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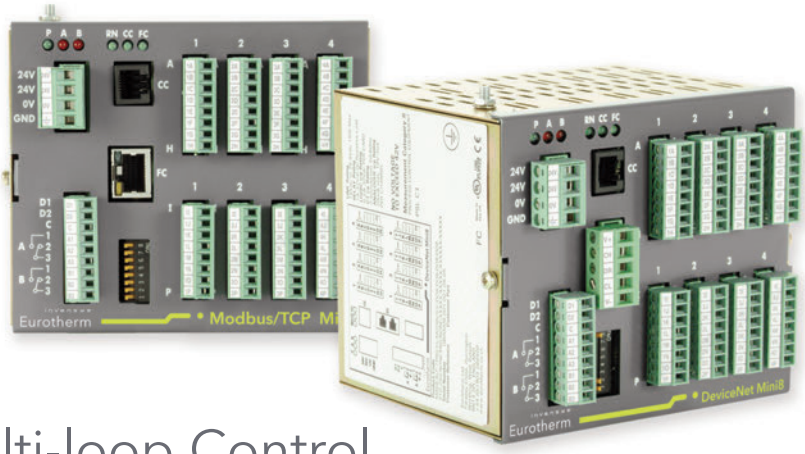
Eurotherm

Mini8® Controller SERIES



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® network
- Profibus DP network
- Modbus TCP
- EtherNet/IP
- OEM Security

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

The Mini8 controller is an ideal partner to a programmable logic controller. Able to multi-drop on either Serial, Fieldbus or Ethernet communications. It offers a cost effective alternative to performing analogue measurement or loop control in a PLC. Implementing these functions in the Mini8 controller 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 is comparable with the Eurotherm 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 controller's high density analogue I/O can be combined with Eurotherm's 6000 series paperless graphic recorder.

Setpoint programming

The Mini8 controller 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 controller 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

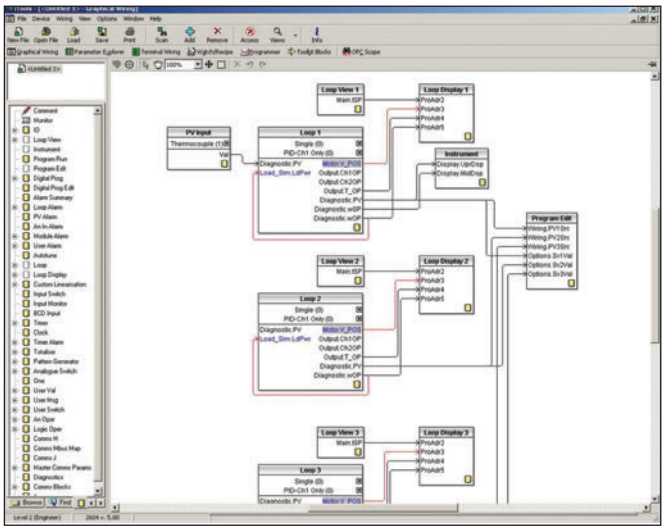
The Mini8 controller with a CT3 input card fitted, has the capability of detecting failures in heater loads connected to its time proportioned outputs. By measuring the current flowing through the heaters via 3 current transformer inputs the Mini8 controller can, for up to 8 loops, detect Partial Load 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 (GWE)

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.



OEM Security

An OEM or reseller can protect their intellectual property by preventing unauthorised cloning of the configuration.

Specification

General

Environmental performance

Power supply voltage:	17.8V dc min to 28.8V dc max.
Supply ripple:	2Vp-p max.
Power consumption:	15W max.
Operation temperature:	0 to 55°C
Storage temperature:	–10 to 70°C
Operating humidity:	5% to 95% RH non-condensing
Max. applied voltage any terminal:	42Vpk.

The Mini8 controller must be mounted in a protective enclosure.

Electromagnetic compatibility (EMC)

EMC:	EN61326 for Industrial Environments

This controller conforms with the essential protection requirements of the EMC Directive 2004/108/EC, by the application of EMC standard EN61326. This instrument satisfies the general requirements of the industrial environment defined in EN 61326.

