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ZI Zirconia Input Module

Ch1: Thermo-couple input
Ch2: Zirconia probe input, 0 to 1800mV

RLY8 Eight-way Relay Module

Relays 1 and 5 shown; other relays similar.
Basic isolation between all relays.
No internal snubber circuitry fitted.

DO16 Sixteen-channel Digital Output Module

Two sets of 8 digital outputs; for each set, connect an external power supply across the respective P and C terminals. (The two C terminals are commoned internally.)
Recommended supply voltage (V_{CS}) = 24V \pm 20%
Logic 1: output voltage = V_{CS} - 1V (full load)
output current = 700mA (max.)
Logic 0: output voltage = < 1V
output current = 10mA
Choose fuses to suit overall load.
Use slow-blow fuses capable of withstanding inrush currents of 30A for 100ms
Note: Any plant-side power supply connected to a DO16 module must be capable of supplying an inrush current of 30A for 100ms.

AO2 Two-channel Analogue Output Module

The AO2 supports two independent channels, each configurable for either a nominal 0V to 10V range or a nominal 0mA to 20mA range.
In voltage mode the load resistance R_L must be 500 Ω or more.
In current mode the load resistance R_L must be 500 Ω or less.

DI6 Six-channel Digital Input Module

Logic inputs
Contact inputs

DI6 Six-channel Digital Input Module

Logic inputs
Contact inputs

AI2 Two-channel Analogue Input Module

AI2-TC: Thermocouple, mV
AI2-DC: mV (see Table 6)
AI2-MA: mA (see note)
AI2-RTD: RTD, Potentiometer

Note: Shunt resistors (5 Ω) for the mA option are mounted on the terminal unit.

Table 6: Voltage ranges for AI2-DC module

Channel	Input Range	Terminals
1	-150mV to +150mV	A1(+) & C1
2	-10V to +10V	H1(+) & C1
	0V to +1.8V	A2(+) & C2
	-10Vdc to +10V	H2(+) & C2

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AI3 Three-channel Analogue Input Module

Note: Use the C/I terminals for externally powered inputs. Use the P/C terminals when using the module's internal supply.
4 to 20mA
AI3 MA: 4 to 20mA transmitter
AI3 MV: \pm 150mV I/P
AI3 MA I/P: mA I/P

AI4 Four-channel Analogue Input Module

AI4 MA: mA I/P
AI4 MV: \pm 150mV I/P
AI4 MA I/P: mA I/P

AI8 High Density Analogue Input Module

Four different terminal unit variants are available—
AI8-RT: 4 x platinum resistance thermometer (RTD) inputs
AI8-MA: 8 x current inputs (standard & fast polling rate respectively)
AI8-TC: 8 x thermocouple inputs (with cold junction) or voltage (mV) inputs

AI12 Two-channel Analogue Input Module

AI12: 2 isolated channels of universal analogue input
AI13: 3 channels of mA input
AI14: 2 isolated pairs of analogue input
AI18: 8 channels mA, mV, or TC, or 4 channels RTD
AO2: 2 isolated channels of mA or V output
DI6 MV: Digital input, 6 channels, AC mains I/P 115V rms
DI6 HV: Digital input, 6 channels, AC mains I/P 230V rms
DO16: Digital input, 16 channels, logic/contact closure
RLY8: Relay output, 8 channels (n/o)
ZI: For use with a zirconia probe

Table 5: Module Polling Rates

Module	Standard (10ms)	Fast (1ms)
AI2	Yes	No
AI3	Yes	No
AI4	Yes	No
AI8	Yes	Yes
AO2	Yes	Yes
DI6 MV	Yes	Yes
DI6 HV	Yes	Yes
DO16	Yes	Yes
RLY8	Yes	Yes
ZI	Yes	No

† AI8-FMA variant uses fast polling rate only; other AI8 variants use standard rate only.

