MT6200 多功能數位顯示控制器

MT6200 Multi-Function Digital Display Controller

大視窗 2 公分 4 位數字體，可做 4 段輸出控制，多元化輸入信號，1 組 DC24V 輔助電源輸出，適用溫度、濕度、壓力、水位、流量、氣體等設備使用~

訂購型號 Ordering Information

MT6200 - 代碼1 - 代碼2 - 代碼3 - 代碼4 - 代碼5

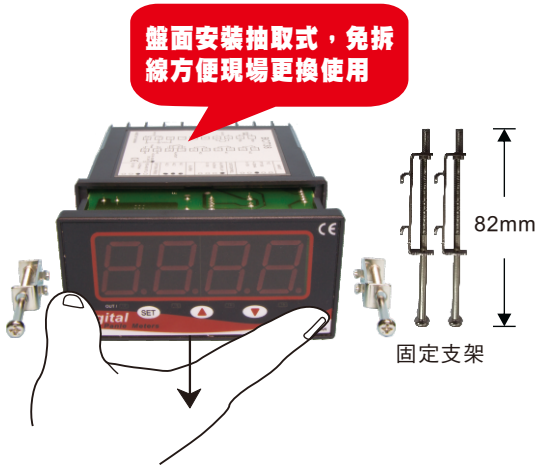
代碼1 輸入信號			代碼2 輸出			代碼3 警報		代碼4 通訊應用		代碼5 電源電壓		
	熱電偶	T		繼電器 OUT/AL4	R		1組	1	不選擇	N		
	白金熱電阻	D							4-20mA 再傳輸	R		
	類比信號	L		線性電流 4-20mA	M		2組	2	RS485	C	AC90~250V 50/60Hz	A
							3組	3	0-10V	V	DC24V	D

主要規格 Specifications

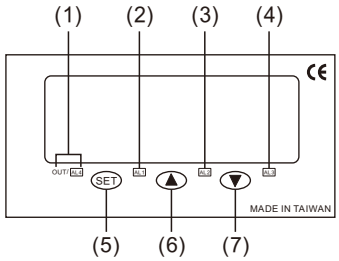
- 輸入：熱電偶種類 J. K. T. E. B. R. S. N. C
  白金熱電阻 DIN PT-100、JIS PT-100
  類比信號 4-20mA、0-50mV、1-5V、0-10V
- 精度：熱電偶±1℃、白金熱電阻±0.2℃、類比信號±3μV、≦±0.1% FS
- 取樣時間：0.5秒
- 輸出：繼電器：5A/AC240V，電氣壽命 10^4 次以上(額定負載內)
- 耐壓能力：主迴路-外殼對地 1500V/1M
  控制迴路-外殼對地 1000V/1M
- 記憶體：斷電保持記憶 EEPRON
- 消耗電力：3VA 以內
- 對應範圍值：-1999~9999
- 小數點位數設定：輸入溫度 Sensor 小數點一位，類比信號小數點可設 3 位數
- 電源電壓：AC90~250V 50/60Hz，DC24V
- 操作環境：溫度 0~50℃；濕度 0~90%

特點 Features

- 4 位數 0.8" LED 顯示器，可應用於流量、水位、壓力、氣體、溫濕度等功能
- 各式熱電偶、熱電阻，直流類比信號輸入選擇
- 標準一組接點 RELAY 輸出、一組警報，警報擴充至三組，可規劃時間計時功能，警報模式可參數設定 Hi 或 Lo，並可搭配主輸出做偏差上、下限，區域內、外警報，具有八種模式可選擇規劃
- 4-20mA 實際值再傳輸，可搭配記錄器、監控系統等使用
- RS485 通迅功能(MODBUS RTU 格式) N82
- 可選擇工作電源電壓 DC24V 電源輸入
- 內建 DC24V 補助電壓輸出，可搭配前端傳送器工作電壓使用

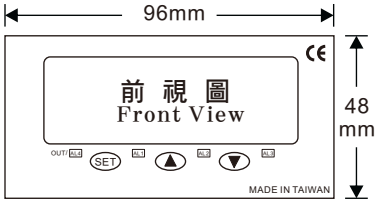


面板操作說明 Operating Instruction

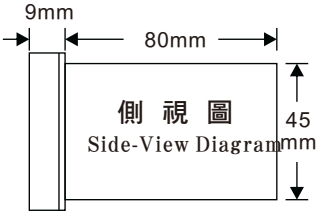


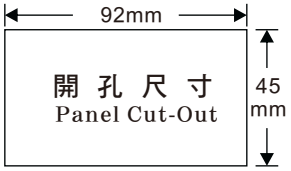
(1) OUT/A4 控制輸出指示燈
(2) AL1 第一組警報輸出指示燈
(3) AL2 第二組警報輸出指示燈
(4) AL3 第三組警報輸出指示燈
(5) SET 參數循環確認鍵
(6) ▲：上加鍵
(7) ▼：下減鍵