Electrical safety

Safety:	Meets EN61010, installation category II, pollution degree 2

INSTALLATION CATEGORY II
This controller complies with the European Low 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:	W124 x H108 x D115mm
Weight:	1Kg typical
Mounting:	DIN rail to EN50022 35 x 7.5 or 35 x 15 horizontally

Approvals

CE, cUL listed (file E57766)

Communications

Network communications support

Modbus RTU:		RS485, 2 x RJ45, user select switch for 3-wire or 5-wire
	Baud rates:	4800, 9600, 19200
DeviceNet:		CAN, 5-pin standard "open connector" with screw terminals
	Baud rates:	125k, 250k, 500k
Profibus DP:		RS485 via standard 9 pin D connector or 2 RJ45 connectors
	Baud rates:	Up to 12M set by the Master
Ethernet:		Standard Ethernet RJ45 connector
	Baud rate:	10baseT
EtherNet/IP:		Standard Ethernet RJ45 connector
	Baud rates:	10baseT 100baseT

Modbus /DeviceNet /Profibus /Ethernet/EtherNet/IP are mutually exclusive options; refer to the Mini8 controller Order Code.

Configuration communications support

Modbus RTU:		3-wire RS232, through RJ11 configuration port
	Baud rates:	4800, 9600, 19200

All versions of Mini8 controller 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 pk.
Contact material:	Gold
Snubbers:	Snubber networks are NOT fitted
Contact isolation:	42V pkmax.

The PSU card supports 2 independent and isolated logic inputs

Input types:	Logic (24V dc)
Input logic 0 (off):	–28.8V to +5V dc
Input logic 1 (on):	+10.8V to +28.8V dc
Input current:	2.5mA (approx.) at 10.8V; 10mA max at 28.8V supply
Detectable pulse width:	110ms min.
Isolation to system:	42V pkmax.

Input/Output cards

TC8 8-channel and TC4 4-channel TC input card

The TC8 supports 8 independently programmable and electrically isolated channels, catering for all standard and custom thermocouple types. The TC4 supports 4 channels to the same specification.

Channel types:	TC, mV Input Range: –77mV to +77mV
Resolution:	20 bit (ΣΔ converter), 1.6µV with 1.6s filter time
Temperature coefficient:	< ±50ppm (0.005%) of reading/ °C
Cold junction range:	–10°C to +70°C
CJ rejection:	> 30:1
CJ accuracy:	± 1°C
Linearisation types:	C, J, K, L, R, B, N, T, S, LINEAR mV, custom
Total accuracy:	± 1°C ± 0.1% of reading (using 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:	>100M
Input leakage current:	<100nA (1nA typical)
Common mode rejection:	>120dB, 47 - 63Hz
Series mode rejection:	>60dB, 47 - 63Hz
Isolation channel-channel:	42V pkmax.
Isolation to system:	42V pkmax.

DO8 8-channel digital output card

The DO8 supports 8 independently programmable channels, the output switches requiring external power supply. Each channel is current and temperature protected, foldback 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 (Vcs):	15V dc to 30V dc
Logic 1 voltage output:	> (Vcs - 3V) (not in power limiting)
Logic 0 voltage output:	< 1.2V dc 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
Isolation (channel-channel):	N/A (Channels share common connections)
Isolation to system:	42V pkmax.

RL8 8-channel relay output card

The RL8 supports 8 independently programmable channels. This module may only be fitted in slot 2 or 3, giving a maximum of 16 relays in a Mini8 controller.

The Mini8 controller chassis must be earthed (grounded) using the protective earth stud.

Channel types:	On/Off, Time Proportioned
Maximum contact voltage:	264V ac
Maximum contact current:	2 amps ac
Contact snubber:	Fitted on module
Minimum contact wetting:	5V dc, 10mA
Min. pulse time:	220ms
Isolation (channel-channel):	264V 230V nominal
Isolation to system:	264V 230V nominal

CT3 3-channel current-transformer input Card

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

Channel types:	A (current)
Factory set accuracy:	Better than ±2% of range
Current input range:	0mA to 50mA rms, 50/60Hz nominal
Transformer ratio:	10/0.05 to 1000/0.05
Input load burden:	1W
Isolation:	None (provided by CT)

Load failure detection

Requires CT3 module.

