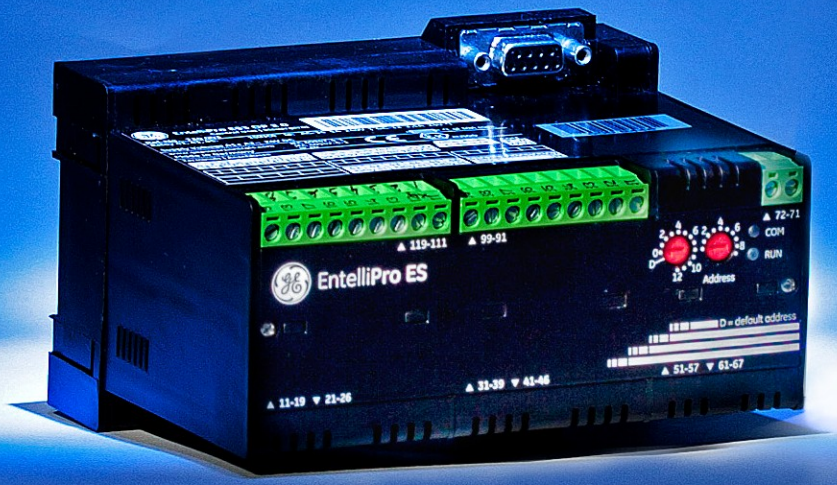
GE Industrial Solutions

EntelliPro ES Motor Controller

Installation and Instruction Manual



EntelliPro ES Revision: 3.0
Manual Part Number: GEH-6000

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EPOS Motor Management System
Chapter 1: Introduction

This chapter provides an overview of the EPOS Motor Control System. Additional details are provided in subsequent chapters.

1.1 Overview

The EPOS Electronics Protection and Object Control System is a motor protection system designed specifically for low-voltage motor applications. It is comprised of the following modules:

- EntelliPro ES: a modular control unit that represents the lowest level in the control hierarchy of the EPOS system.
- EntelliPro CT: a current transformer that is used in conjunction with EntelliPro ES in a branch-drawout system.
- WinESG: a Profibus base programmable software used to configure EntelliPro ES Alarm handling, read and write parameters.
- Optional EntelliPro CP3 or EntelliPro CP5: Modbus-based HMI (human-machine interface). One HMI is provided as part of the MCC package and is programmed to display metering and other parameters. Refer to chapter 6 for additional information.

The EntelliPro ES can be programmed as an EntelliPro ES retrofit, where the Profibus telegrams match the ESS DP device. Alternatively, the EntelliPro ES can be programmed as a non-retrofit unit, where additional Profibus telegrams are made available.

The EntelliPro ES provides the following key features:

- Flexible protection, control, and communication options to suit any low-voltage motor application.
- Small footprint designed specifically for IEC and NEMA MCC applications.
- Modular design reduces the number of spare components for maintenance and testing.
- DIN rail mounting.
- Dual, simultaneous communication protocols (Modbus and Profibus) allow simple integration into monitoring and control systems.
- Multiple inputs and outputs.
- Eleven pre-programmed motor starter types.
- Programmable custom motor starter logic for complex systems.

1.1.1 Warnings, cautions, notes, and references

WARNING notices are used in this publication to emphasize that hazardous voltages, currents, or other conditions that could cause personal injury exist in this equipment or may be associated with its use. Warning notices are also used for situations in which inattention or lack of equipment knowledge could cause either personal injury or damage to equipment.

CAUTION notices are used for situations in which equipment might be damaged if care is not taken.

NOTES call attention to information that is especially significant to understanding and operating the equipment. This document is based on information available at the time of its publication. While efforts have been made to ensure accuracy, the information contained herein does not cover all details or variations in hardware and software, nor does it provide for every possible contingency in connection with installation, operation, and maintenance. Features may be described herein that are not present in all hardware and software systems. GE Industrial Solutions assumes no obligation of notice to holders of this document with respect to changes subsequently made.

ATEX sign is used to indicate mandatory settings and items for use of EntelliPro to protect motors in in potential explosive environment.

GE Industrial Solutions makes no representation or warranty, expressed, implied, or statutory, with respect to, and assumes no responsibility for the accuracy, completeness, sufficiency, or usefulness of the information contained herein. No warrantees of merchantability or fitness for purpose shall apply.

References

For details of the Modbus RTU protocol, refer to PI-MBUS-300 Rev. J from Modicon/AEG Schneider Automation. For details of RS-485 communications, refer to the EIA-485 standard.

Modbus RTU® is a registered trademark of AEG Schneider Automation. Modbus® is a registered trademark of Modicon Inc.

For additional information on the EntelliPro CP3 and CP5 HMI, please refer to the Beijer Electronics H-T40 and H-T70 installation and operation manuals.

For details on Profibus standards, refer to IEC 61158.

1.1.2 Definitions

A, Amps	amperes
ATEX	EU directives describing what equipment is allowed in an explosive atmosphere environment.
AUX	auxiliary
bps	bits per second
CP	EntelliPro CP3 or CP5
CT	current transformer
COM, Comms	communications
Ctrl	control
DP	decentralized peripheral
FLA	full load amps
FV	full voltage
EPOS	electronic protection and object control system
EU	European Union
FC	Modbus function code
GF	ground fault
GND	ground
Hz	Hertz
GSD	device description data
HMI	Human Machine Interface
lb	pound
Ict	primary current in EntelliPro CT
Ir	normal motor operating current
I/O	input and outputs
Kohms (ku)	kilo-ohms
LED	light emitting diode
MAX	maximum
MCC	motor control center
MIN	minimum
mSec (ms)	milliseconds
NVM	nonvolatile memory
Ops	operations
PL	phase loss
PLC	programmable logical controller
PTC	positive temperature coefficient
RTU	remote terminal unit
SEC, s	seconds
SEV 32, SEN	GE Neumuenster switchboard systems
SOS	sum of squares
spst	single pole-single throw
TCP	transmission control protocol
%UB	percent unbalance

1.1.3 Description of the EntelliPro ES Motor Control Module

The EntelliPro ES is used in conjunction with CTs in branch-drawout systems. This system consists of LEDs, fuses, contactors, and additional components required for the control and switching of the branch. The EntelliPro ES includes the following input/output capabilities:

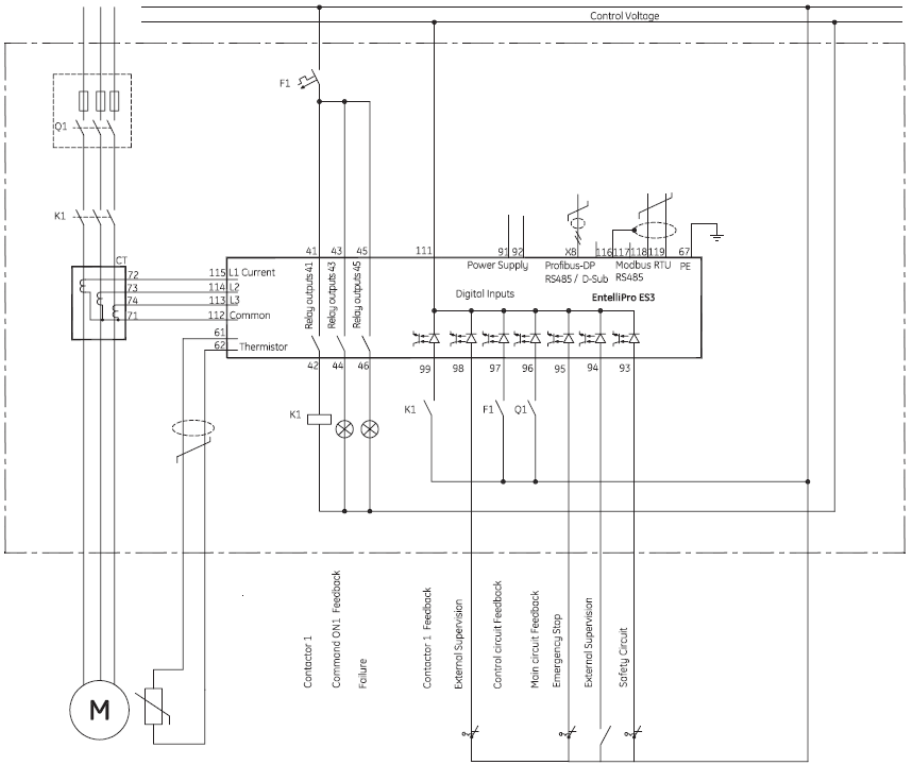
- Seven to sixteen inputs, depending on the catalog type
- Three to eight outputs, depending on the catalog type

The following additional functions are available:

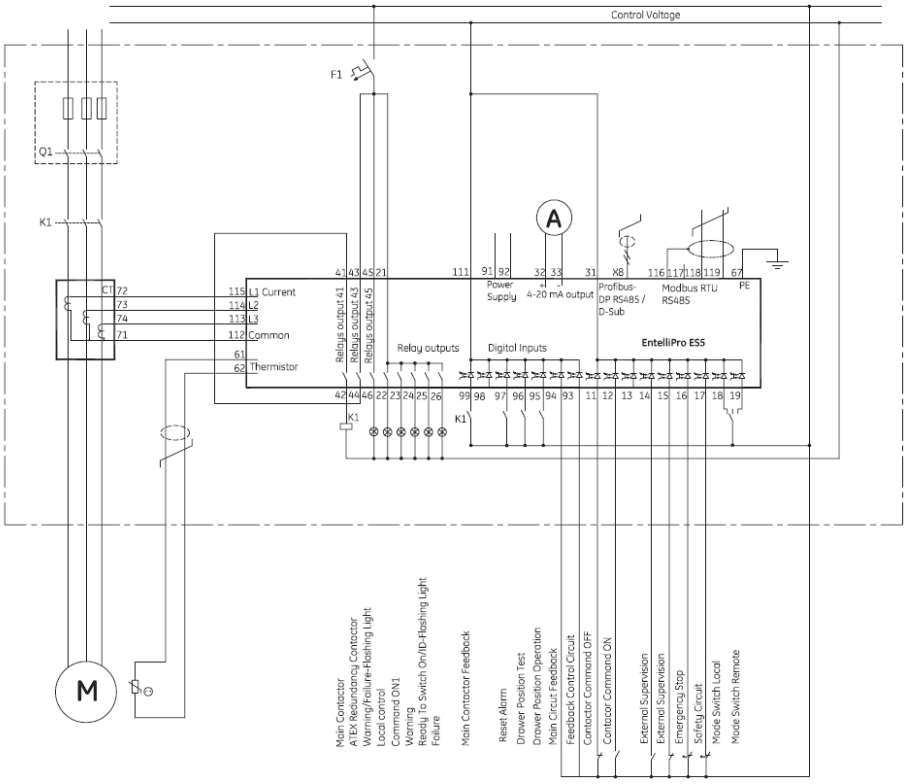
- Overload protection
- Thermistor protection
- 4–20 mA output sensing
- EntelliPro ES alarm modules configurable for fault (trip) or warning (alarm)
- Eleven predefined starter types
- Six predefined controls
- Start inhibits
- Restart timer
- Number of starts
- Number of contactor closures (each relay has its own counter)
- Operating hours
- Non-operating hours
- Counters for overload, ground fault, and thermistor faults
- Time stamp event
- Time stamp analog value

The thermal model uses motor protection curves according to IEC 60947 (IEC Class 5 to 40) and incorporates hot/cold biasing, unbalance biasing, and exponential cooling.

Figure 1-1 shows an example of a single-line system for EntelliPro ES3 and ES5.



Entellipro ES3 DOL standard configuration



EntelliPro ES5 DOL standard configuration

Figure 1-1: Single-line diagram

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:

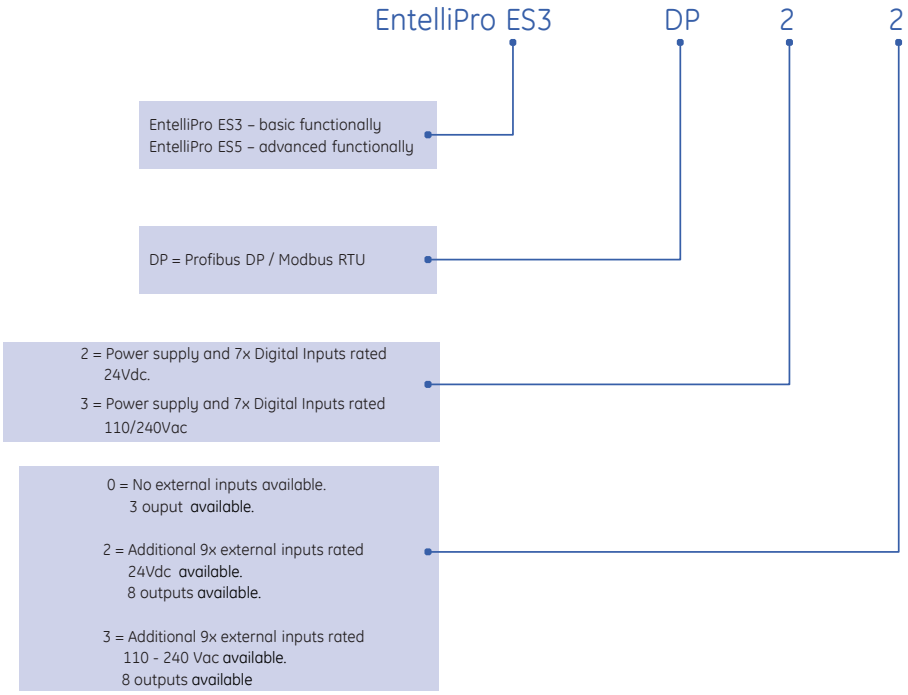


Table 1-1 shows features and protections available for the five catalogs.

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

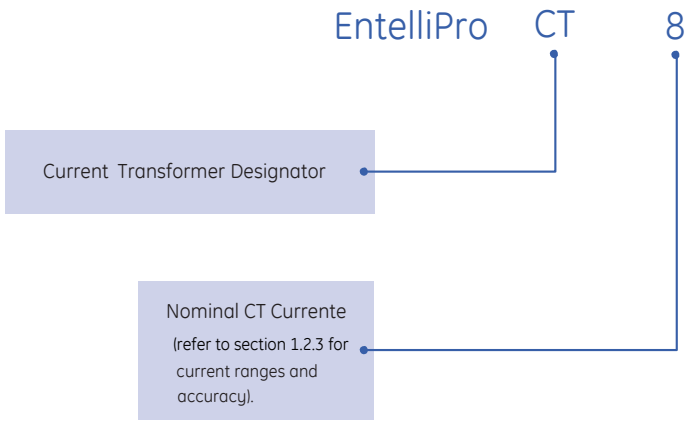
1.1.5 EntelliPro ES Current Transformer Definition

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:



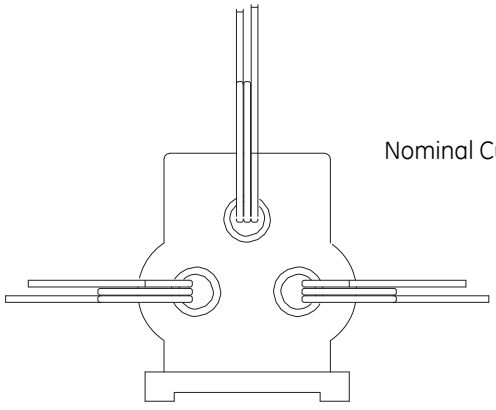
Use of the appropriate transformer will allow the FLA setting to be configured in the range of CT/6 to CT. For example , if the EntelliPro CT 64 transformer is chosen, the FLA setting can be configured from 64/6=10.7 amps to 64 amps in 0.1 amp increments.

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**.

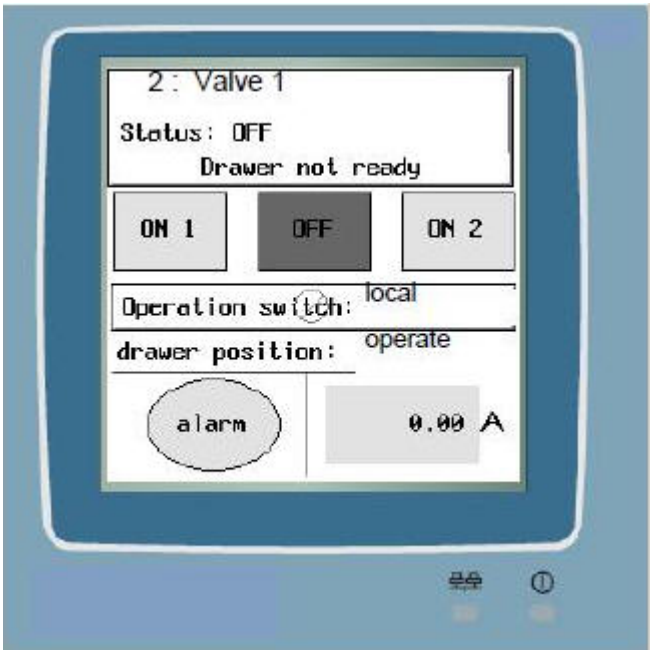


Figure 1-3: HMI front screen

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.

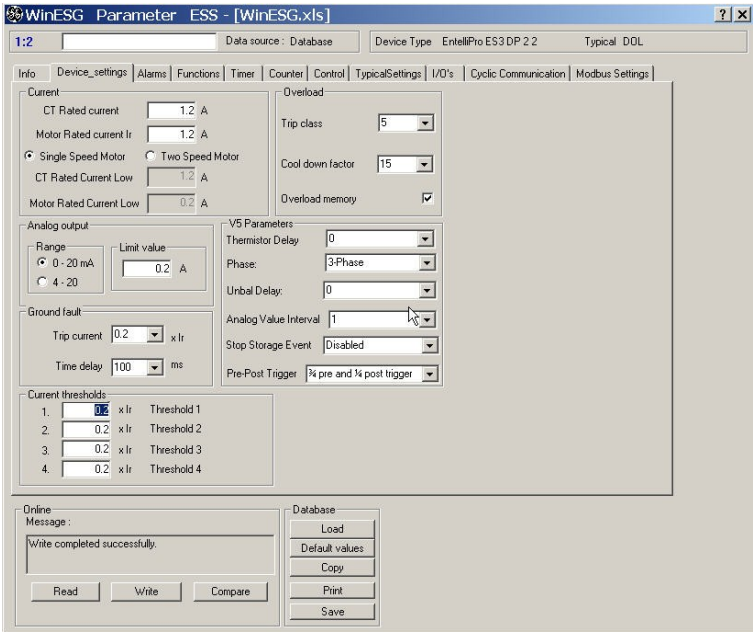


Figure 1-4: WinESG Panel

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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.

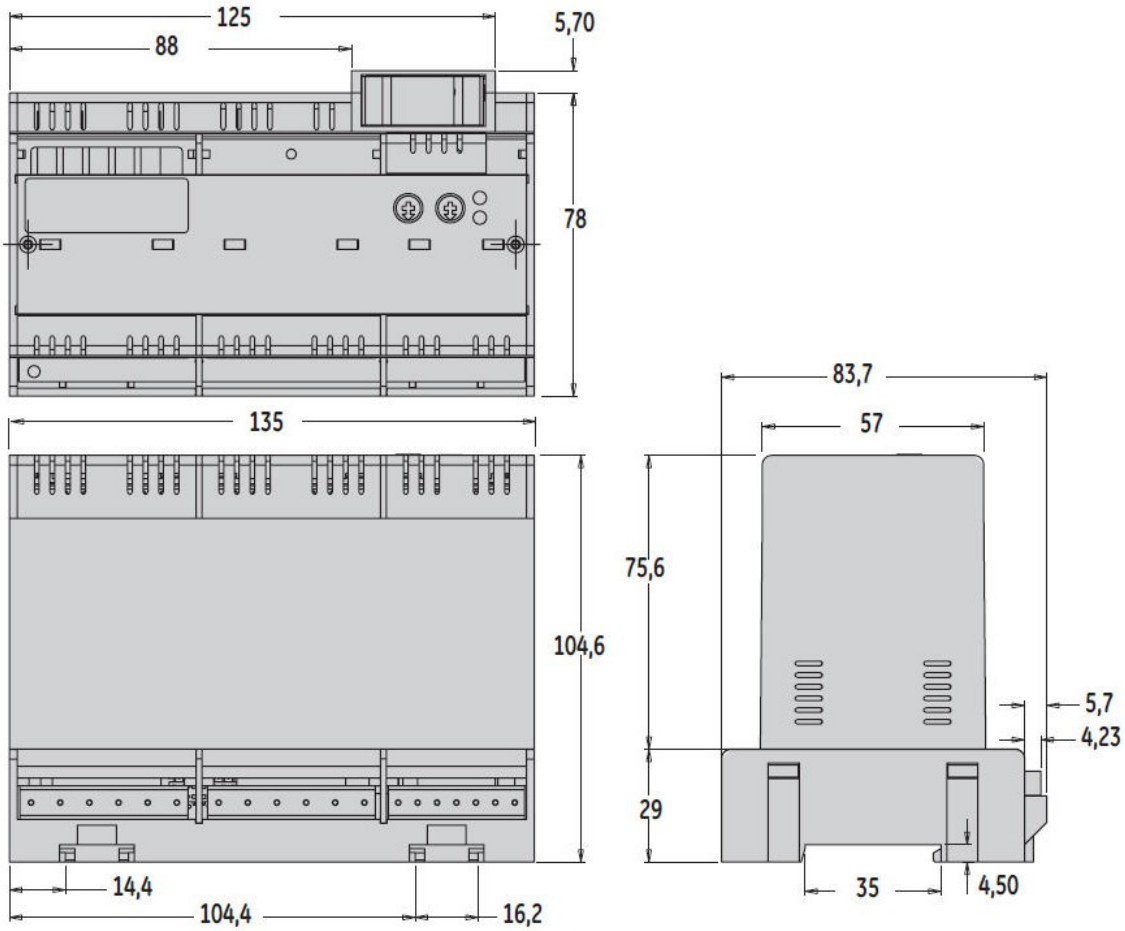


Figure 2-1: EntelliPro ES Dimension

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.

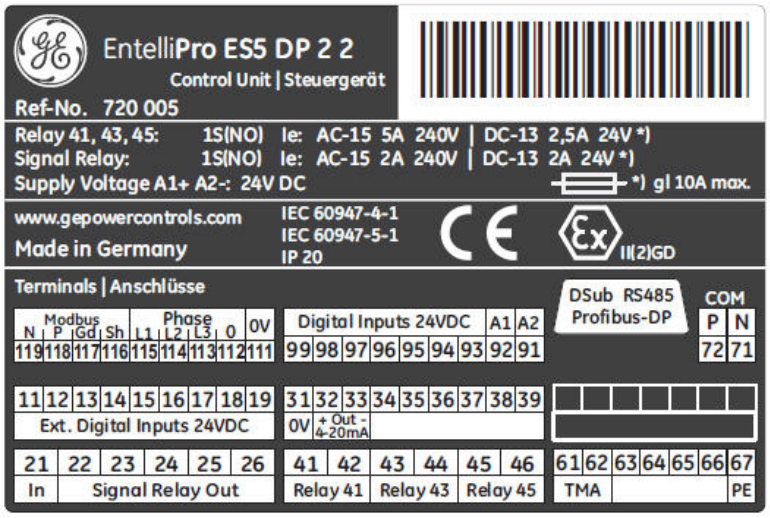


Figure 2-2: EntelliPro ES label example

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).

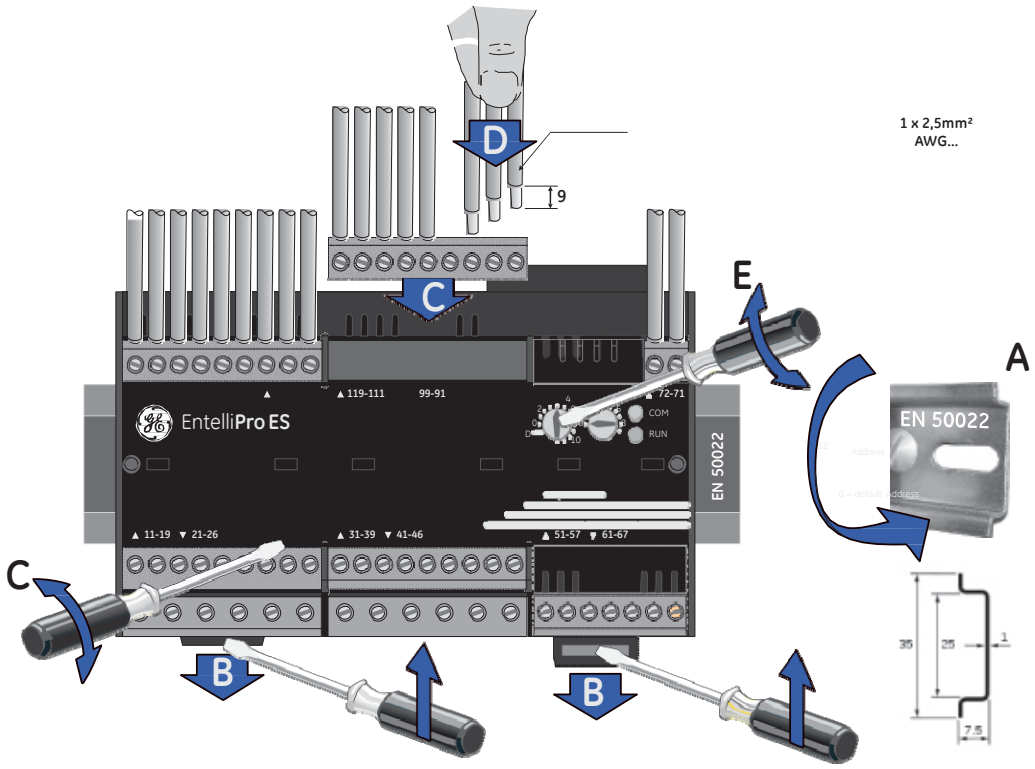


Figure 2-3: EntelliPro ES DIN rail mounting and removal

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.

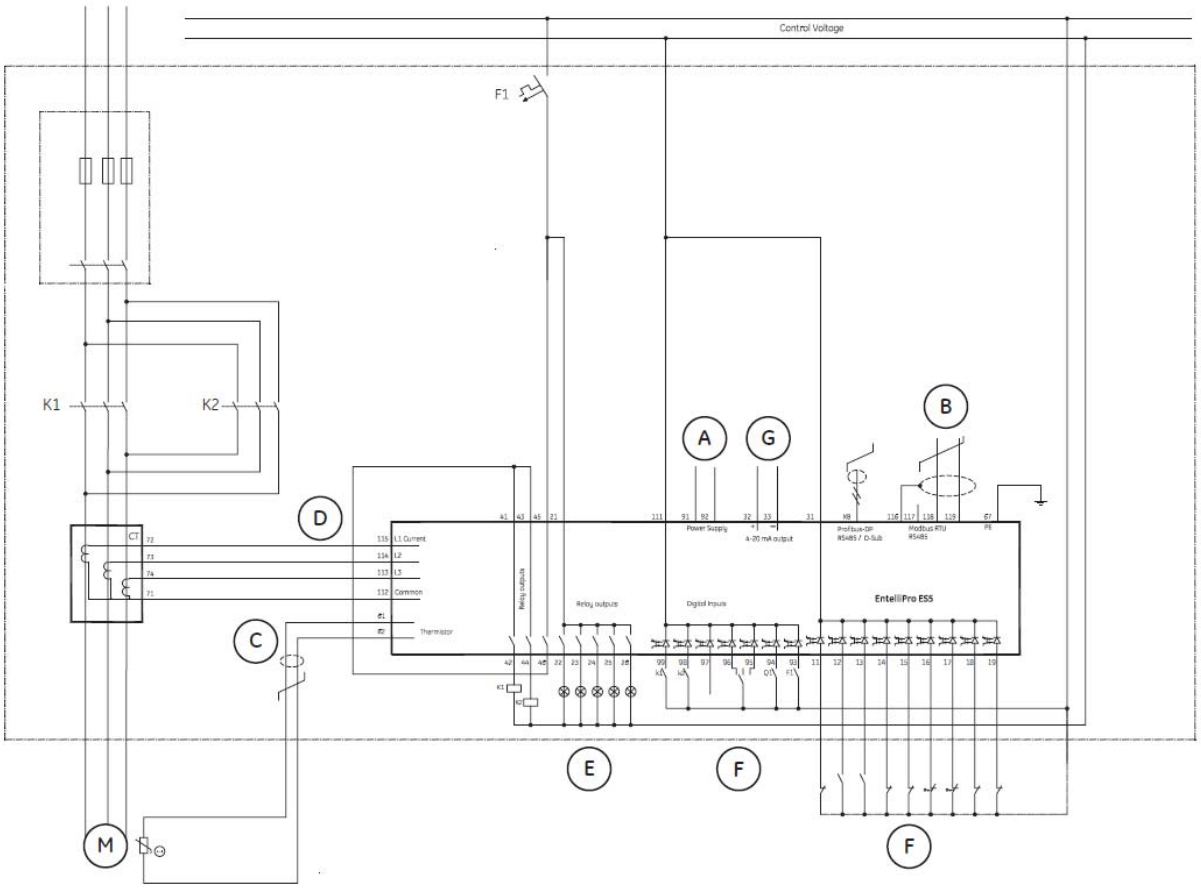


Figure 2-4: EntelliPro ES wiring connections

2.1.2.2 Communication connection

Two two-wire RS485 ports (Modbus RTU and Profibus) are available. Up to 32 EntelliPro ES relays can be daisy- chained together on a communication channel without exceeding the driver capability. Commercially available repeaters can be used to add more than 32 relays. A suitable cable should have the characteristic impedance of 120 ohms (for example, Belden #9841) and total wire length should not exceed 1200 meters (4000 ft.). Commercially available repeaters will allow for transmission distances greater than 1200 meters.

Voltage differences between remote ends of the communication link are not uncommon.

For this reason, surge protection devices are internally installed across all RS485 terminals. Internally, an isolated power supply with an optocoupled data interface is used to prevent noise coupling.

CAUTION

CAUTION: To ensure that all devices in a daisy-chain are at the same potential, it is imperative that the common terminals of each RS485 port are tied together and grounded only once at the master or at the EntelliPro ES. Failure to do so may result in intermittent or failed communications.

Refer to Figure 2-4, Item B for Modbus communication connections. Profibus connections are made on disconnect. For information on Profibus cable types and lengths, refer to the installation guide for Profibus wiring on the PI Center home page http://www.Profibus.com/nc/downloads.

2.1.2.3 Thermistor connection

A positive temperature coefficient (PTC) thermistor can be directly connected to the EntelliPro ES TMA terminals. Refer to Figure 2-4, Item C, for thermistor connection. Connection must be in accordance to IEC 34-11-2.

2.1.2.4 Phase Current Connection

The EntelliPro ES has three channels for phase current inputs. The phase CTs should be chosen so the FLA is not less than 1/6 of the rated phase CT primary. Ideally, the phase CT primary should be chosen such that the FLA is 100% of the phase CT primary or slightly less, never more. This will ensure maximum accuracy for the current measurements. The maximum phase CT primary current is 6400A, with additional interposing CT.