外觀尺寸圖 Packge Information

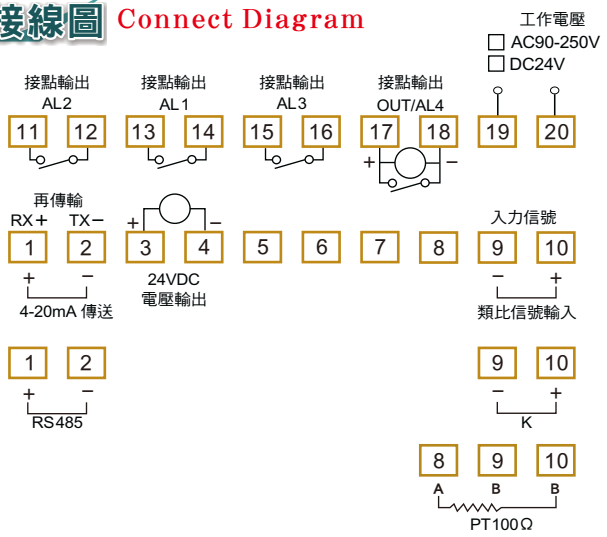


開孔尺寸圖 Locate Description





接線圖 Connect Diagram



輸入種類PC板規劃
specification option of PCB

	GX	GY	GA
TC	ON	OFF	OFF
PT	ON	OFF	OFF
mA	ON	OFF	ON
mV	ON	OFF	OFF
V	OFF	ON	OFF

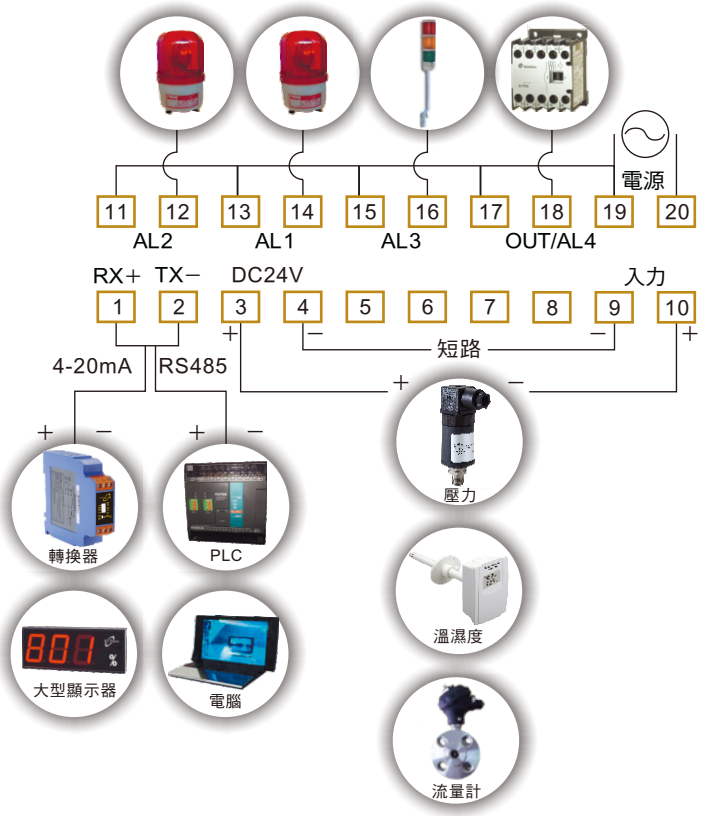
例輸入 4-20mA

GA ■ 短路

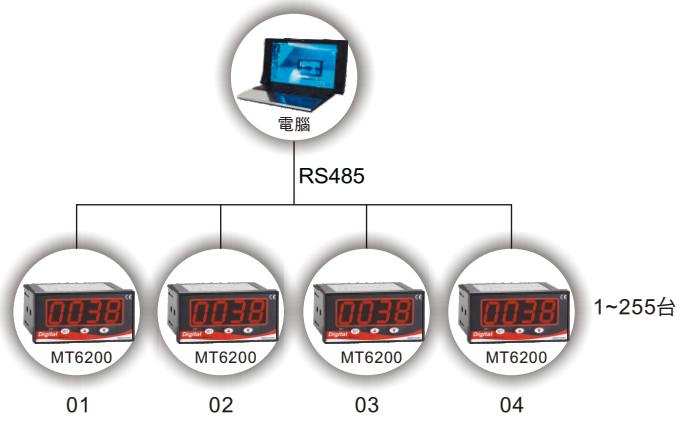
GY □□

GX ■ 短路

接線應用圖 Connecting Application

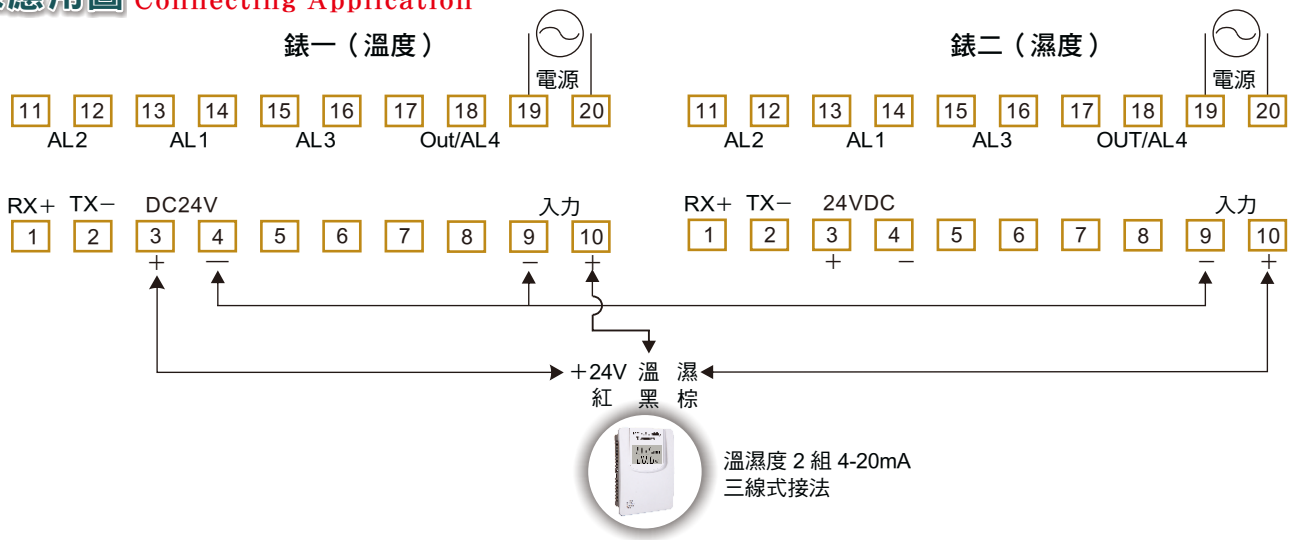


腳位說明圖 Pin Description



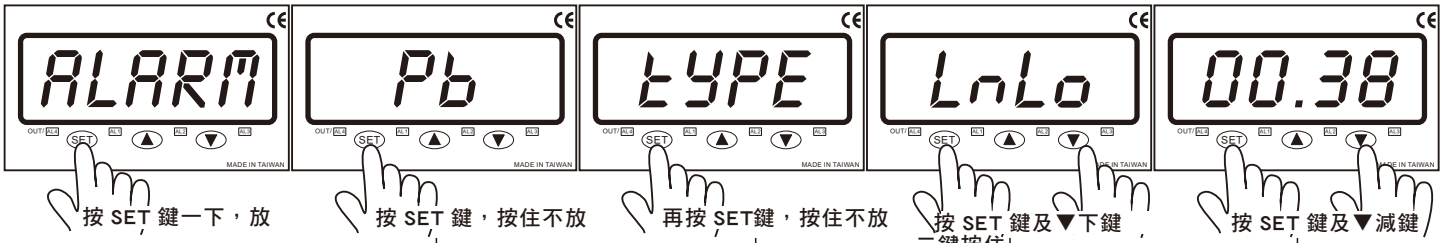
- 1+、2− 4-20mA 再傳送(RS485 輸出選購只能選購其中一種功能)
- 3+、4− DC24V 輸出，可提供傳送器或傳感器工作電源使用
- 9−、10+ 輸入信號(類比信號及溫度 K 選購其中一種功能)
- 8A、9B、10B 輸入溫度 PT100Ω、電阻信號
- 11、12 第二段接點 RELAY(警報 2)
- 13、14 第一段接點 RELAY(警報 1)
- 15、16 第三段接點 RELAY(警報 3)
- 17、18 主輸出 RELAY 可設定數值控制，並可帶動警報配合設定，可做偏差上、下限，區域內、外警報
- 19、20 工作電源 AC90~250V(DC24V 選購)

接線應用圖 Connecting Application



MT6200 說明書

各階層參數說明



按 SET 鍵一下，放 進入 → 第一階層

- 現在 PV 值補償調整 PVoF 0.0
- 第一組警報值設定 A 1SP 1.0 上限60
- 第二組警報值設定 A2SP 1.0 上限75
- 第三組警報值設定 A3SP 1.0

※第四組警報設定

按 SET 鍵，按住不放 5 秒進入 → 第二階層

- 輸出比例帶設定 ON/OFF Pb 0.0
- 輸出加微分時間設定 td 60
- 輸出週期時間設定 Ct 15
- 主輸出遲滯溫度設定 HYSt 0.1
- 第一組警報遲滯間隙設定 A 1HY 0.1 預設:1
- 第一組警報動作延遲時間 A 1dt 0.01