Max number of loads:	16 Time Proportioned Outputs
Max loads per CT:	6 loads per CT input
Alarms:	1 in 8 Partial load failure, Over current, SSR short circuit, SSR open circuit
Commissioning:	Automatic or manual
Measurement interval:	1 sec - 60 sec

DI8 8-channel logic input card

The DI8 supports 8 independent input channels.

Input types:	Logic (24V dc)
Input logic 0 (off):	-28.8V to +5V dc
Input logic 1 (on):	+10.8V to +28.8V dc
Input current:	2.5mA (approx.) at 10.8V; 10mA max at 28.8V supply
Detectable pulse width:	110ms min.
Isolation channel-channel:	42V pkmax.
Isolation to system:	42V pkmax.

RT4 resistance thermometer input card

The RT4 supports 4 independently programmable and electrically isolated resistance input channels. Each channel may connected as 2 wire, 3 wire or 4 wire.

Channel types:	Resistance/PT100
Input range:	0 to 600 ohms, –200°C to +850°C for PT100
Calibration error:	±0.1ohms ±0.1% of reading, 22 to 500 ohms ±0.3°C ±0.1% of reading, -200°C to +850°C
Resolution:	0.008 ohms, 0.2°C
Measurement noise:	0.016 ohms, 0.04°C peak to peak, 1.6s channel filter 0.06 ohms, 0.15°C peak to peak, no filter
Linearity error:	±0.02 ohms, ±0.05°C
Temp coefficient:	±0.002% of ohms reading per °C ambient change relative to normal ambient 25°C
Lead resistance:	22 ohms max in each leg. Total resistance including leads is restricted to the 600 ohm maximum limit. 3 wire connection assumed matched leads.
Bulb current:	300µA
Isolation channel-channel:	42V pkmax
Isolation to system:	42V pkmax

AO8 8-channel and AO4 4-channel 4-20mA output card

The AO8 supports 8 independently programmable and electrically isolated mA output channels for 4-20mA current-loop applications. The AO4 supports 4 channels to the same specification. The AO4 and AO8 modules may only be fitted in slot 4.

Channel types:	mA (current) Output
Output range:	0-20mA, 360Ω load max.
Setting accuracy:	±0.5% of reading
Resolution:	1 part in 10000 (1uA typical)
Isolation channel-channel:	42V pkmax.
Isolation to system:	42V pkmax.

Software features

Toolkit blocks

User wires:		Orderable options of 30, 60, 120 or 250
User values:		32 real values
2 input maths:	24 blocks	Add, subtract, multiply, divide, absolute difference, maximum, minimum, hot swap, sample and hold, power, square root, Log, Ln, exponential, switch
2 input logic:	24 blocks	AND, OR, XOR, latch, equal, not equal, greater than, less than, greater than or equal to, less than or equal to
8 input logic:	4 blocks	AND, OR, XOR
8 input multiple operator:	4 blocks	Maximum, Minimum, Average. Input/Outputs to allow cascading of blocks
8 input multiplexer:	4 blocks	8 sets of 8 values selected by input parameter
BCD input:	2 blocks	2 decades (8 inputs giving 0 to 99)
Input monitor:	2 blocks	Max, min, time above threshold
16 point linearisation:	2 blocks	16-point linearisation fit
Polynomial fit:	2 blocks	Characterisation by poly fit table
Switchover:	1 block	Smooth transition between two input values
Timer blocks:	8 blocks	OnPulse, OnDelay, OneShot, MinOn Time
Counter blocks:	2 blocks	Up or down, Directional flag
Totaliser blocks:	2 blocks	Alarm at Threshold value
Real time clock:	1 block	Day & time, 2 time based alarms
Transducer scaling:	2 blocks	Transducer Auto-tare, calibration & comparison cal

PID control loop blocks

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
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
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

Process alarms

Number of alarms:	32 analogue, 32 digital, 32 Sensor break
Alarm types:	Absolute high, absolute low, deviation high, deviation low, deviation band, sensor break, logic high, logic low, rising edge, falling edge, edge
Alarm modes:	Latching or non-latching, blocking, time delay

