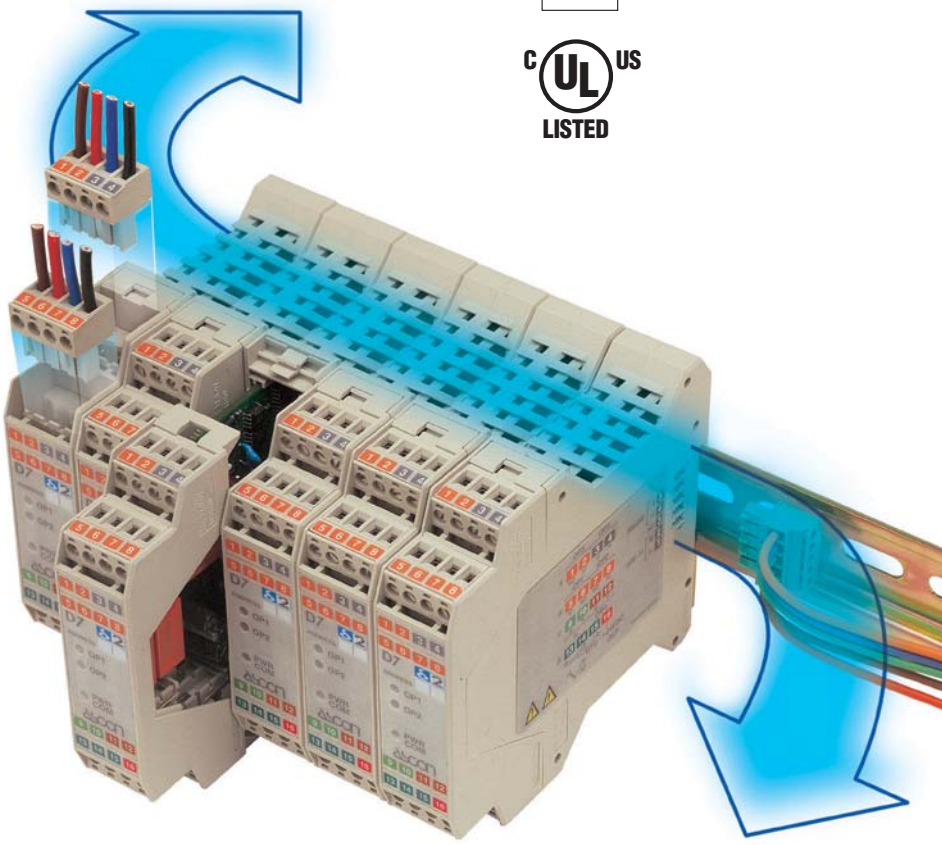
S E R I E S

DIN rail mounting double action controller with analogue output, deltadue® series D3 line

Continuous control on DIN rail

The deltadue® 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 tunig
- Open/Stop/Close output for electric actuators
- Singol action as well as heat/cool control
- Full integration with the deltadue® series data acquisition and control modules
- Easy integration with PC and PLC system
- Easy and simplified installation and maintenance



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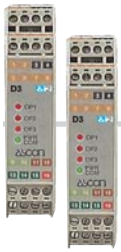
ISO 9001 Certified



