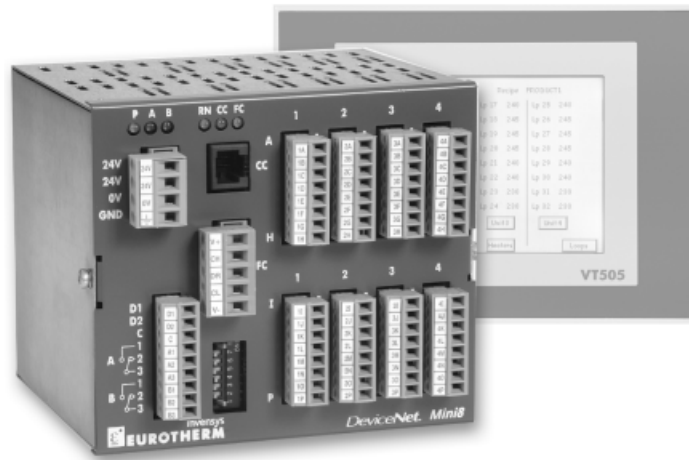


Mini8™

MODEL




Invensys
EUROTHERM

Multi-loop control and data acquisition

Specification Sheet

- 16 control loops
- 32 analogue inputs
- Modular & compact
- SP programming
- Maths and logic
- Remote HMI
- Modbus RTU
- DeviceNet
- Profibus DP
- CANopen
- Modbus TCP

The **Mini8** offers high performance control usually only found in Eurotherm's panel mount PID controllers. It is also a very competitive and compact data acquisition device. Mini8's modular design enables its I/O and feature set to be selected to cater for a wide range of applications from simple to complex.

Mini8 is an ideal partner to a programmable logic controller. Able to multi-drop on either Serial, Fieldbus or Ethernet communications, Mini8 offers a real cost effective alternative to performing analogue measurement or loop control in a PLC. Implementing these functions in the Mini8 reduces the hardware cost of the PLC, relieving it of the burden of performing analogue functions, often allowing a lower specification processor to be used.

The feature set of the Mini8 is comparable with Eurotherm's 3000 series panel controllers including its high performance PID control and SP programming functions together with a range of features such as Maths, Logic and Timing blocks.

When used in a data acquisition installation the Mini8's high density analogue I/O can be combined with Eurotherm's 6000 series paperless graphic recorder products to provide unsurpassed local and network access to your process.

VT505 Operator panel

- 5.7" Touchscreen LCD
- 128 User pages
- 34 Variables per page
- 128 recipes
- Modbus RTU master
- Import of Bitmap images

VT505 provides an ideal operator interface for monitoring and changing process parameters in any slave controller. Compatible with any Modbus RTU product such as the Mini8 it can also be used as a operation window into other communicating devices.

Although compact the VT505 is constructed in a rugged pressed aluminium case with a sealed matrix touch display. Its IP65 panel rating makes it ideal for harsh industrial environments.

Dynamic text, help messages and easy to use function keys provide the operator with rapid access to any data that he wishes to view or adjust. Functions can be programmed via the matrix touch screen for direct access to displays, alarms, recipe download or simply to toggle or alter a variable.

The VT505 can be ordered pre-configured to suit Mini8 applications, enabling plug and play operation, without the need for any user configuration. Alternatively, users can create their own customised view of their process using the VTWIN programming software.

Setpoint Programming

The Mini8 can run up to 8 programmer function blocks, to follow a user defined series of ramp and dwell segments. Each Programmer is capable of running a program of up to 16 segments with 8 event outputs. The event outputs can be used internally within the configuration soft wiring or to external digital or relay outputs. (Note that this depends on the type and number of the hardware outputs fitted).

Recipes

Using a PC tool, recipes can be created that can be used to change the operating parameters of the Mini8 simply by selecting a new recipe via the HMI. This is very useful where multiple products are processed using the same controller but require different parameters to be set.

