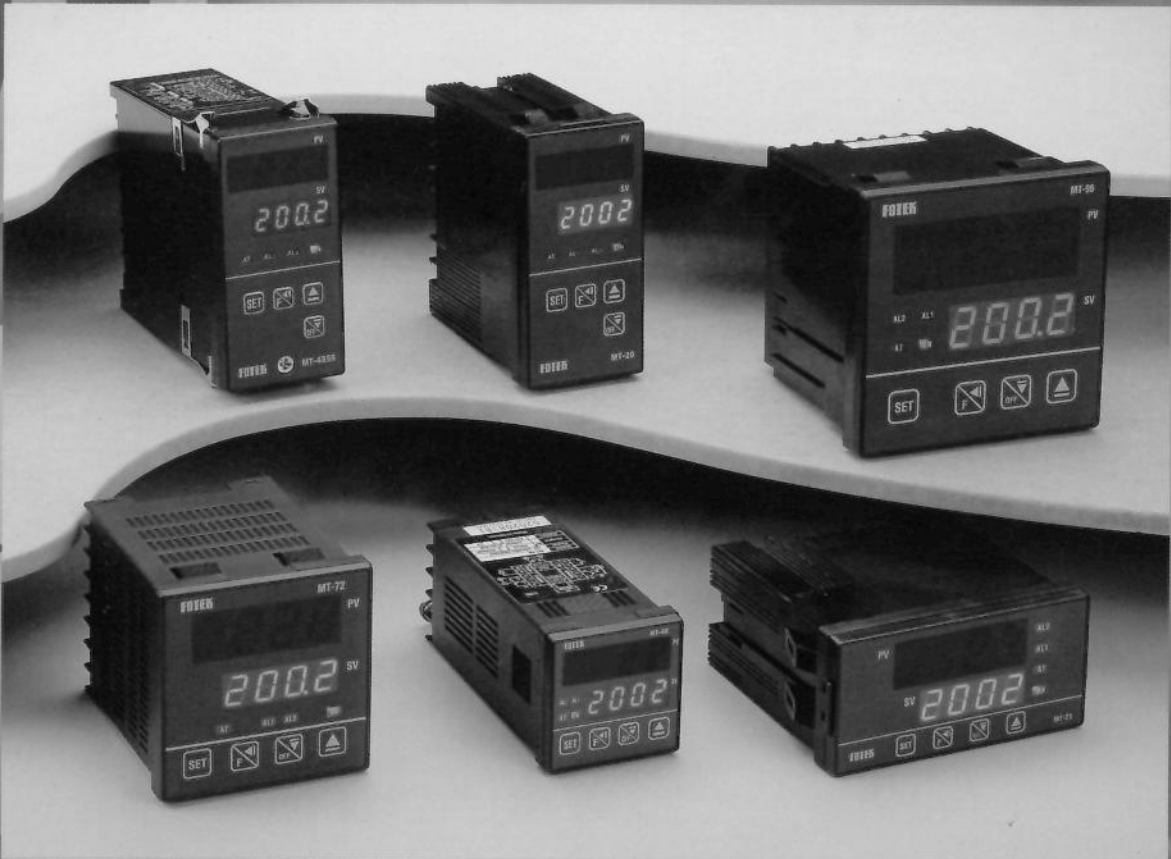




FOTEK

**2002 MT SERIES FUZZY+PID
AI TEMPERATURE CONTROLLERS**
RELIABILITY · EASINESS &
PERFORMANCE



● EASY CONTROL
FUZZY+PID

● RUN/STOP
OPERATED ON THE PANNEL

● MULTI-INPUT
K/J/PT SELECTABLE

● AUTO TUNNING
BIAS VALUE SETTABLE

● COMMUNICATION
RS-485

● INPUT SHIFT
PV BIAS CORRECTABLE

MT Series PID+Fuzzy Temperature Controller

FUZZY PID CONTROLLER

※Artificial Intelligence<AI>Control

FUZZY+PID CONTROL

※Enhanced Autotuning Method

AT BIAS VALUE SETTABLE

※Muti-Input Type

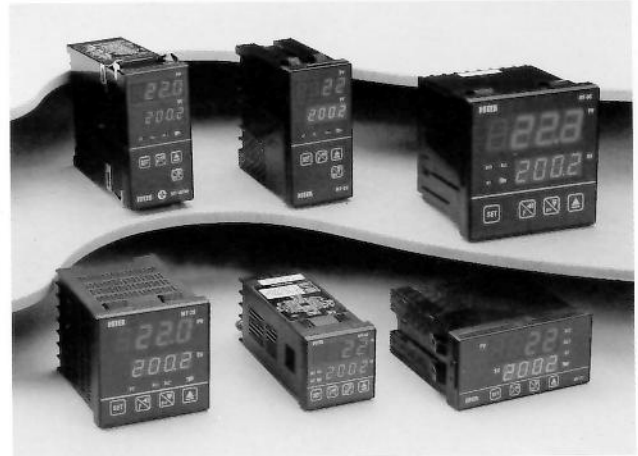
K/J/PT SELECTABLE

※Alarm Function

15 MODES SELECTABLE

※RUN/STOP Function

OPERATED ON THE PANEL EASILY



※Communication Function

RS-485 OPTIONED

■ Guiding of Model/型號索引

EX. MT-4896-R-RS-mA

① ② ③ ④ ⑤

① Series/系列代號

MT Series Temperature Controller

② Outline/外型尺寸

4896=48<W>x96<H> mmxmm

48=48<W>x48<H> mmxmm

72=72<W>x72<H> mmxmm

96=96<W>x96<H> mmxmm

20=48(W)x96(H) mmxmm

21=96(W)x48(H) mmxmm

③ Output Method/輸出方式

R=Relay Output

V=Voltage Pulse Output

L=Linear 4~20 mA Output

④ Others/其他

Non=Standard

RS=RS-485

CT=Current Transmitter

S:PV Resender

⑤ Input/輸入

Non=K/J/PT

mA=mA

V=0~10V

VR=Variable Resisfance

■ Nomenclature/圖示說明

PV:Display of The Process Value 顯示現在值

SV:Display of The Setting Value 顯示設定值

[SET]:Key of Setting 設定鍵

[F]:Key of Shift & Function 功能鍵及移位鍵

