# EPower™ MC controller

MODEL

invensys
Eurotherm

## Power management and control units

Specification Sheet

- Fully software configurable
- Predictive Load Management
- Current rating 800A to 2000A
- Voltage up to 690V ac
- All types of firing modes
- 1% measurement accuracy
- Large integral four row display
- Remote display option
- Multi-channel unit
- Event Log
- Optional I/O
- Modbus RTU
- Profibus DP
- DeviceNet® communication
- Ethernet (Modbus TCP)
- EtherNet/IP
- CC-Link
- Voltage, current and power control
- Complete diagnostics
- Energy counter
- Single phase Load Tap Changer

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 2000 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.

**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.

* Refer to factory

### Communication

Eurotherm has an approach to open communications, offering standard fieldbus networks such as Profibus DP, DeviceNet® EtherNet/IP and CC-Link 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 (Uimp) | 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

#### Power (at 40°C

**Caution**

Although the driver module supply voltage range is 85 to 265V ac, the fans (if any) fitted to the thyristor stacks are specified for use at one of 115V ac or 230V ac. It must be ensured that the utility supply voltage is suitable for the fan(s), otherwise, fan life may be shortened or the cooling effect may not be sufficient, either case presenting a possible hazard to the equipment or to the operator.

If the fan supply voltage is likely to fall by more than 10% below nominal, the maximum current of the stack must be derated by 25A from its 40 degC rating. Stacks should not be operated if the fan supply voltage falls by more than 15% of nominal.

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

Voltage range: 100 to 240 V ac (+10% - 15%)
Frequency range: 47 to 63 Hz
Power requirement: 60W
Installation Category: Installation category II (category III for relays)

Power Stack

Number of stacks: Up to three identical units per Driver Module.
Voltage range: 100 to 690 V ac (+10% - 15%).
Frequency range: 47 to 63 Hz
Nominal current: 800 to 2000 Amps according to model.
Power dissipation: 1.3W per Amp, per phase.
Rated short-circuit conditional current: 100kA
Cooling (remote thyristor stacks): Forced air (fan)
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.

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 11, 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

| **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) | 11.5 (25.6) |

Table 2 MC unit weights

Weights ± 50gm (2 oz)

| **Current** | **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 | 70 (154.3) | 113 (249.1) | 163 (359.4) |

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 |

#### Environment

Temperature limits Operating: 0°C to 50°C (apply to factory for derating information)
Storage: -25°C to 70°C
Humidity limits: 5% to 95% RH (non-condensing)
Altitude (maximum): 1000 metres
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 Pk; 6mS duration; 10 bumps
Vibration (EN60068-2-6): 67-150Hz 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: | ±16V or ±40mA |
| | – terminal: | ±1.5V or ±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) | | ±0.1% |
| Ambient temperature error (Note 3) | | <0.01%/°C |
| Input resistance (+'ve terminal to 0V) | | >140kΩ |
| Input resistance (–'ve terminal to 0V) | 150Ω | |
| Allowable voltage (–'ve terminal to 0V) | | ±1V |
| Series mode rejection of mains interference | 46dB | >30dB |
| Common mode dc rejection | 46dB | >40dB |
| Hardware response time | 5ms | |
| **Note 1:** w.r.t. to the relevant –'ve input<br>**Note 2:** w.r.t. total working span<br>**Note 3:** % of effective range (0 to 5V, 0 to 10V)<br>**Note 4:** 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) | | ±0.1% |
| Ambient temperature error (Note 2) | | <0.01%/°C |
| Input resistance (+'ve to –'ve terminal) | 235Ω | |
| Input resistance (–'ve terminal to 0V) | 150Ω | |
| Allowable voltage (–'ve terminal to 0V) | | <±1V |
| Series mode rejection of mains interference | 46dB | >30dB |
| Common mode dc rejection | 46dB | >40dB |
| Hardware response time | 5ms | |
| **Note 1:** w.r.t. total working span<br>**Note 2:** % of effective range (0 to 20mA)<br>**Note 3:** 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: | ±2A |

| Analogue output: Voltage output performance | | |
|---|---|---|
| **Parameter** | **Typical** | **Max/Min** |
| Total voltage working span (within ±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) | | <±0.1% |
| Ambient temperature error (Note 2) | | <0.01%°C |
| Minimum load resistance | | >800Ω |
| DC output impedance | | <2Ω |
| Hardware response time (10% to 90%) | 20ms | <25ms |
| **Note 1:** w.r.t. total working span<br>**Note 2:** % of effective range (0 to 5V, 0 to 10V)<br>**Note 3:** 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) | | <±0.1% |
| Ambient temperature error (Note 2) | | <0.01%°C |
| Maximum load resistance | | <550Ω |
| DC Output conductance | | <1µA/V |
| Hardware response time (10% to 90%) | 20ms | <25ms |
| **Note 1:** w.r.t. total working span<br>**Note 2:** % of effective range (0 to 20mA)<br>**Note 3:** After warm up. Ambient = 25°C | | |

Table 7 Analogue output specification table (current outputs)

### 10V supply (Potentiometer supply)

| | | |
|---|---|---|
| Output voltage: | | 10.0V ± 0.3V @ 5.5mA |
| Short circuit o/p current: | | 15mA max. |
| Ambient temperature drift: | | ± 0.012%/°C (typ); ±0.04%/°C (max.) |
| Absolute maxima | Pin 1: | (–0.7V or –300mA) or (+16V or +40mA) |

### Digital I/O

| | |
|---|---|
| Hardware response time: | 100µs |
| Voltage inputs | |
| Active level (high): | 4.4V<Vin<30V |
| Non-active level (low): | –30V<Vin<+2.3V |
| Input impedance: | 10kΩ |
| Contact closure input | |
| Source current: | 10mA min; 15mA max |
| Open contact (non active) resistance: | >500Ω |
| Closed contact (active) resistance: | <150Ω |
| Current source output | |
| Source current: | 9mA<$I_{source}$<14mA @ 14V<br>10mA<$I_{source}$<15mA @ 0V<br>9mA<$I_{source}$<14mA @ -15V |
| Open circuit voltage: | <14V |
| Internal pull-down resistance: | 10kΩ (to 0V) |
| Absolute maxima + terminal: | ±30V or ±25mA |
| - terminal: | ±2A |

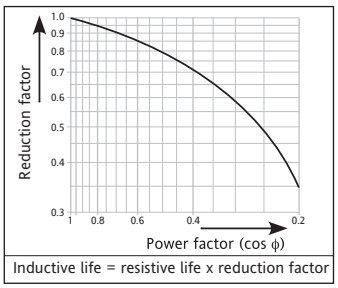
**Notes:**

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



Inductive life = resistive life x reduction factor

| | | |
|---|---|---|
| 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 |
| Watchdog relay (standard): | | 3-way connector on underside of driver module |
| Relays two to four (option): | | 12-way option module connector |
| 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 network waveform samples, taken at a rate of 20kHz.

