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5011692102-EPC2

DTE10P Series Temperature Controller Instruction Sheet

Thank you very much for choosing Delta DTE series temperature controller. Please read this instruction sheet carefully before using your DTE to ensure proper operation. Keep this instruction sheet handy for quick reference.

■ Precaution

⚠ **DANGER! Caution! Electric Shock!**

DTE is an OPEN-TYPE device and therefore should be installed in an enclosure free of airborne dust, humidity, electric shock and vibration. The enclosure should prevent non-maintenance staff from operating the device (e.g. key or specific tools are required for opening the enclosure) in case danger and damage on the device may occur.

⚠ **WARNING!**

1. Prevent dust or metallic debris from falling into the device and cause malfunctions. DO NOT modify or uninstall the circuit board of DTE without being permitted. DO NOT use empty terminals.
2. Keep away from high-voltage and high-frequency environment during the installation in case of interference. Prevent using the device in premises which contain:

   (a) dust or corrosive gas; (b) high humidity and high radiation; (c) shock and vibration.
3. The power has to be switched off when wiring or changing the temperature sensor.
4. When installing the circuit board of the accessory, please make sure the power of the main unit is switched off and insert the accessory into the correct slot on the main unit.
5. Make sure to use compensation wire which matches the thermocouple or platinum resistance when extending or connecting the thermocouple or platinum resistance.
6. Keep the wire as short as possible when wiring a sensor to the controller. Separate the power cable and load wire in order to prevent interference and induced noise.
7. Make sure the power cables and signal device are installed correctly before switching on the power; otherwise serious damage may occur.
8. DO NOT touch the terminal or repair the device when the power is on; otherwise an electric shock may occur.
9. Please wait for 1 minute after the power is switched off to allow the capacitor to discharge and DO NOT touch the internal wiring within this period.
10. DO NOT touch the internal terminal when DTE is either switched on or off in case you may damage the circuit.
11. Please place DTE with other heating objects (e.g. power supply) within proper distance while installing DTE.

■ Ordering Information

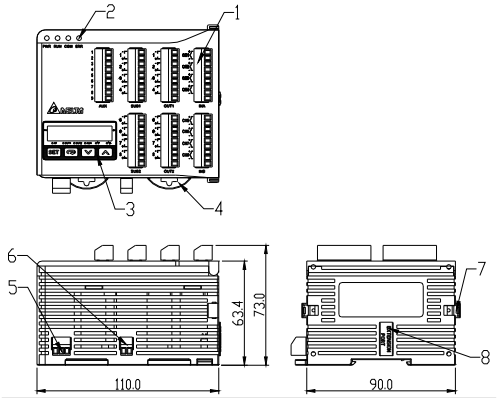
DTE 1 2 3-4

Series name	DTE: Delta E series temperature controller		
1 Device type	1: main unit	2: accessory	
2 3 - 4	0T: 4-channel TC 0P: 3-channel PT	0T: 4-channel TC 0V: 4 channels of voltage pulse output 0C: 4 channels of linear current output 0R: 4 channels of relay output 0L: 4 channels of linear voltage output CT: 4 channels of current transformer sensors DS: Display and setup module	0P: 3-channel PT 0D: 8-channel EVENT input

■ Specifications

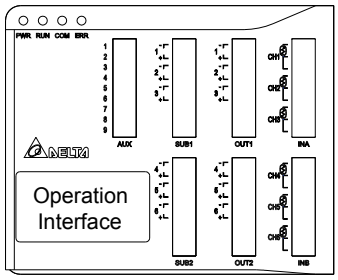
Power input	24 VDC, isolated switching power supply
Voltage range	90 to 110% rated voltage
Power consumption	Max. 10W + 3W × number of DTC2000 controllers connected in parallel (Max. 7)
Input sensor	Thermocouple: K, J, T, E, N, R, S, B, L, U, TXK
	Platinum resistance: Pt100, JPt100, Ni120, Cu50
Sampling cycle	Thermocouple or platinum resistance: 1.0 second/all input
Control method	PID, PID programmable, manual, ON/OFF
Output accessories (optional)	Relay output: SPST, Max. 250 VAC load, 3 A resistive load
	Voltage pulse output: 12 VDC, Max. 40 mA current output
	Current output: DC 4 to 20 mA output (resistive load < 500Ω); for OUT1 and OUT2 only
	Analog voltage output: 0 to 10 V (resistive load > 1,000Ω); for OUT1 and OUT2 only
Output functions (optional)	Control output, alarm output or proportional output (proportional output is only applicable in the model with linear voltage and current output for OUT1, OUT2)
Alarm modes (optional)	13 alarm modes available
Communication	RS-485 digital communication; supports baud rate 2,400 to 115,200 bps
Communication protocol	Supports Modbus ASCII/RTU
Extension port	The extension port transmits 24V power supply and communication signals to extension module DTC2000.
Vibration resistance	10 ~ 55Hz 10m/s^2 3 axes 10mins
Shock resistance	Max. 300m/s^2 3 axes 6 directions, 3 times each
Ambient temperature	0 to +50°C
Storage temperature	-20 to +65°C
Operation altitude	< 2,000m
Ambient humidity	35 to 85% RH (non-condensing)
Pollution degree	2

■ Product Profile & Outline



DTE10P	
1	I/O terminals
2	Status LED
3	Display and setup unit
4	DIN rail clip
5	Power input port
6	RS-485 communication port
7	Extension module fixing clip
8	Extension port

■ Panel Layout



■ Input

The standard DTE main unit is attached with 3 channels of inputs. You can purchase additional DTE20P to expand the number of input channels. DTE supports maximum 6 channels of inputs which belong to group INA and group INB. Each group possesses 3 input channels.