[▲]:Key of Increasing Autotuning 上加鍵及自動演算鍵

[OFF]:Key of Decreasing & ON/OFF 下減鍵及開關鍵



FOTEK

PID+Fuzzy Temperature Controller MT Series

■ General Specification/共同規格

| | | |
|----------------------------|------------------------------|-----------------------|
| Power Supply 工作電壓 | 90~265 VAC 50/60Hz | |
| Power Consumption 消耗功率 | 5VA Max. | |
| Sensor Input 測溫體 | K/J/PT-100Ω Selectable | |
| Control Output 控制輸出 | Relay 繼電器 | SPDT IC 5A/250 VAC |
| | Voltage 電壓 | 12V/50mA |
| | Linear 線性輸出 | 4~20mA, Load:600Ω Max |
| Alarm Output 警報輸出 | SPST 1/a 5A/250 VAC | |
| Control Method 控制方式 | FUZZY+PID or ON/OFF Settable | |
| Ambient Temperature 工作環境溫度 | -10°C~+75°C | |
| Ambient Humidity 工作環境濕度 | 25%~85% RH | |

■ Characteristic/特性

| | |
|----------------------------|---|
| Accuracy 顯示精度 | ±(0.1% of F.S. + 1 Digit) |
| Cycle Time 動作週期 | 0~99 sec |
| Proportional Band(P) 比例帶 | 0~999 |
| Integral Time 積分時間 | 0~3999 sec |
| Derivative Time (D) 微分時間 | 0~3999 sec |
| Alarm Range 警報範圍 | -99~999 |
| PV Sampling Time 顯示值取樣時間 | 0.1sec |
| Input Shift(Bias) 輸入校正 | -99~+99 |
| AT Bias (TU) 演算偏差量 | 0~999 |
| Memory Method 記憶方式 | EEPROM |
| Insulation Resistance 絕緣阻抗 | Over 50MΩ/500VDC |
| Dielectric Strength 耐壓強度 | Over 2.5KV/ 1 minute |
| EMC Standard | ESD:8KV Air Discharge(Level 3)/EN-61000-4-2 RF Interference:10V/M/ENV50140 BURST TEST:2KV/EN61000-4-4 |