CAUTION: Polarity of the phase CTs is critical for the ground fault calculation. Refer to Figure 2-4, Item D for typical phase current input connections.

2.1.2.5 Input/output connection

EntelliPro ES has 16 inputs, 3 form A motor output relays and 5 form A signal output relays.

NOTE: The number of Inputs and outputs depends on the catalog number.

NOTE

Inputs can be mapped to any of the input functions, such as contactor 1 On command, contactor 2 On command, contactor feedback, etc. Inputs can also be configured as active high or low signals. In an input is configured as active low, the input will be active if the voltage is below the fixed drop-off threshold. If an input is configured as active high, the input will be active if the voltage is above the fixed pick-up threshold. Refer to section 1.2.3 for input electrical specification. The complete list of input mapping is shown in Table 2-4.

Refer to Figure 2-4, Items E (outputs) and F (inputs), for typical output and input connections.

Digital Input Mapping	
Active High Signal	Active Low Signal
ON1 Command	ON1 Command
ON2 Command	ON2 Command
OFF Command	OFF Command
Main Contactor 1 Feedback MCCB ON Feedback	Main Contactor 1 Feedback MCCB ON Feedback
Main Contactor 2 Feedback MCCB OFF Feedback	Main Contactor 2 Feedback MCCB OFF Feedback
Start Contactor Feedback Signal Breaker Charged Status Signal	Start Contactor Feedback Signal Breaker Charged Status Signal
Bypass Feedback	Bypass Feedback
Limit Switch 2	Limit Switch 2
Limit Switch Close	Limit Switch Close
Feedback 4	Feedback 4
Delta Contactor Feedback Signal Soft Starter Up to Speed feedback Torque Switch1	Delta Contactor Feedback Signal Soft Starter Up to Speed feedback Torque Switch1
Torque Open	Torque Open
Breaker tripped2	Breaker Tripped2
External Fault Signal 1 (External Supervision)	External Fault Signal 1 (External Supervision)
External Supervision Feedback	External Supervision Feedback
Breaker ready for Switch On	Breaker Ready for Switch On
Torque Close	Torque Close
Torque Switch 2	Torque Switch 2
Drawer Test Position Signal	Drawer Test Position Signal
Drawer Operation Position Signal	Drawer Operation Position Signal
Remote Input Signal	Remote Input Signal
Local Input Signal	Local Input Signal
Reset Alarms Input Signal	Reset Alarms Input Signal
Main Circuit Feedback	Main Circuit Feedback
Control Circuit Feedback	Control Circuit Feedback
Emergency Stop Signal	Emergency Stop Signal
Safety Circuitry Signal	Safety Circuitry Signal
Limit Switch 1	Limit Switch 1
Limit Switch Open	Limit Switch Open
Soft Starter External Fault	Soft Starter External Fault
Breaker Tripped 1	Breaker Tripped 1
External Fault Signal 2 (External Supervision)	External Fault Signal 2 (External Supervision)

Table 2-4: Input mapping

2.1.2.6 4-20mA output connection

Refer to Figure 2-4, Item G, for typical 4-20mA connections.

2.1.2.7 Dielectric strength testing

It may be required to test a complete motor starter for dielectric strength ("flash" or "HIPOT") with the EntelliPro ES Installed. The EntelliPro ES is rated for 1.5 kV AC for 1 second isolation between relay contacts, EntelliPro ES CT inputs and the PE terminal (66). Some precautions are required to prevent damage to the EntelliPro ES during these tests.

To avoid damage to filter capacitors and transient suppressors by continuous high voltage, disconnect the PE terminal during testing of power supply inputs. The CT inputs, inputs, and output relays do not require any special precautions. Low voltage inputs (less than 30 volts), and RS485 communication ports are not to be tested for dielectric strength under any circumstance.

2.2 Motor Control Configuration

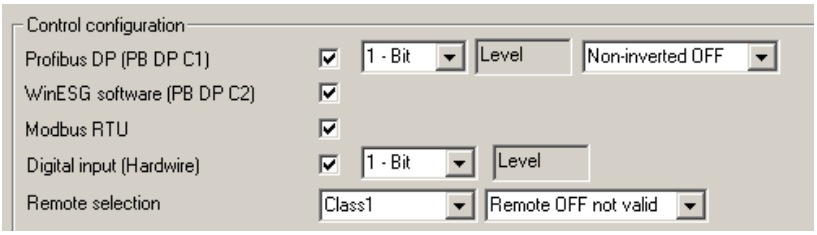
This section is split into two parts; one for an expert integrator requiring a full knowledge of all parameters and configuration and the other requiring minimal knowledge to configure the EntelliPro ES.

For the expert user, refer to section 2.2.1. For non-expert user, refer to sections 2.2.2.

2.2.1 Motor Control Detailed Configuration

The EntelliPro ES can control the motor (start, stop, reset…) by four means: Profibus class 1, which can be PLC or other automation systems, Modbus RTU master, which can be the EntelliPro CP or other Modbus RTU base system, Hardwire and WinESG.

The first step in the configuration is to assign the four sources (Profibus class1, CP/Modbus RTU, Hardwire, WinESG) as locals or remote. This is done in WinESG parameterization/control panel shown in the illustration below or Modbus function code 6 register 115. If a source is not assigned as remote, it automatically becomes a local source if enabled by checking the box to the right of the source. Only one remote source can be selected.



NOTE

NOTE: If Profibus Class 1 is enabled, the remote source selection can only be set to Class 1.

In addition EntelliPro ES provides a "local-remote-off" switch which selects if locals or remote sources control the motor ON/OFF operation.

NOTE

NOTE: Only one source can control the switch.

The following sources can be configured as the controller of the "local-remote-off" switch configuration:

Profibus Class 1	The "local-remote-off" switch can only be configured over Profibus Class 1 master module.
CP / Modbus RTU	The "local-remote-off" switch can only be configured over Entellipro CP / Modbus RTU module or other Modbus masters modules.
Hardwire	The "local-remote-off" switch can only be configured with hardwired input. Switch must be connected to the input and the input mapped accordingly.

Fixed Local — Control commands (start, stop, reset etc) can only be issued by local sources. See section 2.2.1.1 for the local source listing.

NOTE **NOTE:** If the hardwire connection is set to 1-bit (level) then locals CP / Modbus RTU and WinESG are disabled. If hardwire connection is set to 2-bit (edge) input configuration, the locals CP / Modbus RTU and WinESG controls are enabled. See section 2.2.1.2 for detail of 1-bit and 2-bit configurations.

Fixed Remote — Control commands (start, stop, reset etc) can only be issued by the remote source. See section 2.2.1.1 for the remote source listing.

The control of the "local-remote-off" switch can be set in WinESG parameterization/control panel or by configuring Modbus RTU register 115. The switch control in WinESG is shown below:

2.2.1.1 Local and Remote Sources Listing

Local sources are defined as hardwire, CP / Modbus RTU or other Modbus RTU modules, and WinESG.

Remote control sources are defined as hardwire, Modbus RTU or other Modbus RTU modules, and Profibus Class 1, which can be PLC or other Profibus based automation system.

2.2.1.2 Input Configuration

Input can be configured as 1-bit or 2-bit. If set to 1-bit then a single input is used to control the contactor closing and opening. If set to 2-bit, one input will be mapped to close the contactor and a different input use to open the contactor.

The same is applicable to Profibus communication. If set to 1-bit, a single ON1 (or ON2) bit is use to turn the contactor on and off. If using 2-bit, ON1 (or ON2) bit is used to turn on the contactor and OFF bit is use to open the contactor.

2.2.1.3 Motor Control via Modbus Configuration

Table 2-5 shows the Modbus register mapping of remote source and switch control selections. By setting register 115 to 34 decimal (0x22), it indicates that Modbus is the remote source and also controls the local-remote-off switch.

Register	Description	Bit Definition
115	Bit0 thru Bit2 defines the Remote source Bit0 – Bit 2 Bit4 thru Bit6 defines the source that controls the local/ remote/ off switch Bit 0- bit 2	 0 - None 1 - Profibus Class 1 2- Modbus 3-Hardwire 0- None 1- Profibus Class 1 2-Modbus 3-Hardwaire 4-Fixed Local 5-Fixed Remote

Table 2-5 Remote source and switch control selection via Modbus

To start contactor1, Modbus command function code 5 register 11 set to ON selects the remote source (Modbus), as a means to control the start/stop/reset operations. This command may be issued only once upon power up.

Once the remote selection is made, a start command can be issued using Modbus function code 5 register 1.

To start contactor2, Modbus command function code 5 register 11 set to ON selects the remote source (Modbus), as a means to control the start/stop/reset operations.. Once the remote selection is made a start command can be issued using Modbus function code 5 register 2.

To start the contactors, Modbus command function code 5 register 10 set to ON selects the local sources (hardwire, Modbus RTU and WinESG), as a means to control the start/stop/reset operations. This command may be issued only once upon power up.

Once the local selection is made, a start command can be issued from any local sources.

2.2.1.4 Motor Control via WinESG

Similar configuration as above can be done using GE configuration software WinESG. Refer to WinESG parameterization /control panel on Chapter 5.

2.2.1.5 Motor Control via Profibus Class 1

After configuring the switch control via Modbus or WinESG, write telegram B10008 can be used to control the contactors. Refer to Chapter 4 for additional information on this telegram.

2.2.1.6 ATEX Configuration

CAUTION

EntelliPro ES can be configured for use in potentially explosive atmospheres (ATEX). Configuration of EntelliPro ES as ATEX can be done using Modbus RTU master or WinESG configurator tool ONLY (Profibus-DP Class1 CANNOT be used):

WinESG Configurator - refer to WinESG parameterization typical settings panel in section 5.3.2.8.

Modbus by settings register 111 bit 0 to 1, using Function Code 06.

Certain configuration restrictions are placed when configured as ATEX:

Overload protection cannot be disabled or set as warning. It must be configured as fault only.

Thermistor protection cannot be disabled or set as warning. It must be configured as fault only.

Phase Loss cannot be disabled or set as warning. It must be configured as fault only. The Phase Loss time delay is automatically set to immediate, instead of selectable from 1 to 15 seconds.

Phase Unbalance time delay is automatically set to 500msec instead of selectable from 1 to 15 seconds.

ATEX redundancy contactor is made available.

Auto-Reset parameter can be set to manual reset, one auto-reset, two auto-reset and three auto-reset only. Always auto-reset is not allowed.

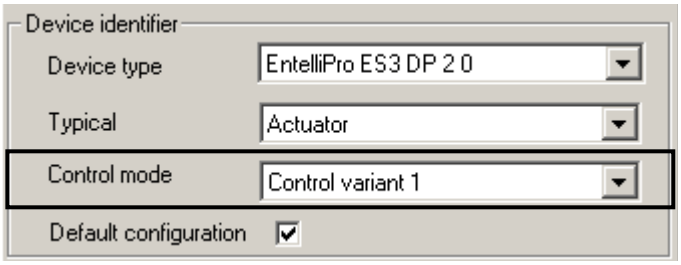
Thermal memory cannot be disabled

2.2.2 Motor Control Pre-Programmed Configuration

For ease of configuration, EntelliPro ES provides a set of control mode variances that allow easy control of the motor by different means: Modbus, Profibus Class1, WinESG and Hardwire.

To enable the pre-programmed control configuration, the default configuration must be enabled in the WinESG parameterization/information panel. To enable the default configuration via Modbus, holding register 62 bit 0 must be set.

WinESG parameterization/information panel shown in illustration below, can be used to configure the default configuration parameter.



Six pre-programmed controls variant are available. Following is the configuration of each variant.

NOTE

NOTE: Control variants 2 and 5 are not applicable to EntelliPro ES3.

Control Variant 1 Configuration

Profibus Class1 master is enabled, configured as remote source, and has the control of the "local-remote-off" switch.

Profibus Class1 bus failure detection is enabled. On Class1 bus failure, switch position is forced to local position.

Modbus failure has not affected the on switch position.

Refer to Figure 2-5.

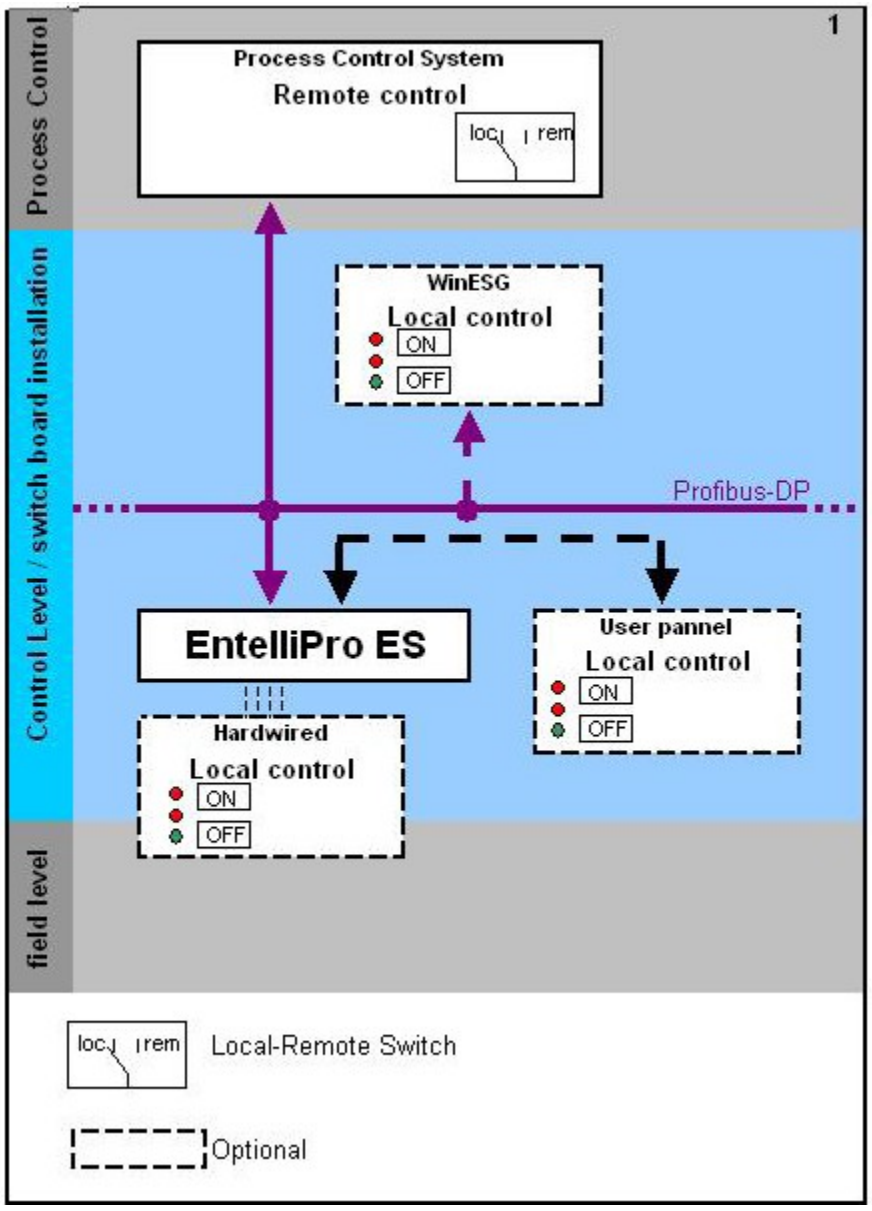


Figure 2-5: Control variant 1 configuration

Control Variant 2 Configuration

Profibus Class1 master is enabled, configured as remote source, and hardwire has the control of the "local-remote-off" switch.

Profibus Class1 bus failure detection is enabled. Class1 bus failure does not affect switch position. Modbus failure has not affected the on switch position.

Refer to Figure 2-6.

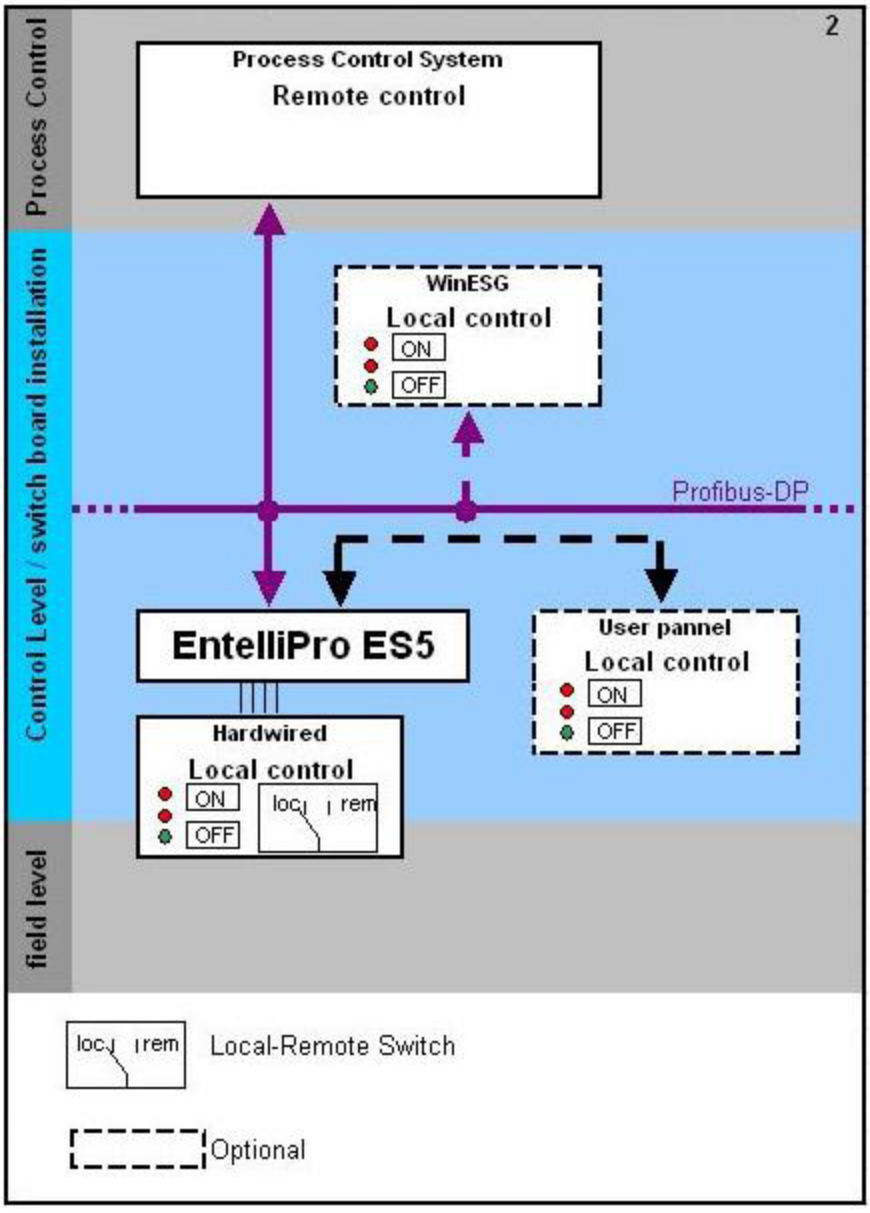


Figure 2-6:Control variant 2 configuration

Control Variant 3 Configuration

Profibus Class1 master is enabled, configured as remote source, and Modbus has the control of the "local-remote-off" switch.

Profibus Class1 bus failure detection is enabled. On Class1 bus failure, has no effect on the switch position. On Modbus failure the switch position is forced to local position.

Refer to Figure 2-7.

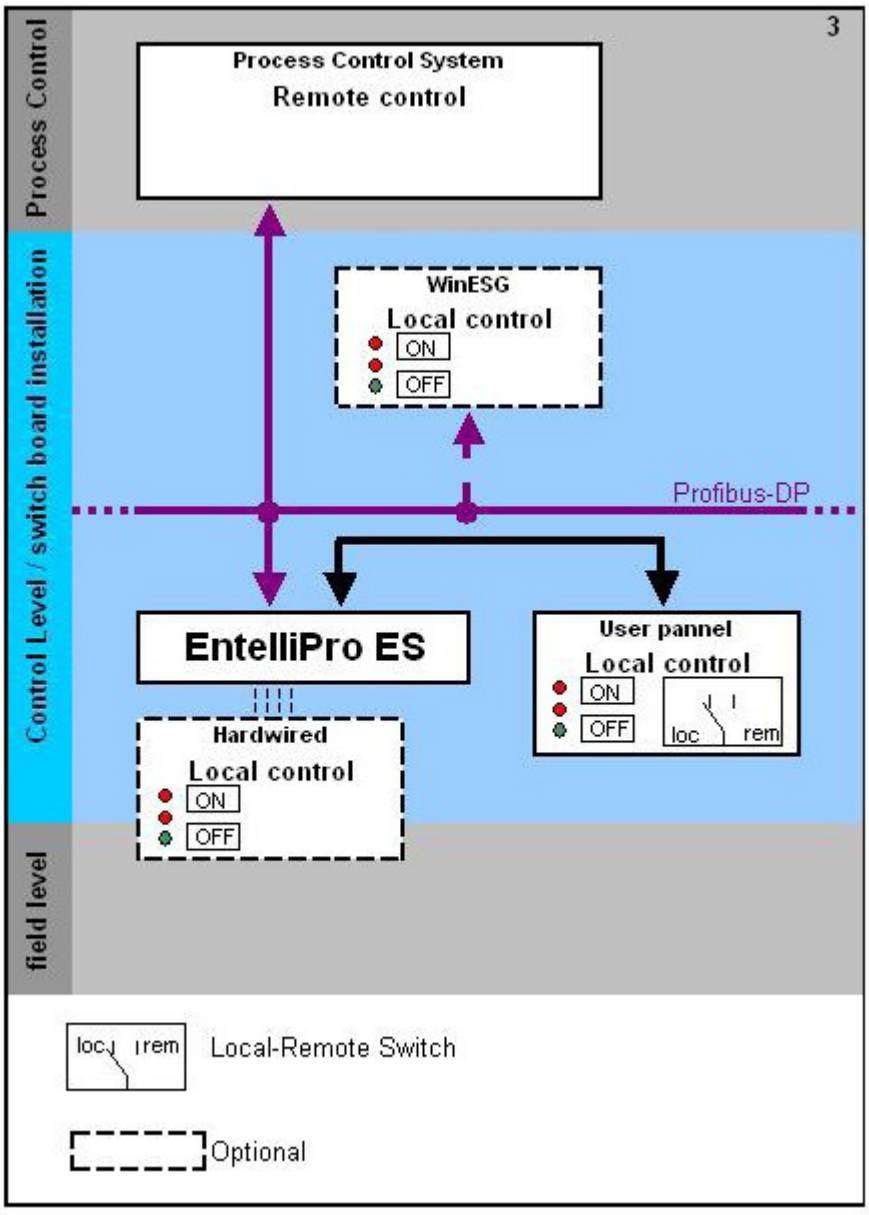


Figure 2-7: Control variant 3 configuration

Control Variant 4 Configuration

Profibus Class1 master is disabled. Modbus is configured as remote source and has the control of the "local-remote-off" switch.

Profibus Class1 bus failure detection is disabled.

On Modbus` failure the switch position is forced to local position

Refer to figure 2-8

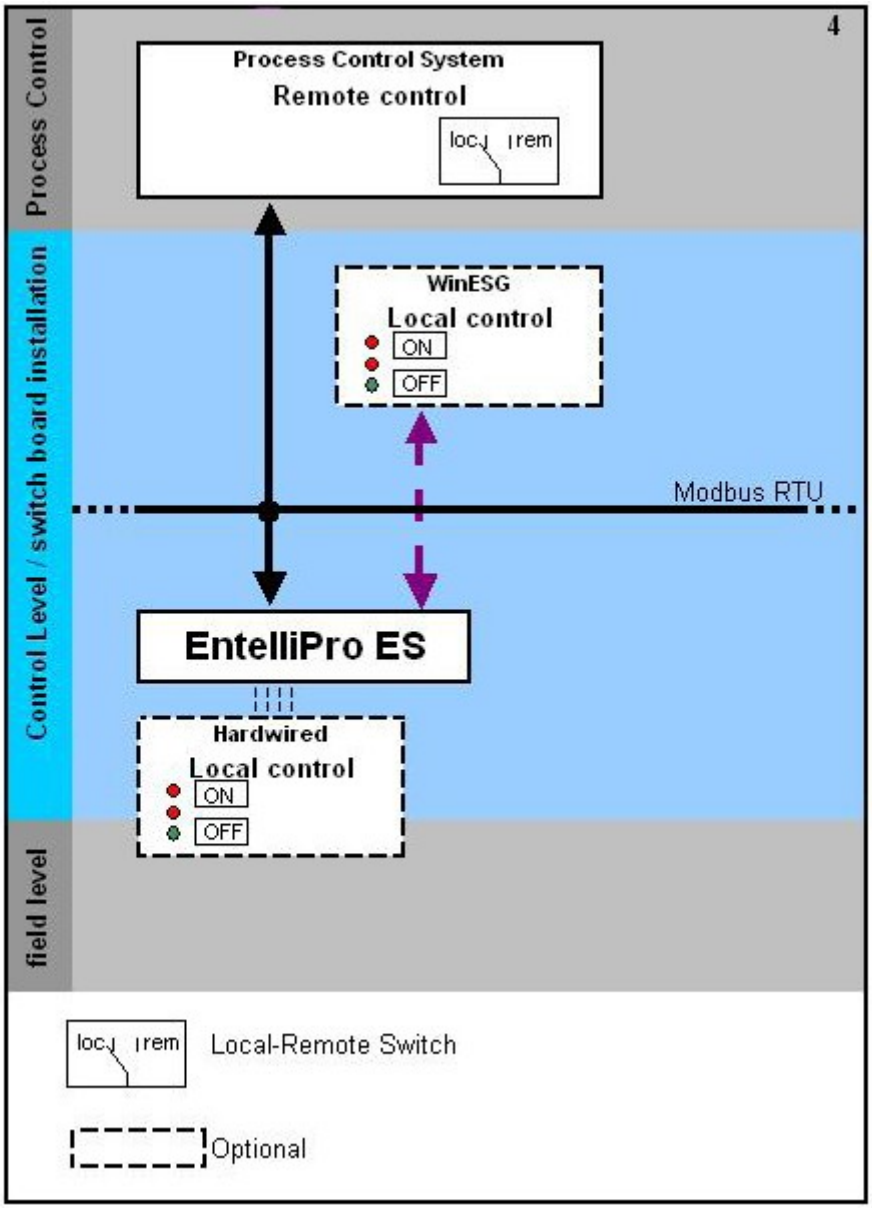


Figure 2-8: Control variant 4 configuration

Control Variant 5 Configuration

Profibus Class1 master is disabled. Modbus is configured as remote source and hardwire has the control of the "local-remote-off" switch.
Profibus Class1 bus failure detection is disabled.

Modbus failure has no effect on switch position. Refer to Figure 2-9.

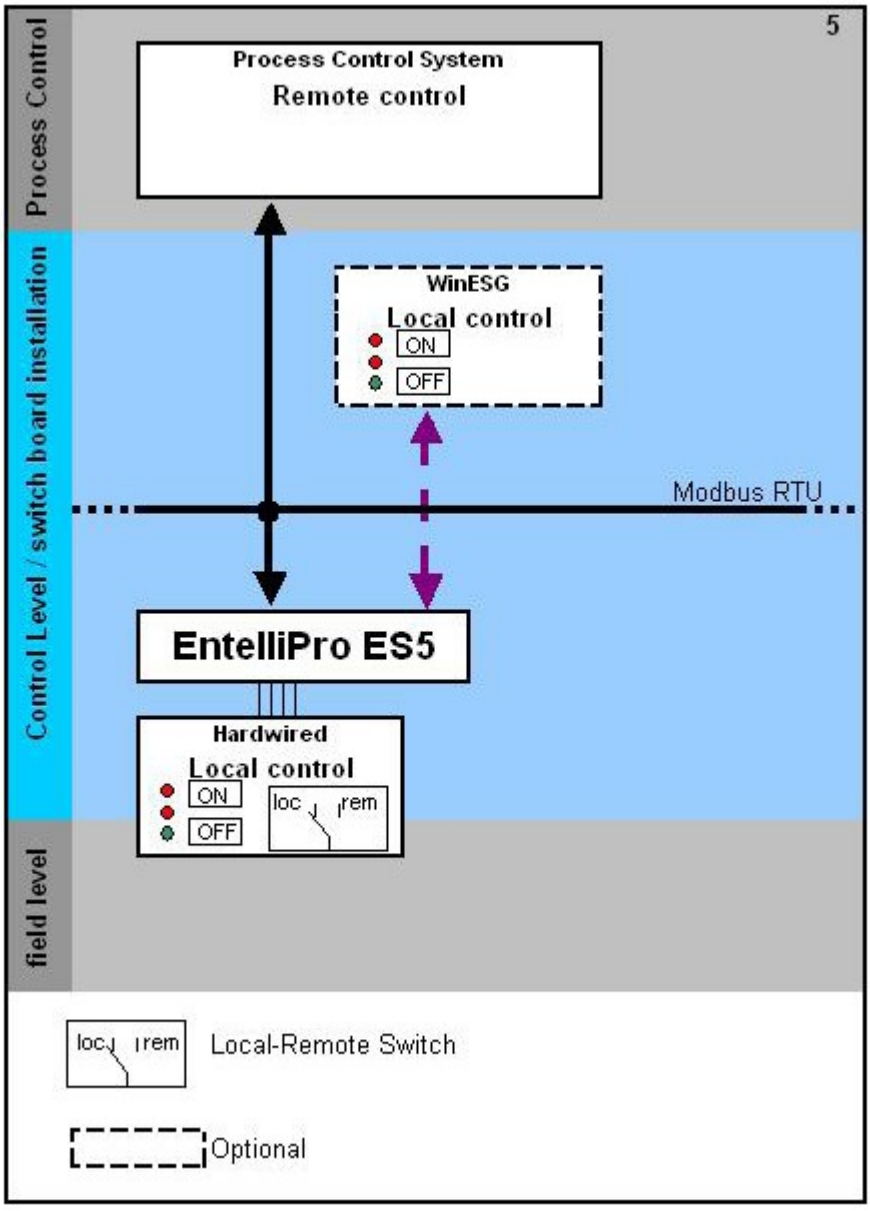


Figure 2-9: Control variant 5 configuration

Control Variant 6 Configuration

Profibus Class1 master is enabled. Any local sources (Modbus, WinESG, Hardwire) if enabled, can control the motor operation (ON/OFF).

Profibus Class1 bus failure detection is disabled.

Refer to Figure 2-10.

