

# EPower™ MC controller

## MODEL

- Fully software configurable
- Predictive Load Management
- Current rating 800A to 4000A
- Voltage up to 690V ac
- All types of firing modes
- Measurement accuracy <1%
- Large integral four row display
- Remote display option
- Multi-channel unit
- Event Log
- Optional I/O
- Modbus RTU comms
- Profibus DP comms
- DeviceNet® comms
- Ethernet (Modbus TCP) comms
- EtherNet/IP comms
- CC-Link comms
- Profinet IO comms
- Voltage, current and power control
- Complete diagnostics
- Energy counter
- Single phase Load Tap Changer

i n v e n s i s  
Eurotherm



## Power management and control units

### Specification Sheet

EPower™ MC Controller is the Eurotherm® series of power management and control units. Combining the advantages of the latest technologies and innovations to produce a truly impressive performance for your process.

#### Ratings

The EPower current ratings cover the range from 800 Amps up to 4000 Amps. Ratings are designed at 40°C, but operation can be defined up to 50°C with associated deratings. The voltage rating can go up to a maximum of 690 volts in air cooled units (800 Amps to 2000 Amps) and 600 volts in water cooled units (2000 Amps to 4000 Amps).

#### Predictive Load Management (Patented)

You can reduce your energy costs across your plant by utilising the Predictive Load Management functionality within EPower. This innovative feature provides a better distribution of energy across different loads in your installation by managing the priority and if necessary, load shedding.

#### Multi Channel Unit

EPower includes seven different power configurations within one unit, depending on the number of power modules fitted. From single phase configuration to two times two phase control, the unit is perfectly modular and configurable to your process requirements. Multiple zones can be controlled with one unit.

Many more features are available (Log file management, advanced alarm strategy, optional I/O...) to provide you with the best of the technology for your process.

#### Display and Remote Display

EPower is fitted with a 4 line x 10 character display with indication of the process values, and diagnostic information, along with an alarm and event message centre. Optionally, the EPower has a 32h8e remote display to allow for the process values and alarm information to be presented front of panel in a clear and unambiguous way. Secure access to the local setpoint is also provided to allow for local control when needed. The remote display, as an indicator, can also provide over temperature policeman functionality removing the need for additional panel instrumentation.

imagine having the power to save energy

## Communication

Eurotherm has an approach to open communications, offering standard fieldbus networks such as Modbus RTU, Profibus DP, DeviceNet®, Ethernet (Modbus TCP), EtherNet/IP, CC-Link and Profinet IO communications. The use of Fieldbus makes integration into PLCs and other supervisory systems easy to accomplish. It allows an easier integration into PLCs and other supervisory systems by using the main protocols of the market.

## Configuration

“Quick Start” HMI menus provide an easy and friendly way to quickly configure the unit. With the more complex configurations using the iTools software package.

## Specification

### General

#### General Standards

The product is designed and produced to comply with EN60947-4-3 (Low voltage switch gear and control gear). Other applicable standards are cited where appropriate.

#### Installation Categories

General installation category details for the driver and power modules are summarised in the table below.

	Installation Category	Rated impulse withstand voltage (U <sub>imp</sub> )	Rated insulation voltage
Communications	II	0.5kV	50V
Standard I/O	II	0.5kV	50V
Driver Module power	II	2.5kV	230V
Relays	III	4kV	230V
Power Modules (up to 600V)	III	6kV	600V
Power Modules (690V)	II	6kV	690V
Auxiliary (Fan) supply	II	2.5kV	230V

Table 1 Installation category details

#### Module of control (MC) = driver module + firing interface modules

MC unit (Driver Module + one power module per power stack)

Voltage range: 100 to 240V ac (+10% - 15%)

Frequency range: 47 to 63 Hz

Power requirement: 60W

Installation Category: Installation category II (category III for relays)

External thyristor stack HPower

Number of stacks: Up to four stacks per drive depending on the configuration chosen

Voltage range (air cooled units): 100 to 690V ac (+10% - 15%)

Voltage range (water cooled units): 100 to 600V ac (+10% - 15%)

Frequency range: 47 to 63 Hz

Nominal current: 800 to 4000 Amps according to model

Power dissipation: 1.3W per Amp, per phase

Rated short-circuit conditional current: CE Rated 100kA (not a UL508A test)

#### Cooling

(remote thyristor stacks): Forced air (fan) or water, according to model

Fan supply voltage: 115 or 230V ac, as specified at time of order (see 'Caution' above)

Fan power requirement: 100W to 720W, according to current rating and number of stacks

Incoming water temp (max): 20°C (68°F) (max)

Water flow rate (min): 10 l/min (2.65 U.S. gallons/min) (2.21 imperial gallons/min)

#### Water pipe

Internal diameter: ½ in (12.7mm)

Outside diameter (typical): 19.1mm (0.75in)

Max operating temp: 80°C (176°F)

Working pressure (max): 1.6MPa (232psi)

Recommended material: Polyurethane

#### Warning

Supply and drain water pipes must be of non conductive material for at least 1 metre from the Thyristor stack and each element of metal piping in the cooling circuit must be individually bonded to safety earth.

Protection Thyristor drive: High-speed fuses and RC circuits

Pollution degree: Pollution degree 2 (EN60947-1)

#### Installation category

Power network: Installation category II or category III (see Table 1 above)

Auxiliary (fan) supply: Installation category II assuming nominal phase voltage with respect to earth is ≤300V rms (see Table 1 above)

Utilization categories AC51: Non-inductive or slightly inductive loads, resistance furnaces

AC56a: Switching of transformers.

Duty cycle: Uninterrupted duty / continuous operation

Form designation: Form 4

Short circuit protection

co-ordination type: Type 1 (fuses)

Load Types: Single or multiphase control of resistive loads (low/high temperature coefficient and non-aging/aging types) and transformer primaries.

## Physical

Dimensions and fixing centres See Fixing Details

Weight kg (lbs): See Tables 2 and 3

Weights ± 50gm (2 oz)

Weight (including 2kg (4.4lb) for driver module)			
1 Phase	2 Phase	3 Phase	4 Phase
4.0 (8.13)	6.5 (14.5)	9 (19.13)	11 (25.6)

Table 2 MC unit weights

Nominal current of the Stack	Weight		
	1 Phase	2 Phase	3 Phase
800/1000A	25 (55.2)	40 (88.2)	50 (101.2)
1300A	25 (55.2)	40 (88.2)	90 (198.2)
1700/2000A (air cooled)	70 (154.3)	113 (249.1)	163 (359.4)
2000A (water cooled)	18 (40)	See Note below	
3000A/4000A	23 (51)	See Note below	

Table 3 Thyristor stack weights

lb	oz
0.1	1.6
0.2	3.2
0.3	4.8
0.4	6.4
0.5	8.0
0.6	9.6
0.7	11.2
0.8	12.8
0.9	14.4

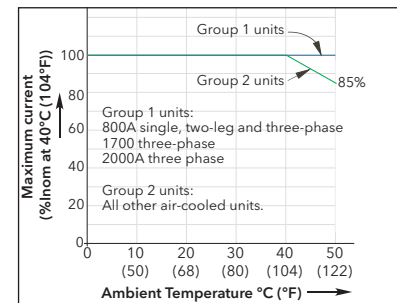
Note. Water cooled units are available as single phase only.

## Environment

Temperature limits Operating: 0°C to 50°C (32°F to 122°F)

(see graph for derating information)

Storage: -25°C to 70°C (-13°F to 158°F)



Humidity limits: 5% to 95% RH (non-condensing)

Altitude (maximum): 1000 metres (3280 ft.)

Protection: Control units; IP10 (EN60529)

Thyristor stacks: IP00 (EN60529)

Atmosphere: Non-explosive, non-corrosive and non-conductive

External wiring: Must comply with IEC 364

Shock (EN60068-2-29): 10g peak; 6ms duration; 100 bumps

Vibration (EN60068-2-6): 67 to 150Hz at 1g

## EMC

Standard: EN60947-4-3 Emissions class A

This product has been designed for environment A (Industrial). Use of this product in environment B (domestic, commercial and light industrial) may cause unwanted electromagnetic disturbances in which cases the user may be required to take adequate mitigation measures.

Immunity criteria: Immunity criterion 1 (criterion 3 for voltage dips and short-time interruptions)

## Operator Interface

Display:	4 lines of up to 10 characters each. Display pages can be used to view process variable values and to view and edit the configuration of the unit. (Editing of the configuration is better carried out using configuration software (iTools). In addition to the standard displays, up to 4 'custom' pages can be defined which allow bargraph displays, text entry etc.
Character format:	7 high x 5 wide yellow-green LCD dot matrix array
Push buttons:	4 push buttons provide page and item entry and scroll facilities
LED indicators (beacons):	3 indicators (PWR LOC and ALM) are supplied to indicate that power is applied, that Local Control is selected and that there is one or more active alarm respectively

## Standard Inputs/Outputs (SK1)

All figures are with respect to driver module 0V, unless otherwise stated.

Number of inputs/outputs

No of analogue inputs: 2

No of analogue outputs: 1

No of digital inputs/outputs: 2 (each configurable as an input or an output)

10V (Potentiometer) supply: 1

Update rate: Twice the mains frequency applied to power module 1. Defaults to 83.2 Hz (12 ms) if no power applied to power module 1 or if supply frequency lies outside the range 47 to 63Hz.)

Termination: Removable 10-way connector. (5.08 mm. pitch)

## Analogue Inputs

Performance: See Tables 4 and 5

Input types: Each input is configurable as one of:  
0 to 10V, 1 to 5V, 2 to 10V, 0 to 5V,  
0 to 20mA, 4 to 20 mA

Absolute maxima + terminal:  $\pm 16V$  or  $\pm 40mA$

- terminal:  $\pm 1.5V$  or  $\pm 300mA$

Analogue input: Voltage input performance		
Parameter	Typical	Max/Min
Total voltage working input span (Note 1)		-0.25V to +12.5V
Resolution (noise free) (Note 2)	13 bits	
Calibration error (Notes 3 and 4)	<0.25%	<0.5%
Linearity error (Note 3)		$\pm 0.1\%$
Ambient temperature error (Note 3)		<0.01%/°C
Input resistance (+ve terminal to 0V)		>140k $\Omega$
Input resistance (-ve terminal to 0V)	150 $\Omega$	
Allowable voltage (-ve terminal to 0V)		$\pm 1V$
Series mode rejection of mains interference	46dB	>30dB
Common mode dc rejection	46dB	>40dB
Hardware response time	5ms	
<b>Note 1:</b> w.r.t. to the relevant -ve input		
<b>Note 2:</b> w.r.t. total working span		
<b>Note 3:</b> % of effective range (0 to 5V, 0 to 10V)		
<b>Note 4:</b> After warm up. Ambient = 25°C		

Table 4 Analogue input specification table (voltage inputs)

Analogue input: Current input performance		
Parameter	Typical	Max/Min
Total current working input span		-1mA to +25mA
Resolution (noise free) (Note 1)	12 bits	
Calibration error (Notes 2 and 3)	<0.25%	<0.5%
Linearity error (Note 2)		$\pm 0.1\%$
Ambient temperature error (Note 2)		<0.01%/°C
Input resistance (+ve to -ve terminal)	235 $\Omega$	
Input resistance (-ve terminal to 0V)	150 $\Omega$	
Allowable voltage (-ve terminal to 0V)		$\pm 1V$
Series mode rejection of mains interference	46dB	>30dB
Common mode dc rejection	46dB	>40dB
Hardware response time	5ms	
<b>Note 1:</b> w.r.t. total working span		
<b>Note 2:</b> % of effective range (0 to 20mA)		
<b>Note 3:</b> After warm up. Ambient = 25°C		