MT Series PID+Fuzzy Temperature Controller

Setting of Parameter / 參數設定

| Mode Setting 參數設定 | Symbols 參數符號 | Range 範圍 | Remarks 備註 |
|---|-------------------|-------------------------|---|
| Control Status 控溫狀態 按 [SET] 鍵 3 秒 ↓ Press [SET] Key 3 Sec | 1999 1999 | -99~1999 | |
| Cycle Time 動作週期 按 [SET] 鍵 ↓ Press [SET] Key | CT 15 | 0~99 | ① CT=0 ON/OFF控制 CT=0 ON/OFF Control ② 線性輸出型不顯示 Linear Type Disappeared |
| Auto Tunning 自動演算 按 [SET] 鍵 ↓ Press [SET] Key | AT 0 | 0 or 1 | ① AT=0 控溫狀態 AT=0 Control Status AT=1 自動演算狀態 AT=1 Autotunning Status |
| Autotuning Bias 演算偏差值 按 [SET] 鍵 ↓ Press [SET] Key | Tu 0 | 0~999 | ① 演算值=SV-Tu Autotunning Value=SV-Tu |
| Proportional Band 比例帶 按 [SET] 鍵 ↓ Press [SET] Key | °C/°F P 25 | 0~999 | ① CT=0 P值不顯示 CT=0 P Disappeared |
| Integral Time 積分時間 按 [SET] 鍵 ↓ Press [SET] Key | SEC I 150 | 0~3999 | ① CT=0 I值不顯示 CT=0 I Disappeared |
| Derivative Time 微分時間 按 [SET] 鍵 ↓ Press [SET] Key | SEC D 41 | 0~3999 | ① CT=0 D不顯示 CT=0 Ddisappeared |
| Hysteresis 應差設定 按 [SET] 鍵 ↓ Press [SET] Key | °C/°F HYS 2 | -99~999 | ① CT=0 才顯示 CT=0 Appeared only |
| Input Selecting 輸入選擇 按 [SET] 鍵 ↓ Press [SET] Key | InL K | K/J/Pt | ① K:0~1372°C ② J:0~1200°C ③ PT:-200~850°C |
| Unit Selecting 單位選擇 按 [SET] 鍵 ↓ Press [SET] Key | Unit °C | °C/°F | |
| Decimal Point 小數點選擇 按 [SET] 鍵 ↓ Press [SET] Key | dP 0 | 0 or 1 | ① dP=0 No Decimal Point dP=1 One Decimal Point |
| Code 通信碼選擇 按 [SET] 鍵 ↓ Press [SET] Key | rS 0 | 0 or 1 Appeared Only | ① 0:HEX Code 1:ASCII Code ② 附RS-485才顯示 Communication Type Appeared Only |
| Input Shift 輸入校正 按 [SET] 鍵 ↓ Press [SET] Key | °C/°F ShL 0 | -99~999 | |
| Alarm Mode 警報模式 按 [SET] 鍵 ↓ Press [SET] Key | ALM 0 | 0~15 | ① 參考警報模式 Prefer to the mode of Alarm |
| Contoller No. 控制器編號 按 [SET] 鍵 ↓ Press [SET] Key | Id 00 | 0~99 | ① 附RS-485才顯示 Communication Type Appeared Only |

Setting of Alarm/警報設定

| Limit Setting 參數設定 | Symbols 參數符號 | Range 範圍 | Remarks 備註 |
|-------------------------------|-----------------|-------------|------------------------------------|
| Control Status 控溫狀態 | 1999 1999 | -99~1999 | |
| Lock Setting 鎖定設定 | LcL 0 | 0~3 | 0 = 無鎖定功能 0 = Unlock |
| AL1 Alarm Setting AL1警報值設定 | AL1 50 | -99~9999 | 1 = SV可設定 1 = SV Settable |
| AL2 Alarm Setting AL2警報值設定 | AL2 50 | -99~9999 | 2 = SV及AL可設定 2 = SV&AL Settable |
| Range Setting 設定值上限設定 | SLH 399 | -99~9999 | 3 = 設定鎖住 3 = All lock |

