E+PLC400

A Versatile, Precision PLC

... with the best in PID control and recording performance

E+PLC400 is a PID controller, recorder and PLC combined in a single, modular solution which is incredibly easy to engineer. Using an open industry standard (IEC 61131-3) platform and a single, integrated programming and visualisation environment, this innovative instrument is designed to offer flexibility to match process requirements while reducing engineering time. It is feature rich and gives an enhanced user experience which delivers operational efficiency, better process performance and easier regulatory compliance.

E+PLC400 combines full PLC functionality with unique Eurotherm control and recording capability made available in rapidly engineered function blocks. It is available in a choice of base sizes, is scalable to suit current and future process needs, and comes with a versatile range of precision I/O modules.

E+PLC400 uses CODESYS, a leading open platform, to provide a familiar programming environment with a range of IEC 61131-3 languages available to ensure ease of use. Easy, flexible visualisation is provided by the connection of up to two local operator panels as well as the ability to view the process via a web server on mobile devices such as PCs, tablets and smartphones; all quickly configured with automatic tag recognition within the same programming environment as the PLC.

- **Open PLC with easy control and recording**
  - Scalable, modular solution with single programming tool
  - Standard IEC 61131-3 programming
  - Single, integrated CODESYS programming environment offering PLC, PID control, recording and visualisation
  - Pre-validated, rapidly engineered function blocks
- **Precision PID control in a PLC**
  - Reduces processing times
  - Increases productivity
  - Optimises energy usage
  - Improves quality
  - Minimises scrap/re-work
- **Secure recording in a PLC**
  - Easier regulatory compliance
  - Accurate, stable control performance
  - Precision measurement of process variables
  - Secure data recording at point of measurement
  - Complete, accurate, traceable records
- **A PLC with integrated visualisation**
  - Visualisation programming integrated within the CODESYS environment
  - Intuitive process interface via up to two local operator panels
  - Mobile process viewing on PCs, tablets and smartphones

A modular, flexible, integrated solution

Eurotherm®

by Schneider Electric

All the pieces of your process puzzle with added versatility and scalability

Precision measurement

To control accurately, you need to measure precisely. The modular form of the E+PLC^{400} enables the incorporation of a versatile selection of precision I/O modules which enable accurate control and recording. Analogue and digital I/O, relay outputs and zirconia input are all available for inclusion in a selection of base sizes to exactly match application needs. Its high performance I/O gives accurate measurements, enabling tighter control and an exact historical record of a process.

A versatile solution for small to medium-sized applications

Best in control

E+PLC^{400} incorporates over 50 years of control knowledge including the unique Eurotherm auto-tuning PID algorithms that provide a superior control performance.

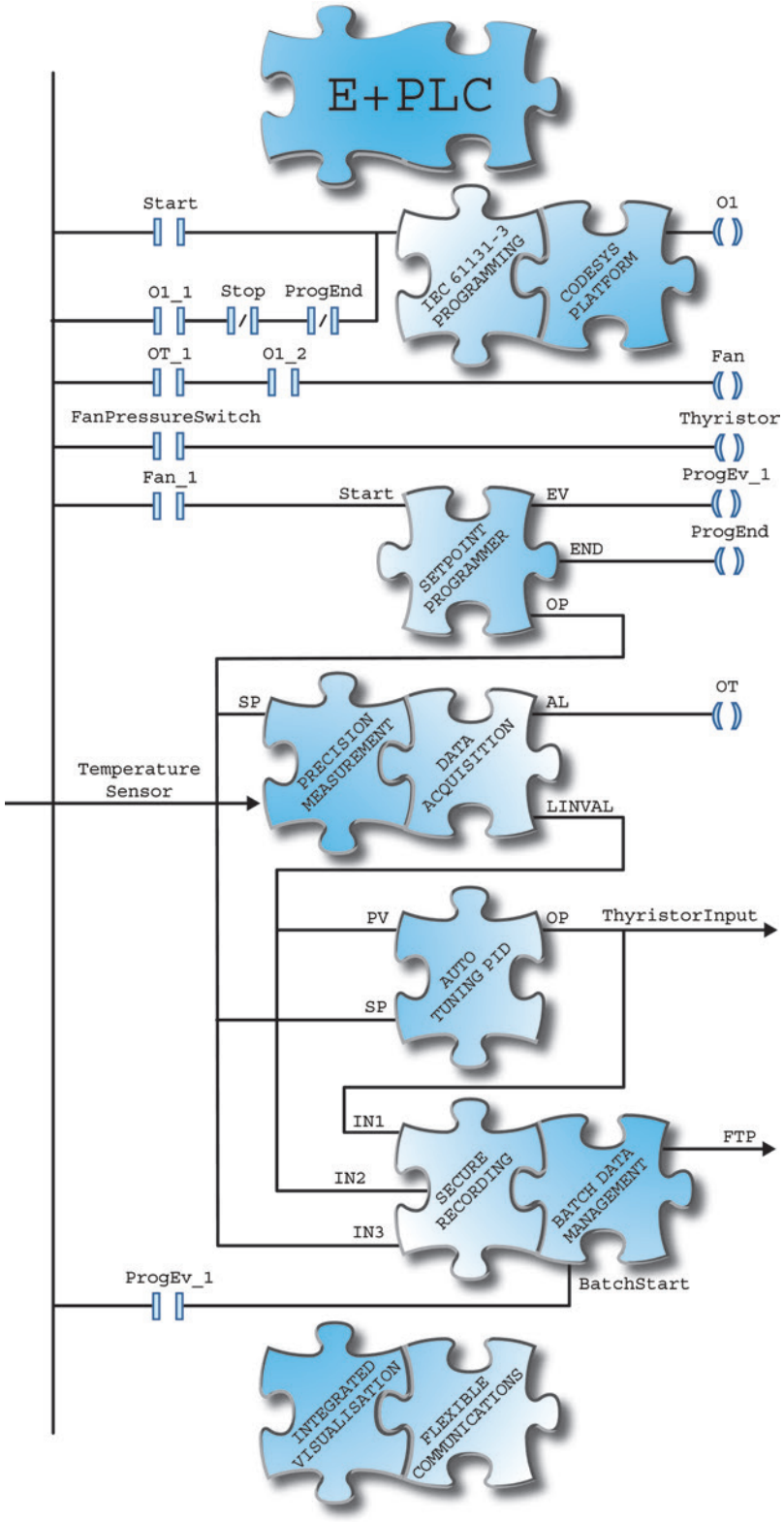
- Reduce process times by getting to the setpoint quickly
- Optimise energy usage by eliminating overshoot or undershoot while still providing rapid control response
- Improve quality by giving stable control performance with tighter tolerances
- Provided in pre-engineered function block form that you simply need to parameterise

Cost effective, superior control performance – why compromise?

