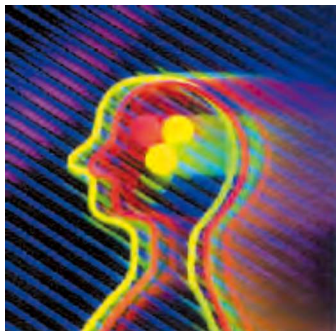




Think Controls

FOTEK

Self-adaptive Fuzzy + PID Temperature Controller NT series

§ Intelligence
§ Performance
§ Reliability

§ Easiness
§ Stability
§ Sensitivity

Complete Human-interface & Function

- | | |
|-------------|------------------------------------|
| * 輸出量顯示 | * Output volume display |
| * 負載電流量顯示 | * Load current display |
| * 關閉控溫功能 | * Turn off control function |
| * 快速自動演算鍵 | * Fast auto-tuning setting |
| * 緩衝起動功能 | * Soft start function |
| * 加熱斜率控制 | * Ramp control function |
| * 手動輸出控制 | * Manual output control function |
| * 全機種可附通訊功能 | * Communication function available |

CE RoHS



陽明電機股份有限公司
FOTEK CONTROLS CO., LTD.

www.fotek.com.tw

Model guiding / 型號索引

Ex.	NT	48	R	CT	RS
	1	2	3	4	5
1	Series (系列名稱)				
2	Outline (外形) (Unit: mm)				
3	Output method (輸出方式)				
4	Optioned (附加功能)				
5	Optioned (附加功能)				

NT: New generation Temperature controller					
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10: 24*48*100	20: 48*96*60	21: 96*48*60	22: 22.6*75*100		
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32: 34*75*65	48: 48*48*72(1/16 DIN)	72: 72*72*60	96: 96*96*60(1/16 DIN)		
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R: Relay (3A/250VAC)	NT-10R(0.25A/250VAC)	V: SSR (30mA/12V)	L: Linear output (4~20mA)		
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CT: With Heater break detecting	NT-10R(0.25A/250VAC)	mA: DC current input	mV: DC Voltage input		
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RS: With RS-485 communication (MODBUS protocol)	S: PV transmitter				
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How to set the function or parameter / 如何設定功能及參數

1. 「Temperature setting status」: Press 「SET」 key instantaneously to enter into the temperature setting status.
2. 「Auto-tuning status」: Press 「▲」 key 3 sec to set 「Auto-tuning」, then press 「▲」 key 3 sec to reset it.
3. 「Manu-output status」: Press 「▼」 key 3 sec to turn off the output control, then press the 「SET」 key to set the 「Manu-output volume」. If press 「▼」 key 3 sec may to release 「Manu-output status」.
4. 「Display mode selecting」: Press 「SET」 key 3 sec to select display mode
 - 4-1. Without CT type: Display 「Output volume」 (u.xx) → then press 「SET」 key 3 sec → to display 「Temperature set value」
 - 4-2. With CT type: Display 「output volume」 (u.xx) → then press 「SET」 key 3 sec → to display 「Load current」 (xx.xx) → then press 「SET」 key 3 sec → to display 「Temperature set value」
5. 「Parameter setting status」: Press 「F」 key 3 sec to enter into the parameter setting status.
6. 「Alarm setting status」: Press 「SET」 & 「F」 key 3 sec to enter into the Alarm setting status.
7. 「Communication setting status」: Press 「SET」 & 「▼」 key 3 sec to enter into the Communication setting status.
8. 「Soft start function」: At the final parameter of 「setting of alarm」, Press 「SET」 key 3 sec to set the **Soft start setting value 「SV2」**. the fixed output volume is set by the manual output volume.
9. 「Ramping control」: At the 「rAP」 parameter in the 「setting of alarm」 level, if 「rAP = 0」, it has not the ramping control function. if 「rAP ≠ 0」, it will perform the ramping control function.
10. 「Display mode setting」: At the 「Sdc」 parameter in the 「Setting of parameter」 level, if 「Sdc = n」, it will be kept on the selected display mode, if 「Sdc = A」, it will be returned to the Temperature set value mode after 10 seconds.

