

Digital PID

TAIE

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Temperature/Process Controllers

FU Series



*Integrated Mold
Technology Leadership*

High Light LED New feelings - new release



Best comparison of price and function

Programmable

Fuzzy

Autotuning

MODBUS



Match to RoHS System

Patent No. : ZL200820301949.5 、 M347604

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)

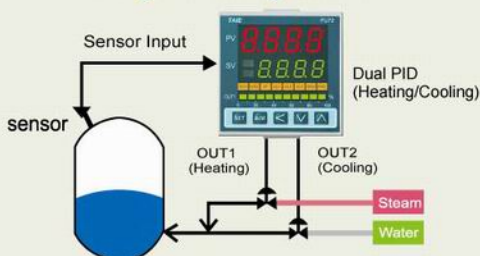
Multi-Option of input & output

- 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.



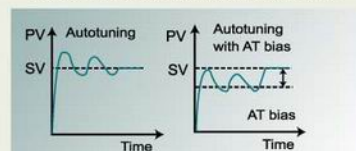
Optimize function

Heating and Cooling Control



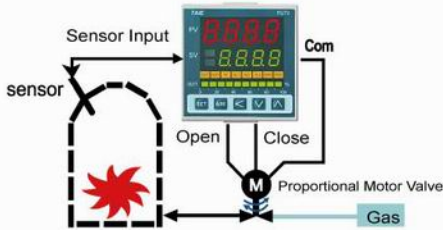
PID autotuning control

It will make to calculate optimize PID value.

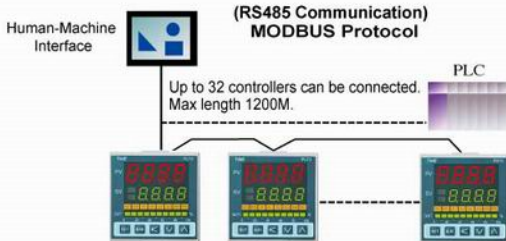


When autotuning acts, it will make PV hunting 1~2 cycle to calculate optimize PID value. To protect user's device, FU series controller can perform PV hunting below SV by setting AT bias value (ATVL).

Motor Valve Control



RS-485 Communication



Ramp/Soak Program



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

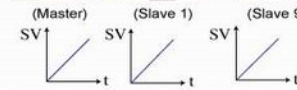


There are 2 patterns can be linked together as 16 segments in ramp/soak program.

TTL Communication

(TTL Communication)

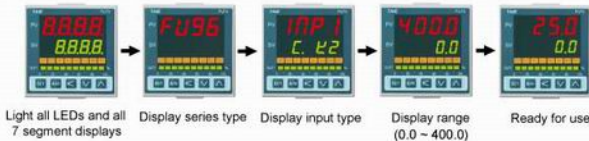
Up to 10 controllers can be connected. Max length 1M.



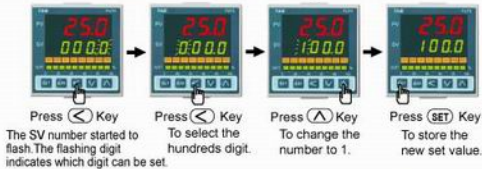
The SV value of slave controllers will be remotely by master controller, and reached to max value at the same time

Operations

1. Power ON: Controller will display as the following



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



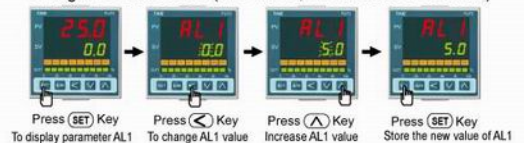
3. Auto Tuning (AT):

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



4. Change the Alarm value:

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



* To change Alarm mode, press (SET) + (<) 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
Deviation Low Alarm	System Normal Alarm
Band Alarm	
PV	Program
PV High Alarm	Program Run Alarm
PV Low Alarm	Program End Alarm
	Segment End Alarm

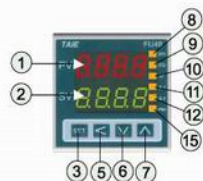
5. Alarm mode type (Referenced for ALD1/ALD2/ALD3)