- 第二組警報遲滯間隙設定 A2HY 0.1 預設:1
- 第二組警報動作延遲時間 A2dt 0.01
- 第三組警報遲滯間隙設定 A3HY 0.1
- 第三組警報動作延遲時間 A3dt 0.01
- 面版按鍵參數鎖定 LoCY 0100

※搭配警報模式使用

再按 SET鍵，按住不放 5 秒進入 → 第三階層

- 入力種類選擇 tYPE J
- 單位選擇 Unit C
- 高點及低點遮避隱藏 CUt nonE
- 小數點位數 dP 000.0
- OUT1 輸出方向控制可當第 4 組接點警報用 (加熱 rEY, Lo) (冷卻 dir, Hi) ACt rEY
- 設定 SV 值可設定的範圍低點 LoLt 0.0
- 設定 SV 值可設定的範圍高點 HiLt 100.0
- 軟體濾波器 FiLt 10.0
- 第一組警報功能 A 1FU diF.H 預設:a.Hi
- 第一組警報模式 A 1md nonE
- 第二組警報功能 A2FU diF.L 預設:a.Hi
- 第二組警報模式 A2md nonE
- 第三組警報功能 A3FU H i
- 第三組警報模式 A3md nonE
- RS485 串列位址 Addr 1
- RS485 通訊鮑率 bAUd 9.6
- n81 , n82 格式 FtU n82

按 SET 鍵及▼下鍵，二鍵按住不放 5 秒 進入 → 第四階層

- 線性信號低點對應值 LnLo 0.0
- 線性信號高點對應值 LnH i 100.0

※線性信號低點對應值及高點對應值需與第三層範圍低點 LoLt；範圍高點 HiLt 設同等值（熱電偶及白金電阻不用）

按 SET 鍵及▼減鍵，兩鍵同時按一下放跳回主畫面 → 第五階層

回主畫面

按上鍵一下，放 進入 SV 主設定

在開機正常 PV 值顯示劃面按上鍵直接設定第四組警報設定值

設定*溫度60度以上AL1 ON
溫度回到59以下 AL1 OFF
*溫度75度以上AL2 ON
溫度回到74以下 AL2 OFF

入力種類參數設定選擇包括熱電偶、白金電阻及線性輸入，可控制範圍如下表

tYPE	RANGE(℃)	RANGE(℉)
J	−50～1000	−58～1832
U	−50～1070	−58～2498
t	−270～400	−454～752
E	−50～750	−58～1382
b	0～1800	32～3272
r	0～1750	32～3182
S	0～1750	32～3182
n	−50～1300	−58～2372
C	−50～1800	−58～3272
d-Pt	−200～850	−328～1652
J-Pt	−200～650	−328～1202
L inE	類比信號－1999～9999	

