T630

MODEL

Process Controller
Product Data

EUROTHERM

CONTROLS
DATA MANAGEMENT
PROCESS AUTOMATION

Invensys
An Invensys company

- **Single Loop/Ratio/Dual Loop Cascade, Override control or Manual Station**
- **Analogue or incremental raise/lower (VP) output**
- **Autotune standard**
- **DIN 43700 standard (72mm × 144mm), IP65/NEMA 4 front panel**
- **Universal, isolated I/O, TC, RTD, high level with transmitter PSU**
- **MODBUS communications**
- **Fieldbus – Profibus DP**
- **Configuration via front panel or PC**
- **Password protection of configuration parameters**
- **Minimal hardware options facilitate spares holding/maintenance**

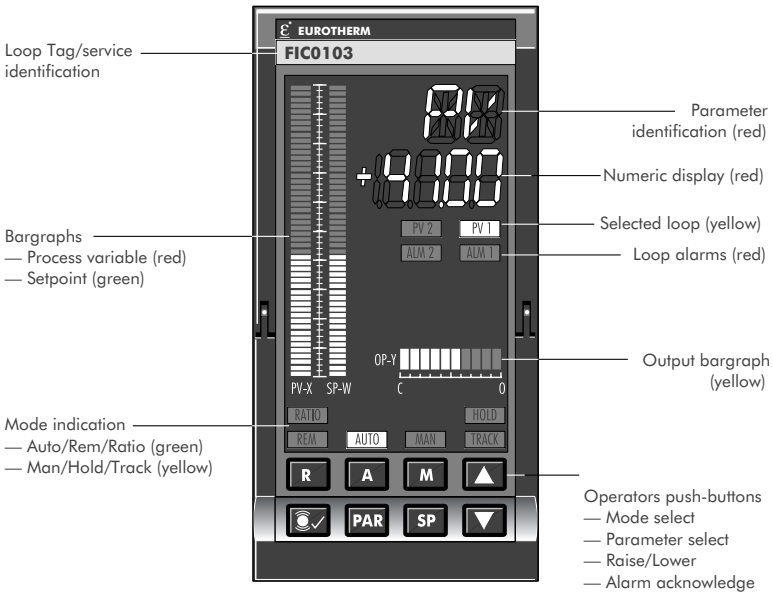
Description

Eurotherm has re-invented the Process Controller by taking the widely-acclaimed features of the 6350/60 product range – 100,000 units sold since 1980 – and implementing them using state-of-the-art technology and styling, setting new standards of performance and flexibility combined with ease of use, at a price anyone can afford.

T630 is designed to fit into existing panel cutouts as well as new panels requiring traditional loop integrity with the benefit of industry-standard communications for integration into a supervisory control environment. With a choice of dual-loop cascade as well as single loop or ratio control algorithms, the T630 will actually save panel space in retrofit situations by replacing two or even three existing units. Needless to say, the expansion I/O card allows full hand-shaking and bumpless transfer when separate units are connected in cascade or in master-slave configuration.

The Operator interface is a model of clarity, recalling the classic TCS look while adopting modern standards and display technology, using a custom display that maximises readability.

It will appeal as much to OEMs and System Integrators as End-Users, thanks to its ease of use and limited hardware variants — a single I/O expansion card and a second slot for communications minimises spares holding. Parameterisation is intuitive, thanks to the alphanumeric display used for messages, and a clear, concise manual guides the user and provides further explanation. Commissioning engineers will appreciate the standard Autotune feature.



