

Mini8[®] Controller

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[®] network
- Profibus DP network
- CANopen
- Modbus TCP
- 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 real 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 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 controller'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 instrument 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 instrument 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 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

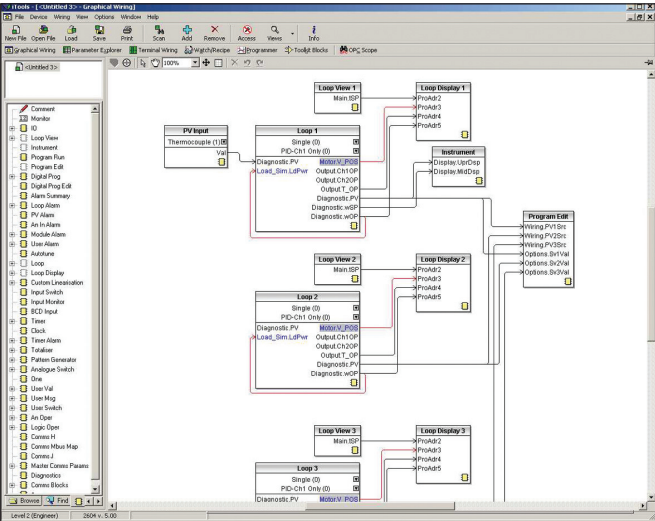
The Mini8 controller with a CT3 input card fitted, has the capability of detecting failures in heater loads connected to its time proportioned outputs. By measuring the current flowing through the heaters via 3 current transformer inputs the Mini8 controller can, for up to 8 loops, detect Partial Load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

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
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
INSTALLATION CATEGORY 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 and weight:	W124 x H108 x D115mm, 1Kg typical
Power requirements	
Supply voltage:	17.8 to 28.8V dc
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 or 5 pin M12 connector CanOpen with 5-way screw terminal
Transmission standards:	EIA485 (3- or 5-wire) CAN (DeviceNet), Profibus 42V ac/dc max.
Isolation:	
Ethernet communications option	
Protocol:	Modbus TCP with RJ45 connector
Isolation:	42V ac/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
Note: All versions of the 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
Contact material:	Gold
Snubbers:	Snubber networks are NOT fitted
Contact isolation:	42V ac/dc max.
The PSU card supports 2 independent and isolated logic inputs	
Input types:	Logic (24V dc)
Input logic 0 (off):	< 5V dc
Input logic 1 (on):	> 10.8V dc
Input operating range:	-30V dc to +30V dc
Input current:	2.5mA (approx.) at 10.5V; 10mA max @ 30V supply
Detectable pulse width:	110ms min.
Isolation to system:	42V ac/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:	$\pm 0.1\%$ of reading $\pm 1^{\circ}$ C (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:	42V ac/dc max
Isolation to system:	42V ac/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:	42V ac/dc Max
Isolation to system:	42V ac/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, 0.08V 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:	300uA
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 (24V dc)
Input logic 0 (off):	<5V dc
Input logic 1 (on):	> 10.8V dc
Input operating range:	-30V dc to +30V dc
Input current:	2.5mA (approx.) at 10.5V; 10mA max @ 30V supply
Detectable pulse width:	110ms min.
Isolation channel-channel:	42V ac/dc max.
Isolation to system:	42V ac/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:	15V dc to 30V dc
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
Isolation channel-channel:	N/A (Channels share common connections)
Isolation to system:	42V ac/dc max.

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 (1uA typical)
Settling time:	100ms
Isolation channel-channel:	42V ac/dc max
Isolation to system:	42V ac/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 @ 5V dc, Max 2A @ 264V ac Min 4000,000 (max load) operation with internal snubber
Functions:	Includes control outputs, alarms, events and status
Isolation channel-channel:	264V ac
Isolation to system:	264V ac

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
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)