Heater Failure Detection

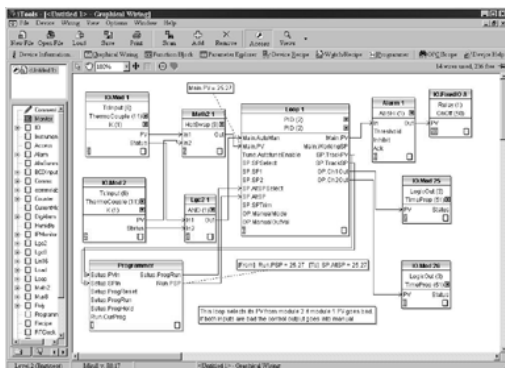
The Mini8 with a CT3 input card fitted, has the capability of detecting failures in heater loads connected to its time proportioned outputs. By measuring the current flowing through the heaters via 3 current transformer inputs the Mini8 can, for up to 8 loops, detect Partial Load failure, Over Current, as well as SSR short or open circuit. Individual load current parameters indicate the measurement for each heater. The current monitor block utilises a cyclic algorithm to measure the current flowing through one heater per measurement interval.

Toolkit Blocks

A range of toolkit functions, including Maths, Logic and Timing blocks can be used to create custom solutions and small machine controllers.

iTools Graphical Wiring Editor

The GWE is an extremely easy way to create applications. It allows users to select the function blocks they wish to use in their application then connect them together using 'Soft Wiring'. The GWE gives the user a pictorial view of exactly what he has configured and can also be used to monitor runtime conditions.



TECHNICAL SPECIFICATION

General

Environmental performance

Temperature limits	Operation:	0 to 55°C
	Storage:	-10 to 70°C
Humidity limits		5 to 95% RH non condensing
IP Rating		IP20
Vibration		2g peak, 10 to 150Hz
Altitude		<2000 metres
Atmospheres		Not suitable for use in explosive or corrosive atmosphere
Mounting		DIN rail to EN50022 35 x 7.5 or 35 x 15 horizontally

Electromagnetic compatibility (EMC)

Emissions and immunity	BS EN61326
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This controller conforms with the essential protection requirements of the EMC Directive 89/336/EEC, by the application of EMC standard EN61326. This instrument satisfies the general requirements of the industrial environment defined in EN 61326.

Electrical safety

BS EN61010	Installation cat. II; Pollution degree 2
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INSTALLATION CATEGORY

This controller complies with the European Voltage Directive 73/23/EEC, by the application of the safety standard EN 61010.

POLLUTION DEGREE 2

Normally, only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation shall be expected

Physical

Dimensions and weight	W124 x H108 x D115mm, 1Kg typical
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Power requirements

Supply voltage	17.8 to 28.8Vdc
Supply ripple	2V Pk to Pk Max
Power consumption	15W Max

Approvals

CE, cUL listed (file E57766)

Communications

Serial communications options

Protocols	Modbus RTU Slave with RJ45 connector Profibus DP with 9-Pin D or RJ45 connector DeviceNet with 5 way screw terminals CanOpen with 5 way screw terminal EIA485 (3 or 5 wire) CAN (Devicenet), Profibus 42Vac/dc max.
Transmission standards	
Isolation	

Ethernet communications option

Protocol	Modbus TCP with RJ45 connector
Isolation	42Vac/dc max.
Transmission standard	10Base T 802.3
Features	DHCP client, 4 simultaneous masters, preferred master

Configuration communications support

Modbus RTU	3-wire EIA232, through RJ11 configuration port. Baud rates: 4800, 9600, 19200
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Note: All versions of Mini8 support one configuration port.

The configuration port can be used simultaneously with the network link.

Fixed I/O resources

The PSU card supports 2 independent and isolated relay contacts

Relay output types	On/Off (C/O contacts, "On" closing the N/O pair)
Contact current	<1A (resistive loads)
Terminal voltage	<42V
Contact material	Gold
Snubbers	Snubber networks are NOT fitted.
Contact isolation	42Vac/dc max.
The PSU card supports 2 independent and isolated logic inputs	
Input types	Logic (24Vdc)
Input logic 0 (off)	< 5Vdc.
Input logic 1 (on)	> 10.8Vdc.
Input operating range	-30Vdc to +30Vdc.
Input current	2.5mA (approx.) at 10.5V; 10mA max @ 30V supply.
Detectable pulse width	110ms min.
Isolation to system	42Vac/dc max.

