

# DIN rail mounting temperature controller with current transformer input deltadue<sup>®</sup> series D1 line

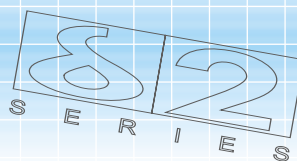
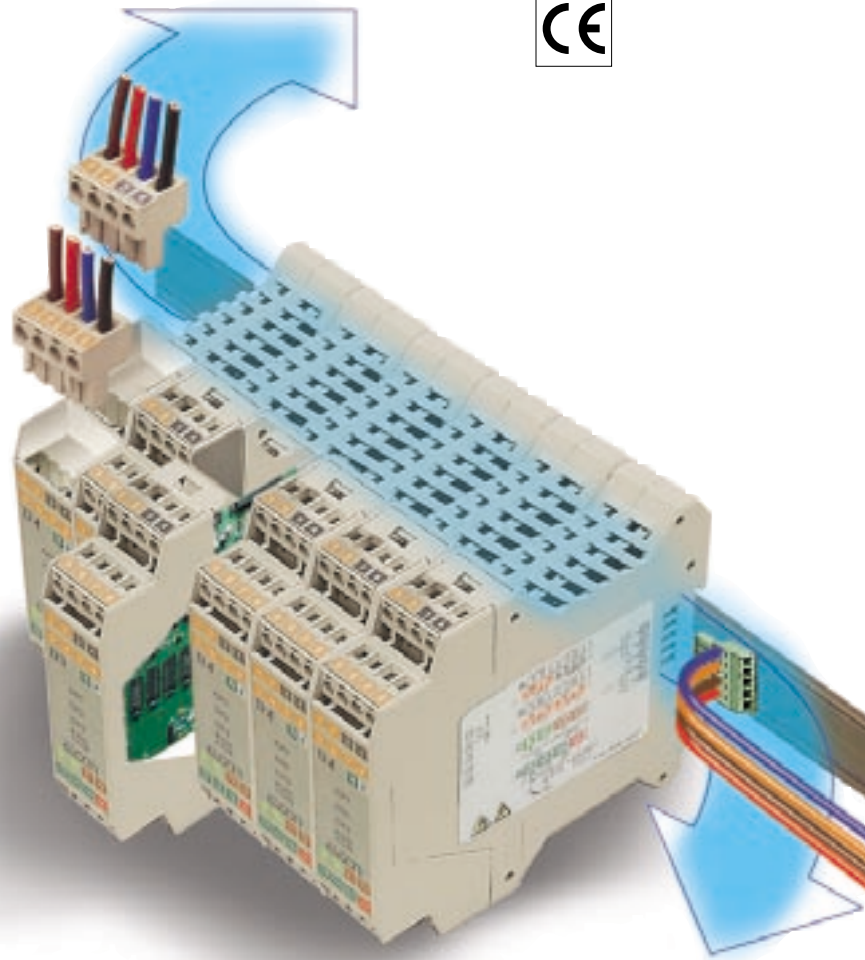


## The controller with load control

The deltadue<sup>®</sup> series includes a powerful DIN rail mounting controller module capable to detect the failures of both the electric load and the solid state relay. The D1 line can satisfy a wide range of applications requiring temperature control to be integrated with PC and PLC systems.

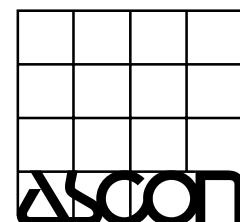
The features of the line include:

- Common bus for power supply and serial communications
- Totally withdrawable
- Easy replacement without switching off the power supply
- Digital input for remote commands
- Timer and Start-Up function
- Automatic tuning
- Four outputs
- Current transformer input
- Full integration with the deltadue<sup>®</sup> series data acquisition and control modules
- Easy and simplified installation and maintenance



E

ISO 9001 Certified





## Advantages and peculiarities

### Keeping costs low



- Modular construction and compact dimensions
- Quick mounting on DIN rail
- Possibility of prewiring
- Common bus for power supply and serial communications



- Polarised connectors
- Coloured Terminal identification



### High integration

- Mounting on the machine or real panel
- Remote/centralised control
- RS485/CanBus
- Communications interface