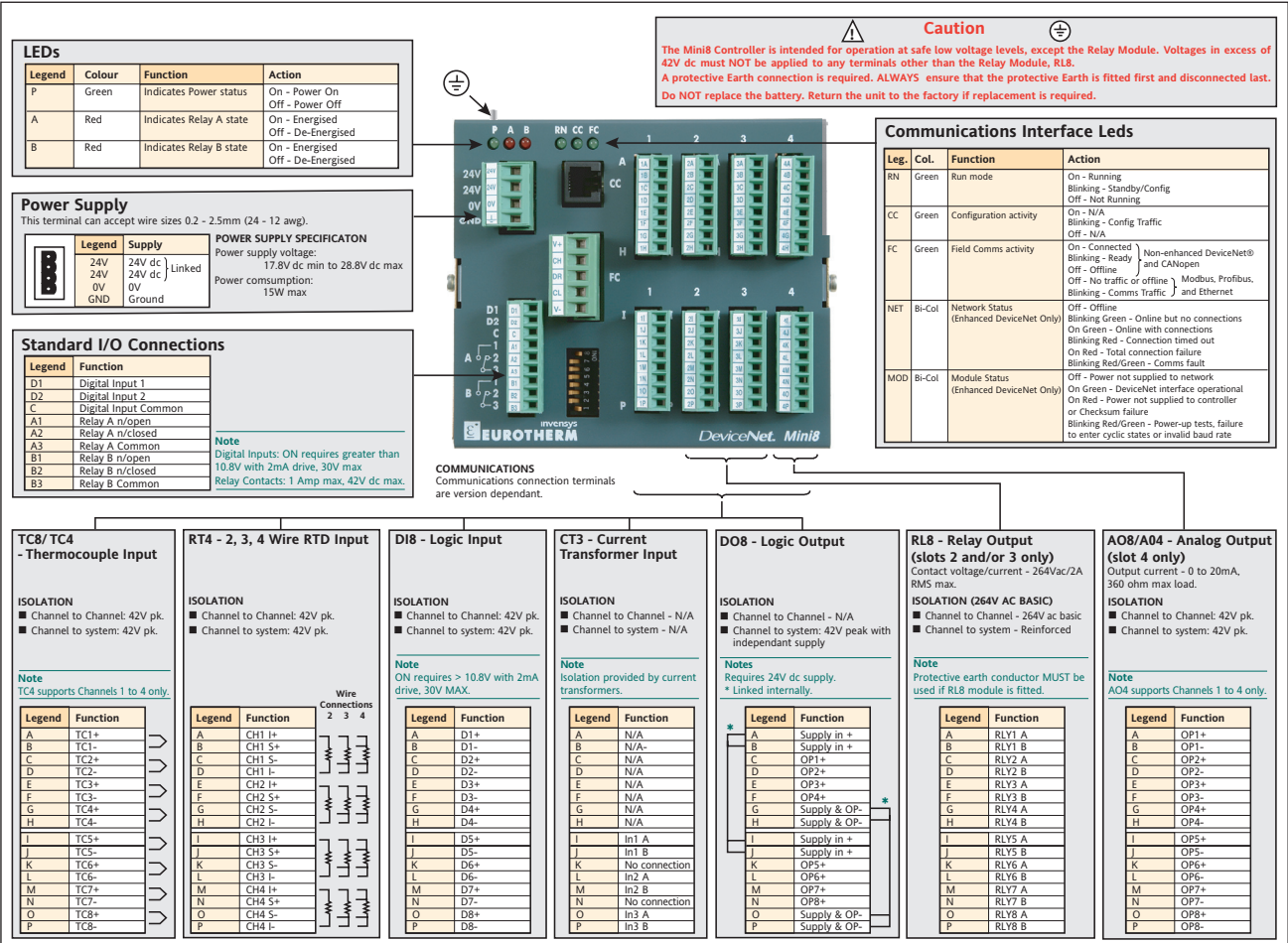
Load failure detection

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
Automatic or manual
1 sec - 60 sec

Application blocks

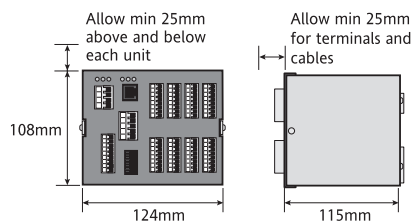
Soft wiring:
User values:
2 Input maths:
Orderable options of 30, 60 120 or 250
32 real numbers with decimal point
24 blocks, add, subtract, multiply, divide, absolute difference, maximum, minimum, hot swap, sample and hold, power, square root, Log, Ln, exponential,

switch
2 Input logic:
24 blocks, AND, OR, XOR, latch, equal, not equal, greater than, less than, greater than or equal to, less than, 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 2 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 Controller

Mechanical Details



Mounting Information

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

Odering Code

MINI8	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 programmer
XPRG Multi programmer (Note 1)