Input/Output modules

TC4/8 4/8-channel TC input module

The TC4/8 supports 4/8 independently programmable and electrically isolated channels, catering for all standard and custom thermocouple types.

mV Input range	-77mV to +77mV, mA with burden resistor
Resolution	20 bit ($\Sigma\Delta$ converter), 1.6 μ V with 1.6s filter time
Temperature coefficient	< ± 50 ppm (0.005%) of reading/ $^{\circ}$ C
Cj rejection	> 30:1
Cj accuracy	$\pm 1^{\circ}$ C
Linearisation types	C, J, K, L, R, B, N, T, S, LINEAR mV, custom.
Accuracy	$\pm 1^{\circ}$ C $\pm 0.1\%$ of reading (internal CJC)
Channel PV filter	0.0 seconds (off) to 999.9 seconds, 1st order low-pass.
Sensor break	AC detector: Off, Low or High resistance trip levels
Input resistance	>100 M Ω
Input leakage current	<100nA (1nA typical).
Common mode rejection	>120dB, 47 - 63Hz
Series mode rejection	>60dB, 47 - 63Hz
Isolation channel-channel	42Vac/dc max
Isolation to system	42Vac/dc max

RT4 4-channel RTD input module

The RTD4 supports 4 independent resistance measuring channels.

Channel types	2-wire, 3-wire or 4-wire, mA with burden resistor
Input range	10 Ω to 640 Ω
Linearisation type	Pt100, Linear, custom
Channel PV filter	0.0 seconds (off) to 999.9 seconds. 1st order low-pass
Isolation channel to channel	42Vac/dc Max
Isolation to system	42Vac/dc Max
Common mode rejection	120dB, 48Hz to 62Hz
Series mode rejection	60dB, 48Hz to 62Hz

Accuracy specification (ohms)

Factory calibration at 150 Ω	$\pm 0.05\Omega$
Factory calibration at 400 Ω	$\pm 0.08\Omega$
Linearity	$\pm 0.05\Omega$ (from best-fit straight line)
Temperature coefficient	Better than 0.001% of input value change per $^{\circ}$ C ambient change
Limiting resolution	0.005 Ω (17bit)
Effective resolution	0.01 Ω with 3.2s filter, 0.02 Ω with 1.6s filter, 0.03 Ω with 0.8s filter, 0.08 Ω with 0s (no) filter

Input noise	0.03 Ω pk-pk with 1.6s filter; 0.16 Ω pk-pk with 0s (no) filter
Lead resistance	22 Ω or more per lead. Note that leads must be matched in 3-wire mode

Bulb current	300 μ A
Sensor break system	125nA dc applied at S+ and S-

Accuracy specification (Pt100)

Pt100 Linearisation	BSEN60751:1996, IEC 751:1983
Calibration	$\pm 0.3^{\circ}$ C $\pm 0.05\%$ of input value (input in $^{\circ}$ C)
Linearity	$\pm 0.1^{\circ}$ C (from best-fit straight line)
Temperature coefficient	Better than 0.1 $^{\circ}$ C PV change over 0 $^{\circ}$ C to 55 $^{\circ}$ C Amb
Effective resolution	0.025 $^{\circ}$ C with 3.2s filter, 0.05 $^{\circ}$ C with 1.6s filter, 0.075 $^{\circ}$ C with 0.8s filter, 0.2 $^{\circ}$ C with 0s (no) filter
Input noise	0.1 $^{\circ}$ C pk-pk with 1.6s filter; 0.5 $^{\circ}$ C pk-pk with 0s (no) filter

DI8 8-channel logic input module

The DI8 comprises of 8, logic input channels to the same specification as the 2 fixed I/O resource logic inputs

Input type	Logic (24Vdc)
Input logic 0 (off)	<5Vdc
Input logic 1 (on)	> 10.8Vdc.
Input operating range	-30Vdc to +30Vdc.
Input current:	2.5mA (approx.) at 10.5V; 10mA max @ 30V supply.
Detectable pulse width	110ms min.
Isolation channel-channel	42Vac/dc max.
Isolation to system	42Vac/dc max.

CT3 3-channel current-transformer input module

The CT3 supports 3 independent channels designed for heater current monitoring. A scan block allows periodic test of up to 16 nominated outputs, over 8 loops, to detect load (failure) changes.

Channel types	A (current)
Channel rating	300mA max. (6CT's)
Factory set accuracy	better than $\pm 2\%$ of range
Current input range	0mA to 50mA rms
Transformer ratio	10/0.05 to 1000/0.05
Input load burden	1W
Isolation	None

DO8 8-channel digital output module

The DO8 supports 8 independently programmable channels, the output switches requiring external power supply. Each channel is current and temperature protected, holdback limiting occurring at about 100mA. The supply line is protected to limit total card current to 200mA.