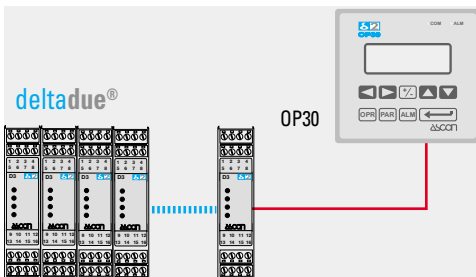
- Withdrawable
- Easy replacement without switching off the power supply



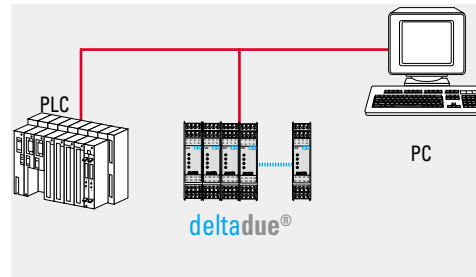
### Easy maintenance

### Typical applications

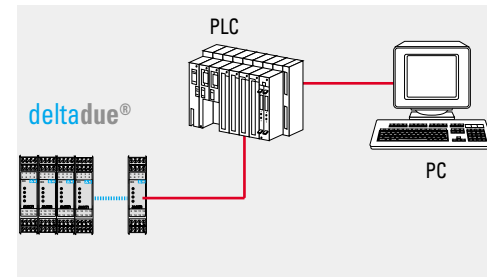
#### Local control with operator panel OP30



#### Distributed control with PLC and with dedicated modules for critical loops



#### Distributed control with PC supervision



### Resources

**Main universal input**

12 TC, Pt100, ΔT, mA, V, Custom → PV

**Auxiliary input (option)**

→ AUX

**Digital input**

→ IL

OP1 → [Switch] [Diode]

OP2 → [Switch] [Diode]

OP3 (option) → [Switch] [Diode]

OP4 → [Relay]

Setpoint

LOC 2 MEM START UP TIMER

Special functions (option)

[Hand icon] 2 MEM HOLD PV

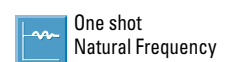
IL connected functions

Modbus RS485  
Parameterisation  
Supervision

### Operating mode

		Control		Alarms		
1	Single action	OP1			OP2	OP3
		OP4		OP1	OP2	OP3
4	Double action (option)	OP1	OP2			OP3
		OP1	OP4	OP2	OP3	
5		OP4	OP2	OP1		OP3
6						

#### Fuzzy tuning with automatic selection



## Technical data

Features at env. 25°C	Description		
Total configurability	By means of the configuration tool it is possible to select: - type of input - the type of control input - type of output - type and functionality of the alarms - type of Setpoint - control parameter values		
PV input	Common characteristics	A/D converter with resolution of 50.000 points Update measurement time: 0.2 sec Sampling time: 0.5 sec Input bias: - 60...+ 60 digit Input filter: 1...30 sec. OFF = 0	
	Accuracy	0.25% ± 1 digit (for temperature sensor) 0.1% ± 1 digit (for mA e mV)	Between 100...240V~ the error is minimal
	Resistance thermometer (for ΔT: R1+R2 must be <320Ω)	Pt100Ω at 0°C (IEC 751) °C/°F selectable	2 or 3 wires connection Burnout (with any combination)
	Thermocouple	L,J,T,K,S,R,B,N,E W3,W5 (IEC 584) °C/°F selectable	Internal cold junction compensation with NTC Error 1°C/20°C ±0,5°C ± 0.5°C Burnout
	DC input (current)	0/4...20mA, 2.5Ω ext. shunt Rj >10MΩ	Burnout. Engineering units, decimal point position configurable low range: -999...9999 high range: -999...9999 (min range of 100 digits)
	DC input (voltage)	10...50mV, 0-50mV Rj >10MΩ	Line: 20Ω max (3 wire) Input drift: 0.35°C/10°C Env. Temp. <0.35°C/10Ω Wire Res.  Line 150Ω max. Input drift: <2μV/1°C Env. Temp. <5μV/10Ω Wire Res.  Input drift: <0.1% / 20°C Env. Temp. <5μV/10Ω R. Wire Res.
Auxiliary inputs	CT current transformer	50 or 100mA input hardware selectable	Current visualization via serial comm. 10 ... 200A With 1A resolution and Heater Break Alarm
Digital input	The closure of the external contact produces any of the following actions:		Auto/Man mode change, Stored Setpoint activation measure hold, Timer activation (if option installed)
Operating mode	1 single or double action P.I.D. loop or ON/OFF with 1, 2 or 3 alarms		
Control mode	Algorithm	P.I.D with overshoot control or On-Off	
	Proportioning band (P)	0.5...999.9%	OFF=0
	Integral time (I)	0.1...100.0 min	
	Derivative time (D)	0.01...10.00 min	
	Error dead band	0.1...10.0 digits	
	Overshoot control	0.01...1.00	Single action PID algorithm
	Manual reset	0.0...100.0%	
	Cycle time (Time proportioning only)	1...200 sec	
	Control output high limit	10.0...100.0%	
	Soft-start output value	0.1...100.0%	
	Output safety value	0.0...100.0% (-100.0...100.0% for Heat/Cool)	On/Off algorithm
	Control output hysteresis	0.1...10.0%	
	Dead band	-10.0...10.0%	Double action PID algorithm (Heat/Cool) with Overlap
	Relative cool gain	0.1...10.0	
Cycle time (Time proportioning only)	1...200 sec		
Control output high limit	10.0...100.0%		
Cool output hysteresis	0.1...10.0%		