Measurements on each network 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 network configuration, the phase voltage referred to is one of:

a. the line voltage referenced to neutral in four star,
b. the line voltage referenced to neutral or another phase for single phase or
c. 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 frequency (F): | ±0.02Hz |
| 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 ($I_{RMS}$): | ±0.5% of Nominal $I_{RMS}$ for current readings > 3.3% of Nominal $I_{RMS}$ Unspecified for readings ≤ 3.3% Nominal $I_{RMS}$ (see note) |
| Load RMS voltage squared (Vsq): | ±1% of (Nominal V)$^2$ |
| Load RMS current squared (Isq): | ±1% of (Nominal I)$^2$ |
| 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, Vsq Burst, VsqMax 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 Number | I/P Current/O/P Current | Iext Scale |
|---|---|---|---|
| 800A | CO180268 | 800A:5A | 800 |
| 1000A | CO180269 | 1000A:5A | 1000 |
| 1300A | CO180270 | 1250A:5A | 1250 |
| 1700A | CO180271 | 1750A:5A | 1750 |
| 2000A | CO180272 | 2000A:5A | 2000 |

Table 8 Current transformer specification

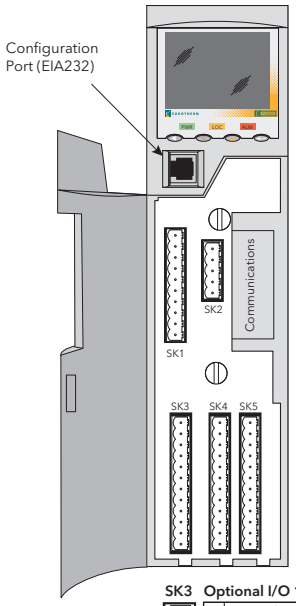
All current transformers to be accuracy class 0.5.
All current transformers to be able to operate continuously at up to 120% of specified input current.

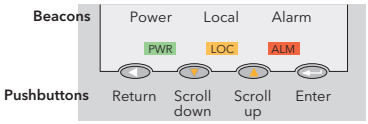
## Communications

| | | |
|---|---|---|
| CC-Link: | Protocol: | CC-Link version 1.1 |
| | Connector: | 5-way |
| | Indicators: | RUN and ERR |
| DeviceNet: | Protocol: | DeviceNet |
| | Connector: | 5-way |
| | Indicators: | Network Status and Module Status |
| Ethernet: | Type: | 10baseT (IEEE801) |
| | Protocol: | Modbus TCP |
| | Connector: | RJ45 |
| | Indicators: | Tx activity (green and communications activity (yellow) |
| EtherNet/IP: | Protocol: | EtherNet/IP |
| | Connector: | RJ45 |
| | Indicators: | NS (Network satus, MS (module status and LINK (Link status |
| Modbus RTU: | 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) |
| Profibus: | Protocol: | Profibus DPV1 |
| | Connector: | 9-way D type |
| | Indicators: | Mode and Status |

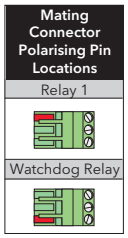
# Electrical Installation

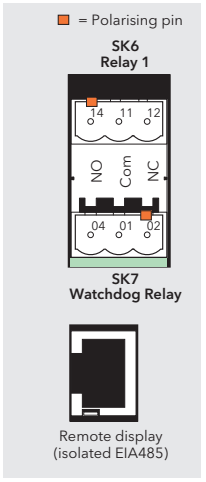
## Drive Unit Connectors




**Mating Connector Polarising Pin Locations**



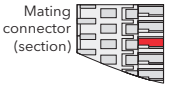

**SK1 Standard I/O**

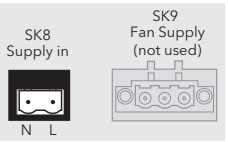
| | | |
|---|---|---|
| 1 | 1 | +10 Volts out |
| | 2 | Analogue i/p 1 + |
| | 3 | Analogue i/p 1 – |
| | 4 | Analogue i/p 2 + |
| | 5 | Analogue i/p 2 – |
| | 6 | Analogue o/p 1 + |
| | 7 | Analogue o/p 1 0V |
| | 8 | Digital i/o 1+ |
| | 9 | Digital i/o 2+ |
| 10 | 10 | Digital i/o 0V |

**SK2 Predictive Load Management Option**

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

= Polarising pin




**SK3 Optional I/O 1**

| | | |
|---|---|---|
| 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 | 12 | Relay 2 NC (22) |

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

**SK4 Optional I/O 2**

| | | |
|---|---|---|
| 1 | 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 | 12 | Relay 3 NC (32) |

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

**SK5 Optional I/O 3**

| | | |
|---|---|---|
| 1 | 1 | +10 Volts out |
| | 2 | Analogue i/p 5 + |
| | 3 | Analogue i/p 5 – |
| | 4 | Analogue o/p 4 + |
| | 5 | Analogue o/p 4 0V |
| | 6 | Digital i/p 7 + |
| | 7 | Digital i/p 8 + |
| | 8 | Digital 0V |
| | 9 | Not used |
| | 10 | Relay 4 NO (44) |
| | 11 | Relay 4 Com (41) |
| 12 | 12 | Relay 4 NC (42) |

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

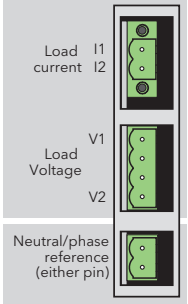
| Safety Earth Details | | |
|---|---|---|
| **Minimum earth cable cross section** | **Earth Terminal** | |
| | **Size** | **Tightening torque** |
| Same as Line/Neutral supply cables | M6 | 5 Nm (3.7 ft lb.) |

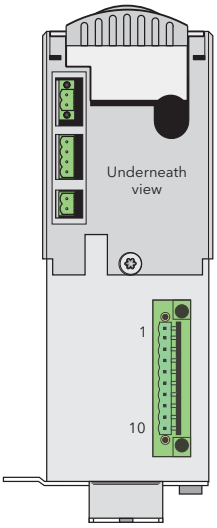
## MC Power Module

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

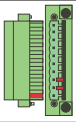
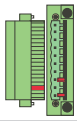
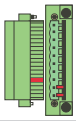
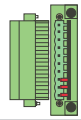
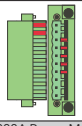
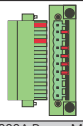
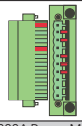
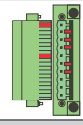
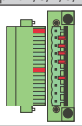
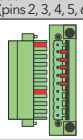
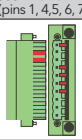
| | Module 1 | Module 2 | Module 3 | Module 4* |
|---|---|---|---|---|
| Current feedback connector | I2 / I1 | I1 / I2 | I1 + I2 / None | None / I1 + I2 |
| Voltage feedback connector | V1 / V2 | V2 / V1 | V1 + V2 / None | None / V1 + V2 |
| Neutral/ phase reference connector | | | | |