Table 6: Voltage ranges for AI2-DC module

Channel	Input Range	Terminals
1	-150mV to +150mV	A1(+) & C1
2	-10V to +10V	H1(+) & C1
	0V to +1.8V	A2(+) & C2
	-10Vdc to +10V	H2(+) & C2

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I/O MODULES: QUICK WIRING GUIDE

For full details, refer to the E+PLC400 Hardware Reference Guide (HA031923).

In the diagrams below, dashed and double lines indicate the following:
 --- Basic insulation. Defined as the insulation between conductive parts that is necessary only for the proper functioning of the equipment; may not provide protection against electric shock.
 Double insulation. This is defined as insulation between conductive parts, which provides protection against electric shock.

Module Polling Rates

† AI8-FMA variant uses fast polling rate only; other AI8 variants use standard rate only.

AI2 Two-channel Analogue Input Module

AI2-TC: Thermocouple, mV
AI2-DC: mV (see Table 6)
AI2-MA: mA (see note)
AI2-RTD: RTD, Potentiometer

Note: Shunt resistors (5 Ω) for the mA option are mounted on the terminal unit.

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AI8	Yes	Yes
AO2	Yes	Yes
DI6 MV	Yes	Yes
DI6 HV	Yes	Yes
DO16	Yes	Yes
RLY8	Yes	Yes
ZI	Yes	No

† AI8-FMA variant uses fast polling rate only; other AI8 variants use standard rate only.

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2	-10V to +10V	H1(+) & C1
	0V to +1.8V	A2(+) & C2
	-10Vdc to +10V	H2(+) & C2

BATTERY REPLACEMENT

The E+PLC400 contains a coin-cell battery, used to maintain the controller module terminal unit's volatile memory. The battery is user-replaceable. Eurotherm recommends replacing the battery every 12 months. For instructions refer to *E+PLC400 Hardware Reference Guide (HA031923)*.

PRODUCT DATA

Symbols

Symbols that may appear on the unit or its labelling are shown in Table 7:

Symbol	Meaning
	Refer to the user guide for instructions.
	Protective ground conductor terminal.
	Precautions against electrostatic discharge must be taken before handling this unit or any electronic component of it.
	This unit is RoHS compliant.
	For environmental reasons, this product must be recycled before its age exceeds the number of years shown in the circle
	Underwriters Laboratories listed mark for the United States and Canada
	This unit is CE compliant
	RCM. Regulatory Compliance Mark for Australia and NZ.
	Risk of electric shock

Table 7: Symbols used on the E+PLC400

Weight

Weights for various E+PLC400 hardware configurations are shown in Table 8.

Hardware Configuration	Weight
0-module backplane (including controller module) or 4-way backplane	0.7kg (1.54lb)
4-way backplane (with controller module and 4 x I/O modules)	1.65kg (3.64lb)
8-way backplane without modules	0.98kg (2.16lb)
8-way backplane with controller module and 8 x I/O modules	3.1kg (6.83lb)
16-way backplane without modules	1.6kg (3.53 lb)
16-way backplane with controller module and 16 x I/O modules	5.24kg (11.55lb)

Table 8: E+PLC400 weight

China RoHS

This certificate relates to the product models mentioned above. The data shown here is related to the following version of the China RoHS 2.0: "Administrative Measures for the Restriction of Hazardous Substances in Electric Appliances and Electronic Products" released January 21st 2016.

Part Name	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
金属部件 Metal parts	0	0	0	0	0	0
塑料部件 Plastic parts	0	0	0	0	0	0
电子元件 Electronic components	0	0	0	0	0	0
触点 Contacts	0	0	0	0	0	0
线缆和附件 Cables & cabling accessories	0	0	0	0	0	0

本表格依据SJ/T11364的规定编制。
O: 表示该有害物质在该部件所有均质材料中的含量均在GB/T 26572规定的限量要求以下。
X: 表示该有害物质在该部件的某一均质材料中的含量超出GB/T 26572规定的限量要求。

This table is made according to SJ/T 11364.
O: indicates that the concentration of hazardous substance in all of the homogeneous materials for this part is below the limit as stipulated in GB/T 26572.
X: indicates that concentration of hazardous substance in at least one of the homogeneous materials used for this part is above the limit as stipulated in GB/T 26572.