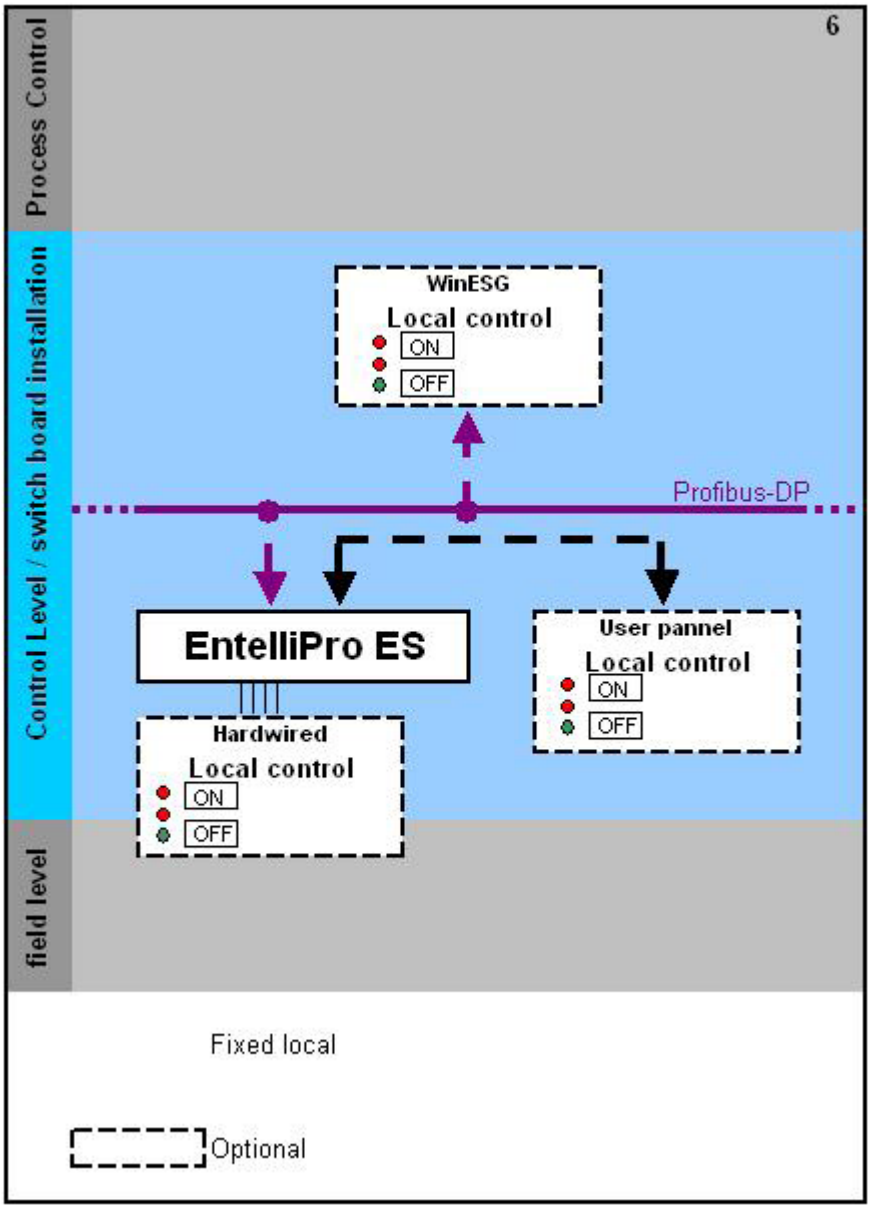


Figure 2-10: Control variant 6 configuration

2.3 Motor Starter Configuration

There are eleven pre-programmed starter types (typicals), which can be selected via Modbus RTU or Profibus communication..

The following are the starter types:

- Full-voltage non-reversing
- Full-voltage reversing
- Star-delta open transition
- Star-delta reverse open transition
- Soft starter
- Reverse soft starter
- Breaker Control (see note below)
- Dahlander
- Pole changer
- Solenoid valve
- Actuator with limit or torque switch

In additional customers can order customized motor starter arrangement by providing GE with desired logic control for inputs, outputs and timers.

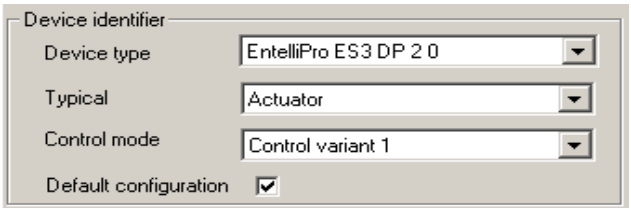
NOTE

NOTE: Customer can change pre-defined configurations of any motor starter if the default configuration is not selected.

NOTE

NOTE: Breaker Control selection is NOT available on EntelliPro ES Revision 1.002. Custom logic can be created to to simulate the application.

To select the motor starter type via Modbus, holding register 62 bit 8 to 11 should be used. Refer to Chapter 4 for additional Modbus information. WinESG parameterization/information panel shown in the illustration below can be used to configured the motor starter type.



DANGER

WARNING: If "allow direction switchover" is enabled, make sure the "motor ON direction switchover time" timer exceeds the contactor or breaker clearing time to avoid short circuit.

2.3.1 Motor Starter Type - Full-voltage non-reversing starter

The typical full-voltage non-reversing starter type is a full voltage or across the line non-reversing starter.

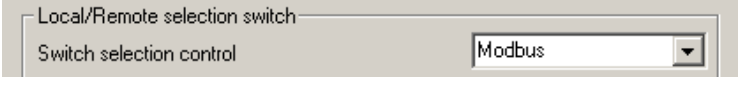
Before the motor can be turned ON the "drawer ready switch" must be active. In order to activate the "drawer ready switch" the following must be done:

- All faults and device errors must be cleared using WinESG control panel, Modbus function code 6 registers 65 thru 106 depending on the fault type, Profibus class 1 telegram B2701, or hardwire (make sure an input is mapped to "reset alarm" in WinESG parameterization / I/O panel). Input mapping can also be done using Modbus function code 6 registers 194 thru 197.
- A valid OFF command must be set on hardwire. Make sure an input is mapped to "command OFF" in WinESG parameterization/I/O panel or Modbus and it is active.
- If the drawer supervision is enabled, as shown below the drawer supervision hardwire input must be active.

- Remote or local selection must be made via the appropriate source. The first step is to select the source (Profibus class 1, Modbus or Hardwire) that has the control of the local-remote switch. This is done in the WinESG parameterization/control panel shown in illustration below.

If Profibus Class 1 is selected as a controlling mechanism, telegram B10008 bit 9 sets the local control and bit 10 sets the remote control. If bit 9 is set, all mechanisms defined as locals can control the motor (ON/OFF). If bit 10 is set, the mechanism defined as remote can control the motor (ON/OFF).

If Modbus is selected as a controlling mechanism, either coil command (function code 05) 10, to select local control or coil command 11 to select remote control must be issued. If coil command 10 is issued, all mechanisms defined as locals can control the motor (ON/OFF). If coil command 11 is issued, the mechanism defined as remote can control the motor (ON/OFF).



If Hardwire is selected as a controlling device, one input must be mapped to mode switch local and a different input to mode switch remote. If input mode switch local is active, all mechanisms defined as locals can control the motor (ON/OFF). If input mode switch remote is active, the mechanism defined as remote can control the motor (ON/OFF).

If Fixed local is selected as a controlling device, any source assigned as local can control the motor (ON/OFF).

If Fixed remote is selected as a controlling device, only the remote source can control the motor (ON/OFF).

NOTE

NOTE: only one control (local or remote) can be enabled at a time. If both (local and remote) are active the "drawer ready switch" will be OFF and the motor cannot start.

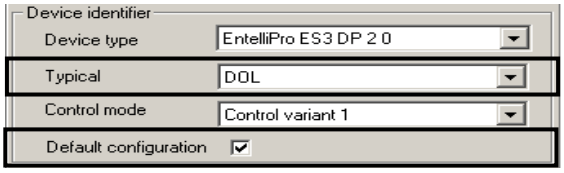
NOTE

NOTE: to make any changes on the configuration, "parameter allowed" must be enabled in WinESG parameterization/function panel or Modbus function code 6 register 62.

Refer to section 2.2.1 for the motor control detailed configuration.

Full-voltage non-reversing starter operation: when an ON1 command is received, contactor K1, controlled by EntelliPro ES output relay 41, will close, provided the motor is in the off state and the drawer ready switch is active, which will start the motor. When an OFF command is received contactor K1 will open and the motor will stop.

If the default configuration and the DOL typical are selected in the WinESG parameterization/information panel shown in the illustration below or by setting Modbus function code 6 register 62 bit0 to 1 and bits 8,9,10 and 11 to 0x0, the inputs and outputs are mapped as below:



For EntelliPro ES3 types:

Input 99 is mapped to contactor 1 feedback	- active high
Input 98 is mapped to external supervision	- active low.
Input 97 is mapped to control circuit feedback	- active low
Input 96 is mapped to main circuit feedback	- active low
Input 95 is mapped to emergency stop	- active low
Input 94 is mapped to external supervision	- active high
Input 93 is mapped to safety circuit	- active low

Output 41 is mapped to contactor 1
Output 43 is mapped to ON1 feedback
Output 45 is mapped to failure

For EntelliPro ES5 types:

Input 99 is mapped to contactor 1 feedback	- active high
Input 98	- not used
Input 97 is mapped to reset alarm	- active high
Input 96 is mapped to drawer in test mode	- active high
Input 95 is mapped to drawer in operation mode	- active high
Input 94 is mapped to main circuit feedback	- active low
Input 93 is mapped to control circuit	- active low
Input 11 is mapped to command OFF	- active low
Input 12 is mapped to command ON	- active high
Input 13	- not used
Input 14 is mapped to external fault	- active high
Input 15 is mapped to external supervision	- active low
Input 16 is mapped to emergency stop	- active low
Input 17 is mapped to safety circuit	- active low
Input 18 is mapped to mode switch local	- active high
Input 19 is mapped to mode switch remote	- active high

Output 41 is mapped to contactor 1
Output 43 is mapped to ATEX redundancy contactor 
Output 45 is mapped to warning (high priority) and failure - relay flashing (low priority)
Output 22 is mapped to local control
Output 23 is mapped to ON1 feedback
Output 24 is mapped to warning
Output 25 is mapped to drawer ready switch (high priority) and identification –relay flashing (low priority)
Output 26 is mapped to failure

NOTE: if default configuration box is left un-checked, the user will have the ability to change the mapping and other parameters.

Refer to Tables 2-6 and 2-7 for the complete default configuration of the full-voltage non-reversing starter motor starter.

Figures 2-11 and 2-12 show typical full-voltage non- reversing starter wiring diagrams for EntelliPro ES3 and EntelliPro ES5.

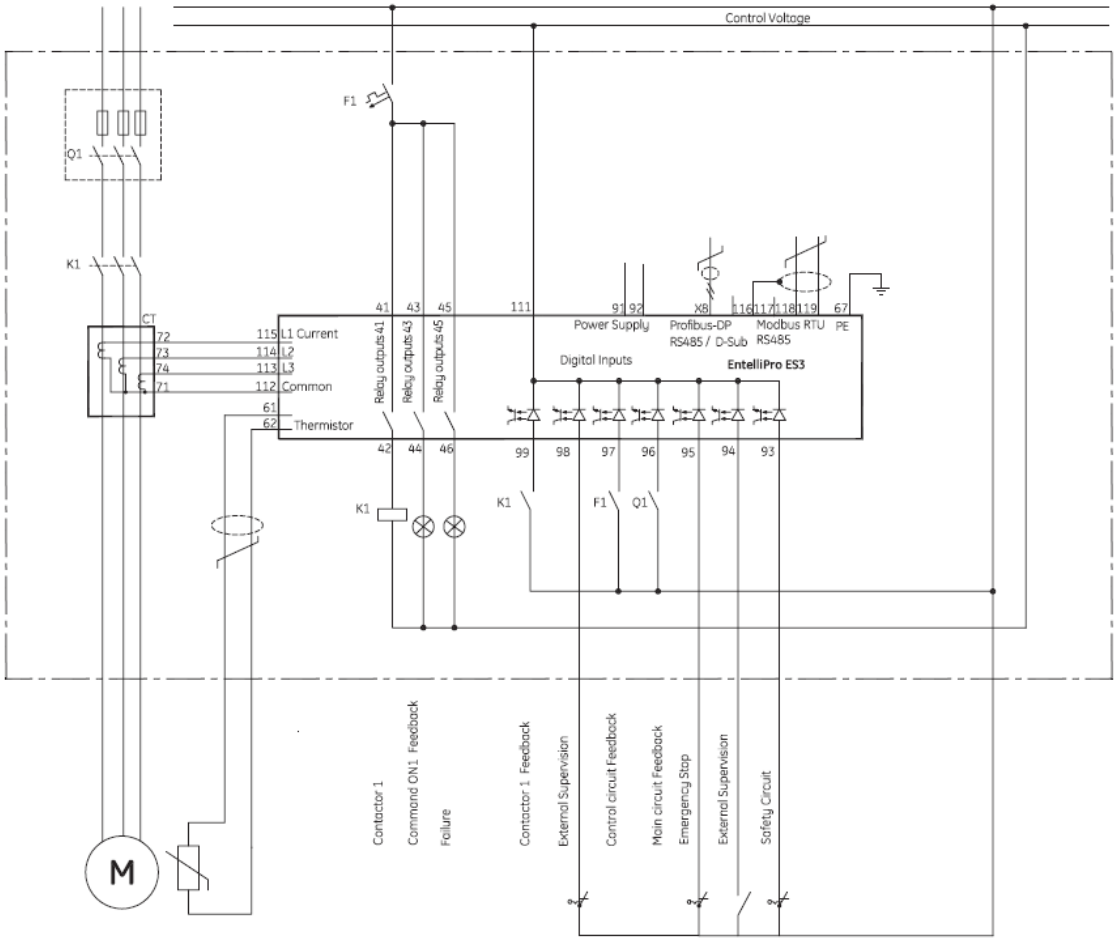


Figure 2-11: EntelliPro ES3 Full-voltage non-reversing (DOL) starter wiring diagram

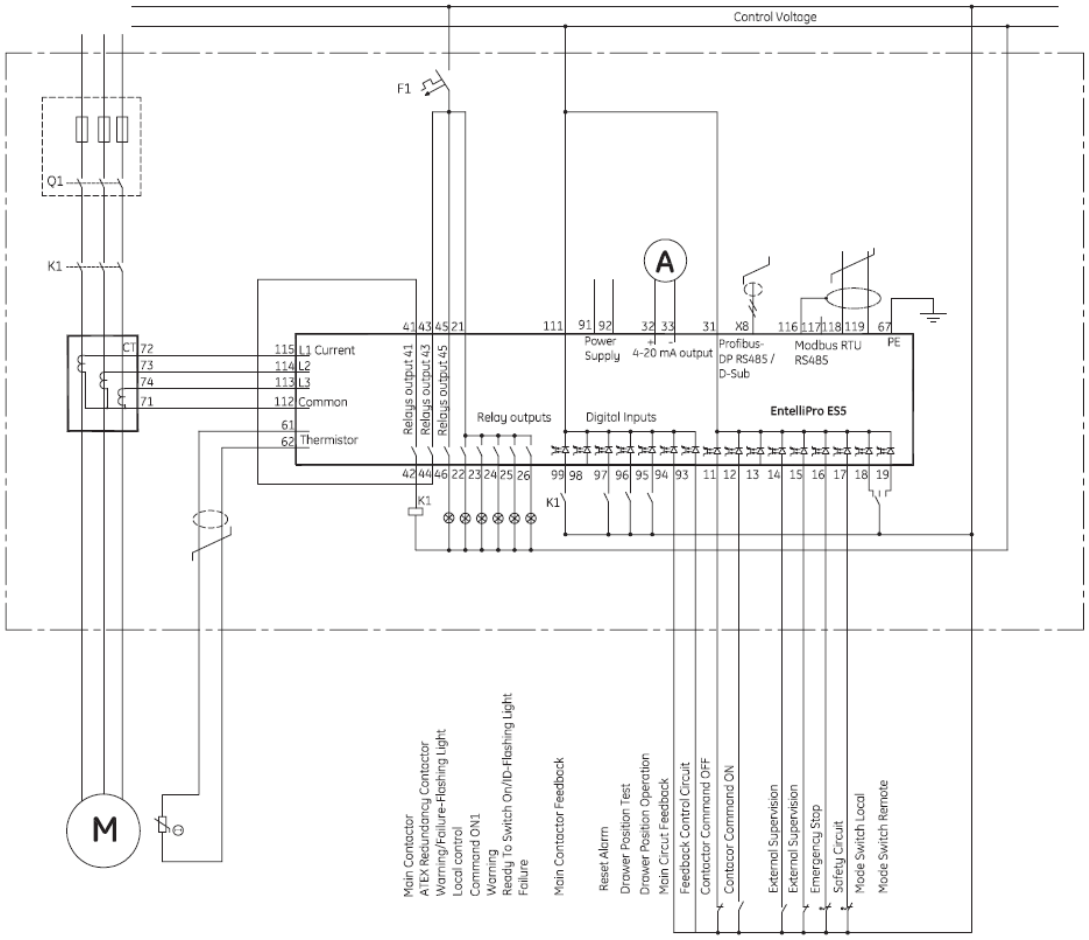


Figure 2-12: EntelliPro ES5 full-voltage non-reversing starter (DOL) wiring diagram

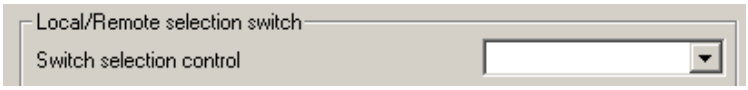
2.3.2 Motor Starter Type - Full-voltage reversing starter

The typical full-voltage reversing starter is a full voltage or across the line reversing starter.

Before the motor can be turned ON the "drawer ready switch" must be active. In order to activate the "drawer ready switch" the following must be done:

- All faults and device errors must be cleared using WinESG control panel, Modbus function code 6 registers 65 thru 106 depending on the fault type, Profibus class 1 telegram B2701, or hardwire (make sure an input is mapped to "reset alarm" in WinESG parameterization / I/O panel). Input mapping can also be done using Modbus function code 6 registers 194 thru 197.
- A valid OFF command must be set on hardwire. Make sure an input is mapped to "command OFF" in WinESG parameterization/I/O panel or Modbus and it is active.
- If the drawer supervision is enabled, as shown below the drawer supervision hardwire input must be active.

- Remote or local selection must be made via the appropriate source. The first step is to select the source (Profibus class 1, Modbus or Hardwire) that has the control of the local-remote switch. This is done in the WinESG parameterization/control panel shown in illustration below.



If Profibus Class 1 is selected as a controlling mechanism, telegram B10008 bit 9 sets the local control and bit 10 sets the remote control. If bit 9 is set, all mechanisms defined as locals can control the motor (ON/OFF). If bit 10 is set, the mechanism defined as remote can control the motor (ON/OFF).

If Modbus is selected as a controlling mechanism, either coil command (function code 05) 10, to select local control or coil command 11 to select remote control must be issued. If coil command 10 is issued, all mechanisms defined as locals can control the motor (ON/OFF). If coil command 11 is issued, the mechanism defined as remote can control the motor (ON/OFF).

If Hardwire is selected as a controlling device, one input must be mapped to mode switch local and a different input to mode switch remote. If input mode switch local is active, all mechanisms defined as locals can control the motor (ON/OFF). If input mode switch remote is active, the mechanism defined as remote can control the motor (ON/OFF).

If Fixed local is selected as a controlling device, any source assigned as local can control the motor (ON/OFF).

If Fixed remote is selected as a controlling device, only the remote source can control the motor (ON/OFF).

NOTE

NOTE: only one control (local or remote) can be enabled at a time. If both (local and remote) are active the "drawer ready switch" will be OFF and the motor cannot start.

NOTE

NOTE: to make any changes on the configuration, "parameter allowed" must be enabled in WinESG parameterization/function panel or Modbus function code 6 register 62.

Refer to section 2.2.1 for the motor control detailed configuration.

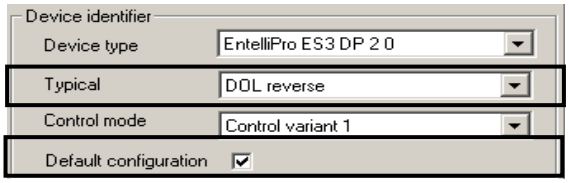
Full-voltage reversing starter operation: when an ON1 command is received, contactor K1, controlled by EntelliPro ES output relay 41, will close, provided the motor is in the off state and the drawer ready switch is active, which will start the motor. When an OFF command is received contactor K1 will open and the motor will stop.

Similarly when a reverse ON2 command is received, contactor K2, controlled by EntelliPro output reply 43, will be closed, provided motor is in the OFF state, which will start the motor in a reverse direction.

In case the motor is running in one direction and a command is received instructing the motor to rotate in opposite direction, the decision of accepting the commands will be dependent on the configuration of the "allow direction switchover" parameter set in WinESG parameterization/typical settings panel or the bit set on Modbus function code 6 register 111.

If this bit is set, the motor is allowed to accept the command, which will cause the motor to stop and wait for the transfer timer to expire before starting the motor in the opposite direction. Transfer time is set on parameter "motor ON direction switchover time" in WinESG parameterization/timer panel or on Modbus function code 6 register 30

If the default configuration and the DOL reverse typical are selected in the WinESG parameterization/information shown in the illustration below or by setting Modbus function code 6 register 62 bit0 to 1 and bits 8,9,10 and 11 to 0x1,the inputs and outputs are mapped as below:



For EntelliPro ES3 types:

Input 99 is mapped to contactor 1 feedback - active high
Input 98 is mapped to contactor 2 feedback - active high
Input 97 is mapped to control circuit feedback - active low
Input 96 is mapped to main circuit feedback - active low
Input 95 is mapped to emergency stop - active low
Input 94 is mapped to external supervision - active high
Input 93 is mapped to safety circuit - active low

Output 41 is mapped to contactor 1
Output 43 is mapped to contactor 2
Output 45 is mapped to failure

For EntelliPro ES5 types:

Input 99 is mapped to contactor 1 feedback - active high
Input 98 is mapped to contactor 2 feedback - active high
Input 97 is mapped to reset alarm - active high
Input 96 is mapped to drawer in test mode - active high
Input 95 is mapped to drawer in operation mode - active high
Input 94 is mapped to main circuit feedback - active low
Input 93 is mapped to control circuit - active low
Input 11 is mapped to command OFF - active low
Input 12 is mapped to command ON1 - active high
Input 13 is mapped to command ON2 - active high
Input 14 is mapped to external fault - active high
Input 15 is mapped to external supervision - active low
Input 16 is mapped to emergency stop - active low
Input 17 is mapped to safety circuit - active low
Input 18 is mapped to mode switch local - active high
Input 19 is mapped to mode switch remote - active high

Output 41 is mapped to contactor 1

Output 43 is mapped to contactor 2

Output 45 is mapped to ATEX redundancy contactor

Output 22 is mapped to local control

Output 23 is mapped to ON1 feedback

Output 24 is mapped to ON2 feedback

Output 25 is mapped to drawer ready switch (high priority) and identification –relay flashing (low priority)

Output 26 is mapped to failure

NOTE

NOTE: if default configuration box is left un-checked, the user will have the ability to change the mapping and other parameters.

Refer to Tables 2-6 and 2-7 for the complete input, output, timer and control configurations of the full-voltage reversing starter motor starter.

Figures 2-13 and 2-14 show a typical full-voltage reversing starter wiring diagrams for EntelliPro ES3 and EntelliPro ES5.

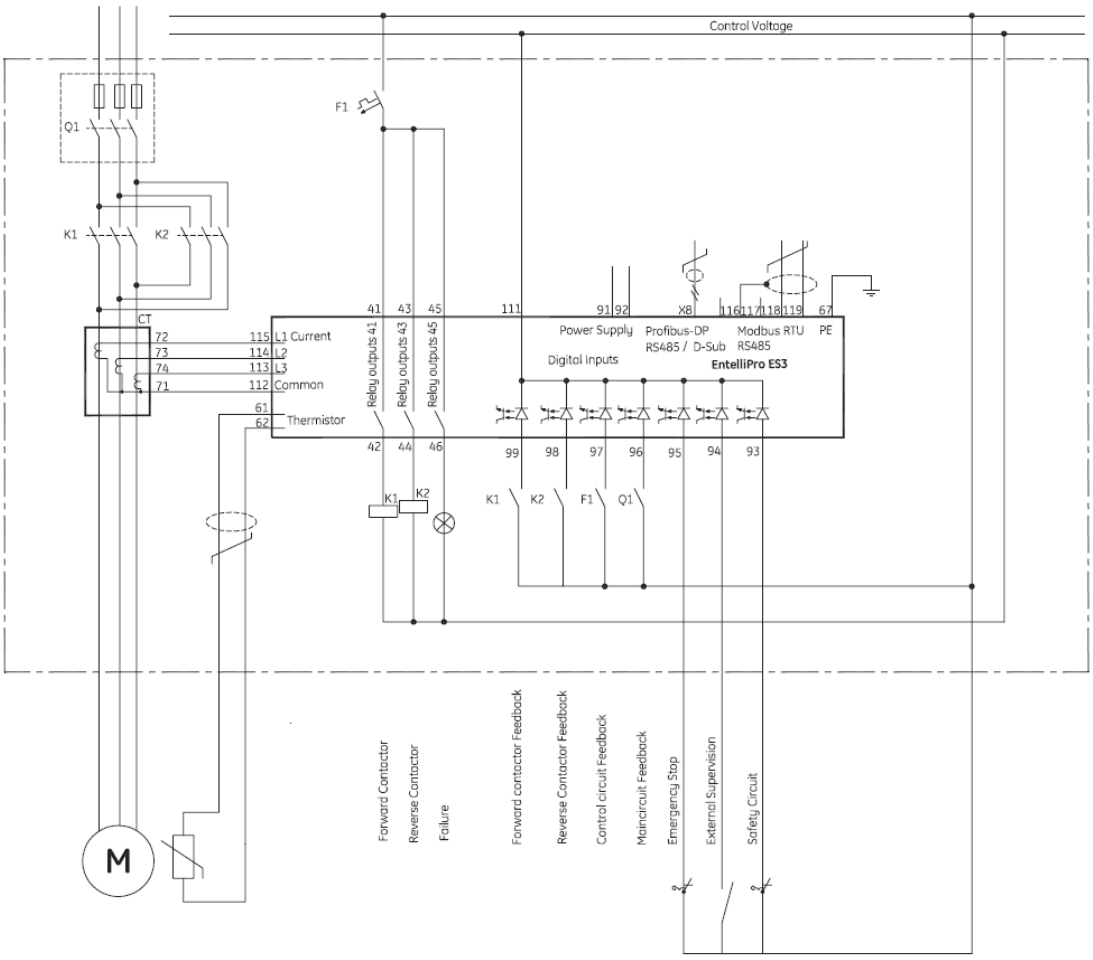


Figure 2-13: EntelliPro ES3 Full-voltage reversing starter wiring diagram

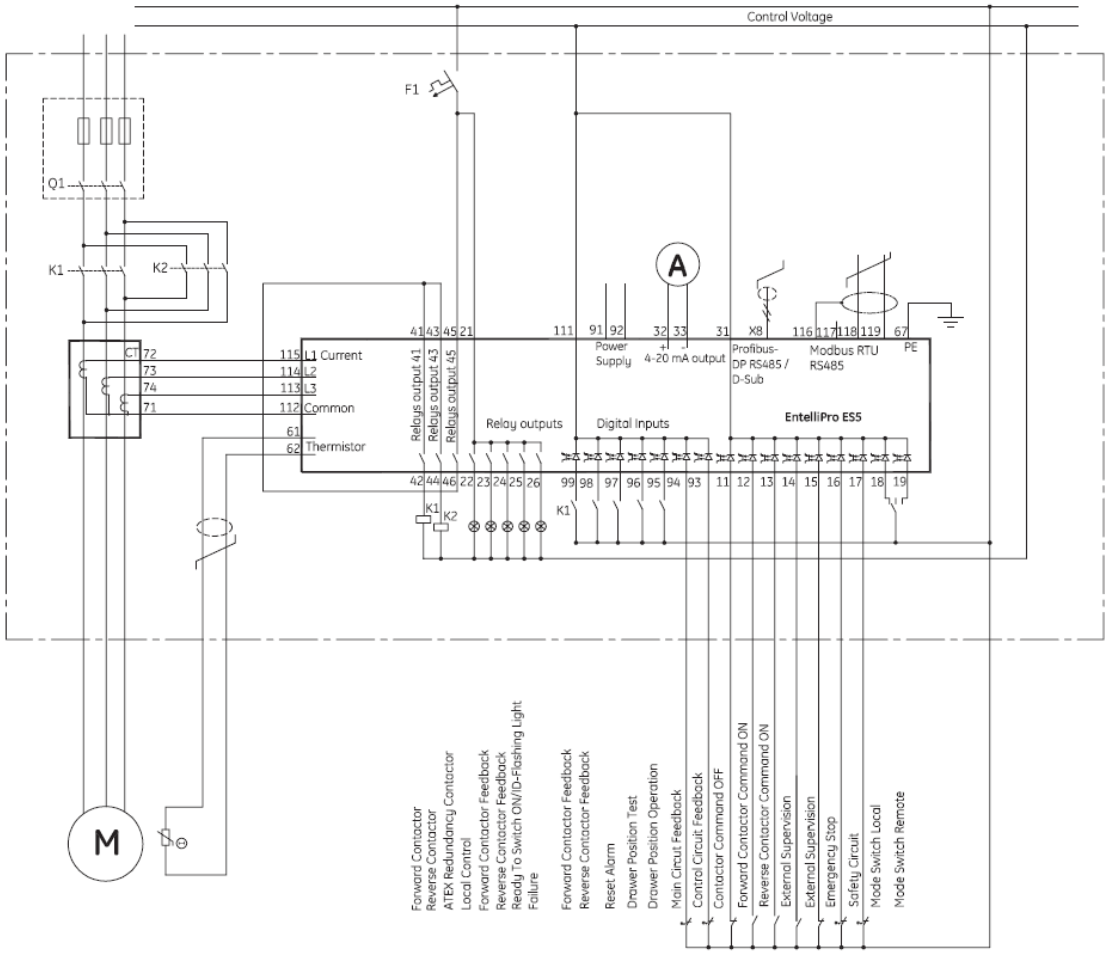


Figure 2-14: EntelliPro ES5 Full-voltage reversing starter wiring diagram

2.3.3 Motor Starter Type Star-delta open transition starter

The typical Star-delta open transition starter is a reduced voltage starter.

Before the motor can be turned ON the "drawer ready switch" must be active. In order to activate the "drawer ready switch" the following must be done:

- All faults and device errors must be cleared using WinESG control panel, Modbus function code 6 registers 65 thru 106 depending on the fault type, Profibus class 1 telegram B2701, or hardwire (make sure an input is mapped to "reset alarm" in WinESG parameterization / I/O panel). Input mapping can also be done using Modbus function code 6 registers 194 thru 197.
- A valid OFF command must be set on hardwire. Make sure an input is mapped to "command OFF" in WinESG parameterization/I/O panel or Modbus and it is active.
- If the drawer supervision is enabled, as shown below the drawer supervision hardwire input must be active.