1. 「溫度值設定狀態」: 按「SET」鍵一下就可進入「溫度值設定狀態」
2. 「自動演算狀態」: 按「▲」鍵3秒可進入「自動演算狀態」; 再按「▲」鍵3秒解除「自動演算狀態」
3. 「手動輸出控溫狀態」: 按「▼」鍵3秒關閉輸出 (顯示「OFF」), 再按「SET」鍵3秒後可設定「手動輸出量」 (顯示n.xx), 完成手動輸出量設定後如果再按「▼」鍵3秒可解除「手動輸出控溫狀態」回復自動控溫狀態。
4. 「顯示模式選擇」: 按「SET」鍵3秒
 - 4-1. 無CT型: 「輸出量顯示」 (u.xx) → 再按「SET」鍵3秒 → 「溫度設定值顯示」
 - 4-2. CT型: 「輸出量顯示」 (u.xx) → 再按「SET」鍵3秒 → 「負載電流量顯示」 (xx.xx) → 再按「SET」鍵3秒 → 「溫度設定值顯示」
5. 「參數設定」: 按「F」鍵3秒: 進入「參數設定」狀態
6. 「警報設定」: 按「SET」 & 「F」鍵3秒: 進入「警報設定」狀態
7. 「通訊參數設定」: 按「SET」 & 「▼」鍵3秒: 進入「通訊參數設定」狀態
8. 「緩衝起動設定」: 在警報設定的最後一個參數時按「SET」鍵3秒可設定「緩衝起動設定值 (SV2)」, 固定輸出量由手動輸出量設定。
9. 「加熱速率控制」: 可設定警報設定層的參數「rAP」; 「rAP = 0」時沒有溫升速率控制功能, 「rAP ≠ 0」時執行溫升速率控制。
10. 「顯示自動切換設定」: 可設定參數設定層的參數「Sdc」; 「Sdc = n」時持續顯示「選擇顯示模式」; 「Sdc = A」時10秒後會自動切回「溫度設定值顯示模式」。

Fuzzy + PID Intelligent Temperature Controller

General Specification / 共同規格

Fixed method		Panel type						Rail type	
Model	型號	NT-10	NT-48	NT-20	NT-21	NT-72E	NT-96E	NT-22	NT-32
Outline (U t: mm)	外形尺寸	24*48*100	48*48*72	48*96*60	96*48*60	72*72*60	96*96*60	22.6*75*100	34*75*65
Alarm output	警報輸出	Single alarm	Two alarm					Single alarm	Two alarm
Power supply	工作電壓	90~265 VAC/ 50/60 Hz or 24VDC/AC (Optioned)							
Power consumption	消耗電流	5 VA max. or 100mA max. (24VDC/AC)							
Input method	輸入方式	PT / K / J / R / S / T / B / E / N / L(Selectable) or 4~mA or 0~10VDC (Optioned)							
Control method	控制方式	Fuzzy + PID or ON / OFF selectable							
Control output	控制輸出	Relay or SSR or 4~20mA (Optioned)							
Alarm output	警報輸出	Relay 1a (3A/250VAC SPDT)							
Display range	顯示範圍	-999 ~ 9999							
Accuracy of display	顯示精度	± (0.1 % OF F.S. + 1 DIGIT)							
Setting range	設定範圍	-999 ~ 9999							
Memory method	記憶方式	EEPROM							
Insulation resistance	絕緣強度	OVER 50MΩ / 500VDC							
Dielectric strength	耐壓強度	OVER 2.5 KV / 1 MINUTE							
Operating circum.	使用環境	-25℃ ~ 80℃ ; 35%~85% RH							
EMC standard		ESD : 8 KV Air Discharge (Level3) / EN-61000-4-2 RF Interference : 10V / M / ENV-50140 Burst test : 2KV / EN61000-4-4							