APPLICATIONS

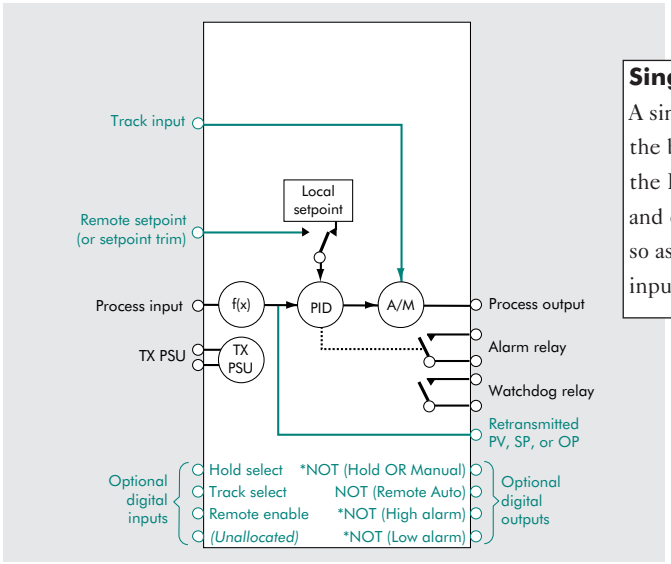
The T630 is designed for control of standard process variables — Temperature, Flow, Pressure, etc — in applications such as industrial boilers, furnaces, kilns, reactors and mixing vessels; in fact any application where high integrity process control is required.

The communications options make the T630 ideally suited for front-end PID control where the logic and coordination is carried out in a DCS or PLC.

CONTROL CONFIGURATIONS

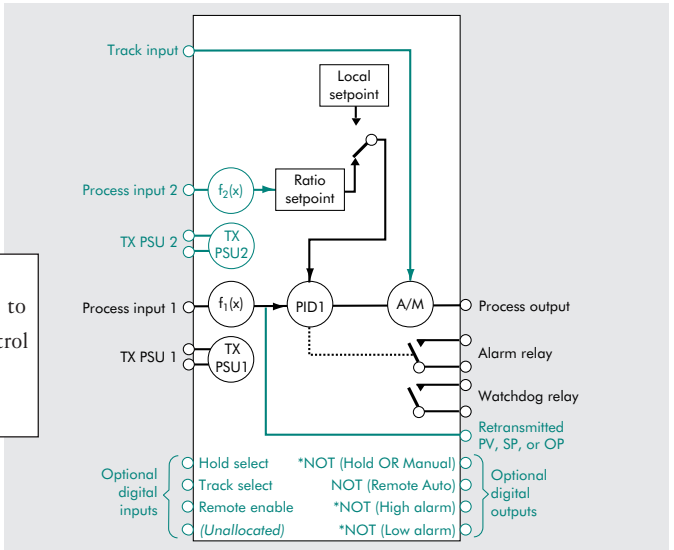
The basic input/output set allows for a single process input (with integral transmitter supply) and a single process output, both isolated. Two relays are provided for watchdog and process alarm. An expansion I/O card provides a second process input with transmitter PSU, a further analogue input and one analogue output. These may be connected in various ways to the available internal parameters such as remote setpoint, track, retransmitted process variable etc. More flexibility is provided by four digital inputs and four digital outputs which may be connected to mode enable and alarm/status fields respectively. All such parameters and status fields may be modified from the front panel or a supervisory computer when not connected to the I/O terminals.

This level of flexibility enables the following configurations.



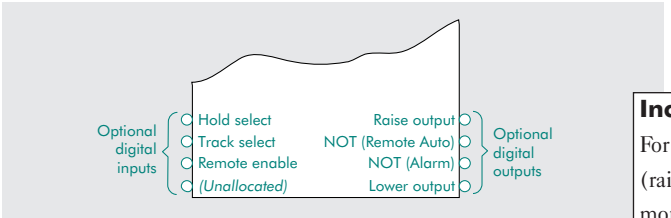
Single loop control

A simple single loop process controller algorithm can be achieved with the basic I/O board only. Use of a hardwired remote setpoint requires the Expansion I/O board, which also provides the necessary analogue and digital I/O for interlocking between separate master and slave units so as to assure bumpless transfers. Alternatively the setpoint trim input allows offset of the process variable in furnace applications etc.



Ratio control

The ratio controller implementation allows the controlled variable to follow an external input at a set ratio. The ratio setpoint and control PV are viewed in loop 1 while the ratio PV and the setpoint in engineering terms may be viewed in loop 2.