階層及按鍵鎖定。鎖定使階層不可進入，或按鍵無效控制。詳見下表：

LoCY	
設定值	功 能 切 換
0000	所有參數不可改
0001	只有 SV 可以調
0010	僅 USER 階層可調
0011	USER 及 PID 階層可調
0100	USER、PID 及 OPTI 階層可調
0101	USER、SoFt、PID 及 OPTI 階層可調
0110~0111	所有階層開放調整
1XXX	當最高位數改為 1 時，多開放第二組輸出，其它功能同上

輸入種類 PC 板規劃

	GX	GY	GA
TC	ON	OFF	OFF
PT	ON	OFF	OFF
mA	ON	OFF	ON
mV	ON	OFF	OFF
V	OFF	ON	OFF

例輸入 4-20mA

GA ■ 短路
GY □□
GX ■ 短路

警報模式

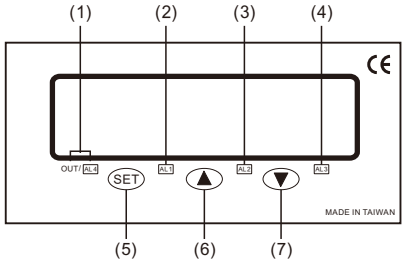
ALMD	說 明
nonE	不附加特殊模式
StdY	第一次不警報
LAtH	警報後不回復
St.LA	第一次不警報，警報後不回復
HH.nn	時分延遲、復歸後不解除警報
nn.SS	分秒延遲、復歸後不解除警報
A1Hd	時分延遲、復歸後解除警報
nn.S	分秒延遲、復歸後解除警報

警報功能種類設定

A1FU A2FU A3FU	說明	警報動作圖示	A1FU A2FU A3FU		警報動作圖示
nonE	A接點不警報				
A.H i	絕對上限A接點警報	ON ▲ALSV PV	A.bdH i	區域外A接點警報	ON OFF ON ▲SV−ALSV ▲SV ▲SV+ALSV PV
A.Lo	絕對下限A接點警報	ON ▲ALSV PV	A.bdLo	區域內A接點警報	OFF ON OFF ▲SV−ALSV ▲SV ▲SV+ALSV PV
A.d iFH	偏差上限A接點警報	ON ▲SV+ALSV PV	A.ton	A接點延遲警報ON	Aldt ON ▲ALSV ▲計時結束 PV
A.d iFL	偏差下限A接點警報	ON ▲SV+ALSV PV	A.toFF	A接點延遲警報OFF	ON Aldt ▲ALSV ▲計時結束 PV

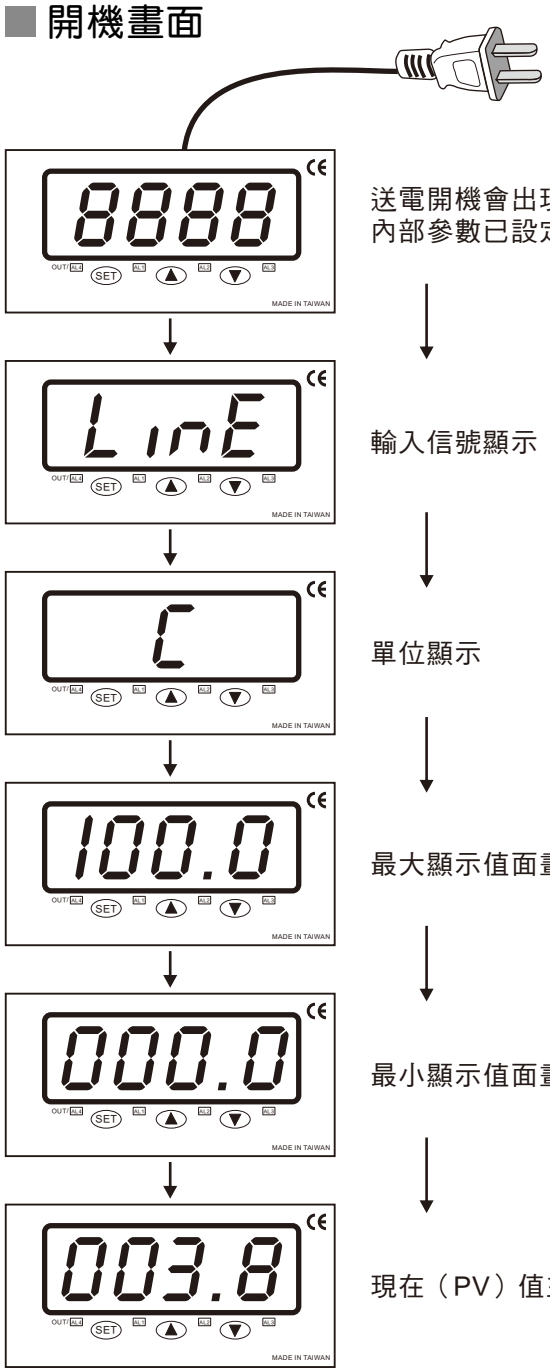
※ 以上為 A 接點警報動作，B 接點警報動作與 A 接點警報動作反向
※ 偏差上、下限，區域外、區域內警報需搭配主輸出使用