DTE series supports the following input sensors:

Input Sensor Type	Register Value	Range
For DTE10P / DTE20P		
Temperature measurement resistance (Cu50)	14	-50 ~ 150°C
Temperature measurement resistance (Ni120)	13	-80 ~ 300°C
Platinum resistance (Pt100)	12	-200 ~ 850°C
Platinum resistance (JPt100)	11	-20 ~ 400°C
For DTE10T / DTE20T		
Thermocouple TXK type	10	-200 ~ 800°C
Thermocouple U type	9	-200 ~ 500°C
Thermocouple L type	8	-200 ~ 850°C
Thermocouple B type	7	100 ~ 1,800°C
Thermocouple S type	6	0 ~ 1,700°C
Thermocouple R type	5	0 ~ 1,700°C
Thermocouple N type	4	-200 ~ 1,300°C
Thermocouple E type	3	0 ~ 600°C
Thermocouple T type	2	-200 ~ 400°C
Thermocouple J type	1	-100 ~ 1,200°C
Thermocouple K type	0	-200 ~ 1,300°C

Note: The default setting in DTE10P is “Pt100".

Communication address: Input sensor types at H10A0 ~ H10A5; input upper limits at H1010 ~ H1015; input lower limits at H1018 ~ H101D.

■ Output

DTE supports maximum 12 channels of outputs, belonging to output groups OUT1, OUT2, SUB1 and SUB2, each group with 3 channels. See the explanations below for how input channels correspond to output groups.

- Without group INB (3 channels of input): Every channel corresponds to 2 groups of output and 2 groups of alarms. OUT1 and SUB1 are for control output, and OUT1 can be used for proportional output. OUT2 and SUB2 are fixed for alarm output.
- With group INB (6 channels of input): Every channel is paired with 2 groups of outputs. OUT1 and OUT2 are used for control output or proportional output of CH1 ~ CH6. SUB1 and SUB2 are used for control output or alarm output.

See Table 1 for the relations between input and output.

	3 channels of input	6 channels of input	
Output Group	INA (CH1 ~ CH3)	INA (CH1 ~ CH3)	INB (CH4 ~ CH6)
OUT1	Main control output or proportional output	Main control output or proportional output	No corresponding output
OUT2	Alarm 1 output	No corresponding output	Main control output or proportional output
SUB1	Control output	Control output or alarm 1 output	No corresponding output
SUB2	Alarm 2 output	No corresponding output	Control output or alarm 1 output

Table 1

Note: SUB1 and SUB2 do not support DTE20L and DTE20C. Please install the optional output modules you purchase into the correct slot.

• Communication Address of Output & How to Set up Parameters

See Table 2 for the communication addresses of output and Table 3 for the definition of the value in the address.

	INA			INB		
	CH1	CH2	CH3	CH4	CH5	CH6
OUT1, OUT2	H10A8	H10A9	H10AA	H10AB	H10AC	H10AD
SUB1, SUB2	H10B0	H10B1	H10B2	H10B3	H10B4	H10B5

Table 2

	Value = 0	Value = 1	Value = 2	Value = 3
OUT1, OUT2**	Heating control	Cooling control	Proportional output	Disable output
SUB1, SUB2**	Heating control	Cooling control	Alarm output*	Disable output

Table 3

* When there are only 3 channels of inputs, SUB1 cannot be used for alarm output but heating/cooling control only.

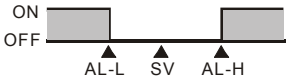
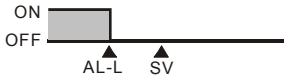
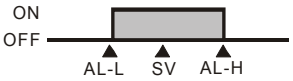
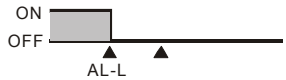
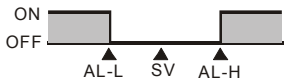
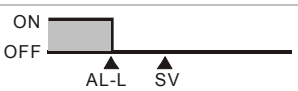
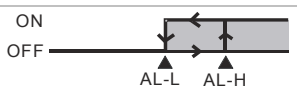
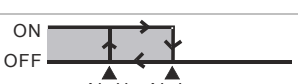
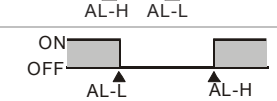
** When there are only 3 channels of inputs, OUT2 and SUB2 cannot be set up by the user but set up automatically as "alarm output" by the controller.