**External feedback connections**

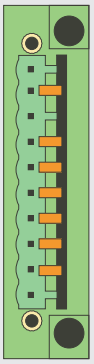


**Thyristor Stack Connector Polarising Pins**

| 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) | |
|  |  |  | |

**Connector for remote Thyristor Stack**



* Refer to factory

**Busbar conductor details**

| Max. Current | Line/Load Busbar fixing details | | | | Safety earth details | | |
|---|---|---|---|---|---|---|---|
| | Conductor cross section ('s') | Bolt Size | Bolts per busbar | Torque (ft lb) | Cross Section | Bolt Size | Torque (ft lb) |
| 800A | 2 x 50mm x 5mm (500mm²) | M10 | 2 | 40Nm (29.5) | 250mm² (s/2) | M8 | 15Nm (11.1) |
| 1000A | 2 x 60mm x 5mm (600mm²) | M10 | 2 | 40Nm (29.5) | 300mm² (s/2) | M8 | 15Nm (11.1) |
| 1300A | 2 x 100mm x 5mm (1000mm²) | M10 | 1 or 2 Phase 2 3 Phase 4 | 40Nm (29.5) | 250mm² (s/4) | M8 | 15Nm (11.1) |
| 1700A/ 2000A | 3 x 100mm x 5mm (1500mm²) | M10 | 6 | 40Nm (29.5) | 375mm² (s/4) | M8 | 15Nm (11.1) |

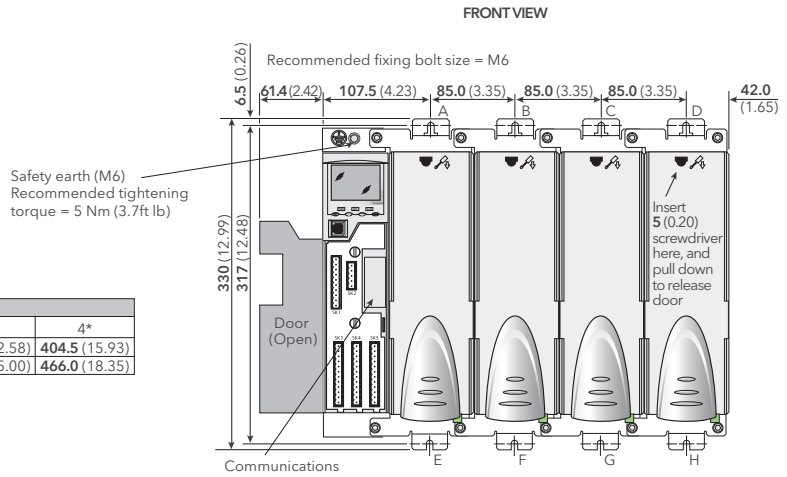
**Note 1.** The figures above are intended only as theoretical examples. The installation must comply with localsafety and emissions regulations in its entirety.

**2.** The current transformer should be chosen such that its full-scale output is 5 amps.

## Fixing Details

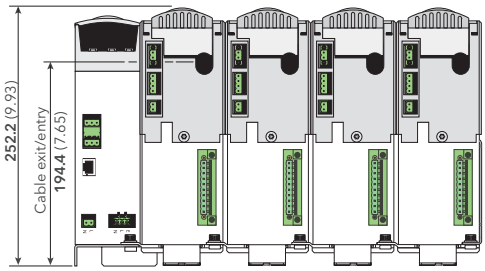
**Note:** Units are shown with individual mounting brackets. Multi-phase units come supplied with 2, 3 or 4 phase brackets as appropriate. See table below for details.

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 |



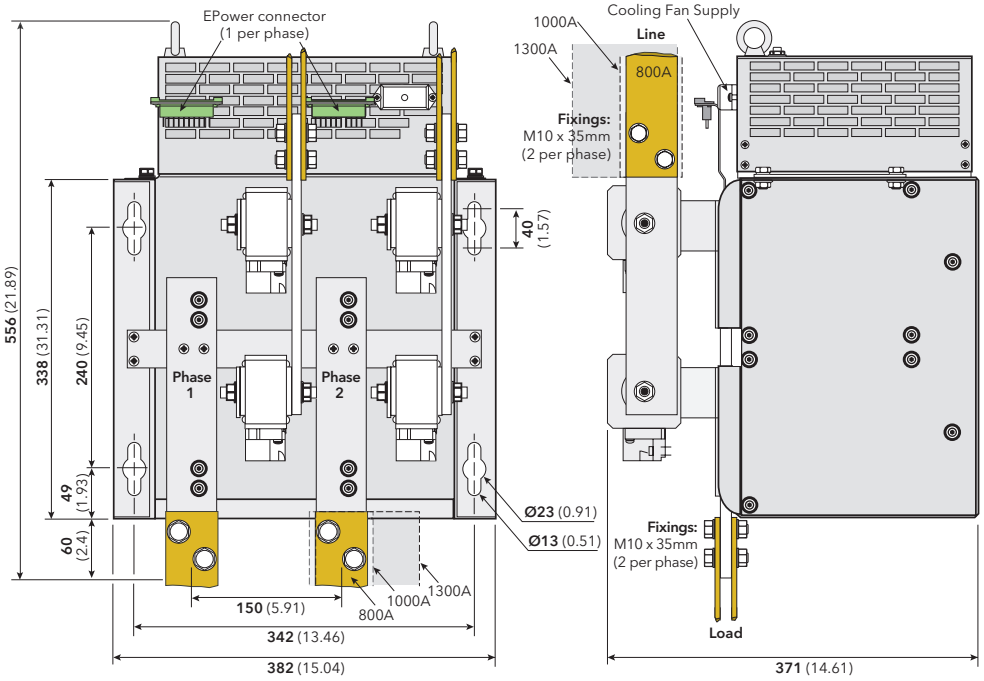

VIEW ON UNDERSIDE

* Refer to factory

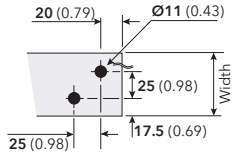
## Thyristor Stack Fixing Details

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

Dimension **mm** (inches)