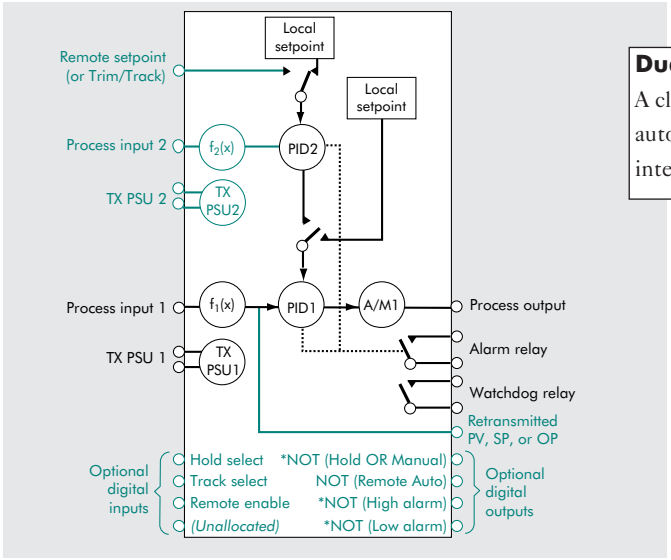


Incremental output

For single loop, dual loop cascade and ratio control, incremental (raise/lower) outputs for the control of fixed speed bi-directional motors are available. The algorithm provides raise and lower output pulses and compensation for both motor inertia and backlash. Position feedback display is available if required. The expansion I/O card is required and outputs are allocated as shown.

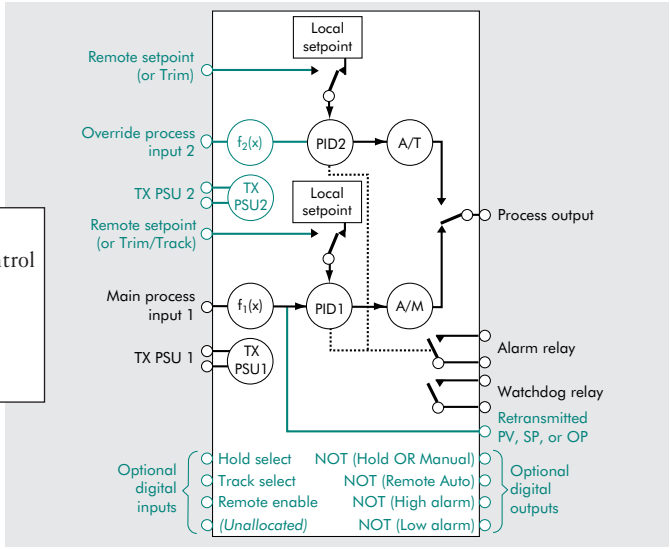
* Different for incremental output; high/low alarm has common output.

CONTROL CONFIGURATIONS (continued)



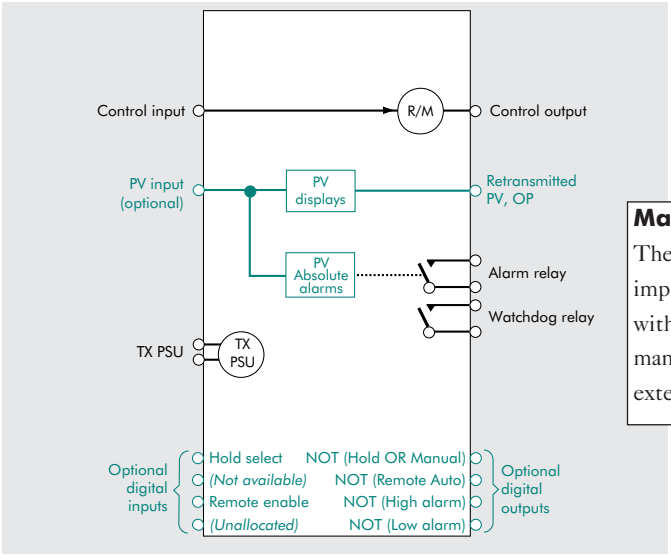
Dual loop cascade control

A classical two loop cascade pair with full bumpless, procedureless auto/manual/remote switching. All necessary interlocks are made internally so that wiring and configuration are very simple.