Signed: Kevin Shaw, R&D Director: *MSlow* Date: *24th June 2016*

Manufacturing Address

Eurotherm Ltd., Faraday Close, WORTHING, BN13 3PL, U.K.
Telephone: +44 1903 268500
Fax: +44 1903 265982
Web: www.eurotherm.com

All modules, including the Controller module, comply with the 40 Year Environment Friendly Usage Period.

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E+PLC400

Installation and Wiring Instructions

The E+PLC400 is a modular system which provides multi-loop PID control, analogue and digital input and output (I/O), signal conditioning and computational blocks using a variety of plug-in modules, configured by the CODESYS Development System software running on a PC.

The E+PLC400 hardware consists of a *backplane*, into which a number of *terminal units* are fitted, each of which has an associated *I/O module* plugged into it. Base units holding 0, 4, 8 or 16 modules are available.

The backplane is also fitted with one *Controller module*. This provides system configuration and communications support, with firmware, application and user files held on an integral SD card. If it becomes necessary to replace the Controller module, its SD card can easily be transferred from the old module to a new one, causing minimal disturbance to the system. The terminal units are specific to I/O module type and provide connectors for the termination of user wiring. They also provide interconnections between I/O modules and the Controller. The I/O Modules, which clip into the terminal units, are dedicated to specific analogue or digital inputs or outputs.

A suitable Power Supply is the 2750P, available as 1.3, 2.1, 5.0, or 10.0 amp units. Refer to the *E+PLC400 Hardware Reference Guide (HA031923)* for power consumption figures.

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MECHANICAL INSTALLATION

As shown in Figure 1 & Table 1, the E+PLC400 backplane is available in four sizes, accommodating 0, 4, 8 and 16 I/O modules respectively.

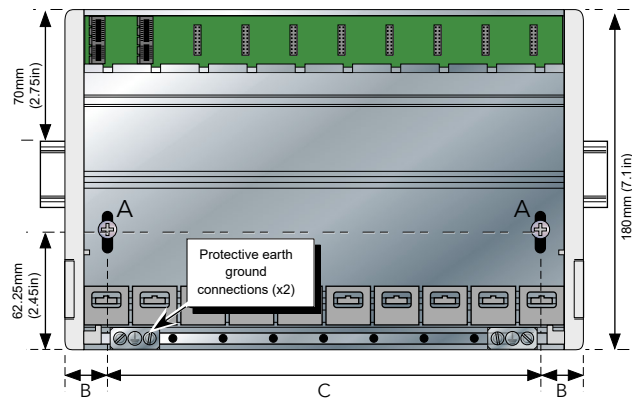


Figure 1: Backplane dimensions

Backplane	Dimension 'B'	Dimension 'C'	Depth
0 module	For all backplanes:	26mm (1.02in)	For all backplanes: 132mm (5.2in)
4 modules	22.5mm (0.8in)	127.4mm (5.02in)	(cover opening clearance: 160mm)
8 modules		229mm (9.02in)	
16 modules		432.2mm (17.02in)	(6.3in)

Table 1: Backplane dimensions

Mounting the backplane on a DIN rail

Use a horizontally mounted symmetrical DIN rail to EN50022-35X7 or EN50022-35X15.

- Mount the DIN rail horizontally, ensuring that it makes good electrical contact with the enclosure. Use a protective earth ground cable if necessary.
- Using a suitable Pozidriv screwdriver, loosen the base screws ('A' in Figure 1) and allow them and their associated base retention clips to drop to the bottom of the screw slot.
- Fit the instrument onto the top edge of the DIN rail, and use the screwdriver to slide the screws (A) and associated clips upwards as far as they will go towards the top of the screw slots.
- Ensuring that the angled edge of the base retaining clips locate behind the bottom edge of the DIN rail, tighten screws 'A'.