• Control Output:

DTE offers PID control, ON/OFF control, manual control and programmable PID control. Control output methods are set at address H10B8 ~ H10BF (default = 0: PID), PID parameters at H1028 ~ H105F, ON/OFF parameters at H1058 ~ H106F, and manual control parameters at H1070 ~ H107F.

• Alarm Output:

DTE offers 13 alarm modes. The alarm modes are set up at address H10C0 ~ H10C7, upper limits at H1080 ~ H1087 and lower limits at H1088 ~ H108F.

SV	Alarm Mode	Alarm Output Operation
0	No alarm	Off
1	Alarm output is enabled when the temperature reaches upper and lower limits: The alarm will be enabled when PV exceeds SV + AL-H or falls below SV – AL-L.	
2	Alarm output will be enabled when the temperature reaches the upper limit: The alarm will be enabled when the PV exceeds SV + AL-H.	
3	Alarm output will be enabled when the temperature reaches the lower limit: The alarm will be enabled when the PV falls below SV – AL-L.	
4	Alarm output will be enabled when the PV is between SV + AL-H and SV – AL-L.	
5	Alarm output will be enabled when the temperature reaches the absolute value of the upper and lower limits: The alarm will be enabled when the PV exceeds AL-H or falls below AL-L.	
6	Alarm output will be enabled when the temperature reaches the absolute value of the upper limit: The alarm will be enabled when the PV exceeds AL-H.	
7	Alarm output will be enabled when the temperature reaches the absolute value of the lower limit: The alarm will be enabled when the PV falls below AL-L.	
8	Upper/lower limit standby alarm: The alarm will be enabled when the PV reaches SV and further exceeds SV + AL-H or falls below SV – AL-L.	
9	Upper limit standby alarm: The alarm will be enabled when the PV reaches SV and further exceeds SV + AL-H.	
10	Lower limit standby alarm: The alarm will be enabled when the PV reaches SV and further falls below SV – AL-L.	
11	Upper limit hysteresis alarm: The alarm will be enabled when the PV exceeds SV + AL-H. The alarm will be disabled when the PV falls below SV + AL-L.	
12	Lower limit hysteresis alarm: The alarm will be enabled when the PV falls below SV – AL-H. The alarm will be disabled when the PV exceeds SV – AL-L.	
13	CT alarm: The alarm will be enabled when the CT value exceeds AL-H or falls below AL-L.	

■ LED Display

PWR: On ⇨ DTE is powered.

RUN: On ⇨ Any of the channel is executing.

COM: Flashing ⇨ Communication in progress

ERR: Indicating errors (red)

ERR LED is on indicates one of the following errors occur, and the output has to be disabled.

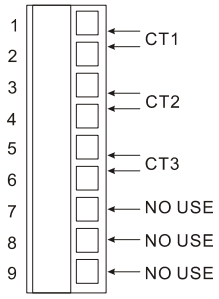
1. Memory EEPROM error.
2. Any of the input points is not connected.
3. Any of the input points exceeds the setup range.
4. Any of the input temperatures has not been stabilized.

■ Synchronous Communication Protocol & Auto ID Setup

This function allows the auto setup of communication protocol in extension module DTC2000 and DTC2001 following the communication protocol set in the DTE main unit. The station IDs of DTC decrease. See below for the steps.

1. Set the auto communication ID of DTE as “1” (communication address: H10F8).
2. Switch off DTE. Connect DTE with extension module DTC2000, DTC2001 and switch on DTE again.
3. Default communication protocol: 9,600bps, 7 bits, Even, 1 stop bit, communication address = 01.
4. This function will consume 3 ~ 5 seconds more when you switch on DTE.

■ CT (Current Transformer)



• Function

DTE10P offers maximum 3 channels of CT (CT1 ~ CT3), responsible for monitoring the current in INA. Each CT group can be set up independently. With alarm outputs, when the detected current value is beyond the allowed range, the corresponding alarm will be enabled.
Slot INA offers 3 channels of input, and CH1 ~ CH3 correspond to the current detected at CT1 ~ CT3.
Hardware requirement: Accessory DTE2CT inserted in the slot AUX.

• How to Operate

1. Enable the CT function: Write 1234H into the address 47F1H and then 0004H into address 4824H.

bits in 4824H	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Flag	--	Hot runner control	Slope control	--	Latch	CT	EVENT	--

Notes:

- The flag to enable CT is at bit2 of 4824H. Write 0004H to bit2 to set it on.
- If the “multistate” function is enabled, for example, writing in 0024H means enabling bit5 and bit2 at the same time.
- You can only choose to use either the CT or EVENT function.
- If there is already a set value in 4824H and you would like to modify it, reset it to 0 before you set up a new value.