Table 5 Analogue input specification table (current inputs)

## Analogue outputs

Performance: See Tables 6 and 7

Output types: Each output is configurable as one of  
0 to 10V, 1 to 5V, 2 to 10V, 0 to 5V,  
0 to 20mA, 4 to 20mA

Absolute maxima + terminal: (-0.7V or -300mA) or (+16V or +40mA)  
0V terminal:  $\pm 2A$

Analogue output: Voltage output performance		
Parameter	Typical	Max/Min
Total voltage working span (within $\pm 20mA$ (typ.) current span)		-0.5V to +12.5V
Short circuit current		<24mA
Resolution (noise free) (Note 1)	12.5 bits	
Calibration error (Notes 2 and 3)	<0.25%	<0.5%
Linearity error (Note 2)		$\pm 0.1\%$
Ambient temperature error (Note 2)		<0.01%/°C
Minimum load resistance		>800 $\Omega$
DC output impedance		<2 $\Omega$
Hardware response time (10% to 90%)	20ms	<25ms
<b>Note 1:</b> w.r.t. total working span		
<b>Note 2:</b> % of effective range (0 to 5V, 0 to 10V)		
<b>Note 3:</b> After warm up. Ambient = 25°C		

Table 6 Analogue output specification table (voltage outputs)

Analogue output: Current output performance		
Parameter	Typical	Max/Min
Total current working span (within -0.3V to +12.5V voltage span)		-24mA to +24mA
Open circuit voltage		<16V
Resolution (noise free) (Note 1)	12.5 bits	
Calibration error (Notes 2 and 3)	<0.25%	<0.5%
Linearity error (Note 2)		$\pm 0.1\%$
Ambient temperature error (Note 2)		<0.01%/°C
Maximum load resistance		<550 $\Omega$
DC Output conductance		<1 $\mu A/V$
Hardware response time (10% to 90%)	20ms	<25ms
<b>Note 1:</b> w.r.t. total working span		
<b>Note 2:</b> % of effective range (0 to 20mA)		
<b>Note 3:</b> After warm up. Ambient = 25°C		

Table 7 Analogue output specification table (current outputs)

## 10V supply (Potentiometer supply)

Output voltage:  $10.0V \pm 0.3V$  @ 5.5mA

Short circuit o/p current: 15mA max.

Ambient temperature drift:  $\pm 0.012\%/^{\circ}C$  (typ);  $\pm 0.04\%/^{\circ}C$  (max.)

Absolute maxima Pin 1: (-0.7V or -300mA) or (+16V or +40mA)

## Digital I/O

Hardware response time: 100 $\mu s$

Voltage inputs

Active level (high):  $4.4V < V_{in} < 30V$

Non-active level (low):  $-30V < V_{in} < +2.3V$

Input impedance: 10k $\Omega$

Contact closure input

Source current: 10mA min; 15mA max

Open contact

(non active) resistance: >500 $\Omega$

Closed contact

(active) resistance: <150 $\Omega$

Current source output

Source current:  $9mA < I_{source} < 14mA$  @ 14V

$10mA < I_{source} < 15mA$  @ 0V

$9mA < I_{source} < 14mA$  @ -15V

Open circuit voltage: <14V

Internal pull-down resistance: 10k $\Omega$  (to 0V)

Absolute maxima + terminal:  $\pm 30V$  or  $\pm 25mA$

- terminal:  $\pm 2A$

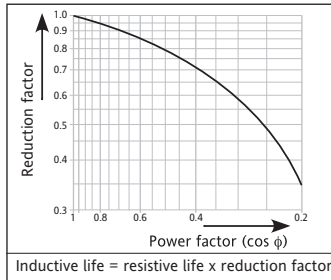
## Notes:

1. Absolute maximum ratings refer to externally applied signals
2. The 10V potentiometer supply is designed to supply two 5k $\Omega$  potentiometers connected in parallel with one another.
3. The maximum current for any 0V terminal is  $\pm 2A$ .

### Relay Specification

The relays associated with this product have gold plated contacts applicable to 'dry circuit' (low current) use.

**Note:** Normally closed and normally open refer to the relay when the coil is not energised.



Contact life	Resistive loads:	100,000 operations (de-rate with inductive loads as per figure)
High power use	Current:	<2A (resistive loads)
	Voltage:	<264V RMS
Low power use	Current:	>1mA
	Voltage:	>1V
Contact configuration:	Single pole change-over (One set of Common, Normally Open and Normally Closed contacts)	
Termination		
Relay 1 (standard):	3-way connector on underside of Driver Module (see Electrical Installation)	
Watchdog relay (standard):	3-way connector on underside of Driver Module (see Electrical Installation)	
Relays two to four (option):	12-way option module connector (see Electrical Installation)	
Installation Category	Installation category III, assuming that nominal phase to earth voltage is ≤ 300V RMS. Isolation between different relays' contacts is double isolation, in accordance with the installation category and phase to earth voltage specified above	
Absolute max switching capability:	<2A at 240V RMS (resistive loads)	

### Optional Input/Output Modules (SK3, SK4, SK5)

Up to three input/output modules can be fitted, each containing the inputs and outputs detailed below. Unless otherwise stated below, the specification for the optional I/O (including relays) is as given above for the standard I/O.

Termination:	Removable 12-way (5.08mm pitch) connector per module
Number of modules:	Up to 3
Number of inputs:	1 analogue input and 2 digital inputs per module
Number of outputs:	1 analogue output per module
Number of relays:	1 set of common, normally open and normally closed contacts per module
10V potentiometer supply output voltage:	10.0V ±0.3V at 5.5mA

### Mains Network Measurements

All network measurements are calculated over a full mains cycle, but internally updated every half-cycle. For this reason, power control, current limits and alarms all run at the mains half-cycle rate. The calculations are based on waveform samples, taken at a rate of 20kHz. Measurements on each phase are synchronised to its own phase and if the line voltage cannot be detected, the measurements stop for that phase. It should be noted that, depending on the configuration, the phase voltage referred to is one of:

- the line voltage referenced to neutral in four star,
- the line voltage referenced to neutral or another phase for single phase or
- the line voltage referenced to the phase applied to the next adjacent power module for three phase star or delta configurations.

The parameters below are directly derived from measurements for each phase.

Accuracy (20 to 25°C) (Excludes errors due to Current Transformer (CT)). Error = max 0.5% for class 0.5 CTs)

Line RMS voltage (Vline):	±0.5% of Nominal Vline.
Load RMS voltage (V):	±0.5% of Nominal V for voltage readings >1% of Nominal V Unspecified for readings lower than 1%Vnom.
Thyristor RMS current (I <sub>RMS</sub> ):	±0.5% of Nominal I <sub>RMS</sub> for current readings > 3.3% of Nominal I <sub>RMS</sub> Unspecified for readings ≤ 3.3% Nominal I <sub>RMS</sub>
Load RMS voltage squared (Vs <sub>q</sub> ):	±1% of (Nominal V) <sup>2</sup>

Load RMS current squared (Is <sub>q</sub> ):	±1% of (Nominal I) <sup>2</sup>
True load power (P):	±1% of (Nominal V) × (Nominal I)
Frequency resolution:	0.1 Hz
Measurement resolution:	11 bits of Nominal value (noise free)
Measurement drift with ambient temp:	<0.02% of reading /°C

Further parameters (S, PF, Q, Z, Iavg, IsqBurst, IsqMax, Vavg, Vs<sub>q</sub> Burst, Vs<sub>q</sub>Max and PBurst) are derived from the above, for each network (if relevant). See EPower MC Controller User guide (Meas submenu) for further details.

### External Current Transformer

**Ratio:** Chosen such that the full scale output from the current transformer is 5 Amps. Table 8 shows details for suitable Current Transformers, including the IExt scaling required for Network Setup configuration

Module	Part	i/p Current: o/p Current	Iext Scale	Extrnal dimensions (L x W x H) mm (in)
800A	CO030232	800A:5A	800	169 x 92 x 72 (6.65 x 3.62 x 2.83)
1000A	CO030233	1000A:5A	1000	169 x 92 x 72 (6.65 x 3.62 x 2.83)
1300A	CO030234	1250A:5A	1250	169 x 92 x 72 (6.65 x 3.62 x 2.83)
1700A	CO030235	1750A:5A	1750	190 x 137 x 80 (7.48 x 5.39 x 3.15)
2000A	CO030236	2000A:5A	2000	190 x 137 x 80 (7.48 x 5.39 x 3.15)
3000A	CO030237	3000A:5A	3000	199 x 156 x 88 (7.84 x 6.41 x 3.46)
4000A	CO030238	4000A:5A	4000	221 x 145 x 90 (8.70 x 5.71 x 3.54)

Table 8 Current transformer specification

All current transformers to be accuracy class 0.5.

All current transformers to be able to operate continuously at up to 120% of specified input current.

The precision of the current transformer (CT) affects I, I<sup>2</sup> and P control modes. To compute the minimum expected overall accuracy of a unit operating in these control modes, the CT accuracy must be taken into account. MC EPower units are delivered with class 0.5 CTs as standard.

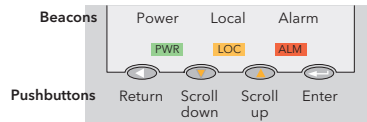
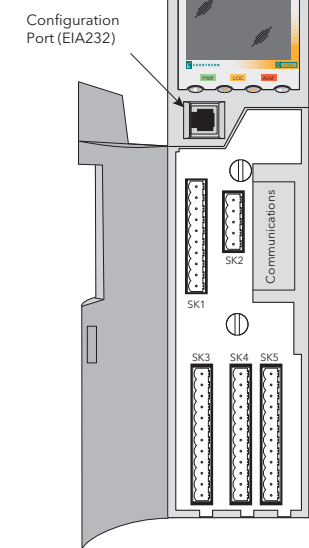
Assuming the current transformer phase lag to be negligible, then for 'I' and 'P' modes, overall accuracy is calculated by adding the CT accuracy figure to the corresponding control mode accuracy figure (above). For I<sup>2</sup> control mode, add twice the CT precision to the accuracy figure.