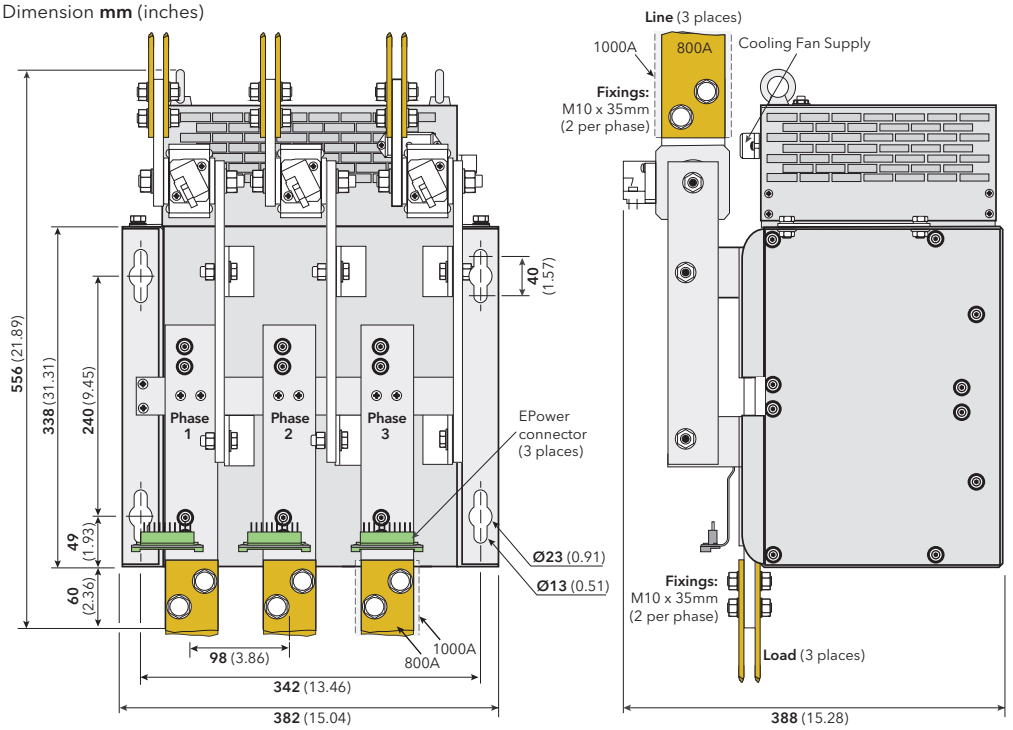

| Busbar details | |
|---|---|
| 800A | 2 x 50mm x 5mm |
| 1000A | 2 x 60mm x 5mm |
| 1300A | 2 x 100mm x 5mm |
| Fixings | 2 x M10 x 35mm |
| Tightening torque (ft lb) | 40Nm (29.5) |

| Busbar drilling details | |
|---|---|
|  | |
| Busbar width | 50mm (800A)<br>60mm (1000A)<br>100mm (1300A) |

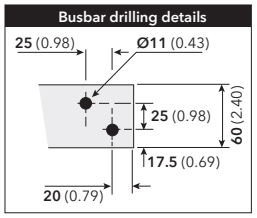
## Thyristor Stack Fixing Details (continued)

### 800/1000 Amp 3 Phase Units

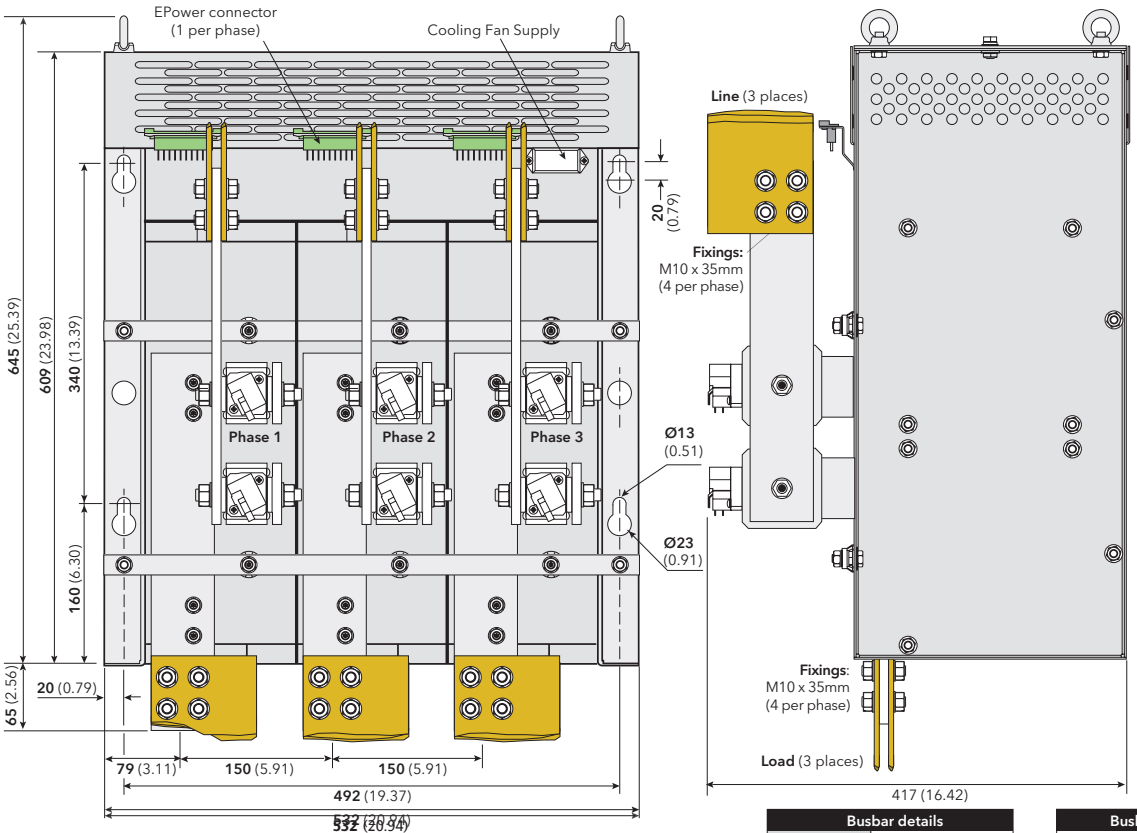
Dimension **mm** (inches)



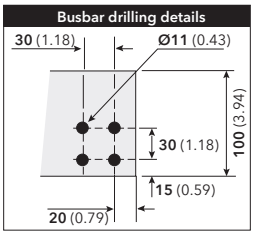

| Busbar details | |
|---|---|
| 800A | 2 x 50mm x 5mm |
| 1000A | 2 x 60mm x 5mm |
| Fixings | 2 x M10 x 35mm |
| Tightening torque (ft lb) | 40Nm (29.5) |