2. When you use INA input or INA + INB input, set up relevant parameters using the table below.
   INA input:

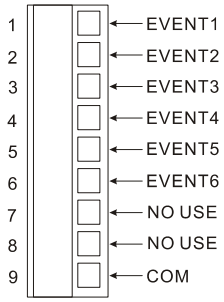
INA	CH1	CH2	CH3
OUT1 control mode	10A8H	10A9H	10AAH
OUT2 control mode	10B0H	10B1H	10B2H
Alarm 1 output mode	10C0H	10C1H	10C2H
Alarm 2 output mode	10C4H	10C5H	10C6H
Upper bound of Alarm 1 output	1080H	1081H	1082H
Lower bound of Alarm 1 output	1088H	1089H	108AH
Upper bound of Alarm 2 output	1084H	1085H	1086H
Lower bound of Alarm 2 output	108CH	108DH	108EH
CT value (latch)	19A0H	19A1H	19A2H
CT value (dynamic)	19A4H	19A5H	19A6H

INA + INB input:

INA+INB	CH1	CH2	CH3	CH4	CH5	CH6
OUT1 control mode	10A8H	10A9H	10AAH	10ABH	10ACH	10ADH
Alarm 1 output mode	10C0H	10C1H	10C2H	10C3H	10C4H	10C5H
Upper bound of Alarm 1 output	1080H	1081H	1082H	1083H	1084H	1085H
Lower bound of Alarm 1 output	1088H	1089H	108AH	108BH	108CH	108DH
CT value (latch)	19A0H	19A1H	19A2H	--	--	--
CT value (dynamic)	19A4H	19A5H	19A6H	--	--	--

3. OUT1 control mode has to be set to “0” (heating) or “1” (cooling). It cannot be set to “2” (proportional output).
4. You can select Alarm 1 or Alarm 2 to be the output contact. The output mode has to be set to “13” (000DH).
5. Adjust the upper/lower bound of the alarm output.
6. The CT value will only be measured when there is OUT1 executing. If OUT1 does not exist, the previous CT value measured will be displayed.

■ EVENT Input



• Function

DTE10P offers 6 channels of EVENT input (EV1 ~ EV6), and each EVENT can be set up independently. Slot number 1 ~ 6 in AUX on DTE10P correspond to EV1 ~ EV6. EV1 to EV6 can be short-circuited individually with slot number 9 to switch functions.
Hardware requirement: Accessory DTE20D inserted in the slot AUX.

• How to Operate

1. Enable the EVENT function: Write 1234H into the address 47F1H and then 0002H into address 4824H.

bits in 4824H	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Flag	--	Hot runner control	Slope control	--	Latch	CT	EVENT	--

Notes:
- The flag to enable EVENT is at bit1 of 4824H. Write 0002H to bit1 to set it on.
- If the “multistate” function is enabled, for example, writing in 0022H means enabling bit5 and bit1 at the same time.
- You can only choose to use either the CT or EVENT function.
- If there is already a set value in 4824H and you would like to modify it, reset it to 0 before you set up a new value.

2. Each channel can be set up individually for specific functions.

Addresses:

CH	CH1	CH2	CH3	CH4	CH5	CH6
Address for the EVENT function	1998H	1999H	199AH	199BH	199CH	199DH

Functions:

Set value	0	1	2	3	4
Function	N/A	RUN (open circuit) STOP (short circuit)	SV1 (open circuit) SV2 (short circuit)	Auto (open circuit) Manual (short circuit)	Execute (open circuit) Pause (short circuit)

Definitions:
- RUN/STOP: To enable or disable the output.
- SV1/SV2: To switch between set values.
- Auto/manual: To switch between the PID and manual controls.
- Execute/pause: To execute or pause the counting time when in programmable PID control.

Example: If you would like the function of EVENT1 at CH1 to be “SV1/SV2”, write 0002H into address 1998H.

■ Slope

• Function

The temperature rises according to the slope set. Unit: 0.1°C/min.
Example: Suppose the slope is set to “50” and SV “200.0°C”, then the temperature will rise at 5°C per minute until it reaches 200.0°C.

• How to Operate

1. Enable the slope function: Write 1234H into the address 47F1H and then 0020H into address 4824H.

bits in 4824H	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Flag	--	Hot runner control	Slope control	--	Latch	CT	EVENT	--

Notes:

- The flag to enable slope function is at bit5 of 4824H. Write 0020H to bit5 to set it on.
- If the “multistate” function is enabled, for example, writing 0022H means enabling bit5 and bit1 at the same time.
- If there is already a set value in 4824H and you would like to modify it, reset it to 0 before you set up a new value.

2. Set up relevant parameters using the table below.

CH	CH1	CH2	CH3	CH4	CH5	CH6
Set value (SV)	1008H	1009H	100AH	100BH	100CH	100DH
Slope (unit: 0.1°)	1970H	1971H	1972H	1973H	1974H	1975H

Note: To stabilize the control, first execute auto-tuning when the slope function is selected. When auto-tuning is being executed, the slope control will stop.

■ Programmable PID Latch Function

• Function

DTE10P offers programmable PID latch function. When the power is off and on again, the status before the power is cut off can be retained.