### Communications

<b>CC-Link:</b>	Protocol:	CC-Link version 1.1
	Connector:	5-way
	Indicators:	RUN and ERR
<b>DeviceNet:</b>	Protocol:	DeviceNet
	Connector:	5-way
	Indicators:	Network Status and Module Status
<b>Ethernet:</b>	Type:	10baseT (IEEE801)
	Protocol:	Modbus TCP
	Connector:	RJ45
	Indicators:	Tx activity (green and communications activity (yellow))
<b>EtherNet/IP:</b>	Protocol:	EtherNet/IP
	Connector:	RJ45
	Indicators:	NS (Network status, MS (module status and LINK (Link status)
<b>Modbus RTU:</b>	Protocol:	Modbus RTU slave
	Transmission standard:	3-wire EIA485
	Connector:	Twin, parallel-wired RJ45
	Indicators:	Tx activity (green) and Rx activity (yellow)
	Isolation (EN60947-4-3):	Installation category II, Pollution degree 2
	Terminals to ground:	50V RMS or dc to ground (double isolation)
<b>Profibus:</b>	Protocol:	Profibus DPV1
	Connector:	9-way D type
	Indicators:	Mode and Status
<b>Profinet</b>	Protocol:	Profinet IO
	Connector:	R J45
	Indicators:	NS (Network status), MS (Module status) and LINK (Link status)

# Electrical Installation

## Drive Module



**SK1 Standard I/O**

1	+10 Volts out
2	Analogue i/p 1 +
3	Analogue i/p 1 -
4	Analogue i/p 2 +
5	Analogue i/p 2 -
6	Analogue o/p 1 +
7	Analogue o/p 1 0V
8	Digital i/o 1+
9	Digital i/o 2+
10	Digital i/o 0V

**SK2 Predictive Load Management Option**

1	Terminator A
2	Low
3	Shield
4	High
5	Terminator B

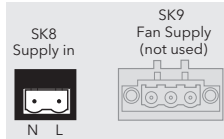
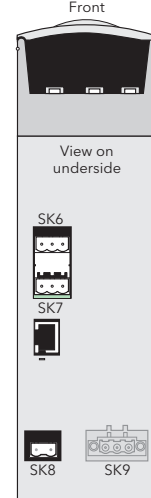
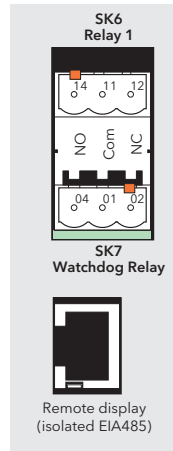
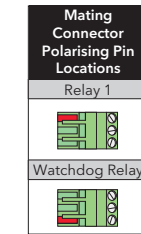


**SK3 Optional I/O 1**

1	+10 Volts out
2	Analogue i/p 3 +
3	Analogue i/p 3 -
4	Analogue o/p 2 +
5	Analogue o/p 2 0V
6	Digital i/p 3 +
7	Digital i/p 4 +
8	Digital 0V
9	Not used
10	Relay 2 NO (24)
11	Relay 2 Com (21)
12	Relay 2 NC (22)

**SK4 Optional I/O 2**

1	+10 Volts out
2	Analogue i/p 4 +
3	Analogue i/p 4 -
4	Analogue o/p 3 +
5	Analogue o/p 3 0V
6	Digital i/p 5 +
7	Digital i/p 6 +
8	Digital 0V
9	Not used
10	Relay 3 NO (34)
11	Relay 3 Com (31)
12	Relay 3 NC (32)



Polarising pins:  
Fixed connector: pins 1 and 2;  
Mating connector: pin 3

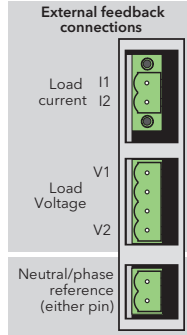
Polarising pins:  
Fixed connector: pins 2 and 3;  
Mating connector: pin 1

Polarising pins:  
Fixed connector: pins 1 and 3;  
Mating connector: pin 2

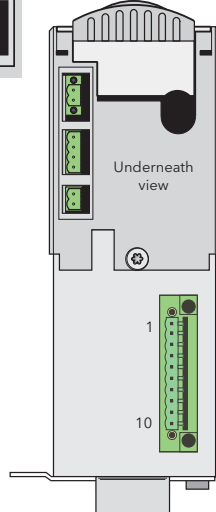
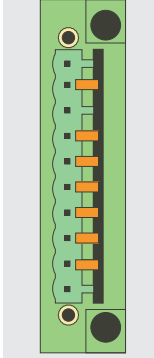
**Safety Earth Details**

Minimum earth cable cross section	Earth Terminal	
	Size	Tightening torque
Same as Line/Neutral supply cables	M6	5 Nm (3.7 ft.lb.)

## MC Power Module



Connector for remote ThyristorStack



**Neutral/phase reference and remote feedback connector polarising pin locations**

	Module 1	Module 2	Module 3	Module 4
Current feedback connector	I2, I1	I1, I2	I1 + I2, None	I1 + I2
Voltage feedback connector	V1, V2	V2, V1	V1 + V2, None	V1 + V2
Neutral/phase reference connector				

**Thyristor Stack Connector Polarising Pins**

Power Module 1 (pins 8 and 9)	Power Module 2 (pins 8 and 10)	Power Module 3 (pins 9 and 10)	Power Module 4 (pins 8, 9 and 10)
800A Power Mod (pins 3, 4, 5, 6, 7)	1000A Power Mod (pins 2, 4, 5, 6, 7)	1300A Power Mod (pins 2, 3, 5, 6, 7)	1700A Power Mod (pins 2, 3, 4, 6, 7)
2000A Power Mod (pins 2, 3, 4, 5, 7)	3000A Power Mod (pins 2, 3, 4, 5, 6)	4000A Power Mod (pins 1, 4, 5, 6, 7)	

## Thyristor Stack

Stack nominal current	Busbar conductor details						
	Line/Load Busbar fixing details Metric (imperial)				Safety earth details Metric (imperial)		
	Conductor cross section ('s)	Bolt size	Bolts per busbar	Torque	Cross section (Note 1)	Bolt size	Torque
800A	2 x 50mm x 5mm (500mm <sup>2</sup> ) (2 x 2 in x 0.2 in (0.8 in <sup>2</sup> ))	M10 (5/8 AF)	2	40Nm (30lb-ft)	250mm <sup>2</sup> (s/2) (0.4 in <sup>2</sup> (s/2))	M8 (1/2 AF)	15Nm (11lb-ft)
1000A	2 x 60mm x 5mm (600mm <sup>2</sup> ) (2 x 2.5 in x 0.2 in (1 in <sup>2</sup> ))	M10 (5/8 AF)	2	40Nm (30lb-ft)	300mm <sup>2</sup> (s/2) (0.5 in <sup>2</sup> (s/2))	M8 (1/2 AF)	15Nm (11lb-ft)
1300A	2 x 100mm x 5mm (1000mm <sup>2</sup> ) (2 x 4 in x 0.2 in (1.6 in <sup>2</sup> ))	M10 (5/8 AF)	1 or 2 Phase 2 = 2 3 Phase = 4	40Nm (30lb-ft)	250mm <sup>2</sup> (s/4) (0.4 in <sup>2</sup> (s/4))	M8 (1/2 AF)	15Nm (11lb-ft)
1700A	3 x 100mm x 5mm (1500mm <sup>2</sup> ) (3 x 4 in x 0.2 in (2.4 in <sup>2</sup> ))	M10 (5/8 AF)	6	40Nm (30lb-ft)	375mm <sup>2</sup> (s/4) (0.6 in <sup>2</sup> (s/4))	M8 (1/2 AF)	15Nm (11lb-ft)
2000A (air)							

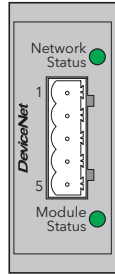
Stack nominal current	Line/Load Busbar fixing details Metric (imperial)	
	Conductor cross section ('s)	Mechanical connection details
	2000A (water)	Load: 3 x 100mm x 5mm (1500mm <sup>2</sup> ) (3 x 4 in x 0.2 in (2.4 in <sup>2</sup> )) Line: 1500mm <sup>2</sup> (2.4 in <sup>2</sup> ) flexible conductors
3000A (water)	Load: 3 x 100mm x 10mm (3000mm <sup>2</sup> ) (3 x 4 in x 0.4 in (4.8 in <sup>2</sup> )) Line: 3000mm <sup>2</sup> (4.8 in <sup>2</sup> ) flexible conductors	Earth connection: Not applicable for water cooled units
4000A (water)	Load: 3 x 125mm x 10mm (3750mm <sup>2</sup> ) (3 x 5 in x 0.4 in (6 in <sup>2</sup> )) Line: 3750mm <sup>2</sup> (6 in <sup>2</sup> ) flexible conductors	

**Note:** 1. The ratio (e.g. s/2) between the cross-sections of the Line/Load and Safety earth conductors is defined in EN60439-1.  
2. Water cooled units should be fitted with 'solid' load conductors but the line voltage must be supplied using flexible conductors of the relevant cross-sectional area as stated above.

## Communications

### DeviceNet Connector Pinout

Pin	Function
1	V- (negative bus supply voltage)
2	CAN_L
3	Cable shield
4	CAN_H
5	V+ (positive bus supply voltage)



Network Status LED Indication	
LED state	Interpretation
Off	Off-line or no power
Steady green	On-line to 1 or more units
Flashing green	On-line - no connections
Steady red	Critical link failure
Flashing red	1 or more connections timed out

Module Status LED Indication	
LED state	Interpretation
Off	No power
Steady green	Operating normally
Flashing green	Missing or incomplete configuration
Steady red	Unrecoverable fault(s)
Flashing red	Recoverable fault(s)

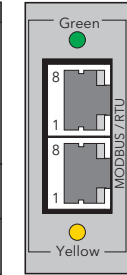
- Notes:**
- See DeviceNet specification for power supply specification
  - During startup, an LED test is performed, satisfying the DeviceNet standard.

### Modbus RTU Pinout

Pin	Signal (EIA485)
8	Reserved
7	Reserved
6	N/C
5	N/C
4	N/C
3	Isolated 0V
2	A
1	B

Internal connections:  
 Pin 1 to 5V via 100k  
 Pin 2 to 0V via 100k

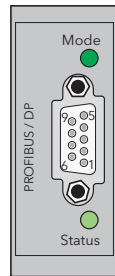
LEDs:  
 Green = Tx activity  
 Yellow = Rx activity



Connectors in parallel

### Profibus Connector Pinout

Pin	Function	Pin	Function
9	N/C	5	Isolated ground
8	A (RxD-/TxD-)	4	RTS
7	N/C	3	B (RxD+/TxD+)
6	+5 V (1)	2	N/C
		1	N/C



Operation Mode LED Indication	
LED state	Interpretation
Off	Off-line or no power
Steady green	On-line, data exchange
Flashing green	On-line, clear
Red single flash	Parametrisation error
Red double flash	Profibus configuration error

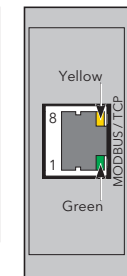
Status LED Indication	
LED state	Interpretation
Off	No power or not initialised
Steady green	Initialised
Flashing green	Diagnostic event present
Steady red	Exception error

- Notes:**
- Isolated 5 Volts for termination purposes. Any current drawn from this terminal affects the total power consumption.
  - The cable screen should be terminated to the connector housing.

### Modbus TCP (Ethernet 10baseT) Pinout

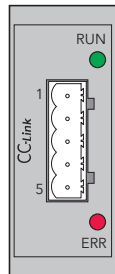
Pin	Function
8	N/C
7	N/C
6	Rx-
5	N/C
4	N/C
3	Rx+
2	Tx-
1	Tx+

LEDs:  
 Green = Tx activity  
 Yellow = Network activity



### CC-Link Connector Pinout

Pin	Function
1	DA (Rx+/Tx+) — 110R, 1/2W, 5% across pins 1 and 2 of first and last connectors
2	DB (Rx-/Tx-) —
3	DG (Signal ground) —
4	SLD (Cable Shield) — SLD and FG connected internally
5	FG (Protective Ground) —



'RUN' LED Indication	
LED state	Interpretation
Off	Off-line or no power
Green	Normal operation
Red	Major fault (fatal error)

'ERR' LED Indication	
LED state	Interpretation
Off	No error or no power
Steady red	Exception or fatal event
Flickering red	CRC Error
Flashing red	Station number of Buad rate has changed since startup

- Notes:**
- A 110 Ohm ( $\pm 5\%$  1/2 watt) terminating resistor should be connected across pins 1 and 2 of the connectors at each end of the transmission line.
  - The cable shield should be connected to pin 4 of each CC-Link connector.
  - The shield and Protective earth terminals (pins 4 and 5) are internally connected.