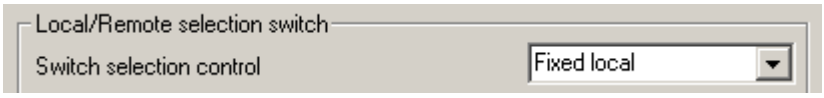
- Remote or local selection must be made via the appropriate source. The first step is to select the source (Profibus class 1, Modbus or Hardwire) that has the control of the local-remote switch. This is done in the WinESG parameterization/control panel shown in illustration below.

If Profibus Class 1 is selected as a controlling mechanism, telegram B10008 bit 9 sets the local control and bit 10 sets the remote control. If bit 9 is set, all mechanisms defined as locals can control the motor (ON/OFF). If bit 10 is set, the mechanism defined as remote can control the motor (ON/OFF).

If Modbus is selected as a controlling mechanism, either coil command (function code 05) 10, to select local control or coil command 11 to select remote control must be issued. If coil command 10 is issued, all mechanisms defined as locals can control the motor (ON/OFF). If coil command 11 is issued, the mechanism defined as remote can control the motor (ON/OFF).

If Hardwire is selected as a controlling device, one input must be mapped to mode switch local and a different input to mode switch remote. If input mode switch local is active, all mechanisms defined as locals can control the motor (ON/OFF). If input mode switch remote is active, the mechanism defined as remote can control the motor (ON/OFF).

If Fixed local is selected as a controlling device, any source assigned as local can control the motor (ON/OFF).



If Fixed remote is selected as a controlling device, only the remote source can control the motor (ON/OFF).

NOTE

NOTE: only one control (local or remote) can be enabled at a time. If both (local and remote) are active the "drawer ready switch" will be OFF and the motor cannot start.

NOTE

NOTE: to make any changes on the configuration, "parameter allowed" must be enabled in WinESG parameterization/function panel or Modbus function code 6 register 62.

Refer to section 2.2.1 for the motor control detailed configuration.

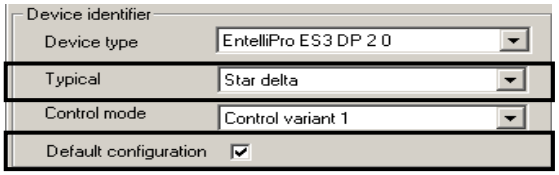
Star-delta open transition operation: when an ON1 command is received, contactor Y, controlled by EntelliPro ES output relay 45, will close, connecting the motor in a Star configuration. When the Y contact feedback mapped to the EntelliPro input is received, contactor K1, controlled by EntelliPro ES output relay 41, will close, connecting the motor to the supply. The motor will start at 58% of the line voltage.

When the "Y contactor maximum ON time" timer expires or the current has fallen below a pre-defined value, set by threshold 4 (typical specific) in WinESG parameterization/device setting panel or Modbus function code 6 register 21, the EntelliPro contact output relay 45 will de-energize; contactor Y opens, opening the Star connection. When the Y contactor feedback is removed, and after the "Y to D switchover time" timer expires contactor K2, controlled by EntelliPro ES output relay 43, will close, connecting the motor in a Delta configuration.

The "Y contactor maximum ON time" and "Y to D switchover time" are configurable in the WinESG parameterization/timer panel or Modbus registers 33 and 34 respectively.

When an OFF command function is received the EntelliPro ES output relays 41, 43, or 45 open; contactor K1, Y, or K2 open and the motor stops.

If the default configuration and the Star delta typical are selected in the WinESG parameterization/information panel shown in the illustration below or by setting Modbus function code 6 register 62 bit0 to 1 and bits 8,9,10 and 11 to 0x2,the inputs and outputs are mapped as below:



For EntelliPro ES3 types:

Input 99 is mapped to contactor 1 feedback - active high
Input 98 is mapped to contactor Y feedback - active high
Input 97 is mapped to contactor D feedback - active high
Input 96 is mapped to main circuit feedback - active low
Input 95 is mapped to emergency stop - active low
Input 94 is mapped to external supervision - active high
Input 93 is mapped to safety circuit - active low

Output 41 is mapped to contactor 1
Output 43 is mapped to contactor D
Output 45 is mapped to contactor Y

For EntelliPro ES5 types:

Input 99 is mapped to contactor 1 feedback - active high
Input 98 is mapped to contactor Y feedback - active high
Input 97 is mapped to contactor D feedback - active high
Input 96 is mapped to drawer test position - active high
Input 95 is mapped to drawer operation position - active high
Input 94 is mapped to main circuit feedback - active low
Input 93 is mapped to control circuit feedback - active low
Input 11 is mapped to command OFF - active low
Input 12 is mapped to command ON - active high
Input 13 is mapped to reset alarm - active high
Input 14 is mapped to external fault 1 - active high
Input 15 is mapped to external fault 2 - active low
Input 16 is mapped to emergency stop - active low
Input 17 is mapped to safety circuit - active low
Input 18 is mapped to mode switch local - active high
Input 19 is mapped to mode switch remote - active high

Output 41 is mapped to contactor 1

Output 43 is mapped to contactor D

Output 45 is mapped to contactor Y

Output 22 is mapped to ATEX redundancy contactor

Output 23 is mapped to ON1 feedback

Output 24 is mapped to local control

Output 25 is mapped to drawer ready switch (high priority) and identification –relay flashing (low priority)

Output 26 is mapped to failure

NOTE

NOTE: if default configuration box is left un-checked, the user will have the ability to change the mapping and other parameters.

Refer to Tables 2-6 and 2-7 for the complete input, output, timer and control configurations of the Star-delta motor starter.

Figures 2-15 and 2-16 show typical Star-delta wiring diagrams for EntelliPro ES3 and EntelliPro ES5.

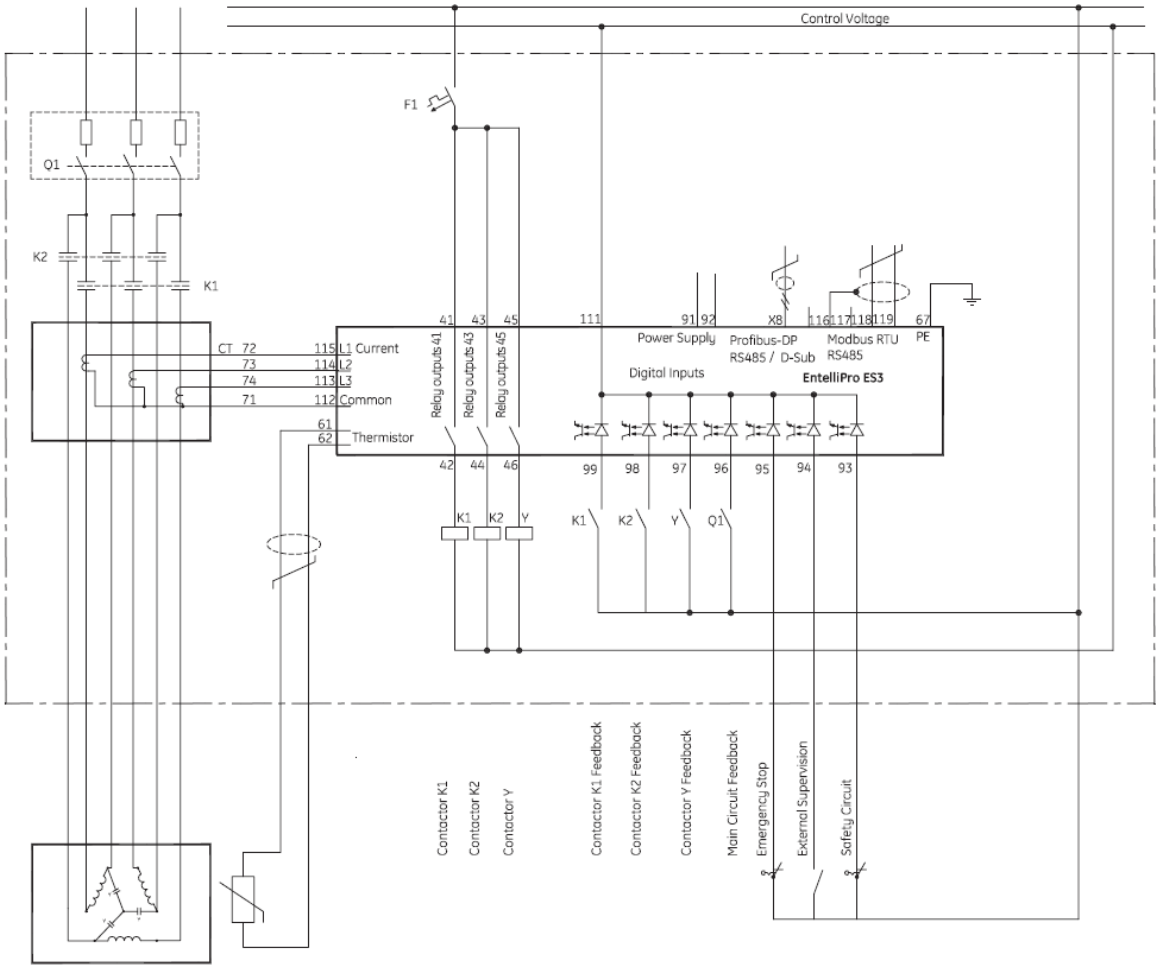


Figure 2-15: EntelliPro ES3 Star-delta open transition starter wiring diagram

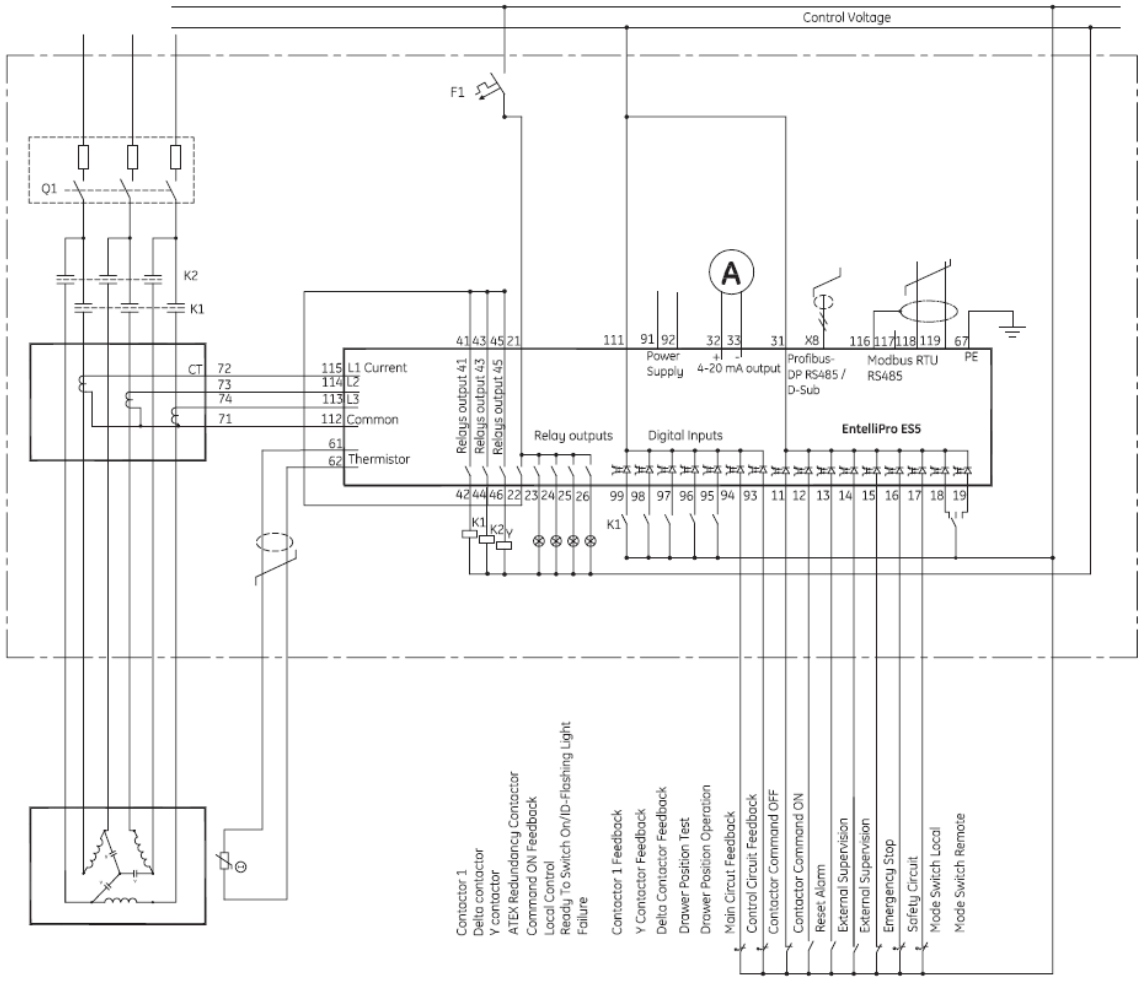


Figure 2-16: EntelliPro ES5 Star-delta open transition starter wiring diagram

2.3.4 Motor Starter Type - Star-delta reverse open transition starter

The typical Star-delta reverse open transition starter is a reduced voltage starter.

Before the motor can be turned ON the “drawer ready switch” must be active. In order to activate the “drawer ready switch” the following must be done:

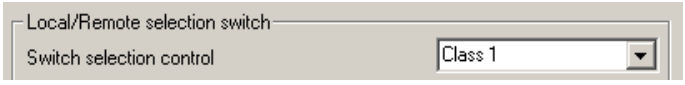
- All faults and device errors must be cleared using WinESG control panel, Modbus function code 6 registers 65 thru 106 depending on the fault type, Profibus class 1 telegram B2701, or hardwire (make sure an input is mapped to “reset alarm” in WinESG parameterization / I/O panel). Input mapping can also be done using Modbus function code 6 registers 194 thru 197.

- A valid OFF command must be set on hardwire. Make sure an input is mapped to “command OFF” in WinESG parameterization/I/O panel or Modbus and it is active.

- If the drawer supervision is enabled, as shown below the drawer supervision hardwire input must be active.

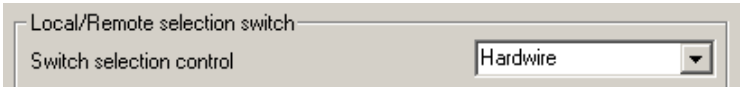
- Remote or local selection must be made via the appropriate source. The first step is to select the source (Profibus class 1, Modbus or Hardwire) that has the control of the local-remote switch. This is done in the WinESG parameterization/control panel shown in illustration below.

If Profibus Class 1 is selected as a controlling mechanism, telegram B10008 bit 9 sets the local control and bit 10 sets the remote control. If bit 9 is set, all mechanisms defined as locals can control the motor (ON/OFF). If bit 10 is set, the mechanism defined as remote can control the motor (ON/OFF).

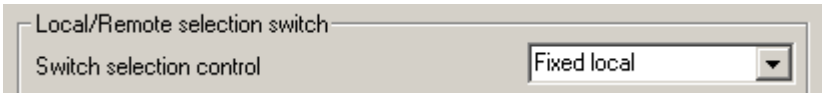


If Modbus is selected as a controlling mechanism, either coil command (function code 05) 10, to select local control or coil command 11 to select remote control must be issued. If coil command 10 is issued, all mechanisms defined as locals can control the motor (ON/OFF). If coil command 11 is issued, the mechanism defined as remote can control the motor (ON/OFF).

If Hardwire is selected as a controlling device, one input must be mapped to mode switch local and a different input to mode switch remote. If input mode switch local is active, all mechanisms defined as locals can control the motor (ON/OFF). If input mode switch remote is active, the mechanism defined as remote can control the motor (ON/OFF).



If Fixed local is selected as a controlling device, any source assigned as local can control the motor (ON/OFF).



If Fixed remote is selected as a controlling device, only the remote source can control the motor (ON/OFF).

NOTE

NOTE: only one control (local or remote) can be enabled at a time. If both (local and remote) are active the "drawer ready switch" will be OFF and the motor cannot start.

NOTE

NOTE: to make any changes on the configuration, "parameter allowed" must be enabled in WinESG parameterization/function panel or Modbus function code 6 register 62.

Refer to section 2.2.1 for the motor control detailed configuration.

Star-delta reverse open transition operation: When an ON1 command is received, contactor Y, controlled by EntelliPro ES output relay 23, will close, connecting the motor in a Wye configuration. When the Y contact feedback mapped to the EntelliPro input is received, contactor K1, controlled by EntelliPro ES output relay 41, will close, connecting the motor to the supply. The motor will start at 58% of the line voltage.

When the "Y contactor maximum ON time" timer expires or the current has fallen below a pre-defined value, set by threshold 4 (typical specific) in WinESG parameterization/device setting panel or Modbus function code 6 register 21, the EntelliPro contact output relay 23 will de-energize; contactor Y opens, opening the Wye connection. When the Y contactor feedback is removed, and after the "Y to D switchover time" timer expires contactor K2, controlled by EntelliPro ES output relay 43, will close, connecting the motor in a Delta configuration.

When an OFF command is received, the EntelliPro ES output relays 41, 43 and 23 open, contactor K1, Y and K2 open and the motor stops.

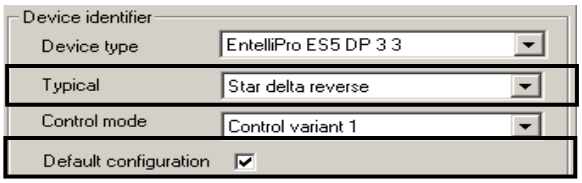
Similarly, when an ON2 command is received, contactor Y, controlled by EntelliPro ES output relay 23, will close, connecting the motor in a Wye configuration. When the Y contact feedback mapped to the EntelliPro input is received, contactor K3, controlled by EntelliPro ES output relay 45, will close, connecting the motor to the supply. The motor will start at 58% of the line voltage.

When the "Y contactor maximum ON time" timer expires or the current has fallen below a pre-defined value, set by threshold 4 (typical specific) in WinESG parameterization/device setting panel or Modbus function code 6 register 21, the EntelliPro contact output relay 23 will de-energize; contactor Y opens, opening the Wye connection. When the Y contactor feedback is removed, and after the "Y to D switchover time" timer expires contactor K2, controlled by EntelliPro ES output relay 43, will close, connecting the motor in a Delta configuration.

When an OFF command is received, the EntelliPro ES output relays 43, 45 and 23 open, contactor K3, Y and K2 open and the motor stops.

The "Y contactor maximum ON time" and "Y to D switchover time" are configurable in the WinESG parameterization/timer panel or Modbus registers 33 and 34 respectively.

If the default configuration and the Star delta reverse typical are selected in the WinESG parameterization/information panel shown in the illustration below or by setting Modbus function code 6 register 62 bit0 to 1 and bits 8,9,10 and 11 to 0x3,the inputs and outputs are mapped as below:



For EntelliPro ES5 types:

Input 99 is mapped to contactor 1 feedback	- active high
Input 98 is mapped to contactor 2 feedback	- active high
Input 97 is mapped to contactor Y feedback	- active high
Input 96 is mapped to contactor D feedback	- active high
Input 95 is mapped to drawer operation position	- active high
Input 94 is mapped to main circuit feedback	- active low
Input 93 is mapped to control circuit feedback	- active low
Input 11 is mapped to command OFF	- active low
Input 12 is mapped to command ON1	- active high
Input 13 is mapped to command ON2	- active high
Input 14 is mapped to external fault 1	- active high
Input 15 is mapped to external supervision	- active low
Input 16 is mapped to emergency stop	- active low
Input 17 is mapped to safety circuit	- active low
Input 18 is mapped to mode switch local	- active high
Input 19 is mapped to mode switch remote	- active high

Output 41 is mapped to contactor 1

Output 43 is mapped to contactor D

Output 45 is mapped to contactor 2

Output 22 is mapped to ATEX redundancy contactor

Output 23 is mapped to Y feedback

Output 24 is mapped to local control

Output 25 is mapped to drawer ready switch (high priority) and identification –relay flashing (low priority)

Output 26 is mapped to failure

NOTE

NOTE: if default configuration box is left un-checked, the user will have the ability to change the mapping and other parameters.

Refer to Tables 2-6 and 2-7 for the complete input, output, timer and control configurations of the Star-delta reverse motor starter.

NOTE

NOTE: this typical is not available on EntelliPro ES3.

Figures 2-17 shows a typical Star-delta reverse wiring diagram for EntelliPro ES5. This starter is not available on EntelliPro ES3.

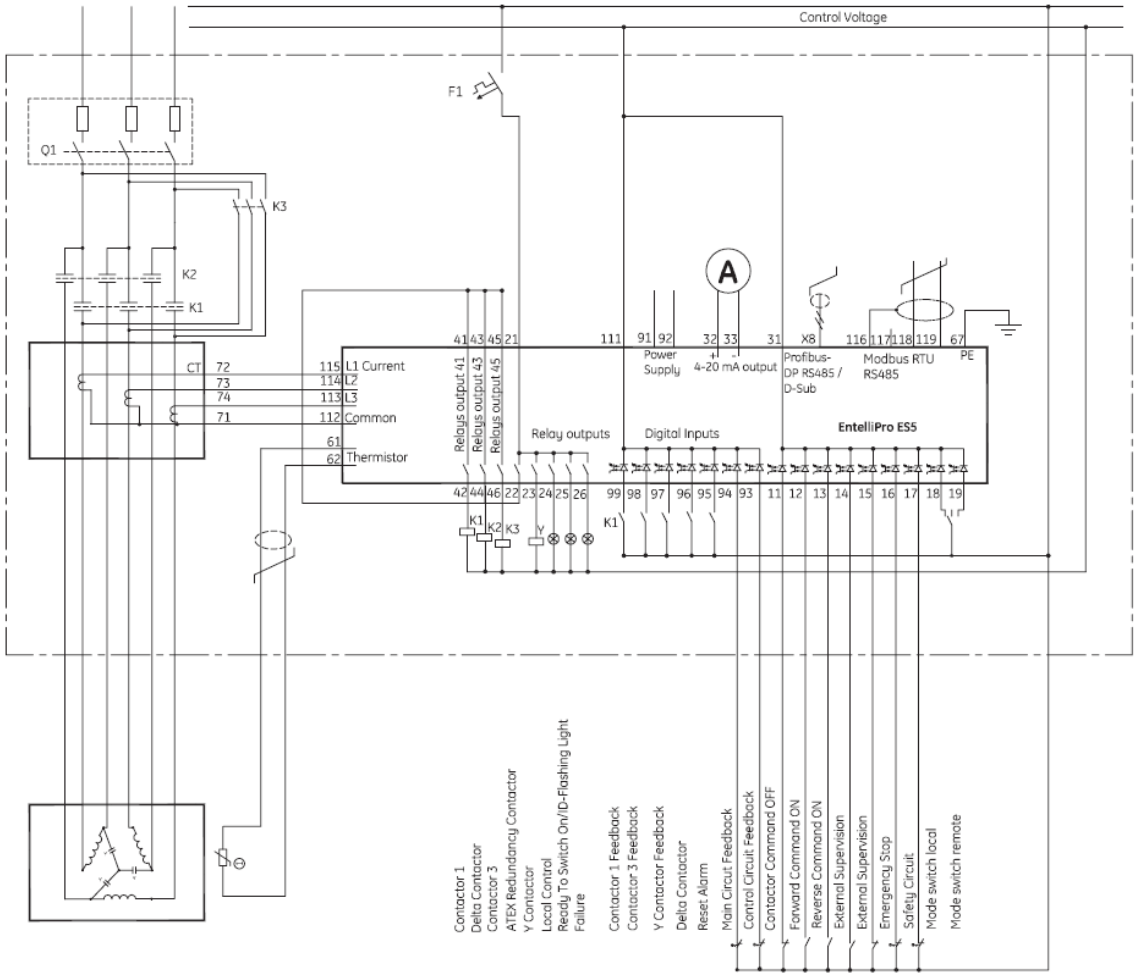


Figure 2-17: EntelliPro ES5 Star-delta reverse open transition starter wiring diagram

2.3.5 Motor Starter Type – Soft starter type

The typical soft starter is used with an external soft starter that ramps the motor speed up to start and down to stop. Once the motor is ramped up, the soft starter can be bypassed.

Before the motor can be turned ON the "drawer ready switch" must be active. In order to activate the "drawer ready switch" the following must be done:

- All faults and device errors must be cleared using WinESG control panel, Modbus function code 6 registers 65 thru 106 depending on the fault type, Profibus class 1 telegram B2701, or hardwire (make sure an input is mapped to "reset alarm" in WinESG parameterization / I/O panel). Input mapping can also be done using Modbus function code 6 registers 194 thru 197.

- A valid OFF command must be set on hardwire. Make sure an input is mapped to "command OFF" in WinESG parameterization/I/O panel or Modbus and it is active.

- If the drawer supervision is enabled, as shown below the drawer supervision hardwire input must be active.

- Remote or local selection must be made via the appropriate source. The first step is to select the source (Profibus class 1, Modbus or Hardwire) that has the control of the local-remote switch. This is done in the WinESG parameterization/control panel shown in illustration below.

If Profibus Class 1 is selected as a controlling mechanism, telegram B10008 bit 9 sets the local control and bit 10 sets the remote control. If bit 9 is set, all mechanisms defined as locals can control the motor (ON/OFF). If bit 10 is set, the mechanism defined as remote can control the motor (ON/OFF).

If Modbus is selected as a controlling mechanism, either coil command (function code 05) 10, to select local control or coil command 11 to select remote control must be issued. If coil command 10 is issued, all mechanisms defined as locals can control the motor (ON/OFF). If coil command 11 is issued, the mechanism defined as remote can control the motor (ON/OFF).

If Hardwire is selected as a controlling device, one input must be mapped to mode switch local and a different input to mode switch remote. If input mode switch local is active, all mechanisms defined as locals can control the motor (ON/OFF). If input mode switch remote is active, the mechanism defined as remote can control the motor (ON/OFF).

If Fixed local is selected as a controlling device, any source assigned as local can control the motor (ON/OFF).

If Fixed remote is selected as a controlling device, only the remote source can control the motor (ON/OFF).

NOTE

NOTE: only one control (local or remote) can be enabled at a time. If both (local and remote) are active the "drawer ready switch" will be OFF and the motor cannot start.

NOTE

NOTE: to make any changes on the configuration, "parameter allowed" must be enabled in WinESG parameterization/function panel or Modbus function code 6 register 62.

Refer to section 2.2.1 for the motor control detailed configuration.

Soft starter operation: when an ON1 command is received, contactor K1, controlled by EntelliPro output relay 41, will close. This provides power for the soft starter to start and power to drive the motor. When the soft starter signals up-to-speed by closing relay UTS, the starter generates the soft starter bypass signal and the EntelliPro ES relay 43 is then closed.

If bypass the control is activated in WinESG parameterization/timer panel or Modbus function code 6 register 111 bit6, an alarm will be generated when the "soft starter timer" set on WinESG parameterization/timer panel or Modbus function code 6 register 36 expires prior to the bypass input signal.

NOTE

NOTE: an input must be mapped to by-pass feedback.

When an OFF command is received and the soft stop is activated in WinESG parameterization/timer panel or Modbus function code 6 register 111 bit5, contactor relay output 43 opens, signaling the soft starter to ramp down.

The opening time of contactor K1, controlled by EntelliPro ES output relay 41, is dependent on the configuration of "soft stop time activated" parameter set in WinESG parameterization/timer panel or Modbus function code 6 register 111 bit5,

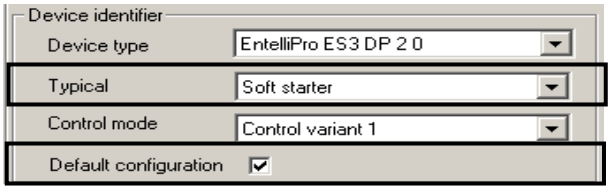
If the "soft stop time activated" parameter is set, the by-pass relay 43 will open immediately after the OFF command is received, and after the soft stop timer expires, output relay 41 opens, K1 opens, and removes power to the soft starter and motor.

The soft stop timer is set on WinESG parameterization/timer panel and/or Modbus holding register 37

NOTE

NOTE: Ensure soft starter is located before contactor.

If the default configuration and the soft starter typical are selected in the WinESG parameterization/information shown in the illustration below or by setting Modbus function code 6 register 62 bit0 to 1 and bits 8,9,10 and 11 to 0x4,the inputs and outputs are mapped as below:



For EntelliPro ES5 types:

Input 99 is mapped to contactor 1 feedback - active high
Input 98 is mapped to main circuit feedback - active low
Input 97 is mapped to by-pass contactor feedback - active high
Input 96 is mapped to up-to-speed feedback - active high
Input 95 is mapped to emergency circuit - active low
Input 94 is mapped to external supervision - active high
Input 93 is mapped to safety circuit - active low

Output 41 is mapped to contactor 1
Output 43 is mapped by-pass contactor
Output 45 is mapped to reset alarm

For EntelliPro ES5 types:

Input 99 is mapped to contactor 1 feedback - active high
Input 98 is mapped to by-pass contactor feedback - active high
Input 97 is mapped to reset alarm - active high
Input 96 is mapped to up-to-speed feedback - active high
Input 95 is mapped to starter fault feedback - active low
Input 94 is mapped to main circuit feedback - active low
Input 93 is mapped to control circuit feedback - active low
Input 11 is mapped to command OFF - active low
Input 12 is mapped to command ON1 - active high
Input 13 is mapped to drawer position test - active high
Input 14 is mapped to external fault 1 - active high
Input 15 is mapped to drawer position operation - active high
Input 16 is mapped to emergency stop - active low

Input 17 is mapped to safety circuit - active low
Input 18 is mapped to mode switch local - active high
Input 19 is mapped to mode switch remote - active high

Output 41 is mapped to contactor 1
Output 43 is mapped to by-pass contactor
Output 45 is mapped to ATEX redundancy contactor
Output 22 is mapped to local control
Output 23 is mapped to On1 command (start)
Output 24 is mapped to reset
Output 25 is mapped to drawer ready switch (high priority) and identification –relay flashing (low priority)
Output 26 is mapped to failure

NOTE

NOTE: If default configuration box is left un-checked, the user will have the ability to change the mapping and other parameters.

NOTE

NOTE: Ensure soft starter is located before contactor.

Refer to Tables 2-6 and 2-7 for the complete input, output, timer and control configurations of the Soft starter.

Figures 2-18 and 2-19 show typical softstarter diagrams for EntelliPro ES3 and EntelliPro ES5.