### 1300 Amp 3 Phase Units



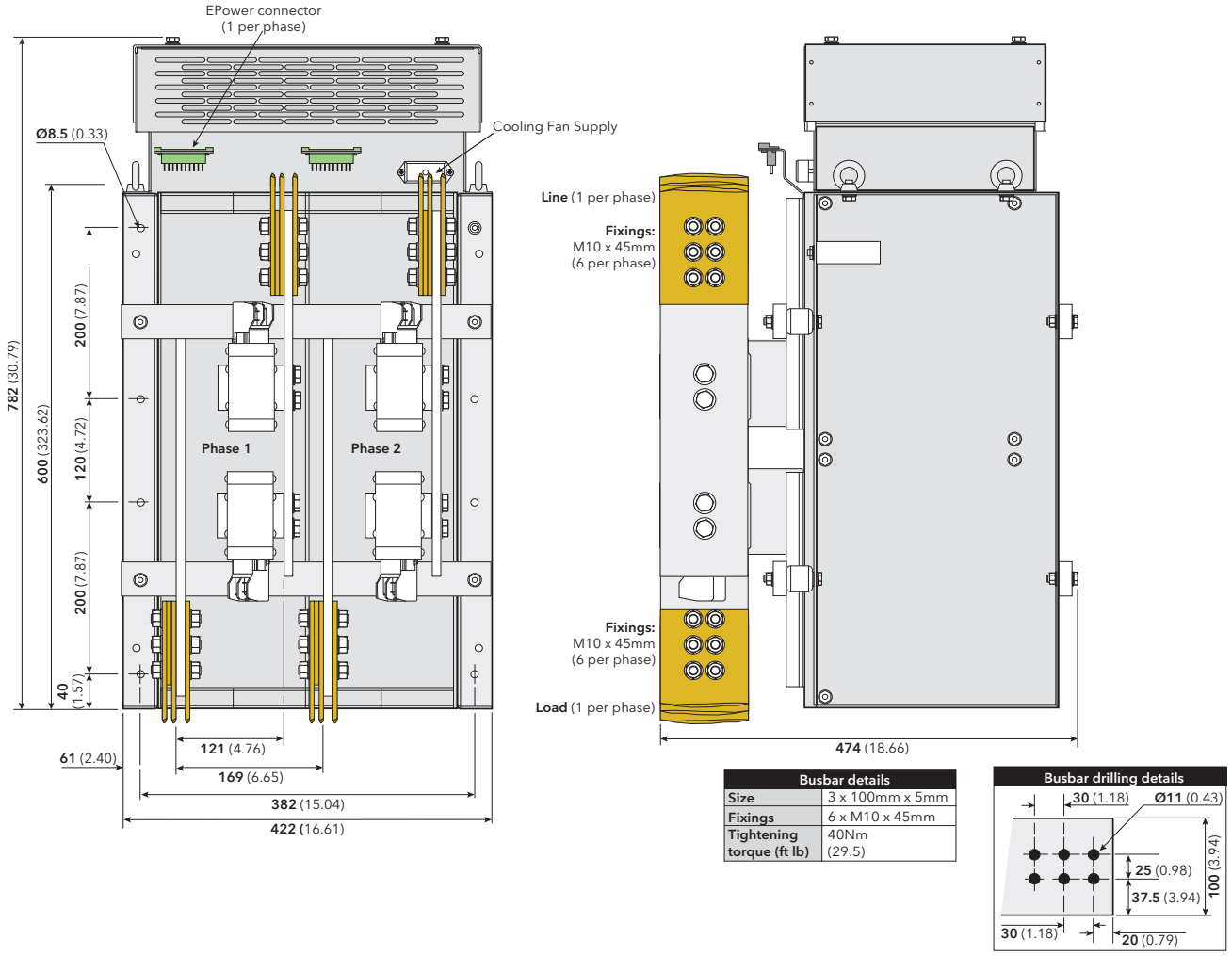

| Busbar details | |
|---|---|
| Size | 2 x 100mm x 5mm |
| Fixings | 4 x M10 x 35mm |
| Tightening torque (ft lb) | 40Nm (29.5) |



## Thyristor Stack Fixing Details (continued)

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

Dimension **mm** (inches)




| Busbar details | |
|---|---|
| Size | 3 x 100mm x 5mm |
| Fixings | 6 x M10 x 45mm |
| Tightening torque (ft lb) | 40Nm (29.5) |

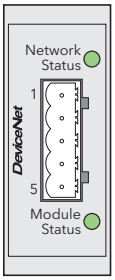



## Communications

### DeviceNet Connector Pinout

| 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) |



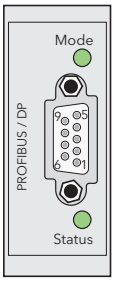

| Pin | Function |
|---|---|
| 1 | V- (negative bus supply voltage) |
| 2 | CAN_L |
| 3 | Cable shield |
| 4 | CAN_H |
| 5 | V+ (positive bus supply voltage) |