### EtherNet/IP Connector Pinout

Pin	Function
1	Tx+
2	Tx-
3	Rx+
4	N/C
5	N/C
6	Rx-
7	N/C
8	N/C



NS (Network Status) LED Indication	
LED state	Interpretation
Off	No power or no IP address
Steady green	On-line, one or more connections established (CIP class 1 or 3)
Flashing green	On-line, no connections enabled
Steady red	Duplicate IP address, ('fatal' error)
Flashing red	One or more connections timed out (CIP class 1 or 3)

MS (Module Status) LED Indication	
LED state	Interpretation
Off	No power
Steady green	Controlled by a scanner in Run state
Flashing green	Not configuration or scanner in idle state
Steady red	Major fault (Exception-state, fatal error etc.)
Flashing red	Recoverable fault

LINK LED Indication	
LED state	Interpretation
Off	No Link, no activity
Steady green	Link established
Flickering green	Activity in progress

### Profinet IO Connector Pinout

Pin	Function
1	Tx+
2	Tx-
3	Rx+
4	N/C
5	N/C
6	Rx-
7	N/C
8	N/C



NS (Network status) LED	
LED state	Interpretation
Off	No power or no connection with I/O Controller
Steady green	On-line (RUN); connection with IO controller established. Controller in 'Run' state
Flashing green	On-line (STOP); connection with IO controller established. Controller in 'Stop' state

MS (Module status) LED		
LED state	Interpretation	
Off	Not initialised	No power or the module is in 'SETUP' or 'NW_INIT' state
Green steady	Normal operation	The module has shifted from the 'NW_INIT' state
Green 1 flash	Diagnostic event	One or more Diagnostic Event present
Green 2 flash	Blink	Used by engineering tools to identify the node on the network
Red steady	Exception error	The module is in 'EXCEPTION' state
Red 1 flash	Configuration error	The Expected Identification differs from the Real Identification
Red 2 flash	IP Address error	The IP address is not set
Red 3 flash	Station Name error	The Station Name is not set
Red 4 flash	Internal error	The module has encountered a major internal fault

LINK LED Indication	
LED state	Interpretation
Off	No Link, no activity
Steady green	Link established; no activity
Flickering green	Activity in progress

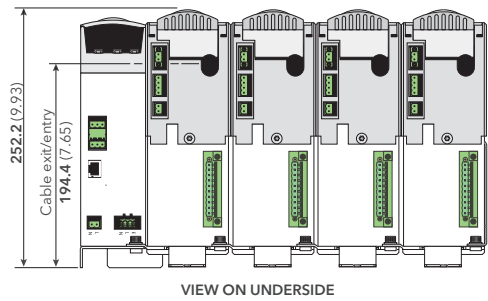
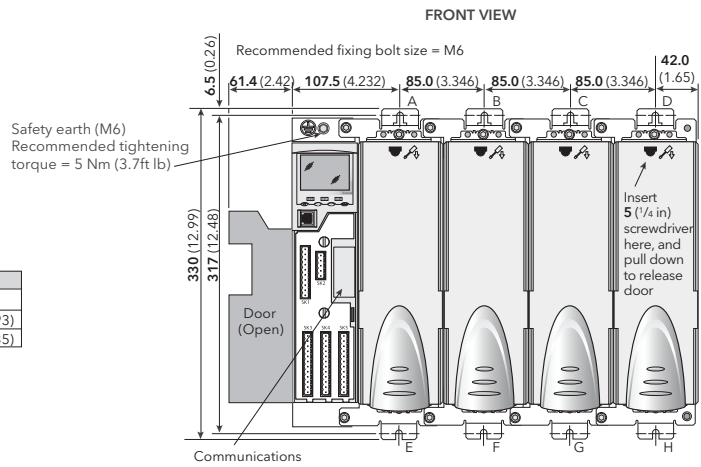
## Fixing Details

**Note:** Units are shown with individual mounting brackets. Multi-phase units come supplied with 2, 3 or 4 phase brackets as appropriate. See table below for details.

Dimension **mm** (inches)

	Overall Widths			
No of phases	1	2	3	4
Door closed	149.5 (5.89)	234.5 (9.23)	319.5 (12.58)	404.5 (15.93)
Door open	211.0 (8.31)	296.0 (11.65)	381.0 (15.00)	466.0 (18.35)

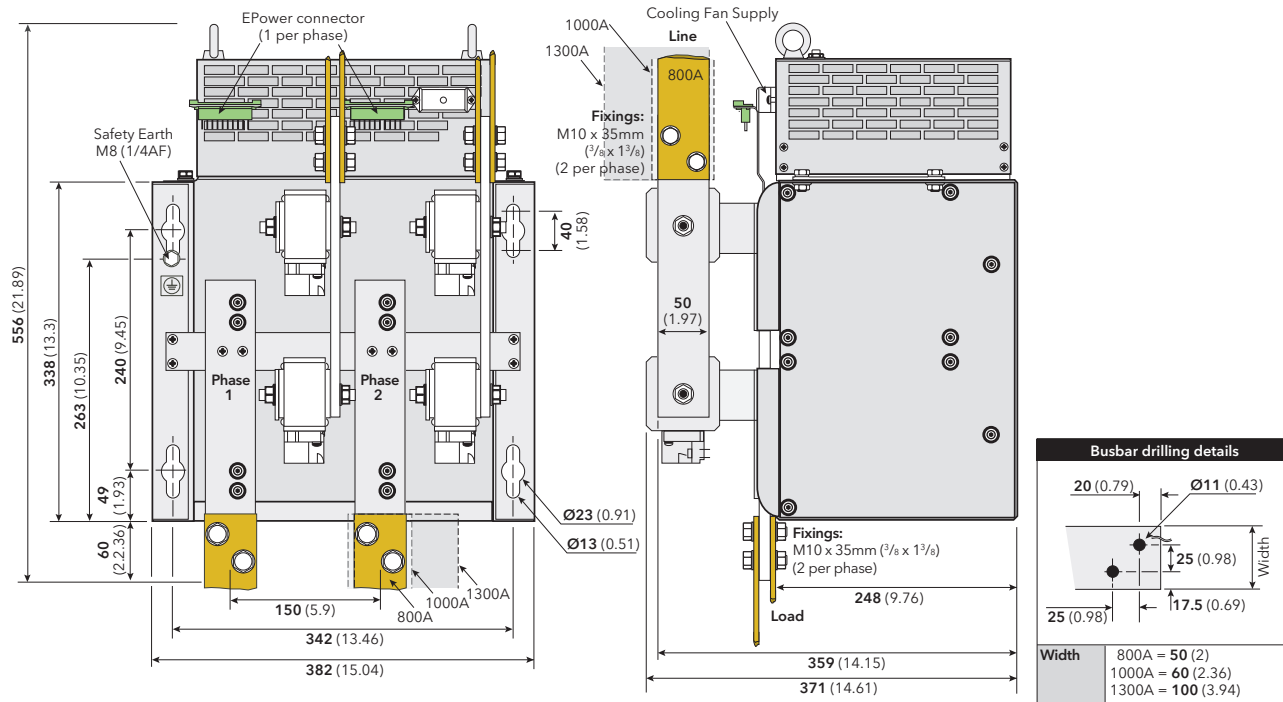
Bracket	Upper	Lower
2-phase	Use A & B	Use E & F
3-phase	Use A, B & C	Use E, F & G
4-phase	Use A, B, C & D	Use E, F, G & H



## Thyristor Stack Fixing Details

### 800/1000/1300 Amp 1 or 2 Phase Units

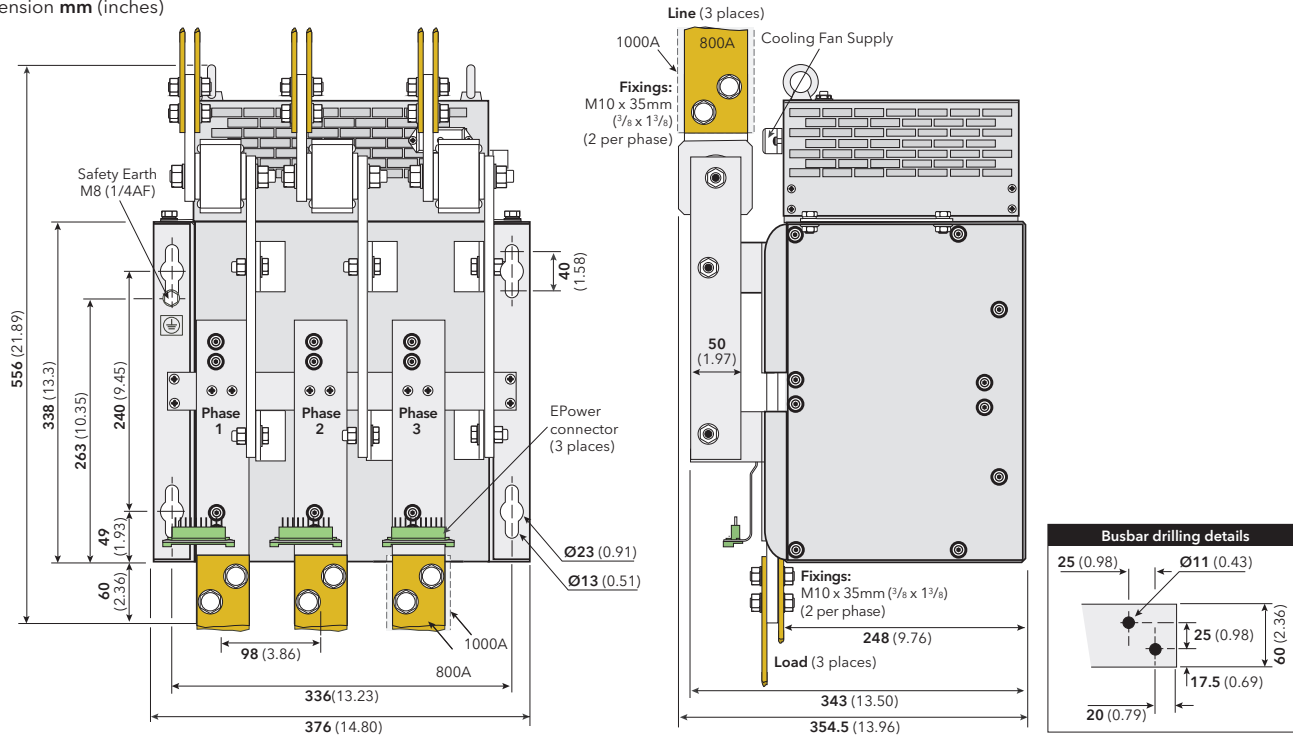
Dimension **mm** (inches)