Setting of Communication / 通訊參數設定

Function	Range	Description
<pre> graph TD A[Control status 控制狀態 8888 8888] -- "Press [SET] & ▼ key 3 sec" --> B[Controller NO. 控制器編號設定 Id 1] B -- "Press [SET] key" --> C[Communication protocol 通訊協定選擇 rS 0] C -- "Press [SET] key" --> D[Communication speed 通訊速率選擇 bPS 192] D -- "Press [SET] key" --> E[Data configuration 資料結構選擇 bIt 8N1] E -- "Press [SET] key" --> A </pre>	-200 ~ 9999	
	1 ~ 255	1> Range: 1~255
	0 ~ 1	1> 「rs=0」: Modbus-RTU 2> 「rs=1」: Modbus-ASCII
	96 / 192 / 384	1> 「bPS =96」: 9600 bps 2> 「bPS =192」: 19200 bps 3> 「bPS =384」: 38400 bps
	8N1 / 8O1 / 8E1 8N1 / 7O1 / 7E1	1> 「bIt =8N1」: 8 bit non parity 2> 「bIt =8O1」: 8 bit odd parity 3> 「bIt =8E1」: 8 bit even parity 4> 「bIt =8N2」: 8 bit non parity 5> 「bIt =7O1」: 7 bit odd parity 6> 「bIt =7E1」: 7 bit even parity

Setting of parameter / 參數設定

Function	Range	Description
Control status 控制狀態 8888 Press [F] key ↓ 3 sec	-200 ~ 9999	
Cycle time 動作週期 Ct 15 Press [SET] key ↓	0 ~ 99	1> 「 CT = 0 」: ON/OFF control 2> Disappeared in Linear output type
Auto tuning 自動演算 At 0 Press [SET] key ↓	0 ~ 1	1> 「 At = 0 」: Control status 2> 「 At = 1 」: Auto tuning status
Auto tuning bias 自動演算偏差值 tu 0 Press [SET] key ↓	0 ~ 99	1> Auto tuning value = 「SV - tu」
Proportion band 比例帶 P 10 Press [SET] key ↓	0 ~ 3999	1> 「 CT = 0 」 → 「P」 is disappeared
Integral time 積分時間 I 120 Press [SET] key ↓	0 ~ 3999	1> 「 CT = 0 」 → 「I」 is disappeared
Derivative time 微分時間 d 30 Press [SET] key ↓	0 ~ 3999	1> 「 CT = 0 」 → 「d」 is disappeared
Hysteresis 動作應差 Hys 1 Press [SET] key ↓	0 ~ 99	1> 「 CT = 0 」 → 「Hys」 is appeared only 2> 「PV > SV」 → Out ON ; 「PV < (SV-Hys)」 → Out OFF
Gain 輸出控制增益 GAn 1.0 Press [SET] key ↓	0.1~9.9	1> Gain of output control
Input selecting 輸入選擇 Int k Press [SET] key ↓	PT / K / J / R / S T / B / E / N / L	1> 10 input type are selectable
Unit selecting 單位選擇 Unt C Press [SET] key ↓	°C / °F	
Decimal point selecting 小數點選擇 dp 0 Press [SET] key ↓	0 / 1	1> 「 dp = 0 」: Without decimal point 2> 「 dp = 1 」: One decimal point
Input shift setting 輸入修正 Sht 0 Press [SET] key ↓	-999 ~ 9999	1> 「PV」 = (PV + Sht)
Control method setting 控制方式 H_C Htr Press [SET] key ↓	Htr / cLr	1> 「 Htr 」: Heating control 2> 「 cLr 」: Cooling control
Alarm mode setting 警報模式 ALt 0 Press [SET] key ↓	0 ~ 26	1> Refer to the mode of Alarm
Display mode setting 顯示自動切換設定 Sdc n Press [SET] key ↓	n / A	1> 「 n 」: Manual setting 2> 「 A 」: Auto setting