Mode of Alarm/警報模式

| ALT NO. | Mode模式 | Description說明 |
|---------|------------------------------------|---|
| 0 | Over Heat Alarm I 過熱警報 I | $PV \geq (SV + AL1)$ AL1 On (Deviation) |
| 1 | Over Heat Alarm II 過熱警報 II | $PV \leq (SV + AL1)$ AL1 On (Deviation) |
| 2 | Under Heat Alarm I 低溫警報 I | $PV \geq (SV - AL1)$ AL1 On (Deviation) |
| 3 | Under Heat Alarm II 低溫警報 II | $PV \leq (SV - AL1)$ AL1 On (Deviation) |
| 4 | Interval Alarm I 區間警報 I | $(SV - AL1) \leq PV \leq (SV + AL1)$ AL1 On |
| 5 | Interval Alarm II 區間警報 II | $(SV - AL1) \leq PV \leq (SV + AL1)$ AL1 Off |
| 6 | Interval Alarm III 區間警報 III | $(SV - AL2) \leq PV \leq (SV + AL1)$ AL1 On |
| 7 | Interval Alarm IV 區間警報 IV | $(SV - AL2) \leq PV \leq (SV + AL1)$ AL1 Off |
| 8 | Interval Alarm V 區間警報 V | $(SV - AL1) \leq PV \leq (SV + AL1)$ AL1 On (First Cycle Unable) |
| 9 | Interval Alarm VI 區間警報 VI | $(SV - AL2) \leq PV \leq (SV + AL1)$ AL1 Off (First Cycle Unable) |
| 10 | Under Heat Alarm II 低溫警報 II | $PV \leq (SV - AL1)$ AL1 On, (First Cycle Unable) |
| 11 | Absolute Upper Value Alarm 絕對值上限警報 | $PV \geq AL1$ AL1 On, $PV \leq (AL2)$ AL2 On |
| 12 | Absolute Lower Value Alarm 絕對值下限警報 | $PV \geq AL1$ AL1 On, $PV \geq (AL2)$ AL2 On |
| 13 | Interval Alarm VII 區間警報 VII | $PV \geq (SV + AL1)$ AL1 On, $PV \leq (SV - AL2)$ AL2 On |
| 14 | Interval Alarm VIII 區間警報 VIII | $PV \geq (SV + AL1)$ AL1 On, $PV \geq (SV - AL2)$ AL2 On |
| 15 | Over Heat Alarm III 過熱警報 III | $PV \geq (SV + AL1)$ AL1 Flicker, $PV \geq (SV + AL2)$ AL2 On |

FFF Sensor Break(感溫線斷線)

--- Sensor e(感溫線反接)

MT Series PID+Fuzzy Temperature Controller

Setting of Communication/通信協定

| | | | |
|------------------------|------------|-----------------------|----------|
| Communication Standard | EIA RS-485 | Communication Speed | 9600 bps |
| Communication Code | ASCII | Communication Station | 0~99 |

Process of PROTOCOL

Digital Read

Command:

@ NO. R Address FCS CR

Response:

@ NO. R Response Code Data FCS CR

Digital Write

Command:

@ NO. W Address Data FCS CR

Response:

@ NO. W Response Code FCS CR

Remarks

@:Start Code/起始位址

CR:Stop Code/停止位址

NO:Station Number/控制器編號

R:Read Data Command/讀取指令

W:Write Data Command/寫入指令

Data:Data for Reading or Writing/讀編資料

Response Code:回應碼

00:Commad Completed Normally/指令完成

01:Address Overflow/位址錯誤

02:Data Overflow/資料錯誤

03:FCS Overflow/核對錯誤

04:Command Error/指令錯誤

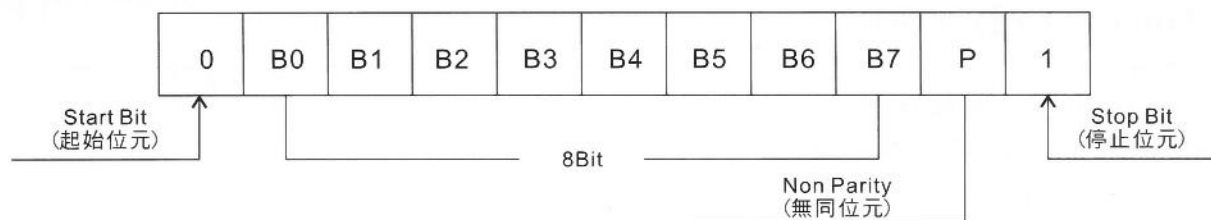
05:Lock/未開放

Address:Parameter Address

位址:參數位址

| NO 號碼 | Description 說明 |
|----------|--|
| 00 | ALI(Alarm#1) Range:-0099~0999 |
| 01 | ALI(Alarm#2) Range:-0099~0999 |
| 02 | Non-use |
| 03 | SLH(Hight Limit of Set) Range:0000~9999 |
| 04 | HYS(Hysteresis) Range:0000~9999 |
| 05 | Non-use |
| 06 | Non-use |
| 07 | CT (Cycle Time) Range:0000~0099 |
| 08 | P (Proportional Band) Range:0000~0999 |
| 09 | I (Integral Time) Range:0000~3999 |
| 10 | D (Derivative Time) Range:0000~3999 |
| 11 | INT (Input Type) K:0000,J:0001,PT:0002 |
| 12 | UNT (Unit Select) C:0000,F:0001 |
| 13 | SHT (Input Shift) Range:-0099~0099 |
| 14 | ALT (Alarm mode) 0000~0015 |
| 15 | Non-use |
| 16 | Setting Value Range:-0999~9999 |
| 17 | TU (Autotunning Bias) Rang:0000~0999 |
| 18 | ID (Station NO) 0000~0099 |
| 19 | PV (Process Value) Range:-999~9999 |
| 20 | LOCK(Setting Lock) 0000,0001,0002,0003 |
| 21 | AT (Setting of AT) 0000:Without AT, 0001:Auto-Tunning |
| 22 | Value of SV/PV |
| 23 | Status of Out/AL1/AL2 |
| 24 | Decimal Point Setting 0000:Non 0001:One Decimal |
| 25 | ON/OFF Setting 0000:ON 0001:OFF |

■ Configuration of Communication 通信資料結構



| Symbol (符號) | Description (內容) | Code (代碼) | Symbol (符號) | Description (內容) | Code (代碼) |
|-------------|------------------|-----------|-------------|-------------------------|-----------|
| @ | Start Code (起始碼) | 40H | 00 | Station/Address (站號/位址) | 00H |
| R | Read (讀取) | 52H | 21 | Station/Address (站號/位址) | 21H |
| W | Write (更改) | 57H | 99 | Station/Address (站號/位號) | 99H |
| FCS | Check Code (檢查碼) | X | 0000 | Data (資料) | 00H 00H |
| CR | Stop Code (停止碼) | 0DH | 9999 | Data (資料) | 99H 99H |
| "—" | Minus (負號) | 2DH | | | |

Ex. To Write The SV of No.16 Controller <SV=150>
(更改#16號溫控器的SV值)

Instruction: 40H 16H 57H 16H 01H 50H 0DH
(指令) @ No.16 W Addr.16 Data CR

Response: 40H 16H 57H 00H HEX 0DH
(回應) @ No.16 W Response Code FCS CR

Ex. To Read The Output Status of No.9 <Out/AL1/AL2>
(讀取#9號溫控器的輸出狀態Out/AL1/AL2)

Instruction: 40H 09H 52H 23H 0DH
(指令) @ No.9 R Addr.23 CR

Response: 40H 09H 52H 00H 00H 07H HEX 0DH
(回應) @ No.9 R Response Code Data FCS CR

| Data | Out | AI1 | AI2 | Data | Out | AI1 | AI2 |
|---------|-----|-----|-----|---------|-----|-----|-----|
| 00H 00H | X | X | X | 00H 04H | X | X | O |
| 00H 01H | O | X | X | 00H 05H | O | X | O |
| 00H 02H | X | O | X | 00H 06H | X | O | O |
| 00H 03H | O | O | X | 00H 07H | O | O | O |