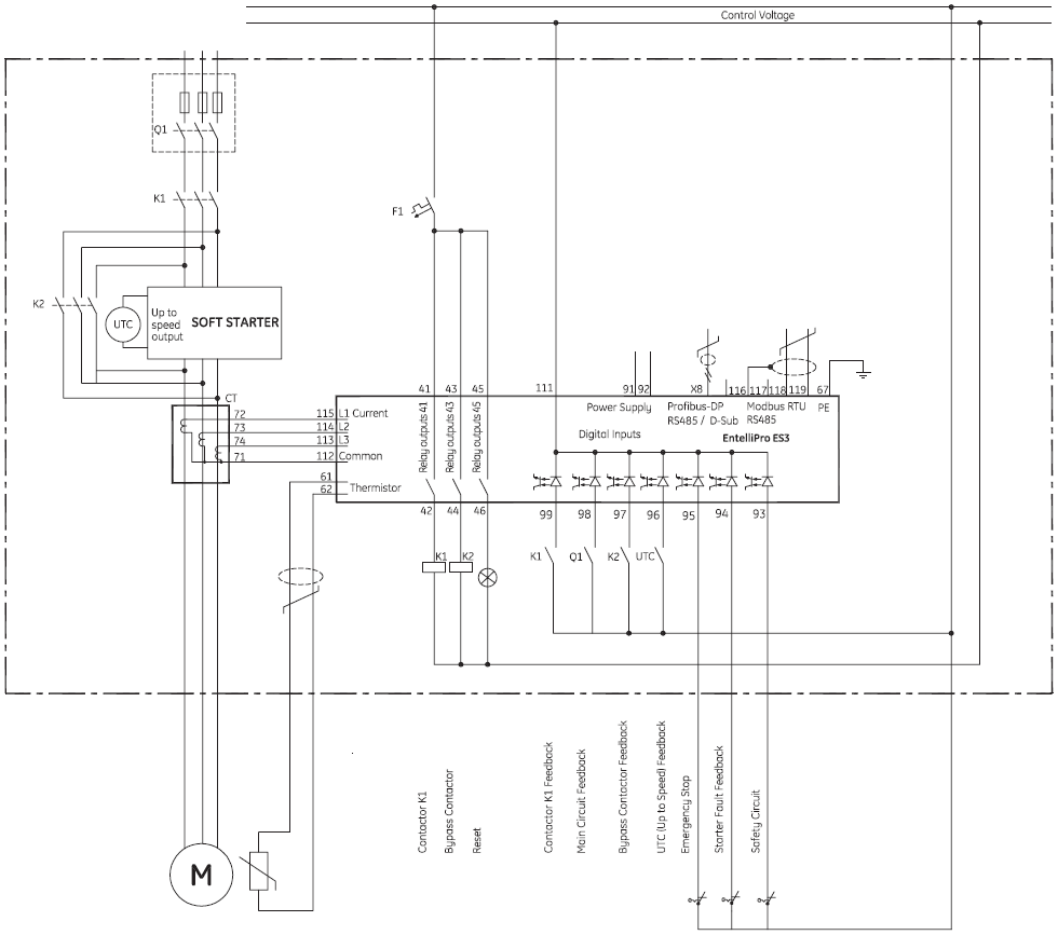


Figure 2-18 EntelliPro ES3 Softstarter starter wiring diagram

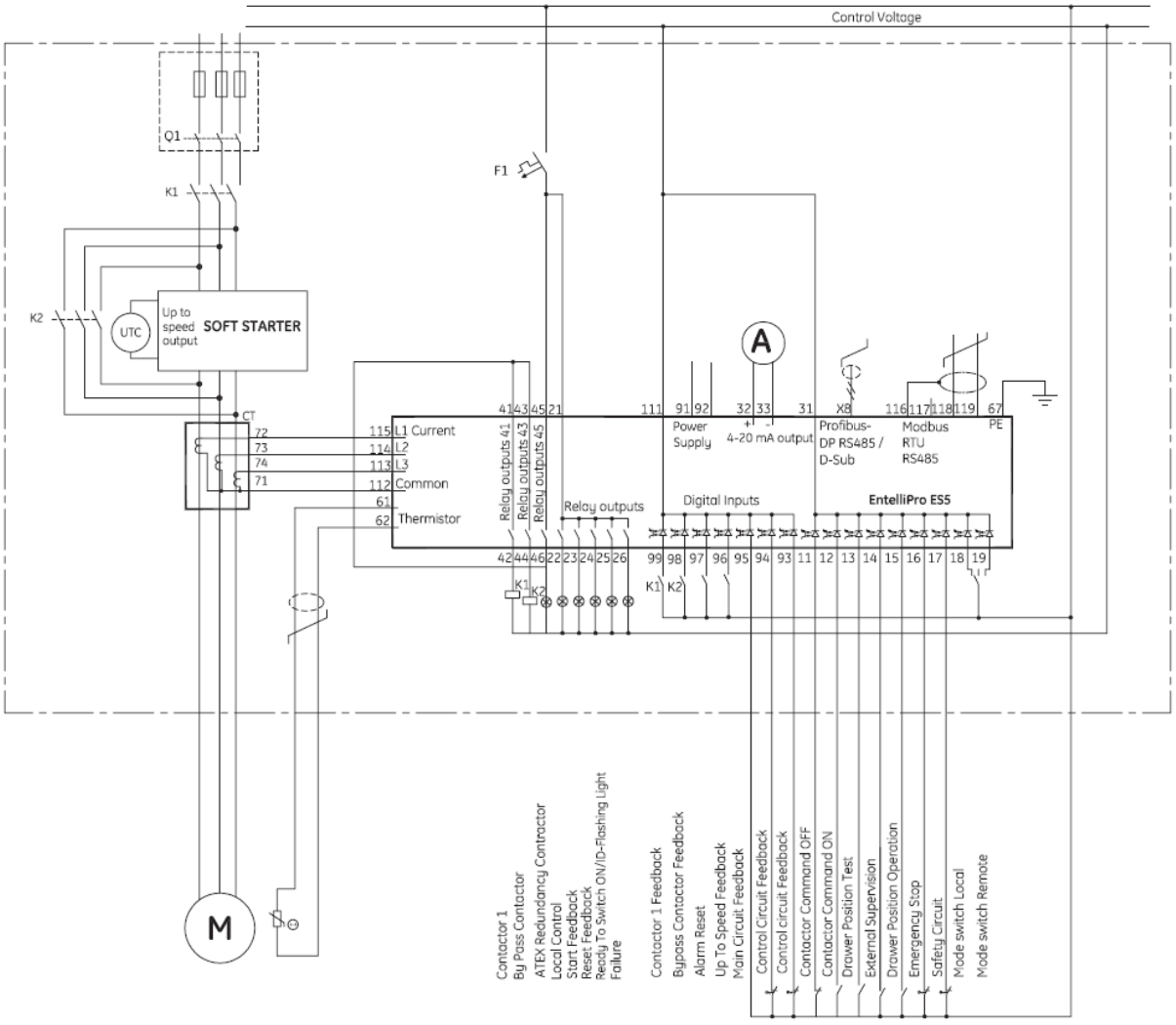


Figure 2-19: EntelliPro ES5 softstarter starter wiring diagram

2.3.6 Motor Starter Type - Soft starter reverse type

The typical soft starter reverse starter type is used with an external soft starter that ramps the motor speed up to start and down to stop. Once the motor is started, the soft starter can be bypassed.

Before the motor can be turned ON the "drawer ready switch" must be active. In order to activate the "drawer ready switch" the following must be done:

- All faults and device errors must be cleared using WinESG control panel, Modbus function code 6 registers 65 thru 106 depending on the fault type, Profibus class 1 telegram B2701, or hardwire (make sure an input is mapped to "reset alarm" in WinESG parameterization / I/O panel). Input mapping can also be done using Modbus function code 6 registers 194 thru 197.

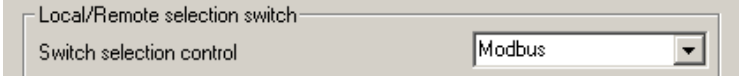
- A valid OFF command must be set on hardwire. Make sure an input is mapped to "command OFF" in WinESG parameterization/I/O panel or Modbus and it is active.

- If the drawer supervision is enabled, as shown below the drawer supervision hardwire input must be active.

- Remote or local selection must be made via the appropriate source. The first step is to select the source (Profibus class 1, Modbus or Hardwire) that has the control of the local-remote switch. This is done in the WinESG parameterization/control panel shown in illustration below.

If Profibus Class 1 is selected as a controlling mechanism, telegram B10008 bit 9 sets the local control and bit 10 sets the remote control. If bit 9 is set, all mechanisms defined as locals can control the motor (ON/OFF). If bit 10 is set, the mechanism defined as remote can control the motor (ON/OFF).

If Modbus is selected as a controlling mechanism, either coil command (function code 05) 10, to select local control or coil command 11 to select remote control must be issued. If coil command 10 is issued, all mechanisms defined as locals can control the motor (ON/OFF). If coil command 11 is issued, the mechanism defined as remote can control the motor (ON/OFF).



If Hardwire is selected as a controlling device, one input must be mapped to mode switch local and a different input to mode switch remote. If input mode switch local is active, all mechanisms defined as locals can control the motor (ON/OFF). If input mode switch remote is active, the mechanism defined as remote can control the motor (ON/OFF).

If Fixed local is selected as a controlling device, any source assigned as local can control the motor (ON/OFF).

If Fixed remote is selected as a controlling device, only the remote source can control the motor (ON/OFF).

NOTE

NOTE: Only one control (local or remote) can be enabled at a time. If both (local and remote) are active the "drawer ready switch" will be OFF and the motor cannot start.

NOTE

NOTE: To make any changes on the configuration, "parameter allowed" must be enabled in WinESG parameterization/function panel or Modbus function code 6 register 62.

Refer to section 2.2.1 for the motor control detailed configuration.

Soft starter reverse operation: when an ON1 command is received, contactor K1, controlled by EntelliPro output relay 41, will close. This provides power for the soft starter to start and power to drive the motor in the forward direction. When the soft starter signals up-to-speed by closing relay UTS, the starter generates the soft starter bypass signal and the EntelliPro ES relay 45 is then closed.

If bypass control is activated in WinESG parameterization/timer panel or Modbus function code 6 register 111 bit6, an alarm will be generated when the "soft starter timer" set on WinESG parameterization/timer panel or Modbus function code 6 register 36 expires prior to the bypass input signal.

NOTE

NOTE: An input must be mapped to by-pass feedback.

When an OFF command is received and the soft stop is activated in WinESG parameterization/timer panel or Modbus function code 6 register 111 bit5, contactor relay output 45 opens, signaling the soft starter to ramp down.

The opening time of contactor K1, controlled by EntelliPro ES output relay 41, is dependent on the configuration of "soft stop time activated" parameter set in WinESG parameterization/timer panel or Modbus function code 6 register 111 bit5,

If the "soft stop time activated" parameter is set, the by-pass relay 45 will open immediately after the OFF command is received, and after the soft stop timer expires, output relay 41 opens, K1 opens, and removes power to the soft starter and motor.

The soft stop timer is set on WinESG parameterization/timer panel and/or Modbus holding register 37

Similarly, when an ON2 command is received, contactor K2, controlled by EntelliPro output relay 43, will close. This provides power for the soft starter to start and power to drive the motor in the reverse direction. When the soft starter signals up-to-speed by closing relay UTS, the starter generates the soft starter bypass signal and the EntelliPro ES relay 45 is then closed.

If bypass control is activated in WinESG parameterization/timer panel or Modbus function code 6 register 111 bit6, an alarm will be generated when the "soft starter timer" set on WinESG parameterization/timer panel or Modbus function code 6 register 36 expires prior to the bypass input signal.

When an OFF command is received and the soft stop is activated in WinESG parameterization/timer panel or Modbus function code 6 register 111 bit5, contactor relay output 45 opens, signaling the soft starter to ramp down.

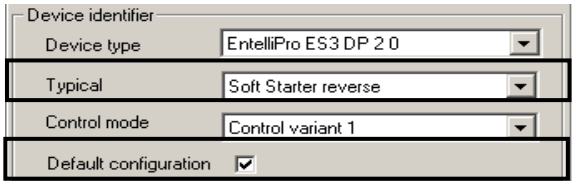
The opening time of contactor K3, controlled by EntelliPro ES output relay 43, is dependent on the configuration of "soft stop time activated" parameter set in WinESG parameterization/timer panel or Modbus function code 6 register 111 bit5,

If the "soft stop time activated" parameter is set, the by-pass relay 45 will open immediately after the OFF command is received, and after the soft stop timer expires, output relay 43 opens, K2 opens, and removes power to the soft starter and motor.

The soft stop timer is set on WinESG parameterization/timer panel and/or Modbus holding register 37

NOTE: Ensure soft starter is located before contactor.

If the default configuration and the soft starter reverse typical are selected in the WinESG parameterization/information shown in the illustration below or by setting Modbus function code 6 register 62 bit0 to 1 and bits 8,9,10 and 11 to 0x5,the inputs and outputs are mapped as below:



For EntelliPro ES3 types:

Input 99 is mapped to forward contactor 1 feedback - active high
Input 98 is mapped to reverse contactor 2 feedback - active low
Input 97 is mapped to by-pass contactor feedback - active high
Input 96 is mapped to up-to-speed feedback - active high
Input 95 is mapped to emergency circuit - active low
Input 94 is mapped to starter fault - active low
Input 93 is mapped to safety circuit - active low

Output 41 is mapped to forward contactor 1
Output 43 is mapped by-pass contactor
Output 45 is mapped to reverse contactor 2

For EntelliPro ES5 types:

Input 99 is mapped to forward contactor 1 feedback - active high
Input 98 is mapped to reverse contactor 2 feedback - active high
Input 97 is mapped to by-pass contactor feedback - active high
Input 96 is mapped to up-to-speed feedback - active high
Input 95 is mapped to starter fault feedback - active low
Input 94 is mapped to main circuit feedback - active low
Input 93 is mapped to control circuit feedback - active low
Input 11 is mapped to command OFF - active low
Input 12 is mapped to command forward ON1 - active high
Input 13 is mapped to command reverse ON2 - active high
Input 14 is mapped to external fault 1 - active high
Input 15 is mapped to external fault 2 - active low
Input 16 is mapped to emergency stop - active low
Input 17 is mapped to safety circuit - active low
Input 18 is mapped to mode switch local - active high
Input 19 is mapped to mode switch remote - active high

Output 41 is mapped to forward contactor 1
Output 43 is mapped to reverse contactor 2
Output 45 is mapped to by-pass contactor
Output 22 is mapped to ATEX redundancy contactor
Output 23 is mapped to ON1/ON2 command (start)
Output 24 is mapped to reset
Output 25 is mapped to drawer ready switch (high priority) and identification –relay flashing (low priority)
Output 26 is mapped to failure

NOTE: If default configuration box is left un-checked, the user will have the ability to change the mapping and other parameters.

NOTE: Ensure soft starter is located before contactor.

Refer to Tables 2-6 and 2-7 for the complete input, output, timer and control configurations of the reverse soft starter.

Figures 2-20 and 2-21 show typical reverse soft starter diagrams for EntelliPro ES3 and EntelliPro ES5.

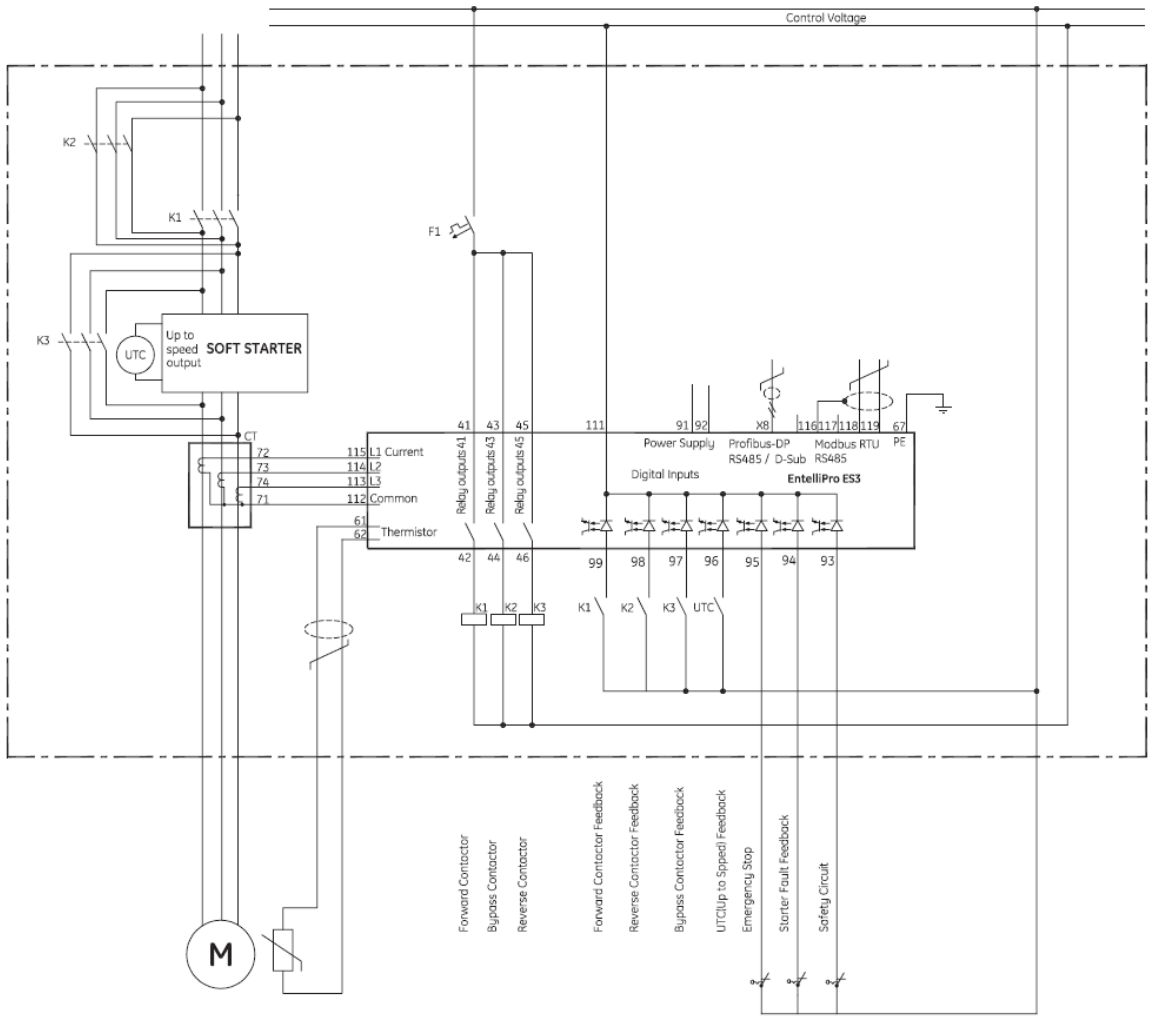


Figure 2-20: EntelliPro ES3 reverse softstarter starter wiring diagram

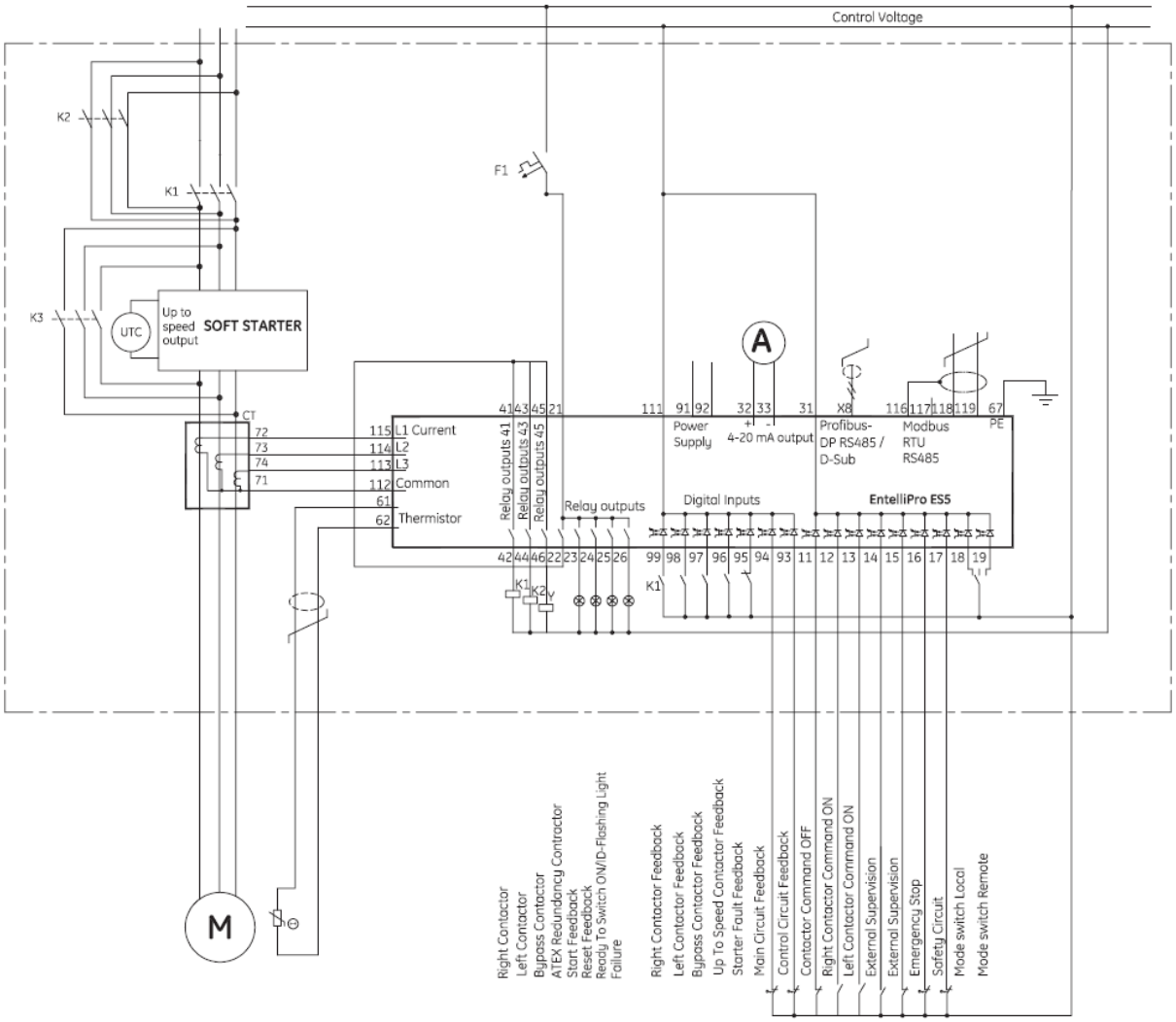


Figure 2-21: EntelliPro ES5 reverse softstarter starter wiring diagram

2.3.7 Breaker Control

The typical breaker control starter type is used to control opening and closing of the breaker.

Before the breaker can be turned ON the "drawer ready switch" must be active. In order to activate the "drawer ready switch" the following must be done:

- All faults and device errors must be cleared using WinESG control panel, Modbus function code 6 registers 65 thru 106 depending on the fault type, Profibus class 1 telegram B2701, or hardwire (make sure an input is mapped to "reset alarm" in WinESG parameterization / I/O panel). Input mapping can also be done using Modbus function code 6 registers 194 thru 197.

- A valid OFF command must be set on hardwire. Make sure an input is mapped to "command OFF" in WinESG parameterization/I/O panel or Modbus and it is active.

- If the drawer supervision is enabled, as shown below the drawer supervision hardwire input must be active.

- Remote or local selection must be made via the appropriate source. The first step is to select the source (Profibus class 1, Modbus or Hardwire) that has the control of the local-remote switch. This is done in the WinESG parameterization/control panel shown in illustration below.

If Profibus Class 1 is selected as a controlling mechanism, telegram B10008 bit 9 sets the local control and bit 10 sets the remote control. If bit 9 is set, all mechanisms defined as locals can control the motor (ON/OFF). If bit 10 is set, the mechanism defined as remote can control the motor (ON/OFF).

If Modbus is selected as a controlling mechanism, either coil command (function code 05) 10, to select local control or coil command 11 to select remote control must be issued. If coil command 10 is issued, all mechanisms defined as locals can control the motor (ON/OFF). If coil command 11 is issued, the mechanism defined as remote can control the motor (ON/OFF).

If Hardwire is selected as a controlling device, one input must be mapped to mode switch local and a different input to mode switch remote. If input mode switch local is active, all mechanisms defined as locals can control the motor (ON/OFF). If input mode switch remote is active, the mechanism defined as remote can control the motor (ON/OFF).

If Fixed local is selected as a controlling device, any source assigned as local can control the motor (ON/OFF).

If Fixed remote is selected as a controlling device, only the remote source can control the motor (ON/OFF).

NOTE

NOTE: Only one control (local or remote) can be enabled at a time. If both (local and remote) are active the "drawer ready switch" will be OFF and the motor cannot start.

NOTE

NOTE: To make any changes on the configuration, "parameter allowed" must be enabled in WinESG parameterization/function panel or Modbus function code 6 register 62.

Refer to section 2.2.1 for the motor control detailed configuration.

Breaker control operation: When a start function ON1 is received, contactor K1, controlled by EntelliPro output relay 41, will close for pre-defined time, defined as "breaker open/close signal time" in WinESG parameterization/timer panel or Modbus function code 6 register 37. When this timer expires, contact output relay K1 opens.

When a stop function is received, contactor K2, controlled by EntelliPro ES output relay 43, will close for a pre-defined timer defined as "breaker open/close signal time" in WinESG parameterization/timer panel or Modbus function code 6 register 37. When the timer expires, contact output 43 opens.

Refer to Tables 2-6 and 2-7 for the complete input, output, timer and control configurations of breaker control motor starter.

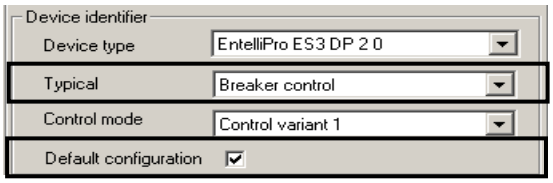
Figure-s 222 and 2-23 show typical breaker control motor starter diagrams for EntelliPro ES3 and EntelliPro ES5.

NOTE

NOTE: Interpoling CTs are required for higher than 630Amps system.

CAUTION: EntelliPro ES should not be used as a means to provide instantaneous breaker protection.

If the default configuration and the breaker typical are selected in the WinESG parameterization/information panel shown in the illustration below or by setting Modbus function code 6 register 62 bit0 to 1 and bits 8,9,10 and 11 to 0x8,the inputs and outputs are mapped as below:



For EntelliPro ES3 types:

Input 99 is mapped to Breaker ON feedback - active high
Input 98 is mapped to Breaker ready to switch ON feedback - active high
Input 97 is mapped to breaker charged feedback - active high
Input 96 is mapped to main circuit feedback - active low
Input 95 is mapped to breaker-tripped feedback - active low
Input 94 is mapped to external fault 1 - active low
Input 93 is mapped to safety circuit - active low

Output 41 is mapped to breaker ON
Output 43 is mapped to breaker OFF
Output 45 is mapped to reset

For EntelliPro ES5 types:

Input 99 is mapped to breaker ON feedback - active high
Input 98 is mapped to breaker ready to switch ON feedback - active high
Input 97 is mapped to breaker charged feedback - active high
Input 96 is mapped to external fault 1 - active low
Input 95 is mapped to breaker-tripped feedback - active low
Input 94 is mapped to main circuit feedback - active low
Input 93 is mapped to control circuit feedback - active low
Input 11 is mapped to command OFF - active low
Input 12 is mapped to command ON - active high
Input 13 is mapped to reset alarm - active high
Input 14 is mapped to external fault 1 - active high
Input 15 is mapped to external fault 2 - active low
Input 16 is mapped to emergency stop - active low
Input 17 is mapped to safety circuit - active low
Input 18 is mapped to mode switch local - active high
Input 19 is mapped to mode switch remote - active high

Output 41 is mapped to breaker ON

Output 43 is mapped to breaker OFF

Output 45 is mapped to reset

Output 22 is mapped to local control

Output 23 is mapped to ON1 command (start)

Output 24 is mapped to warning

Output 25 is mapped to drawer ready switch (high priority) and identification –relay flashing (low priority)

Output 26 is mapped to failure

Refer to Tables 2-6 and 2-7 for the complete input, output, timer and control configurations of breaker control motor starter.

Figures 2-22 and 2-23 show typical breaker control motor starter diagrams for EntelliPro ES3 and EntelliPro ES.

NOTE

NOTE: Interpoling CTs are required for higher than 630Amps system.

CAUTION

CAUTION: If the Breaker feedback alarm is disabled, the EntelliPro ON/OFF command will be the Breaker status NOT the Breaker auxiliary switch status (Breaker feedback input). For example, if the ON command is sent and feedback alarm is disabled, the Breaker status will be ON irrepective of the breaker feedback hardwired input.