Mounting the backplane directly onto a panel

- Remove screws ('A') and their associated base retention clips.
- Hold the base horizontally on the panel and mark the position of the two holes on the panel (for centres, see Figure 1, above).
- Drill two 5.2mm holes in the panel.
- Using M5 bolts, nuts and washers, secure the base to the panel, ensuring that it makes good electrical contact with the enclosure. Use a protective earth ground cable if necessary.

EMC

The earthing strip at the lower edge of the backplane also provides termination facilities for EMC, cable screens etc.

To ensure compliance with the European EMC directive observe the following precautions:

For both methods of mounting (see above) the backplane must be in good electrical contact with a grounded metal (aluminium or steel) sheet which is part of the enclosure. If this contact is not possible, connect both ends of the DIN rail or both protective earth ground cable connections at the ends of the backplane, to the enclosure by two substantial earth braids (10mm x 2mm) not more than 100mm in length.

If these connections are not practical, clip ferrite clamps over the input leads, as near the terminal unit connector as possible. Several input pairs may be inserted through a single clamp. Clamps should have a minimum 200Ω impedance at 100MHz. A suitable clamp is Richco MSFC-13K.

Page 2

Fitting terminal units to the backplane

- As illustrated in Figure 2, locate the lug at the upper edge of the terminal unit into the slot in the base. (1)
- Press on the lower end of the terminal unit until it 'clicks' into place. (2)
- To remove a terminal unit, press the retention clip (3) to release the terminal unit and withdraw it from the slot in the backplane.

Fitting I/O modules

- Open the retaining lever on the face of the module (4).
- Insert the module (5), ensuring that it engages with the backplane and terminal unit connectors.
- Once secure, close the retaining lever.
- To remove a module, open the retaining clip and pull the module out of the backplane.

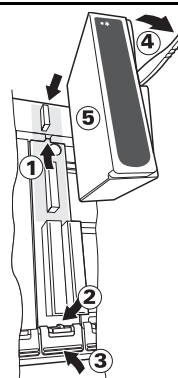


Figure 2: Fitting Modules

Fitting the Controller module

To insert the module, press it into place, ensuring that it engages with the backplane and terminal unit connectors. Use a 3mm flat-blade screwdriver to rotate the ¼ turn fastener clockwise. Use the opposite procedure to remove the module.

ELECTRICAL INSTALLATION

Installation Category & Pollution Degree

This product conforms with UL61010 and BS EN61010 installation category II and pollution degree 2. These are defined as follows:

- Installation category II: The rated impulse voltage for equipment on nominal 230V ac mains is 2500V.
- Pollution degree 2: Normally, only non-conductive pollution occurs. However, occasionally a temporary conductivity caused by condensation shall be expected.

Personnel

Installation must be carried out only by qualified personnel.

Enclosure of live parts

To prevent hands or metal tools touching parts that may be electrically live, the unit must be installed in an enclosure.

Blank Terminal Unit

Backplanes are supplied to hold zero, four, eight or 16 modules. If the backplane is not fully populated, then you must fit a blank terminal unit (part no. 026373) immediately to the right of the last I/O module, in order to maintain IP20 rating.

Equipment and personnel protection

- The designer of any control scheme must consider the potential failure modes of control paths and, for certain critical control functions, provide a means to achieve a safe state during and after a path failure.
- Separate or redundant control paths must be provided for critical control functions.
- System control paths may include communication links. Consideration must be given to the implications of unanticipated transmission delays or failures of the link.
- Each implementation of this equipment must be individually and thoroughly tested for proper operation before being placed into service.

Wiring

WARNING

Live sensors. The unit allows operation with temperature sensors connected directly to electrical heating elements. Ensure that nobody touches such connections whilst the connections are 'live'. Cables, connectors and switches for connecting 'live' sensors must be mains rated.

The unit must be connected in accordance with the wiring data given in this instruction sheet. Particular care must be taken not to connect AC supplies to low

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voltage inputs and outputs. Copper conductors must be used for all but thermocouple connections.

Wiring must comply with all local wiring regulations e.g. IEEE wiring regulations (BS7671) or NEC Class 1 wiring methods.