"X":OFF "O":ON

MT Series PID+Fuzzy Temperature Controller

■ Illustration/功能說明

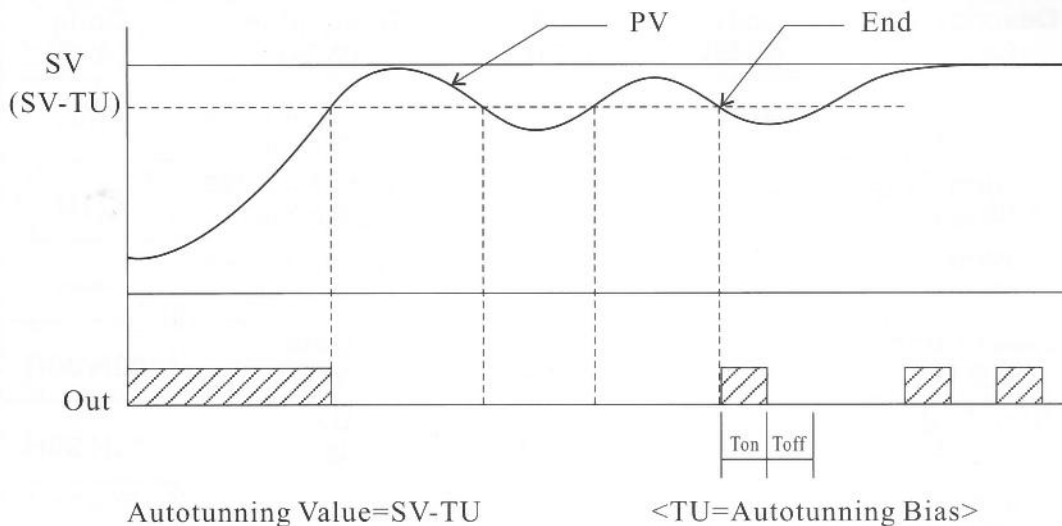
Cycle Time<CT>動作週期

$CT = T_{on} + T_{off}$

T_{on} = Time of Heater ON 加熱時間

T_{off} = Time of Heater OFF 不加熱時間

Auto Tunning<AT> 自動演算



Input Shift<SHT>輸出校正

To Correct The Difference Between The Actual Value And The PV Value
可修正實際值和顯示值的誤差

PV Resender 顯示值再傳送

The Range of Transmitter Is Set By The SLH.


Ex. SLH=200,0~200 Will be Transmitted To 4~20mA


"OFF" Key 關閉鍵

To Turn OFF All Output Of Temperature Controller, Only Display
The Value of PV.

可關閉溫控器所有輸出，只顯示實際溫度值。

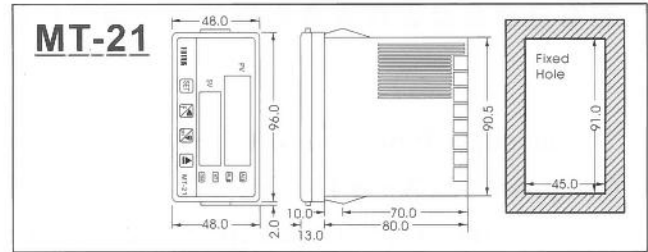
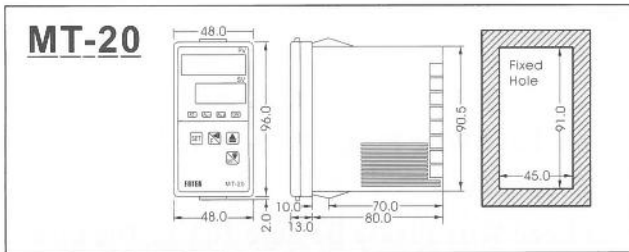
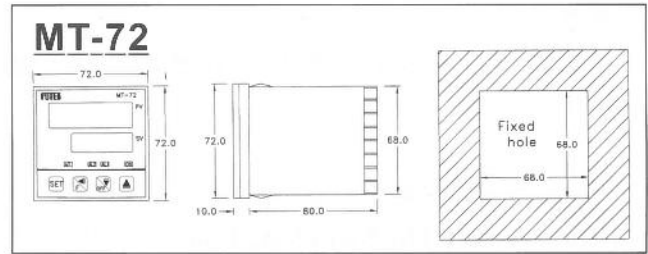
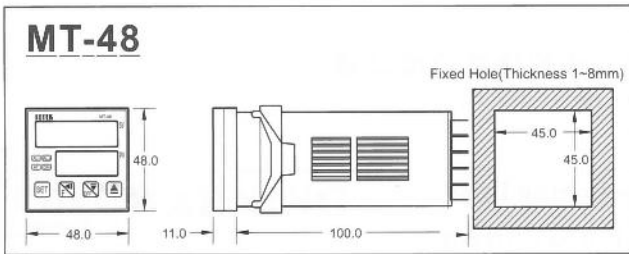
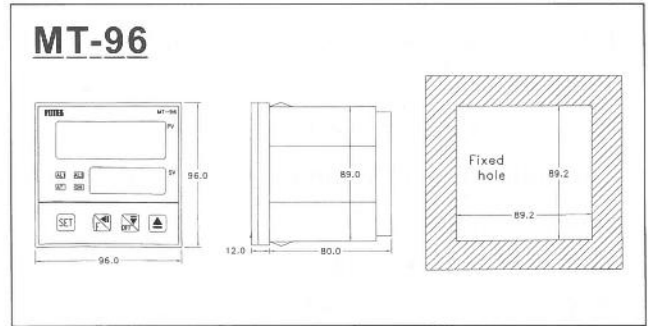
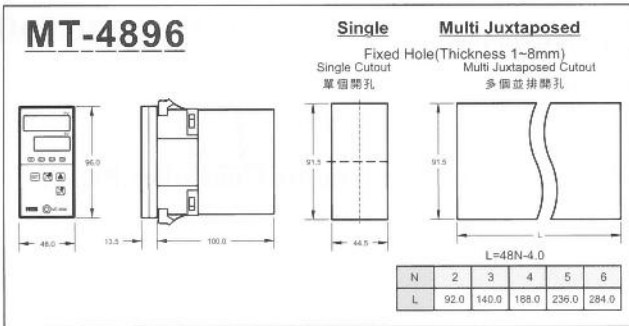
Atuo Tunning Key 自動演算鍵