### Fuzzy-Tuning

Two methods of tuning are available:

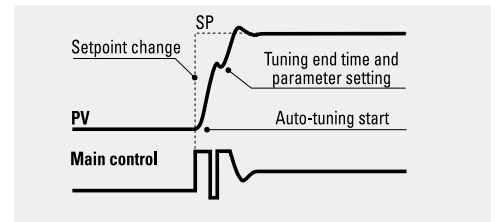
- **Auto-Tuning "one shot"**
- **Natural frequency "one shot"**

The **Fuzzy-Tuning** automatically selects one of the two methods which assures the best result for each condition.

The **Auto-Tuning** method works best on the step response basis.

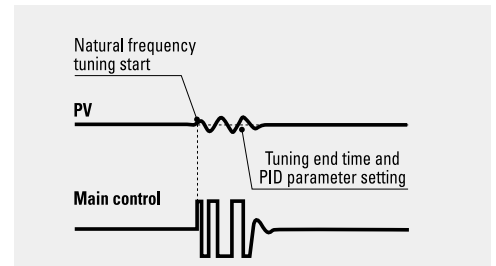
When activated, if a deviation exists between the Setpoint and process variable larger than 5% of scale range, the controller modifies the output value. Then, in a short time, it calculates the PID parameters and the new algorithm is operational immediately.

The main advantages of this method are fast calculation and quick implementation.



The **Natural frequency** method works best when the process variable is very near to the Setpoint. When activated, it causes a process oscillation around the Setpoint value.

The main advantage of this method is a reduced disturbance to the process.



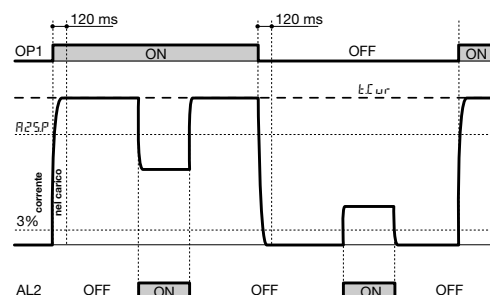
### Current transformer

With CT option the load current can be measured, read via serial communications and alarm can be generated. The heater break/SSR failure alarm detects both of the following conditions:

- low load current during the ON phase of the time proportioning control (heater break)
- leakage current higher than 3% of the full load current during the OFF phase of the time proportioning control (SSR failure)

**Example:**

CT installed on OP1, alarm on AL2 with phase ON as active phase (configuration digit **P** = 8).