The 8 channels are isolated from the system (but not from each other). To maintain isolation it is essential to use an independent and isolated PSU.

Channel types	On/Off, Time Proportioned
Channel supply	15Vdc to 30Vdc
Logic 1 voltage output	> (Vcs - 3V) (not in power limiting)
Logic 0 voltage output	< 1.2Vdc no-load, 0.9V typical
Logic 1 current output	100mA max. (not in power limiting)
Min. pulse time	20ms
Channel power limiting	Current limiting capable of driving short-circuit load

Terminal supply protection	Card supply is protected by 200mA self-healing fuse
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Isolation channel-channel	N/A (Channels share common connections)
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Isolation to system	42Vac/dc max.
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AO4/8 4/8-channel 4-20mA output module

The AO4/8 supports 4/8 independently programmable and electrically isolated mA output channels for 4-20mA current-loop applications. 1 card can be fitted in slot 4.

Channel types	mA (current) Output
Output range	0-20mA, 360 Ω
Setting accuracy	0.1% of value typical
Resolution	1 part in 10000 (1 μ A typical)
Settling time	100ms
Isolation channel-channel	42Vac/dc max
Isolation to system	42Vac/dc max

RL8 8-channel relay output module

The RL8 offers independent pairs of normally open relay contacts of which 2 cards can be fitted in slots 2 and 3

Type	Form A, normally open
Rating	Min 10mA @ 5Vdc, Max 2A @ 264Vac Min 4000,000 (max load) operation with internal snubber
Functions	Includes control outputs, alarms, events and status
Isolation channel-channel	264Vac
Isolation to system	264Vac

Software features

Control

Number of loops	0, 4, 8 or 16 loops (order options)
Control modes	On/Off, single PID, Dual channel OP
Control outputs	Analogue 4-20mA, Time proportioned logic, OnOff
Cooling algorithms	Linear, water, fan, or oil
Tuning	3 sets PID, One-shot auto-tune.
Auto manual control	Bumpless transfer or forced manual output available

Setpoint rate limit	Ramp in units per sec, per min or per hour
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Output rate limit	Ramp in % change per second
Other features	Feedforward, Input track, Sensor break OP, Loop break alarm, remote SP, 2 internal loop setpoints

Setpoint programmer

Number of programmers	8 with 1 channel each
Number of programs	1 per programmer
Number of segments	16 per program
Number of event outputs	8 per programmer (physical outputs limited by I/O count and type)
Digital inputs	Reset, Run, Hold, Run/Hold, Run/Reset/Advance, /skip plus 2 assignable (e.g.wait)

Power failure action	Ramp, Reset or Continue
Servo Start	PV or SP
Other features	Timed events, PV events, user values, guaranteed soak

Process alarms

Number 32
 Type High, low, devhi, devlo, devband
 Latching None, auto, manual, event
 Other features Delay, inhibit, blocking

Digital alarms

Number 32
 Type PosEdge, negEdge, edge, high, low
 Latching None, auto, manual, event
 Other features Delay, blocking, inhibit

Zirconia

Number 2
 Functions Carbon potential, dewpoint, %O₂ LogO₂, probe mV
 Supported probes Barber Colman, Drayton, MMICarbon, AACC, Accucarb, SSI, MacDhui, BoschO₂, BoschCarbon

Gas reference Internal or remote analogue input
 Probe diagnostics Clean recovery time, impedance measurement
 Probe burn-off Automatic or manual
 Other features Sooting alarm with tolerance setting, PV offsets

Humidity

Number 1
 Functions Relative humidity, dewpoint
 Measurement Psychrometric (wet & dry) inputs
 Atmosphere compensation Internal or remote analogue input
 Other features Psychrometric constant adjust

Recipes

Number 8
 Parameters 24 per recipe
 Length of Name 8 Characters
 Selection HMI, comms, strategy

