1.1.4 EntelliPro ES order code

Five unique catalog numbers are offered:

EntelliPro ES3 DP 2 0

EntelliPro ES3 DP 3 0

EntelliPro ES5 DP 2 2

EntelliPro ES5 DP 2 3

EntelliPro ES5 DP 3 3

The EntelliPro ES catalog configuration definition is shown below:

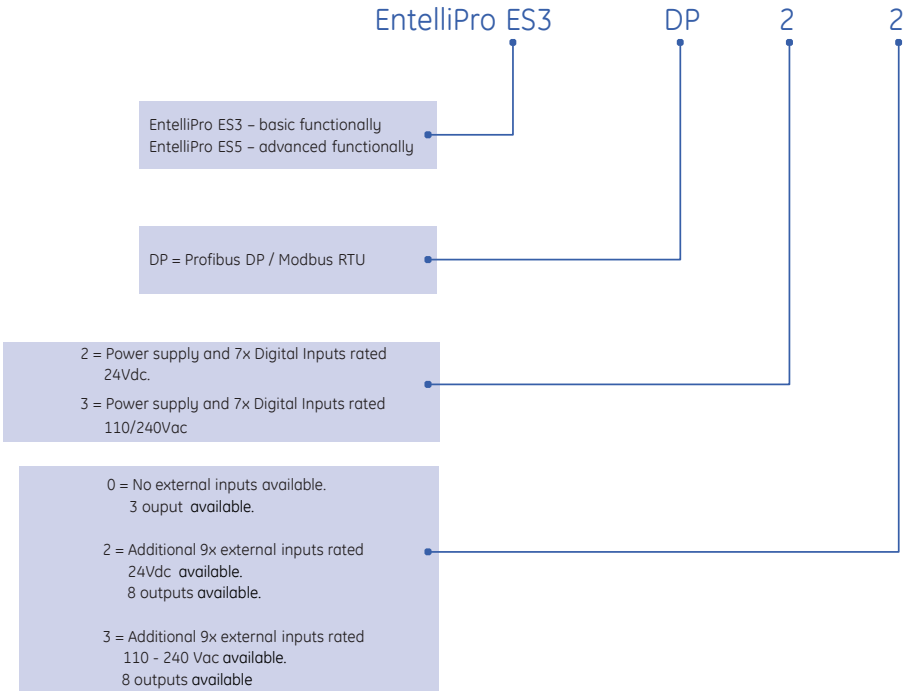


Table 1-1 shows features and protections available for the five catalogs.

Features / Protections	EntelliPro ES3 DP 2 0	EntelliPro ES3 DP 3 0	EntelliPro ES5 DP 2 2	EntelliPro ES5 DP 2 3	EntelliPro ES5 DP 3 3
24Vdc Supply input	X		X	X	
110/240Vac Supply input		X			X
24Vdc (7) Digital Input	X			X	
24Vdc (16) Digital Input			X		
110/240Vac (7) Digital Input		X			
110/240Vac (9) Digital Input				X	
110/240Vac (16) Digital Input					X
5A 240Vac/2.5A 24Vdc (qty. 3) Output Contact	X	X	X	X	X
2A 240Vac/2A 24Vdc (qty. 5) Output Contact			X	X	X
LT (Thermal Overload)	X	X	X	X	X
Ground Fault	X	X	X	X	X
Phase Loss	X	X	X	X	X
Current Unbalance	X	X	X	X	X
Thermistor function	X	X	X	X	X
Stalled Rotor	X	X	X	X	X
Under Current	X	X	X	X	X
4-20mA Output			X	X	X
Metering	X	X	X	X	X
Unit Healthy Indication LED	X	X	X	X	X
Communication LED	X	X	X	X	X
Time stamped event logging	X	X	X	X	X
Time stamped analog value logging	X	X	X	X	X
11 Pre Programmed Motor Starter Logic	X	X	X	X	X
Programmable thresholds	X	X	X	X	X
Operating hours/Switch Counter register	X	X	X	X	X
Communication (Modbus and Profibus)	X	X	X	X	X

Table 1-1: List of features and protections

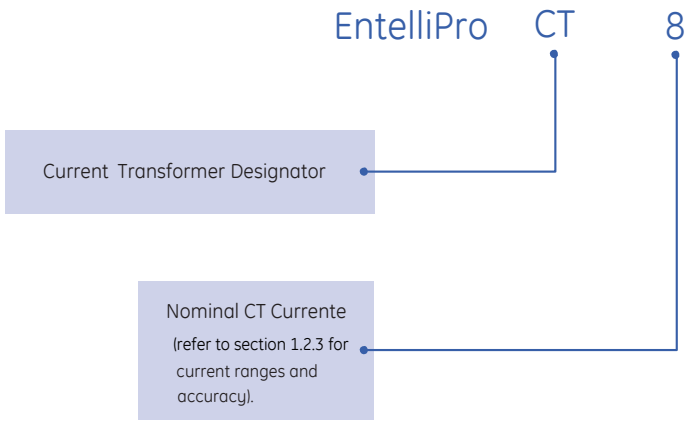
1.1.5 EntelliPro ES Current Transformer Definition

There are three items that must be considered when configuring the motor load level of the EntelliPro ES. The items to consider are the transformer type, the number of primary windings, and the EntelliPro ES full load current setting (FLA).