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

### Profibus Connector Pinout

| 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 |



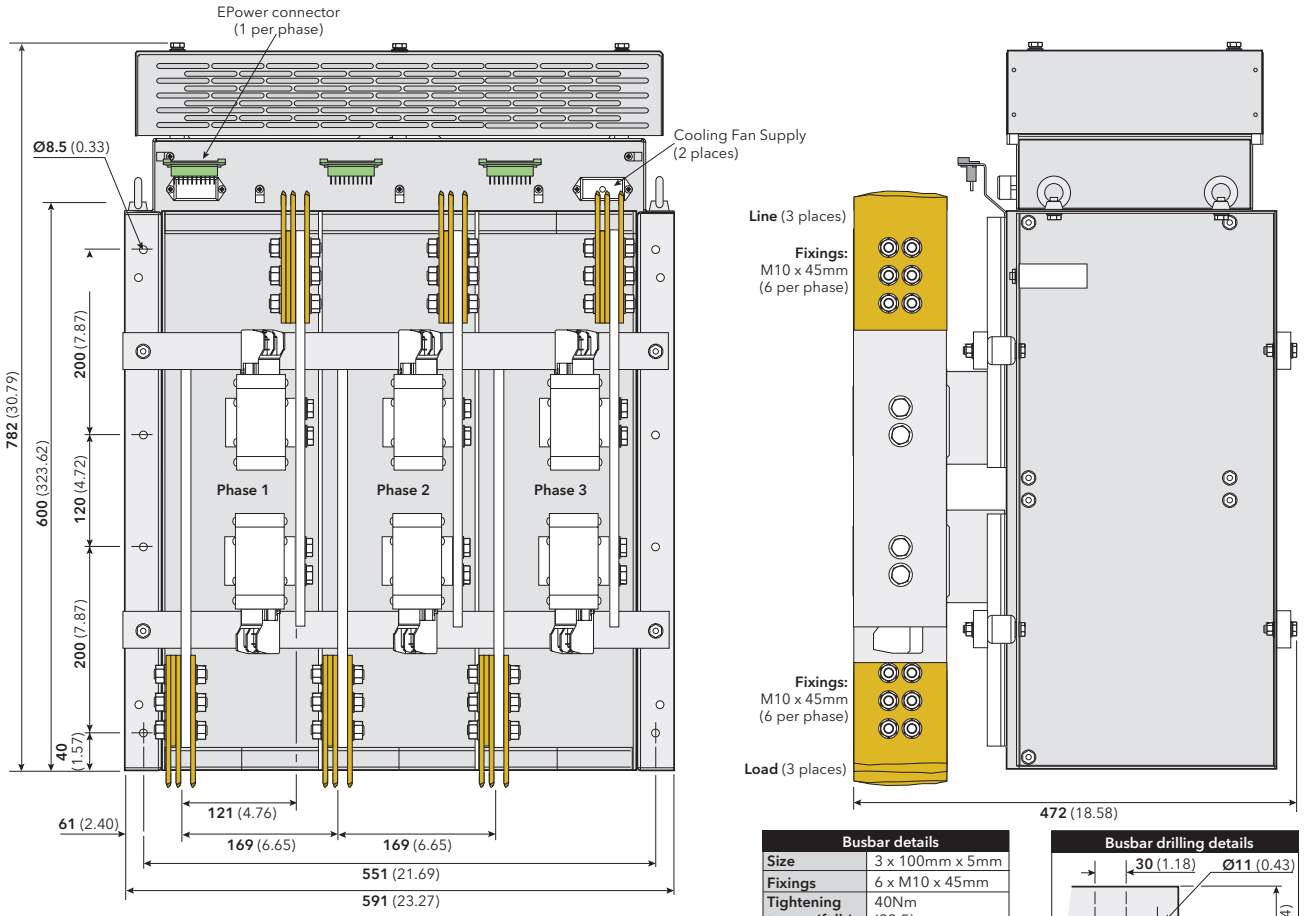

| Pin | Function | Pin | Function |
|---|---|---|---|
| 9 | N/C | 5 | Isolated ground |
| 8 | A (RxD-/TxD-) | 4 | RTS |
| 7 | N/C | 3 | B (RxD+/TxD+) |
| 6 | +5 V (1) | 2 | N/C |
| | | 1 | N/C |

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

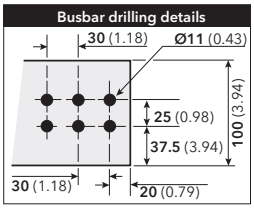
## Thyristor Stack Fixing Details (continued)

### 1700/2000 Amp 3 Phase Units

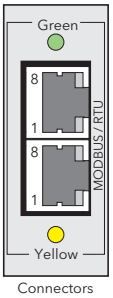
Dimension **mm** (inches)




| Busbar details | |
|---|---|
| Size | 3 x 100mm x 5mm |
| Fixings | 6 x M10 x 45mm |
| Tightening torque (ft lb) | 40Nm (29.5) |




### Modbus RTU Pinout




Connectors in parallel

| 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

### EtherNet/IP Connector Pinout

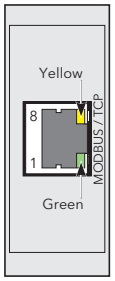
| NS (Network Status) LED Indication | |
|---|---|
| **LED state** | **Interpretation** |
| Off | No power or no IP address |
| Steady green | On-line, one or more connections established (CIP class 1 or 3) |
| Flashing green | On-line, no connections enabled |
| Steady red | Duplicate IP address, ('fatal 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 (Exeption-state, fatal error etc.) |
| Flashing red | Recoverable fault |

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

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

### Modbus TCP (Ethernet 10baseT) Pinout



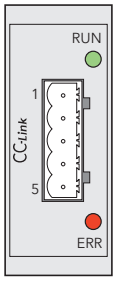

| Pin | Function |
|---|---|
| 8 | N/C |
| 7 | N/C |
| 6 | Rx- |
| 5 | N/C |
| 4 | N/C |
| 3 | Rx+ |
| 2 | Tx- |
| 1 | Tx+ |

LEDs:
Green = Tx activity
Yellow = Network activity

### CC-Link Connector Pinout

| 'RUN' LED Indication | |
|---|---|
| **LED state** | **Interpretation** |
| Off | Off-line orno 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 |



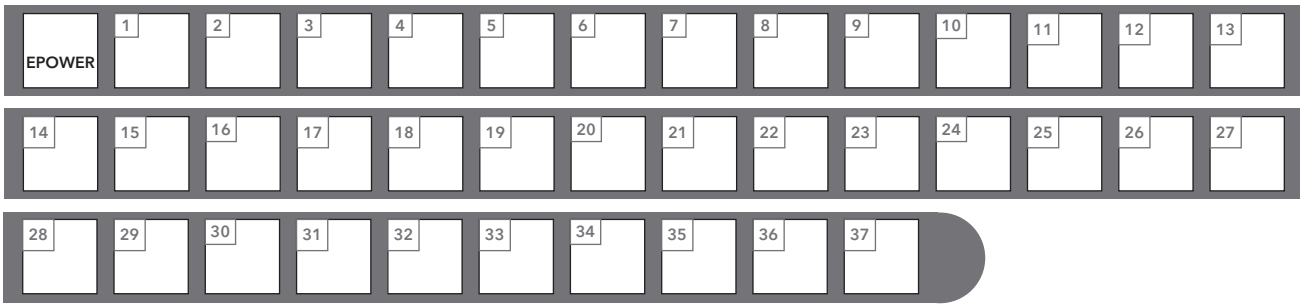

| Pin | Function | |
|---|---|---|
| 1 | DA (Rx+/Tx+) | 110R, 1/2W, 5% across pins 1 and 2 of first and last connectors |
| 2 | DB (Rx-/Tx-) | |
| 3 | DG (Signal ground) | |
| 4 | SLD (Cable Shield) | SLD and FG connected internally |
| 5 | FG (Protective Ground) | |

**Notes:**

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

## 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

| | |
|---|---|
| **EPOWER** | Power Controller |

### 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 |
| **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 |
| **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 |
| **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* |
| **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) |

### 2 Voltage

| | |
|---|---|
| **XXX** | For Driver mod only |

### 3 Fan Supply

| | |
|---|---|
| **230V** | 230V ac ≥160A |
| **115V** | 115V ac ≥160A |
| **XXX** | No fan ≤100A |

### 4 Warranty

| | |
|---|---|
| **XXX** | Standard |
| **WL005** | 5 Year |
| **USWL3** | US Extended |

### 5 Internal Use

| | |
|---|---|
| **XXX** | None |

### 6 Internal Use

| | |
|---|---|
| **XXX** | None |

### 7 Option

| | |
|---|---|
| **XX** | None - End of Code |
| **00** | Unit with options and/ or quick start definition |