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 = 99.99 = continued alarm = others = alarm ON Delay time
11 Deviation high alarm OFF ON LOW HIGH PV	14 Process high alarm with hold action* OFF ON OFF PV LOW HIGH	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	05 Process high alarm OFF ON OFF PV LOW HIGH	18 System failed alarm*(ON) Normal Failed OFF ON AL
12 Deviation low alarm ON OFF LOW HIGH PV	15 Process low alarm with hold action* ON OFF OFF PV LOW HIGH	System failed alarm*(OFF) Normal Failed ON OFF AL
03 Deviation high/low alarm with hold action* ON OFF OFF PV LOW HIGH	06 Process low alarm ON OFF OFF PV LOW HIGH	19 No alarm
13 Deviation high/low alarm ON OFF ON PV LOW HIGH	16 Process low alarm ON OFF OFF PV LOW HIGH	

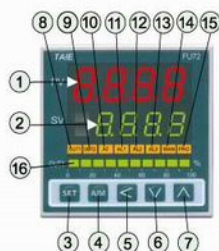
▲:SV △: Alarm set value

Parts Description

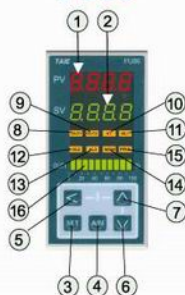
FU48



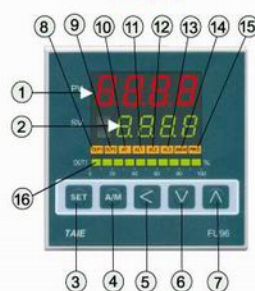
FU72



FU86



FU96



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 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
∨ ⑥	Down Key	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 OUT 1 is on (Orange)
OUT2 ⑨	OUT2 lamp	Lights when OUT 2 is on (Orange)
AT ⑩	Autotuning lamp	Lights when Autotuning is activated (Orange)
AL1 ⑪	Alarm 1 lamp	Lights when Alarm 1 is activated (Orange)
AL2 ⑫	Alarm 2 lamp	Lights when Alarm 2 is activated (Orange)
AL3 ⑬	Alarm 3 lamp	Lights when Alarm 3 is activated (Orange)
MAN ⑭	Manual output lamp	Lights when manual output is activated (Orange)
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 (Green)