Four unique current transformer catalog numbers are offered:

EntelliPro CT 8
EntelliPro CT 32
EntelliPro CT 64
EntelliPro CT 630

The CT catalog configuration definition is shown below:



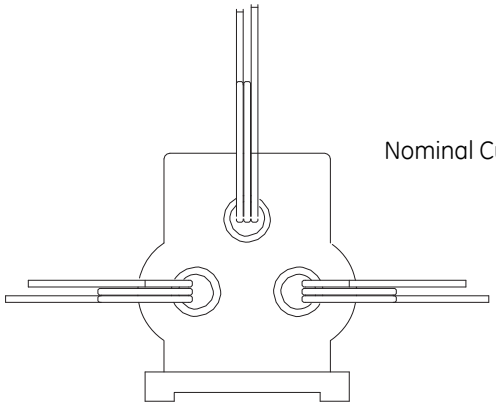
Use of the appropriate transformer will allow the FLA setting to be configured in the range of CT/6 to CT. For example , if the EntelliPro CT 64 transformer is chosen, the FLA setting can be configured from 64/6=10.7 amps to 64 amps in 0.1 amp increments.

There may be cases where the available transformer types have inappropriate ranges for the application. For example, when trying to protect the motor load level at 77 amps, the EntelliPro CT 64 is too small. Considering the EntelliPro CT 630 would result in the lowest FLA setting of 630/6=105 amps, which is too large for this application.

This case would require using multiple turns on the CT primary (see figure 1-2 and equation below). The solution to the 77 amp example is to use an EntelliPro CT 630 with two primary turns. The nominal CT current = 630 / 2 = 315 amps. This would set the FLA range from 52.5 amps (315/6) to 315 amps. So, 77 amps could be selected.

Use of the minimum number of primary turns is recommended.

In addition, these CTs can be used as interposing CTs to increase the primary current.



$$\text{Nominal Current (CT with loops)} = \frac{\text{Nominal CT Current}}{\text{\# of loops}}$$

Example using EntelliPro CT 8 as 2A CT

Calculating # of primary loops required

# of primary loops = 8/2 = 4 Turns

Figure 1-2: Primary feeding loops

1.2 Specifications

NOTE **NOTE:** Specifications are subject to change without notice.

1.2.1 Protection Specifications

Overload Fault (Thermal Model)

IEC Class curves ..... 5, 10, 15, 20, 25, 30, 35, 40 (IEC 60947)

Thermal overload pickup 1.20

Motor full-load current (FLA) ..... 1/6 Ict to Ict in steps of 0.1

Curve biasing

Phase loss: ..... 1.83 x Ir

Phase unbalance: ..... 1.43 x Ir

Timing accuracy ..... ±10% up to 8 x FLA and ±20% from 8 to 10 x FLA

Elements ..... fault (trip) and warning (alarm) - warning not valid for ATEX

Phase Loss

Range ..... fixed at 60% (any phase <40% of max phase)

Accuracy ..... ±5%

Time delay ..... 0–15 seconds in steps of 1s (0 = disable)
immediately when ATEX is selected

Timing accuracy ..... ±20%

Elements ..... fault (trip) and warning (alarm) - warning not valid for ATEX

Current Unbalance

Range ..... fixed at 30% (any phase <70% of max phase)

Accuracy ..... ±5%

Time delay ..... 0–15 seconds in steps of 1s (0 = disable)
Fix to 500ms when ATEX is selected

Timing accuracy ..... ±20%

Elements ..... fault (trip) and warning (alarm)

Ground Fault

Pickup level ..... 20–100% of FLA in steps of 10%

Trip time delay band ..... 0.1–1.0s in steps of 0.1s (other values will generate an error)

Timing accuracy ..... ±20%

Elements ..... fault (trip) and warning (alarm)

Thermistor

Sensor types: ..... PTC (RHOT = 3.6 kΩ, RRESET = 1.5 kΩ)

Time delay 500ms

Elements ..... fault (trip) and warning (alarm) - warning not valid for ATEX

Connection ..... 1, 3 or 6 thermistors in series

Standard ..... IEC 34-11-12

Max cable length to detect short ..... AWG 14 = 266m AWG 16 = 160m AWG 20 = 70m

1.2.2 Metering and monitoring specifications

Event Recorder

Capacity ..... 250 events

Data storage ..... non-volatile memory

Phase Metering

Accuracy ..... ±5% with external CT

Elements ..... single phase, average

1.2.3 Input specification

Digital Inputs

Fixed pickup ..... 16.8Vdc (24Vdc version)
77Vac (110/240Vac version)

Fixed drop-off ..... 10Vdc (24Vdc version)
30Vac (110/240Vac version)

CAUTION

CAUTION: The usage of voltage between the drop-off and pickup range is not recommended.