• How to Operate

1. Enable the programmable PID latch function: Write 1234H into the address 47F1H and then 0008H into address 4824H.

bits in 4824H	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Flag	--	Hot runner control	Slope control	--	Latch	CT	EVENT	--

Notes:

- The flag to enable PID latch is at bit3 of 4824H. Write 0008H to bit3 to set it on.
- If the “multistate” function is enabled, for example, writing in 0028H means enabling bit5 and bit3 at the same time.
- If there is already a set value in 4824H and you would like to modify it, reset it to 0 before you set up a new value.

■ Opposite Output

• Function

The 6 channels on DTE10P can be set to opposite output, that is, when the output is set to 0, the actual output will be 1.

• How to Operate

To set CH1 and CH3 to opposite output, first write 1234H into the address 47F1H and then 0005H into address 4821H to set on CH1 (bit0) and CH3 (bit2).

CH6	CH5	CH4	CH3	CH2	CH1
Bit5	Bit4	Bit3	Bit2	Bit1	Bit0

■ Delayed Alarm

• Function

When the set condition for alarms is met, the alarm will be enabled after a pre-set period of time.

• How to Operate

Set up the time using the table below. Unit: second

CH	CH1	CH2	CH3	CH4	CH5	CH6
Address for delayed alarm	1990H	1991H	1992H	1993H	1994H	1995H

■ Output Limits

• Function

The output is limited between the maximum and minimum percentages.

• How to Operate

Set up relevant parameters using the table below.

CH	CH1	CH2	CH3	CH4	CH5	CH6
Max. output (%)	1980H	1981H	1982H	1983H	1984H	1985H
Min. output (%)	1988H	1989H	198AH	198BH	198CH	198DH

Note: When the output volume is limited at 20 to 80%, it means the output volume 0 to 100% calculated by the controller is corresponding to the actual output 20 to 80%.

■ Programmable Control Time Unit

• Function

The unit of programmable control time can be “minute” or “second”.

• How to Operate

Write 0 to the address to set the time unit to “minute” (default) or write 1 to set it to “second”.

CH	CH1	CH2	CH3	CH4	CH5	CH6
Address for time unit	1978H	1979H	197AH	197BH	197CH	197DH

■ Input Filter

• Function

To avoid unstable PV display due to interferences, DTE10P offers the filter function. Instead of averaging the values, the filter function here calculate the weighted average value of the “current PV” and “previous PV”.

The filter equation: PV (displayed value) = [previous PV x (filter times – 1) + current PV] / filter times

The bigger the filter times, the bigger the weight of the previous PV, and the smoother the temperature display, which is a good way to suppress interferences.

• How to Operate

Set up relevant parameters using the table below.

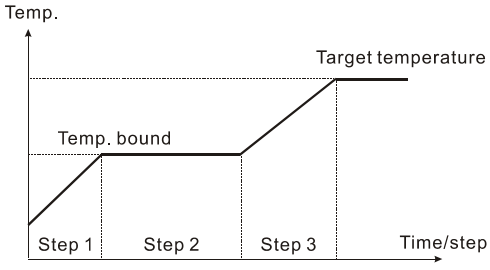
Parameter	Address	Default value	Range
Filter times	10F7H	8	0 ~ 50
Filter range	10F9H	1.0	0.1 ~ 10.0

■ Hot Runner Control

• Function

The hot runner control includes 3 steps:

1. Heating up by constant output volume
2. Timed PID control (Soak)
3. Slope heating to the target temperature (SV)



• How to Operate

1. Enable the hot runner control function: Write 1234H into the address 47F1H and then 0060H into address 4824H.

bits in 4824H	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Flag	--	Hot runner control	Slope control	--	Latch	CT	EVENT	--

Notes:

- The flag to enable hot runner control is at bit6 of 4824H (and bit5 as to be enabled at the same time). Write 0060H to set both bits on.
- If there is already a set value in 4824H and you would like to modify it, reset it to 0 before you set up a new value.

2. Set up relevant parameters using the table below.

CH	CH1	CH2	CH3	CH4	CH5	CH6
Temp. bound (unit: 0.1°)	1960H	1961H	1962H	1963H	1964H	1965H
Constant output volume (unit: 0.1%)	1968H	1969H	196AH	196BH	196CH	196DH
Timed time (unit: min.)	19B0H	19B1H	19B2H	19B3H	19B4H	19B5H
Target temperature (unit: 0.1°)	1008H	1009H	100AH	100BH	100CH	100DH
Slope (unit: 0.1°)	1970H	1971H	1972H	1973H	1974H	1975H

• Example

Assume the temperature bound is 100.0, constant output volume is 35.0, timed time is 15, target temperature is 200.0 and slope is 20.0, thus

1. The heater outputs by the 35% constant volume and waits for the temperature to rise to 100 degrees,
2. When the temperature hits 100 degrees, switch to the PID soak mode and retain the temperature constantly for 15 minutes.
3. When the time is up, switch to the slope control mode, executing the condition of a 20 degree temperature rise every minute.
4. When the heating achieves 200 degrees, the hot runner control is completed.