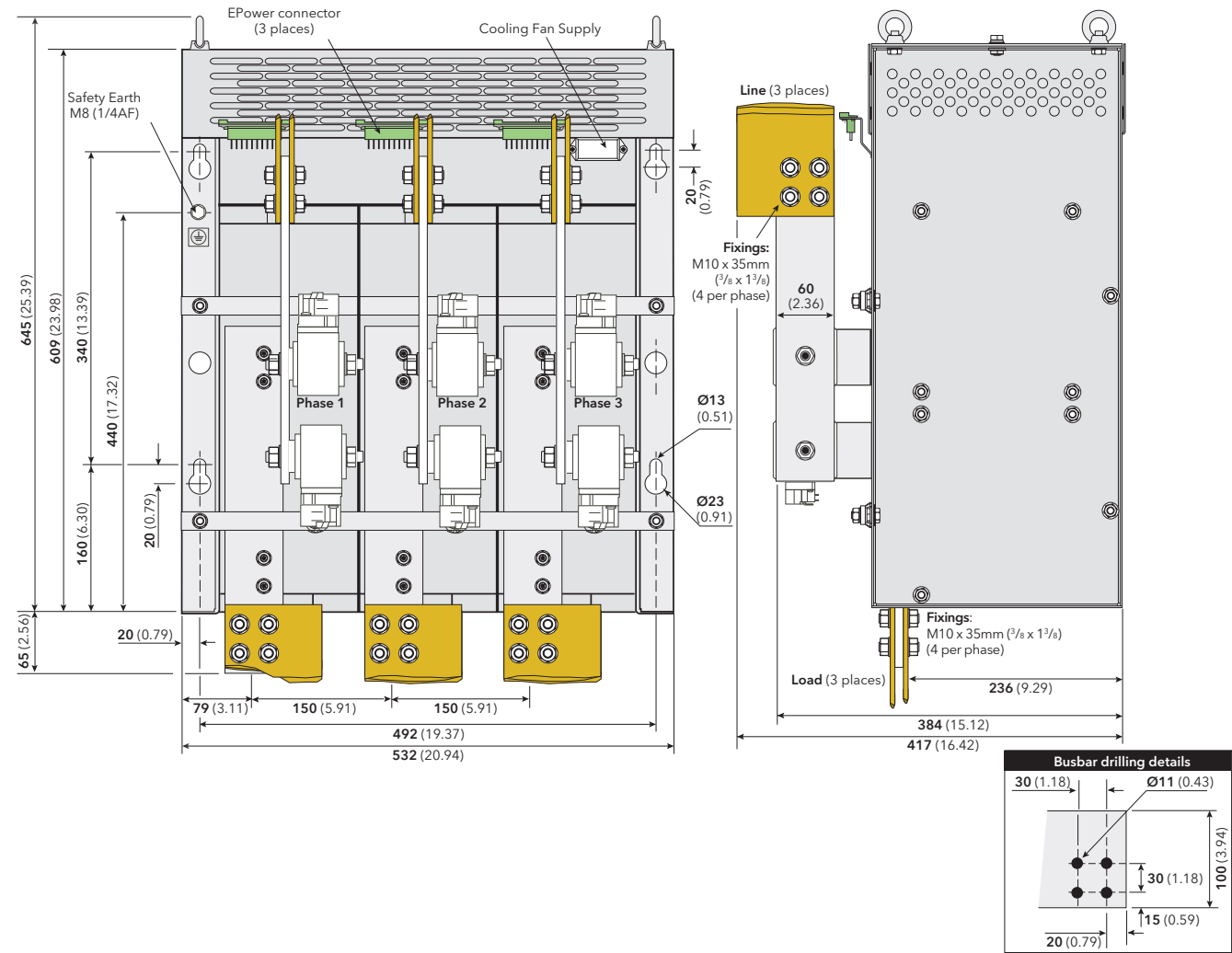
## Thyristor Stack Fixing Details (continued)

### 800/1000 Amp 3 Phase Units

Dimension mm (inches)



### 1300 Amp 3 Phase Units

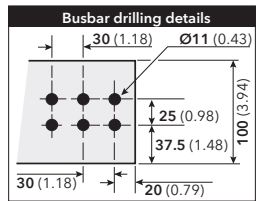
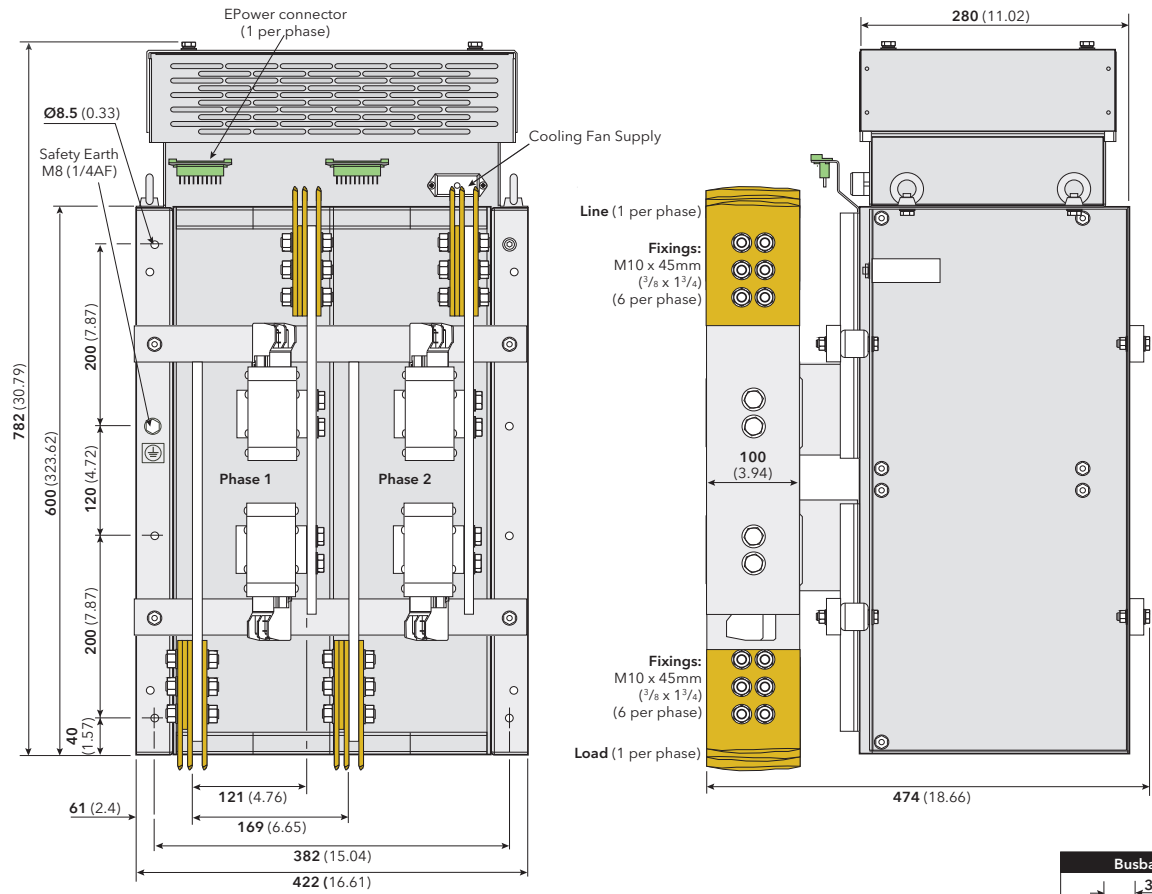




# Thyristor Stack Fixing Details (continued)

## 1700/2000 Amp Air Cooled 1 or 2 Phase Units

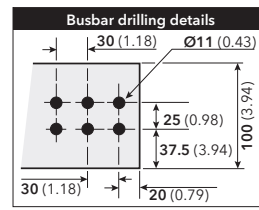
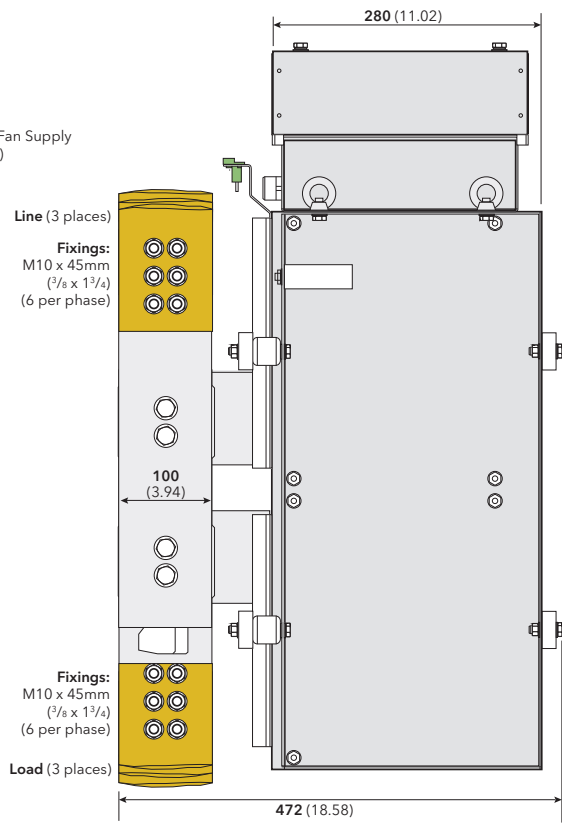
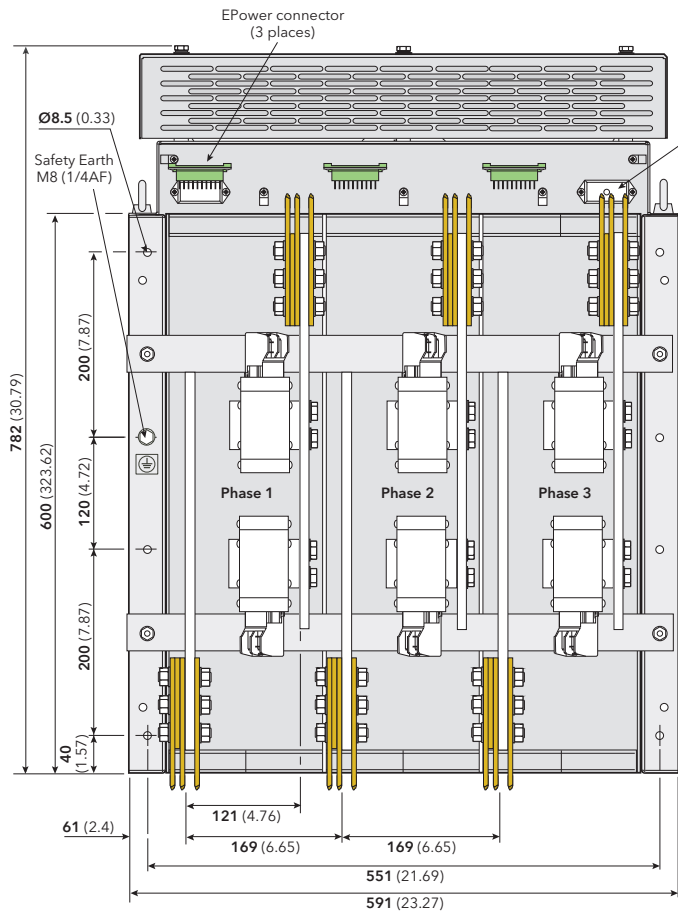
Dimension mm (inches)