Override control

Override control allows a secondary loop to take over the main control output in order to prevent an undesirable operating condition, for example in flow control with pressure override. The two PID algorithms drive a single control output via a low signal selector.



Manual station

The Manual Station acts as the output device to an externally implemented control loop or simply as a manual loader. When used with an external control signal, the unit may be switched into local manual either by the operator or, automatically on failure of the external system.

* Different for incremental output; high/low alarm has common output.

ALARM HANDLING

The basic controller has both a watchdog relay output and a relay for process alarms. Use of the Expansion I/O board provides additional high and low alarm outputs. Process alarms are indicated by flashing of the loop 1 and loop 2 alarm LEDs on the front panel.

Unacknowledged absolute and deviation alarms cause flashing of the PV and SP bargraphs respectively. Alarms may be acknowledged by pushbutton for the current loop, and the alarm acknowledge status is also accessible via the communications.

'ITOOLS' THE CONFIGURATOR

- **On-line and off-line configuration**
- **Cloning, File Load, Save and Copy**
- **Application Documentation HTML or CSV format**
- **OPC client/server**
- **OPC Scope commissioning utility**

What does it do?

'iTools' is used to set up the type, range, linearisation and scaling of analogue inputs, the PID control type and parameters and all other functions and features within the T630.

Trending How do I use it?

Simply plug the configuration cable into the RJ11 socket on the T630 module. Let 'iTools' scan for the device. The module can then be put into configuration mode.

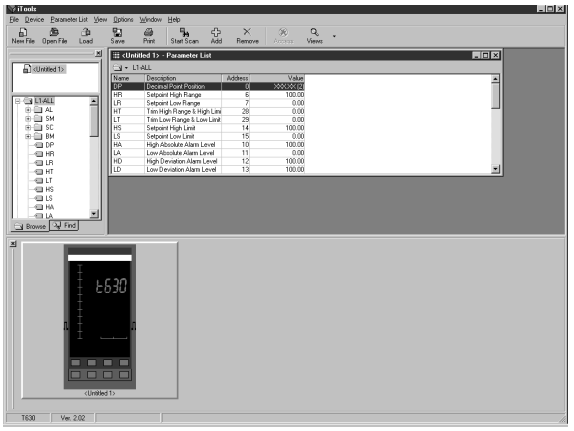
Simply click on the explorer 'folder' to select a parameter page, then click the parameter you wish to edit. A select list will appear for the variable, either a helpful multi choice, pick list or numeric data entry box will pop up.

How many values can I select?

Every parameter can be selected and may be set as required.

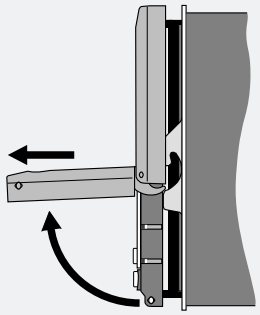
How do I save and document my configuration?

Once the T630 configuration has been completed then the application can be saved as a 'clone' file for repeat application. Clone files can be loaded, copied, saved and edited both on and off line.