## Technical data

Features at env. 25°C	Description		
OP1-OP2 outputs	SPST Relay N.O., 2A/250V~ for resistive load SSR, 1A/250V~ for resistive load Too meet the double isolation requirements OP1 and OP2 must have the same load voltage		
OP3 output	SPST Relay N.O. 2A/150V~ for resistive load		
OP4 output	Logic not isolated: 0/5V-, ±10% 30 mA max		
AL1- AL2 - AL3 alarms	Hysteresys	0.1...10.0%	
	Action	Active high Action Type	Deviation threshold ±range Band threshold 0...range Absolute threshold whole range
		Active low	
	Special functions	Sensor break, heater break alarm, Loop break Acknowledge (latching), activation inhibit (blocking) Connected to Timer (if options installed)	
Setpoint	Local	Up and down ramps 0.1...999.9 digit/min. (OFF=0)	
	Local plus 2 stored with tracking or Stand-by	Low limit: from low range to high limit. High limit: from low limit to high range	
	Timer	Automatic start at the power on, manual start by digital inputs or serial comm.s Setting time: 1...9999 sec/min Stand-by Setpoint: $5LLO \leq SP \leq 5LH$	
Special functions (option)	Start-up	Start-up Setpoint: $5LLO \leq SP \leq 5LH$ Hold time: 0...500 min Control output high limit 5.0...100.0%	
	Fuzzy-Tuning one shoot	The controller selects automatically the best method according to the process conditions	One shot Auto Tuning One shot Natural Frequency
Auto/Man Station	Standard with bumpless function, by digital input or serial communications		
Serial Comm.s	RS485 isolated, Modbus/Jbus protocol, 1200, 2400, 4800, 9600 bit/sec, two wires		
Auxiliary Supply	+24V ± 20% 30mA max - for external transmitter supply		
Operational Safety	Measure input	Detection of out of range, short circuit or sensor break with automatic activation of the safety strategies	
	Control output	Safety value: -100%...100%	
	Parameters	Parameter and configuration data are stored in a non volatile memory for an unlimited time	
General characteristics	Outputs lock		
	Power supply (PTC protected)	24V~ (-15% +25%) 50/60Hz and 24V-(dc voltage) (-15%+25%)	Power consumption 3W max
	Safety	EN61010-1 (IEC1010-1), installation class 2 (2500V) pollution class 2, <b>instrument class II</b>	
	Electromagnetic compatibility	Compliance to the CE standards	
	Protection	Terminal strip IP20	
Dimensions	Pitch: 22.5 mm - depth: 114.5 mm with: 53		

### Heat/Cool control

By a sole PID control algorithm, the controller handles two different outputs, one of these performs the Heat action, the other one the Cool action. It is possible to overlap the outputs. The Cool action can be adjusted using the relative cool gain parameter. The Heat and Cool outputs can be limited separately.

### Digital input

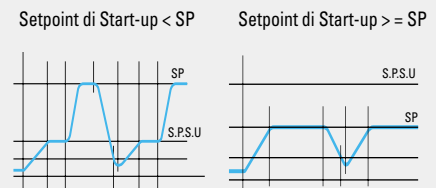
The digital input can be configured to have one of the following functions:

- Measure hold
- Auto/Man mode change
- Stored Setpoint activation
- Timer activation

### Special functions

To improve the instrument performance and to reduce the wiring and installation costs, two special functions are available:

#### - Start-up



#### - Timer

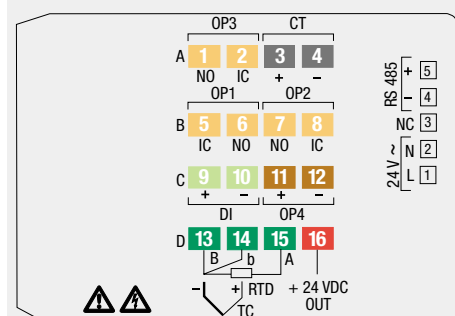


The use of these functions avoids additional device installation (e.g. external timer), therefore allowing a significant costs reduction.