If Press The  Key 3 Seconds, It May Enter To The Status of Auto Tunning.

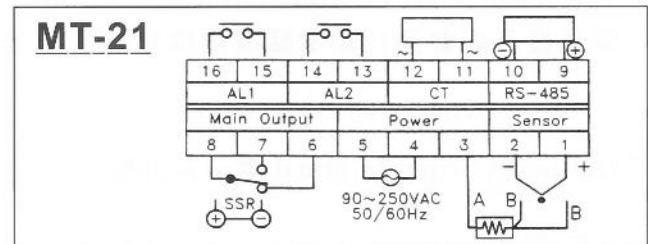
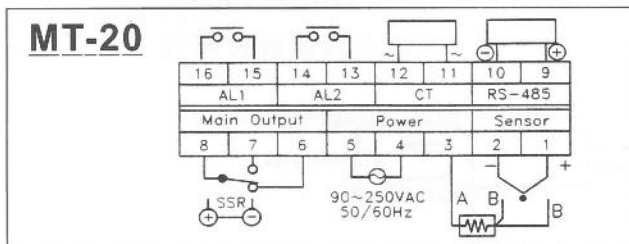
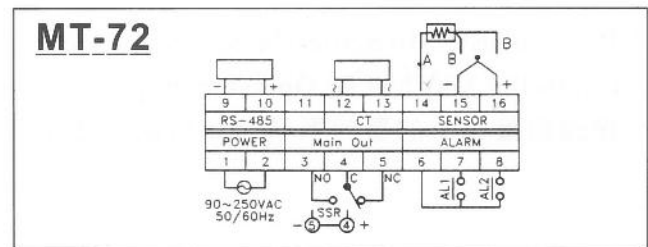
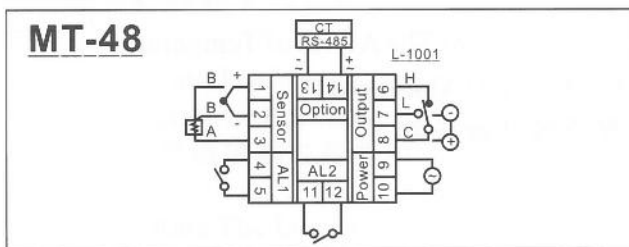
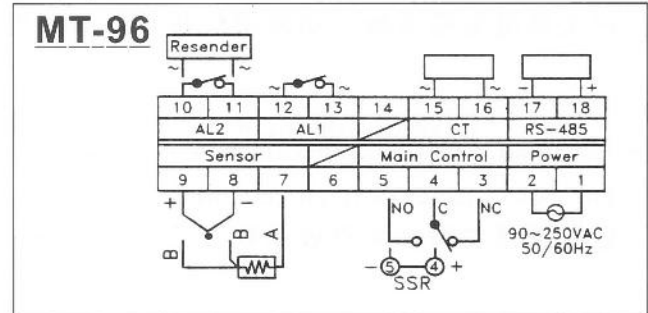
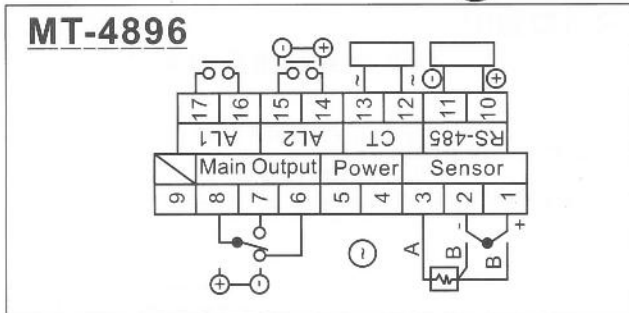
按  鍵3秒，可以進入自動演算狀態。