面版指示說明



(1) OUT/A4 控制輸出指示燈
(2) AL1 第一組警報輸出指示燈
(3) AL2 第二組警報輸出指示燈
(4) AL3 第三組警報輸出指示燈
(5) SET 參數循環確認鍵
(6) ▲：上加鍵
(7) ▼：下減鍵
※ 當超過一分鐘未按任何按鍵，程式將會自動回到主畫面

開機畫面



送電開機會出現顯示內部參數已設定畫面

輸入信號顯示

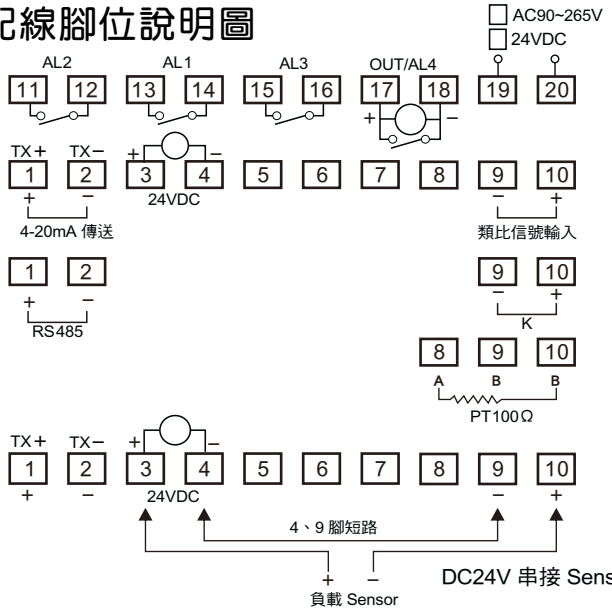
單位顯示

最大顯示值面畫

最小顯示值面畫

現在（PV）值主畫面

配線腳位說明圖

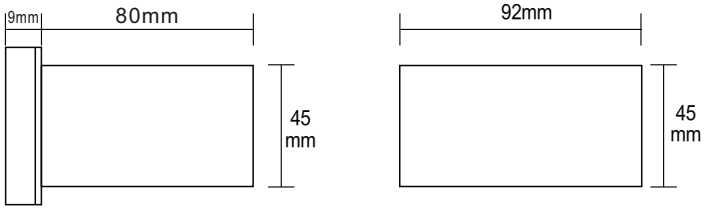


1+、2− 4-20mA 再傳送（RS485 輸出選購只能選購其中一種功能）
3+、4− DC24V 輸出，可提供傳送器或傳感器工作電源使用
9+、10− 輸入信號（類比信號及溫度 K 選購其中一種功能）
8A、9B、10B 輸入溫度 PT 100Ω、電阻信號
11、12 第二段接點 RELAY（警報 2）
13、14 第一段接點 RELAY（警報 1）
15、16 第三段接點 RELAY（警報 3）
17、18 主輸出 RELAY 可設定數值控制，並可帶動警報配合設定，可做偏差上、下限，區域內、外警報
19、20 工作電源 AC90～264V（DC24V 選購）

故障訊息檢修

故障訊息	故 障 狀 況	排 除 方 法
PV 值閃爍	入力信號超出上下限值	1. 調整適當上下限值 2. 檢查入力信號是否過高或過低
oPEn	入力信號斷線或開路	1. 檢查入力線接點是否正確 2. 檢查入力線是否斷路 3. 檢查入力線是否損壞
階層 Level	USER / PID / OPT / 無法調整 PID Level 無法調整 OPT1 Level無法進入或調整	檢查 LOCK 設定是否正確
控制功能	輸出控制完全錯誤或失控	檢查 Act 的設定 rEv , dir是否錯誤
	量測溫度與實際溫度誤差過大	1. 檢查 PvoF 是否設定錯誤，或更改 PvoF=0 再測試 2. 檢查 tyPE 及 Unit 是否設定錯誤
	設定溫度與穩定溫度誤差過大	檢查 SpoF 是否設定錯誤，或 SpoF=0 再測試
RS-485 通訊	RS-485 通訊無效	請確定有訂購 RS-485 通訊功能並有安裝過通訊模組
	RS-485 通訊失效	1. 通訊軟體需符合 Mod Bus protocol 2. 確認 Addr 參數與軟體位址設定是否相符 3. 確認 bAUd 參數與軟體鮑率設定是否相符

開孔尺寸



MT6200 通訊協定

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1. COMMUNICATION FUNCTIONS

1.1 General

- VD series provides a communication function by RS-485 interface, by which it can transmit and receive data to and from host computer, programmable controller, graphic display panel, etc.
- The communication system consists of master station and slave stations. Up to 255slave station can be connected per master station.
- In order that the master station and slave station can communicate, the format of the transmit/receive data must coincide. For the VD series, the format of the communication data is determined by the MODBUS protocol (RTU mode).
- Please use an RS-232C→RS-485 converter in case of designating a personal computer or other devices which have an RS-232C interface as a master station.

2. SPECIFICATIONS

2.1 Communication Specifications

Item	Specification	
Electrical specification	Based on EIA RS-485	
Transmit system	2-wire, semi-duplicate	
Synchronizing system	Asynchronous mode	
Connection format	1 : N	
Number connection unit	Up to 255 units	
Transmission distance	500m max	
Transmission speed	2400 / 4800 / 9600 / 19200 selectable	
Data format	Start bit	1 bit
	Data length bit	8 bits
	Parity bit	None
	Stop bit	2 bits
Transmission code	HEX value (MODBUS RTU mode)	
Error detection	CRC-16 bits	
Isolation	Functional isolation between transmission circuit and others (with stand voltage: 500V AC).	