Unit : mm

External Dimension

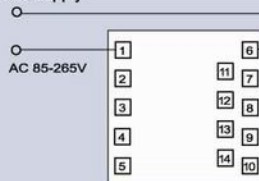
FU48			
FU72			
FU86			
FU96			

Terminal Arrangement

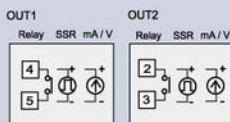
FU48

48 × 48 mm

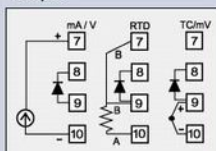
A. Power Supply



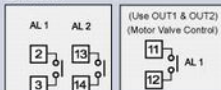
B. Control Output



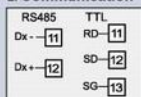
C. Input



D. Alarm



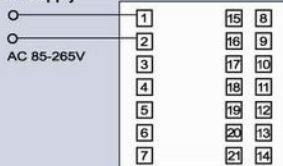
E. Communication



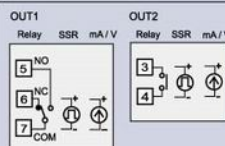
FU72

72 × 72 mm

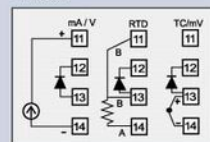
A. Power Supply



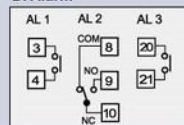
B. Control Output



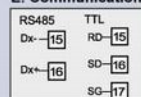
C. Input



D. Alarm



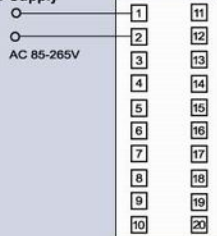
E. Communication



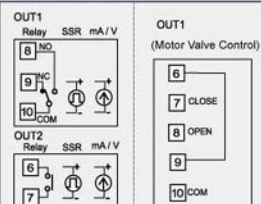
FU86

48 × 96 mm

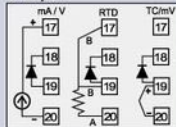
A. Power Supply



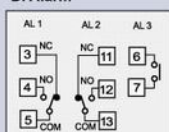
B. Control Output



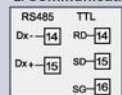
C. Input



D. Alarm



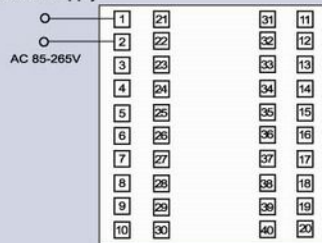
E. Communication



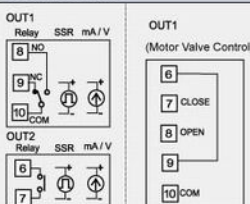
FU96

96 × 96 mm

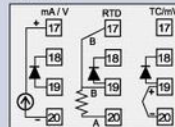
A. Power Supply



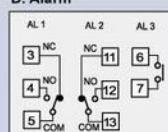
B. Control Output



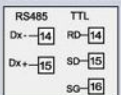
C. Input



D. Alarm



E. Communication

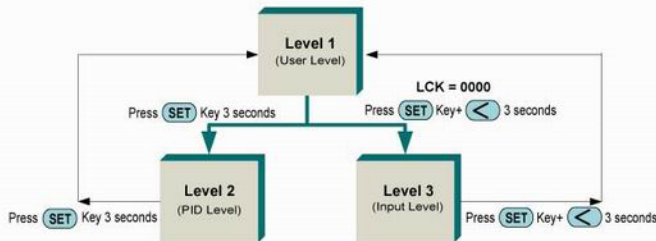


Levels Explanation

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	OUTL
Autotuning	AL
Alarm 1 set value	AL1
Alarm 2 set value	AL2
Alarm 3 set value	AL3

Return to "P.V."

Level 2 (PID Level)

Proportional band 1 (For output 1)	P1	Range : 0.0~200.0%
Integral time 1 (For output 1)	I1	Range : 0~3600 seconds
Derivative time 1 (For output 1)	D1	Range : 0~900 seconds
Dead-band time	DB1	FU don't have this function
Auto tuning offset value	HY51	Range : 0~USPL
Output 1 cycle time	CYT1	Range : 0~150 seconds
Hysteresis for output 1 ON/OFF control	HYS1	PV > (SV+HYS1), OFF PV ≤ (SV-HYS1), ON
Proportional band 2 (For output 2)	P2	The same with P1
Integral time 2 (For output 2)	I2	The same with I1
Derivative time 2 (For output 2)	D2	The same with D1
Output 2 cycle time	CYT2	The same with CYT1
Hysteresis for output 2 ON/OFF control	HYS2	The same with HYS1
Control gap 1 (For output 1)	GAP1	Set point of output 1 (Heating side) =SV - GAP1 (Set when it has duel display)
Control gap 2 (For output 2)	GAP2	Set point of output 2 (Cooling side) =SV + GAP2 (Set when it has duel display)
Function lock	LCK	

Return to "P.V."

Level 3 (Input Level)

Input type selection	INPI	
Analog input low limit calibration (Used for mA and V input)	ANLI	Range : -1999 ~ 9999
Analog input high limit calibration (Used for mA and V input)	ANHI	Range : 0 ~ 9999
Decimal point position (Available for mA and V input)	dP	0000 + 000.0 + 00.00 + 0.000
Lower Set-Point Limit	LSPL	Scaling Low Limit
Upper Set-Point Limit	USPL	Scaling High Limit
Remote input low limit calibration (FU don't have this function)	ANL2	
Remote input high limit calibration (FU don't have this function)	ANH2	
Alarm mode of AL1	ALd1	Range: 00~18 Refer to "Alarm mode type"
Alarm time of AL1	ALt1	Range : 0~99 Min 59 Secs 0=Flicker Alarm + 99:59=Continued Others=On delay time (If ALD=07, ALT means alarm on time)
Alarm mode of AL2	ALd2	The same with ALd1
Alarm time of AL2	ALt2	The same with ALt1
Alarm mode of AL3	ALd3	(FU48 don't have AL3)
Alarm time of AL3	ALt3	(FU48 don't have AL3)
Hysteresis of all Alarm	HY5A	Range : 0~1000
Output 1 low limit calibration (Used for mA and V output)	CLO1	Range : 0 ~ 9999
Output 1 high limit calibration (Used for mA and V output)	CHO1	Range : 0 ~ 9999
Output 2 low limit calibration (Used for mA and V output)	CLO2	The same with CLO1
Output 2 high limit calibration (Used for mA and V output)	CHO2	The same with CHO1
Retransmission low limit calibration (FU don't have this function)	CLO3	
Retransmission high limit calibration (FU don't have this function)	CHO3	
Full run time of proportional motor (Used for proportional motor valve control output)	rUCY	Range : 5~200 seconds
Used for programmable controller to wait continued operation	WAR	0=Not wait Others=Wait value
Alarm forward / inverse action setting can force the use of a-contact into b-contact	SEAR	Level 4 setting please ask distributor
Communication Protocol Selection	PSL	MODBUS RTU / MODBUS ASCII / TAIE
Communication Bits Configuration	b.t5	0_81 / 0_82 / E_81 / E_82
ID number	IDNO	Range : 0 ~ 255
Baudrate	bAUD	2400 / 4800 / 9600 / 19200 / 38400 bps
SV compensation	S.V	Range : -1000~1000
PV compensation	P.V	Range : -100.0~500.0
Unit of PV & SV	UNIT	C(°C) / F(°F) / A(Analog)
PV Filter	PV.F	PV will response faster if PVFT is smaller.
Reserved	CASC	FU don't use it
Action mode	OUT	Heat / Cool
Control algorithm	OPAd	PID / Fuzzy
Frequency	H=	50 / 60HZ