Recognition time ..... 40 msec

Current draw at rated voltage ..... 5ma on 24Vdc (24Vdc version)
7ma on 240Vac (120/240Vac version)

Type ..... opto-isolated inputs

Maximum input voltage ..... 28.8Vdc (24Vdc version)
275Vac (120/240Vac version)

Phase Current Inputs

Range.....8A CT: 1.34–8.0A (10 x CT)
32A CT: 5.30–32A (10 x CT)
64A CT: 10.6–64A (10 x CT)
630A CT: 105–630A (10 x CT)

Frequency .....47.5 to 63.0 Hz

Accuracy.....with external CT: ±5% / direct: ±2%

	Current [* Ict]	EntelliPro CT 8 [A]	EntelliPro CT 32 [A]	EntelliPro CT 64 [A]	EntelliPro CT 630 [A]	Overall Current accuracy [%]
low current	0,033	0,267	1,067	2,133	21	8
Min. rated motor current	0,167	1,33	5,33	10,67	105	5
Max. rated motor current	1	8	32	64	630	5
Over load current	3	24	96	192	1890	5
	8	64	256	512	5040	8
	10	80	320	640	6300	Caution! see below

Table 1-2: EntelliPro ES CT types primary current ranges and accuracy

Table below shows the nominal motor current range that the EntelliPro CTs can be used.
The range can be enlarged by feeding multiple primary loops. refer to section 1.1.5.

CAUTION

CAUTION: The overcurrent range above 8*Ict cannot be used to protect motors in explosive areas, due to decrease accuracy. If motor protection up to 10 *Ict is desired , the nominal current must be derated per the table below.

	Current [* Ict]	EntelliPro CT 8 [A]	EntelliPro CT 32 [A]	EntelliPro CT 64 [A]	EntelliPro CT 630 [A]	Overall Current accuracy [%]
low current	0,033	0,267	1,067	2,133	21	8
Min. rated motor current	0,167	1,33	5,33	10,67	105	5
Max. rated motor current	0.8 * 1	6,4	25,6	51,2	504	5
	0.8 * 3	19.2	76.8	153	1512	5
Over load current	0.8 * 10	64	256	512	5040	8

Example

Motor rated current X is 32 A and motor inrush current is 7X, that is 224 A. **EntelliPro CT 32** can be used in ATEX area.

Motor rated current X is 25 A and motor inrush current is 9X, that is 225 A. **EntelliPro CT 32** can be used in ATEX area.

Motor rated current X is 32 A and motor inrush current is 9X, that is 288 A. **EntelliPro CT 32** must not be used in ATEX area. Use **EntelliPro CT 64** in ATEX area.

1.2.4 Output specifications

4 - 20 mA Output

Accuracy.....±1% from displayed RMS

Motor Contact Relays

Configuration.....electromechanical SPST

Contact material.....silver alloy

Operate time.....10ms

Minimum contact load.....10mA at 5Vdc

Continuous current.....5A at 240Vac / 30Vdc

Resistive load capacity

Maximum switched power.....150W or 1250VA

Maximum switched current.....5A

Maximum switched voltage.....150Vdc or 250Vac

Life expectancy

Mechanical.....20 million operations

Electrical .....100,000 operations at 5A, 30Vdc or 250Vac

Application category (for AC-15 and DC-13).....5A/240VA – AC-15
2.5A / 24Vdc – DC-13
According to IEC-60947-5-1 Normal and Abnormal Conditions
A7DQS or gl 10Amps fuses required

Signal Relays

Configuration.....electromechanical SPST

Contact material.....silver alloy

Operate time.....10ms

Minimum contact load.....10mA at 5Vdc

Continuous current.....3A at240Vac

Resistive load capacity

Maximum switched current.....3A

Maximum switched voltage.....150Vdc or 250Vac

Life expectancy

Mechanical.....20 million operations

Electrical .....100,000 operations at 5A, 30Vdc or 250Vac

1.2.5 Power supply specifications

This section lists the specifications for the power supply. The power consumptions of the EntelliPro modules are listed in Table 1-3.

Nominal.....24Vdc (24Vdc version)/140mA (max)
110/240Vac (120/240Vac version)/60mA (max)

Range.....19–28.8Vdc (24Vdc version)
77–264Vac (110/240Vac version)