A typical MODBUS protocol character is shown below:

1	2	3	4	5	6	7	8	9	10	11
Start bit	Data bits								Stop bits	

One character is including 1 Start bit and 8 Data bits and 2 Stop bits.

3. CONNECTION

△ WARNING
For avoiding electric shock and malfunctions, don't turn on the power supply until all wiring has been completed.

3.1 Terminal Allocation

◆

Terminal number	Signal name
1	+
2	-

◆

Terminal number	Signal name
15	+
16	-

◆

Terminal number	Signal name
13	+
14	-

3.2 Wiring

- □ Use twisted pair cables with shield.
  Recommended cable: UL2464, UL2448, etc.
- □ The total extension length of the cable is up to 500m. A master station and up to 255 units of the VD series can be connected per line.
- □ Both ends of the cable should be connecting with terminate resistors 100Ω 1/2W.
- □ The shield wire of the cable should be grounded at one place on the master station unit side.

4. SETTING OF COMMUNICATION CONDITION

In order that the master station and VD series can correctly communicate, following settings are required.

- All communication condition settings of the master station are the same as those of VD series.
- All VD series connected on a line are set to address (ADDR), which are different from each other.

4.1 Set Items

The parameters to be set are shown in the following table. Set them by operating the front panel keys.

Parameter	Item	Value at delivery	Setting range	Remarks
BAUD	Transmission speed	9600	2400/4800/9600/19200	Set the same communication
---------	Data length	8 bits	Fixed (can't be changed)	condition to the
---------	Stop bit	2 bit	Fixed (can't be changed)	master station and all
---------	Parity setting	None	Fixed (can't be changed)	slave station.
ADDR	Address	1	1 to 255	Set a different value to each station.

4.2 Setting Operation Method

The following example shows how to set the communication condition.
Example: Setting a transmission speed is 9600 bps and address at 12 on a station.

Key operation	Indication	Description
Power ON	25/100	Power on running state (PV/SV indication)
SET (5 seconds)	PB	Press SET key simultaneously for approximately 5 seconds to get level parameter.
SET (5 seconds)	TYPE	Press SET key simultaneously for approximately 5 seconds to get level parameter.
SET		Press SET key to go into level.
SET	ADDR	Press SET key repeatedly until ADDR is display.
△ or ▽	ADDR/12	Press △ or ▽ key to setting "ADDR=12"
SET	BAUD	Press SET key again to select next parameter "BAUD"
△ or ▽	BAUD/9.6K	Press △ or ▽ key to setting "BAUD=9.6K"
SET	BAUD	Press SET key to save "BAUD".
SET + ▽	25/100	Press SET +▽ one time to return the normal indication (PV/SV indication).

5. MODBUS COMMUNICATION PROTOCOL

5.1 General

The communication system by the MODBUS protocol is that the communication is always started from the master station and a slave station responds to the received message.

Transmission procedures is as shown below.

1. The master station sends a command message to a slave station.
2. The slave station checks that the address in the received message matches with the own address or not.
3. If matched, the slave station executes the command and sends back the response message.

4. If mismatched, the slave station leaves the command message and wait for the next command message.
5. The master station can individually communicate with any one of slave stations connected on the same line upon setting the address in the command message.

5.2 Composition of Message

Command message and response message consist of 4 fields; Address, Function code, Data and CRC check code. And these are sends in this order. The allowable character transmitted for all fields are hexadecimal 0-9,A-F

RTU mode framing

START	ADDRESS	FUNCTION	DATA	CRC CHECK	END
T1-T2-T3-T4	8 BITS	8 BITS	N × 8 BITS	16 BITS	T1-T2-T3-T4

In the following, each field is explained.

1. **Start**
   In RTU mode, messages start with a silent interval of at least 3.5 character times. This is most easily implemented as a multiple of character times at the baud rate that is being used on the network (shown as T1-T2-T3-T4 in the figure above). The first field then transmitted is the device address.

2. **Address**
   Address is the number specifying a slave station. Valid slave device addresses are in the range 0f 1-255 decimal. A master addresses a slave by placing the slave address in the address field of the message. When the slave sends its response, it places its own address in this address field of the response to let the master know which slave is responding.
   Address 0 is used for the broadcast address, which all slave stations recognize. When the broadcast address (address 0) is applied on the command message, no any response message will be sent from the slave stations.
3. **Function**
   This is a code to designate the function executed at a slave station. When a message is sent from a master to a slave device the function code field tells the slave what kind of action to perform. When the slave responds to the master, it uses the function code field to indicate either a normal response or that some kind of error occurred. For normal response, the slave simply echoes the original function code. For an exception response, the slave returns a code that is equivalent to the original function code with its most-signification bit set to a logic 1.
4. **Data**
   Data are the data required for executing function codes. The composition of data varies with function codes. Refer to chapter 6 for details.
   A data address is assigned to each data in the temperature controller. For reading/writing the data by communication, designate the data address.
5. **CRC check**
   This is the code to detect message errors (change in bit) in the signal transmission. On the MODBUS protocol (RTU mode), CRC-16 (Cyclical Redundancy Check) is applied. For CRC calculation method, refer to section 5.5.
6. **End**
   Following the last transmitted character, a similar interval of at least 3.5 character times marks the end of message. A new message can begin after this interval.

5.3 Response of Slave Station

1. **Response for normal command**
   To a relevant message, the slave station creates and sends back a response message, which corresponds to the command message. The composition of

message in this case is the same as in section 5.2. Content of the data field depend on the function code. For details, refer to Chapter 6.