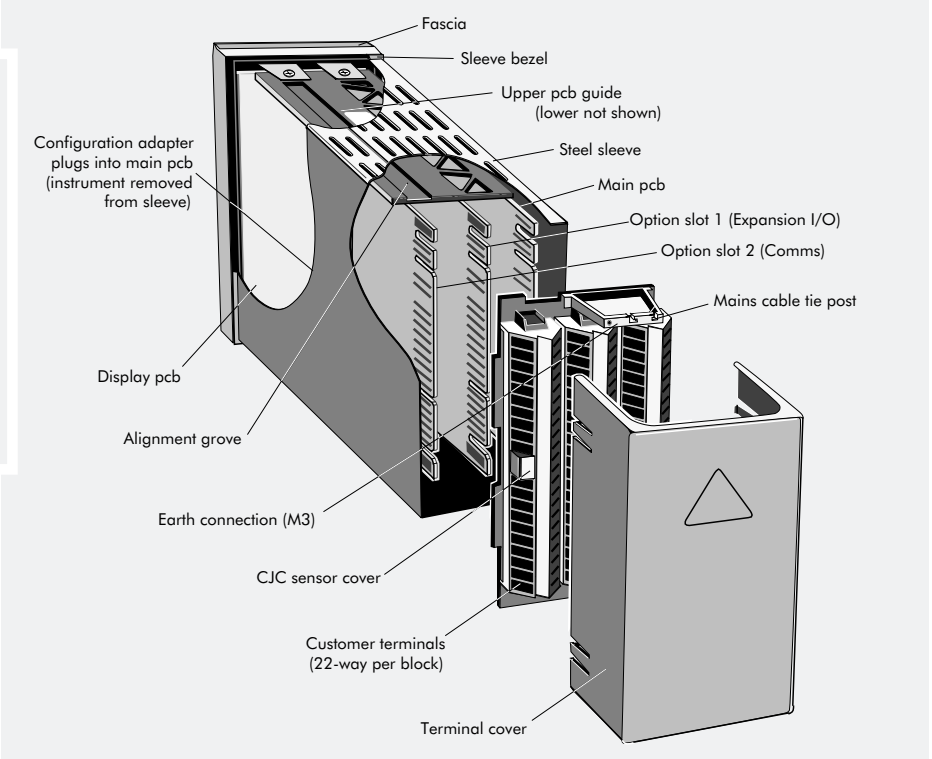


SPECIFICATION

Hardware structure



Lower part of bezel operates as cam-acting lever for easy insertion and withdrawal



SPECIFICATION (continued)

Input/output summary

I/O type	Type	Isolation pcb	Main I/O pcb	Expansion available	Total
Process (analogue) I/P	V, mA, T/C, PRT	Individual	1	1	2
Process (analogue) O/P	V1, mA	Individual	1		1
Transmitter supply	24V	Individual	1	1	2
Analogue I/P	V	By group, common 0V		1	1
Analogue O/P	V	By group, common 0V		1	1
Digital I/P	Logic	By group, common 0V		4	4
Digital O/P	Logic	By group, common 0V		4	4
Alarm relay	SPST		1		1
Watchdog relay	SPST		1		1

Note 1: Consult factory

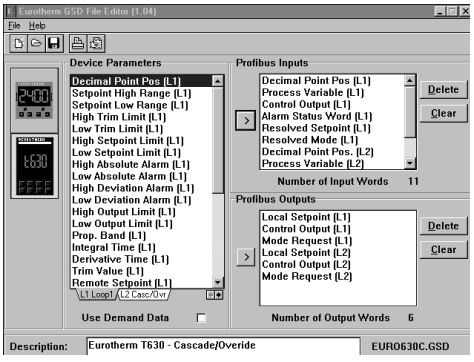
Input characterisation

Type	Range	Linearisation accuracy
Process		
Linear	—	—
Square root	—	—
Thermocouples		
J	–210 to +1200°C	±0.02°C
K	–270 to +1372°C	±0.05°C
T	–270 to +400°C	±0.04°C
S	–50 to +1767°C	±0.04°C
R	–50 to +1767°C	±0.04°C
B	0 to 1820°C	±0.1°C
N	0 to 1300°C	±0.05°C
Resistance thermometers		
PT100	–210 to 1200°C	±0.01°C

Communications

The T630 can be easily integrated with PLCs and third party control systems via optional communications cards. Industry standard MODBUS and PROFIBUS-DP interface cards are available to provide the link to the T630's local operator display and control of process variables without comprise in PLC performance.