■ RS-485 Communication

1. DTE supports baud rates 2,400/4,800/9,600/19,200/38,400/57,600/115,200 bps and does not support communication format 7, N, 1/8, E, 2/8, O, 2. Communication protocol = Modbus ASCII or RTU.
2. Function codes: 03H = read maximum 8 words in the register; 06H = write 1 word into the register.
3. Address and contents: Every parameter has 2 communication addresses. One is numbered by the function of the parameter, and the other is by the order of channel (as shown in the table below).

		INA			INB		
Content	Explanation	CH1	CH2	CH3	CH4	CH5	CH6
Present temperature value/input error code	Unit; 0.1 See Table 5	H1000 (H1100)	H1001 (H1200)	H1002 (H1300)	H1003 (H1400)	H1004 (H1500)	H1005 (H1600)
Set temperature value	Unit: 0.1	H1008 (H1101)	H1009 (H1201)	H100A (H1301)	H100B (H1401)	H100C (H1501)	H100D (H1601)
Max. temperature value	Disabled when higher than default value	H1010 (H1102)	H1011 (H1202)	H1012 (H1302)	H1013 (H1402)	H1014 (H1502)	H1015 (H1602)
Min. temperature value	Disabled when lower than default value	H1018 (H1103)	H1019 (H1203)	H101A (H1303)	H101B (H1403)	H101C (H1503)	H101D (H1603)
Error temperature value	-999 ~ +999 Unit: 0.1°C	H1020 (H1104)	H1021 (H1204)	H1022 (H1304)	H1023 (H1404)	H1024 (H1504)	H1025 (H1604)
Proportional band value (Pb)	0 ~ 9,999 Unit: 0.1	H1028 (H1105)	H1029 (H1205)	H102A (H1305)	H102B (H1405)	H102C (H1505)	H102D (H1605)
Ti value	0 ~ 9,999	H1030 (H1106)	H1031 (H1206)	H1032 (H1306)	H1033 (H1406)	H1034 (H1506)	H1035 (H1606)
Td value	0 ~ 9,999	H1038 (H1107)	H1039 (H1207)	H103A (H1307)	H103B (H1407)	H103C (H1507)	H103D (H1607)
Integration default	0.0 ~ 100.0% Unit: 0.1%	H1040 (H1108)	H1041 (H1208)	H1042 (H1308)	H1043 (H1408)	H1044 (H1508)	H1045 (H1608)
Proportional control offset error value, when Ti = 0	0.0 ~ 100.0% Unit: 0.1%	H1048 (H1109)	H1049 (H1209)	H104A (H1309)	H104B (H1409)	H104C (H1509)	H104D (H1609)
Proportional band coefficient of output 1 and output 2	0.01 ~ 99.99 Unit: 0.01	H1050 (H110A)	H1051 (H120A)	H1052 (H130A)	H1053 (H140A)	H1054 (H150A)	H1055 (H160A)
Dead band of control output 1 & output 2.	-99.9 ~ 999.9	H1058 (H110B)	H1059 (H120B)	H105A (H130B)	H105B (H140B)	H105C (H150B)	H105D (H160B)
Hysteresis for output 1	0 ~ 9,999 Unit: 0.1%	H1060 (H110C)	H1061 (H120C)	H1062 (H130C)	H1063 (H140C)	H1064 (H150C)	H1065 (H160C)
Hysteresis for output 2	0 ~ 9,999 Unit: 0.1%	H1068 (H110D)	H1069 (H120D)	H106A (H130D)	H106B (H140D)	H106C (H150D)	H106D (H160D)