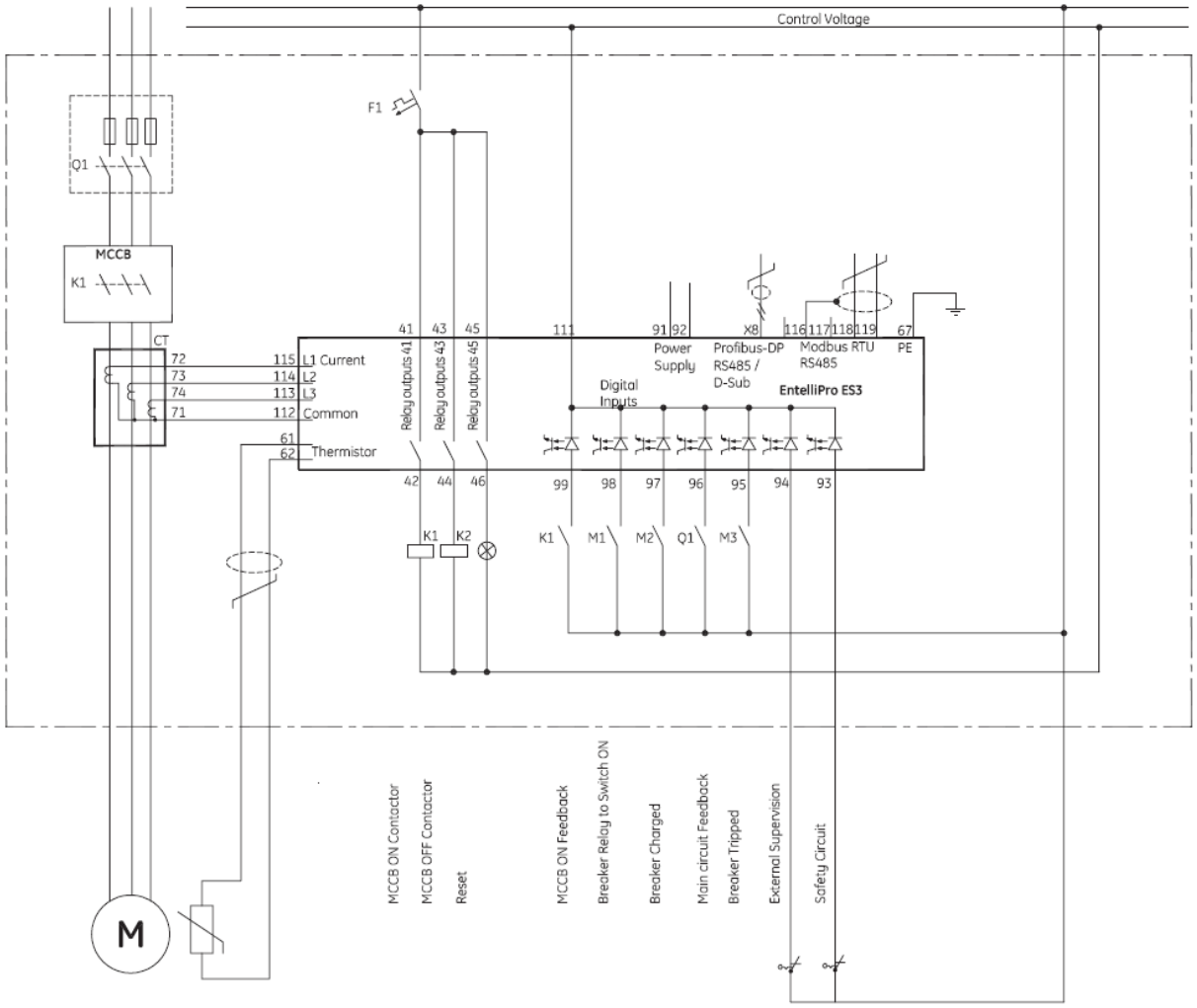


Figure 2-22: EntelliPro ES3 Breaker control starter wiring diagram

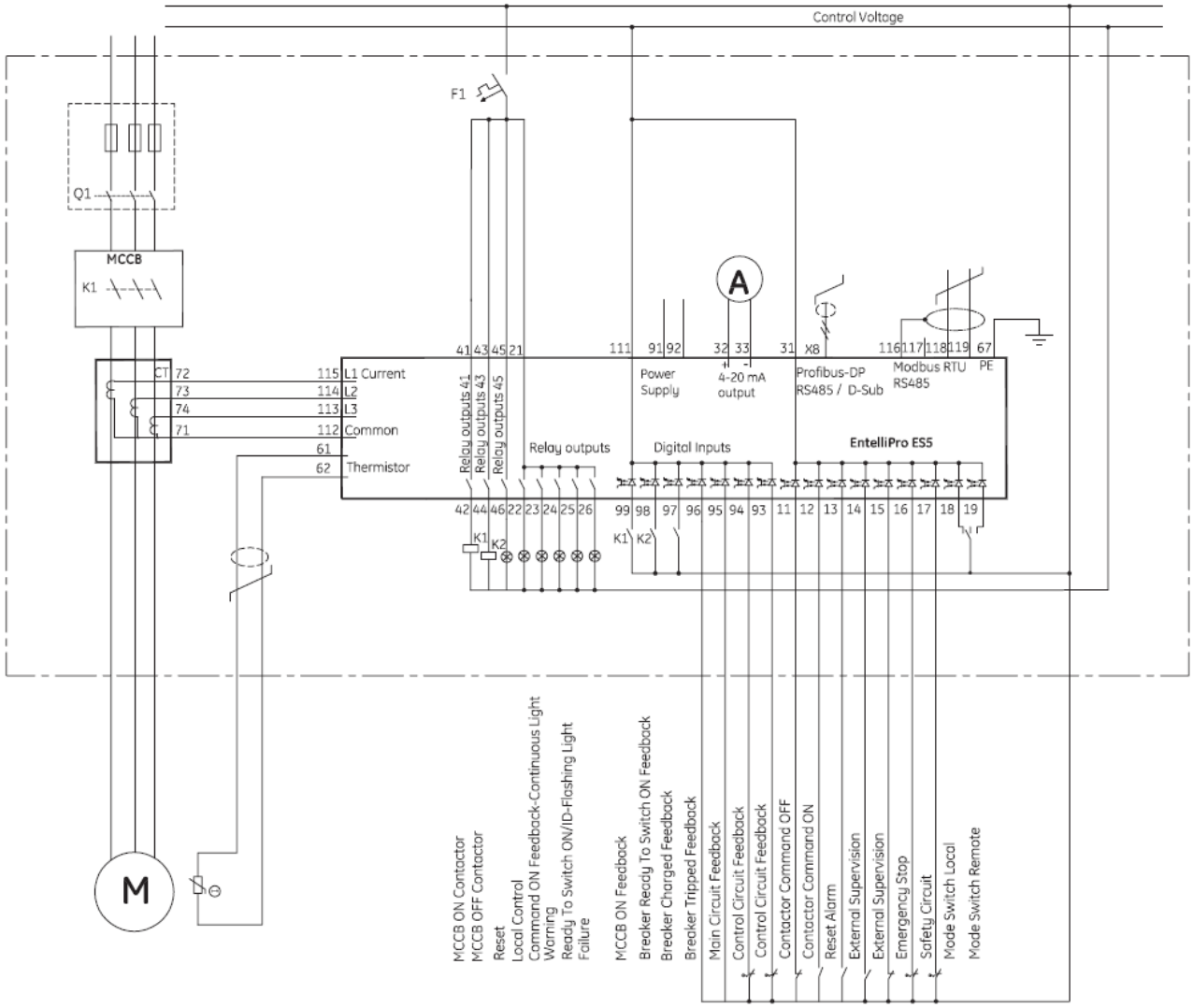


Figure 2-23: EntelliPro ES5 Breaker control starter wiring diagram

2.3.8 Motor Starter Type - Dahlander starter type

The typical Dahlander starter type is a full voltage across the line two-speed starter.

Before the motor can be turned ON the "drawer ready switch" must be active. In order to activate the "drawer ready switch" the following must be done:

- All faults and device errors must be cleared using WinESG control panel, Modbus function code 6 registers 65 thru 106 depending on the fault type, Profibus class 1 telegram B2701, or hardwire (make sure an input is mapped to "reset alarm" in WinESG parameterization / I/O panel). Input mapping can also be done using Modbus function code 6 registers 194 thru 197.

- A valid OFF command must be set on hardwire. Make sure an input is mapped to "command OFF" in WinESG parameterization/I/O panel or Modbus and it is active.

- If the drawer supervision is enabled, as shown below the drawer supervision hardwire input must be active.

- Remote or local selection must be made via the appropriate source. The first step is to select the source (Profibus class 1, Modbus or Hardwire) that has the control of the local-remote switch. This is done in the WinESG parameterization/control panel shown in illustration below.

If Profibus Class 1 is selected as a controlling mechanism, telegram B10008 bit 9 sets the local control and bit 10 sets the remote control. If bit 9 is set, all mechanisms defined as locals can control the motor (ON/OFF). If bit 10 is set, the mechanism defined as remote can control the motor (ON/OFF).

If Modbus is selected as a controlling mechanism, either coil command (function code 05) 10, to select local control or coil command 11 to select remote control must be issued. If coil command 10 is issued, all mechanisms defined as locals can control the motor (ON/OFF). If coil command 11 is issued, the mechanism defined as remote can control the motor (ON/OFF).

If Hardwire is selected as a controlling device, one input must be mapped to mode switch local and a different input to mode switch remote. If input mode switch local is active, all mechanisms defined as locals can control the motor (ON/OFF). If input mode switch remote is active, the mechanism defined as remote can control the motor (ON/OFF).

If Fixed local is selected as a controlling device, any source assigned as local can control the motor (ON/OFF).

If Fixed remote is selected as a controlling device, only the remote source can control the motor (ON/OFF).

NOTE

NOTE: Only one control (local or remote) can be enabled at a time. If both (local and remote) are active the "drawer ready switch" will be OFF and the motor cannot start.

NOTE

NOTE: To make any changes on the configuration, "parameter allowed" must be enabled in WinESG parameterization/function panel or Modbus function code 6 register 62.

Refer to section 2.2.1 for the motor control detailed configuration.

Dahlander starter operation: when an ON1 command (low speed) is received, contactor K1, controlled by EntelliPro ES output relay 41, will close, which will start the motor in a low speed.

When an ON2 command (high speed) is received, contactor K1 opens. When the low speed feedback input from contactor K1 is inactive (removed), contactor Y, controlled by EntelliPro ES output relay 45 will close. When the contactor Y feedback signal is received, contactor K2 controlled by EntelliPro ES output relay 43, closes, which starts the motor in a high speed.

CAUTION

CAUTION: Contactor Y does not close until the low speed contactor K1 feedback signal is received. If not received within the "contactor feedback timer" set on WinESG parameterization/timer window or Modbus function code 6 register 26.

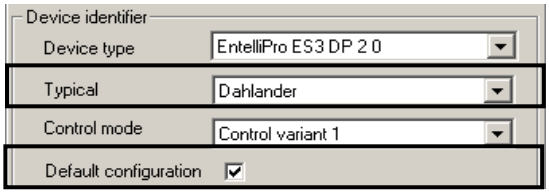
Should an ON2 command (fast start) start be received when K1 is closed, and direct switch over is allowed, K1 will open immediately, and contactors K2 and Y will close when the K1 feedback signal is removed.

Should a start function ON1 be received when K2 and Y contactors are closed, and "allow direct direction switchover" is set, in the WinESG parameterization\typical settings or Modbus function code 6 register 111 bit3, K2 and Y contactors will open immediately. K1 will close after the "fast to slow wait time" in WinESG parameterization/timer panel or Modbus function code 6 register 30 timer expires

Refer to Tables 2-6 and 2-7 for the complete input, output, timer and control configurations of the Dahlander motor starter.

Figures 2-24 and 2-25 show typical Dahlander starter diagrams for EntelliPro ES3 and EntelliPro ES5.

If the default configuration and the Dahlander typical are selected in the WinESG parameterization/information panel shown in the illustration below or by setting Modbus function code 6 register 62 bit0 to 1 and bits 8,9,10 and 11 to 0x6,the inputs and outputs are mapped as below:



For EntelliPro ES3 types:

Input 99 is mapped to contactor 1 feedback - active high
Input 98 is mapped to contactor 2 feedback - active high
Input 97 is mapped to contactor Y feedback - active low
Input 96 is mapped to main circuit feedback - active low
Input 95 is mapped to emergency stop - active low
Input 94 is mapped to external supervision - active high
Input 93 is mapped to safety circuit - active low

Output 41 is mapped to contactor 1
Output 43 is mapped to contactor 2
Output 45 is mapped to contactor Y

For EntelliPro ES5 types:

Input 99 is mapped to contactor 1 feedback - active high
Input 98 is mapped to contactor 2 feedback - active high
Input 97 is mapped to contactor Y feedback - active high
Input 96 is mapped to drawer in test mode - active high
Input 95 is mapped to drawer in operation mode - active high
Input 94 is mapped to main circuit feedback - active low
Input 93 is mapped to control circuit - active low
Input 11 is mapped to command OFF - active low
Input 12 is mapped to command slow ON1 - active high
Input 13 is mapped to command fast ON2 - active high
Input 14 is mapped to external supervision - active high
Input 15 is mapped to reset alarm - active high
Input 16 is mapped to emergency stop - active low
Input 17 is mapped to safety circuit - active low

Input 18 is mapped to mode switch local - active high

Input 19 is mapped to mode switch remote - active high

Output 41 is mapped to contactor 1

Output 43 is mapped to contactor 2

Output 45 is mapped to contactor Y

Output 22 is mapped to ATEX redundancy contactor

Output 23 is mapped to slow ON1 feedback

Output 24 is mapped to fast ON2 feedback

Output 25 is mapped to drawer ready switch (high priority) and identification –relay flashing (low priority)

Output 26 is mapped to failure

NOTE

NOTE: If default configuration box is left un-checked, the user will have the ability to change the mapping and other parameters.

Figures 2-23 and 2-24 show typical Dahlander starter wiring diagrams for EntelliPro ES3 and EntelliPro ES5.

Refer to Tables 2-6 and 2-7 for the complete *in*put, output, timer and control configurations of the Dahlander motor starter.

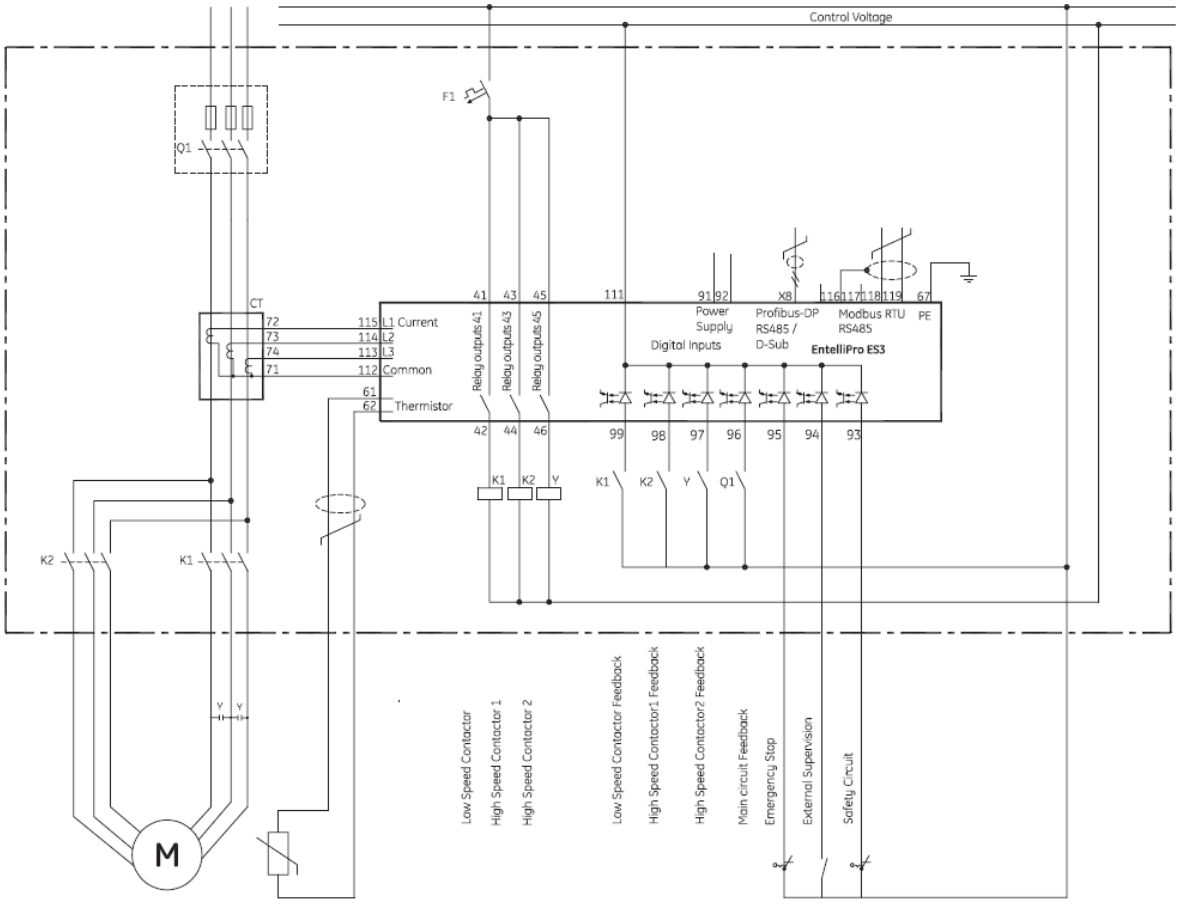


Figure 2-24: EntelliPro ES3 Dahlander starter wiring diagram

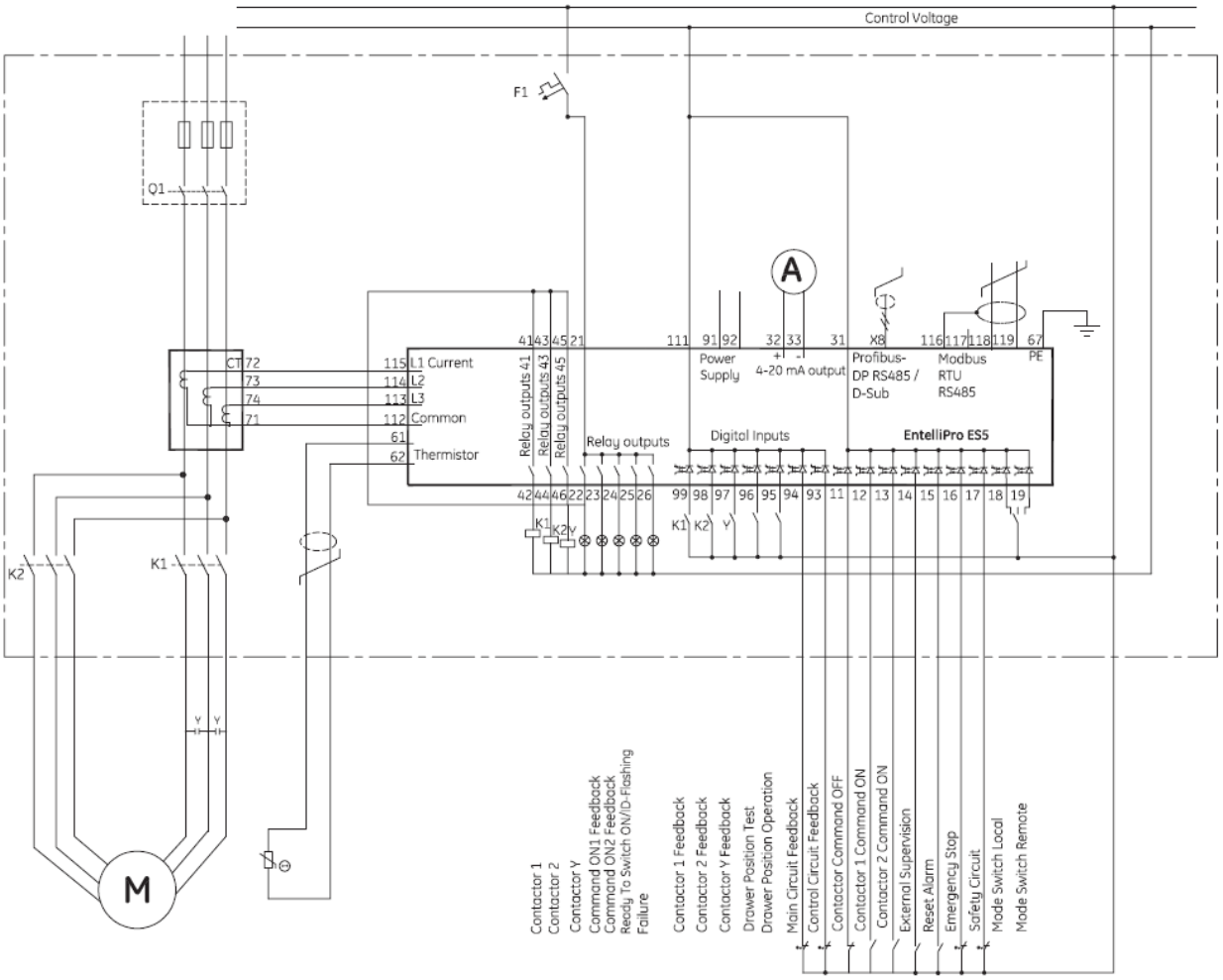


Figure 2-25: EntelliPro ES5 Dahlander starter wiring diagram

2.3.9 Motor Starter Type – Pole changer starter type

The typical Pole changer starter type is a full voltage across the line two-speed starter.

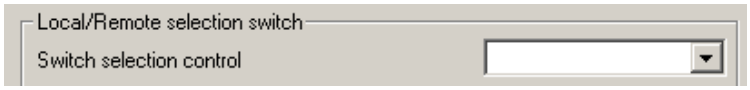
Before the motor can be turned ON the "drawer ready switch" must be active. In order to activate the "drawer ready switch" the following must be done:

- All faults and device errors must be cleared using WinESG control panel, Modbus function code 6 registers 65 thru 106 depending on the fault type, Profibus class 1 telegram B2701, or hardwire (make sure an input is mapped to "reset alarm" in WinESG parameterization / I/O panel). Input mapping can also be done using Modbus function code 6 registers 194 thru 197.

- A valid OFF command must be set on hardwire. Make sure an input is mapped to "command OFF" in WinESG parameterization/I/O panel or Modbus and it is active.

- If the drawer supervision is enabled, as shown below the drawer supervision hardwire input must be active.

- Remote or local selection must be made via the appropriate source. The first step is to select the source (Profibus class 1, Modbus or Hardwire) that has the control of the local-remote switch. This is done in the WinESG parameterization/control panel shown in illustration below.



If Profibus Class 1 is selected as a controlling mechanism, telegram B10008 bit 9 sets the local control and bit 10 sets the remote control. If bit 9 is set, all mechanisms defined as locals can control the motor (ON/OFF). If bit 10 is set, the mechanism defined as remote can control the motor (ON/OFF).

If Modbus is selected as a controlling mechanism, either coil command (function code 05) 10, to select local control or coil command 11 to select remote control must be issued. If coil command 10 is issued, all mechanisms defined as locals can control the motor (ON/OFF). If coil command 11 is issued, the mechanism defined as remote can control the motor (ON/OFF).

If Hardwire is selected as a controlling device, one input must be mapped to mode switch local and a different input to mode switch remote. If input mode switch local is active, all mechanisms defined as locals can control the motor (ON/OFF). If input mode switch remote is active, the mechanism defined as remote can control the motor (ON/OFF).

If Fixed local is selected as a controlling device, any source assigned as local can control the motor (ON/OFF).

If Fixed remote is selected as a controlling device, only the remote source can control the motor (ON/OFF).

NOTE

NOTE: Only one control (local or remote) can be enabled at a time. If both (local and remote) are active the "drawer ready switch" will be OFF and the motor cannot start.

NOTE

NOTE: To make any changes on the configuration, "parameter allowed" must be enabled in WinESG parameterization/function panel or Modbus function code 6 register 62.

Refer to section 2.2.1 for the motor control detailed configuration.

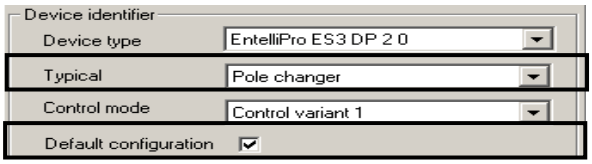
Pole changer starter operation: when an ON1 command (low speed) is received, contactor K1, controlled by EntelliPro output relay 41, will close, which will start the motor in a low speed.

When a start function ON2 (high speed) is received contactor K1 opens. When contactor K1 Off status feedback is received, contactor K2, controlled by EntelliPro output relay 43, closes, which starts the motor in a high speed.

Should an ON2 command (fast start) start be received when K1 is closed, and direct switch over is allowed, K1 will open immediately, and contactors K2 will close.

Should a start function ON1 be received when K2 is closed, and "allow direct direction switchover" is set, in the WinESG parameterization\typical settings or Modbus function code 6 register 111 bit3, K2 contactor will open immediately. K1 will close after the "fast to slow wait time" in WinESG parameterization/timer panel or Modbus function code 6 register 30 timer expires

If the default configuration and the pole changer typical are selected in the WinESG parameterization/information panel shown in the illustration below or by setting Modbus function code 6 register 62 bit0 to 1 and bits 8,9,10 and 11 to 0x7,the inputs and outputs are mapped as below:



For EntelliPro ES3 types:

Input 99 is mapped to contactor 1 feedback - active high
Input 98 is mapped to contactor 2 feedback - active high
Input 97 is mapped to control circuit feedback - active low
Input 96 is mapped to main circuit feedback - active low
Input 95 is mapped to emergency stop - active low
Input 94 is mapped to external supervision - active high
Input 93 is mapped to safety circuit - active low

Output 41 is mapped to contactor 1
Output 43 is mapped to contactor 2
Output 45 is mapped to failure

For EntelliPro ES5 types:

Input 99 is mapped to contactor 1 feedback - active high
Input 98 is mapped to contactor 2 feedback - active high
Input 97 is mapped to reset alarm - active high
Input 96 is mapped to drawer in test mode - active high
Input 95 is mapped to drawer in operation mode - active high
Input 94 is mapped to main circuit feedback - active low
Input 93 is mapped to control circuit feedback - active low
Input 11 is mapped to command OFF - active low
Input 12 is mapped to command slow ON1 - active high
Input 13 is mapped to command fast ON2 - active high
Input 14 is mapped to external supervision 1 - active high
Input 15 is mapped to external supervision 2 - active low
Input 16 is mapped to emergency stop - active low
Input 17 is mapped to safety circuit - active low
Input 18 is mapped to mode switch local - active high
Input 19 is mapped to mode switch remote - active high

Output 41 is mapped to contactor 1
Output 43 is mapped to contactor 2
Output 45 is mapped to ATEX redundancy contactor

Output 22 is mapped to local control

Output 23 is mapped to slow ON1 feedback

Output 24 is mapped to fast ON2 feedback

Output 25 is mapped to drawer ready switch (high priority) and identification –relay flashing (low priority)

Output 26 is mapped to failure

NOTE

NOTE: If default configuration box is left un-checked, the user will have the ability to change the mapping and other parameters.

Refer to Tables 2-6 and 2-7 for the complete input, output, timer and configurations of a Pole changer starter. Figures 2-26 and 2-27 show typical Pole changer starter diagrams for EntelliPro ES3 and EntelliPro ES5.

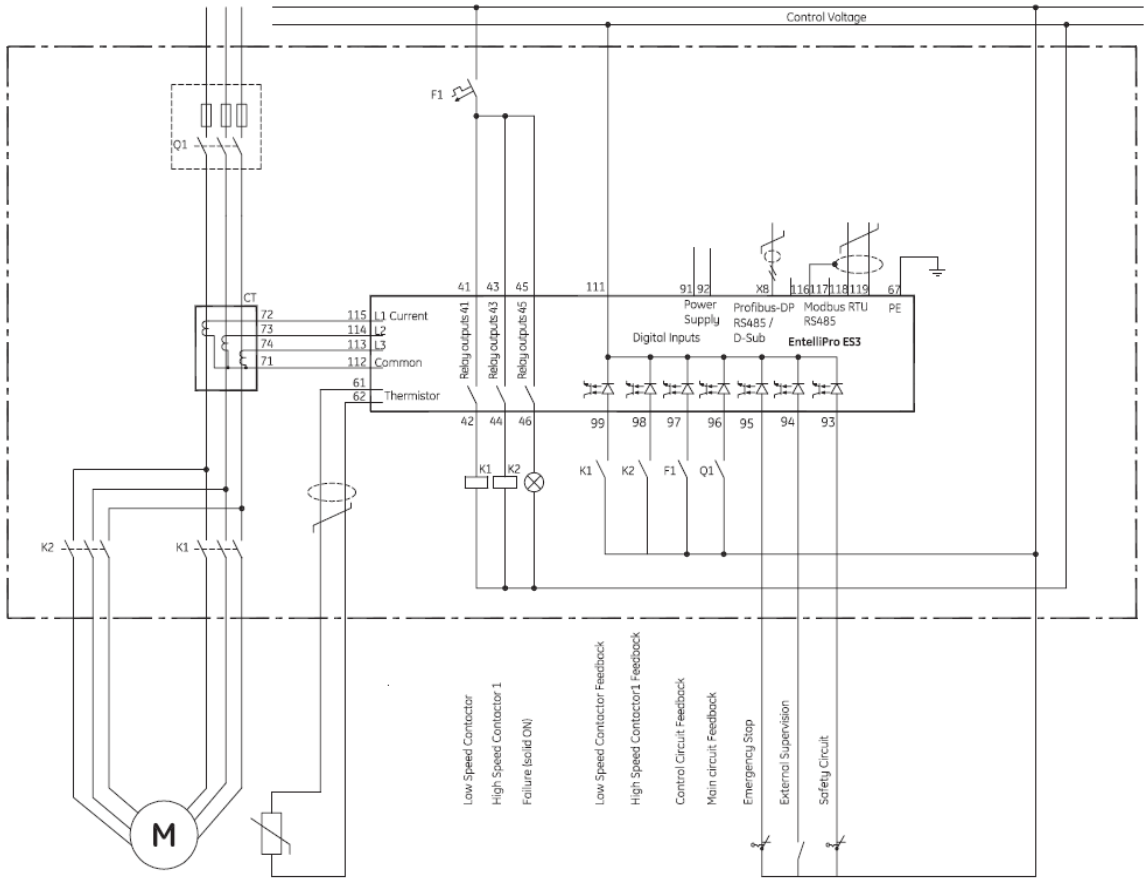


Figure 2-26: EntelliPro ES3 Pole changer starter wiring diagram

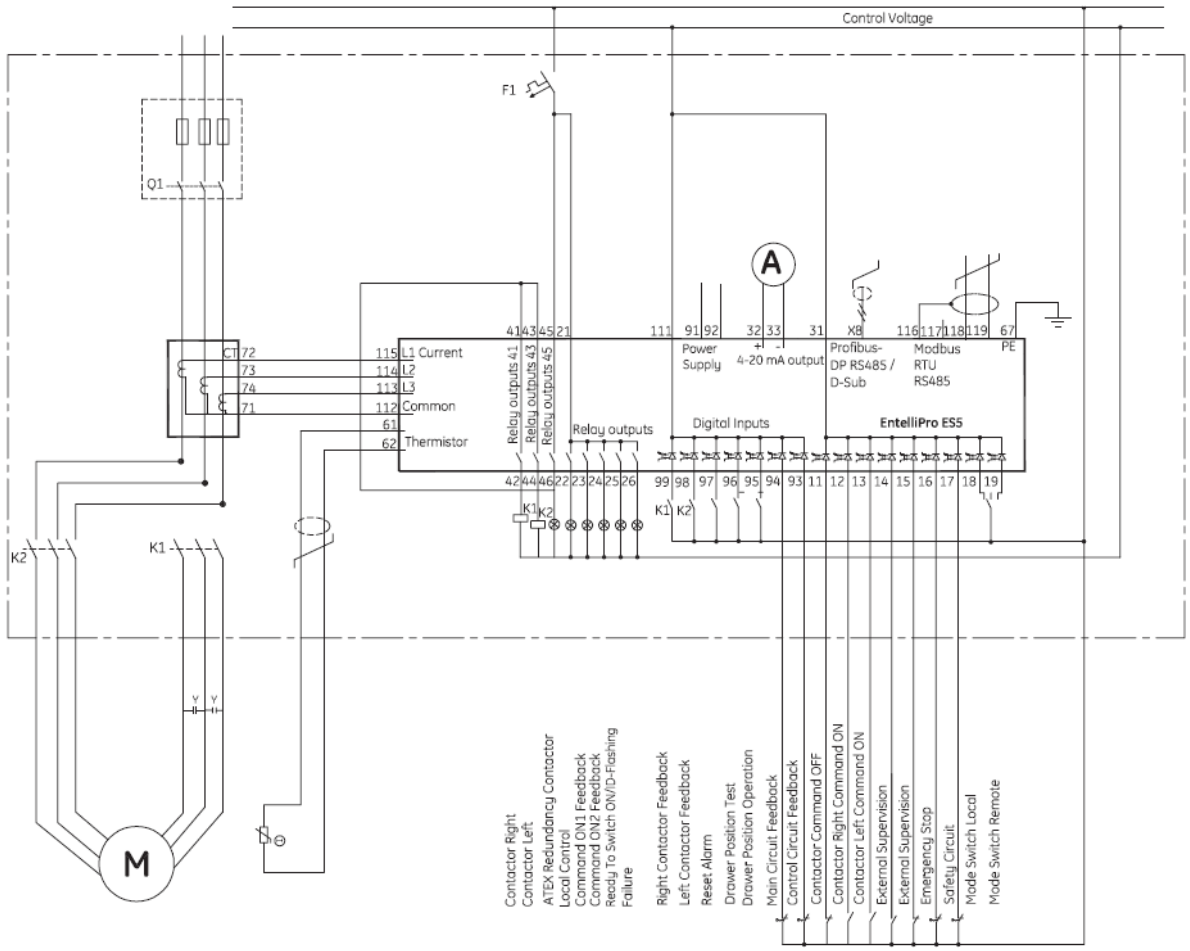


Figure 2-27: EntelliPro ES5 Pole changer starter wiring diagram

2.3.10 Solenoid valve type

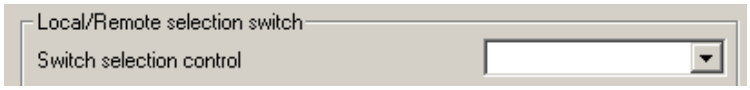
Before the solenoid can be activated the "drawer ready switch" must be active. In order to activate the "drawer ready switch" the following must be done:

- All faults and device errors must be cleared using WinESG control panel, Modbus function code 6 registers 65 thru 106 depending on the fault type, Profibus class 1 telegram B2701, or hardwire (make sure an input is mapped to "reset alarm" in WinESG parameterization / I/O panel). Input mapping can also be done using Modbus function code 6 registers 194 thru 197.

