Products

DT3
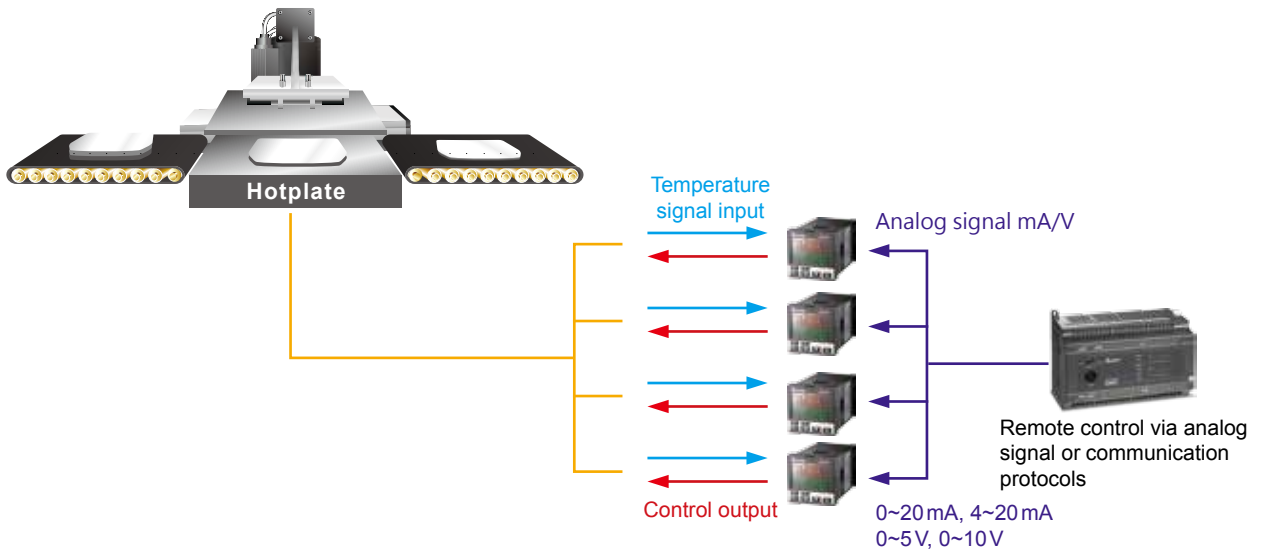## High Speed Intelligent Temperature Controller

The Delta temperature controller DT3 series is designed with upgraded hardware and higher specifications as well as smart operation, fast response, easy modularization, plus user-friendly and user-defined function keys. With Self-Tuning and FUZZY temperature control functions, controllers can be installed in open space and confined space applications and are capable of presenting a smooth temperature control curve. In addition, the innovative design enables customers to replace the module with new functions to attain the ultimate in extension flexibility.
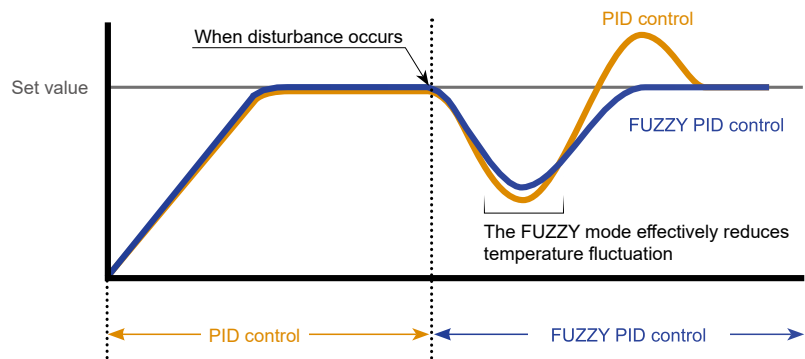
■ Remote Control

Sets DT3 temperature via analog output of host controller

Temperature signal input

Analog signal mA/V

Remote control via analog signal or communication protocols

Control output

0~20 mA, 4~20 mA
0~5 V, 0~10 V

Hotplate

■ Various Control Modes

► Auto Tuning
► FUZZY
► Manual
► ON/OFF
► PID Process Control
► Self Tuning

When disturbance occurs

PID control

Set value

FUZZY PID control

The FUZZY mode effectively reduces temperature fluctuation

PID control

FUZZY PID control

■ Extension Ability

Modular design of functional devices lets users replace the module as needed for application flexibility
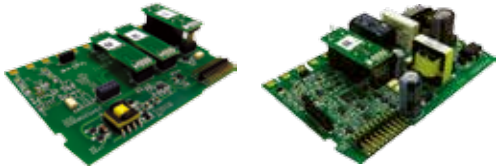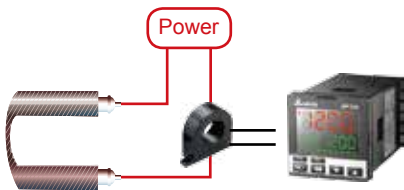