deltadue®

distributed control/acquisition

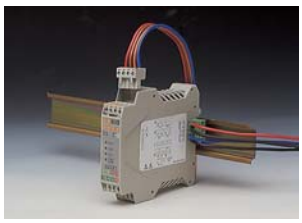
Advantages and peculiarities

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

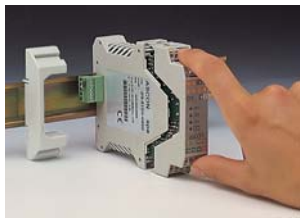


High integration

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

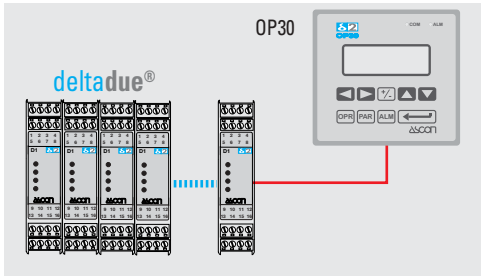
Easy maintenance

- Withdrawable
- Easy replacement without switching off the power supply

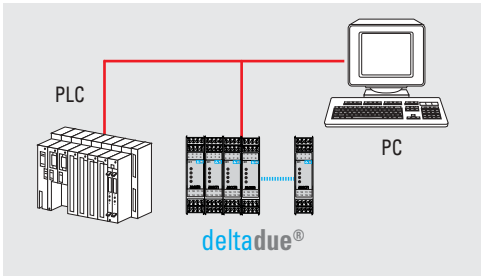


Typical applications

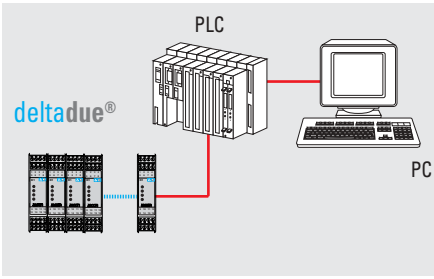
Local control with operator panel OP30



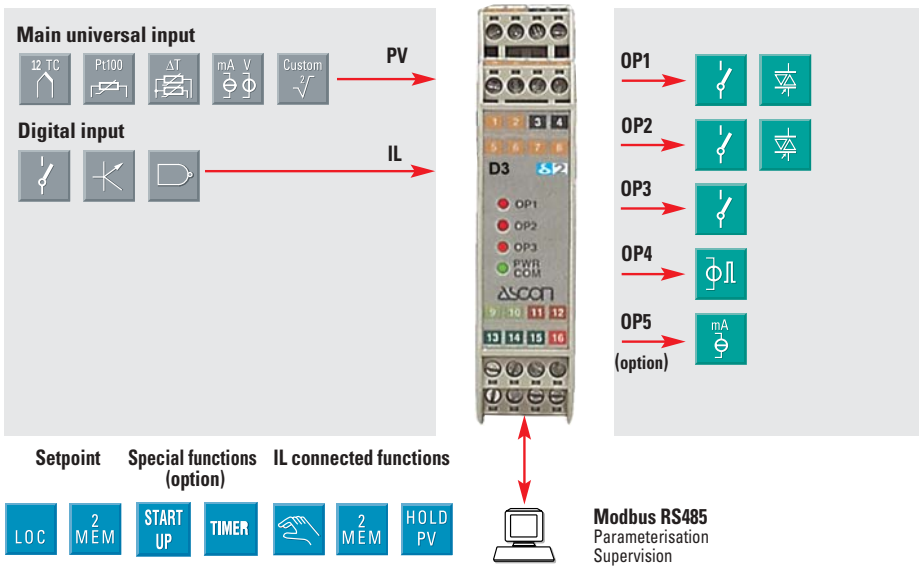
Distributed control with PLC and with dedicated modules for critical loops



Distributed control with PC supervision



Resources



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

One shot Auto tuning

One shot Natural Frequency

Technical data

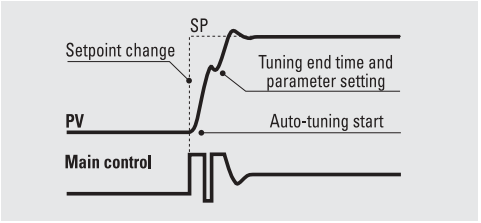
Features at env. 25°C	Description			
Total configurability	By means of the configuration tool it is possible to select: - type of input - the type of control input - type of output - type and functionality of the alarms - type of Set-point - control parameter values			
PV input	Common characteristics	A/D converter with resolution of 50000 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…240Vac 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)	Line: 20Ω max. (3 wire) Input drift: 0.35°C/10°C Env. Temp. <0.35°C/10Ω Wire Res.
	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	Line 150Ω max. Input drift: <2µV/°C Env. Temp. <5µV/10Ω Wire Res.
	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)	Input drift: <0.1%/20°C Env. Temp. <5µV/10Ω Wire Res.
	DC input (voltage)	10...50mV, 0...50mV Rj >10MΩ		
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 PID loop or ON/OFF with 1, 2 or 3 alarms			
Control mode	Algorithm	PID with overshoot control or ON/OFF PID with valve algorithm, for controlling motorised positioners		
	Proportional band (P)	0.5…999.9%		Singol action PID algorithm
	Integral time (I)	0.1…100.0 min	OFF=0	
	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		
	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%		Double action PID algorithm (Heat/Cool) with Overlap
	Relative cool gain	0.1…10.0		
	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