Setpoint programmer

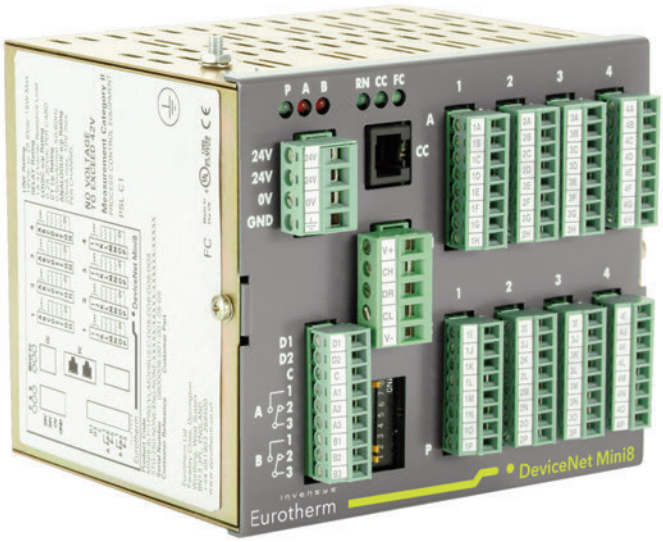
The Setpoint Programmer is a software orderable option.

Number of programs:	8
Number of segments:	128
Number of event outputs:	8 per program (64 total)
Digital inputs:	Run, Hold, Reset, Run/Hold, Run/Reset, Program Advance, Skip, Segment, Sync
Power failure action:	Ramp, Reset, Continue
Servo start:	PV, SP

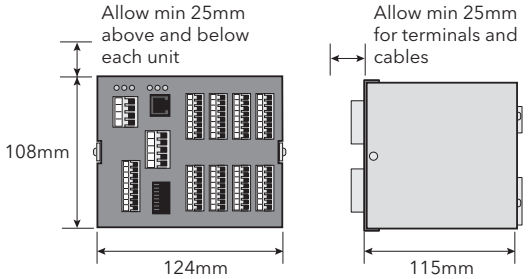
Recipes

Recipes are a software orderable option.

Number of recipes:	8
Tags:	24 tags in total



Mechanical Details



Mounting Information

The Mini8 controller is intended to be horizontally mounted on symmetrical DIN Rail to EN50022-35 or 35 x 35 x 15

Communications Interface LEDs

Legend	Colour	Function	Action
RN	Green	Run mode	On – Running Blinking – Standby/Config Off – Not Running
CC	Green	Configuration activity	On – N/A Blinking – Config Traffic Off – N/A
FC	Green	Field Comms activity	On – Connected Blinking – Ready Off – Offline } Non-enhanced DeviceNet® Off – No traffic or offline Blinking – Comms Traffic } Modbus, Profibus, and Ethernet
NET	Bi-Col	Network Status (enhanced DeviceNet only)	Off – Offline Blinking Green – Online but no connections On Green – Online with connections Blinking Red – Connection timed out On Red – Total connection failure Blinking Red/Green – Comms fault
		Network Satus (EtherNet/IP only)	Off – Not online Flashing Green – Online but no connection Steady Green – Online and operating correctly Flashing Red – Connection timeout Steady Red – Duplication of IP address Flashing Green and red – Initialisation
MOD	Bi-Col	Module Status (enhanced DeviceNet only)	Off – Power not supplied to network On Green – DeviceNet interface operational On Red – Power not supplied to controller or Checksum failure Blinking Red/Off – Recoverable fault. Comms. error between network and DeviceNet interface Blinking Red/Green – Power-up tests, failure to enter cyclic states or invalid baud rate
		Module Status (EtherNet/IP only)	Off – Not online Flashing Green – Online but no connection Steady Green – Online and operating correctly Flashing Red – Connection timeout Steady Red – Duplication of IP address Flashing Green and Red – Initialisation

RL8
Relay Output
(slots 2 and/or 3 only)

Contact voltage/current – 264V ac/2A RMS max.

ISOLATION (264V ac Basic
- Channel to Channel: 264V ac Basic
- Channel to system: Reinforced

Note.
Protective earth conductor MUST be used if RL8 module is fitted.

