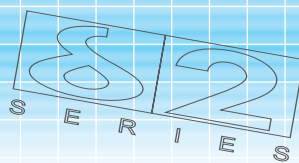
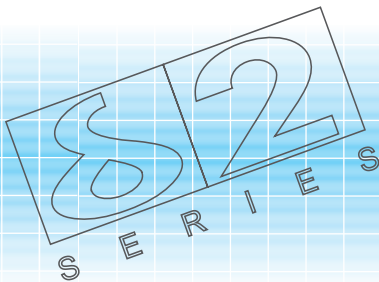
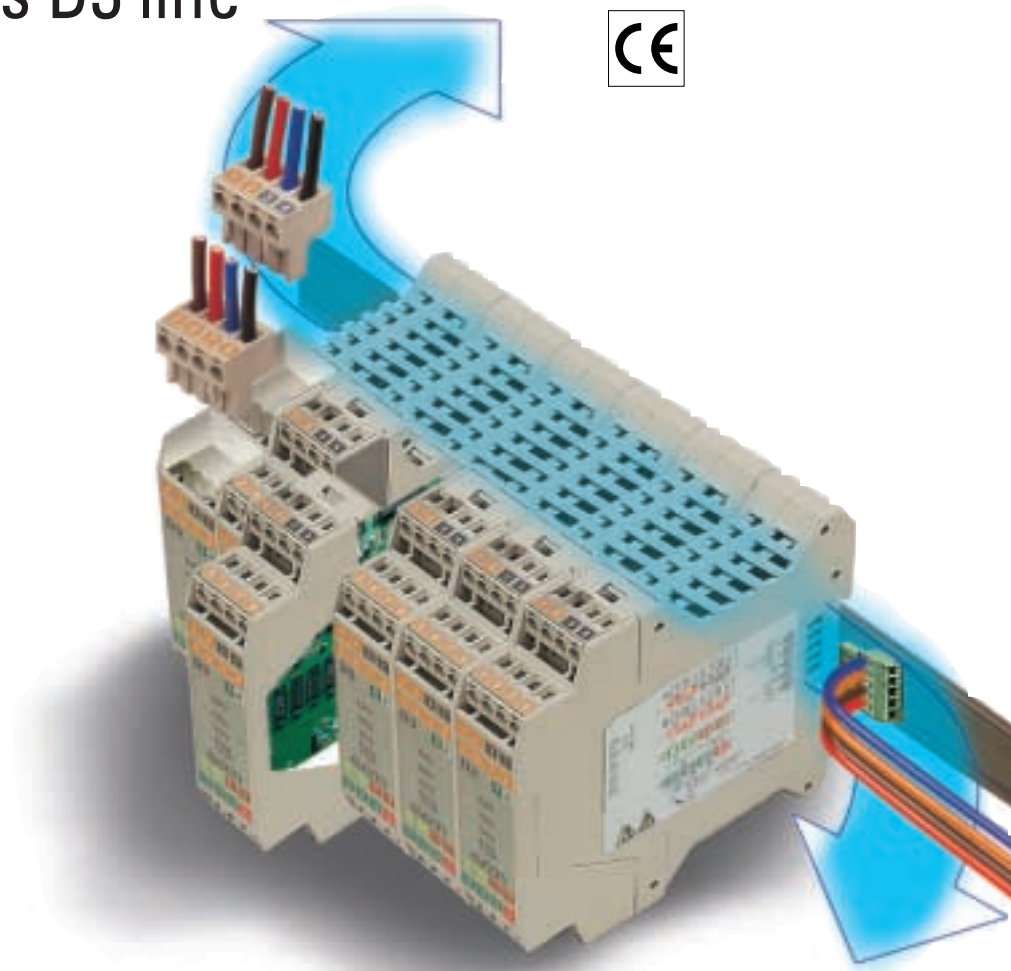


# DIN rail mounting double action controller with analogue output, delta**due**<sup>®</sup> series D3 line

## Continuous control on DIN rail

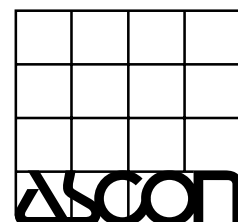
The delta**due**<sup>®</sup> series includes one of the most advanced line of DIN rail mounting controller modules. The D3 line can satisfy almost every control application with the following features:

- 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
- Open/Stop/Close output for electric actuators
- Single action as well as heat/cool control
- Full integration with the delta**due**<sup>®</sup> series data acquisition and control modules
- Easy integration with PC and PLC system
- 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



### Wiring error reduction

- Polarised connectors
- Coloured Terminal identification



### High integration

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



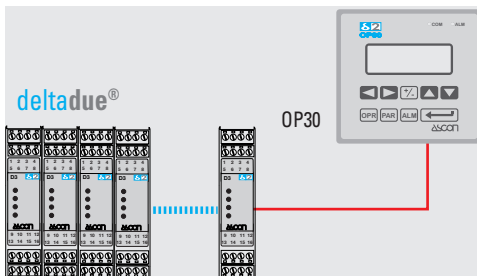
### Easy maintenance

- Withdrawable
- Easy replacement without switching off the power supply

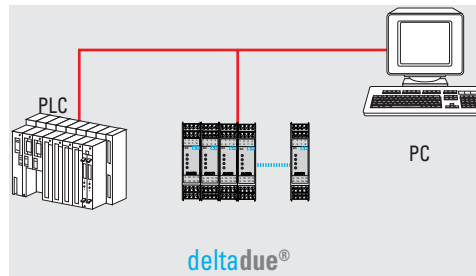


## Typical applications

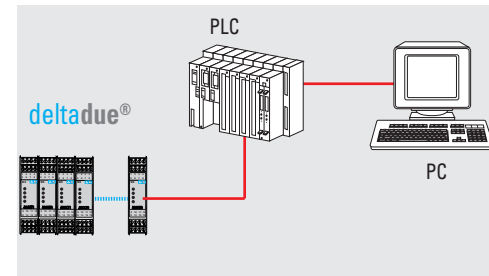
### Local control with operator panel OP30



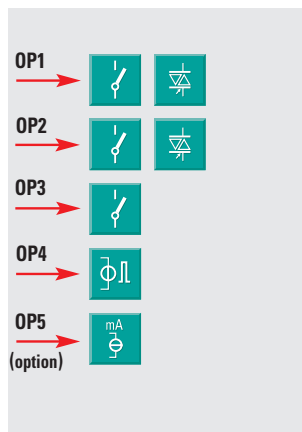
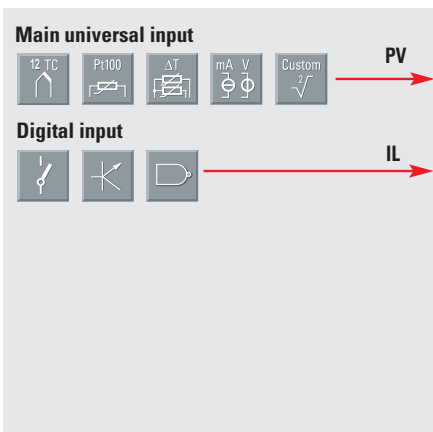
### Distributed control with PLC and with dedicated modules for critical loops



### Distributed control with PC supervision



## Resources



Setpoint Special functions (option) IL connected functions



Modbus RS485  
Parameterisation  
Supervision

## Operating mode

	Control	Alarms	Retransmission
			PV/SP
1	Single action	OP1	OP2 OP3 OP5
2		OP4	OP1 OP2 OP3 OP5
3		OP5	OP1 OP2 OP3
4	Double action	OP1 OP2	OP3 OP5
5		OP1 OP4	OP2 OP3 OP5
6		OP4 OP2	OP1 OP3 OP5
7		OP1 OP5	OP2 OP3
8		OP5 OP2	OP1 OP3
9	OP5 OP4	OP1 OP2 OP3	
10	Valve (Option)	OP1 OP2	OP3 OP5

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 s Sampling time: 0.5 s Input bias: - 60...+ 60 digit Input filter: 1...30 s 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 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	Input drift: <0.1%/20°C Env. Temp. <5μV/10Ω R. Wire Res.	
Digital input	The closure of external contact produces any of the following actions: Auto/Man mode change, Stored Setpoints 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 PID with valve algorithm, for controlling motorised positioners	
	Proportional 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 digit	
	Overshoot control	0.01...1.00	
	Manual reset	0.0...100.0%	
	Cycle time (Time proportioning only)	1...200 s	Singol action PID algorithm
	Control output high limit	10.0...100.0%	
	Soft-start output value	0.1...100.0%	OFF=0
	Output safety value	0.0...100.0% (-100.0...100.0% for Heat/Cool)	
	Control output hysteresis	0.1...10.0%	On/Off algorithm
	Dead band	-10.0...10.0%	
	Relative cool gain	0.1...10.0	Double action PID algorithm (Heat/Cool) with Overlap
	Cycle time (Time proportioning only)	1...200 s	
Control output high limit	10.0...100.0%		
Cool output hysteresis	0.1...10.0%		
Motor travel time	15...600 s	Valve drive PID algorithm without feedback potentiometer	
Motor minimum step	0.1...5.0%		