For PROFIBUS-DP standard profiles (*.GSD) files are available. A Windows configurator which defines the profile is provided to map controller parameters to PLC registers. This allows the PLC control program to read and write to the controller as if it were an internally fitted module.



Inputs and Outputs

I/O technology:	Delta sigma.
Boards providing I/O:	Main pcb, and (optional) I/O expansion pcb
I/O types:	See table for summary; details follow

Process (analogue) inputs

General

Types available:	V, mA (via external burden), thermocouple, 2/3-wire RTD
Characterisation:	Linear, square root, thermocouple, RTD
Common mode rejection:	140dB
Series mode rejection:	60dB
Input isolation:	240V 50/60Hz working
PV sample rate:	8Hz
Resolution:	14 bits minimum

mA inputs

Ranges:	0-20mA, 4-20mA using external 50Ω burden resistor
Break protection:	0-20mA down; 4-20mA selectable up/down
Resolution:	14 bits min. (1.2μA)
Accuracy @25°C:	0.1% of range (excluding external burden resistor)
Temp drift/°C range:	< ±[450μV + 0.007% of reading] @ 99% confidence; < ±[50μV + 0.004% of reading]/°C typical

Thermocouple inputs

Thermocouples types:	J, K, T, S, R, B, N
CJC accuracy:	±0.25°C (@ 25°C ± 5°C)
CJC ambient rejection:	30:1 typical

(Other characteristics as for 150mV input range — see above)

Voltage inputs

Ranges:	0-10V, 1-5V
Break protection:	0-10V pull-down; 1-5V selectable up/down
Input impedance:	>245kΩ
Resolution:	14 bits min. (520μV)
Accuracy @25°C:	0.1% of range
Temperature drift/°C:	< ±[500μV + 0.014% of reading] @ 99% confidence; < ±[20μV + 0.006% of reading] typical

Resistance thermometer inputs (PRT)

Input type:	2- or 3-wire
Sensor type supported:	Pt100
Range:	–210 to +1200°C
Lead rejection (3-wire):	8mΩ/Ω of lead resistance
Sensor current:	250μA
Input impedance:	>10MΩ
Resolution:	14 bits min. (0.16°C)
Accuracy @25°C:	0.1% of range
Temperature drift:	< ±[2.4mΩ + 0.003% of reading] max; < ±[0.6mΩ + 0.002% of reading] typical

Process (analogue) outputs

General isolation:	60V

Current outputs

Range:	0-20mA, 4-20mA
Over-/under- range:	up to 22mA
Maximum load:	1kΩ
Resolution:	12 bits min. (5μA)
Accuracy @25°C:	0.5%
Temperature drift/°C:	< ±[5μA + 0.03% of reading]

Voltage outputs (Consult factory)

Range:	0-10V, 1-5V
Over-/under- range:	–1V to +11V
Maximum load:	10mA
Resolution:	12 bits min. (2.5mV)
Accuracy @25°C:	0.5%
Temperature drift/°C:	< ±[0.5mV + 0.03% of reading]

Transmitter power supply

Voltage:	24V ±1.2V (up to 22mA)
Current:	0-22mA (limit at 30mA)
Isolation:	60V working

SPECIFICATION (continued)

Analogue inputs

Range:	0-10V, 1-5V
Over-/under- range:	–1 to +11V
Break detection	Selectable up/down scale or last value, response time <1 sample period
Input impedance:	>250kΩ
Resolution:	12 bits min. (3mV)
Accuracy @25°C:	0.1% of range
Temperature drift/°C:	< ±[0.5mV + 0.014% of reading]; < ±[0.1mV + 0.008% of reading] typical

Analogue outputs

Range:	0-10V, 1-5V
Over-/under- range:	–1 to +11V
Maximum load:	10mA
Resolution:	12 bits min. (2.5μV)
Accuracy @25°C:	0.1% of range
Temperature drift/°C:	< ±[0.5mV + 0.014% of reading]; < ±[0.1mV + 0.008% of reading] typical