Transducer calibration

Number 2
 Type Shunt, load cell, comparison
 Other features Autotare

Communication tables

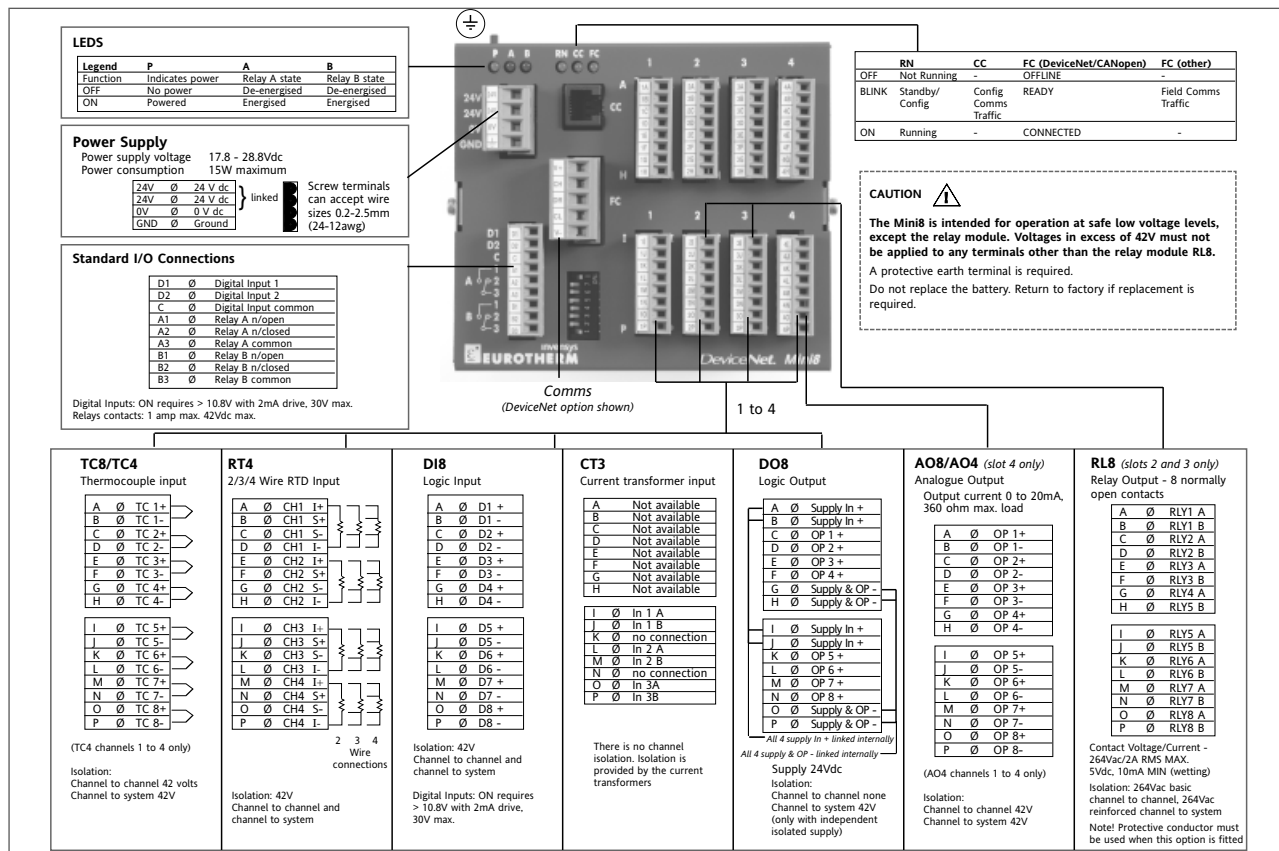
Number 250
 Function Modbus remapping (indirection)
 Data formats Integer, IEEE (full resolution)

Load failure detection

Requires CT3 module
 Number of loops Hardware supports 8 loops
 Maximum 6 loads per CT input
 1 in 8 Partial load failure, Over current, SSR short circuit, SSR open circuit
 Alarms Automatic or manual
 Commissioning Interval time 1 sec - 60 sec

Application blocks

Soft wiring Orderable options of 30, 60 120 or 250
 32 real numbers with decimal point.
 24 blocks, add, subtract, multiply, divide, absolute difference, maximum, minimum, hot swap, sample and hold, power, square root, Log, Ln, exponential, switch.
 24 blocks, AND, OR, XOR, latch, equal, not equal, greater than, less than, greater than or equal to, less
 4 blocks, AND, OR, XOR
 4 blocks, 8 sets of 8 values selected by input parameter
 4 blocks, average, min, max sum
 2 blocks, 2 Decades
 2 blocks, max, min, time above threshold
 2 blocks, 16-point linearisation fit
 2 blocks, characterisation by Poly Fit table
 1 block, smooth transition between two values
 8 blocks, OnPulse, OnDelay, OneShot, MinOn Time
 2 blocks, Up or down, directional flag
 2 blocks, alarm at threshold value
 1 block, day & time, 2 time based alarms