Easy setpoint programming

Feature rich, the E+PLC^{400} includes highly flexible, easy to use setpoint programming. Using a spreadsheet style format, multiple programs with numerous segments can be quickly configured ensuring easy setup and improved operational efficiency.

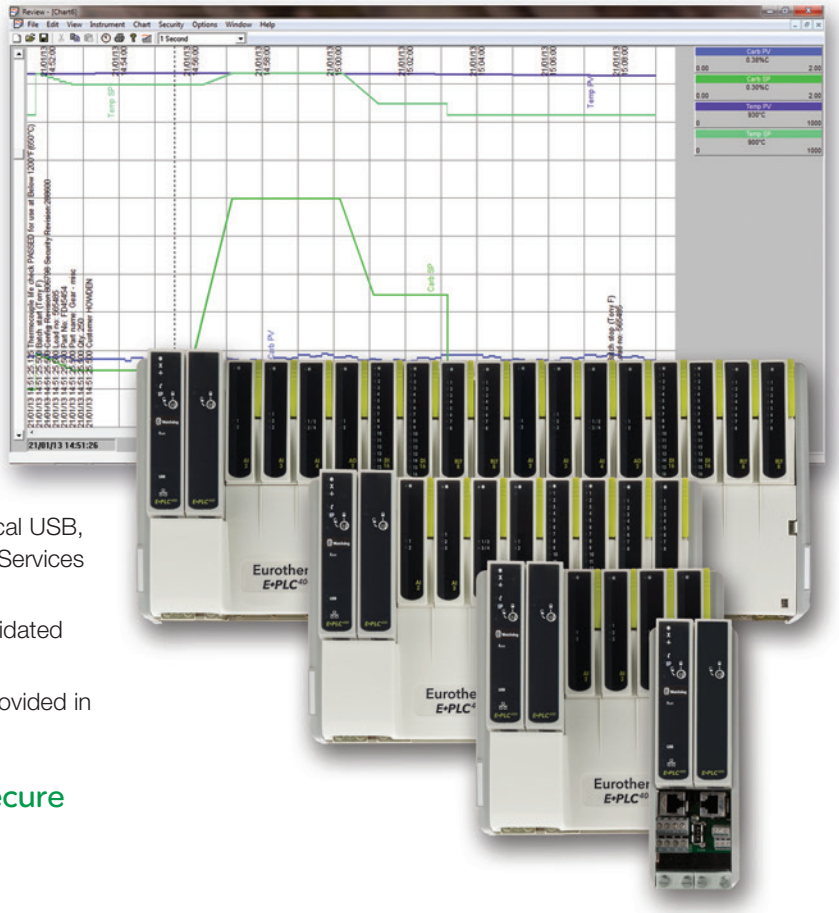
Guaranteed operation which can lower processing costs



Best in recording

E+PLC^{400} has integrated recording capability with highly efficient batch data management strategies to ensure total data integrity and security. It provides complete peace of mind by using decades of recording expertise to ensure compliance with both regulatory and quality standards through:

- Continual secure recording at point of measurement
- Incorporating power and network fail strategies ensure to complete data integrity
- Complete record/batch traceability with all process and metadata securely stored together
- Efficient archiving and data management using local USB, FTP servers and the innovative Eurotherm Online Services tool, EOS Director
- Archiving strategies providing self-healing, fully validated records
- Secure recording and batch data management provided in easily parameterised, function block form



Efficient data management of totally secure process records

Reduced engineering

The E+PLC^{400} uses the leading CODESYS platform to provide a familiar programming environment and reduce engineering costs. Complete solutions are built in this single, integrated environment. It incorporates advanced Eurotherm PID control and recording capability in the form of easy to use function blocks along with the integrated design of visualisation elements. E+PLC^{400} offers you a complete, high performance PLC solution for your process, designed for rapid engineering and versatile application.

Programming tools which will reduce your engineering time include:

- Rich functionality in easy to use function blocks
  - Auto-tuning PID control
  - Secure recording
  - Batch data management
  - Setpoint programmer
  - Zirconia probe input
- Comprehensive inbuilt PLC function block libraries
- A single, integrated programming environment to engineer a complete, scalable process solution, including PLC, PID control, recording and visualisation

Creating a complete, high performance scalable PLC solution has never been easier

E+PLC^{400} uses standard IEC 61131-3 programming languages

Continuous Function Chart (CFC)
Function Block Diagram (FBD)
Instruction List (IL)
Ladder Diagram (LD)
Sequential Function Chart (SFC)
Structured Text (ST)
Inbuilt visualisation objects

CODESYS

Runtime
Visualization
Fieldbus

Easy system integration and efficient process management

E+PLC^{400} is designed for easy integration into wider systems with simultaneous support of Modbus TCP and RTU master or slave and EtherCAT* communications. It can write to and record data from slave devices and is easily combined with other system components such as power controllers and discrete control instruments.