# Thyristor Stack Fixing Details (continued)

## 1700/2000 Amp Air Cooled 3 Phase Units

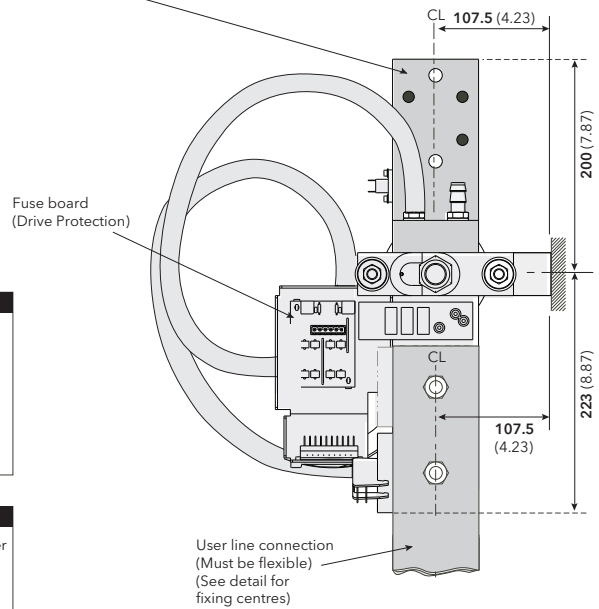
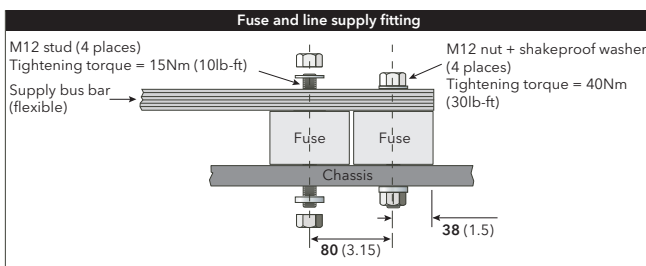
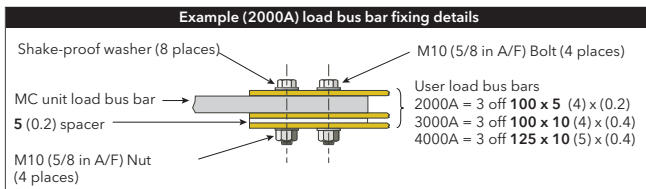
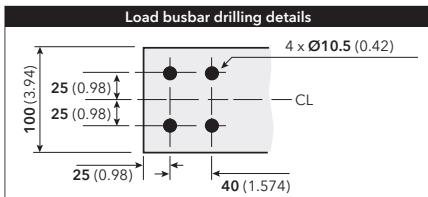
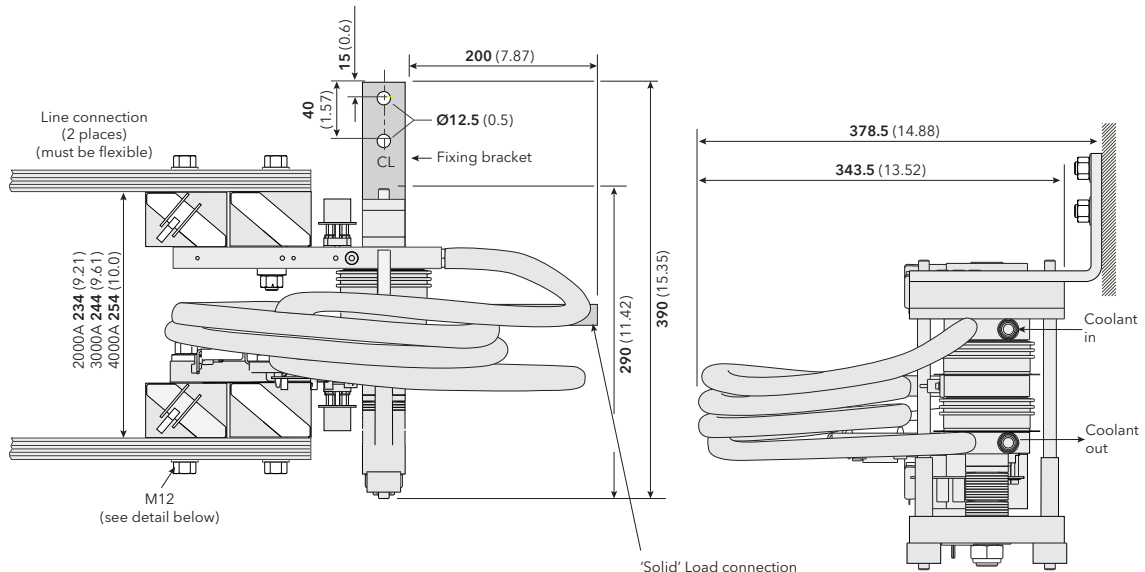
Dimension mm (inches)



# Thyristor Stack Fixing Details (continued)

## 2000/3000/4000 Amp Water Cooled Units

Dimension mm (inches)



## Order codes

### EPower for MC Unit



The code is divided in three sections:

- 1 Hardware, which defines the type, number and size of the unit and/or the modules.
- 2 Optional hardware and software functions.
- 3 QuickStart which is intend to configure the unit for maximum 60 to 80% of the application (single unit in 1, 2 or 3 legs configuration)

The code can then be either "Short" and include only the main hardware fields or "medium" and combine the hardware + the optional fields, or finally "Long" with the additional quick start code at the end.

Basic Product		5 Internal Use		15 Software Option 1	
EPOWER	Power Controller	XXX	None	XXX	None
1 Phase/Amps		6 Internal Use		16 Software Option 2	
1PH-800A-AC	1 Phase unit 800 Amps air cooled version	XXX	None	XXX	None
1PH-1000A-AC	1 Phase unit 1000 Amps air cooled version	7 Option		EMS	Energy Measurement (Counter)
1PH-1300A-AC	1 Phase unit 1300 Amps air cooled version	XX	None - End of Code	LTC	Load Tap Changer
1PH-1700A-AC	1 Phase unit 1700 Amps air cooled version	00	Unit with options and/or quick start definition	17 Not Used	
1PH-2000A-AC	1 Phase unit 2000 Amps air cooled version	8 Communications Protocol		XXX	Default
1PH-2000A-WC	1 Phase unit 2000 Amps water cooled version	XX	No optional fieldbus communication	18 Quick Start	
1PH-3000A-WC	1 Phase unit 3000 Amps water cooled version	Y2	2-wire 485 Modbus (RJ45 connector)	XX	None - End of code
1PH-4000A-WC	1 Phase unit 4000 Amps water cooled version	PB	Profibus-DPV1 (with D type connector)	QS	Quick Start config
2PH-800A-AC	2 Phase unit 800 Amps air cooled version	ET	Modbus-TCP	19 Language	
2PH-1000A-AC	2 Phase unit 1000 Amps air cooled version	DN	DeviceNet	ENG	English
2PH-1300A-AC	2 Phase unit 1300 Amps air cooled version	IP	Ethernet/IP	FRA	French
2PH-1700A-AC	2 Phase unit 1700 Amps air cooled version	CC	CC-Link	GER	German
2PH-2000A-AC	2 Phase unit 2000 Amps air cooled version	PN	Profinet IO	ITA	Italian
2PH-2000A-WC	2 Phase unit 2000 Amps water cooled version	9 Module 1		SPA	Spanish
2PH-3000A-WC	2 Phase unit 3000 Amps water cooled version	XX	None	20 Load Current (nominal)	
2PH-4000A-WC	2 Phase unit 4000 Amps water cooled version	IO	IO optional board	16A	16 Amps
3PH-800A-AC	3 Phase unit 800 Amps air cooled version	10 Module 2		25A	25 Amps
3PH-1000A-AC	3 Phase unit 1000 Amps air cooled version	XX	None	40A	40 Amps
3PH-1300A-AC	3 Phase unit 1300 Amps air cooled version	IO	IO optional board	50A	50 Amps
3PH-1700A-AC	3 Phase unit 1700 Amps air cooled version	11 Module 3		63A	63 Amps
3PH-2000A-AC	3 Phase unit 2000 Amps air cooled version	XX	None	80A	80 Amps
3PH-2000A-WC	3 Phase unit 2000 Amps water cooled version	IO	IO optional board	100A	100 Amps
3PH-3000A-WC	3 Phase unit 3000 Amps water cooled version	12 Predictive Load Management		125A	125 Amps (Note 2)
3PH-4000A-WC	3 Phase unit 4000 Amps water cooled version	XXX	None	160A	160 Amps (Note 2)
4PH-800A-AC	4 Phase unit 800 Amps air cooled version	PLM	Predictive Load Management	200A	200 Amps (Note 2)
4PH-1000A-AC	4 Phase unit 1000 Amps air cooled version	13 External Feedback		250A	250 Amps (Note 2)
4PH-1300A-AC	4 Phase unit 1300 Amps air cooled version	XF	External feedback*	315A	315 Amps (Note 2)
4PH-1700A-AC	4 Phase unit 1700 Amps air cooled version	14 Remote Panel		400A	400 Amps (Note 2)
4PH-2000A-AC	4 Phase unit 2000 Amps air cooled version	XX	None	500A	500 Amps (Note 2)
4PH-2000A-WC	4 Phase unit 2000 Amps water cooled version	32ENG	32h8e English	630A	630 Amps (Note 2)
4PH-3000A-WC	4 Phase unit 3000 Amps water cooled version	32FRA	32h8e French	800A	800 Amps (Note 2)
4PH-4000A-WC	4 Phase unit 4000 Amps water cooled version	32GER	32h8e German	900A	900 Amps (Note 2)
PWR-800A-AC	Power module for stack 800 A air cooled version (Note 1)	32ITA	32h8e Italian	1000A	1000 Amps (Note 2)
PWR-1000A-AC	Power module for stack 1000 A air cooled version (Note 1)	32SPA	32h8e Spanish	1150A	1150 Amps (Note 2)
PWR-1300A-AC	Power module for stack 1300 A air cooled version (Note 1)	2 Voltage		1300A	1300 Amps (Note 2)
PWR-1700A-AC	Power module for stack 1700 A air cooled version (Note 1)	600V	100 to 600V (for air cooled stacks)	1500A	1500 Amps (Note 2)
PWR-2000A-AC	Power module for stack 2000 A air cooled version (Note 1)	690V	100 to 690V (for water cooled stacks)	1700A	1700 Amps (Note 2)
PWR-2000A-WC	Power module for stack 2000 A water cooled version (Note 1)	XXX	For Driver mod only	1850A	1850 Amps (Note 2)
PWR-3000A-WC	Power module for stack 3000 A water cooled version (Note 1)	3 Fan Supply		2000A	2000 Amps (Note 2)
PWR-4000A-WC	Power module for stack 4000 A water cooled version (Note 1)	XXX	No fan	3000A	3000 Amps (Note 2)
2 Voltage		4 Warranty		4000A	4000 Amps (Note 2)
600V	100 to 600V (for air cooled stacks)	XXX	Standard		
690V	100 to 690V (for water cooled stacks)	WL005	5 Year		
XXX	For Driver mod only	USWL3	US Extended		
3 Fan Supply					
XXX	No fan				
4 Warranty					
XXX	Standard				
WL005	5 Year				
USWL3	US Extended				

**21 Load Voltage (nominal)**

100V	100 Volts
110V	110 Volts
115V	115 Volts
120V	120 Volts
127V	127 Volts
200V	200 Volts
208V	208 Volts
220V	220 Volts
230V	230 Volts
240V	240 Volts
277V	277 Volts
380V	380 Volts
400V	400 Volts
415V	415 Volts
440V	440 Volts
460V	460 Volts
480V	480 Volts
500V	500 Volts
575V	575 Volts
600V	600 Volts
660V	660 Volts (Note 3)
690V	690 Volts (Note 3)