Ride-through.....30ms

1.2.6 Communication specifications

Profibus

Port.....opto-isolated

Modes.....DP V1 slave, up to 12Mbps

Connector.....9-pin D connector

Standard.....IEC 61158

Installation.....PI installation guidelines

Modbus RTU over RS485

Port.....opto-isolated

Baud rates.....up to 19.2kbps (Modbus

Protocol.....half-duplex

1.2.7 Testing and certification

Test Reference Standard Test Level

Dielectric voltage withstands.....1.5kV

Impulse voltage withstand.....EN60255-5

Electrostatic discharge.....EN61000-4-2/IEC60255-22-2 Level 4

RF immunity.....EN61000-4-3/IEC60255-22-3 Level 3

Fast transient disturbance.....EN61000-4-4/IEC60255-22-4 Class A

Surge immunity.....EN61000-4-5/IEC60255-22-5 Level 3

Conducted RF immunity.....EN61000-4-6/IEC60255-22-6 Level 3

Radiated and conducted emissions.....CISPR11 /CISPR22/ IEC60255-25 Class A

Sinusoidal vibration .....IEC60255-21-1 Class 1

Voltage dip and interruption .....IEC61000-4-11 0, 40, 70% dips, 250/300 cycle interrupts

Harmonics IEC61000-4-13

Voltage ripple .....IEC61000-4-17 15% ripple

Environmental (cold).....IEC60068-2-1 -25° C, 96 hrs

Environmental (dry heat).....IEC60068- 2-2 70° C, 96 hrs

Relative humidity cyclic .....IEC60068- 2-30 6-day variant 2

Short-circuit current*.....IEC60947-5-1

Pollution degree.....I

Rated impulse withstand voltage 4kV

Overvoltage category II according to IEC 60947-1 7.2.3.1 item 2) b)
(when EntelliPro ES is directly connected to the main voltage)

Overvoltage category III according to IEC 60947-1 7.2.3.1 item 2) b)
(when EntelliPro ES is not directly connected to the main voltage)

ATEX certificatio

SIL1

Profibus certification

***CAUTION:** A maximum A7DQS or gl 10A fuse is required on motor relays.

1.2.8 Approvals

Applicable Council Directive According to Low-Voltage Directive EN60255-5, EN61010-1

CE compliance: EMC Directive EN50263 / EN61000-6-2/ EN61000-6-4

ISO: Manufactured under a registered quality program – ISO9001

ROSH compliance:

1.2.9 Physical specifications

The size and weight of the EntelliPro ES module is as follows:

Size ..... 135mm (W) x 82.5mm (H) x104.5mm (D)

Weight 0.45kg

1.2.10 Environmental specifications

Ambient temperatures ..... storage/shipping: –40° to 90° C
operating: –20° to 60° C

Humidity ..... operating up to 95% (non-condensing) at 55° C (per IEC60068 2- 30 Variant 2, 6 days)

operating up to 95% (non-condensing) at 55° C (per IEC60068-2- 30 Variant 2, 6 days)

Altitude ..... 2000m (max)

1.3 EntelliPro CP3/CP5 HMI

The EntelliPro CP3 and CP5 HMI, shown in Figure 1-3, is a microprocessor-based device that connects to an industry-standard Modbus RTU on RS-485 wiring.

The HMI is factory programmed to communicate with the EntelliPro ES devices in a MCC environment in order to provide a convenient station for viewing metering, status and setting information and controlling contactors operations.

EntelliPro CP5 HMI can be connected to multiple EntelliPro ES devices in the MCC network, while the EntelliPro CP3 HMI is mainly connected to a single EntelliPro ES device.

For additional information on the HMI refer to **www.beijerelectronics.com**.

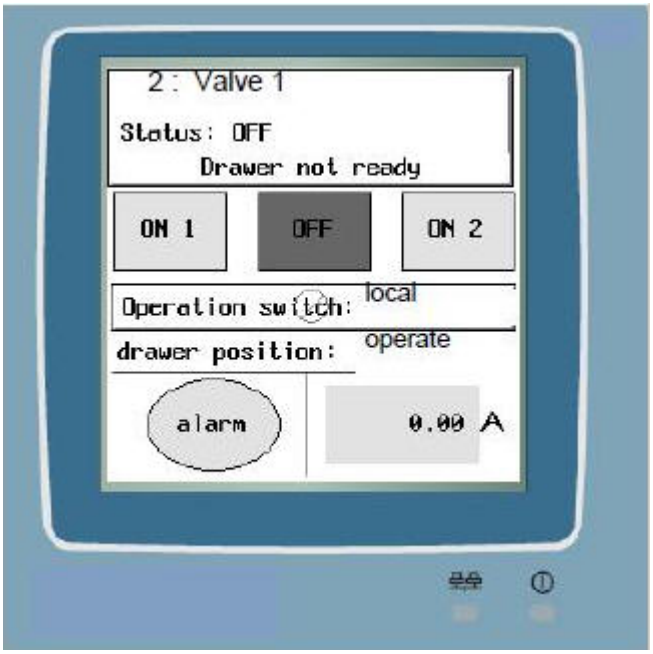


Figure 1-3: HMI front screen

1.4 WinESG Configuration Tool

WinESG is a Profibus-based HMI used with the EPOS System to configure the EntelliPro ES. It provides the capability for a full parameterization and configuration of the EntelliPro ES devices. In addition it supports metering, event log, analog data retrieval, and downloading of custom logic application. Refer to Chapter 5 for detailed operation of the WinESG.