Digital inputs

Pullup voltage:	24V dc via 12kΩ, or open-circuit (selectable)
Input thresholds:	Logic 1: 6.5V minimum Logic 0: 2.5V maximum

Digital outputs

Pullup voltage:	24V dc via 12kΩ, or open-circuit (selectable)
Max. low-state current:	100mA
Max. external pullup voltage:	50V
Isolation:	60V dc working

Relays

Watchdog and alarm relays:	SPST, open when de-energised (alarm condition)
Contact rating:	1A at 24V ac/dc. Absolute max. rating 2A at 60V
Isolation:	60V working

Control characteristics

General

Loop update time:	125ms total
Action on sensor failure:	User-selectable – no mode change, or forced manual mode with selectable 'failsafe' output (last or low OP)
Power-fail recovery:	User-selectable – last operating condition, or manual with selectable 'failsafe' output (last or low OP)

Control Algorithms

Type (user-selectable):	Single Loop, Ratio, Dual Loop Cascade, Override, Manual Station
Control algorithm:	Selectable for P, PI, PD, PID or ON/OFF; direct or inverse-acting
Control output:	0-100% for direct or reverse acting actuator; raise/lower output for incremental actuators
Autotune:	Single-shot self tune, PID terms freeze after defined period

Serial communications

MODBUS

Standard:	RS422 (5-wire) or RS485 (3-wire)
Data rate:	Selectable 1200-19,200 bits/sec
Data format:	8 bit, selectable parity, 1/2 stop bits
Protocol:	MODBUS/J-BUS RTU (slave)
Line impedance:	120Ω-240Ω twisted pair
Line length:	1220m maximum at 9600 baud
Units per line:	16 instruments max electrical loading, expandable to 128 by use of buffers

Fieldbus communications

PROFIBUS-DP

Physical Medium:	2-wire RS485
Network Topology:	Linear bus with active termination of bus at both ends
Protocol:	PROFIBUS –DP, intelligent slave
Number of stations:	32 per network segment up to 127 with repeaters

Baud rate (Kbit/sec)	9.6	19.2	93.75	187.5	500	1500	12000
Distance/segment (meters)	1200	1200	1200	1000	400	200	100

Configuration

Parameters storage:	Non-volatile EEPROM
Front panel:	Parameter access by list: loop 1, loop 2, general, comms, main I/O, expansion I/O and calibration
Access protection:	Operator parameters with no password. Control and instrument parameters via separate passwords
PC (via configuration adaptor):	Plugs into side of unpowered unit via RJ11 connector

Fascia

Display technology:	LED
Bargraph Displays:	2 vertical, 51 segment LED for PV-X (red) and SP-W (green); Display in 2% steps 1 horizontal, 10 segment LED for OP-Y (yellow); Display in 10% steps
Numeric Displays:	$4\frac{1}{2}$ digit display (red) with decimal point.
Alphanumeric display:	2 character 14 segment starburst LEDs for parameter identification or error 19999 resolution
Alarm/status displays:	LEDs (green/yellow/red)
Push-buttons:	Elastomeric with orange legend
Loop Tag/Service identification:	Write-on label (white) at top of fascia

Physical

Dimensions:	72mm × 144mm × 252.55mm (including keypads)
Weight:	1.39kg
MTBF	20 years
Terminals type:	Clamping screw with cable protector
Maximum wire/ferrule size:	$2.5mm^2$

Power Supplies

Mains version

Voltage range:	90-265V ac rms
Frequency range:	45-65Hz
Power rating:	25VA
Hold up time:	20ms
Fuse:	Factory replacement only