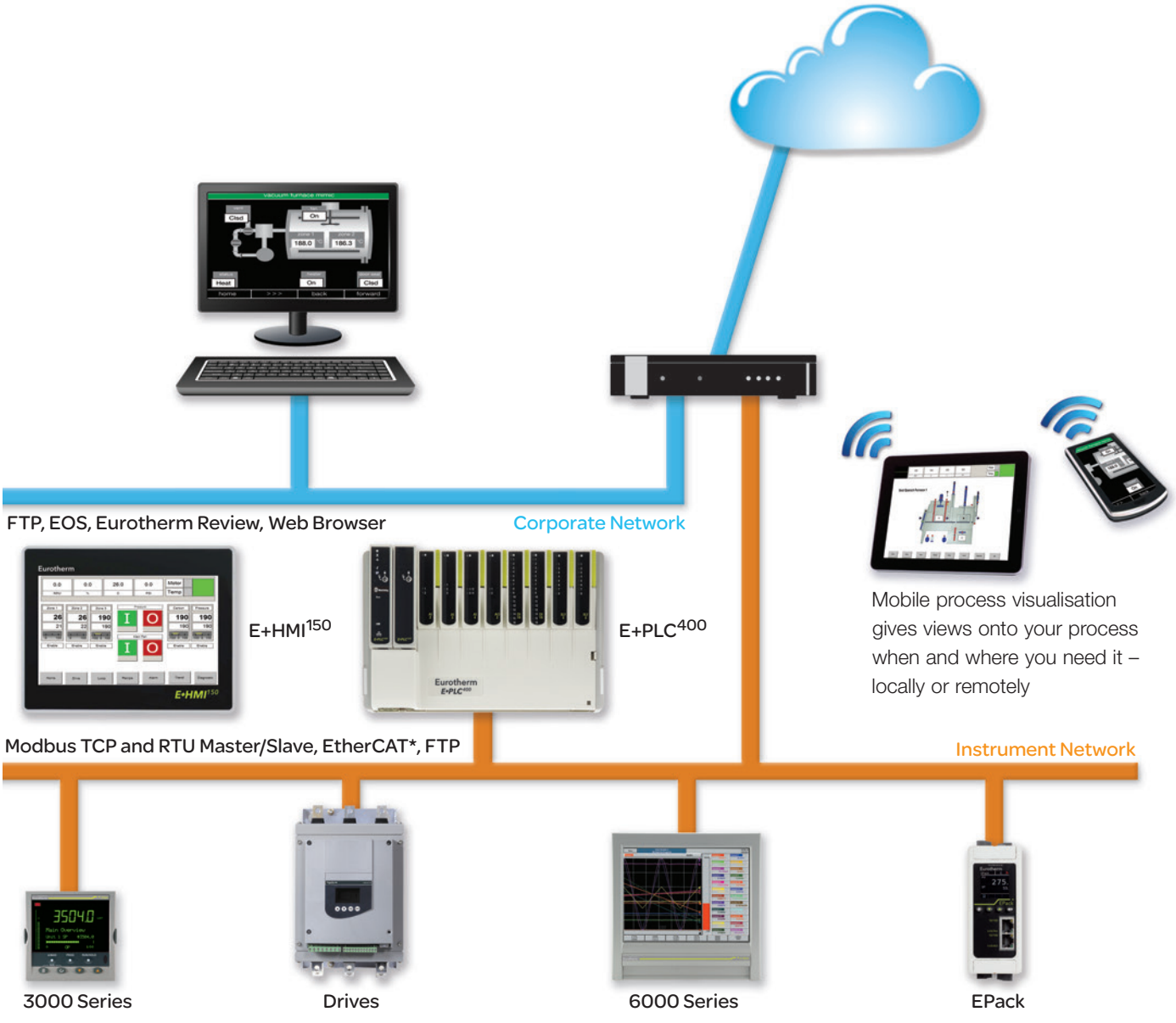
The powerful network capability of the E+PLC^{400} is also utilised for secure archiving strategies to multiple FTP servers and/or to the highly efficient EOS online data management services. It further provides the ability to view and manage your process when and where you need by utilising any web browser.

EOS Director:

- Secure offsite storage of long-term historical records
- Efficiently manage, search and analyse data
- Secure access when and where you need it

EOS Advisor:

- Efficient online management of calibration and accreditation data
- Designed to increase plant availability



Mobile process visualisation gives views onto your process when and where you need it – locally or remotely

* Contact factory for availability

E+PLC400 Specification

Base Unit

General

The base unit is fitted with the E+PLC400 processor module plus additional I/O modules. These modules plug onto terminal units, which provide the wiring interface between the plant or machine and the I/O modules. Bases are available in 4 sizes to suit the number of modules required in a particular system.

Communication between the I/O modules and the processor is effected by the use of a passive internal module I/O bus running along the width of the base.

Each module position is tracked separately for additional security during live replacement of I/O modules.

The base consists of an aluminium extrusion, the internal I/O bus and mounting supports. It is designed to be DIN rail mounted or directly fixed to a bulkhead or mounting plate.

Mechanical

Based on the number of modules and allowing for future expansion, the E+PLC400 can be supplied in a range of standard base sizes to suit process requirements. The dimensions and weights of the different base sizes are detailed in the table below:

Module Capacity (Base Size)	0	4	8	16
Weight (no modules) kg	0.2	0.7	1.0	1.6
Weight (all modules) kg	0.7	1.65	3.1	5.3

Mounting:	DIN rail or Bulkhead, mounted vertically
DIN rail:	Use symmetrical DIN rail to EN50022 (35 x 7.5 or 35 x 15)
Casing:	Without additional protection IP20
Ventilation space:	25mm free space above and below

Controller General

Supply voltage range:	24V dc ±20%
Power consumption:	< 82W maximum for fully loaded rack
Fuse rating:	0.5A time lag (Not customer replaceable)
Surge current:	8A maximum
Module power consumption:	See individual module specification

Environmental

Operating temperature:	0 to 55°C
Storage temperature:	–25°C to 85°C
Relative humidity:	5 to 95% (non-condensing)

Approvals and compliance

RoHS:	EU; China
GOST:	GOST CUTR
CCC:	Exempt
Packaging:	BS61131-2: 2007 section 6.3.3/6.3.4
Shock/Vibration:	To BS EN61131-2 : section 4.2.1 (5 to 150 Hz. at 1g; 0.5 octave per min.)
Altitude:	<2000 metres

RFI

EMC emissions:	BS EN61326 – 1: 2006 Class A
EMC immunity:	BS EN61326 – 1: 2006 Industrial Locations

Safety

BS EN61010-1:2010
Installation cat II, Pollution degree 2
Safety earth and screen connections are made to earth terminals at the bottom of the base
CE and cUL

Diagnostic LEDs

Diagnostic LEDs indicate module diagnostic status.

All modules:	A green LED at the top indicates the module is powered and operating correctly
Analogue modules:	Red LEDs for each channel to indicate channel failure
Digital modules:	Yellow LEDs for each channel to indicate the channel state

Processor Module

Processor and communications diagnostics are available from the LEDs on the front of the processor module. More advanced diagnostics are available remotely using the CODESYS function blocks.

Controller module:	A green LED at the top indicates the module is powered and operating correctly
Internal diagnostics:	A red LED indicates failure of the internal self diagnostic routines or an abnormal operating state.
Battery (if installed):	A green LED indicates battery health
Serial communications:	A yellow LED indicates communications activity
IP address:	A yellow LED indicates if the unit has resolved it IP address for Ethernet communications
Run:	A green LED indicates a program is loaded and running
USB link:	A green LED indicate USB activity, periodic flashing shows an error
USB over-current indication:	A yellow LED indicates an over current error
Ethernet link:	A yellow LED indicate Ethernet link and flashes to show activity
Ethernet Link speed:	A green LED indicates 100Mbs operation

Power on Self Tests: On power up the E+PLC400 automatically performs Power On Self Tests. These are a series of diagnostic tests used to assess the instrument health. The above LEDs indicate module diagnostic status in case of a problem.

Removable SD Memory Card

The storage of the processor firmware, and application is stored on a secure SDHC card this enables easy transfer from one processor to a replacement.