I/O module and controller module terminals accept wire sizes from 0.20 to 2.5mm² (14 to 24AWG). The screws should be tightened to 0.4Nm (5.3lbin) using a 3.5mm flat blade screwdriver.

For battery and watchdog connections, wire sizes are 0.12 to 1.5mm² (16 to 28AWG); tighten to 0.3Nm with a 2mm screwdriver.

Power Isolation

The installation must include a power isolating switch or circuit breaker. This device should be in close proximity (<1 metre) to the unit, within easy reach of the operator and marked as the disconnecting device for the instrument.

Earth Leakage Current

Earth leakage currents of up to 3.5mA may exist due to RFI filtering. This may affect the design of an installation of multiple units protected by Residual Current Device (RCD) or Ground Fault Detector (GFD) circuit breakers.

Over Current Protection

Eurotherm recommends the DC power supply to the system is fused appropriately to protect the unit's cabling. The instrument includes a fuse within the Controller module to protect the supply from a fault within the unit. Should this fuse rupture the Controller module must be returned to the supplier for repair.

Voltage Rating

The maximum continuous voltage applied between any of the following terminals must not exceed 300V RMS or dc:

- DI6 input or RLY8 relay output to logic, dc or sensor connections;
 - Any connection to ground
- The unit must not be wired to a three-phase supply with an unearthed star connection. Under fault conditions, such a supply could rise above 300V RMS or dc with respect to ground and the unit would not be safe.

Conductive Pollution

Electrically conductive pollution must be excluded from the enclosure in which the unit is mounted. To secure a suitable atmosphere in conditions of conductive pollution, an air filter must be fitted to the air intake of the enclosure. Where condensation is likely, a thermostatically controlled heater should be installed in the enclosure.

Installation requirements for EMC

To ensure compliance with the European EMC directive certain installation precautions are necessary. If using relay outputs it may be necessary to fit suitable filters depending on the type of load.

This unit should not be wired as part of a DC distribution network.

Power Supply Specification

Supply voltage: 24V dc ± 20%.

Reverse polarity protected

Power consumption: 82W max, per base.

The power consumption for each I/O module is stated on the module label also in *E+PLC400 Hardware Reference Guide* (HA031923).

CAUTION

The instrument will be damaged if a supply voltage exceeding 30V is applied.

Earthing: Safety (protective earth) conductor

The equipment must not be operated without a protective earth conductor first being connected to one of the earth terminals on the backplane. The earth cable should have at least the current rating of the largest power cable used to connect to the unit.

To connect the protective earth, a copper eyelet should be used with the screw and washer supplied with the backplane, tightened to a torque of 1.2Nm (10.6lbin).

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CONTROLLER MODULE TERMINAL UNIT:

SWITCHES AND CONNECTORS

Supply wiring

Figure 3 shows wiring details for supply and battery wiring and watchdog relays.

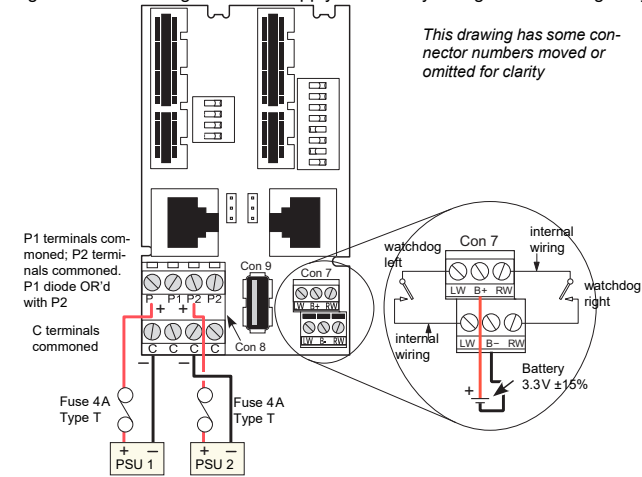


Figure 3: Supply wiring and watchdog relay details.

Switches

Currently, only the WR ('Watchdog Re-try') switch is utilized (Figure 4). All others are reserved.