**22 Control Type (Note 4)**

1P	Single phase
2P	Two phase control
3P	Three phase control

**23 Load Configuration (Note 5)**

1P	Single phase
3S	Star
3D	Delta
4S	Star with neutral
6D	Open delta

**24 Load Type**

XX	Resistive
TR	Transformer primary

**25 Firing Mode (Note 6)**

PA	Phase angle
HC	Half cycle
BF	Burst firing (default 16 cycles)
FX	Fix modulation period (default 2 seconds)
LG	Logic mode

**26 Feedback**

V2	RMS load voltage squared
I2	RMS load current squared
TP	True power
VR	RMS load voltage
IR	RMS load current
OL	Open loop

**27 Current Transfer Mode (Linear Current Limit) (Note 7)**

XX	Off
I2	RMS load current squared transfer
IR	RMS load current transfer

**28 Analogue Input 1 Function (Note 7)**

XX	None
SP	Setpoint
HR	Setpoint limit
IL	Current limit
VL	Voltage limit
PL	Power limit
TS	Current transfer span

**29 Analogue Input 1 Type**

XX	None
1V	1-5 Volt
2V	2-10 Volt
5V	0-5 Volt
0A	0-20 mA
4A	4-20 mA

**30 Analogue Input 2 Function (Note 7)**

XX	None
SP	Setpoint
HR	Setpoint limit
IL	Current limit
VL	Voltage limit
PL	Power limit
TS	Current transfer span

**31 Analogue Input 2 Type**

XX	None
0V	0-10 Volt
1V	1-5 Volt
2V	2-10 Volt
5V	0-5 Volt
0A	0-20 mA
4A	4-20 mA

**32 Analogue Output Function**

X	None
V	Voltage
I	Current
P	Power
R	Impedance

**33 Analogue Output Type**

XX	None
0V	0-10 Volt
1V	1-5 Volt
2V	2-10 Volt
5V	0-5 Volt
0A	0-20 mA
4A	4-20 mA

**34 Digital Input 2 Function**

XX	None
AK	Alarm acknowledgement
RS	Remote setpoint selection

**35 Alarm Relay Configuration**

XX	None
AA	Any alarm
PA	Process alarms
FB	Fuse blown

**36 Load Management Configuration**

XX	None - Load Management disabled
SH	Sharing
I1	Incremental Type 1
I2	Incremental Type 2
RI	Rotating Incremental
DC	Distributed Control
DI	Distributed Control and Incremental Control
RD	Rotating Distributed Control and Incremental Control

**37 Predictive Load Management Address**

XX	Predictive Load Management address (00 to 63) Default address 00
----	---

**Order codes**

**External Thyristor Stack (HPower)**



**1 Phase/Amps**

1PH-800A-AC	1 Phase unit 800 Amps air cooled version
1PH-1000A-AC	1 Phase unit 1000 Amps air cooled version
1PH-1300A-AC	1 Phase unit 1300 Amps air cooled version
1PH-1700A-AC	1 Phase unit 1700 Amps air cooled version
1PH-2000A-AC	1 Phase unit 2000 Amps air cooled version
1PH-2000A-WC	1 Phase unit 2000 Amps water cooled version
1PH-3000A-WC	1 Phase unit 3000 Amps water cooled version
1PH-4000A-WC	1 Phase unit 4000 Amps water cooled version
2PH-800A-AC	2 Phase unit 800 Amps air cooled version
2PH-1000A-AC	2 Phase unit 1000 Amps air cooled version
2PH-1300A-AC	2 Phase unit 1300 Amps air cooled version
2PH-1700A-AC	2 Phase unit 1700 Amps air cooled version
2PH-2000A-AC	2 Phase unit 2000 Amps air cooled version
2PH-2000A-WC	2 Phase unit 2000 Amps water cooled version
2PH-3000A-WC	2 Phase unit 3000 Amps water cooled version
2PH-4000A-WC	2 Phase unit 4000 Amps water cooled version
3PH-800A-AC	3 Phase unit 800 Amps air cooled version
3PH-1000A-AC	3 Phase unit 1000 Amps air cooled version
3PH-1300A-AC	3 Phase unit 1300 Amps air cooled version
3PH-1700A-AC	3 Phase unit 1700 Amps air cooled version
3PH-2000A-AC	3 Phase unit 2000 Amps air cooled version
3PH-2000A-WC	3 Phase unit 2000 Amps water cooled version
3PH-3000A-WC	3 Phase unit 3000 Amps water cooled version
3PH-4000A-WC	3 Phase unit 4000 Amps water cooled version
4PH-800A-AC	4 Phase unit 800 Amps air cooled version
4PH-1000A-AC	4 Phase unit 1000 Amps air cooled version
4PH-1300A-AC	4 Phase unit 1300 Amps air cooled version
4PH-1700A-AC	4 Phase unit 1700 Amps air cooled version
4PH-2000A-AC	4 Phase unit 2000 Amps air cooled version
4PH-2000A-WC	4 Phase unit 2000 Amps water cooled version
4PH-3000A-WC	4 Phase unit 3000 Amps water cooled version
4PH-4000A-WC	4 Phase unit 4000 Amps water cooled version
PWR-800A-AC	Power module for stack 800 A air cooled version (Note 1)
PWR-1000A-AC	Power module for stack 1000 A air cooled version (Note 1)
PWR-1300A-AC	Power module for stack 1300 A air cooled version (Note 1)
PWR-1700A-AC	Power module for stack 1700 A air cooled version (Note 1)
PWR-2000A-AC	Power module for stack 2000 A air cooled version (Note 1)
PWR-2000A-WC	Power module for stack 2000 A water cooled version (Note 1)
PWR-3000A-WC	Power module for stack 3000 A water cooled version (Note 1)
PWR-4000A-WC	Power module for stack 4000 A water cooled version (Note 1)

**2 Fan Supply**

115V	115V ac
230V	230V ac
000	No fan. For water cooled stacks

**SPARE FUSE FOR POWER MODULES**

Stack nominal current	Fuse (+switch) part number		
	(1Phase)	(2Phase)	(3 Phase)
800A/1000A	CS030440U002	CS030440U002	CS030442U002
1300A	CS030442U002	CS030442U002	CS030442U002
1700A/2000A (air)	CS030443U002	CS030443U002	CS030443U002
2000A (water)	CS030614U002	Water-cooled units are available as single phase only	
3000A	CS030615U002		
4000A	CS030616U002		

**Notes**

- Stack not included.
- The maximum nominal current selectable is the current rating selected in Field 1.
- Only available if 690V selected in Field 2.
- Selection dependent on number of Phases selected in Field 1.  
1PH = 1P only  
2PH = 1P or 2P only  
3PH = 1P or 3P only
- Selection dependent on number of Phases selected in Field 1.  
1PH = 1P only  
2PH = 1P, 3S or 3D only  
3PH = Any  
If 1P selected in Field 22 only option is 1P.
- PA not selectable if 2P selected in Field 22.  
HC not selectable if TR selected in Field 24.
- Except XX the selection in Fields 28 and 30 cannot be the same.

# 32h8e EPower Remote Panel



Model number 32h8e is a horizontal 1/8DIN indicator and alarm unit that performs the dual function of remote display for EPower and independent 'policeman'. The latter is intended to disconnect should an overtemperature (or other excess process condition) occur.

32h8e communicates with EPower using Modbus protocol via the EIA485 RJ45 connector located on the underside of the EPower controller.


The remote panel is normally ordered as an option with EPower units. It is a fixed hardware build consisting of a relay output in OP1 and an analogue output in OP3. There are no user communications since this is used to communicate with EPower and the supply is high voltage only (100-240Vac). The unit is configured using 'QuickStart' code on initial start up.

The 32h8e is based on a 32h8i indicator and has the same and additional features as this instrument. For features not covered please refer to HA029005.

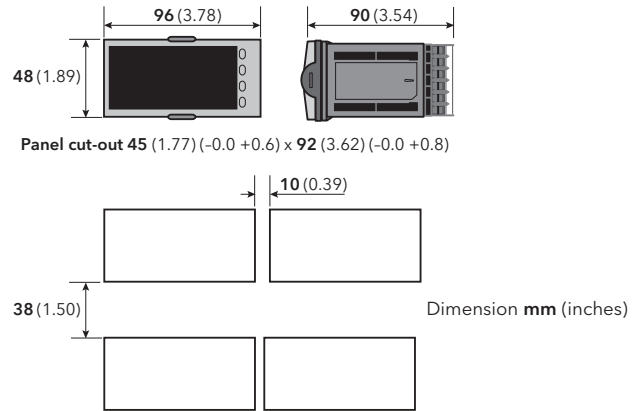
The 32h8e displays EPower Current, Voltage, Power and Setpoint parameters for each EPower Network. The Setpoint of the EPower networks can be adjusted via the 32h8e HMI. Indication of selected setpoint is included: local or remote.

## Wire sizes

The screw terminals accept wire sizes from 0.5 to 1.5mm (16 to 22AWG). Hinged covers prevent hands or metal making accidental contact with live wires. The rear screws should be tightened to 0.4Nm (3.3lb in).