### Fuzzy-Tuning

Two methods of tuning are available:

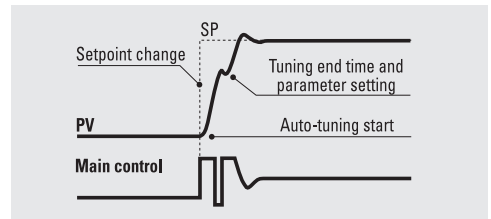
- **Auto-Tuning "one shot"**
- **Natural frequency "one shot"**

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.

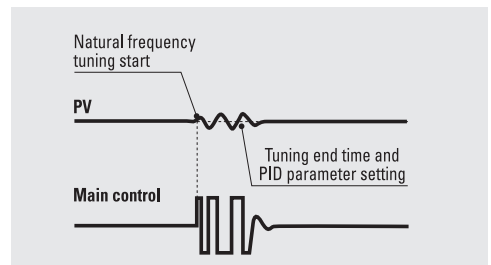
When activated, if a deviation exists between the Setpoint and process variable larger than 5% of scale range, the controller modifies the output value. Then, in a short time, it calculates the PID parameters and the new algorithm is operational immediately.

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.



### 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.

## Technical data

Features at env. 25°C	Description			
OP1-OP2 outputs	SPST Relay NO, 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 NO 2A/150V~ for resistive load			
OP4 output	Logic not isolated: 0/5V-, ±10% 30 mA max.			
OP5 Analogue output (option)	Control or PV/SP retransmission	Galvanic isolation: 500V~/1 min Resolution: 12 bit Accuracy: 0.1%	In current: 0/4...20mA, 750Ω/15V max.	
AL1- AL2 - AL3 alarms	Hysteresys	0.1...10.0%		
	Action	Active High	Deviation threshold ±range	
		Active low	Action Type	Band threshold 0...range Absolute threshold whole range
		Special functions	Sensor break, Loop break Acknowledge (latching), activation inhibit (blocking) Connected to Timer (if option 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		
Special functions (options)	Timer	Automatic start at the power on, manual start by digital inputs or serial comm.s Setting time: 1...9999 s/min Stand-by Setpoint: $5LLO \leq SP, P \geq 5LH I$		
	Start-up	Start-up Setpoint: $5LLO \leq SP, P \geq 5LH I$ 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, 1,200, 2,400, 4,800, 9,600 bit/s, 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	in a non volatile memory for an unlimited time		
	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 width: 53			

### Digital input

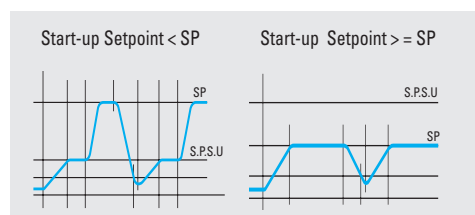
The digital input can be configured to have one of the following functions:

- Measure hold
- Auto/Man switching
- Stored Setpoint activation
- Timer activation

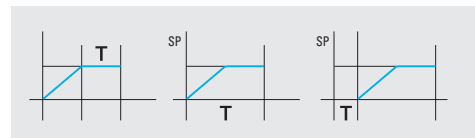
### Special functions

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

#### - Start-up



#### - Timer



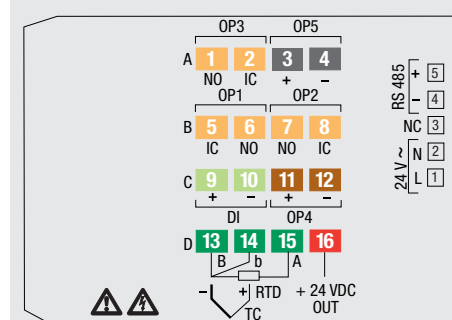
The use of these functions avoids additional device installation (e.g. external timer), therefore allowing a significant costs reduction.