Fuzzy + PID Intelligent Temperature Controller

Setting of alarm / 警報設定

Function	Range	Description
Control status 控制狀態 8888	0 ~ 9999	
Press SET & F key ↓ 3 sec Lock setting 鎖定設定 L c k 0	0 ~ 3	1> 「Lck=0」: Unlock ; Lck=1」: SV settable only 「Lck=2」: SV&AL settable ; 「Lck=3」: All lock
Press SET AL1 Limit setting AL1 警報設定 AL 1 50	-999 ~ 9999	1> Refer to the mode of Alarm
Press SET AL2 Limit setting AL2 警報設定 AL 2 50	-999 ~ 9999	1> Refer to the mode of Alarm
Press SET Hysteresis of alarm 警報應差值設定 A L H 1	0 ~ 9999	Ex. $PV \geq (SV + AL1) \rightarrow AL1$ ON, $PV < (SV + AL1 - ALH) \rightarrow AL1$ OFF
Press SET Flick timer 警報閃爍輸出時間設定 t 10	0 ~ 99	1> Range: 0~99 sec 2> Cycle time of flick timer
Press SET Setting limit 最大設定值限制 S L h 400	0 ~ 9999	1> $SV \leq SLH$ 2> Range of transmitter : 0~SLH→
Press SET Output limit 輸出量限制設定 O u t 100	0 ~ 100%	1> Output volume = Control output volume * 「Out」
Press SET Process output volume 實際輸出量 U n 0.0	0 ~ 99.99	1> Display the output volume
Press SET Max. display value setting 最大顯示值設定 dSPH 1000	0 ~ 9999	1> Current or Voltage input type will be appeared only 2> Max. input value will be transmitted into the dSPH
Press SET Min. display value setting 最小顯示值設定 dSPL 0	-999 ~ 9999	1> Current or Voltage input type will be appeared only 2> Min. input value will be transmitted into the dSPL
Press SET Process current of heater 實際加熱器輸出電流值 C t u 0.00	0 ~ 99.99	1> Range: 0.00 ~ 99.99 A
Press SET Heater break setting 加熱器斷線電流設定值 H b 1.00	0 ~ 99.99	1> Range: 0.00 ~ 99.99 A 2> 「C t u」 < 「H b」 → AL2 ON
Press SET CT Low limit setting CT最小值設定 C t L 0.00	0 ~ 99.99	1> Range: -9.99 ~ 99.99 2> Offset of CT current
Press SET CT High limit setting CT最大值設定 C t h 30.00	0 ~ 99.99	1> Range: 0.00 ~ 99.99 2> To set the max.CT current
Press SET Ramp control setting 溫升速率控制 r A P 0	0 ~ 9999	1> Range: 0 ~ 9999 °C or °F / minute 2> Rap=0: Without Ramp control function
Press SET Min. output volume setting 最小輸出量設定 L o t 0	0 ~ 100%	1> Range: 0 ~ 100% 2> Setting of min. output volume
Press SET 3 sec Soft start setting 緩起動設定 SV2 0	-999 ~ 9999	1> 「SV2」 = 0: Without soft start function 2> 「PV」 < 「SV2」: output volume is fixed at manual output volume 3> 「PV」 ≥ 「SV2」: Output volume is controlled by PID

Mode of alarm / 警報模式【NT-□□】

Alt	Description / 警報說明	Alt	Description / 警報說明	Alt	Description / 警報說明
0	AL1 ON SV (SV+AL1) AL2 ON SV (SV+AL2)	1	AL1 ON (SV-AL1) SV AL2 ON SV (SV+AL2)	2	AL1 ON (SV-AL1) SV AL2 ON (SV-AL2) SV
3	AL1 ON (SV-AL2) SV (SV+AL1) AL2 ON SV (SV+AL2)	4	AL1 ON (SV-AL1) SV (SV+AL1) AL2 ON SV (SV+AL2)	5	AL1 ON (SV-AL1) SV (SV+AL1) AL2 ON SV (SV+AL2)
6	AL1 ON AL1 AL2 ON AL2	7	AL1 ON First cycle unable AL1 AL2 ON AL2	8	AL1 ON First cycle unable (SV-AL1) SV AL2 ON SV (SV+AL2)
9	AL1 ON First cycle unable (SV-AL1) SV (SV+AL1) AL2 ON SV (SV+AL2)	10	AL1 ON SV (SV+AL1) AL2 ON SV (SV+AL2) ← tnr → 99h59m	11	AL1 ON AL1 AL2 ON AL2
12	AL1 ON AL1 AL2 ON AL2	13	AL1 ON SV (SV+AL1) AL2 ON (SV-AL2) SV	14	AL1 ON SV (SV+AL1) AL2 ON (SV-AL2) SV
15	AL1 ON 1 SV (SV+AL1) AL2 ON SV (SV+AL2)	16	AL1 ON SV (SV+AL1) AL2 ON SV (SV+AL2) ← tnr → 99h59m	17	AL1 ON SV (SV+AL1) AL2 ON SV (SV+AL2) ← tnr → 99m59s
18	AL1 ON SV (SV+AL1) AL2 ON SV (SV+AL2) ← tnr → 99m59s	19	Non-used	20	AL1 ON Flicker SV (SV+AL1) AL2 ON SV (SV+AL2)
21	AL1 ON Flicker SV (SV+AL1) AL2 ON First cycle unable (SV-AL1) SV (SV+AL2)	22	AL1 ON Flicker SV (SV+AL1) AL2 ON (SV-AL1) SV	23	AL1 ON Flicker SV (SV+AL1) AL2 ON (SV-AL1) SV
24	AL1 ON Flicker SV (SV+AL1) AL2 ON (SV-AL1) SV (SV+AL2)	25	AL1 ON Flicker SV (SV+AL1) AL2 ON (SV-AL1) SV (SV+AL2)	26	AL1 ON AL1 SV AL2 ON First cycle unable (SV-AL2) SV