Mini8 Ordering code

1 Mini8	2	3	4	5	6	7	8	
9	10	11	12	13	14	15	16	17

1	Model
MINI8	Mini8 controller

2	Control Loops
ACQ	IO Acquisition only
4LP	4 Control loops
8LP	8 Control loops
16LP	16 Control loop

3	Programs
0PRG	No programs
1PRG	1 programmer
XPRG ⁽¹⁾	Multi programmer

4	PSU
VL	24Vdc

5	Communications
MODBUS	Modbus RTU
ISOLMBUS	Isolated Modbus RTU
DEVICENET	DeviceNet
PBUSRJ45	Profibus RJ45
PBUS9PIN	Profibus 9 Pin 'D' type
ENETMBUS	Ethernet Modbus/TCP
CANOPEN	CANopen

6	Temperature Units
C	Centigrade
F	Fahrenheit

7	8	9	10	IO Slots 1-4
XXX				No module fitted
TC4				4 Channel TC input
TC8				8 Channel TC input
RT4				4 Channel RTD
D18				8 Channel logic IP
AO4 ⁽²⁾				4 Channel 4-20mA OP
AO8 ⁽²⁾				8 Channel 4-20mA OP
DO8				8 Channel logic OP
RL8 ⁽³⁾				8 Channel relay OP
CT3 ⁽⁴⁾				3 Channel CT input

11	Application
STD	No configuration
EC8 ⁽⁵⁾	8 Loop plastics controller *
FC8	8 Loop controller with Analogue output Slot 1 = TC8 Slot 4 = AO8 requires 250 wires

* Code EC8 requires 250 wires and
Slot 1 = TC8,
Slot 2 = CT3 or XXX,
Slot 3 = DO8,
Slot 4 = DO8

12	Wires
30	30 User Wires
60	60 User Wires
120	120 User Wires
250	250 User Wires

13	Recipes
None	No recipes
RCP	8 Recipes

14	Installation Manual
ENG	English
GER	German
FRA	French
SPA	Spanish
ITA	Italian

15	Configuration Software
NONE	No CD
ITTOOLS	ITools CD & Mini8 documentation

16	Warranty
XXXXX	Standard
WL005	Extended

17	Calibration Certificates
XXXXX	None
CERT1	Certificate of Conformity
CERT2 ⁽⁶⁾	Factory input calibration per input

Notes

- (1) If 4 Loops ordered 4 programmers;
8 or 16 loops ordered 8 programmers
- (2) AO4/AO8 in slot 4 only
- (3) RL8 in slots 2/3 only
- (4) Only 1 CT3 per Mini8
- (5) EC8 is a preconfigured version of Mini8 offering 8 control loops with Heat/Cool logic outputs
- (6) CERT2 is 5 point calibration

Accessories

Bulkhead mounting plate	SubMin8/Mechanics/Mtgplate
2.49Ω 0.1% Burden resistor	SubMin8/Shunt/249R.1
Modbus load terminator	SubMini8/Resistor/Term/Mbus/RJ45
Profibus load terminator	SubMini8/Resistor/Term/PBus/RJ45
Network 3.0m RS485 cable	SubMin8/Cable/RJ45/3.0
Network 0.5m RS485 cable	SubMin8/Cable/RJ45/0.5
Mini8 Config tools & Manuals	SubMin8/CD/std
Mini8 Config cable	SubMin8/Cable/Config
VT505 Config cable	SubV505/Cable/Config
VT505 EIA232 cable	SubV505/Cable/232/3.0
VT505 EIA485 cable	SubV505/Cable/485/3.0
Mini8 Installation booklet	SubMin8/Manual/Inst
Mini8 Engineering manual	SubMin8/Manual/Eng
VT505 Operating booklet	SubMin8/Manual/Panel/EC8
1.3A, 30W Power supply	2500P/1A3/ENG
2.5A, 60W Power supply	2500P/2A5/ENG
5A, 120W Power supply	2500P/5A0/ENG
10A, 240W Power supply	1500P/10A/ENG