Figure 1-4 shows the parameterization panel view of the WinESG Set-up software.

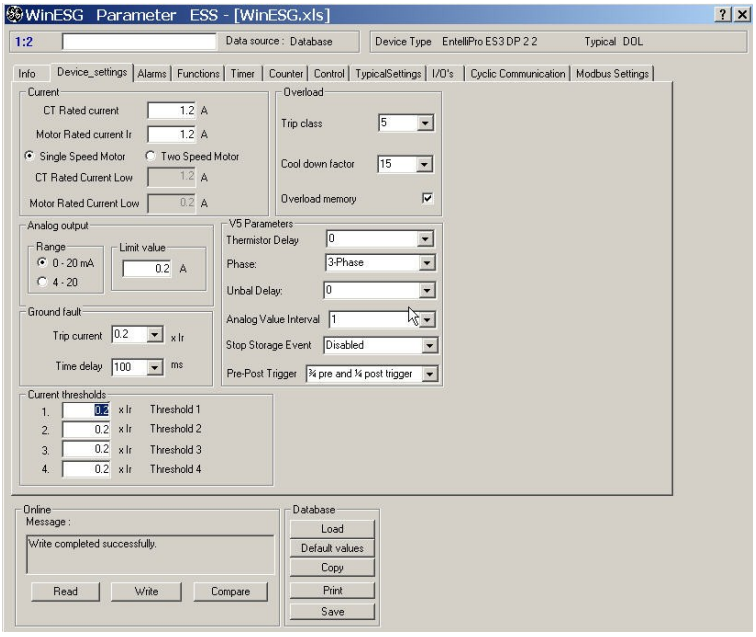


Figure 1-4: WinESG Panel

GE Industrial Solutions

EPOS Motor Management System
Chapter 2: Installation / Configuration

2.1 Installation and initial operating

The EntelliPro ES is an intelligent motor control relay that is mainly installed in low voltage systems for industrial usage. To ensure safe operation, several measures must be taken.

CAUTION

CAUTION: Only use genuine draw out units produced by the factory. Observe proper cable laying in the cable terminal compartment and outside the switch cabinet.

CAUTION

CAUTION: Only qualified personnel are allowed to install, commission, maintain or modify this device in accordance with relevant requirements.

The following tables show the recommended cable type and spacing.

Cable type	Category
power cable (400VAC....)	A
control cable	B
function cable (TMA, ...)	C
bus cable	D

Table 2-1: Recommended EntelliPro ES Cable listing

	A	B	C	D
A	•	3 cm	10 cm	10 cm

Table 2-2: Recommended cable spacing

NOTE

NOTES:

- Do not use multi-stranded cable with combinations from categories A to D.
- The PE-connection of the EntelliPro ES must be connected.
- The maximum length of the connection cable to the current transformer is 20 cm.
- Before initial commissioning of the installation the communication bus wiring and the signal quality must be tested with a Profibus/Modbus test and diagnostic device.
- All wires connected to the EntelliPro ES- modules must be checked prior to operation.

2.1.1 Mechanical installation

This section describes the mechanical installation of the EPOS system, including dimensions for mounting and information on module withdrawal and insertion.

2.1.1.1 Dimensions

The EntelliPro ES is packaged in a modular arrangement. Figure 2-1 shows the dimensions of the EntelliPro ES.

NOTE

NOTE: All dimensions are in mm.