		INA			INB		
Content	Explanation	CH1	CH2	CH3	CH4	CH5	CH6
Read/write output 1 value	Unit: 0.1 %	H1070 (H110E)	H1071 (H120E)	H1072 (H130E)	H1073 (H140E)	H1074 (H150E)	H1075 (H160E)
Read/write output 2 value	Unit: 0.1 %	H1078 (H110F)	H1079 (H120F)	H107A (H130F)	H107B (H140F)	H107C (H150F)	H107D (H160F)
Upper limit for alarm output	Alarm enabled when temperature exceeds upper limit	H1080 (H1110)	H1081 (1210)	H1082 (H1310)	H1083 (H1410)	H1084 (H1510)	H1085 (H1610)
Lower limit for alarm output	Alarm enabled when temperature falls below lower limit	H1088 (H1111)	H1089 (H1211)	H108A (H1311)	H108B (H1411)	H108C (H1511)	H108D (H1611)
Tuning for upper limit of analog output	Current (4 ~ 20mA) or voltage output tuning	H1090 (H1112)	H1091 (H1212)	H1092 (H1312)	H1093 (H1412)	H1094 (H1512)	H1095 (H1612)
Tuning for lower limit of analog output	Current (4 ~ 20mA) or voltage output tuning	H1098 (H1113)	H1099 (H1213)	H109A (H1313)	H109B (H1413)	H109C (H1513)	H109D (H1613)
Input sensor type	See “Input” section	H10A0 (H1114)	H10A1 (H1214)	H10A2 (H1314)	H10A3 (H1414)	H10A4 (H1514)	H10A5 (H1614)
Output function for output 1	0: heating 1: cooling 2: proportional output	H10A8 (H1115)	H10A9 (H1215)	H10AA (H1315)	H10AB (H1415)	H10AC (H1515)	H10AD (H1615)
Output function for output 2	0: heating (default) 1: cooling 2: alarm	H10B0 (H1116)	H10B1 (H1216)	H10B2 (H1316)	H10B3 (H1416)	H10B4 (H1516)	H10B5 (H1616)
Control method	0: PID 1: ON-OFF 2: manual 3: PID programmable	H10B8 (H1117)	H10B9 (H1217)	H10BA (H1317)	H10BB (H1417)	H10BC (H1517)	H10BD (H1617)
Alarm 1 output mode	See “Alarm Output” section	H10C0 (H1118)	H10C1 (H1218)	H10C2 (H1318)	H10C3 (H1418)	H10C4 (H1518)	H10C5 (H1618)
Alarm 2 output mode	See “Alarm Output” section	H10C4 (H1518)	H10C5 (H1618)	H10C6 (H1718)			
Heating/cooling cycle for output 1	1 ~ 99 seconds 0 = 0.5 second	H10C8 (H1119)	H10C9 (H1219)	H10CA (H1319)	H10CB (H1419)	H10CC (H1519)	H10CD (H1619)
Heating/cooling cycle for output 2	1 ~ 99 seconds 0 = 0.5 second	H10D0 (H111A)	H10D1 (H121A)	H10D2 (H131A)	H10D3 (H141A)	H10D4 (H151A)	H10D5 (H161A)
Run/Stop the control	0: stop 1: executing 2: program stops 3: program pauses	H10D8 (H111B)	H10D9 (H121B)	H10DA (H131B)	H10DB (H141B)	H10DC (H151B)	H10DD (H161B)
Status of PID auto-tuning	0: stop 1: executing	H10E0 (H111C)	H10E1 (H121C)	H10E2 (H131C)	H10E3 (H141C)	H10E4 (H151C)	H10E5 (H161C)
Positive/negative proportional output	0: positive 1: negative (slope)	H10E8 (H111D)	H10E9 (H121D)	H10EA (H131D)	H10EB (H141D)	H10EC (H151D)	H10ED (H161D)
LED status	b1: Alarm 2; b2: °C; b3:°F; b4: Alarm 1; b5: OUT2; b6: OUT1; b7: AT	H1124	H1224	H1324	H1424	H1524	H1624

Content	Explanation							
Other statuses	H10F0 Temperature unit	H10F1 Open special function (H1234)	H10F2 Return to default (H1357)	H10F3 Reserved	H10F4 Reserved	H10F5 Reserved	H10F6 Reserved	H10F7 Reserved
Communication specifications (See Table 4)	H10F8 Auto ID setup	H10F9 Reserved	H10FA Baud rate	H10FB ASCII = 0 RTU = 1	H10FC 8 bits = 0 7 bits = 1	H10FD 2 stop = 0 1 stop = 1	H10FE Parity bit	H10FF ID 1 ~ 247

• Communication Parameter Setting

Content	0	1	2	3	4	5	6
Baudrate	2,400bps	4,800bps	9,600bps	19,200bps	38,400bps	57,600bps	115,200bps
Parity bit	None (N)	Even (E)	Odd (O)				

Table 4

• Error Codes

The error codes can be read from address H1000 ~ H1007. When the input operation is in normal status, H1000 ~ H1007 are for input values. When input error occurs (except for stable status and input exceeding the range), DTE will read error codes in H8001 ~ H8002.

0x1000	Error description
0x8001	EEPROM cannot be written in.
0x8002	Input sensor is not connected.
0x8003	Group INB is not connected.

Table 5

Returning to Default Value: Write H1234 into address H10F1 and H1357 into address H10F2. Restart DTE.

• Programmable Communication Parameter Setting

		INA			INB		
Content	Explanation	CH1	CH2	CH3	CH4	CH5	CH6
Read remaining time of the step	Unit: sec	H111E	H121E	H131E	H141E	H151E	H161E
Read remaining time of the step	Unit: min	H111F	H121F	H131F	H141F	H151F	H161F
Read the NO. of the current pattern	0 ~ 7	H1120	H1220	H1320	H1420	H1520	H1620
Read the NO. of the current step	0 ~ 7	H1121	H1221	H1321	H1421	H1521	H1621
NO. of start pattern	0 ~ 7	H1122	H1222	H1322	H1422	H1522	H1622
NO. of start step	0 ~ 7	H1123	H1223	H1323	H1423	H1523	H1623