Legend	Function
A	RLY1 A
B	RLY1 B
C	RLY2 A
D	RLY2 B
E	RLY3 A
F	RLY3 B
G	RLY4 A
H	RLY4 B
I	RLY5 A
J	RLY5 B
K	RLY6 A
L	RLY6 B
M	RLY7 A
N	RLY7 B
O	RLY8 A
P	RLY8 B

AO8/A04
Ananlogue Output
(slot 4 only)

Output current – 0 to 20mA
360 ohm max. load.

ISOLATION
- Channel to Channel: 42V pk.
- Channel to system: 42V pk.

Note.
AO4 supports Channels 1 to 4 only.

Legend	Function
A	OP1+
B	OP1–
C	OP2+
D	OP2–
E	OP3+
F	OP3–
G	OP4+
H	OP4–
I	OP5+
J	OP5–
K	OP6+
L	OP6–
M	OP7+
N	OP7–
O	OP8+
P	OP8–

LEDs

Legend	Colour	Function	Action
P	Green	Indicates Power status	On – Power On Off – Power Off
A	Red	Indicates Relay A state	On – Energised Off – De-Energised
B	Red	Indicates Relay B state	On – Energised Off – De-Energised

Power Supply

Legend	Supply	
24V	24V dc	} Linked
24V	24V dc	
0V	0V	
GND	Ground	

This terminal can accept wire sizes 0.2 - 2.5mm (24 – 12 awg).

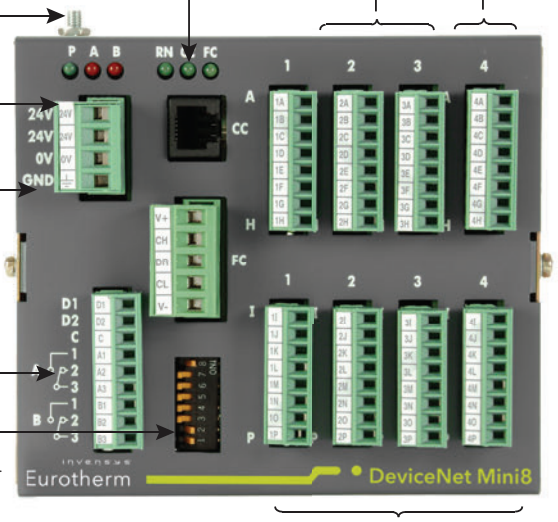
POWER SUPPLY SPECIFICATON
Power supply voltage: 17.8V dc min to 28.8V dc max.
Power comsumption: 15W max.

Standard I/O Connections

Legend	Function
D1	Digital Input 1
D2	Digital Input 2
C	Digital Input Common
A1	Relay A n/open
A2	Relay A n/closed
A3	Relay A Common
B1	Relay B n/open
B2	Relay B n/closed
B3	Relay B Common

Note.
Digital Inputs: ON requires greater than 10.8V with 2mA drive, 30V max.
Relay Contacts: 1 Amp max, 42V dc max.

COMMUNICATIONS
Communications connection terminals are version dependant.



TC8/TC4
Thermocouple Input

ISOLATION
- Channel to Channel: 42V pk.
- Channel to system: 42V pk.

Note.
TC4 supports Channels 1 to 4 only.

Legend	Function
A	TC1+
B	TC1–
C	TC2+
D	TC2–
E	TC3+
F	TC3–
G	TC4+
H	TC4–
I	TC5+
J	TC5–
K	TC6+
L	TC6–
M	TC7+
N	TC7–
O	TC8+
P	TC8–

RT4
2, 3, 4 Wire RTD Input

ISOLATION
- Channel to Channel: 42V pk.
- Channel to system: 42V pk.

Legend	Function
A	CH1 I+
B	CH1 S+
C	CH1 S–
D	CH1 I–
E	CH2 I+
F	CH2 S+
G	CH2 S–
H	CH2 I–
I	CH3 I+
J	CH3 S+
K	CH3 S–
L	CH3 I–
M	CH4 I+
N	CH4 S+
O	CH4 S–
P	CH4 I–

Wire Connections 2 3 4

DI8
Logic Input

ISOLATION
- Channel to Channel: 42V pk.
- Channel to system: 42V pk.

Note.
Input specification as for Standard I/O above.