- 「Alt=15」: t = ON time of AL2 for cooling, OFF time is controlled by PID.
- 「ALH」: Hysteresis of alarm. Ex: $PV \geq (SV+AL1) \rightarrow AL1$ ON, $PV < (SV+AL1-ALH) \rightarrow AL1$ OFF
- 「tnr」 = Process time of tnr, if 「tnu $\geq$ tnr」 $\rightarrow$ AL2 is turned ON or OFF

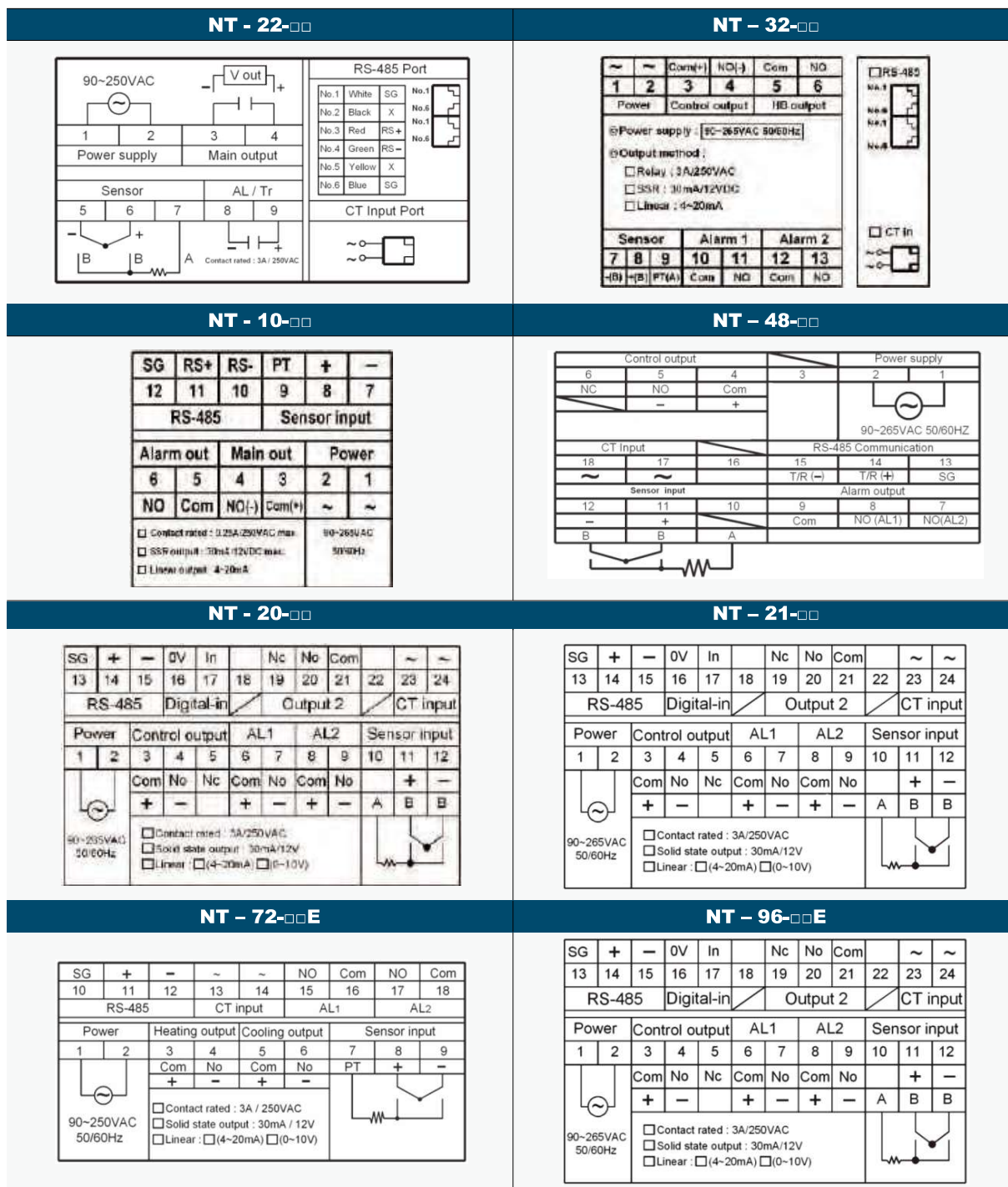
Mode of alarm / 警報模式【NT-□□-CT & eTC-48 & NT-22】

