracy : 0.2%FS, Sample time : 250ms			
TC	K, J, R, S, B, E, N, T, W5Re/W26Re, PL2, U, L			
RTD	PT100, JPT100			
mA dc	DC 4~20mA, 0~20mA			
Voltage dc	DC 0~1V, 0~5V, 0~10V, 1~5V, 2~10V DC -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) According to the input type, °C/°F can be displayed to one decimal			
Output 1	Main control output to HEAT mode or COOL mode			
Relay	SPST type	SPDT type	SPDT type	SPDT type
Voltage Pulse	8A, 240V, electrical life : 100,000 times or more(under the rated load).			
mA dc	For SSR drive. ON:24V, OFF:0V, maximum load current: DC 20mA.			
Voltage dc	DC 4~20mA, 0~20mA ° maximum load resistance: 560Ω.			
Alarm 1	SPST type	SPST type	SPDT type	SPST type
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	0~65°C			
Humidity range	0~50°C / 20~90% RH			
Weight (approx)	approx150g	approx 225g	approx 225g	approx300g
LED Display(PAT.)	high light technology, Red/Green/Orange with in one Module			
RAMP/SOAK Program	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	SPST type	SPST type	SPST type	SPST type
Voltage Pulse	For SSR drive. ON:24V, OFF:0V, maximum load current: DC 20mA.			
mA dc	DC 4~20mA, 0~20mA .Maximum load resistance:560 Ω			
Voltage dc	DC 0~5V, 0~10V, 1~5V, 2~10V. Maximum load current: DC 20mA.			
Alarm 2	SPST type	SPDT type	SPDT type	SPDT type
Alarm 3	None	SPST type	SPST type	SPST type
Heat 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			
mA dc	DC 4~20mA, 0~20mA. Maximum load resistance : 560 Ω			
Voltage dc	DC 0~5V,0~10V,1~5V,2~10V. Maximum load current : DC 20mA.			
Remote SV	DC 4~20mA, 0~20mA, 0~5V, 0~10V, 1~5V, 2~10V are available			
Communication	Protocol : MODBUS RTU,MODBUS ASCII, TAIE Interface : RS232, RS485, TTL Baudrate : 38400, 19200, 9600, 4800, 2400 bps. 8 bit, Start bit : 1 bit, Parity : Odd or Even, Stop bit : 1 or 2 bit			
Water Proof	IP65			

Standard Spec.

Optional Spec.

Input Type Change of TC ↔ RTD



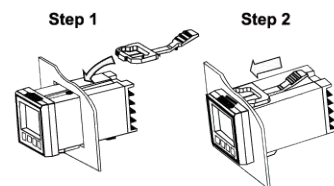
1. Take out the main body from outer case: adjust the jumper to the correct place
2. Start power after setting jumper to the correct place
3. Amend the input type from the front membrane to enter in Level 3 to set.
4. Please be sure to cut off power and start again after amending input type so that the new parameters could be effective.
5. To change input type of TC or RTD is available but linear input is unavailable. Please ask our local distributor for help.

New High Light LED Module Display



Brand-new one set of LED Module design provides more easy and clear reading.

To mount panel easily



To push the clamp of special structure design without using screw to the end can be smoothly fixed on the panel.

Model & Suffix codes

Model	Output1	Output2	Alarm	TRS	Remote SV	Communication	Input Type	Power	Water/Dust Proof
FU48 (STANDARD)	1	0	1	0	0	0	02	A	N
FU48 48x48mm	0 None	0 None	0 None	0 None	0 None	0 None	See Input Codes	A AC 85~265V	N None
FU72 72x72mm	1 Relay	1 Relay	1 1 Set	1 4~20mA	1 4~20mA	1 4~20mA		D DC 24V	W IP65
FU86 48x96mm	2 Voltage Pulse (SSR Drive)	2 Voltage Pulse (SSR Drive)	2 2 Sets	2 0~20mA	2 0~20mA	2 0~20mA			
FU96 96x96mm	3 4~20mA	3 4~20mA	3 3 Sets	A 0~5V	A 0~5V	A 0~5V	3 TTL		
(RAMP/SOAK Programmable)	4 0~20mA	4 0~20mA	A HBA*	B 0~10V	B 0~10V	B 0~10V	A RS232_MODBUS		
PFU48 48x48mm	A 0~5V	A 0~5V	B HBA+AL2	C 1~5V	C 1~5V	C 1~5V	B RS485_MODBUS		
PFU72 72x72mm	B 0~10V	B 0~10V	C HBA+AL2+AL3	D 2~10V	D 2~10V	D 2~10V			
PFU86 48x96mm	C 1~5V	C 1~5V							
PFU96 96x96mm	D 2~10V	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								