Physical

CPU:	Freescale Power QUICC II Pro processor MPC8313
Bus Size:	32 bit
System Clock:	333 MHz
Logging Capacity:	96MB on board, Log files transferred by FTP or USB
Removable SDHC Card Size:	32 Mbytes
USB:	USB 2.0 connected on terminal unit
Memory Resources	76MB Application/Visualisation files 106MB Data Recording 2MB Retain/Persistant
Control Switches:	Processor front panel
Push Button Switches:	Watchdog reset

Watchdog Relays

Each processor is fitted with a single watchdog relay.

Watchdog relay:	SPST, 1 per CPU, connected on the terminal unit
Contact rating (resistive):	24V ac/dc at 0.5A
Isolation:	30V ac rms or 60V dc

Communications

Ethernet

Supports 10/100baseT Ethernet:	Modbus-TCP Master or Slave, EtherCAT*
Connectors:	RJ45 connector
Network medium:	Ethernet Cat5 shielded cables
Speed:	10/100baseT auto-select
Line length (maximum):	100 metres, extendible by repeater
Allocation of IP address:	Fixed, DHCP
Modbus:	TCP configurable master or slave
Max numbers of slaves:	16 Modbus TCP slaves
Isolation:	50V dc; 30V ac (IEEE802.3)

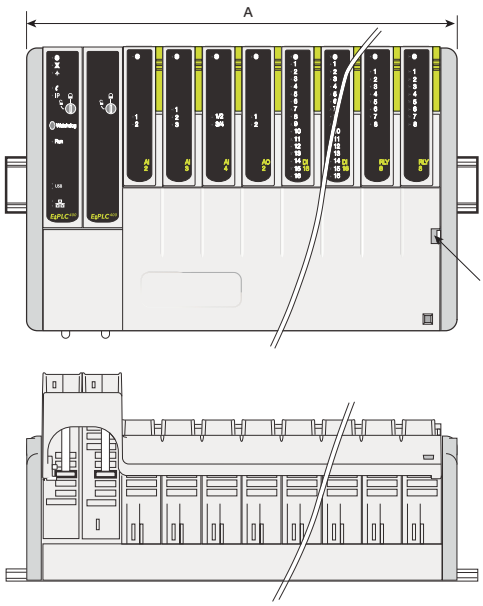
RS422/485 Serial Communications

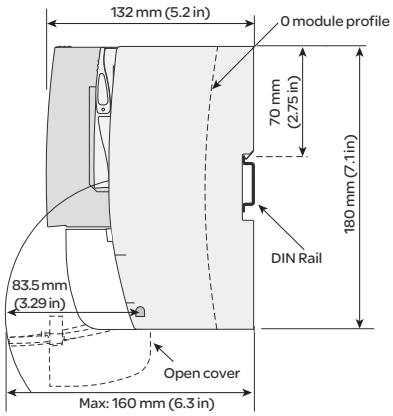
Connector:	RJ45 connector
Comms medium:	RS422 (5-wire) or RS485 (3-wire), jumper select
Line impedance:	120Ω-240Ω twisted pair
Line length:	1220m maximum at 9600 bits/sec
Max number of slaves:	16 Modbus RTU Slaves
Protocol:	Modbus RTU configurable master or slave

Note: Use of a communications buffer/isolator is recommended.

Mechanical details

Base Size	A mm (inches)
0 module	61.25 (2.41)
4 module	162.75 (6.41)
8 module	274 (10.8)
16 module	477 (18.8)





Input/Output Modules

Code	Description	Page
AI2-DC	Two Channel Analogue Input Module	7
AI2-TC	Two Channel Isolated TC Input Module with CJC	7
AI2-MA	Two Channel Isolated Analogue Input Module with 5Ω shunt fitted for mA inputs	8
AI3	Three Channel Isolated 4-20mA analogue input module with 24V Tx PSU	8
AI4-TC	Four Channel Isolated in pairs, TC, with CJC	8
AI4-MA	Four Channel Isolated in pairs, mA Input Module	9
AI4-MV	Four Channel Isolated in pairs, mV Input Module	9
AI8-RT	Four Channel Isolated RTD Input Module*	9
AI8-TC	Eight Channel TC with CJC (isolated in pairs)*	10
AI8-MA	Eight Channel mA Input Module (isolated in pairs)*	10
AI8-FMA	Fast Eight Channel Isolated mA Input Module 20ms*	10
AO2	Two Channel Isolated DC (V or mA) Output Module	11
DI6-230V	Six Channel High Voltage Logic (230V ac) Input Module	11
DI6-115V	Six Channel High Voltage Logic (115V ac) Input Module	11
DI16	Sixteen Channel Digital Input Module	12
DO16	Sixteen Channel Digital Output Module	12
RLY8	Eight Channel Relay Output Module	13
ZI	Zirconia Input Module	13

* Contact factory for availability

T/C Type	Overall range (°C)	Standard	Max. linearisation error
B	0 to +1820	IEC584.1	0 to 400°C = 1.7°C 400 to 1820°C = 0.03°C
C	0 to +2300	Hoskins	0.12°C
D	0 to +2495	Hoskins	0.08°C
E	–270 to +1000	IEC584.1	0.03°C
G2	0 to + 2315	Hoskins	0.07°C
J	–210 to +1200	IEC584.1	0.02°C
K	–270 to +1372	IEC584.1	0.04°C
L	–200 to +900	DIN43710:1985 (to IPTS68)	0.02°C
N	–270 to +1300	IEC584.1	0.04°C
R	–50 to +1768	IEC584.1	0.04°C
S	–50 to +1768	IEC584.1	0.04°C
T	–270 to +400	IEC584.1	0.02°C
U	–200 to +600	DIN43710:1985	0.08°C
NiMo/NiCo	–50 to +1410	ASTM E1751-95	0.06°C
Platinel	0 to +1370	Engelhard	0.02°C
Mi/NiMo	0 to +1406	Ipsen	0.14°C
Pt20%Rh/Pt40%/Rh	0 to +1888	ASTM E1751-95	0.07°C

Table 1 Thermocouple types, ranges and accuracies

RTD Type	Overall range (°C)	Standard	Max. linearisation error
Cu10	–20 to +400	General Electric Co.	0.02°C
Cu53	–70 to +200	RC21-4-1966	0.01°C
JPT100	–220 to +630	JIS C1604:1989	0.01°C
Ni100	–60 to +250	DIN43760:1987	0.01°C
Ni120	–50 to +170	DIN43760:1987	0.01°C
Pt100	–200 to + 850	IEC751	0.01°C
Pt100A	–200 to +600	Eurotherm Recorders SA	0.09°C

Table 2 RTD type details

AI2 -DC – Two Channel Analogue Input Module

This analogue input module is used to monitor analogue signals from a wide range of plant sensors. With the DC terminal unit it is optimised for mV, V, RTD or resistive sensors and Pot position sensing applications, for use with a Zirconia probe (often associated with a temperature measurement) for oxygen measurements.