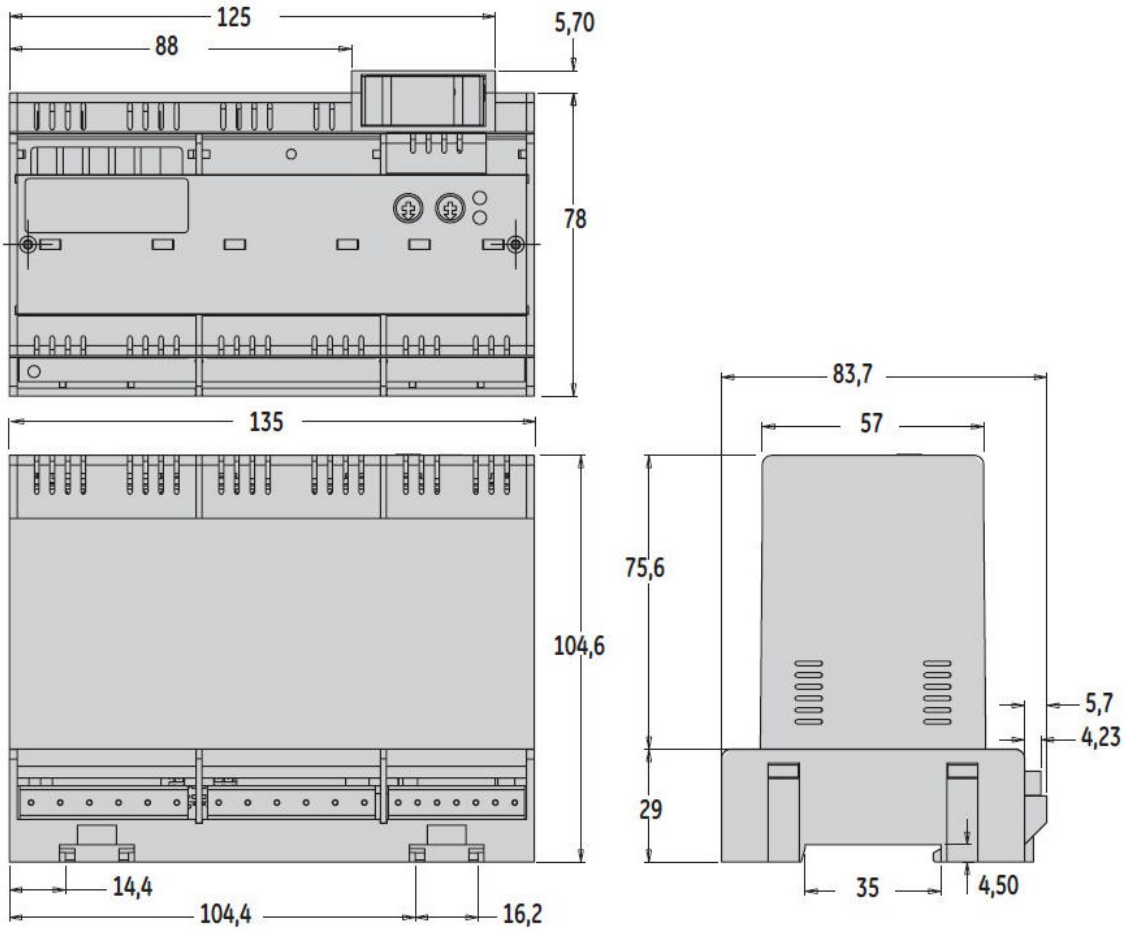


Figure 2-1: EntelliPro ES Dimension

2.1.1.2 Product identification

The product identification label is located on top of the EntelliPro ES module. This label indicates the product catalog number (EntelliPro ES5 2 2), reference number, terminal numbers, relay rating, power supply rating, and agency certification among other parameters. The fiigure below shows an example of the label.

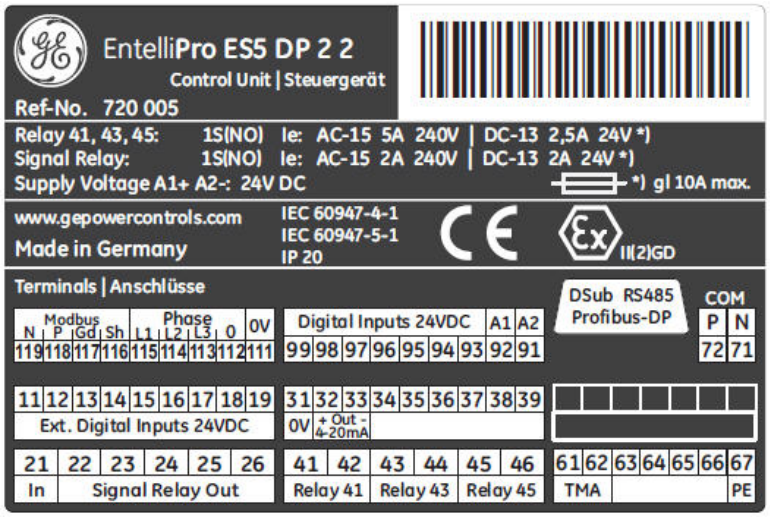


Figure 2-2: EntelliPro ES label example

2.1.1.2.1 Label Definition

The following description is applicable to the label in figure 2-2.

EntelliPro ES5 DP 2 2 defines the catalog number of the device.

Ref-No. is a GE defined number for the unit.

Relays 41, 43, and 45 are motor relays rated AC-15 5A/240Vac and DC-13

2.5A/24Vdc Supply Voltage A1+ A2-: 24V DC, indicates that the power supply for this

unit is 24Vdc. Terminal definitions:

N	Modbus – connection
P	Mobdbus + connection
Gd	Modbus common connection
Sh	Shield connection
L1	Phase L1 connection
L2	Phase L2 connection
L3	Phase L3 connection Phases L1/L2/L3 common connection
0V(111)	Digital inputs (93...99) common
0V(31)	External Digital inputs (11...19) common

DSub RS485 Profibus indicates the Profibus DP connection

2.1.1.3 Mounting

CAUTION

CAUTION: To avoid the potential for personal injury from fire hazards, ensure the unit is mounted in a safe location and/or within an appropriate enclosure. Unit must be un-powered and all connectors removed during installation.

The EntelliPro ES can be DIN mounted using DIN rail to the equipment. The DIN rail mounting, removal, wire connection and connector insertion and removal are illustrated in Figure 2-3.