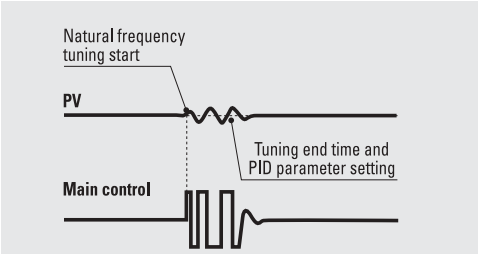
Two methods of tuning are available:
- **Auto-Tuning "one shot"**
- **Natural frequency "one shot"**

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/250Vac (4A at 120 Vac) for resistive load SSR, 1A/250Vac for resistive load Too meet the double isolation requirements, OP1 and OP2 must have the same load voltage			
OP3 output	SPST Relay NO 2A/150Vac for resistive load			
OP4 output	Logic not isolated: 0/5Vdc, ±10% 30 mA max.			
OP5 Analogue oputput (option)	Control or PV/SP retransmission	Galvanic isolation: 500Vac/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 / Active low	Action Type	Deviation threshold ±range Band threshold 0…range Absolute threhold 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: SCLO <= SP. 2 >= SLH1		
	Start-up	Start-up Setpoint: SCLO <= SPSU >= SLH1 Hold time: 0…500 min Control output high limit: 5.0…100.0%		
One shot Fuzzy-Tuning	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	+24Vdc ±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 Outputs lock	Parameter and configuration data are stored in a non volatile memory for an unlimited time		
General characteristics	Power supply (PTC protected)	24Vac (-25...+12%) 50/60Hz and 24Vdc (-15...+25%)	Power consumption 3W max.	
	Safety	EN61010-1 (IEC1010-1), installation class 2 (2.5kV) pollution class 2, instrument class II		
	Electromagnetic compatibility	Compliance to the CE standards		
	UL and cUL approval	File E176452		
	Protection	Terminal strip IP20		
	Dimensions	Pitch: 22.5 mm - depth: 114.5 - mm width: 53		
	Weight	161 g approx.		

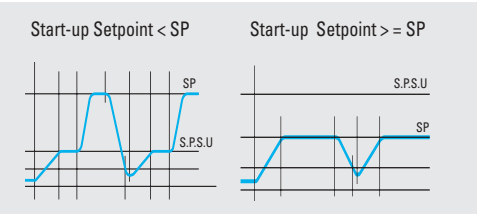
Digital input

The digital input can be configured to have one of the following functions:
- Measure hold
- Auto/Man switching
- Stored Setpoint activation
- Timer activation

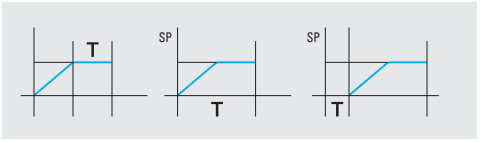
Special functions

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

- Start-up



- Timer

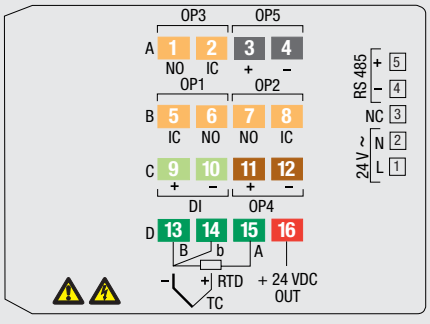


The use of these functions avoids additional device installation (e.g. external timer), therefore allowing a significant costs reduction .

Moreover there are
- **Output lock** function,

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

Electrical connections



Ordering codes

	Line	Basic model				Accessories					Configuration								
											1st part					2nd part			
Model:	D3	5	B	C	D	–	E	F	0	0	/	I	L	M	N	–	O	P	Q	R

Outputs
Serial comm.s
Options
Special functions
Instr. handbook

Setpoint
Alarm AL3
Alarm AL2
Alarm AL1
Output type
Control mode
Input

Outputs	OP1	OP2	B
	Relay	Relay	1
	SSR	SSR	5

Serial communications	C
CanBus	3
RS 485 Modbus/Jbus SLAVE	5

Options	D
None	0
Valve drive output	2
Analogue output	5
Valve drive output + Analogue output (retransmission only)	7