- A valid OFF command must be set on hardwire. Make sure an input is mapped to "command OFF" in WinESG parameterization/I/O panel or Modbus and it is active.

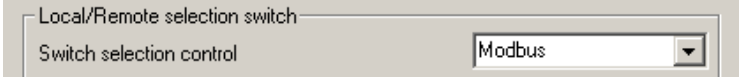
- If the drawer supervision is enabled, as shown below the drawer supervision hardwire input must be active.

- Remote or local selection must be made via the appropriate source. The first step is to select the source (Profibus class 1, Modbus or Hardwire) that has the control of the local-remote switch. This is done in the WinESG parameterization/control panel shown in illustration below.



If Profibus Class 1 is selected as a controlling mechanism, telegram B10008 bit 9 sets the local control and bit 10 sets the remote control. If bit 9 is set, all mechanisms defined as locals can control the motor (ON/OFF). If bit 10 is set, the mechanism defined as remote can control the motor (ON/OFF).

If Modbus is selected as a controlling mechanism, either coil command (function code 05) 10, to select local control or coil command 11 to select remote control must be issued. If coil command 10 is issued, all mechanisms defined as locals can control the motor (ON/OFF). If coil command 11 is issued, the mechanism defined as remote can control the motor (ON/OFF).



If Hardwire is selected as a controlling device, one input must be mapped to mode switch local and a different input to mode switch remote. If input mode switch local is active, all mechanisms defined as locals can control the motor (ON/OFF). If input mode switch remote is active, the mechanism defined as remote can control the motor (ON/OFF).

If Fixed local is selected as a controlling device, any source assigned as local can control the motor (ON/OFF).

If Fixed remote is selected as a controlling device, only the remote source can control the motor (ON/OFF).

NOTE

NOTE: Only one control (local or remote) can be enabled at a time. If both (local and remote) are active the "drawer ready switch" will be OFF and the motor cannot start.

NOTE

NOTE: To make any changes on the configuration, "parameter allowed" must be enabled in WinESG parameterization/function panel or Modbus function code 6 register 62.

Refer to section 2.2.1 for the motor control detailed configuration.

Solenoid operation: In order to start the solenoid, the limit switch 1 reached and limit switch 2 reached inputs (inputs 96 and 97on EntelliPro ES3 and inputs 18 and 19 on EntelliPro ES5) must NOT be active at the same time.

NOTE

NOTE: If both limit switches inputs are active (input 96 and 97 on EntelliPro ES3 and 18 and 19 on EntelliPro ES5) a "typical specific" error will be generated, since this is an invalid condition.

When an ON1 command is received, contactor K1, controlled by EntelliPro ES output relay 41, will close, which either opens or closes the valve, depending on the valve type. When an OFF command is received, contactor K1, controlled by EntelliPro ES output relay 41, will open, which either opens or closes the valve, depending on the valve type.

NOTE

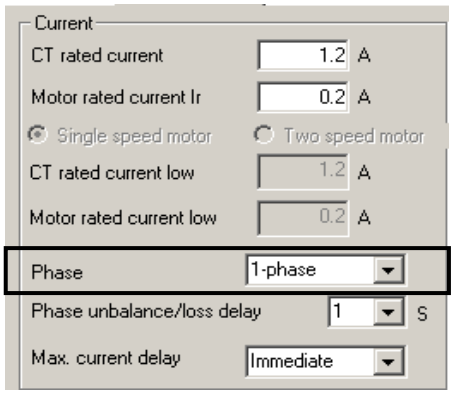
NOTE: Valves with or without a limit switch are supported.

If parameter "limit switches activated", in WinESG parameterization/typical settings panel or Modbus function code 6 register 111 bit 11, is set, and an ON1 command is received, a "switch position" warning or a fault will be generated if the limit switch 1 feedback (input 97 on EntelliPro ES3 and input 18 on EntelliPro ES5) is not received (becomes active) prior to the ""limit switch time", set in WinESG parameterization/timer panel or Modbus function code 6 register 35, expires.

When limit switch 2 is reached (input 96 on EntelliPro ES3 and input 19 on EntelliPro ES5) a "switch position" warning or a fault will be generated.

CAUTION

CAUTION: The phase system in WinESG parameterization\device settings panel shown in the illustration below or Modbus function code 6 register 5 must be set to 1 phase if the system is a 1 phase system for proper overload protection.



If the default configuration and the solenoid typical are selected in the WinESG parameterization/information panel shown in the illustration below or by setting Modbus function code 6 register 62 bit0 to 1 and bits 8,9,10 and 11 to 0x9,the inputs and outputs are mapped as below:

For EntelliPro ES3 types:

Input 99 is mapped to contactor 1 feedback	- active high
Input 98 is mapped to main circuit	- active low
Input 97 is mapped to limit switch 1 reached	- active low
Input 96 is mapped to limit switch 2 reached	- active low
Input 95 is mapped to emergency stop	- active low
Input 94 is mapped to external supervision	- active high
Input 93 is mapped to safety circuit	- active low

Output 41 is mapped to contactor 1

Output 43 is mapped to command ON1 (start)

Output 45 is mapped to failure

For EntelliPro ES5 types:

Input 99 is mapped to contactor 1 feedback	- active high
Input 98 is mapped to drawer in test position	- active high
Input 97 is mapped to drawer in operation mode	- active high
Input 96 is mapped to mode switch local	- active high
Input 95 is mapped to mode switch remote	- active high
Input 94 is mapped to main circuit feedback	- active low
Input 93 is mapped to control circuit feedback	- active low
Input 11 is mapped to command OFF	- active low
Input 12 is mapped to command ON1	- active high
Input 13 is mapped to alarm reset	- active high
Input 14 is mapped to external supervision 1	- active high
Input 15 is mapped to external supervision 2	- active low
Input 16 is mapped to emergency stop	- active low
Input 17 is mapped to safety circuit	- active low
Input 18 is mapped to limit switch 1 feedback	- active low
Input 19 is mapped to limit switch 2 feedback	- active low

Output 41 is mapped to contactor 1

Output 43 is mapped to ready to switch On

Output 45 is mapped to warning (high priority) and failure – relay flashing (low priority)

Output 22 is mapped to local control

Output 23 is mapped to ON1 feedback

Output 24 is mapped to warning

Output 25 is mapped to drawer ready switch (high priority) and identification – relay flashing (low priority)

Output 26 is mapped to failure

NOTE: If default configuration box is left un-checked, the user will have the ability to change the mapping and other parameters.

Refer to Tables 2-6 and 2-7 for the complete input, output, timer and control configurations of a solenoid valve starter.

Figures 2-28 and 2-29 show typical solenoid valve starter diagrams for EntelliPro ES3 and EntelliPro ES5.

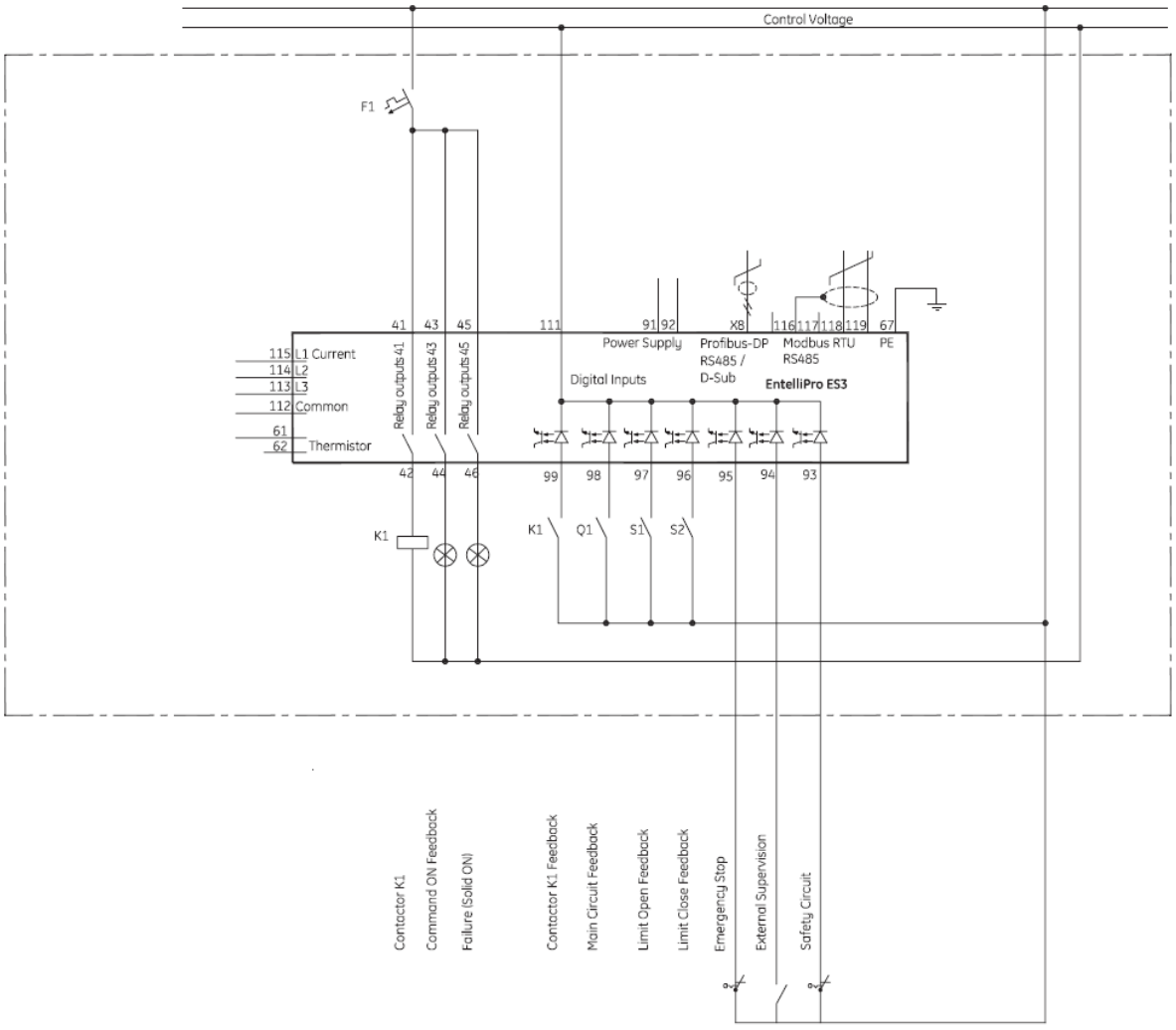


Figure 2-28: EntelliPro ES3 Solenoid valve wiring diagram

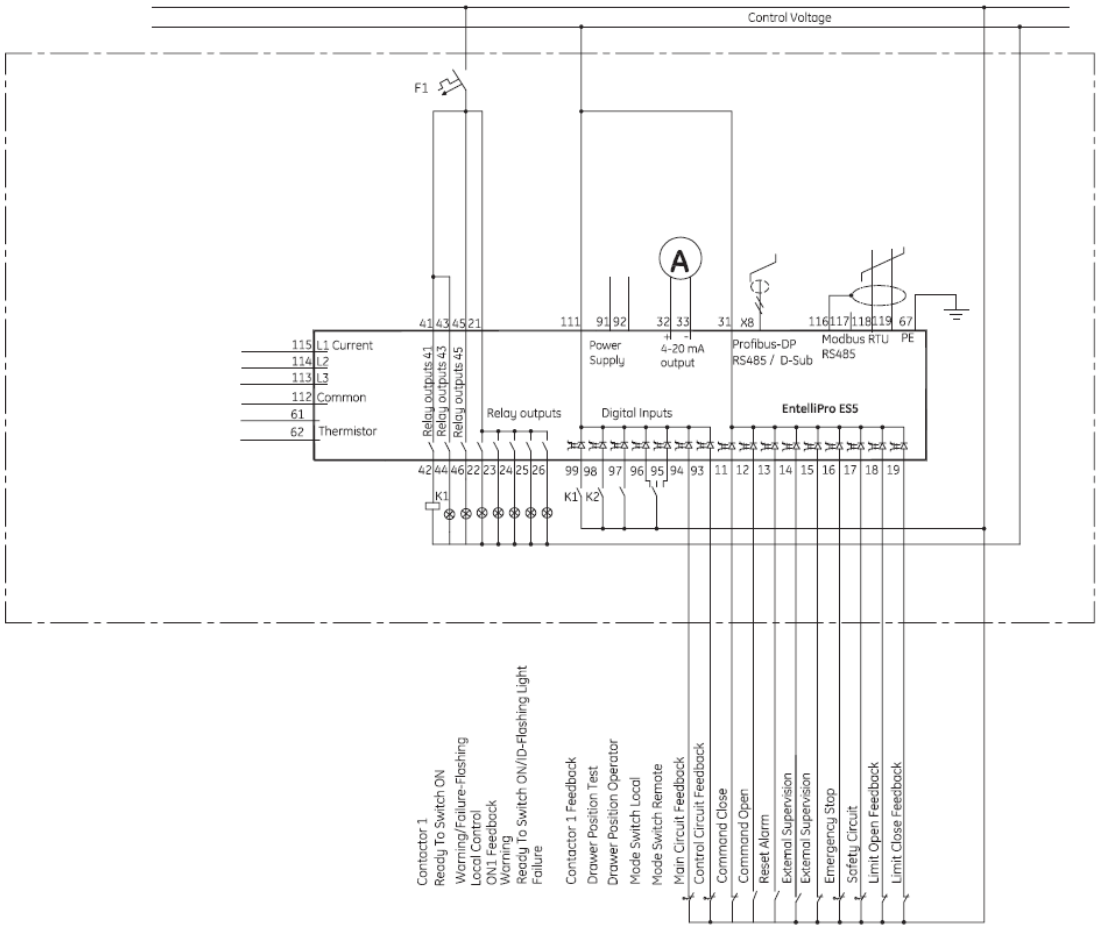


Figure 2-29: EntelliPro ES5 Solenoid valve wiring diagram

2.3.11 Actuator type

The typical actuator type is typically used on applications where a motor moves a valve between two endpoints – open and closed.

Before the motor can be turned ON the "drawer ready switch" must be active. In order to activate the "drawer ready switch" the following must be done:

- All faults and device errors must be cleared using WinESG control panel, Modbus function code 6 registers 65 thru 106 depending on the fault type, Profibus class 1 telegram B2701, or hardwire (make sure an input is mapped to "reset alarm" in WinESG parameterization / I/O panel). Input mapping can also be done using Modbus function code 6 registers 194 thru 197.

- A valid OFF command must be set on hardwire. Make sure an input is mapped to "command OFF" in WinESG parameterization/I/O panel or Modbus and it is active.

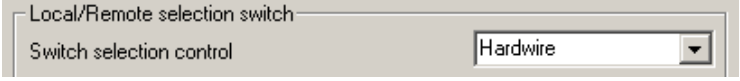
- If the drawer supervision is enabled, as shown below the drawer supervision hardwire input must be active.

- Remote or local selection must be made via the appropriate source. The first step is to select the source (Profibus class 1, Modbus or Hardwire) that has the control of the local-remote switch. This is done in the WinESG parameterization/control panel shown in illustration below.

If Profibus Class 1 is selected as a controlling mechanism, telegram B10008 bit 9 sets the local control and bit 10 sets the remote control. If bit 9 is set, all mechanisms defined as locals can control the motor (ON/OFF). If bit 10 is set, the mechanism defined as remote can control the motor (ON/OFF).

If Modbus is selected as a controlling mechanism, either coil command (function code 05) 10, to select local control or coil command 11 to select remote control must be issued. If coil command 10 is issued, all mechanisms defined as locals can control the motor (ON/OFF). If coil command 11 is issued, the mechanism defined as remote can control the motor (ON/OFF).

If Hardwire is selected as a controlling device, one input must be mapped to mode switch local and a different input to mode switch remote. If input mode switch local is active, all mechanisms defined as locals can control the motor (ON/OFF). If input mode switch remote is active, the mechanism defined as remote can control the motor (ON/OFF).



If Fixed local is selected as a controlling device, any source assigned as local can control the motor (ON/OFF).

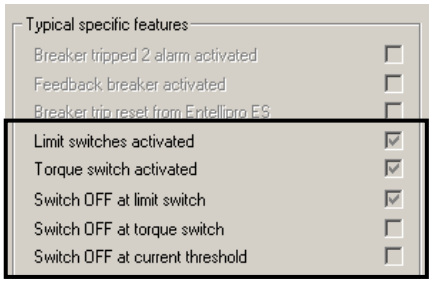
If Fixed remote is selected as a controlling device, only the remote source can control the motor (ON/OFF).

NOTE: Only one control (local or remote) can be enabled at a time. If both (local and remote) are active the "drawer ready switch" will be OFF and the motor cannot start.

NOTE: To make any changes on the configuration, "parameter allowed" must be enabled in WinESG parameterization/function panel or Modbus function code 6 register 62.

Refer to section 2.2.1 for the motor control detailed configuration.

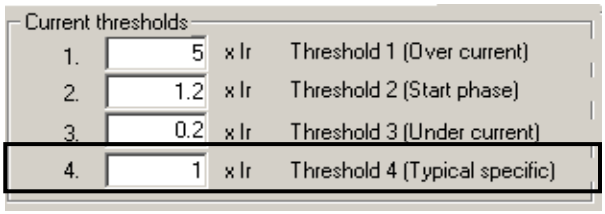
This motor starter supports switch off at limit switch, switch off at torque switch and switch off at current threshold. These parameters are configured in WinESG parameterization/typical settings panel as shown in the illustration below or Modbus function code 6 register 111.



Only the following six configurations are valid:

Configuration	Limit switch activated	Torque switch activated	Switch OFF at limit switch	Switch OFF at torque switch	Switch OFF at current threshold
1	Enabled		Enabled		
2	Enabled				Enabled
3	Enabled	Enabled	Enabled		
4	Enabled	Enabled		Enabled	
5					Enabled
6		Enabled		Enabled	

NOTE **NOTE:** The current threshold level is set in WinESG parameterization/device settings panel as shown in the illustration below or Modbus function code 6 register 21.



Configuration 1 operation - limit switched activated and switch OFF at limit switch:

In order to start the motor on either direction, the limit switch 1 reached and limit switch 2 reached inputs (inputs 96 and 97on EntelliPro ES3 and inputs 18 and 19 on EntelliPro ES5) must NOT be active at the same time.

NOTE **NOTE:** If both limit switches inputs are active (input 96 and 97 on EntelliPro ES3 and 18 and 19 on EntelliPro ES5) a "position switch" error will be generated, since this is an invalid condition.

When an ON1 right command is received, contactor K1, controlled by EntelliPro output relay 41, will close, provided the motor is in the off state and the drawer ready switch is active, which will start the motor in a right direction. When the limit switch 1 is reached (input 97 on EntelliPro ES3 and input 18 on EntelliPro ES5 active) the motor will stop and will not rotate in the same direction. The motor can only re-start on the opposite direction by using command ON2, after the "motor ON direction switchover time" timer set in WinESG parameterization/timer or Modbus function code 6 register 30 expires.

Similarly when an ON2 left command is received, contactor K2, controlled by EntelliPro output relay 43, will close, provided the motor is in the off state and the drawer ready switch is active, which will start the motor in a left direction. . When the limit switch 1 is reached (input 96 on EntelliPro ES3 and input 19 on EntelliPro ES5 active) the motor will stop and will not rotate in the same direction. The motor can only re-start on the opposite direction by using command ON1, after the "motor ON direction switchover time" timer set in WinESG parameterization/timer or Modbus function code 6 register 30 expires.

In case the motor is running in one direction and a command is received instructing the motor to rotate in opposite direction, the decision of accepting the commands will be dependent on the configuration of the "allow direction switchover" parameter set in WinESG parameterization/typical settings panel or the bit set on Modbus function code 6 register 111.

If this bit is set, the motor is allowed to accept the command, which will cause the motor to stop and wait for the "motor ON direction switchover time" transfer timer to expire before starting the motor in the opposite direction.

When an OFF command is received, EntelliPro contact output relays 41 or 43 open, contactors K1 and K2 close, and the motor stops. The starter logic is fully symmetrical between right and left.

Configuration 2 operation - limit switched activated and switch OFF at current threshold:

In order to start the motor on either direction, the limit switch 1 reached and limit switch 2 reached inputs (inputs 96 and 97on EntelliPro ES3 and inputs 18 and 19 on EntelliPro ES5) must NOT be active at the same time.

NOTE **NOTE:** If both limit switches inputs are active (input 96 and 97 on EntelliPro ES3 and 18 and 19 on EntelliPro ES5) a "position switch" error will be generated, since this is an invalid condition.

When an ON1 right command is received, contactor K1, controlled by EntelliPro output relay 41, will close, provided the motor is in the off state and the drawer ready switch is active, which will start the motor in a right direction. When the limit switch 1 is reached (input 97 on EntelliPro ES3 and input 18 on EntelliPro ES5 active) and the current has exceeded the typical specific threshold 4 set in WinESG parameterization/device settings panel or Modbus function code 6 register 21, the motor will stop and will not rotate in the same direction even when the current is below the threshold. The motor can only re-start on the opposite direction by using command ON2, after the "motor ON direction switchover time" timer set in WinESG parameterization/timer or Modbus function code 6 register 30 expires.

Similarly when an ON2 left command is received, contactor K2, controlled by EntelliPro output relay 43, will close, provided the motor is in the off state and the drawer ready switch is active, which will start the motor in a left direction. When the limit switch 1 is reached (input 96 on EntelliPro ES3 and input 19 on EntelliPro ES5 active) and the current has exceeded the typical specific threshold 4 set in WinESG parameterization/device settings panel or Modbus function code 6 register 21, the motor will stop and will not rotate in the same direction. The motor can only re-start on the opposite direction by using command ON1, after the "motor ON direction switchover time" timer set in WinESG parameterization/timer or Modbus function code 6 register 30 expires.

In case the motor is running in one direction and a command is received instructing the motor to rotate in opposite direction, the decision of accepting the commands will be dependent on the configuration of the "allow direction switchover" parameter set in WinESG parameterization/typical settings panel or the bit set on Modbus function code 6 register 111.

If this bit is set, the motor is allowed to accept the command, which will cause the motor to stop and wait for the "motor ON direction switchover time" transfer timer to expire before starting the motor in the opposite direction.

When an OFF command is received, EntelliPro ES contact output relays 41 or 43 open, contactors K1 and K2 close, and the motor stops. The starter logic is fully symmetrical between right and left.

Configuration 3 operation - limit switched activated, torque switch activated and switch OFF at limit switch:

In order to start the motor on either direction, limit switch 1 reached and limit switch 2 reached inputs (inputs 96 and 97on EntelliPro ES3 and inputs 18 and 19 on EntelliPro ES5) must NOT be active at the same time. In addition

Torque switch 1 reached and torque switch 2 reached inputs (inputs 14 and 15 on EntelliPro ES5) must NOT be active at the same time.

When an ON1 right command is received, contactor K1, controlled by EntelliPro output relay 41, will close, provided the motor is in the off state and the drawer ready switch is active, which will start the motor in a right direction. When the torque limit 1 (input 14 on EntelliPro ES5) is reached a position switch warning or fault will be generated. The warning or fault will be dependent of limit/torque switch parameter set in WinESG parameterization\alarm panel or Modbus registers 64 bit 6 and register 114 bit6 .

When the limit switch 1 is reached (input 97 on EntelliPro ES3 and input 18 on EntelliPro ES5 active) the motor will stop and will not rotate in the same direction. The motor can only re-start on the opposite direction by using command ON2, after the "motor ON direction switchover time" timer set in WinESG parameterization/timer or Modbus function code 6 register 30 expires.

Similarly when an ON2 left command is received, contactor K2, controlled by EntelliPro output relay 43, will close, provided the motor is in the off state and the drawer ready switch is active, which will start the motor in a left direction. . When the torque limit 2 (input 15 on EntelliPro ES5) is reached a position switch warning or fault will be generated. The warning or fault will be dependent of limit/torque switch parameter set in WinESG parameterization\alarm panel or Modbus registers 64 bit 6 and register 114 bit6 .
When the limit switch 2 is reached (input 96 on EntelliPro ES3 and input 19 on EntelliPro ES5 active) the motor will stop and will not rotate in the same direction. The motor can only re-start on the opposite direction by using command ON1, after the "motor ON direction switchover time" timer set in WinESG parameterization/timer or Modbus function code 6 register 30 expires.

In case the motor is running in one direction and a command is received instructing the motor to rotate in opposite direction, the decision of accepting the commands will be dependent on the configuration of the "allow direction switchover" parameter set in WinESG parameterization/typical settings panel or the bit set on Modbus function code 6 register 111.

If this bit is set, the motor is allowed to accept the command, which will cause the motor to stop and wait for the "motor ON direction switchover time" transfer timer to expire before starting the motor in the opposite direction.

When an OFF command is received, EntelliPro contact output relays 41 or 43 open, contactors K1 and K2 close, and the motor stops. The starter logic is fully symmetrical between right and left.

Configuration 4 operation - limit switched activated, torque switch activated and switch OFF at torque switch:

In order to start the motor on either direction, limit switch 1 reached and limit switch 2 reached inputs (inputs 96 and 97on EntelliPro ES3 and inputs 18 and 19 on EntelliPro ES5 must NOT be active at the same time. In addition

Torque switch 1 reached and torque switch 2 reached inputs (inputs 14 and 15 on EntelliPro ES5) must NOT be active at the same time.

When an ON1 right command is received, contactor K1, controlled by EntelliPro output relay 41, will close, provided the motor is in the off state and the drawer ready switch is active, which will start the motor in a right direction. When the torque limit 1 (input 14 on EntelliPro ES5) is reached a position switch warning or fault will be generated. The warning or fault will be dependent of limit/torque switch parameter set in WinESG parameterization\alarm panel or Modbus registers 64 bit6 and register 114 bit6.

When the limit switch 1 is reached (input 97 on EntelliPro ES3 and input 18 on EntelliPro ES5 active) and then the torque limit 1 is reached, the motor will stop and will not rotate in the same direction. The motor can only re-start on the opposite direction by using command ON2, after the "motor ON direction switchover time" timer set in WinESG parameterization/timer or Modbus function code 6 register 30 expires.

Similarly when an ON2 left command is received, contactor K2, controlled by EntelliPro output relay 43, will close, provided the motor is in the off state and the drawer ready switch is active, which will start the motor in a left direction. . When the torque limit 2 (input 15 on EntelliPro ES5) is reached a position switch warning or fault will be generated. The warning or fault will be dependent of limit/torque switch parameter set in WinESG parameterization\alarm panel or Modbus registers 64 bit 6 and register 114 bit6 .
When the limit switch 2 is reached (input 96 on EntelliPro ES3 and input 19 on EntelliPro ES5 active) and then the torque limit 2 is reached, the motor will stop and will not rotate in the same direction. The motor can only re-start on the opposite direction by using command ON1, after the "motor ON direction switchover time" timer set in WinESG parameterization/timer or Modbus function code 6 register 30 expires.

In case the motor is running in one direction and a command is received instructing the motor to rotate in opposite direction, the decision of accepting the commands will be dependent on the configuration of the "allow direction switchover" parameter set in WinESG parameterization/typical settings panel or the bit set on Modbus function code 6 register 111.

If this bit is set, the motor is allowed to accept the command, which will cause the motor to stop and wait for the "motor ON direction switchover time" transfer timer to expire before starting the motor in the opposite direction.

When an OFF command is received, EntelliPro contact output relays 41 or 43 open, contactors K1 and K2 close, and the motor stops. The starter logic is fully symmetrical between right and left.

Configuration 5 operation - limit switched activated disabled, torque switch activated disabled and switch OFF at current threshold:

When an ON1 right command is received, contactor K1, controlled by EntelliPro output relay 41, will close, provided the motor is in the off state and the drawer ready switch is active, which will start the motor in a right direction. When the the current has exceeded the typical specific threshold 4 set in WinESG parameterization/device settings panel or Modbus function code 6 register 21, the motor will stop and will not rotate in the same direction even when the current is below the threshold. The motor can only re-start on the opposite direction by using command ON2, after the "motor ON direction switchover time" timer set in WinESG parameterization/timer or Modbus function code 6 register 30 expires.

Similarly when an ON2 left command is received, contactor K2, controlled by EntelliPro output relay 43, will close, provided the motor is in the off state and the drawer ready switch is active, which will start the motor in a left direction. When the current has exceeded the typical specific threshold 4 set in WinESG parameterization/device settings panel or Modbus function code 6 register 21, the motor will stop and will not rotate in the same direction. The motor can only re-start on the opposite direction by using command ON1, after the "motor ON direction switchover time" timer set in WinESG parameterization/timer or Modbus function code 6 register 30 expires.

In case the motor is running in one direction and a command is received instructing the motor to rotate in opposite direction, the decision of accepting the commands will be dependent on the configuration of the "allow direction switchover" parameter set in WinESG parameterization/typical settings panel or the bit set on Modbus function code 6 register 111.

If this bit is set, the motor is allowed to accept the command, which will cause the motor to stop and wait for the "motor ON direction switchover time" transfer timer to expire before starting the motor in the opposite direction.

NOTE: If "allow direction switchover" is disabled an OFF command is required

When an OFF command is received, EntelliPro contact output relays 41 or 43 open, contactors K1 and K2 close, and the motor stops. The starter logic is fully symmetrical between right and left.