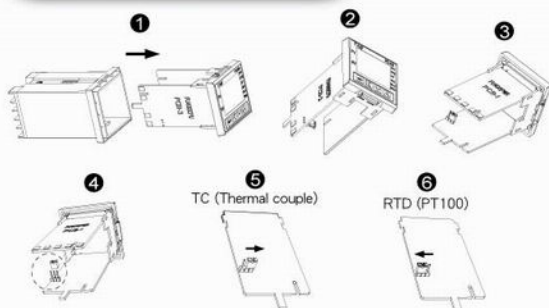
Return to "INPI"

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
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

Standard Spec.	Model	FU48	FU72	FU86	FU96
	Dimension	48X48mm	72X72mm	48X96mm	96X96mm
	Supply voltage	AC 85~265V			
	Frequency	50/60 HZ			
	Power Consumption	approx 3VA	approx 3VA	approx 4VA	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 -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:20mA.			
	Voltage dc	DC 4~20mA , 0~20mA ◦ maximum load resistance : 560Ω.			
		DC 0~5V , 0~10V , 1~5V , 2~10V ◦ maximum load current : 20mA.			
	Alarm 1	SPST type	SPST type	SPDT type	SPST type
		8A , 240V, electrical life : 100,000 times or more(under the rated load).			
Optional Spec.	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 . can be linked together as 16 segments use			
Optional Spec.	Output 2	For heating and cooling control use *Accutron mode is opposite with Output 1			
	Relay	SPST type	SPST type	SPST type	SPST type
	Voltage Pulse	For SSR drive. ON:24V , OFF:0V , maximum load current:20mA.			
	mA dc	DC 4~20mA , 0~20mA ◦ maximum load resistance : 560Ω.			
	Voltage dc	DC 0~5V , 0~10V , 1~5V , 2~10V ◦ maximum load current : 20mA .			
	Alarm 2	SPST type	SPDT type	SPDT type	SPDT type
	Alarm 3	—	SPST type	SPST type	SPST type
	Communication	Protocol : MODBUS RTU , MODBUS ASCII , TAIE Interface : 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			

Input Type Change of TC ↔ RTD



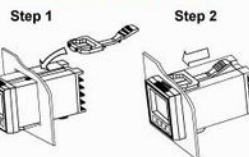
1. Take out the main body from outer case; adjust the jumper to the correct place
2. Start power after setting jumper to the correct place
3. Amend the input type from the front membrane to enter in Level 3 to set.
4. Please be sure to cut off power and start again after amending input type so that the 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	Communi- cation	Input Type	Power	Water/Dust Proof
FU48	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			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				
FU96 96x96mm	3 4~20mA	3 4~20mA	3 3 Sets	A 0~5V	A 0~5V	3 TTL			
(STANDARD)	4 0~20mA	4 0~20mA		B 0~10V	B 0~10V	A RS232_MODBUS			
PFU48 48x48mm	A 0~5V	A 0~5V	A HBA*	C 1~5V	C 1~5V	B RS485_MODBUS			
PFU72 72x72mm	B 0~10V	B 0~10V	B HBA+AL2	D 2~10V	D 2~10V				
PFU86 48x96mm	C 1~5V	C 1~5V	C HBA+AL2+AL3						
PFU96 96x96mm	D 2~10V	D 2~10V							
(RAMP/SOAK Programmable)	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