Steps for installation and removal:

A. Secure DIN Rail (see Item A) to the panel with an appropriate fastener.

B. To insert the unit, snap the EntelliPro ES to the Din rail while releasing the pressure on the unit mounting tabs (see Item B). To remove lift the unit out while holding the tabs up with a screwdriver or another appropriate tool.

C. To insert the connector simply push the connecter toward the EntelliPro terminal (see Item C). Ensure you have the appropriate connector. To remove, separate the connector from the housing using the tip of a small screwdriver (see Item C) or other appropriate tool.

D. Insert each wire into the connector (see Item D) and tighten the connection using the torque shown in the figure. Lightly pull on the wire to check the connection.

E. Use a small screwdriver or other appropriate tool to adjust the Modbus and Profibus communication address switch (see Item E).

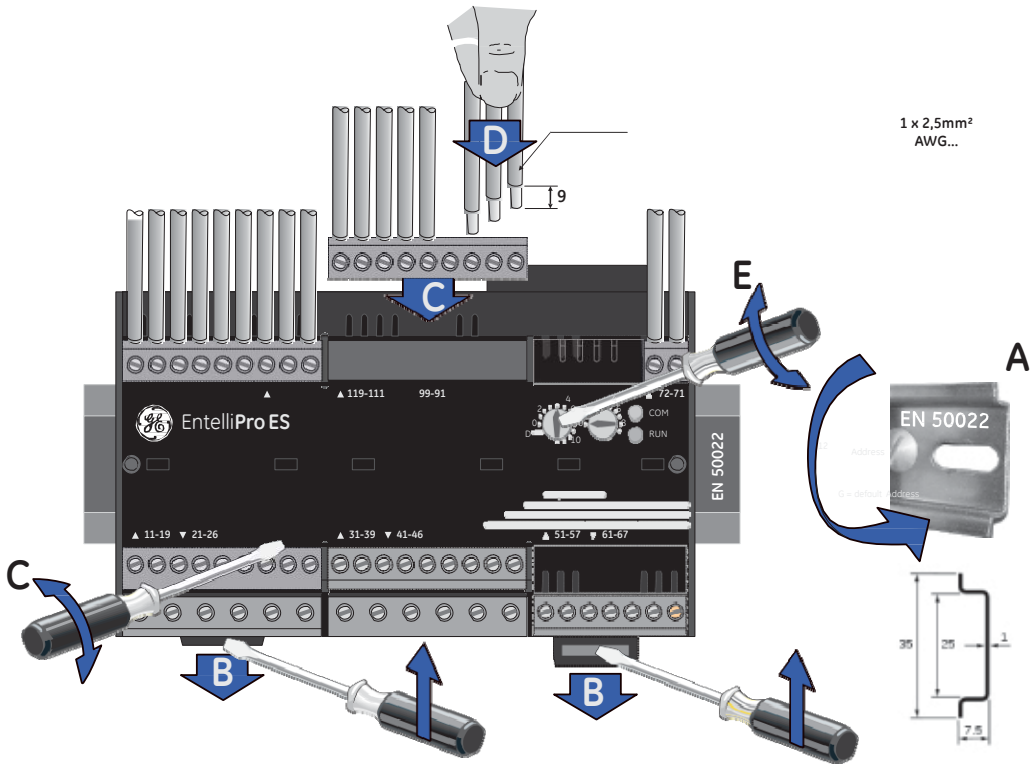


Figure 2-3: EntelliPro ES DIN rail mounting and removal

2.1.1.4 EntelliPro ES Connector terminal identification

The EntelliPro ES connectors pinout and description are shown in Table 2-3

Connector Number	Description
11	Digital Input (24Vdc + or 110/230vac)
12	Digital Input (24Vdc + or 110/230vac)
13	Digital Input (24Vdc + or 110/230vac)
14	Digital Input (24Vdc + or 110/230vac)
15	Digital Input (24Vdc + or 110/230vac)
16	Digital Input (24Vdc + or 110/230vac)
17	Digital Input (24Vdc + or 110/230vac)
18	Digital Input (24Vdc + or 110/230vac)
19	Digital Input (24Vdc + or 110/230vac)
21	Common for Relay Outpus 22 to 26
22	Signal Relay 22 Output
23	Signal Relay 23 Output
24	Signal Relay 24 Output
25	Signal Relay 25 Output
26	Signal Relay 26 Output
31	Digital Inputs Common for Inputs 11 to 19
32	4– 20 mA Output (+)
33	4-20 mA Output (-)
41	Digital Motor Relay Output 41
42	Digital Motor Relay Output 41 RTN
43	Digital Motor Relay Output 43
44	Digital Motor Relay Output 43 RTN
45	Digital Motor Relay Output 45
46	Digital Motor Relay Output 45 RTN
61	PTC Temperature Sensor
62	PTC Temperature Sensor
67	Ground (PE)
91	Supply Voltage (24Vdc - or 110/230Vac)
92	Supply Voltage (24Vdc + or 110/230Vac)
93	Digital Input (24Vdc+ or 110/230Vac)
94	Digital Input (24Vdc + or 110/230vac)
95	Digital Input (24Vdc + or 110/230vac)
96	Digital Input (24Vdc + or 110/230vac)
97	Digital Input (24Vdc + or 110/230vac)
98	Digital Input (24Vdc + or 110/230vac)
99	Digital Input (24Vdc + or 110/230vac)
111	Digital Inputs Common for Inputs 93 to 99
112	CT output, Common
113	CT output, Phase L3
114	CT output, Phase L2
115	CT output, Phase L1
116	Shield
117	Communication Common
118	Modbus D-Positive
119	Modbus D-Negative

Table 2-3: Connector number and description

2.1.2 Electrical installation

This section describes the electrical installation of the EntelliPro ES motor relay.