2. Response for abnormal command

If contents of a command message have an abnormality (for example, non-actual function code is designated) other than transmission error, the slave station does not execute that command but creates and sends back a response message at error detection.

The composition of response message at error detection is shown on below, the value used for function field is function code of command message plus 80H.

ADDRESS	FUNCTION (Function code + 80H)	ERROR CODE	CRC CHECK
8 BITS	8 BITS	8 BITS	16 BITS

Error Code	Contents	Description
01	Illegal function	The function code received is not an allowable action for the slave.
02	Illegal data address	The data address received is not an allowable address for the slave.
03	Illegal data value	A value contained in the data field is not an allowable value for the slave.

5.4 Function Code

The listing below shows the function codes supported by VD series controllers.

Function code		
Code	Function	Object
03	Read-out	Holding Register
04	Read-out	Input Register
06	Write-in	Holding Register

5.5 Calculation of Error Check Code (CRC-16)

CRC-16 is the 2-bytes (16-bits) error check code. From the top of the message (address) to the end of the data field are calculated.

The slave station calculates the CRC of the received message, and does not respond if the calculated CRC is different from the contents of the received CRC code.

A procedure for generating a CRC is:

1. Load a 16-bits register with FFFF hex (all 1's). Call this the CRC register.
2. Exclusive OR the first 8-bit byte of the message with the low-order byte of the 16-bit CRC registers, putting the result in the CRC register.
3. If the LSB is 0: Shift the CRC register one bit to the right (toward the LSB), Zero-filling the MSB.
   If the LSB is 1: Shift the CRC register one bit to the right (toward the LSB), Zero-filling the MSB. Exclusive OR the CRC registers with the polynomial value A001 hex.
4. Repeat step 3 until 8 shifts have been performed. When this is done, a complete 8-bit byte will have been processed.
5. Repeat step 2 through 5 for the next 8-bit byte of the message. Continue doing this until all bytes have been processed.
6. The final content of the CRC register is the CRC value. The CRC field is appended to the message as the last field in the message. When this is done, the low-order byte of the field is appended first, followed by the high-order byte. The CRC high-order byte is the last byte to be sent in the message.

5.6 Transmission Control Procedure

1. Transmission procedure of master station

The master station must proceed to a communication upon conforming to the following items.

1-1. Before sending a command message, provide 44 bits time or more vacant status.

1-2. For sending, the interval between bytes of a command message is below 22 bits time.

1-3. Within 22 bits time after sending a command message, the receiving status is posted.

1-4. Provide 44 bits time or more vacant status between the end of response message reception and beginning for next command message sending (same as in 1-1).

1-5. For ensuring the safety, make a confirmation of the response message and make an arrangement so as to provide 3 or more retries in case of no response, error occurrence, etc.

Note: The above definition is for most unfavorable value. For ensuring the safety, it's recommended the program of the master to work with safety factors of 2 to 3. Concretely, it is advised to arrange the program for 9600 bps with 10ms or more for vacant status (1-1), and within 1ms for byte interval (1-2) and changeover from sending to receiving (1-3).

2. Description

(1). Detection of the message frame

Since the communication system uses the 2-write RS-485 interface, there may be 2 statuses on a line below.

(a) Vacant status (no data on line)

(b) Communication status (data is existing)

Instruments connected on the line are initially at a receiving status and monitoring the line. When 22 bits time or more vacant status has appeared on the line, the end of preceding frame is assumed and, within following 22 bits time, a receiving status is posted. When data appears on the line, instruments receive it while 22 bits time or more vacant status is detected again, and the end of that frame is assumed. Data, which appeared on the line from the first 44ms time or more vacant status to the next 44 bits time or more vacant status is fetched as one frame.

1-1. 44 bits time or more vacant status precedes the command message sending.

1-2. Interval between bytes of 1 command message is smaller than 22 bits time.

(2). Response of this instrument (VD series)

After a frame detection (22 bits time or more vacant status), this instrument carries out-processing with that frame as a command message. If the command message is destined to the own station, a response message is returned. Its processing time is 1 to 10ms (depends on contents of command message). After sending a command message, therefore, the master station must observe the following.

1-3. Receiving status is posted within 22 bits time after sending a command message.

6. DETAILS OF MESSAGE

6.1 Read-out of Word Data [Function Code: 03]

Read the contents of holding registers (0000~ 007D) in the slave.

Broadcast is not possible.

1. Message composition

Command message composition

Address	Function	Starting Address	Word Number*	CRC-16	
01~FF	03	0xxx	0001~007E	Low-order byte	High-order byte
1 byte	1 byte	2 byte	2 bytes	2 bytes	

* Maximum word number = 7E

Response message composition

Address	Function	Byte Number *	Word Data	CRC-16	
01 ~ FF	03	02~FC		Low-order byte	High-order byte
1 byte	1 byte	1 bytes	N bytes	2 bytes	

* Byte number = Word number × 2

2. Message transmission (example)

The following show an example of reading the Setpoint Value (1000) from address No.1 controller.

Command message composition

Address	Function	Starting Address	Word Number	CRC-16
01	03	0000	0001	840A

Response message composition

Address	Function	Byte Number	Word Data	CRC-16
01	03	02	03E8	B8FA

6.2 Read-out of Read-Only Word Data [Function Code: 04]

Read the contents of input registers (1000~1002) in the slave.

Broadcast is not possible.

1. Message composition

Command message composition

Address	Function	Starting Address	Word Number	CRC-16	
01~FF	04	1xxx	0001~007E	Low-order byte	High-order byte
1 byte	1 byte	2 bytes	2 bytes	2 bytes	

Response message composition

Address	Function	Byte Number	Word Data	CRC-16	
01 ~ FF	04	02~FC		Low-order byte	High-order byte
1 byte	1 byte	1 byte	N bytes	2 bytes	

2. Message transmission (example)

The following show an example of reading the Process Value (27) from address No.1 controller.