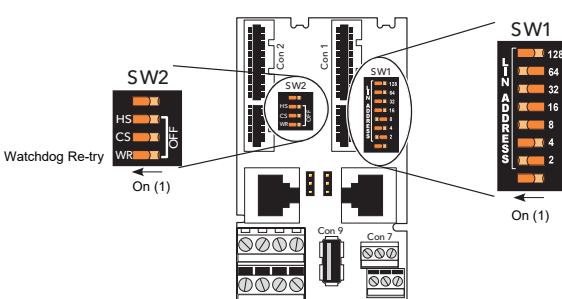


Figure 4: Controller Module switch locations

USB Connector (Con 9)

The USB connector is located between the power connectors and the battery/watchdog relay connectors as shown in Figure 3. USB hardware / software status LEDs are located at the front of the Controller module. The USB port is accessible from software via the path `/usb0`.

Page 5

Serial connectors (Con 5, Con 6)

These are a pair of RJ45 connectors located as shown in Figure 5. The connectors are in parallel to allow simpler daisy chaining. If this is the last instrument on the communications link, a terminator should be fitted to the unused connector. Two links (Con 3 and Con 4) allow the user to select 3-wire or 5-wire EIA 485.

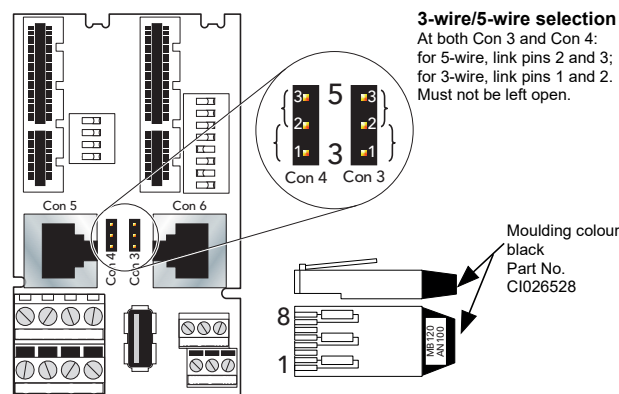


Figure 5: Serial connectors, configuration links and terminator

Pinout

The pinout for the serial communications connector is given in Table 2, below.

Pin	3-wire	5-wire
1	B	TxB
2	A	TxA
3	Com	Com
4	Not connected	Not connected
5	Not connected	Not connected
6	Com	Com
7	Not connected	RxB
8	Not connected	RxA

Table 2: serial connector pinouts

Ethernet comms port

The RJ45 connector is located on the underside of the Controller module. Pinout conforms to industry standard (Table 3). The E+PLC400 supports Ethernet auto-crossover and 100Mbps speed.

Pin	Signal
1	Tx+
2	Tx-
3	Rx+
4	Not connected
5	Not connected
6	Rx-
7	Not connected
8	Not connected

Table 3: Ethernet pinouts

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Status LEDs

A number of LEDs are located on the front of the Controller module. Brief details are given below; full details appear in the *E+PLC400 Hardware Reference Guide* (HA031923).

Symbol	'Power On' indicator	Watchdog	Watchdog status
X	Fault Indicator	Run	Indicates whether program is running.
+	Battery status	USB	Two LEDs: USB activity and fault indicators
C	Serial Comms status		Two LEDs: Ethernet speed and activity indicators
IP	IP resolution status		

Table 4: Controller Module LEDs

SOFTWARE REQUIREMENTS & INSTALLATION

The E+PLC is supplied with a software installation disc containing the CODESYS configuration environment, together with a set of Eurotherm extensions and features specifically designed for the E+PLC.

Operating System:

- Windows 8 / 10 (32/64 Bit), only the versions maintained by Microsoft are supported
- Microsoft Internet Explorer 11, or higher

Recommended System Properties:

- 2.5 GHz Processor, 8 GB RAM, 4 GB available HD space

COMMUNICATING WITH THE E+PLC400

In order to set up communications between the CODESYS software and the E+PLC400, please refer to the section of the Eurotherm E+PLC help within the CODESYS software called "Initial connection & connecting to E+PLC400".

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