CAUTION: EntelliPro ES is not to be used in any way other than described in this manual.

2.1.2.1 Power supply connection

EntelliPro ES3 DP 2 0 and EntelliPro ES5 DP 2 2 are 24Vdc supply input versions, while EntelliPro ES3 DP 3 0, EntelliPro ES5 DP 3 2, and EntelliPro ES5 DP 3 3 are 110 to 240Vac versions.

The operation range for the 24Vdc units is 19Vdc to 29Vdc. The operation range for the 110 to 240Vac units is 77Vac to 266Vac.

CAUTION: Check the voltage rating of the unit before applying control power. Control power outside of the operating range of the power supply will damage the EntelliPro ES.

Figure 2-4 shows the EntelliPro wiring connections. Refer to Item A for power supply connections.

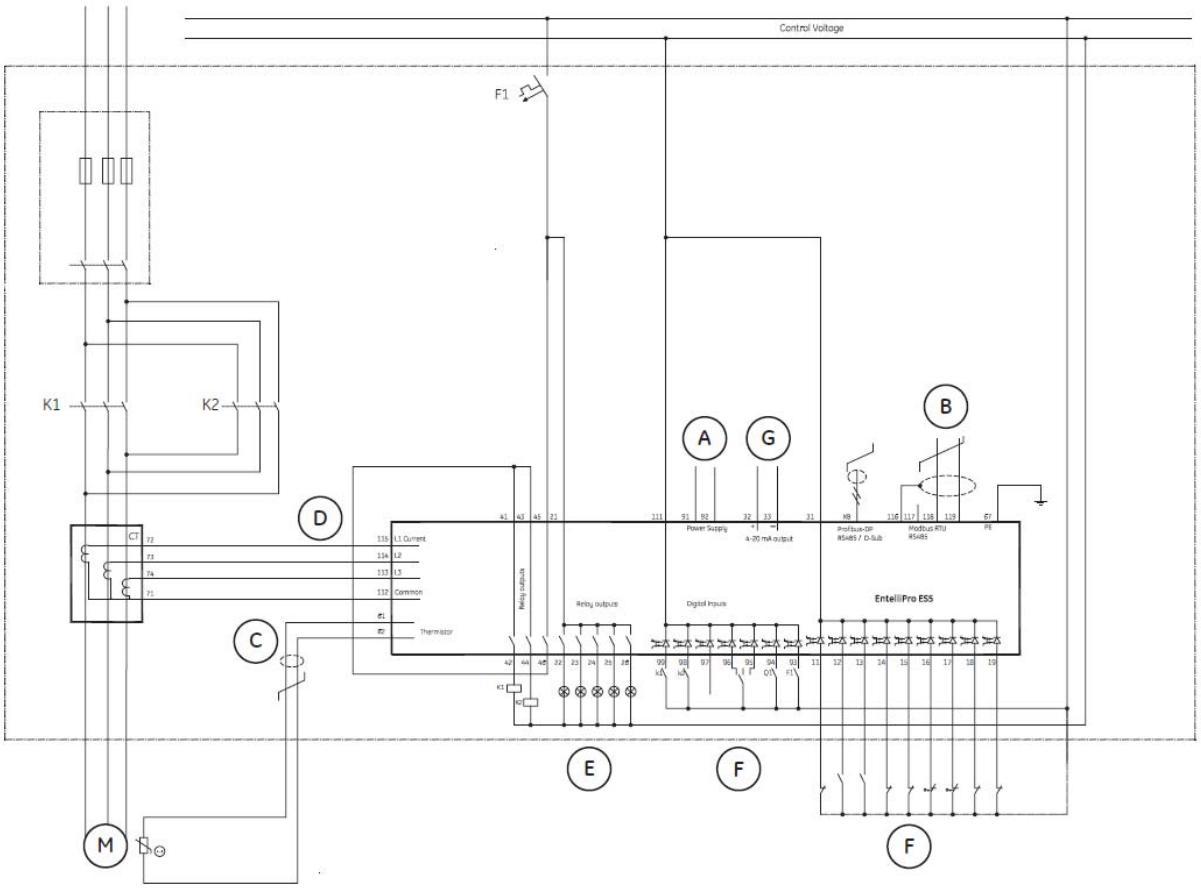


Figure 2-4: EntelliPro ES wiring connections