Command message composition

Address	Function	Starting Address	Word Number	CRC-16
01	04	1000	0001	350A

Response message composition

Address	Function	Byte Number	Word Data	CRC-16
01	04	02	001B	F93B

6.3 Write-in of Word Data (1 word) [Function Code: 06]

1. Message composition

Command message composition

Address	Function	Starting Address	Word Data	CRC-16	
1 ~ FF	06	0xxx	0xxx	Low-order byte	High-order byte
1 byte	1 byte	2 bytes	2 bytes	2 bytes	

Response message composition

Address	Function	Starting Address	Word Data	CRC-16	
1 ~ FF	06	0xxx	0xxx	Low-order byte	High-order byte
1 byte	1 byte	2 bytes	2 bytes	2 bytes	

2. Message transmission (example)

The following show an example of writing the Setpoint Value to address No.1 controller.

Command message composition

Address	Function	Starting Address	Word Data	CRC-16
01	06	0000	01F4	89DD

Response message composition

Address	Function	Starting Address	Word Data	CRC-16
01	06	0000	01F4	89DD

7. ADDRESS MAP AND DATA FORMAT

7.1 Data Format

1. Transmission data format

The MODBUS protocol used in this instrument (VD series) is RTU (Remote Terminal Unit) mode.

Transmitted data is “numeric value” and not “ASCII code”.

2. Internal calculation value and engineering unit

There are 3 different kinds of set value in the VD series controllers.

1. Normal value:
   The data value is transfer into Hexadecimal regardless of decimal. For example: 1000 ℃ will be transfered to 03E8(hex), However, such as output percentage and Pb (proportional band), 100.0 % will be transfered to 03E8(hex).
2. Index code:
   Some parameters value are set by index code. For example, to change the unit to ℃ via communication. The data value would be 0017(hex).

Code	English	Code	English	Code	English	Code	English
00	J	0F	ENG	1E	9.6K	2D	1101
01	K	10	0000	1F	19.2K	2E	1110
02	T	11	000.0	20	0000	2F	1111
03	E	12	00.00	21	0001	30	HI
04	B	13	0.000	22	0010	31	LO
05	R	14	REV	23	0011	32	DIF.H
06	S	15	DIR	24	0100	33	DIF.L
07	N	16	NONE	25	0101	34	BD.HI
08	C	17	STDY	26	0110	35	BD.LO
09	D-PT	18	LATH	27	0111	36	T.ON
0A	J-PT	19	ST.LA	28	1000	37	T.OFF
0B	LINE	1A	HH.MM	29	1001	38	NONE
0C	℃	1B	MM.SS	2A	1010	39	LO
0D	℉	1C	2.4K	2B	1011	3A	HI
0E	ENG	1D	4.8K	2C	1100	3B	HI.LO

7.2 Data Address Map

■ Word data (read-out/write-in) : Function code [03,,05,06]

Data Address	Parameter	Range	Unit
0000	SV	HiLt~LoLt	℃/℉
0001	SPOF	-1000~1000	℃/℉
0002	PVOF	-1000~1000	℃/℉
0003	A1SP	-1000~1000	℃/℉

0004	A2SP	-1000~1000	℃/℉
0005	A3SP	-1000~1000	℃/℉
0006	PB	0.0~300.0	%
0007	TD	900	Sec
0008	CT	0~100	Sec
0009	HYST	0~2000	℃/℉
000A	A1HY	0~2000	℃/℉
000B	A2HY	0~2000	℃/℉
000C	A3HY	0~2000	℃/℉
000D	LOCK	0000~1111	
000E	TYPE	J/K/B/R/S/T/E/N/C/DPT/JPT/LINE (English code)	
000F	UNIT	℃ / ℉ / ENG (English code)	
0010	DP	0000/000.0/00.00/0.000 (English code)	
0011	ACT	REV / DIR(English code)	
0012	LOLT	-1999~9999	℃/℉
0013	HILT	-1999~9999	℃/℉
0014	FILT	0.0~-100.0	
0015	A1FU		
0016	A1MD		
0017	A2FU		
0018	A2MD		
0019	A3FU		
001A	A3MD		
001B	ADDR	0~255	0
001C	BAND		
001D	CH01	0~2000	
001E	CL01	0~2000	
001F	RTSH	0~3000	
0020	RTSL	0~3000	
0021	MR	0.0~100.0	%

■ Word data (read-out only) : Function code [04]

Data Address	Parameter	Contents	Unit
1000	PV	Process value	
1003	LED	BIT,S8,S7,S6,S5,S4,S3,S2,S1,PTN2,PTN1,RUN,PRO,**C2,C1,A2,A1**	
1004	MCODE	14=VT26,1E=VT30,07D0=VD	

8. TROUBLESHOOTING

8.1 Troubleshooting

If the communication is unavailable, check the following items.

- ☐ Whether all devices related to communication are turned on.
- ☐ Whether connections are correct.
- ☐ Whether the number of connected instruments and connection distance are as specified.
- ☐ Whether communication conditions coincide between the master station (host computer) and slave station (VD).
  - ☐ Transmission speed : ☐ 2400 bps ☐ 4800 bps ☐ 9600 bps ☐ 19200 bps
  - ☐ Address :01 ~ FF (master and slave station must be match)
- ☐ Whether send/receive signal timing conforms to Section 5.4 in the manual.
- ☐ Whether more than one instrument connected on the same transmission line share the same address.