PID+Fuzzy Temperature Controller **MT Series**

Outline & Fixed Hole/外型及固定孔尺寸圖



Connection Diagram/接線圖



Notice

■ Notice of Use / 使用注意事項

1. Please Install The Temperature Controller In The Circumstance

Temperature: $-20^{\circ}\text{C} \sim +75^{\circ}\text{C}$ (Without Icing or Condensation)

Humidity: $35\% \sim 85\% \text{RH}$

The high Ambient Temperature May Shorten The Service Life of Temperature Controller, Please Don't Let It Exceed 75°C

溫度控制器安裝環境

溫度: $-20^{\circ}\text{C} \sim +75^{\circ}\text{C}$ (無結冰或結露)

濕度: $35\% \sim 85\% \text{RH}$

高溫環境可能縮短溫度控制器壽命，請不要讓工作的環境溫度超過 75°C

2. The Service Life of Relays Are Affected By The Switching Load.

Please Assure The Switching Load Are Under The Rated Current.

繼電器壽命受工作負載影響很大，請勿超載使用。

3. Thermcouple Type, If Need To Extend The Thermcouple Lead Wire Please Be Sure To Use The Compensation Wires That Must To Match The Thermcouple Type.

PT Resistance Type, If Need To Extend The PT Sensor Lead Wire Please Be Sure To Use The Low Resistance Wire.

熱電偶感溫線，如果須延長時務必使用同規格的補償導線。

白金電阻型感溫線，如果須延長時務必使用低阻抗電線。

4. The Lead Wire of Temperature Sensor, Please Separate It Away From

The Power Lines or High Tension Lines To Avoid Noise Interruption.

感溫線請勿與和高壓線或動力線結紮在一起。

5. It is Suggested To Settle The Separated Alarm System, In Case of The Alarm of Temperature

Controller May Not Be Operated Properly When The Device is Abnormal.

建議設置獨立的警報系統，以免溫控器異常時警報器功能失效。

6. The Temperature Controller May Be Interrupted By Movable Phone or Wireless Device.

溫控器可能會受行動電話或無線發射器干擾。

7. Outline of Crimp Terminal 端子夾外型



■ Notice Of Safety/安全注意事項

Definition of Symbol Marks



WARNING

Potentially Hazardous Situation
In Case Of Mishandling,May Result In Death
Or Serious Injury
潛在危險
如果操作失誤，有可能導致死亡或嚴重傷害。



CAUTION

Potentially Hazardous Situation
In Case of Mishandling,May Result In Slight Dangerous.
潛在危險
如果操作失誤，有可能導致輕微傷害。



WARNING

- 1.Please Do Not Touch The Terminals While The Power Is Supplied, If Do,It May Result In Electronic Shock.
送電中，請勿碰觸接線端以免觸電。
- 2.Please Do Not Let The Metal or Wire Cuttings Drop Into The Insid of Temperature Controller, If Do,It May Resule In Malfunction,Burnning Out or Fire.
請勿讓鐵屑或鋼絲掉入溫控器內，以免造成溫控器失效，燒毀甚至起火。
- 3.Please Make Sure To Wire The Temperature Controller Correctly Before Power ON,If Not, It May Result In Malfunction or Burnning out.
送電前請確認配線是否正確，否則可能導致異常或燒毀。
- 4.Please Do Not Modify or Repair The Temperature Controller,To Avoid Resulting In Malfunction or Burnning out.
請勿修改或修理溫控器，以免造成異常燒毀。



CAUTION

- 1.Please Rate The Power Supply Voltage Wirhin The Specified Range,If Not,It May Result In Malfunction or Burnning.
工作電壓請限制在規格內，否則可能造成溫控器異常或燒毀。
- 2.Please Rate The Load Within The Specified Value,If Not,It May Result In Malfunction or Burnning.
工作負載請勿超過額定電流，否則可能造成溫控器異常或燒毀。
- 3.Please Settle a Separated Alarm Syatem To Ensure Safety Protection In The Event of Malfunction,If Not,It May Result In A Serious Accident.
請設置獨立警報系統，確保溫控器異常時安全保護，否則可能造成嚴重意外事故。



陽明電機股份有限公司
FOTEK CONTROLS CO., LTD.

ServoTech

伺服科技

伺服科技有限公司

<http://www.servo.com.cn>

香港葵涌梨木道79號亞洲貿易中心1822室
Tel: (852)24841882 Fax: (852)24227107

FOTEK[®]

CONTROLS

2002.3