- Block means optional functions with additional charge
- Factory set value K2, code 02
- TC Input(K, J, R, S, B, E, N, T, W, PLII, U, L...) setting, can be changed to any types by user
- RTD(JPT 100, PT100) setting, can be changed to any type by user
- TC, RTD, LINEAR can be changed each other but need to change the parts of hardware. For more details, please contact local agents.
- HBA : Heater Break Alarm (HBA must use AL1 as alarm relay)

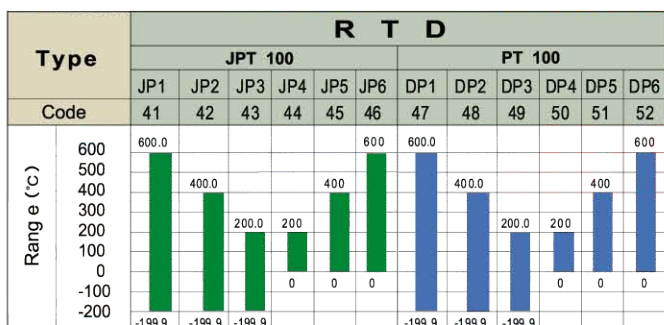
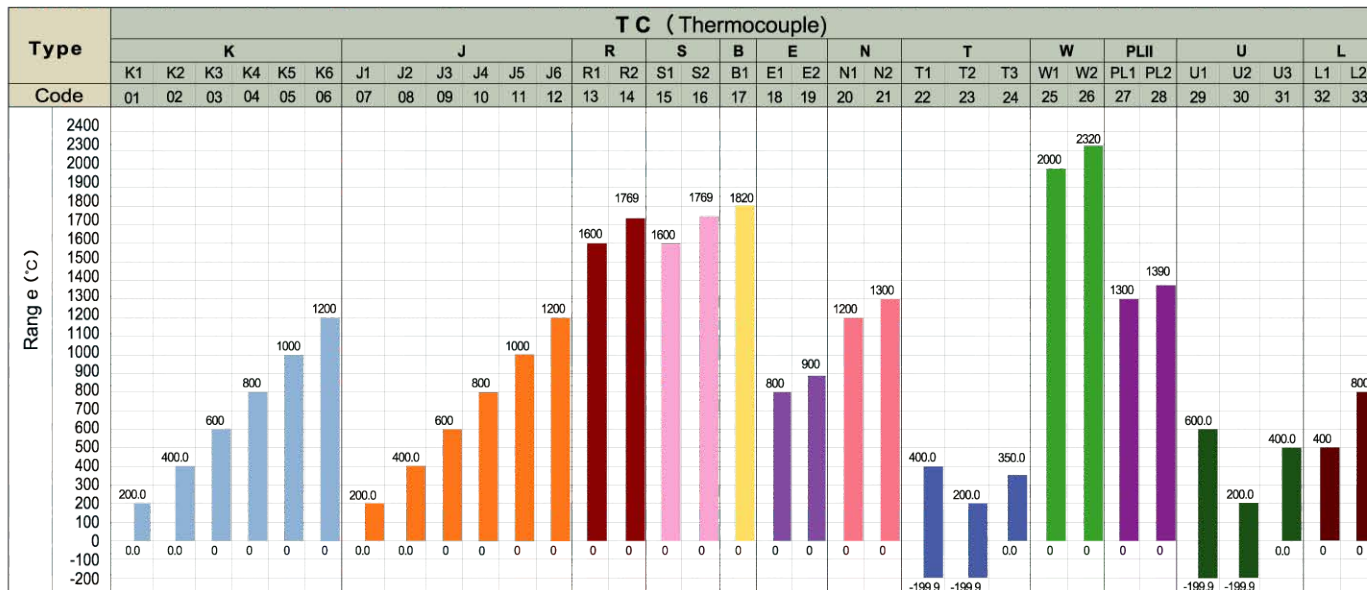
Combination of options and models

Options	RAMP/SOAK PROGRAM	Output 1					Output2	Alarm2	Alarm3	HBA	Transmission	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								
Model														
FU48	○	○	-	○	-	-	○	○	-	○	○	○	○	○
FU72	○	○	-	○	○	-	○	○	○	○	○	○	○	○
FU86	○	-	-	○	○	-	○	○	○	○	○	○	○	○
FU96	○	○	○	○	○	○	○	○	○	○	○	○	○	○

○ Available - Not available

* Remote SV function is not available, if HBA Function has been specified.

Input Type



Type	DC LINEAR					
	AN1			AN2		AN3
	Code	61	62	63	64	71
Input Range	-10~10mV	-2~2V	-5~5V	-10~10V	0~10mV	0~20mV
Set Range	Four kinds	-1999~9999	-199.9~999.9	-19.99~99.99	-1.999~9.999	

Type	DC LINEAR										
	AN4					AN5					
	Code	81	82	83	84	85	86	87	91	92	93
Input Range	0~50mV	0~20mA	0~1V	0~5V	0~10V	0~5KΩ	0~2V	10~50mV	4~20mA	1~5V	2~10V
Set Range	Four kinds of choices:										



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