■ Large Tri-color LCD Display

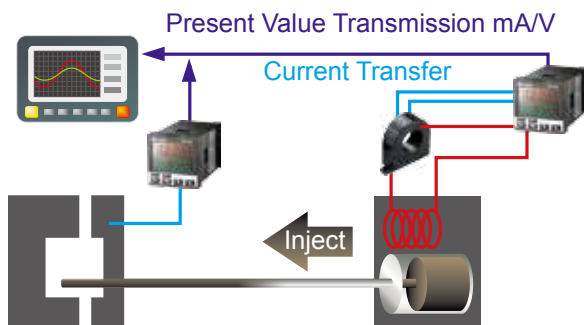The 1st Tri-color LCD temperature controller in Taiwan.

■ Heater Disconnection Detection

Measurable up to 100A

■ Retransmission Output

Present Value Transmission mA/V

Current Transfer

Inject

■ User-defined Function Keys

► Menu
► Auto-tuning
► Control modes selection
► RUN/STOP Mode
► Program hold

■ Point-to-point Control
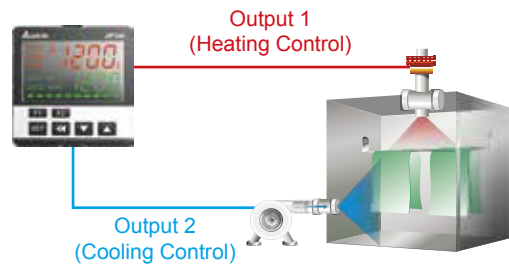## (Proportional Output mA/V)

Sets the Present Value by point-to-point control.

■ Dual Output Control

► Preset temperature is rapidly attained using two sets of outputs for heating and cooling control
► This function is used to automatically calculate two sets of PID parameters, one for heating and one for cooling

Output 1 (Heating Control)

Output 2 (Cooling Control)

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Specifications

Input power supply	100 to 240 V_{AC}, 50/60 Hz, 24 V_{DC} ±10%
Display method	LCD. Present Value: red, Set Value: green
Input sensors	Thermocouple: K, J, T, E, N, R, S, B, L, U, TXK
	Platinum RTD: Pt100, JPt100
	Analog input: 0 to 5 V, 0 to 10 V, 0 to 20 mA, 4 to 20 mA, 0 to 50 mV
Control modes	PID, PID programmable, FUZZY, Self-tuning, manual, ON/OFF
Display accuracy	0 or 1 digit to the right of the decimal point
Sampling rate	Analog input: 0.1s, Thermocouple or platinum RTD: 0.1s
Operating Ambient Temperature	0 ~ +50℃
Operating Relative Humidity	35 to 80% RH (non-condensing)

Alarm Outputs

The DT3 offers 3 alarm outputs, and each alarm output has 18 alarm modes to choose from in the initial setting mode. When the target temperature exceeds or falls below the set point, the alarm output is enabled.

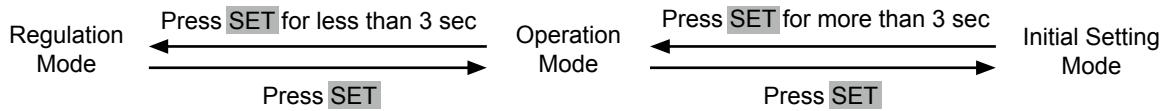| SV	Alarm Mode	Alarm Output Operation
0	Alarm function disabled	
1	Deviation upper- and lower-limit: This alarm output operates when PV value is higher than the set value SV + (AL - H) or lower than the set value SV - (AL - L).	
2	Deviation upper-limit: This alarm output operates when PV value is higher than the set value SV + (AL - H).	
3	Deviation lower-limit: This alarm output operates when PV value is lower than the set value SV - (AL - L).	
4	Absolute value upper- and lower-limit: This alarm output operates when PV value is higher than the set value AL-H or lower than the set value AL - L.	
5	Absolute value upper-limit: This alarm output operates when PV value is higher than the set value AL - H.	
6	Absolute value lower-limit: This alarm output operates when PV value is lower than the set value AL - L.	
7	Hysteresis upper-limit alarm output: This alarm output operates if PV value is higher than the set value SV + (AL - H). This alarm output is OFF when PV value is lower than the set value SV + (AL - L).	
8	Hysteresis lower-limit alarm output: This alarm output operates if PV value is lower than the set value SV - (AL - H). This alarm output is OFF when PV value is higher than the set value SV - (AL - L).	
9	Disconnection Alarm: This alarm output operates if the sensor connection is incorrect or has been disconnected.	
11	CT1 Alarm: CT1 is ON if the value of CT1 is lower than the value of AL - L or higher than AL - H.	
12	CT2 Alarm: CT2 is ON if the value of CT2 is lower than the value of AL - L or higher than AL - H.	
13	When SOAK status (temperature hold) happens to PID program control, alarm output is ON.	
14	When RAMP UP status happens to PID program control, alarm output is ON.	
15	When RAMP DOWN status happens to PID program control, alarm output is ON.	
16	When RUN status happens to PID program control, alarm output is ON.	
17	When HOLD status happens to PID program control, alarm output is ON.	
18	When STOP status happens to PID program control, alarm output is ON.	
19	When END status happens to PID program control, alarm output is ON.	