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

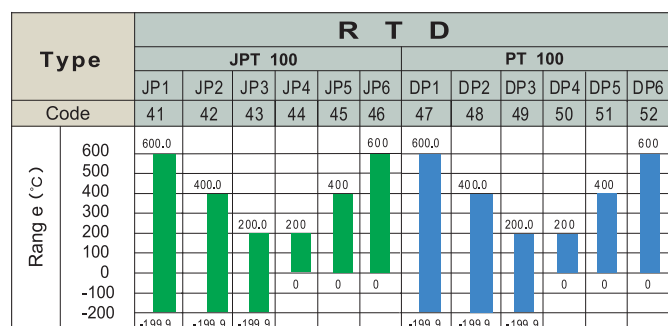
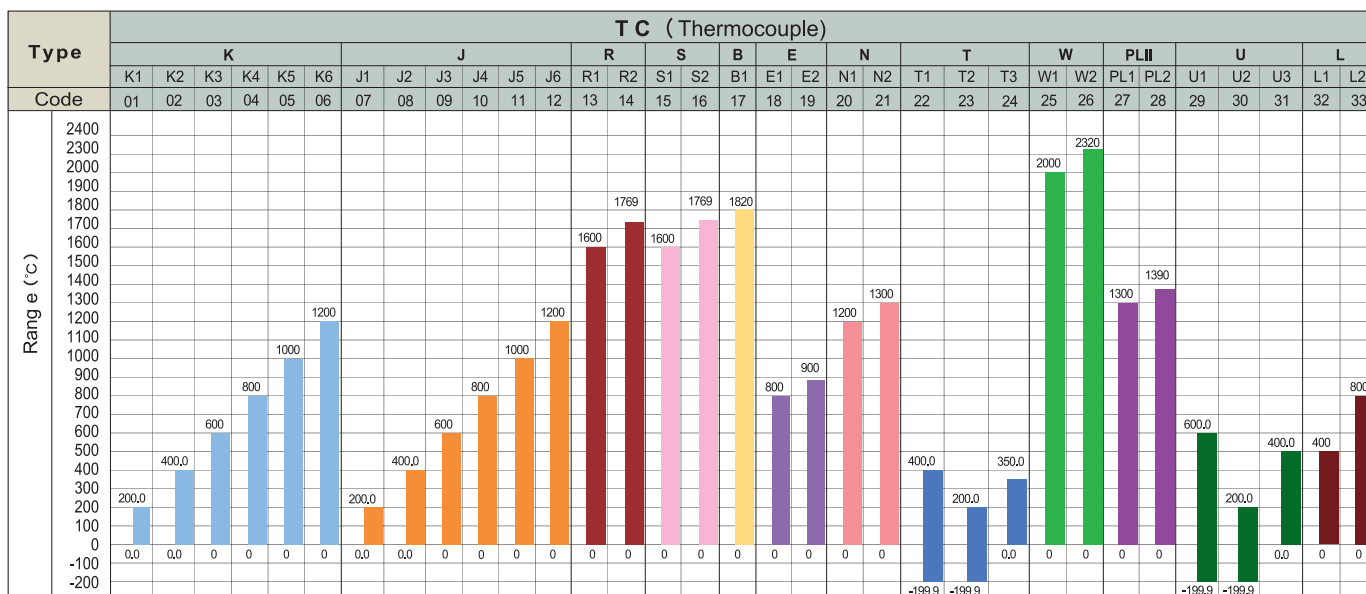
Combination of options and models

Options	RAMP/SOAK PROGRAM	Output 1	Output2	Alarm2	Alarm3	HBA	Transmission	Remote SV	Communication	DC 24V Power
Model		1 φ SCR_Z 3 φ SCR_Z	Motor valve control 1 φ SCR_P 3 φ SCR_P							
FU48	○	○	○	○	○	○	○	○	○	○
FU72	○	○	○	○	○	○	○	○	○	○
FU86	○	○	○	○	○	○	○	○	○	○
FU96	○	○	○	○	○	○	○	○	○	○

○ Available — Not available

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

Input Types



Type	Code	Range
AN1	61	-10~10mV
	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	0~5K ohm
	87	0~2V
AN5	91	10~50mV
	92	4~20mA
	93	1~5V
	94	2~10V

LINEAR

-1999~9999
or
-199.9~999.9
or
-19.99~99.99
or
-1.999~9.999