3 PSU

VL 24V dc

4 Communications

MODBUS Modbus RTU
ISOLMBUS Isolated Modbus RTU
DEVICENET DeviceNet
PBUSRJ45 Profibus RJ45
(Note 7)
PBUS9PIN Profibus 9 Pin 'D'
type (Note 7)
ENETMBUS Ethernet Modbus/TCP
CANOPEN CANOpen
DNETM12 Enhanced DeviceNet

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
DI8 8 Ch logic 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
RL8 8 Ch relay O/P (Note 3)
CT3 3 Ch CT input (Note 4)

10 Application

STD No configuration
EC8 8 Loop plastics controller*
(Note 5)
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

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 Spain
ITA Italian

14 Configuration Software

NONE No CD
ITTOOLS 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

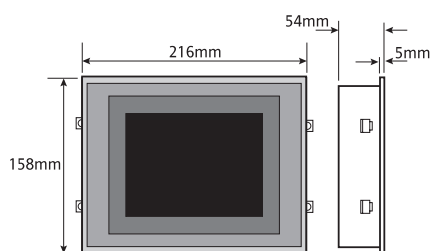
SubMin8/Mechanics/Mtgplate Bulkhead mounting plate
SubMin8/Shunt/249R.1 2.49Ω 0.1% Burden resistor
SubMin8/Resistor/Term/Mbus/RJ45 Modbus load terminator
SubMin8/Resistor/Term/PBus/RJ45 Profibus load terminator
SubMin8/Cable/RJ45/3.0 Network 3.0m RS485 cable
SubMin8/Cable/RJ45/0.5 Network 0.5m RS485 cable
SubMin8/CD/std Mini8 Config tools & manuals
SubMin8/Cable/Config Mini8 Config cable
SubMin8/Manual/Inst Mini8 Installation booklet
SubMin8/Manual/Eng Mini8 Engineering manual

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.

VT505 Operator panel

Mechanical Details



Interfaces

MSP serial port: RS232/422/485/TTY 20mA

Dimensions

External (mm): 210W x 158H x 60D
Cut out (mm): 198W x 148H

Technical data

Power supply: 18...32Vdc/10W
Protection level: IP65 front
Operating temperature (°C): 0...+50
Storage/transport temp. (°C): -20... +60
Humidity (non-condensing): <85%
Power consumed (24Vdc): 10W
Weight (kg): 1,4

Main features

Languages on line: 4
Passwords: 10/8
Pages/fields per page: 128/34
Variable formats available: DEC, HEX, BIN, BCD, ASCII, floating point
Dynamic texts/lists of images: Value depends on dimensions of project memory
ISA alarms/info-messages: -/256
Help messages (pages/info messages /alarms): 128/256/-
Recipes (no./variables per recipe): 128/256
Macros (no./commands per macro): 1024/16
Auto operations/timers/ equations: 32/32/32
Max bargraphs per page (taken together with fields): 34
Project images: BMP, JPEG, TIFF, PSD, WMF, PNG, EPS, etc
Buttons per page: Number of buttons corresponding to the number of Touchscreen cells

VT505 Operator panel

Display type: Graphic LCD. 4 tones of blue STN
Touch screen: Matrix 20 x 16
Back lighting: CCFL
Back lighting lamp life: 45000 hours (at 25°C)
Resolution: 320 x 240 pixels
Display area (mm): 115.17 x 86.37
Columns by rows/character dimensions: Depending on used font
Contrast adjustment: Software set
Character set: Programmable fonts/TTF Windows

User memory

Project (byte): 640k
Recipes/Alarm buffer (bytes): 16k/-flash

Ordering Code

VT505	1	2	3	4	5	6
						NONE

Basic Product	
VT505	Monochrome touch screen, 320 x 240 pixels

1 Type	
STD	Standard
MINI8	Configuration for Mini8 Controller

2 Applications	
NONE	Blank configuration
EC8	8 loop plastics controller
EC16	16 loop plastics controller
EC24	24 loop plastics controller
EC32	32 loop plastics controller
FC8	8 loop 4-20mA output
FC16	16 loop 4-20mA output
FC24	24 loop 4-20mA output
FC32	32 loop 4-20mA output

3 Network Cables	
NONE	No cable supplied
F485	Modbus EIA485 (Note 1)
F232	Modbus EIA232

4 Manual Language	
ENG	English
FRA	French
GER	German

5 Configuration Software	
NONE	No configuration software
VTWIN	VTWIN configuration software (Note 2)

6 Config. Software Language	
NONE	Multi-language

Notes

1. Modbus EIA485 cable required for use with Mini8.
2. Config cable supplied with VTWIN software.

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