Alt	Description / 警報說明	Alt	Description / 警報說明	Alt	Description / 警報說明
0	AL1 ON SV (SV+AL1)	1	AL1 ON (SV-AL1) SV	2	AL1 ON (SV-AL1) SV (SV+AL1)
3	AL1 ON (SV-AL1) SV (SV+AL1)	4	AL1 ON AL1	5	AL1 ON AL1
6	AL1 ON First cycle unable AL1	7	AL1 ON First cycle unable (SV-AL1) SV (SV+AL1)	8	AL1 ON (SV-AL1) SV (SV+AL2)
9	AL1 ON (SV-AL1) SV (SV+AL2)	10	AL1 ON First cycle unable (SV-AL1) SV (SV+AL2)	11	AL1 Flick ON SV (SV+AL1)

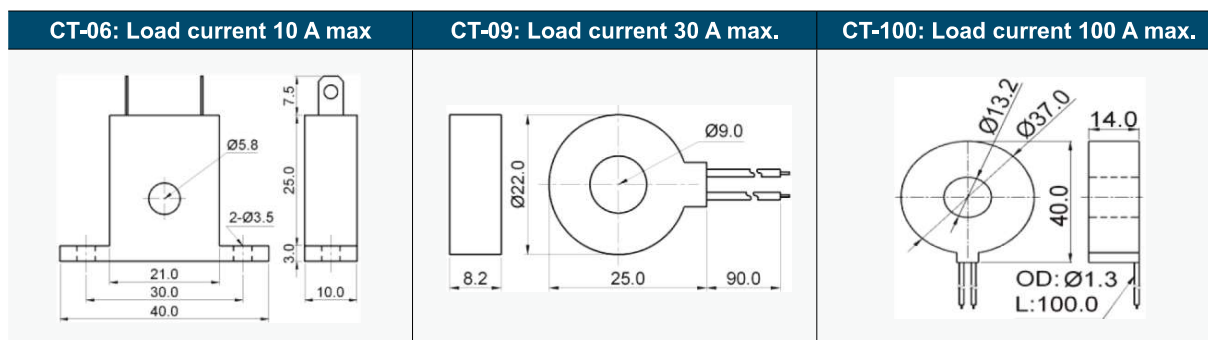
- 「Alt = 11」: t = ON time of AL for cooling, OFF time is controlled by PID.
- 「ALH」: Hysteresis of alarm. Ex: $PV \geq (SV+AL1) \rightarrow AL1$ ON; $PV < (SV+AL1-ALH) \rightarrow AL1$ OFF
- NT-22-CT: HB alarm output is AL1
- NT-48-CT: HB alarm output is AL2