 Ensure that the supply to the unit does not exceed 240V ac +10%

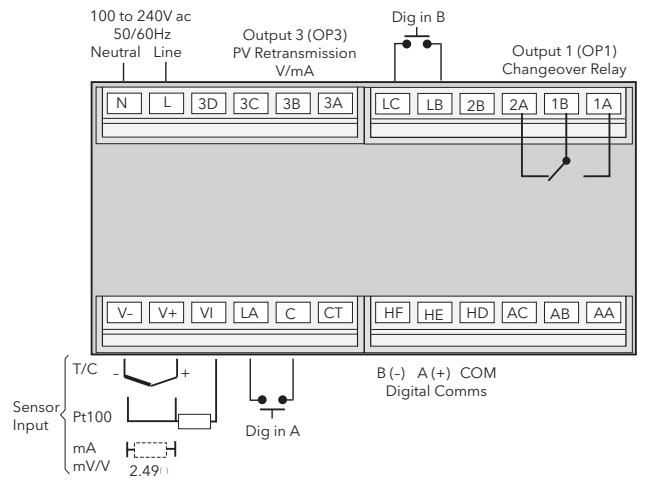
## Mechanical Details



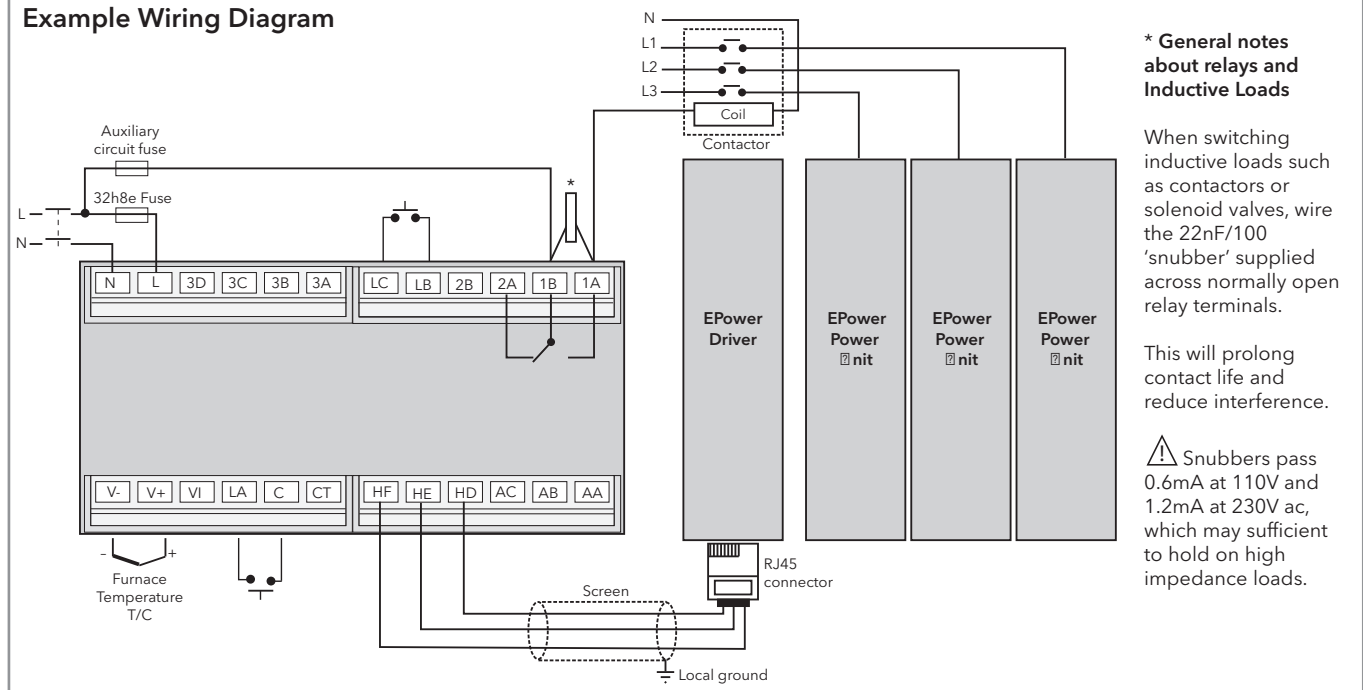
## Recommended minimum spacing

If more than one unit is mounted in the same panel they should be spaced to allow sufficient air flow between them.

## Rear Terminals




## Example Wiring Diagram



### \* General notes about relays and Inductive Loads

When switching inductive loads such as contactors or solenoid valves, wire the 22nF/100 'snubber' supplied across normally open relay terminals.

This will prolong contact life and reduce interference.

 Snubbers pass 0.6mA at 110V and 1.2mA at 230V ac, which may be sufficient to hold on high impedance loads.

## Specification - 32h8e Remote display

### General

#### Environmental performance

Temperature limits	Operation:	0 to 55°C
	Storage:	-10 to 70°C
Humidity limits	Operation:	5 to 85% RH non condensing
	Storage:	5 to 85% RH non condensing
Panel sealing:		IP65, Nema 4X
Shock:		BS EN61010
Vibration:		2g peak, 10 to 150Hz
Altitude:		<2000 metres
Atmospheres:		Not suitable for use in explosive or corrosive atmosphere

#### Electromagnetic compatibility (EMC)

Emissions and immunity: BS EN61326

#### Electrical safety

(BS EN61010): Installation cat. II; Pollution degree 2

#### INSTALLATION CATEGORY II

The rate impulse voltage for equipment on nominal 230V mains is 2500V.

#### POLLUTION DEGREE 2

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

#### Physical

Panel mounting:	1/8 DIN, horizontal
Dimensions and weight:	96mm (3.78") W x 48mm (1.89") H x 90mm (3.54 inches) D, 350g (0.77lbs)
Panel cut-out dimensions:	92mm (1.77 inches) W x 45mm (3.62 inches) H

#### Operator interface

Type:	LCD TN with backlight
Main PV display:	5 digits, green or red
Lower display:	9 character starburst, green
Status beacons:	Units, outputs, alarms

#### Power requirements

Voltage:	100 to 240V ac, -15%, +10%, max 9W
Frequency:	48 to 62Hz

#### Approvals

CE, cUL listed (file E57766)

#### Communications

Serial communications option

Protocol:	Modbus RTU Master
Isolation:	264V ac, double insulated
Transmission standard:	EIA485 (2 wire)

The 32h8e has Modbus Master RS485 Comms with a fixed set of EPower Modbus addresses. Power up the display for the first time, configure the QuickStart code for the standard indicator functions, and the process values and alarm messages are immediately displayed, automatically configured to match the EPower display - for example RMS values or average values for current, voltage and power displayed as 3 phase or as several times single phase as defined by the EPower configuration.

32h8e Terminal			RJ45 Pin Number
HD	White/Green	Common	3
HE	Orange	Rx A(+)	2
HF	White/Orange	Tx B(-)	1

#### Process variable input

Calibration accuracy:	<±0.25% of reading ±1LSD (Note 1)
Sample rate:	9Hz(110ms)
Isolation:	264V ac double insulation from the PSU and communication
Resolution (µV):	<0.5µV with 1.6s filter (mV range) <0.25mV with 1.6s filter (Volts range)
Resolution (effective bits):	>17 bits
Linearisation accuracy:	< 0.1% of reading
Drift with temperature:	<50ppm (typical) <100ppm (worst case)
Common mode rejection:	48-62Hz, >-120db
Series mode rejection:	48-62Hz, >-93dB
Input impedance:	100MΩ (200KΩ on volts range C)
Cold junction compensation:	>30/1 rejection of ambient change
External cold junction:	Reference of 0°C

Cold junction accuracy:	<±1°C at 25°C ambient
Linear (process) input range:	-10 to 80mV, 0 to 10V
Thermocouple types:	K, J, N, R, S, B, L, T, C, custom download (Note 2)

Resistance thermometer types:	3-wire Pt100 DIN 43760
Bulb current:	0.2mA
Lead compensation:	No error for 22 ohms in all leads
Input filter:	Off to 100s
Zero offset:	User adjustable over full range
User calibration:	2-point gain & offset

#### Notes

- (1) Calibration accuracy quoted over full ambient operating range and for all input linearisation types
- (2) Contact Eurotherm for details of availability of custom downloads for alternative sensors

#### OP 1

Type:	Form C (changeover)
Rating:	Min 100mA @12V dc, max 2A@240V ac resistive
Functions:	Alarms, events

#### OP 3

Isolation:	264V ac double insulated
Functions:	Retransmission
Current output	Rating: 0-20mA into <500Ω Accuracy: ±(<0.25% of Reading + <50µA) Resolution: 13.6 bits
Voltage output	Rating: 0-10V into >500Ω Accuracy: ±(<0.25% of Reading + <25mV) Resolution: 13.6 bits

#### Software features

##### Alarms

Number:	4
Type:	Absolute high & low, Rate of change (rising or falling)
Latching:	Auto or manual latching, non-latching, event only
Output assignment:	Up to four conditions can be assigned to one output
EPower Alarms:	Missing mains, Thyristor short circuit, Open thyristor, Fuse blown, Over temperature, Voltage dips, Frequency fault, Power module 24V fault, Total load failure, Chop off, Partial Load Failure, Partial Load Unbalance, Volt fault, Temperature pre alarm, Power module wdog fault, Power module comms error, Power module timeout, Closed loop, Output fault

The pre-set alarms have a fixed medium priority enables indicator alarms to be configured as lower, the same or higher priority. EPower alarms can be globally acknowledged via the 32h8e HMI.

##### Other status outputs

Functions:	Including sensor break, power fail, new alarm, pre-alarm
Output assignment:	Up to four conditions can be assigned to one output

##### Custom messages

Number:	15 scrolling text messages
No of characters:	127 characters per message max
Languages:	English, German, French, Spanish, Italian
Selection:	Active on any parameter status using conditional command

##### Recipes

Number:	5 recipes with 19 parameters
Selection:	HMI interface, communications or digital IO

##### Other features

Display colour:	Upper display selectable green or red or change on alarm
Scrolling text:	Parameter help, custom messages
Display filter:	Off to zero last 2 digits
Peak monitor:	Stores high and low values

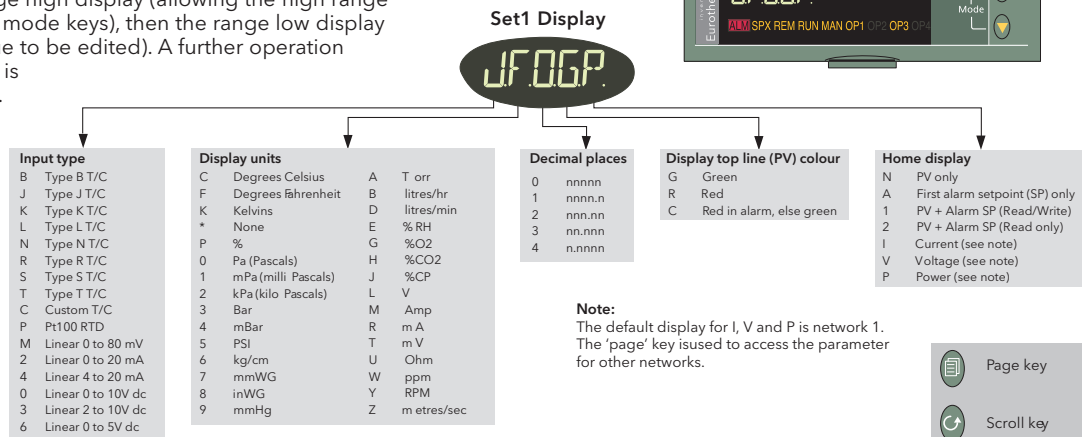
## 32h8e Initial configuration

At first switch on, after the start-up sequence, the initial configuration page is displayed.

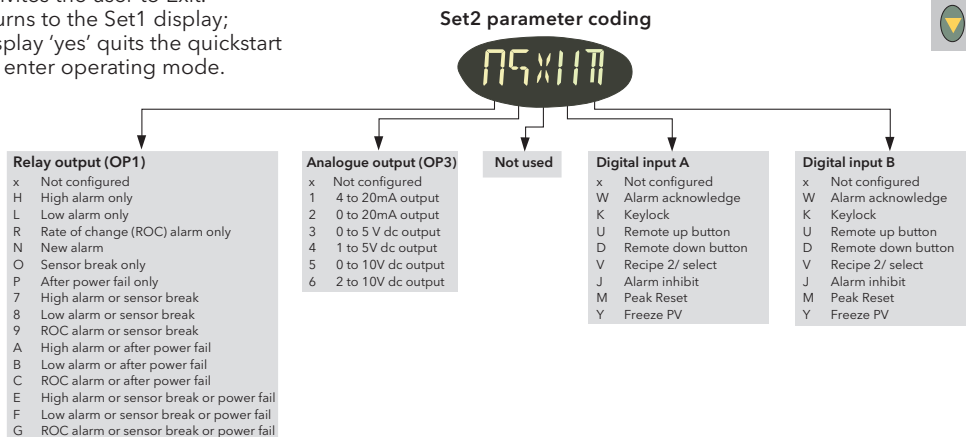
Note: the following 'quickstart' description applies only to new (not previously configured) instruments. If the instrument has previously been configured (either at the factory or subsequently) the instrument starts up showing the relevant process value.

The initial display shows 'Set1' on the top line, with a coded display below with its first item flashing. The lower line is decoded as shown in table.

The 'mode' (up/down arrows) are used to scroll through the available choices for each item. Once the required value is displayed, the scroll key is used to select the next character for editing. Once all five characters have been edited, further operations of the scroll key call the range high display (allowing the high range value to be edited using the mode keys), then the range low display (allowing the low range value to be edited). A further operation calls the Set2 display, which is decoded in the table below.



After Set2 parameters have been edited, a further operation of the scroll key invites the user to Exit. Operating the scroll key returns to the Set1 display; operating a mode key to display 'yes' quits the quickstart menu and causes the unit to enter operating mode.



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