Moreover there are

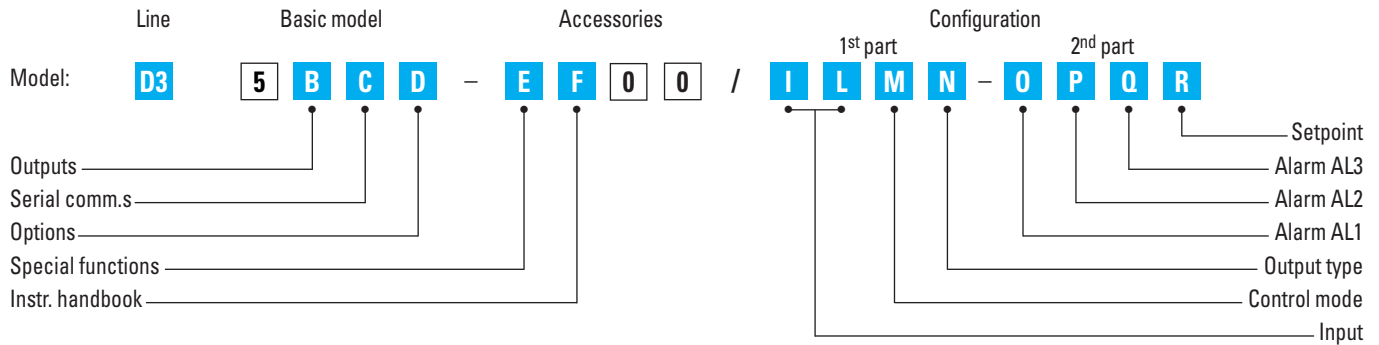
- **Output lock** function,

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

### Electrical connections



# Ordering codes



<b>Outputs</b>	OP1	OP2	<b>B</b>
	Relay	Relay	1
	SSR	SSR	5
<b>Serial communications</b>			<b>C</b>
	CanBus		3
	RS 485 Modbus/Jbus SLAVE		5
<b>Options</b>			<b>D</b>
	None		0
	Valve drive output		2
	Analogue output		5
	Valve drive output + Analogue output (retransmission only)		7
<b>Special functions</b>			<b>E</b>
	Not fitted		0
	Start-up + Timer		2
<b>Instruction handbook</b>			<b>F</b>
	Italian-English (std)		0
	French-English		1
	German-English		2
	Spanish-English		3

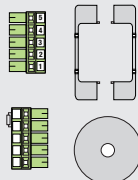
Inpt type	Range scale		<b>I</b>	<b>L</b>
TR Pt100 IEC751	-99.9...300.0 °C	-99.9...572.0 °F	0	0
TR Pt100 IEC751	-200...600 °C	-328...1112 °F	0	1
TC L Fe-Const DIN43710	0...600 °C	32...1112 °F	0	2
TC J Fe-Cu45% Ni IEC584	0...600 °C	32...1112 °F	0	3
TC T Cu-CuNi	-200...400 °C	-328...752 °F	0	4
TC K Chromel -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
<b>Control mode</b>			<b>M</b>	
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	
<b>Output type - Single action</b>	<b>Output type - Double action</b>	<b>N</b>		
Relay	Heat Relay, Cool Relay	0		
Digital	Heat Relay, Cool Digital	1		
Analogue	Heat Digital, Cool Relay	2		
Valve drive	Heat Relay, Cool Analogue	3		
	Heat Analogue, Cool Relay	4		
	Heat Digital, Cool Analogue	5		
	Heat Analogue, Cool Digital	6		
<b>AL1-AL2-AL3 type and function</b>			<b>O-P-Q</b>	
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	
<b>Setpoint type</b>			<b>R</b>	
Local only			0	
Local and 2 tracking stored Setpoints			1	
Local and 2 Stand-by stored Setpoints			2	

## Installation kit

Each set of interconnected controllers requires one model **AD3-KIT/BA.RT.PC.CD** kit:

Power supply and serial comm.s connector code AD3/BA

Connector with termination resistor for serial comm.s code AD3/RT



Couple of connector protections code AD3/PC

CD Rom with configuration software tool code AD3/CD

**If not differently specified the controller will be supplied with standard version  
Model: D3 5150-0000**

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