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

Inpt 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 Pt6%Rh IEC584	0…1800	°C	32…3272	°F	0	8
TC N Nichrosil-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
PID single reverse action		2
PID single direct action		3
PID double action	Linear cool output	4
	ON-OFF cool output	5
	Water cool output	6
	Oil cool output	7

Output type - Single action	Output type - Double action	N
OP1	Heat OP1, Cool OP2	0
OP4	Heat OP1, Cool OP4	1
OP5	Heat OP4, Cool OP2	2
Valve drive (OP1 and OP2)	Heat OP1, Cool OP5	3
	Heat OP5, Cool OP2	4
	Heat OP4, Cool OP5	5
	Heat OP5, Cool OP4	6

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

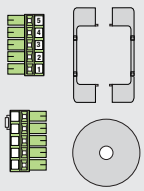
Setpoint type	R
Local only	0
Local and 2 tracking stored Setpoints	1
Local and 2 Stand-by stored Setpoints	2

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

DX line - Manager Gateway

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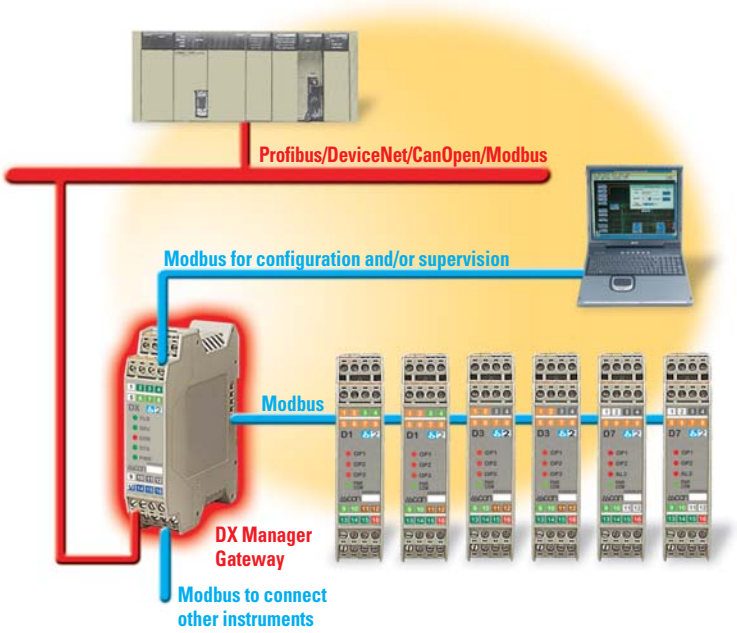
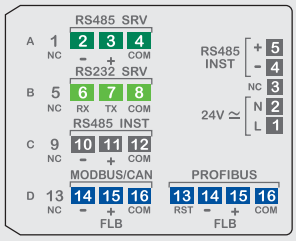


Electrical connections



Ordering codes

	Line	Basic model				Accessories				Configuration			
Model:	DX	5	B	C	0	– 0	F	0	0	/ 0	0	0	0

N° of instruments backed up
Fieldbus communications
Instructions handbook

Number of instruments to be backed up	B
4	1
8	2
16	3
32	4

Fieldbus communications	C
None	0
CANopen	3
RS 485 Modbus/Jbus	5
Profibus DP slave	7

Instructions handbook	F
Italian-English (standard)	0
French-English	1
German-English	2
Spanish-English	3

If not differently specified the controller will be supplied with standard version
Model: DX 5100-0000

Technical data

Features at env. 25°C	Description		
Functions	Manager	OFF line configuration and parameterization. Backup of the configuration and parameter data of the connected modules. Hot swapping, automatic configuration and parameterization of the replaced modules	
	Gateway	Network adapter for Profibus DP, DeviceNet, CANopen and RS485/RS232 converter	
Communications ports	Instruments Bus	RS485 Modbus protocol master replicated on the terminal connectors (max. 19200 baud)	
	Support	RS485, RS232 Modbus protocol slave, isolated (max. 38400 baud)	
	Fieldbus	RS485 Modbus protocol slave, isolated (max. 57600 baud)	
		Profibus DP slave	DP control: SPC3
			DP interface: RS485 isolated, max. 12 Mb/s
		CAN 2.0b, isolated, max. 1Mb/s	
General characteristics	See the entry “General characteristics” of the other module for details		