Module type:	AI2-DC
No of channels:	2
Input types:	mV, V, RTD, Resistance, Potentiometer, Pyrometer, Zirconia (HiZ)
mV input range:	–150mV to +150mV
Initial accuracy:	Better than 0.1% of reading ± 10uV
Resolution:	Better than 2uV
Voltage input range:	–10V to +10V
Initial accuracy:	Better than 0.1% of reading ± 2mV
Resolution:	Better than 0.2mV
Zirconia probe input range:	0.0V to +1.8V
Initial accuracy:	Better than 0.1% of reading ± 20uV
Resolution:	Better than 7uV
RTD/Ohms input range:	0Ω to 640Ω, supporting 2-, 3- or 4-wire sensor connection
Initial accuracy:	Better than 0.1% of reading ± 0.1Ω
Resolution:	Better than 0.02Ω
RTD/HiOhms input range:	0Ω to 7kΩ, supporting 2-, 3- or 4-wire sensor connection
Initial accuracy:	Better than 0.1% of reading ± 0.5Ω
Resolution:	Better than 0.2Ω
Potentiometer input range:	0% to 100% rotation positioning of 100Ω to 7kΩ linear pot
Initial accuracy:	Better than 0.1% of reading ± 0.1%
Resolution:	Better than 0.001%
Power consumption:	2W maximum
System isolation:	300V RMS or dc (double insulation)
Channel isolation:	50V RMS or dc (basic insulation)
Common mode rejection:	>120dB (47-63Hz)
Series mode rejection:	>60dB (47-63Hz)

Input specification

RTD LIN Types:	See Table 2

Note: User calibration options can improve performance, limited only by noise and non-linearity.

AI2-TC – Two Channel Isolated TC Input Module with CJC

This analogue input module is used to monitor analogue signals from a wide range of plant sensors. With the TC terminal unit it is optimised for mV and thermocouple applications. It also supports a special high-impedance input on channel 2.

Module type:	AI2-TC
No of channels:	2
Input types:	TC, mV, Pyrometer
mV input range:	–150mV to +150mV
Initial accuracy:	Better than 0.1% of reading ± 10uV
Resolution:	Better than 2uV
Power consumption:	2W maximum
System isolation:	300V RMS or dc (double insulation)
Channel isolation:	300V RMS or dc (basic insulation)
Common mode rejection:	>120dB (47Hz to 63Hz)
Series mode rejection:	>60dB (47Hz to 63Hz)

Input specification

TC Linearisation types:	See Table 1
CJC system:	Temperature measured by sensor under the TU input connector
Initial CJC accuracy:	±0.5°C typical (±1°C maximum)
CJC rejection:	Better than 30:1 over operating temperature range

Note: User calibration options can improve performance, limited only by noise and non-linearity.

AI2-MA – Two Channel Isolated Analogue Input Module with 5Ω shunt fitted for mA inputs

This analogue input module is used to monitor analogue signals from a wide range of plant sensors. With the DC-MA terminal unit it is optimised for 4-20mA current loop applications.

Module type:	AI2-MA
No of channels:	2
Input types:	mA
mA Input range:	–30mA to +30mA with 5Ω burden in the Terminal Unit
Initial accuracy:	Better than 0.25% of reading ± 2uA
Resolution:	Better than 0.5uA
Power consumption:	2W maximum
System isolation:	300V RMS or dc (double insulation)
Channel isolation:	300V RMS or dc (basic insulation)
Common mode rejection:	>120dB (47-63Hz)
Series mode rejection:	>60dB (47-63Hz)

Note: User calibration options can improve performance, limited only by noise and non-linearity.

AI3 – Three Channel Isolated 4-20mA analogue input module with 24V Tx

This analogue input module is dedicated to current loop applications with modern transmitters. Each isolated channel includes a loop power supply for the transmitter (if needed). The power supply includes overload protection and automatic reset (when the fault is cleared).

Module type:	AI3
No of channels:	3
mA Input range:	–28mA to +28mA
Initial accuracy:	Better than 0.1% of reading ± 2uA
Resolution:	Better than 0.5uA
Loop burden resistance:	60Ω nominal, 50mA maximum current
Channel PSU:	20-26V dc, current limit 30mA nominal, self-resetting
Power consumption:	Current input mode: <2W; with 3 powered loops: <3.3W
System isolation:	300V RMS or dc (double insulation)
Channel isolation:	50V RMS or dc (basic insulation)
Common mode rejection:	>120dB (47-63Hz)
Series mode rejection:	>60dB (47-63Hz)

Notes:

1. User calibration options can improve performance, limited only by noise and non-linearity.

2. Total burden can be increased to 250Ω by cutting a link track on the terminal unit.

AI4-TC – Four Channel Isolated in pairs, TC, with CJC

This analogue input module is used to monitor analogue signals from a wide range of plant sensors. With the TC terminal unit it is optimised for mV and thermocouple applications.

Module type:	AI4-TC
No of channels:	4
Input types:	TC, mV, Pyrometer
mV input range:	–150 to +150mV
Initial accuracy:	Better than 0.1% of reading ± 10uV
Resolution:	Better than 2µV
Power consumption:	2W maximum
System isolation:	300V RMS or dc (double insulation)
Channel isolation:	300V RMS or dc (basic insulation), CH1+CH2 to CH3+CH4
Common mode rejection:	>120dB (47-63Hz)
Series mode rejection:	>60dB (47-63Hz)

Input specification

TC Linearisation types:	See Table 1
CJC system:	Temperature measured by sensor under the TU input connector
Initial CJC accuracy:	±0.5°C typical (±1°C maximum)
CJC rejection:	Better than 30:1 over operating temperature range

Notes:

1. User calibration options can improve performance, limited only by noise and non-linearity.

2. Wiring care and sensor choice should be used to prevent ground loops when using non-isolated thermocouples.

AI4-MA – Four Channel Isolated in pairs, mA Input Module

This analogue input module is used to monitor analogue signals from a wide range of plant sensors. With the MA terminal unit it is optimised for 4-20mA current loop applications.