### 8 Communications Protocol

| | |
|---|---|
| **XX** | No optional fieldbus communication |
| **Y2** | 2-wire 485 Modbus (RJ45 connector) |
| **PB** | Profibus-DPV1 (with D type connector) |
| **ET** | Modbus-TCP |
| **DN** | DeviceNet |
| **IP** | Ethernet/IP |
| **CC** | CC-Link |

### 9 Module 1

| | |
|---|---|
| **XX** | None |
| **IO** | IO optional board |

### 10 Module 2

| | |
|---|---|
| **XX** | None |
| **IO** | IO optional board |

### 11 Module 3

| | |
|---|---|
| **XX** | None |
| **IO** | IO optional board |

### 12 Predictive Load Management

| | |
|---|---|
| **XXX** | None |
| **PLM** | Predictive Load Management |

### 13 External Feedback

| | |
|---|---|
| **XX** | None - Standard unit |
| **XF** | External feedback* |

* Factory option

### 14 Remote Panel

| | |
|---|---|
| **XX** | None |
| **32ENG** | 32h8e English |
| **32FRA** | 32h8e French |
| **32GER** | 32h8e German |
| **32ITA** | 32h8e Italian |
| **32SPA** | 32h8e Spanish |

### 15 Software Option 1

| | |
|---|---|
| **XXX** | None |
| **EMS** | Energy Measurement (Counter) |
| **LTC** | Load Tap Changer |

### 16 Software Option 2

| | |
|---|---|
| **XXX** | None |
| **EMS** | Energy Measurement (Counter) |
| **LTC** | Load Tap Changer |

### 17 Not Used

| | |
|---|---|
| **XXX** | Default |

### 18 Quick Start

| | |
|---|---|
| **XX** | None - End of code |
| **QS** | Quick Start config |

### 19 Language

| | |
|---|---|
| **ENG** | English |
| **FRA** | French |
| **GER** | German |
| **ITA** | Italian |
| **SPA** | Spanish |

### 20 Load Current (nominal)

| | |
|---|---|
| **16A** | 16 Amps |
| **25A** | 25 Amps |
| **40A** | 40 Amps |
| **50A** | 50 Amps |
| **63A** | 63 Amps |
| **80A** | 80 Amps |
| **100A** | 100 Amps |
| **125A** | 125 Amps (Note 2) |
| **160A** | 160 Amps (Note 2) |
| **200A** | 200 Amps (Note 2) |
| **250A** | 250 Amps (Note 2) |
| **315A** | 315 Amps (Note 2) |
| **400A** | 400 Amps (Note 2) |
| **500A** | 500 Amps (Note 2) |
| **630A** | 630 Amps (Note 2) |
| **800A** | 800 Amps (Note 2) |
| **900A** | 900 Amps (Note 2) |
| **1000A** | 1000 Amps (Note 2) |
| **1150A** | 1150 Amps (Note 2) |
| **1300A** | 1300 Amps (Note 2) |
| **1500A** | 1500 Amps (Note 2) |
| **1700A** | 1700 Amps (Note 2) |
| **1850A** | 1850 Amps (Note 2) |
| **2000A** | 2000 Amps (Note 2) |

## 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

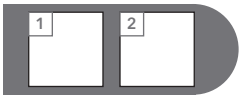
| | |
|---|---|
| XX | None – Load Management disabled |
| SH | Sharing |
| I1 | Incremental Type 1 |
| I2 | Incremental Type 2 |
| RI | Rotating Incremental |
| DC | Distributed Control |
| DI | Distributed Control and Incremental Control |
| RD | Rotating Distributed Control and Incremental Control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

## 37 Predictive Load Management Address

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

# Order codes

## External Stacks




## 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 |
| 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 |
| 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 |
| 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* |

## 2 Fan Supply

| | |
|---|---|
| 115V | 115V ac |
| 230V | 230V ac |

**SPARE FUSE FOR POWER MODULES**

| Power module rating | Fuse number |
|---|---|
| 800A | LA030447U002 |
| 1000A | LA030447U002 |
| 1300A | LA030448U002 |
| 1700A | LA030449U002 |
| 2000A | LA030449U002 |

*Notes*

1. *Stack not included.*
2. *The maximum nominal current selectable is the current rating selected in Field 1.*
3. *Only available if 690V selected in Field 2.*
4. *Selection dependent on number of Phases selected in Field 1.*
   *1PH = IP only*
   *2PH = IP or 2P only*
   *3PH = IP or 3P only*
   *4PH = IP or 2P only*
5. *Selection dependent on number of Phases selected in Field 1.*
   *1PH = 1P only*
   *2PH = 1P, 3S or 3D only*
   *3PH = Any*
   *4PH = 1P, 3S or 3D only*
   *If IP selected in Field 22 only option is IP.*
6. *PA not selectable if 2P selected in Field 22.*
   *HC not selectable if TR selected in Field 24.*
7. *Except XX the selection in Fields 28 and 30 cannot be the same.*

* Refer to factory

# 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.

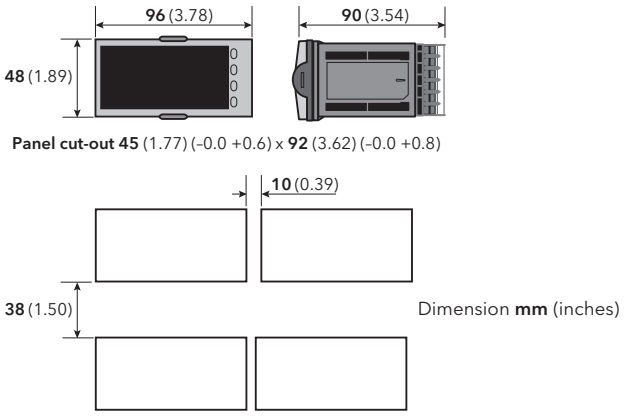
The 32h8e displays EPower Current, Voltage, Power and Setpoint parameters for each EPower Network. The Setpoint of the EPower networks can be adjusted via the 32h8e HMI. Indication of selected setpoint is included: local or remote.