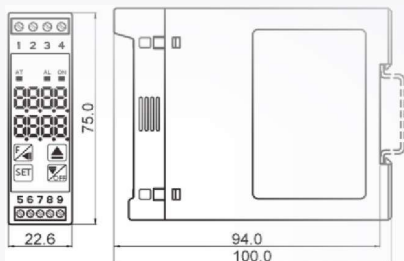
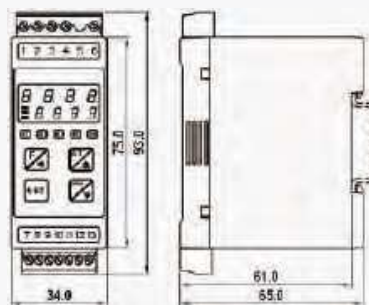
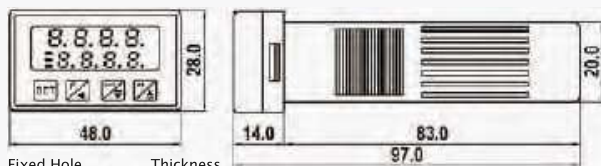
Fuzzy + PID Intelligent Temperature Controller

Connection diagram / 接線圖



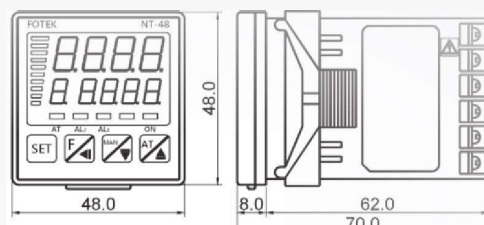
Attachment / 附件



Outline dimension / 外形圖
NT - 22-□□

NT - 32-□□

NT - 10-□□


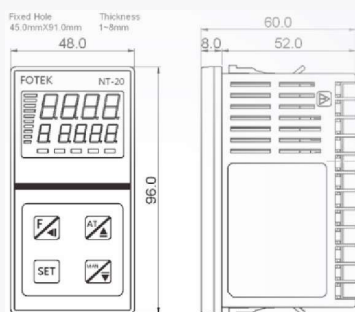
Fixed Hole
45.0mmX23.0mm

Thickness
1~8mm

NT - 48-□□


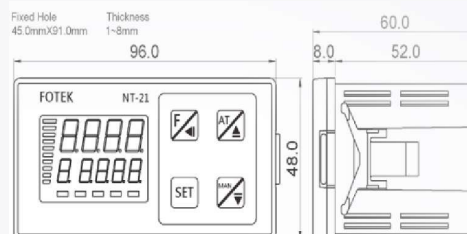
Fixed Hole
45.0mmX45.0mm

Thickness
1~8mm

NT - 20-□□


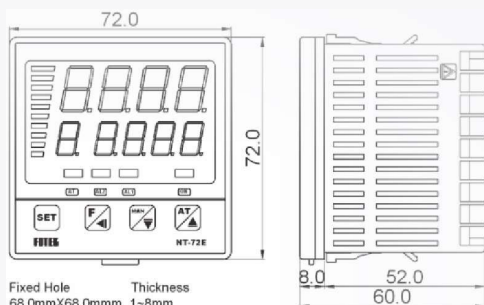
Fixed Hole
45.0mmX31.0mm

Thickness
1~8mm

NT - 21-□□


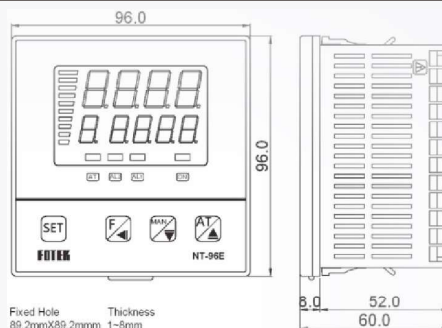
Fixed Hole
45.0mmX31.0mm

Thickness
1~8mm

NT - 72-□□E


Fixed Hole
68.0mmX68.0mm

Thickness
1~8mm

NT - 96-□□E


Fixed Hole
89.2mmX89.2mm

Thickness
1~8mm

Specification may be modified without notice in advance. (2015/5/5)