Module type:	AI4-MA
No of channels:	4
Input types:	mA
mA input range:	–30mA to +30mA with 5Ω burden in the terminal unit
Initial accuracy:	Better than 0.25% of reading ± 2uA
Resolution:	Better than 0.5uA
Power consumption:	2W maximum
System isolation:	300V RMS or dc (double insulation)
Channel isolation:	300V RMS or dc (basic insulation), CH1+CH2 to CH3+CH4
Common mode rejection:	>120dB (47-63Hz)
Series mode rejection:	>60dB (47-63Hz)

Notes:

1. User calibration options can improve performance, limited only by noise and non-linearity.

2. Wiring care and sensor choice should be used to prevent ground loops when using non-isolated thermocouples.

AI4-MV – Four Channel Isolated in pairs, mV Input Module

This analogue input module is used to monitor analogue signals from a wide range of plant sensors.

Module type:	AI4-MV
No of channels:	4
Input types:	mV, Pyrometer, Zirconia Probe
mV input range:	–150mV to +150mV
Initial accuracy:	Better than 0.1% of reading ± 10uV
Resolution:	Better than 2uV
Power consumption:	2W maximum
System isolation:	300V RMS or dc (double insulation)
Channel isolation:	300V RMS or dc (basic insulation), CH1+CH2 to CH3+CH4
Common mode rejection:	>120dB (47-63Hz)
Series mode rejection:	>60dB (47-63Hz)

Notes:

1. User calibration options can improve performance, limited only by noise and non-linearity.

2. Wiring care and sensor choice should be used to prevent ground loops when using non-isolated thermocouples.

AI8-RT – Four Channel Isolated RTD Input Module (consult factory for availability)

This analogue input module is used to monitor resistant thermometer signals from plant sensors. The RTD inputs each require the appropriate terminal unit.

Module type:	AI8-RT
No of channels:	4
Input types:	RTD
RTD support:	Support for 2 and 3-wire resistance thermometer devices
Ohms range:	20Ω to 500Ω and 2 and 3-wire lead compensation
Hi Ohms range:	200Ω to 5KΩ 2 and 3-wire-wire lead compensation
Resolution:	±10mΩ and ±100mΩ (with 0.4s filter)
Linearity:	20ppm of span
System isolation:	300V RMS or dc (double insulation)
Channel isolation:	300V RMS or dc (basic insulation) Galvanic Isolated in pairs
Series mode rejection:	60dB (47-63Hz)
Common mode rejection:	120dB (47-63kHz) >120dB @50/60Hz
Power consumption:	1.8W maximum

Input specification

RTD LIN Types:	See Table 2

AI8-TC – Eight Channel TC with CJC (isolated in pairs) (consult factory for availability)

This analogue input module is used to monitor analogue signals from a wide range of plant sensors. The mV and TC inputs each require the appropriate terminal unit.

Module type:	AI8-TC
No of channels:	8
Input types:	TC, mV
mV range:	–80mV to +80mV at input impedance >100KΩ
Resolution:	±10mΩ and ±100mΩ (with 0.4s filter)
Linearity:	20ppm of span
Power consumption:	1.8W maximum
System isolation:	300V RMS or dc (double insulation)
Channel isolation:	300V RMS or dc (basic insulation) Galvanic Isolated in pairs
Common mode rejection:	120dB (47-63kHz) >120dB @50/60Hz
Series mode rejection:	60dB (47-63Hz)

Input specification

TC Linearisation types:	See Table 1
CJC system:	Measured by 2 RTD (Pt100), located beneath the input connector
Initial CJC accuracy:	±0.8°C – sensed with two PT100 sensors on TU
CJC rejection:	Better than 30:1 over 0°C to +55°C ambient

AI8-MA – Eight Channel mA Input Module (isolated in pairs) (consult factory for availability)

This analogue input module is used to monitor analogue signals from a wide range of plant sensors. The mA inputs require the appropriate terminal unit.

Module type:	AI8-MA
No of channels:	8
Input types:	mA
mA range:	–20mA to +20mA with 3.3Ω burden in the terminal unit
Resolution:	±10mΩ and ±100mΩ (with 0.4s filter)
Linearity:	20ppm of span
System isolation:	300V RMS or dc (double insulation)
Channel isolation:	300V RMS or dc (basic insulation) Galvanic Isolated in pairs
Series mode rejection:	60dB (47-63Hz)
Common mode rejection:	120dB (47-63kHz) >120dB @50/60Hz
Power consumption:	1.8W maximum

AI8-FMA – Fast Eight Channel Isolated mA Input Module 20ms (consult factory for availability)

This analogue input module is used to monitor analogue signals from a wide range of plant sensors. The mA inputs each require the appropriate terminal unit.

Module type:	AI8-FMA
No of channels:	8
Input types:	mA
mA range:	–20mA to +20mA with 3.3Ω burden in the terminal unit
Resolution:	±10mΩ and ±100mΩ (with 0.4s filter)
Linearity:	20ppm of span
System isolation:	300V RMS or dc (double insulation)
Channel isolation:	300V RMS or dc (basic insulation) Galvanic Isolated in pairs
Series mode rejection:	60dB (47-63Hz)
Common mode rejection:	120dB (47-63kHz) >120dB @50/60Hz
Power consumption:	1.8W maximum

AO2 – Two Channel Isolated DC (V or mA) Output Module

This analogue output module provides two isolated analogue output channels. Each output can be independently configured for current or voltage.

Module type:	AO2
No of channels:	2
Current output:	–0.1 to 20mA; 10V dc max. Compliance with total burden less than 500Ω
Resolution:	Better than 1 part in 10,000 (1uA typical)
Voltage output:	–0V to 10V dc; 20mA max. compliance with total load greater than 550Ω –0V to 10V dc; 8mA max. compliance with total load greater than 1500Ω
Resolution:	Better than 1 part in 10,000 (0.5mV typical)
System isolation:	300V RMS or dc (double isolation)
Channel isolation:	300V RMS or dc (basic isolation)
Power consumption:	2.2W maximum
Calibration accuracy:	Better than 0.1% of reading

DI6 – Six Channel High Voltage Logic (115 and 230V ac) Input Module

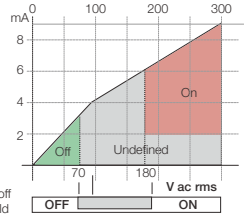
The six channel digital input module accepts AC voltage inputs and is available in two factory options optimized for 115V ac or 230V ac ranges.