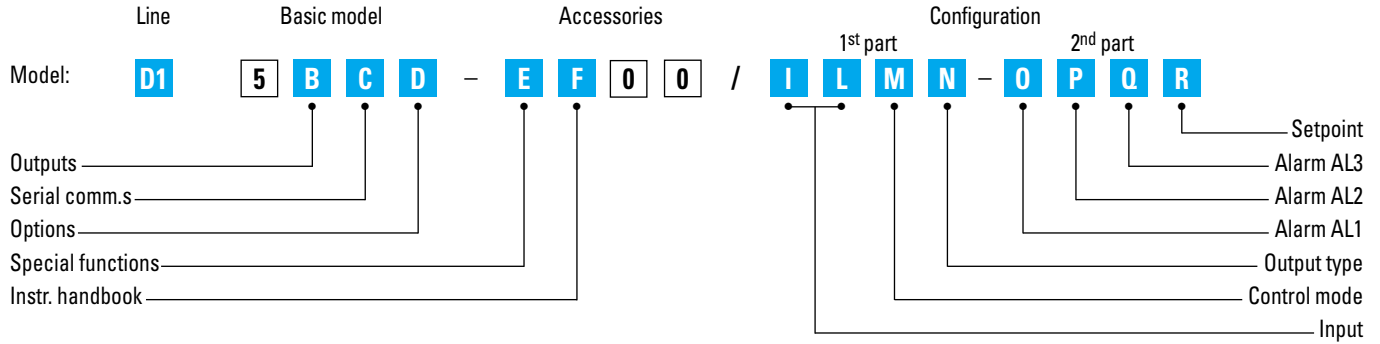
#### • Output lock function,

The outputs can be switched to the OFF status via serial communications.

### Electrical connections



# Ordering codes



Outputs	OP1	OP2	B
Relay		Not fitted	0
Relay		Relay	1
SSR		Not fitted	3
SSR		SSR	5
Serial communications			C
CanBus			3
RS 485 Modbus/Jbus SLAVE			5
Options			D
None			0
Current transformer (CT)			3
Special functions			E
Not fitted			0
Start-up + Timer			2
Instruction handbook			F
Italian-English (std)			0
French-English			1
German-English			2
Spanish-English			3

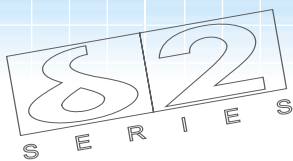
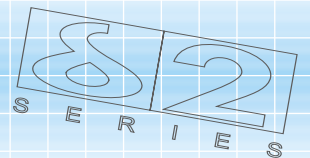
Input type	Range scale	I	L
TR Pt100 IEC751	-99.9...300.0 °C -99.9...572.0 °F	0	0
TR Pt100 IEC751	-200...600 °C -328...1112 °F	0	1
TC L Fe-Const DIN43710	0...600 °C 32...1112 °F	0	2
TC J Fe-Cu45% Ni IEC584	0...600 °C 32...1112 °F	0	3
TC T Cu-CuNi	-200...400 °C -328...752 °F	0	4
TC K Chromel -Alumel IEC584	0...1200 °C 32...2192 °F	0	5
TC S Pt10%Rh-Pt IEC584	0...1600 °C 32...2912 °F	0	6
TC R Pt13%Rh-Pt IEC584	0...1600 °C 32...2912 °F	0	7
TC B Pt30%Rh-Pt	0...1800 °C 32...3272 °F	0	8
Pt6%Rh IEC584			
TC N Nicrosil-Nisil IEC584	0...1200 °C 32...2192 °F	0	9
TC E Ni10%CR-CuNi IEC584	0...600 °C 32...1112 °F	1	0
TC Ni-NiMo 18%	0...1100 °C 32...2012 °F	1	1
TC W3%Re-W25%Re	0...2000 °C 32...3632 °F	1	2
TC W5%Re-W26%Re	0...2000 °C 32...3632 °F	1	3
0...50mV linear	Engineering units	1	4
10...50mV linear	Engineering units	1	5
mV "Custom" scale	On request	1	6
Control mode			M
ON-OFF reverse action			0
ON-OFF direct action			1
P.I.D. single reverse action			2
P.I.D. single direct action			3
	Linear cool output	4	
	ON-OFF cool output	5	
	Water cool output	6	
	Oil cool output	7	
Output type - Singol action	Output type - Double action	<b>N</b>	
Relay	Heat Relay, Cool Relay	0	
Digital	Heat Relay, Cool Digital	1	
	Heat Digital, Cool Relay	2	
AL1-AL2-AL3 type and function			O-P-Q
Disabled or (AL3 only) used by Timer			0
Sensor break/Loop break alarm			1
Absolute	active high	2	
	active low	3	
Deviation	active high	4	
	active low	5	
Band	active out	6	
	active in	7	
Heater break by CT	active during ON output state	8	
	active during OFF output state	9	
Setpoint type			R
Local only			0
Local and 2 tracking stored Setpoints			1
Local and 2 Stand-by stored Setpoints			2

**If not differently specified the controller will be supplied with standard version  
Model: D1 5050-0000**



S E R I E S

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