### 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%

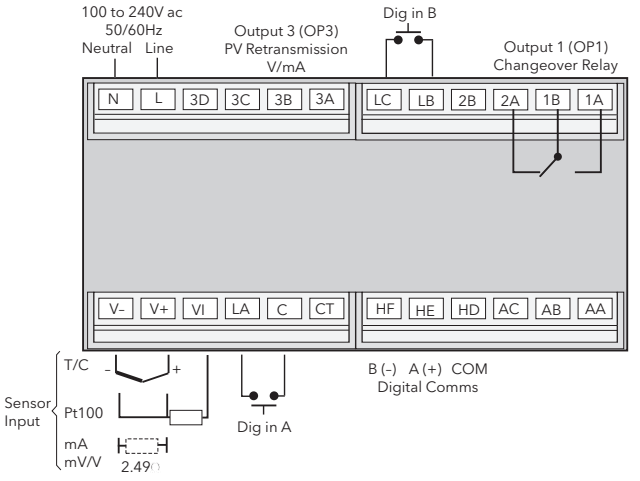
## Mechanical Details



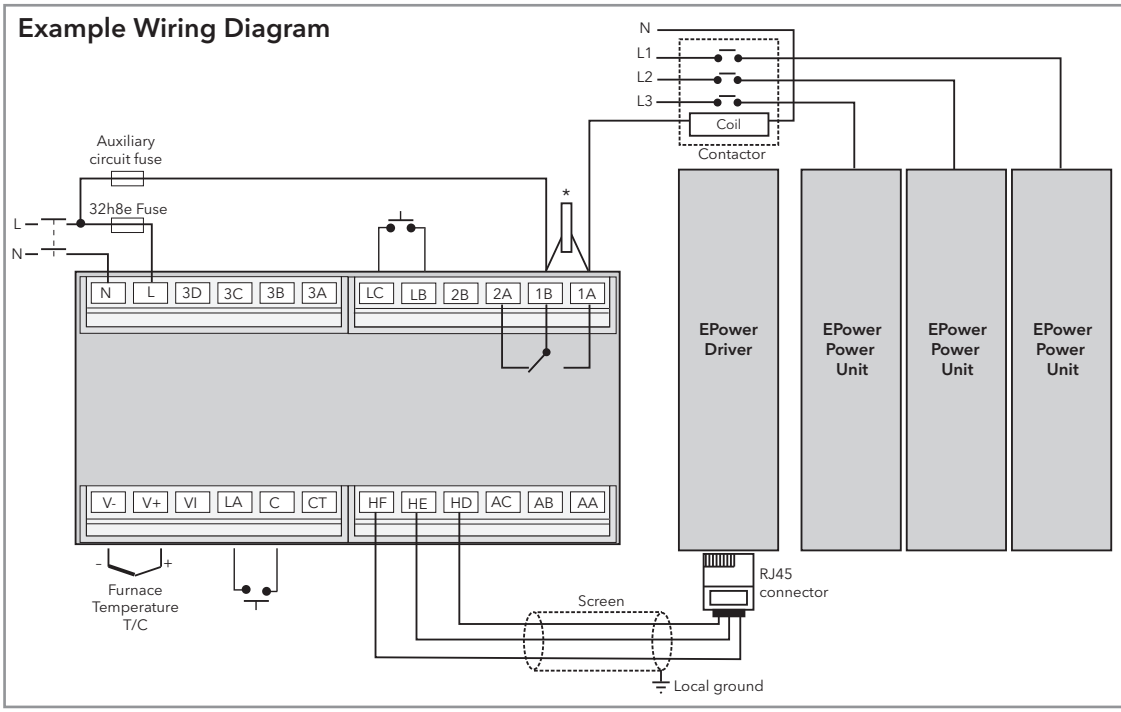

### Recommended minimum spacing

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 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)<br><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 apples only to new (not previously configured) instruments. If the instrument has previously been configured (either at the factory or subsequently) the instruments 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 usingthe 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.

**Set1 Display**

**Input type**

| | |
|---|---|
| B | Type B T/C |
| J | Type J T/C |
| K | Type K T/C |
| L | Type L T/C |
| N | Type N T/C |
| R | Type R T/C |
| S | Type S T/C |
| T | Type T T/C |
| C | Custom T/C |
| P | Pt100 RTD |
| M | Linear 0 to 80 mV |
| 2 | Linear 0 to 20 mA |
| 4 | Linear 4 to 20 mA |
| 0 | Linear 0 to 10V dc |
| 3 | Linear 2 to 10V dc |
| 6 | Linear 0 to 5V dc |

**Display units**

| | | | |
|---|---|---|---|
| C | Degrees Celsius | A | T orr |
| F | Degrees Fahrenheit | B | litres/hr |
| K | Kelvins | D | litres/min |
| * | None | E | % RH |
| P | % | G | %O2 |
| 0 | Pa (Pascals) | H | %CO2 |
| 1 | mPa (milli Pascals) | J | %CP |
| 2 | kPa (kilo Pascals) | L | V |
| 3 | Bar | M | Amp |
| 4 | mBar | R | m A |
| 5 | PSI | T | m V |
| 6 | kg/cm | U | Ohm |
| 7 | mmWG | W | ppm |
| 8 | inWG | Y | RPM |
| 9 | mmHg | Z | m etres/sec |

**Decimal places**

| | |
|---|---|
| 0 | nnnnn |
| 1 | nnnn.n |
| 2 | nnn.nn |
| 3 | nn.nnn |
| 4 | n.nnnn |

**Display top line (PV) colour**

| | |
|---|---|
| G | Green |
| R | Red |
| C | Red in alarm, else green |

**Home display**

| | |
|---|---|
| N | PV only |
| A | First alarm setpoint (SP) only |
| 1 | PV + Alarm SP (Read/Write) |
| 2 | PV + Alarm SP (Read only) |
| I | Current (see note) |
| V | Voltage (see note) |
| P | Power (see note) |

**Note:**
The default display for I, V and P is network 1. The 'page' key isused to access the parameter for other networks.

Page key

Scroll key

Mode keys

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 menuand causes the unit to enter operating mode.

**Set2 parameter coding**

**Relay output (OP1)**

| | |
|---|---|
| x | Not configured |
| H | High alarm only |
| L | Low alarm only |
| R | Rate of change (ROC) alarm only |
| N | New alarm |
| O | Sensor break only |
| P | After power fail only |
| 7 | High alarm or sensor break |
| 8 | Low alarm or sensor break |
| 9 | ROC alarm or sensor break |
| A | High alarm or after power fail |
| B | Low alarm or after power fail |
| C | ROC alarm or after power fail |
| E | High alarm or sensor break or power fail |
| F | Low alarm or sensor break or power fail |
| G | ROC alarm or sensor break or power fail |

**Analogue output (OP3)**

| | |
|---|---|
| x | Not configured |
| 1 | 4 to 20mA output |
| 2 | 0 to 20mA output |
| 3 | 0 to 5 V dc output |
| 4 | 1 to 5V dc output |
| 5 | 0 to 10V dc output |
| 6 | 2 to 10V dc output |

**Not used**

**Digital input A**

| | |
|---|---|
| x | Not configured |
| W | Alarm acknowledge |
| K | Keylock |
| U | Remote up button |
| D | Remote down button |
| V | Recipe 2/ select |
| J | Alarm inhibit |
| M | Peak Reset |
| Y | Freeze PV |

**Digital input B**

| | |
|---|---|
| x | Not configured |
| W | Alarm acknowledge |
| K | Keylock |
| U | Remote up button |
| D | Remote down button |
| V | Recipe 2/ select |
| J | Alarm inhibit |
| M | Peak Reset |
| Y | Freeze PV |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