Module type:	DI6-115, DI6-230
No of channels:	6
Input functions:	On/Off or de-bounce
Frequency:	47Hz-63Hz
Transient immunity:	EN50082
System isolation:	300V RMS or dc (double insulation)
Channel isolation:	300V RMS or dc (basic insulation)
Power consumption:	0.5W maximum

'115V ac' Variant

Active On state:	>95V ac rms, 150V ac rms maximum
Inactive OFF state:	<35V ac rms
Main input current:	More than 2mA required for 'ON'
Maximum input current:	8mA

V-I curve for 115V ac Operation

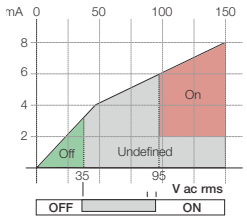


* The threshold may be between Vmaxoff and Vmion Ioff is defined at the threshold

'230V ac' Variant

Active ON state:	>180V ac rms, 264V ac rms maximum
Inactive OFF state:	<70V ac rms
Min input current:	More than 2mA required for 'ON'
Maximum input current:	9mA

V-I curve for 230V ac Operation



Note:

Inadvertent Use of the Wrong Range

115V type on 230V ac No damage will result. Power dissipation will be higher than desirable for continued use on all 6 channels simultaneously.

THIS IS NOT A RECOMMENDED MODE OF OPERATION

DI16 – Sixteen Channel Digital Input Module

This digital input module accepts sixteen inputs and can be wired either for voltage input or for contact closure.

Module type:		DI16
No of channels:		16
System isolation:		300V RMS or dc (double insulation)
Channel isolation:		Channels share a common connection ('C')
Power consumption:	Logic:	0.75W maximum
	Contact:	2.0W maximum
Max. voltage across any channel:		30V dc

'Contact' Mode

Module Internal Isolated		
Power supply (P):		16 to18V dc
Contact closure:	ON state:	Input resistance threshold <1KΩ typical
	OFF state:	Input resistance threshold >7KΩ typical
Wetting current:		>4mA
Wetting voltage:		>12V dc

'Logic' Mode

Logic inputs:	ON state:	Input voltage threshold >10.8V dc, 30V maximum
	OFF state:	Input voltage threshold <5.0V dc, –30V minimum
Input current:		3.8mA @ 12V dc; 2.8mA @ 24V dc

DO16 – Sixteen Channel Digital Output Module

This digital output module provides higher packing density and lower cost per channel. The sixteen digital output module provides sixteen short-circuit protected outputs, which are typically used for control, alarms, or event outputs.

Each channel can drive up to 0.7A and can be used for driving solenoids, relays, lamps, fans, thyristor units, single phase Solid State Relays (SSRs), or some three phase SSRs.

Module type:	DO16
No of channels:	16
Voltage supply (external):	24Vdc ±20%
Leakage current off state:	<10uA
Current output:	
Channel maximum:	0.7A/channel
Module Thermal Cut-off:	90±3°C, restart: 88±3°C
Short Circuit Protection:	0.7A to 1.7A per channel
Output voltage:	>Voltage supply (Vs) less 1V
System isolation:	300V RMS or dc (double insulation)
Channel isolation:	Channels share a common connection
Power consumption:	Module 0.6W maximum
Plant side:	850W maximum

RLY8 – Eight Channel Relay Output Module

This module provides eight relay outputs. These outputs may require external snubber circuits (application dependent).

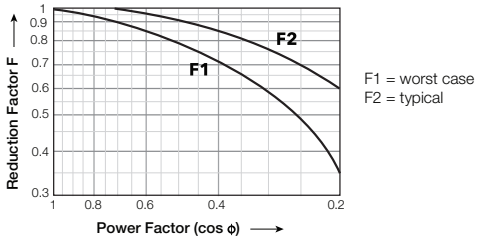
Module type:	RLY8
No of channels:	8 normally open, AgCdO contacts for best operating life
Max current rating:	2A at up to 240V ac; 0.5A at 200V dc, increasing to 2A at 50V dc (resistive)
Min rating:	100mA at 12V
System isolation:	300V RMS or dc (double insulation)
Channel isolation:	300V RMS or dc (basic insulation)
Contact life:	>10 million operations @ 240V ac, 1A rms >600,000 operations @ 240V ac, 2A rms
Mechanical life:	>30 million operations
De-rating:	The above ratings summarise the performance with resistive loads. With complex loads further de-rating may be required
Power consumption:	2.5W

Relay De-rating

AC Voltage

As the AC load becomes more "difficult" a more significant de-rating factor is required. The graph below shows the derating to be applied in terms of contact life, assuming the load requirement is predefined.

Reduction factor for inductive ac loads



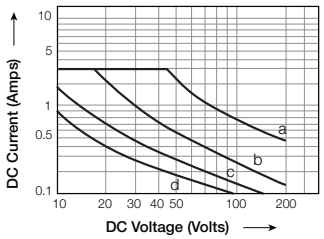
F1 = worst case
F2 = typical

Contact life = resistive contact life x reduction factor

DC voltage

DC operation is also limited for difficult loads, particularly where there is significant inductance. Here the working current must be limited as shown where the load time constant (L/R, in ms) is the significant factor.

Max dc load breaking capacity



a = resistive
b = 20ms
c = 40ms
d = 60ms

ZI – Zirconia Input Module (consult factory for availability)

Module type:	ZI
Input types:	Analogue voltage, Channel 1 – mV (TC), and Channel 2 – (2V Zirconia probe)

Thermocouple Input Specification (Ch1 ONLY)

Input range:	–150mV to +150mV
Calibration accuracy:	±0.1% of electrical input, ±10µV
Noise:	5µV p-p with 1.6s Filter
Resolution:	<2µV with 1.6s Filter
Sensor break detect:	250nA break high, low or off
Input impedance:	10MΩ

Cold Junction Sensor Specification (Ch1 ONLY)

Temperature Range:	–10°C to +70°C
CJ rejection:	< 30:1
CJ accuracy:	± 1.3°C, ±0.5°C typ. ('Automatic' cold junction compensation)

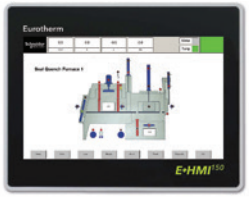
Zirconia Input Specification (Ch2 ONLY)

Input range:	0mV to +1800mV
Calibration accuracy:	± 0.2% of electrical input
Noise:	0.1mV p-p with 1.6s Filter
Resolution:	<50µV with 1.6s Filter
Sensor impedance measurement:	0.1kΩ to 100kΩ ±2%
Input Impedance:	>500MΩ
Input leakage current:	±4.0nA max, ±1nA typical

General Specifications

Power consumption:	1.8W maximum
Common mode rejection:	>80db, 48 - 62Hz
Series mode rejection:	>60db, 48 - 62Hz
System isolation:	300V RMS or dc (double insulation)
Channel isolation:	300V RMS or dc (basic insulation)