RS-485 Communication

DT3 supports baudrate 2,400 to 38,400 bps, MODBUS ASCII/RTU protocol, function code 03H and reads maximum 8 words from the register.

Address	Content	Definition
1000H	Present value (PV)	Measuring unit: 0.1 scale. The following values read mean error occurs. 8002H: Temperature not yet acquired 8003H: Not connected to sensor 8004H: Incorrect sensor
1001H	Set value (SV)	Measuring unit: 0.1 scale
1002H	Upper limit of temp. range	Cannot exceed the default value
1003H	Lower limit of temp. range	Cannot fall below the default value
1005H	Control mode	0: PID, 1: ON/OFF, 2: Manual, 3: FUZZY
1006H	Heating/ Cooling control	0: Heating/ Heating, 1: Cooling/ Heating, 2: Heating/ Cooling, 3: Cooling/ Cooling
1007H	1st Heating/ Cooling control cycle	0.1 ~ 99 sec.
1008H	2nd Heating/ Cooling control cycle	0.1 ~ 99 sec.
1009H	Proportional band (PB)	0.1 ~ 999.9
100AH	Ti value	0 ~ 9999
100BH	Td value	0 ~ 9999
1012H	Read/write Output 1 volume	Unit: 0.1%, only valid in manual control mode
1013H	Read/write Output 2 volume	Unit: 0.1%, only valid in manual control mode
1016H	Regulated temp. value	-99.9 ~ +99.9, Unit: 0.1
102AH	Read/write LED status	b0: ALM3, b1: ALM2, b2: °F, b3: °C, b4: ALM1, b5: OUT2, b6: OUT1, b7 : AT
102BH	Read/write key status	b0: Set, b1: Select, b2: Up, b3: Down, 0: Press it
102CH	Panel lockup status	0: Normal, 1: Fully locked, 11: SV adjustable
102DH	CT value	Unit: 0.1A
103BH	AT setting	0: OFF(default), 1: ON
103CH	Control RUN/STOP setting	0: STOP, 1: RUN (default), 2: END (program), 3: HOLD (program)

Parameters Operation

Regulation Mode ← Press SET for less than 3 sec → Operation Mode ← Press SET for more than 3 sec → Initial Setting Mode

Press SET (Regulation Mode → Operation Mode)

Press SET (Operation Mode → Initial Setting Mode)