• Programmable Parameter Setting

Content	Explanation	Pattern 0	Pattern 1	Pattern 2	Pattern 3	Pattern 4	Pattern 5	Pattern 6	Pattern 7
Max. number of steps in the pattern	0 ~ 7 = N: The pattern executes from step 0 to N.	H2068	H2069	H206A	H206B	H206C	H206D	H206E	H206F
Number of cycles of pattern 0 ~ 7 execution	0 ~ 199: The pattern has been executed for 1 ~ 200 times	H2070	H2071	H2072	H2073	H2074	H2075	H2076	H2077
NO. of current link pattern	0 ~ 8: 8 refers to end of program; 0 ~ 7 refer to the NO. of next pattern	H2078	H2079	H207A	H207B	H207C	H207D	H207E	H207F

Address	Default	Content	Explanation
2000H ~ 203FH	0	Target temperatures for pattern 0 ~ 7 Pattern 0: 2000H ~ 2007H	Unit: 0.1°C
2080H ~ 20BFH	0	Execution time for pattern 0 ~ 7 Pattern 0: 2080H ~ 2087H	Time: 0 ~ 900 (Unit: 1 min)

4. Communication format: 03 = read bit data; 06 = write bit data

• ASCII Mode

Read Command		Read Response Message		Write Command		Write Response Message	
Start word	':'	Start word	':'	Start word	':'	Start word	':'
Machine address 1	'0'	Machine address 1	'0'	Machine address 1	'0'	Machine address 1	'0'
Machine address 0	'1'	Machine address 0	'1'	Machine address 0	'1'	Machine address 0	'1'

Read Command		Read Response Message		Write Command		Write Response Message	
Command 1	‘0’	Command 1	‘0’	Command 1	‘0’	Command 1	‘0’
Command 0	‘3’	Command 0	‘3’	Command 0	‘6’	Command 0	‘6’
Read start address of data/bit	‘1’	Length of response data (byte)	‘0’	Data address	‘1’	Data address	‘1’
	‘0’		‘4’		‘0’		‘0’
	‘0’	Data content in H1000	‘0’		‘0’		‘0’
	‘0’		‘1’		‘1’		‘1’
Read length of data/bit (word/bit)	‘0’		‘F’	Write data content	‘0’	Write data content	‘0’
	‘0’		‘4’		‘3’		‘3’
	‘0’	Data content in H1001	‘0’		‘E’		‘E’
	‘2’		‘0’		‘8’		‘8’
LRC1 check	‘E’		‘0’	LRC1 check	‘F’	LRC1 check	‘F’
LRC0 check	‘A’		‘0’	LRC0 check	‘D’	LRC0 check	‘D’
End word 1	CR	LRC1 check	‘0’	End word 1	CR	End word 1	CR
End word 0	LF	LRC0 check	‘3’	End word 0	LF	End word 0	LF
		End word 1	CR				
		End word 0	LF				

- **LRC Check**

Sum up the contents from “machine address” to “data content”, e.g. H01 + H03 + H10 + H00 + H00 + H02 = H16. Obtain 2’scomplement H EA.

- **RTU Mode**

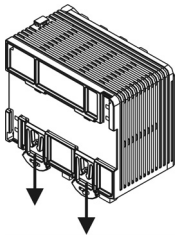
Read Command		Read Response Message		Write Command		Write Response Message	
Machine address	H01	Machine address	H01	Machine address	H01	Machine address	H01
Command	H03	Command	H03	Command	H06	Command	H06
Read start address of data	H10	Length of response data (byte)	H04	Write data address	H10	Write data address	H10
	H00				H01		H01
Read length of data (bit/word)	H00	Data content 1	H01	Write data content	H03	Write data content	H03
	H02		HF4		H20		H20
CRC low byte	HC0	Data content 2	H03	CRC low byte	HDD	CRC low byte	HDD
CRC high byte	HCB		H20	CRC high byte	HE2	CRC high byte	HE2
		CRC low byte	HBB				
		CRC high byte	H15				

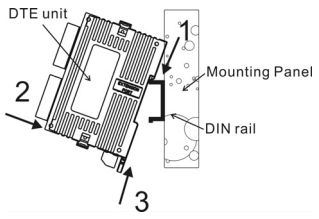
CRC (Cyclical Redundancy Check) is obtained by the following steps:

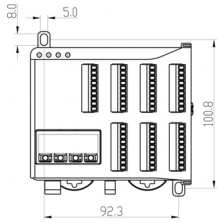
```
unsigned int reg_crc = 0xffff;
 i = 0;
 while (length--)
 {   reg_crc ^= RTUData[i];
       i ++;
       for (j = 0; j < 8; j++)
       {   if (reg_crc & 0x01)          reg_crc = (reg_crc >> 1) ^ 0xA001;
          else                          reg_crc = reg_crc >> 1;
       }
  }
  return(reg_crc);
```

Software for Setting up Communication on PC: Download the free software on Delta’s website.

■ How to Mount & DIN Rail Size







Connect maximum 7 DTC2000 or DTC2001 controllers to DTE by using DIN rail.