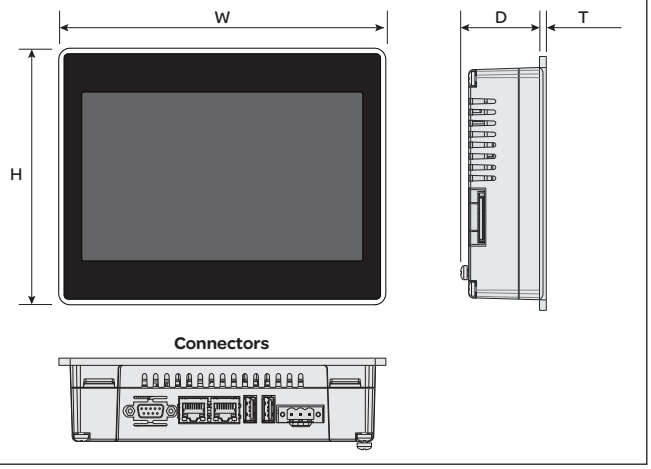
E+HMI^{150} Remote Operator Panel



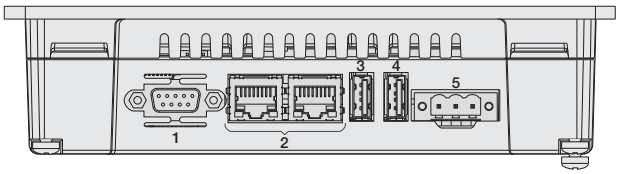
The E+HMI^{150} provides an exceptionally rich and easy operator interface onto the E+PLC product range. It is designed for use in demanding applications and has state-of-the-art features combined into an elegantly designed interface solution. Powerful engineering and graphic design tools ensure advanced configurations can be quickly and easily created to give the best interface for any specific process.

The panel offers remote monitoring and control of the process with client-server functionality.

Mechanical details



Connectors



Pos.	Connector	Description
1	Serial Port	RS-232, RS-485, RS0422 software configurable
2	Ethernet Port	2 x 10/100 Mbit with integrated switch
3	USB Port	Version 2.0-1.1
4	USB Port	Version 2.0 high speed only
5	Power Supply	24V dc (10-32V dc)

E+HMI^{150} Specification

Display

	07	13
Type:	TFT	TFT
Resolution:	800 x 480, WVGA	1280 x 800, WXGA
Active display area:	7” diagonal	13” diagonal
Colors:	64K	64K
Backlight:	LED	LED
Brightness:	300 Cd/m^2 typical	300 Cd/m^2 typical

System Resources

Operating System:		Microsoft Windows CE 6.0
User memory:	07:	128 MB Flash
	13:	256 MB Flash
RAM:		256MB DDR

Operator Interface

Touchscreen:	Analogue resistive
LED indicators:	1 (dual color)

Interface

Ethernet:	2 10/100 Mbit with integrated switch
USB:	2 Host Interface (1 version 2.0,1 version 2.0 and 1.1)

Ratings

Power supply voltage:		24V dc (10 to 32V dc)
Current consumption:		0.65A at 24V dc (max.)
Fuse:		Automatic
Weight Approx:	07:	1.0Kg
Weight Approx:	13:	2.8Kg
Battery:		Rechargeable Lithium battery, not user-replaceable

Environmental Conditions

Operating temperature:		0 to 50°C (vertical installation)
Storage temperature:		–20 to +70°C
Operating and storage humidity:		5 – 85% relative humidity, non-condensing
Protection class:	Front:	IP66
	Rear:	IP20

Dimensions

Faceplate W x H:	07:	187mm (7.36”) x 147mm (5.79”)
	13:	336mm (13.22”) x 267mm (10.51”)
Cutout:	07:	176mm (6.93”) x 136mm (65.35”)
	13:	326mm (12.83”) x 256mm (10.07”)
Depth D (T):	07:	47 + 4 mm (1.85 + 0.16”)
	13:	56 + 4 mm (2.20 + 0.16”)

Approvals

CE:	Emission EN61000-6-4 Immunity EN61000-6-2 for installation in industrial environments
CUL:	UL508 Listed E190581 Class1 Div2 Groups A, B, C, D E465957

E+PLC400 Order codes

Basic Product

EPLC400	Precision PLC

1 Base Size

00	0 Way base (0 I/O slots)
04	4 Way base (4 I/O slots)
08	8 Way base (8 I/O slots)
16	16 Way base (16 I/O slots)

2 Battery Required

BATT	Battery fitted (default)
NOBATT	Battery not fitted

3-18 Slot 1-16

BLANK	Blank terminal unit
NONE	No I/O module fitted (default)
AI2-DC	2 ch – analogue input module
AI2-TC	2 ch – isolated TC input module with CJC
AI2-MA	2 ch – isolated analogue input module with 5Ω shunt fitted for mA inputs
AI3	3 ch – isolated 4-20mA analogue input module with 24V Tx PSU
AI4-TC	4 ch – isolated in pairs, TC, with CJC
AI4-MA	4 ch – isolated in pairs, mA input module
AI4-MV	4 ch – isolated in pairs, mV input module
AI8-RT	4 ch – isolated RTD input module*
AI8-TC	8 ch TC with CJC (isolated in pairs)*
AI8-MA	8 ch mA input module (isolated in pairs)*
AI8-FMA	Fast 8 channel isolated mA input module 20ms*
AO2	2 ch – isolated DC (V or mA) output module
DI6-230V	6 ch high voltage Logic (230V ac) input module
DI6-115V	6 ch high voltage Logic (115V ac) input module
DI16	16 ch digital input module
DO16	16 ch digital output module
RLY8	8 ch – Relay output module
ZI	Zirconia Input Module

19 Reserved

XXXXXX	Future

20-30 Features

NONE	No features required
WVIS	Webserver visualisation*
PROG	Setpoint prorammer
BATCH	Batch and recording
VAC	Vacuum furnace package
HT	Heat Treatment atmosphere control package (zirconia, carbon diffusion, 3 gas IR)

31 Future

XXXXXX	Future
PH2	“Phase 2” advanced order

32 Future

XXXXXX	Future

33-35 Communications Option

NONE	Standard Comms: Serial Modbus RTU Ethernet Modbus/TCP Master/Slave

36 Future

XXXXXX	Future

37 Future

XXXXXX	Future

38 Labels

XXXXX	No custom labels (Eurotherm)
Fnnnn	Custom label

39 Special

XXXXXX	Default

40 USB Memory Stick

NONE	Not required
008G	8GB USB memory stick

* Contact factory for availability

E+HMI150 Order Code

Basic Product

EHMI	Remote Operator Panel

1 Type

150	Remote visualisation for CODESYS V3 E+PLC

2 Display Size

07	7” TFT-LCD operator panel
13	13” TFT-LCD operator panel

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