Regulation Mode	Operation Mode	Initial Setting Mode
At Auto-tuning (when CTRL set in PID or FUZZY and in RUN mode) Press ◄◄ ▽	**1234** Use ▲ ▼ to set up target temperature Press ◄◄ ▽	**CNPt** Set up input type Press ◄◄ ▽
St Self-tuning switch (set when in PID control and the TUNE parameter = ST)	**R-S** Control loop RUN or STOP	**tPUN** Set up temperature unit (not displayed when in analog input)
PCd Select the nth (n = 0 ~ 5) PID. When n = 6, PID is auto-selected.	**PtRN** Set up start pattern (when in PID programmable control and **PStP**)	**tP-H** Set up upper temperature limit
PdoF Set up PID control offset	**StEP** Set up start step (when in programmable control)	**tP-L** Set up lower temperature limit
FZ-R Set up FUZZY gain value	**SP** Set up the position of decimal point	**CtRL** Select control modes
FZdb Set up FUZZY Deadband	**LoC** Lock the keys	**CtRS** Select SV control modes
o1-S Adjust Output 1 hysteresis (when in ON/OFF control)	**AL1H** Set up upper limit of Alarm 1	**WtSV** Set up waiting temperature (when in programmable control)
o2-S Adjust Output 2 hysteresis (when in ON/OFF control)	**AL1L** Set up lower limit of Alarm 1	**W-tN** Set up waiting time (when in programmable control)
o1-H o1-C Control cycle for Output 1 (except in ON/OFF control)	**AL2H** Set up upper limit of Alarm 2	**SLoP** Set up start slope (when in programmable control)
o2-H o2-C Control cycle for Output 2 (except in ON/OFF control)	**AL2L** Set up lower limit of Alarm 2	**PRtN** Select pattern to be edited
CoEF Ratio of Output 1 against Output 2 when in dual output control (set when in PID and dual output control)	**AL3H** Set up upper limit of Alarm 3	**tUNE** Select AT or ST
dEAd Set up deadband (when in dual output)	**AL3L** Set up lower limit of Alarm 3	**S-HC** Select heating, cooling or dual output heating and cooling
PV-F Set up input filter factor	**A1HP** Record highest temperature of Alarm 1	**ALA1 ALA2 ALA3** Set up Alarm 1 mode
PV-R Set up input filter range	**A1LP** Record lowest temperature of Alarm 1	**AL1o AL2o AL3o** Set up Alarm 1 options
PVoF Adjust input compensation	**A2HP** Record highest temperature of Alarm 2	**AL1d AL2d AL3d** Set up Alarm 1 delay
PVGR Adjust input gain	**A2LP** Record lowest temperature of Alarm 2	**otCN** Set up reverse alarm output
SVSL Set up rising slope (when CRTS = SLOP)	**A3HP** Record highest temperature of Alarm 3	**RMEt** Set up Remote type
A1MA Adjust upper limit compensation for analog Output 1*	**A3LP** Record lowest temperature of Alarm 3	**EXEC** Select auxiliary function

Regulation Mode	Operation Mode	Initial Setting Mode
`AIMC` Adjust lower limit compensation for analog Output 1*	`oUt1` Display and adjust Output 1 volume	`CoSH` Enable/disable communication write-in
`A2MA` Adjust upper limit compensation for analog Output 2*	`oUt2` Display and adjust Output 2 volume	`C-SL` Select ASCII or RTU format
`A2MC` Adjust lower limit compensation for analog Output 2*	`o1MA` Set up upper limit percentage for Output 1	`C-No` Set up communication address
`AtMA` Adjust upper limit compensation for Retransmission*	`o1MC` Set up lower limit percentage for Output 1	`bPS` Set up baudrate
`AtMC` Adjust lower limit compensation for Retransmission*	`o2MA` Set up upper limit percentage for Output 2	`LEN` Set up data length
`RM-G` Adjust Remote gain	`o2MC` Set up lower limit percentage for Output 2	`StoP` Set up stop bit
`RM-F` Adjust Remote compensation	`Ct1` Display current measured at CT1	`PRtY` Set up parity bit
`EVt1` Set up EVENT1 function	`Ct2` Display current measured at CT2	
`EVt2` Set up EVENT2 function		
`EVt3` Set up EVENT3 function Press ◄◄ to return to auto-tuning	Press ◄◄ to return to set up target temperature	Press ◄◄ to return to set up input type

*1 scale = 1µA; 1 scale = 1mV
PID mode: Any of the 6 PID groups can be selected. When n = 6, the program will automatically select the PID group that is the closest to the target temperature.

`PCd` Select the nth PID (n = 0 ~ 5)	`SV0` Set up the 0th PID temperature value Press ◄◄ ▽	`SV5` Set up the 5th PID temperature value Press ◄◄ ▽
	`P0` Set up the 0th proportional band value	`P5` Set up the 5th proportional band value
	`i0` Set up the 0th Ti value	`i5` Set up the 5th Ti value
	`d0` Set up the 0th Td value	`d5` Set up the 5th Td value
	`ioF0` Set up the 0th PID integral deviation Press ◄◄ to return to PID deviation	`ioF5` Set up the 5th PID integral deviation Press ◄◄ to return to PID deviation
Press ◄◄ ▷ 0 ~ 5th PID		

Patterns and steps: Edit `PRoG` in `CtRL` parameter. Take editing pattern 0 for example:

`PtRN` Select the pattern number to be edited Select number ▷ Press ◄◄ ▽ to select OFF	`SP00` Edit temperature for Step 0 Press ◄◄ ▽	`PSY0` Select actual number of steps when the program is executing Press ◄◄ ▽
Exit pattern and step editing and switch to `S-HC` to continue the setup process	`EM00` Edit time for Step 0 (time unit: hr, min)	`CYC0` Set up additional cycles (0 ~ 99) for the pattern execution
	Set up Step 0 ~ 15 in order	`LiN0` Set up link pattern. OFF refers to the program end. Press ◄◄ to return to select the pattern number to be edited
	`SP15` Edit temperature for Step 15 `tM15` Edit time for Step 15 Press ◄◄ to set up actual step numbers	

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