Legend	Function
A	D1+
B	D1-
C	D2+
D	D2–
E	D3+
F	D3-
G	D4+
H	D4–
I	D5+
J	D5–
K	D6+
L	D6–
M	D7+
N	D7–
O	D8+
P	D8–

CT3
Transformer Input

ISOLATION
- Channel to Channel: N/A
- Channel to system: N/A

Note.
Isolation provided by current transformers.

Legend	Function
A	N/A
B	N/A
C	N/A
D	N/A
E	N/A
F	N/A
G	N/A
H	N/A
I	In1 A
J	In1 B
K	No connection
L	In2 A
M	In2 B
N	No connection
O	In3 A
P	In3 B

DO8
Logic Output

ISOLATION
- Channel to Channel: N/A
- Channel to system: 42V peak with independant supply

Notes.
Requires 24V dc supply.
* Linked internally.

Legend	Function
A	Supply in +
B	Supply in +
C	OP1+
D	OP2+
E	OP3+
F	OP4+
G	Supply & OP
H	Supply & OP –
I	Supply in +
J	Supply in +
K	OP5+
L	OP6+
M	OP7+
N	OP8+
O	Supply & OP
P	Supply & OP –

Order codes

1	2	3	4	5	6	7	8	9	10	11	12	13	14

15	16	17

Basic Product

MINI8	Mini8 Controller

1 Control Loops

ACQ	IO Acquisition only
4LP	4 Control loops
8LP	8 Control loops
16LP	16 Control loops

2 Programs

0PRG	No programs
1PRG	1 profile – 50 programs
XPRG	Multi-profiles – 50 programs (Note 1)

3 PSU

VL	24V dc

4 Communications

MODBUS	Non isolated Modbus Slave
ISOLMBUS	Isolated Modbus RTU Slave
DEVICENET	DeviceNet Slave
PBUSRJ45	Profibus Slave RJ45
PBUS9PIN	Profibus Slave 9 Pin D type
ENETMBUS	Ethernet Modbus TCP/IP Slave
DNETM12	DeviceNet M12 Connector Slave
ENETIP	EtherNet/IP

5 Temperature Units

C	Centigrade
F	Fahrenheit

6-9 IO Slots 1, 2, 3, 4

XXX	No module fitted
TC4	4 Ch TC input
TC8	8 Ch TC input
RT4	4 Ch RTD input
AO4	4 Ch 4-20mA O/P (Note 2)
AO8	8 Ch 4-20mA O/P (Note 2)
DO8	8 Ch logic O/P
CT3	3 Ch CT input (Note 4)
RL8	8 Ch relay O/P (Note 3)
DI8	8 Ch logic input

10 Applications

STD	No configuration
EC8	8 Loop extrusion controller (Note 5) Requires 8LP or 250 wires and modules placed in the following slots Slot 1 = TC8 Slot 2 = CT3 or XXX Slot 3 = DO8 Slot 4 = DO8
FC8	8 Loop furnace controller Requires 8LP or 250 wires and modules placed in the following slots Slot 1 = TC8 Slot 4 = AO8

11 Wires

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

12 Recipes

NONE	No recipes
RCP	8 Recipes

13 Manual Language

ENG	English
FRA	French
GER	German
SPA	Spanish
ITA	Italian

14 Configuration Software

ENG	English
NONE	No CD
ITOOLS	iTools CD & Mini8 Controller documentation

15 Warranty

XXXXX	Standard
WL005	Extended

16 Calibration Certificates

XXXXX	None
CERT1	Certificate of Conformity
CERT2	Factory input calibration per input (Note 6)

17 Special

XXXXX	Standard
EU0725	OEM Security

Accessories

HA031260	Engeering/CD manual
SUBMINI8/SHUNT/249R.1	2.49R Precision resistor
RES250	250R resistor for 0-5V dc OP
RES500	500R resistor for 0-10V dc OP
CTR100000/000	10A Current transformer
CTR200000/000	25A Current transformer
CTR400000/000	50A Current transformer
CTR500000/000	100A Current transformer
iTools/None/3000CK	Configuration clip
SUB21/IV10	0-10V input adaptor

Notes

1. If 4 Loops ordered 4 programmers are supplied; 8 or 16 loops ordered 8 programmers are supplied.
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.
7. Profibus motherboard fitted.

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