DC version

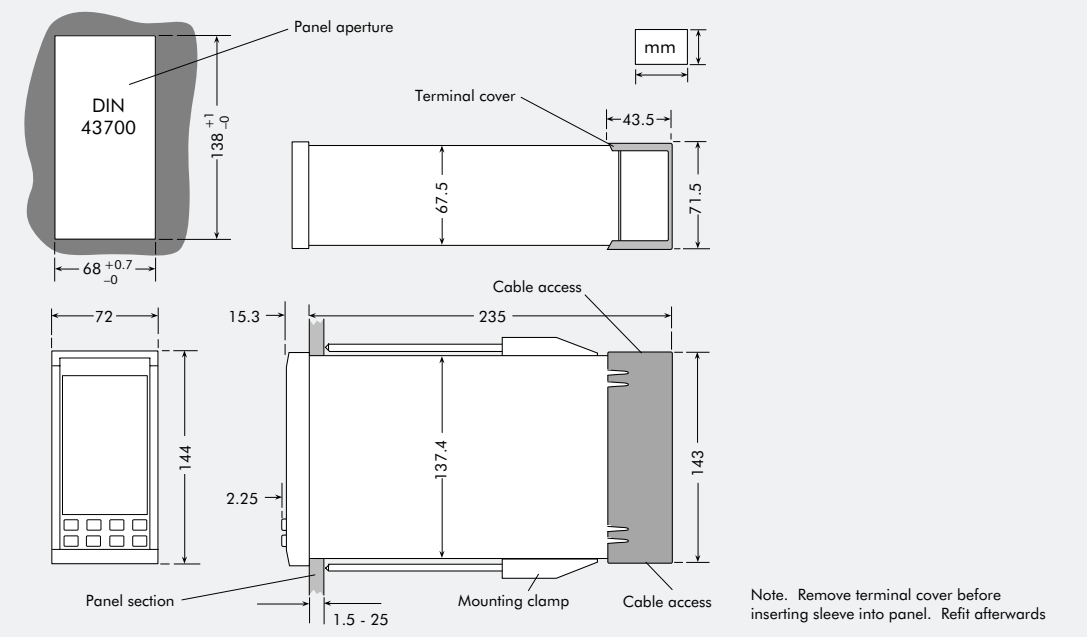
I/P voltage range:	19-55V dc
Power rating:	25VA
Hold up time:	20ms
Fuse:	Factory replacement only

Environmental

CE This product conforms to EMC Directive 89/336/EEC amended by 93/68/EEC, and with the European Low Voltage Directive 72/23/EEC.

Electrical safety:	EN61010-1: 1993/A2:1995
EMC emissions specification:	EN50081-2: Industrial
EMC immunity specification:	EN50082-2: Industrial
Safety specification:	EN61010-1: 1993/A2:1995
Storage temperature:	–10°C to +85°C
Humidity:	5-95% (non-condensing)
Operating temperature:	0°C to +50°C
Front panel sealing:	IP65 and NEMA4
Controller/sleeve sealing:	IP20 from all directions
Isolation:	EN61010 (1993) — Installation category II, Pollution degree II
Vibration and shock:	IEC1131-2 in operation

INSTALLATION



ORDERING INFORMATION

T630 Order codes

Base unit	Power supply	Expansion I/O slot 1	Comms slot 2	Sleeve	Calibration certificate	Factory preconfig
T630	MAINS	ExpIO	SER	T730	—	—

Example

Base unit	Code
Process controller	T630
Power supply	
Universal mains 90 to 265V ac rms	MAINS
DC 19-55V	DC
Expansion I/O (slot 1)	
Not fitted	—
Exp I/O board	ExpIO
Communications (slot 2)	
Not fitted	—
Serial comms board	SER
PROFIBUS	PROF
Sleeve	
Sleeve fitted	T730
Not fitted	—
Calibration certificate	
Not supplied	—
Calibration certificate	Cert
Factory preconfiguration	
Default configuration	—
Customer configuration	Consult factory

Mounting accessories

Base unit	Code
19" rack frame adapter	T960
Blanking plate (non SP65)	T961
Blanking plate SP65	T962

Termination accessories

Base unit	Code
Termination mounted burden resister 250 ohm for 4-20mA input (1-5V range)	LA246779UK25
Termination mounted burden resister 500 ohm for 0/4-20mA input (0/0.2-1V range, process inputs only)	LA246779U50R

Configuration adapter

Base unit	Code
Configuration adapter plus parameterisation software	

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