Configuration 6 operation - torque switch activated and switch OFF at torque switch:

In order to start the motor on either direction, the Torque switch 1 reached and torque switch 2 reached inputs (inputs 14 and 15 on EntelliPro ES5) must NOT be active at the same time. .

NOTE **NOTE:** if both torque switches inputs are active (inputs 14 and 15 on EntelliPro ES5) a "position switch" error will be generated, since this is an invalid condition.

When an ON1 right command is received, contactor K1, controlled by EntelliPro output relay 41, will close, provided the motor is in the off state and the drawer ready switch is active, which will start the motor in a right direction. When the torque switch 1 is reached (input 14 on EntelliPro ES5 active) the motor will stop and will not rotate in the same direction. The motor can only re-start on the opposite direction by using command ON2, after the "motor ON direction switchover time" timer set in WinESG parameterization/timer or Modbus function code 6 register 30 expires.

Similarly when an ON2 left command is received, contactor K2, controlled by EntelliPro output relay 43, will close, provided the motor is in the off state and the drawer ready switch is active, which will start the motor in a left direction. . When the limit switch 2 is reached (input 15 on EntelliPro ES5 active) the motor will stop and will not rotate in the same direction. The motor can only re-start on the opposite direction by using command ON1, after the "motor ON direction switchover time" timer set in WinESG parameterization/timer or Modbus function code 6 register 30 expires.

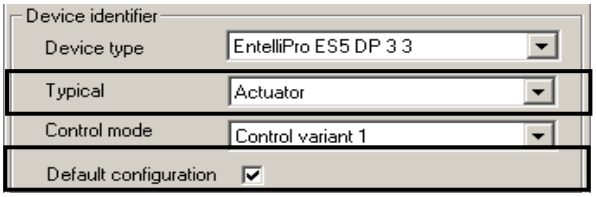
In case the motor is running in one direction and a command is received instructing the motor to rotate in opposite direction, the decision of accepting the commands will be dependent on the configuration of the "allow direction switchover" parameter set in WinESG parameterization/typical settings panel or the bit set on Modbus function code 6 register 111.

If this bit is set, the motor is allowed to accept the command, which will cause the motor to stop and wait for the "motor ON direction switchover time" transfer timer to expire before starting the motor in the opposite direction.

NOTE **NOTE:** If "allow direction switchover" is disabled an OFF command is required prior to switching direction.

When an OFF command is received, EntelliPro contact output relays 41 or 43 open, contactors K1 and K2 open, and the motor stops. The starter logic is fully symmetrical between right and left.

If the default configuration and the actuator typical are selected in the WinESG parameterization/information shown in the illustration below or by setting Modbus function code 6 register 62 bit0 to 1 and bits 8,9,10 and 11 to 0x0,the inputs and outputs are mapped as below:



For EntelliPro ES3 types:

Input 99 is mapped to contactor 1 feedback - active high
Input 98 is mapped to contactor 2 feedback - active low
Input 97 is mapped to limit switch 1 reached - active low
Input 96 is mapped to limit switch 2 reached - active low
Input 95 is mapped to emergency stop - active low
Input 94 is mapped to main circuit feedback - active high
Input 93 is mapped to safety circuit - active low

Output 41 is mapped to contactor 1
Output 43 is mapped to contactor 2
Output 45 is mapped to failure

For EntelliPro ES5 types:

Input 99 is mapped to contactor 1 feedback - active high
Input 98 is mapped to contactor 2 feedback - active high
Input 97 is mapped to external supervision 1 - active high
Input 96 is mapped to mode switch local - active high
Input 95 is mapped to mode switch remote - active high
Input 94 is mapped to main circuit feedback - active low
Input 93 is mapped to control circuit feedback - active low
Input 11 is mapped to command OFF - active low
Input 12 is mapped to command ON1 - active high
Input 13 is mapped to command ON2 - active high
Input 14 is mapped to torque switch 1 feedback - active low
Input 15 is mapped to torque switch 2 feedback - active low
Input 16 is mapped to emergency stop - active low
Input 17 is mapped to safety circuit - active low
Input 18 is mapped to limit switch 1 feedback - active low
Input 19 is mapped to limit switch 2 feedback - active low

Output 41 is mapped to contactor 1
Output 43 is mapped to contactor 2
Output 45 is mapped to ATEX redundancy contactor
Output 22 is mapped to local control
Output 23 is mapped to ON1 – relay flashing
Output 24 is mapped to ON2 – relay flashing
Output 25 is mapped to drawer ready switch (high priority) and identification – relay flashing (low priority)
Output 26 is mapped to failure

NOTE

NOTE: If default configuration box is left un-checked, the user will have the ability to change the mapping and other parameters.

Refer to Tables 2-6 and 2-7 for the complete input, output, timer and control configurations of an actuator starter.

Figures 2-30 and 2-31 show typical actuator starter diagrams for EntelliPro ES3 and EntelliPro ES5.

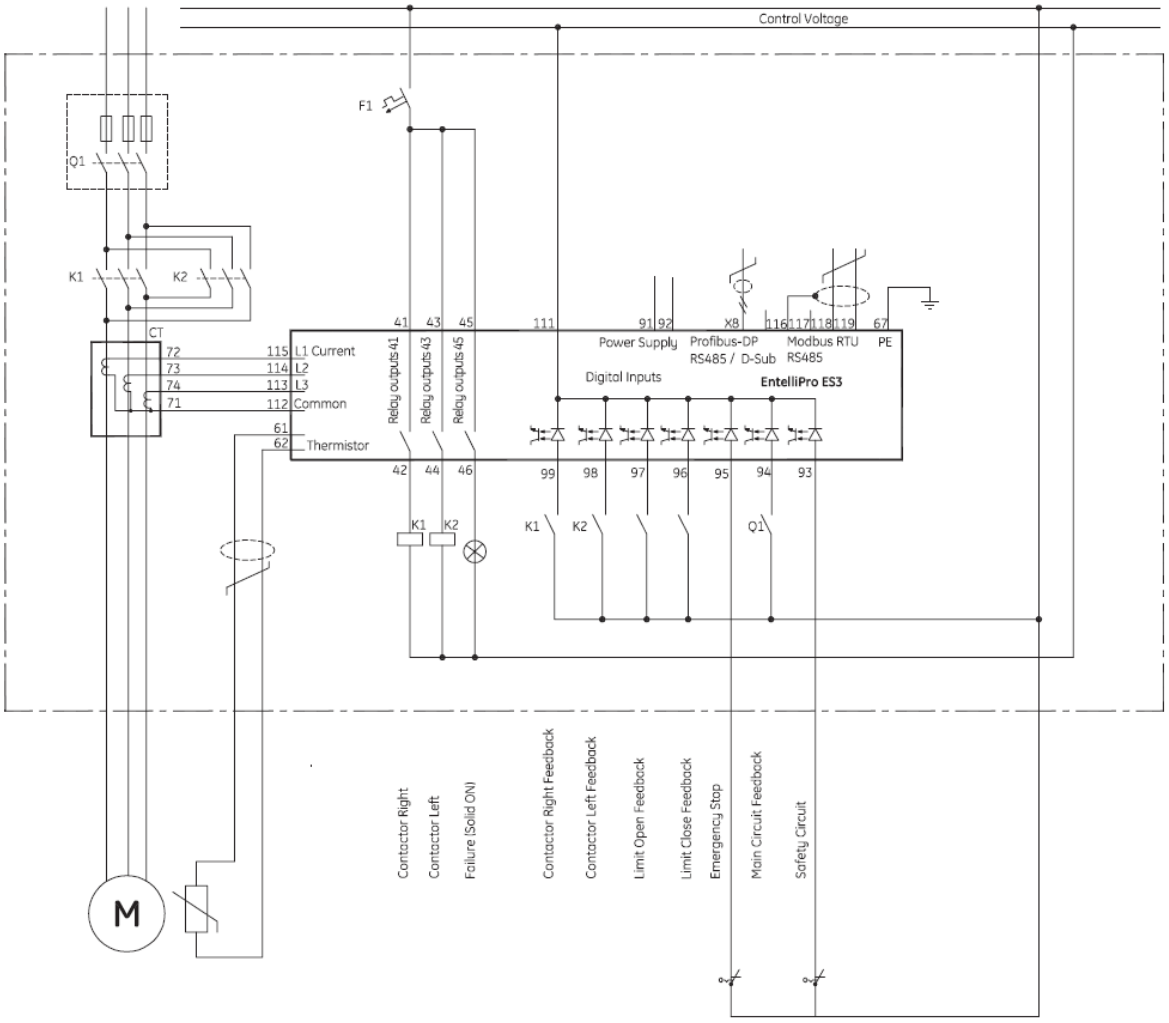


Figure 2-30: EntelliPro ES3 Actuator wiring diagram

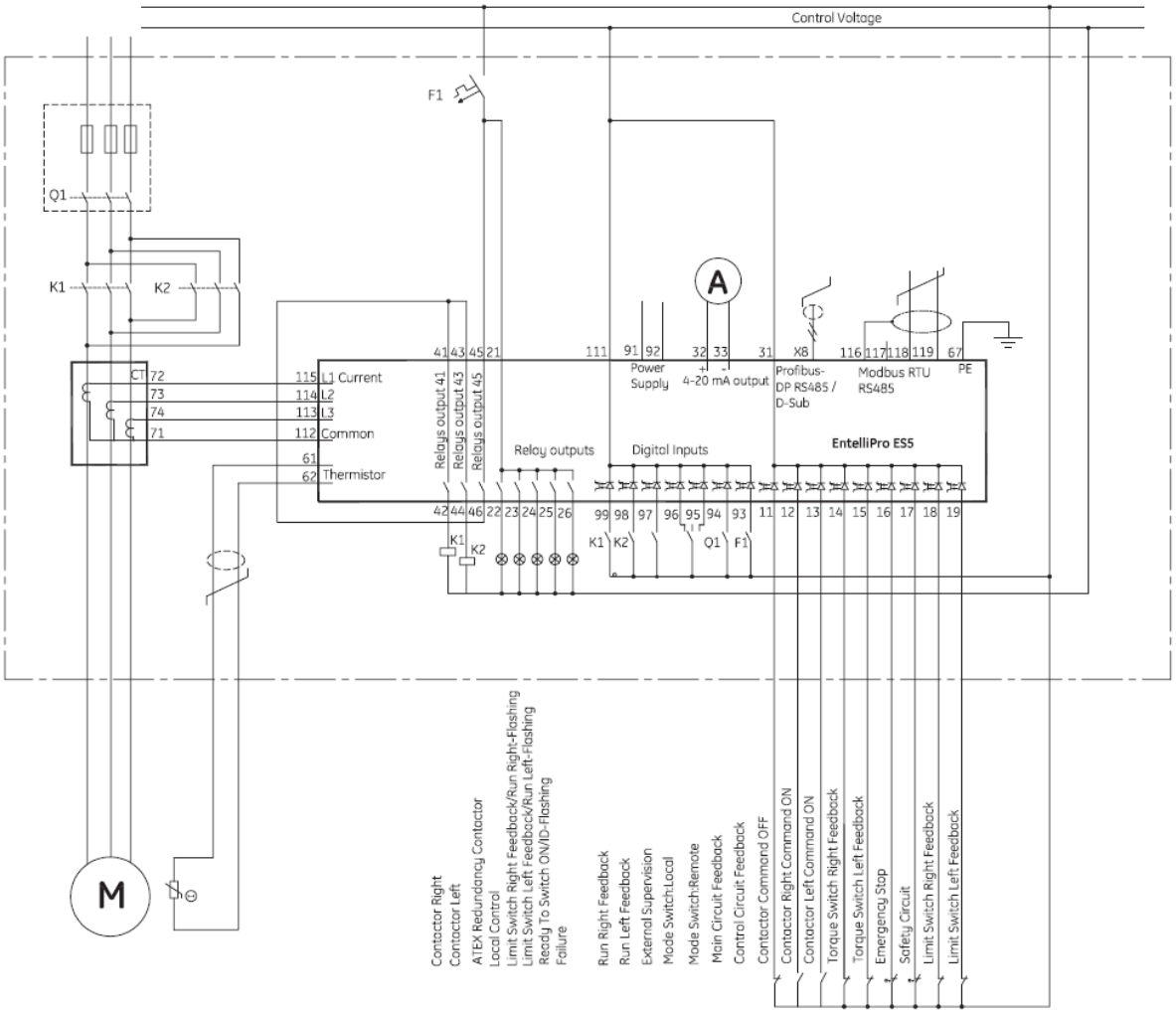


Figure 2-31: EntelliPro ES5 Actuator starter wiring diagram

Tables below show the default configuration for all typicals.

	Motor Starter Standard Configuration										
		EntelliPro ES3									
	Full-voltage non-reversing	Full-voltage reversing	Star-delta non-reversing	Star-delta reversing	Softstarter	Softstarter reversing	Breaker	Dahlander	Pole-changer	Actuator	Solenoid valve
Feedback via contact Activated	Activated	Activated	Activated	N/A	Activated	Activated	Activated	Activated	Activated	Activated	Activated
Feedback via current Activated	Activated	Activated	Activated	N/A	Activated	Activated	N/A	Activated	Activated	Activated	N/A
Direct Switch over without OFF command	N/A	Deactivated	N/A	N/A	N/A	Deactivated	N/A	Activated	Activated	Deactivated	N/A
Current depending YD Switch Over	N/A	N/A	Activated	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Soft Stop Timer	N/A	N/A	N/A	N/A	Deactivated	Deactivated	N/A	N/A	N/A	N/A	N/A
Bypass Control	N/A	N/A	N/A	N/A	Activated	Activated	N/A	N/A	N/A	N/A	N/A
External Soft Starter Fault	N/A	N/A	N/A	N/A	Activated	Activated	N/A	N/A	N/A	N/A	N/A
MCCB Tripped 2 Configuration (Alarm or No-Alarm)	N/A	N/A	N/A	N/A	N/A	N/A	no alarm	N/A	N/A	N/A	N/A
Breaker Trip Reset from EntelliPro ES	N/A	N/A	N/A	N/A	N/A	N/A	Activated	N/A	N/A	N/A	N/A
MCCB Feedback	N/A	N/A	N/A	N/A	N/A	N/A	Activated	N/A	N/A	N/A	N/A
Torque Switch	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Disable	N/A
Switch OFF at Limit Switch	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Activated	N/A
Switch OFF at Current Threshold	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Deactivated	N/A
Switch OFF at Torque Switch	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Deactivated	N/A
Enable Modbus RTU Control	Enable	Enable	Enable	N/A	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Enable Profibus DP Class 2 Control	Enable	Enable	Enable	N/A	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Enable Hardwired Control	Disable	Disable	Disable	N/A	Disable	Disable	Disable	Disable	Disable	Disable	Disable
bit 1 - Class1 n bit 0r (n+1) bit	n bit	n bit	n bit	N/A	n bit	n bit	n bit	n bit	n bit	n bit	n bit
bit 2 - Level/Edge	Level	Level	Level	N/A	Level	Level	Level	Level	Level	Level	Level
bit 3 - Inverted OFF / Non-Inverted OFF	non	non	non	N/A	non	non	non	non	non	non	non
bit 1 - Hardwire n bit 0r (n+1) bit	(n+1) bit	(n+1) bit	(n+1) bit	N/A	(n+1) bit	(n+1) bit	(n+1) bit	(n+1) bit	(n+1) bit	(n+1) bit	(n+1) bit
bit 2 - Hardwire Level/Edge	Edge	Edge	Edge	N/A	Edge	Edge	Edge	Edge	Edge	Edge	Edge
Thermistor Line Broken/Shorted Supervision.	Enable	Enable	Enable	N/A	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Drawer Position Supervision	Deactivated	Deactivated	Deactivated	N/A	Deactivated	Deactivated	Deactivated	Deactivated	Deactivated	Deactivated	Deactivated
Drawer Position 1 bit Modus / 2 bit Modbus	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Modbus Failure Detection	Enable	Enable	Enable	N/A	Enable	Enable	Enable	Enable	Enable	Enable	Enable
ATEX Activated (Ex)	Deactivated	Deactivated	Deactivated	N/A	Deactivated	Deactivated	Deactivated	Deactivated	Deactivated	Deactivated	Deactivated
bit 5 - Remote OFF always valid	Deactivated	Deactivated	Deactivated	N/A	Deactivated	Deactivated	Deactivated	Deactivated	Deactivated	Deactivated	Deactivated
bit 6 - Block Local Switch ON	Enable	Enable	Enable	N/A	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Alarm Setting											
Overload	Enable	Enable	Enable	N/A	Enable	Enable	Disable	Enable	Enable	Enable	Enable
Phase Loss	Enable	Enable	Enable	N/A	Enable	Enable	Disable	Enable	Enable	Enable	Disable
Ground Fault	Enable	Enable	Enable	N/A	Enable	Enable	Disable	Enable	Enable	Enable	Disable
Unbalance Load	Enable	Enable	Enable	N/A	Enable	Enable	Disable	Enable	Enable	Enable	Disable
Thermsitor	Enable	Enable	Enable	N/A	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Emergency Stop	Enable	Enable	Enable	N/A	Enable	Enable	Disable	Enable	Enable	Enable	Enable
Limit Switch	Disable	Disable	Disable	N/A	Disable	Disable	Disable	Disable	Disable	Enable	Enable
Safety Circuit	Enable	Enable	Enable	N/A	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Main Circuit	Enable	Enable	Enable	N/A	Enable	Disable	Enable	Enable	Enable	Enable	Enable
Control Circuit	Enable	Enable	Disable	N/A	Disable	Disable	Disable	Disable	Enable	Disable	Disable
Switch Position	Enable	Enable	Enable	N/A	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Underload Current	Enable	Enable	Enable	N/A	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Overload Current	Enable	Enable	Enable	N/A	Enable	Enable	Enable	Enable	Enable	Enable	Enable
External Supervisory	Enable	Enable	Enable	N/A	Enable	Enable	Enable	Enable	Enable	Disable	Enable
Long Start Time	Enable	Enable	Enable	N/A	Enable	Enable	Enable	Enable	Enable	Enable	Disable
Input Mapping											
Input 99 Mapping	Contactor 1 Feedback	Contactor 1 Feedback	Contactor 1 Feedback	N/A	Contactor 1 Feedback	Contactor 1 Feedback	MCCB ON Feedback	Contactor 1 Feedback	Contactor 1 Feedback	Contactor 1 Feedback	Contactor 1 Feedback
Input 99 High/low Activation	Active High	Active High	Active High	N/A	Active High	Active High	Active High	Active High	Active High	Active High	Active High
Input 98 Mapping	External Supervision	Contactor 2 Feedback	Contactor 2 Feedback	N/A	Main Circuit Feedback	Contactor 2 Feedback	Breaker Ready to Switch ON	Contactor 2 Feedback	Contactor 2 Feedback	Contactor 2 Feedback	Main Circuit Feedback
Input 98 High/Low activation	Active Low	Active High	Active High	N/A	Active Low	Active High	Active High	Active High	Active High	Active High	Active Low

	Motor Starter Standard Configuration										
	EntelliPro ES3										
	Full-voltage non-reversing	Full-voltage reversing	Star-delta non-reversing	Star-delta reversing	Softstarter	Softstarter reversing	Breaker	Dahlander	Pole-changer	Actuator	Solenoid valve
Input 97 Mapping	Control Circuit Feedback	Control Circuit Feedback	Contactor 3 Feedback	N/A	Bypass Feedback	Bypass Feedback	Breaker Charged	Contactor 3 Feedback	Control Circuit Feedback	Limit Open Feedback	Limit Open Feedback
Input 97 High/low Activation	Active Low	Active Low	Active High	N/A	Active High	Active High	Active High	Active High	Active Low	Active Low	Active Low
Input 96 Mapping	Main Circuit Feedback	Main Circuit Feedback	Main Circuit feedback	N/A	Up to Speed Feedback	Up to Speed Feedback	Main Circuit Feedback	Main Circuit Feedback	Main Circuit Feedback	Limit Close Feedback	Limit Close Feedback
Input 96 High/low Activation	Active Low	Active Low	Active Low	N/A	Active High	Active High	Active Low	Active Low	Active Low	Active Low	Active Low
Input 95 Mapping	Emergency Stop	Emergency Stop	Emergency Stop	N/A	Emergency Stop	Emergency Stop	Breaker Tripped 2	Emergency Stop	Emergency Stop	Emergency Stop	Emergency Stop
Input 95 High/low Activation	Active Low	Active Low	Active Low	N/A	Active Low	Active Low	Active Low	Active Low	Active Low	Active Low	Active Low
Input 94 Mapping	External Supervision	External Supervision	External Supervision	N/A	Starter Fault Feedback	Starter Fault Feedback	Tripped	External Supervision	External Supervision	External Supervision	External Supervision
Input 94 High/low Activation	Active High	Active High	Active High	N/A	Active Low	Active Low	Active Low	Active High	Active High	Active Low	Active High
Input 93 Mapping	Safety Circuit	Safety Circuit	Safety Circuit	N/A	Safety Circuit	Safety Circuit	Safety Circuit	Safety Circuit	Safety Circuit	Safety Circuit	Safety Circuit
Input 93 High/low Activation	Active Low	Active Low	Active Low	N/A	Active Low	Active Low	Active Low	Active Low	Active Low	Active Low	Active Low
Relay Output Mapping											
First Function Relay 42 Mapping	Contactor 1	Contactor 1	Contactor 1	N/A	Contactor 1	Contactor 1	MCCB on	Contactor 1	Contactor 1	Contactor 1	Contactor 1
Second Function Relay 42 Mapping	None	None	None	N/A	None	None	None	None	None	None	None
First Function Relay 43 Mapping	ON 1 Feedback	Contactor 2	Contactor D	N/A	Bypass	Bypass	MCCB off	Contactor 2	Contactor 2	Contactor 2	ON 1 Feedback
Second Function Relay 43 Mapping	None	None	None	N/A	None	None	None	None	None	None	None
First Function Relay 45 Mapping	Failure	Failure	Contactor Y	N/A	Reset	Left	Reset	Contactor Y	Failure	Failure	Failure
Second Function Relay 45 Mapping	None	None	None	N/A	None	None	None	None	None	None	None
First Function Relay 22 Mapping	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Second Function Relay 22 Mapping	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
First Function Relay 23 Mapping	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Second Function Relay 23 Mapping	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
First Function Relay 24 Mapping	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Second Function Relay 24 Mapping	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
First Function Relay 25 Mapping	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Second Function Relay 25 Mapping	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
First Function Relay 26 Mapping	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Second Function Relay 26 Mapping	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 2-6: EntelliPro ES3 Motor Starter Configuration

	Motor Starter Standard Configuration										
	EntelliPro ES5										
	Full-voltage non-reversing	Full-voltage reversing	Star-delta non-reversing	Star-delta reversing	Softstarter	Softstarter reversing	Breaker	Dahlander	Polechanger	Actuator	Solenoid Valve
Feedback via contact	Activated	Activated	Activated	Activated	Activated	Activated	Activated	Activated	Activated	Activated	Activated
Feedback via current	N/A	Activated	Activated	Activated	Activated	Activated	N/A	Activated	Activated	Activated	N/A
Direct Switch over without OFF command	N/A	Deactivated	N/A	Deactivated	N/A	Deactivated	N/A	Activated	Activated	Deactivated	N/A
Current depending YD Switch Over	N/A	N/A	Activated	Activated	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Soft Stop Timer	N/A	N/A	N/A	N/A	Deactivated	Deactivated	N/A	N/A	N/A	N/A	N/A
Bypass Control	N/A	N/A	N/A	N/A	Activated	Activated	N/A	N/A	N/A	N/A	N/A
External Soft Starter Fault	N/A	N/A	N/A	N/A	Activated	Activated	N/A	N/A	N/A	N/A	N/A
MCCB Tripped 2 Configuration (Alarm or No-Alarm)	N/A	N/A	N/A	N/A	N/A	N/A	No alarm	N/A	N/A	N/A	N/A
Breaker Trip Reset from EntelliPro ES	N/A	N/A	N/A	N/A	N/A	N/A	Activated	N/A	N/A	N/A	N/A
MCCB Feedback	N/A	N/A	N/A	N/A	N/A	N/A	Activated	N/A	N/A	N/A	N/A
Torque Switch	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Enable	N/A
Switch OFF at Limit Switch	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Activated	N/A
Switch OFF at Current Threshold	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Deactivated	N/A
Switch OFF at Torque Switch	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Deactivated	N/A
Enable Modbus RTU Control	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Enable Profibus DP Class 2 Control	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Enable Hardwired Control	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable
bit 1 - Class1 n bit 0r (n+1) bit	n bit	n bit	n bit	n bit	n bit	n bit	n bit	n bit	n bit	n bit	n bit
bit 2 - Level/Edge	Level	Level	Level	Level	Level	Level	Level	Level	Level	Level	Level
bit 3 - Inverted OFF / Non-Inverted OFF	Non	Non	Non	Non	Non	Non	Non	Non	Non	Non	Non
bit 1 - Hardwire n bit 0r (n+1) bit	(n+1) bit	(n+1) bit	(n+1) bit	(n+1) bit	(n+1) bit	(n+1) bit	(n+1) bit	(n+1) bit	(n+1) bit	(n+1) bit	(n+1) bit
bit 2 - Hardwire Level/Edge	Edge	Edge	Edge	Edge	Edge	Edge	Edge	Edge	Edge	Edge	Edge
Thermistor Line Broken/Shorted Supervision.	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Drawer Position Supervision	Activated	Activated	Activated	Deactivated	Activated	Deactivated	Deactivated	Activated	Activated	Deactivated	Activated
Drawer Position 1 bit Modus / 2 bit Modbus	2 bit	2 bit	2 bit	N/A	2 bit	N/A	N/A	2 bit	2 bit	N/A	2 bit
Modbus Failure Detection	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable
ATEX Activated ⟨Ex⟩	Activated	Activated	Activated	Activated	Activated	Activated	Activated	Activated	Activated	Activated	Activated
bit 5 - Remote OFF always valid	Deactivated	Deactivated	Deactivated	Deactivated	Deactivated	Deactivated	Deactivated	Deactivated	Deactivated	Deactivated	Deactivated
bit 6 - Block Local Switch ON	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Alarm Setting											
Overload	Enable	Enable	Enable	Enable	Enable	Enable	Disable	Enable	Enable	Enable	Enable
Phase Loss	Enable	Enable	Enable	Enable	Enable	Enable	Disable	Enable	Enable	Enable	Disable
Ground Fault	Enable	Enable	Enable	Enable	Enable	Enable	Disable	Enable	Enable	Enable	Disable
Unbalance Load	Enable	Enable	Enable	Enable	Enable	Enable	Disable	Enable	Enable	Enable	Disable
Thermsitor	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Emergency Stop	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Limit Switch	Disable	Disable	Disable	Disable	Disable	Disable	Disable	Disable	Disable	Enable	Enable
Safety Circuit	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Main Circuit	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Control Circuit	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Switch Position	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Underload Current	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Overload Current	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable
External Supervisory	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable	Enable
Long Start Time	Enable	Enable	Enable	Enable	Enable	Enable	Disable	Enable	Enable	Enable	Disable
Input Mapping											
Input 99 Mapping	Contactor 1 Feedback	Contactor 1 Feedback	Contactor 1 Feedback	Contactor 1 Feedback	Contactor 1 Feedback	Contactor 1 Feedback	MCCB ON Feedback	Contactor 1 Feedback	Contactor 1 Feedback	Contactor 1 Feedback	Contactor 1 Feedback
Input 99 High/low Activation	Active High	Active High	Active High	Active High	Active High	Active High	Active High	Active High	Active High	Active High	Active High
Input 98 Mapping	not used	Y Contactor Feedback	Contactor 2 Feedback	Contactor 2 Feedback	Bypass Feedback	Contactor 2 Feedback	Breaker Ready to Switch ON	Contactor 2 Feedback	Contactor 2 Feedback	Contactor 2 Feedback	Drawer position Test
Input 98 High/Low activation	N/A	Active High	Active High	Active High	Active High	Active High	Active High	Active High	Active High	Active High	Active High

	Motor Starter Standard Configuration										
	EntelliPro ES5										
	Full-voltage non-reversing	**Full-voltage reversing**	**Star-delta non-reversing**	**Star-delta reversing**	**Softstarter**	**Softstarter reversing**	**Breaker**	**Dahlander**	**Polechanger**	**Actuator**	**Solenoid Valve**
Input 97 Mapping	Reset Alarm	Reset Alarm	Delta Contactor Feedback	Y Contactor Feedback	Reset Alarm	Bypass Contactor Feedback	Breaker Charged	Contactor Y Feedback	Reset Alarm	External Supervision	Drawer Position Test
Input 97 High/low Activation	Active High	Active High	Active High	Active High	Active High	Active High	Active High	Active High	Active High	Active High	Active High
Input 96 Mapping	Drawer Position Test	Drawer Position Test	Drawer Position Test	Delta Contactor Feedback	Up to Speed Feedback	Up to Speed Feedback	Tripped	Drawer Position Test	Drawer Position Test	Mode Switch Local	Mode Switch Local
Input 96 High/low Activation	Active High	Active High	Active High	Active High	Active High	Active High	Active Low	Active High	Active High	Active High	Active High
Input 95 Mapping	Drawer Position Operation	Drawer Position Operation	Drawer Position Operation	Reset Alarm	fb starter fault	fb starter fault	Tripped 2	Drawer Position Operation	Drawer Position Operation	Mode Switch Remote	Mode Switch Remote
Input 95 High/low Activation	Active High	Active High	Active High	Active High	Active Low	Active Low	Active Low	Active High	Active High	Active High	Active High
Input 94 Mapping	Main Circuit Feedback	Main Circuit Feedback	Main Circuit Feedback	Main Circuit Feedback	Main Circuit Feedback	Main Circuit Feedback	Main Circuit Feedback	Main Circuit Feedback	Main Circuit Feedback	Main Circuit Feedback	Main Circuit Feedback
Input 94 High/low Activation	Active Low	Active Low	Active Low	Active Low	Active Low	Active Low	Active Low	Active Low	Active Low	Active Low	Active Low
Input 93 Mapping	Control Circuit Feedback	Control Circuit Feedback	Control Circuit Feedback	Control Circuit Feedback	Control Circuit Feedback	Control Circuit Feedback	Control Circuit Feedback	Control Circuit Feedback	Control Circuit Feedback	Control Circuit Feedback	Control Circuit Feedback
Input 93 High/low Activation	Active Low	Active Low	Active Low	Active Low	Active Low	Active Low	Active Low	Active Low	Active Low	Active Low	Active Low
Input 11 Mapping	Cmd OFF	Cmd OFF	Cmd OFF	Cmd OFF	Cmd OFF	Cmd OFF	Cmd OFF	Cmd OFF	Cmd OFF	Cmd OFF	cmd close
Input 11 High/low Activation	Active Low	Active Low	Active Low	Active Low	Active Low	Active Low	Active Low	Active Low	Active Low	Active Low	Active Low
Input 12 Mapping	Cmd ON	Cmd ON Right	Cmd ON	Cmd ON Right	Cmd ON	Cmd ON Right	Cmd ON	Cmd ON slow	Cmd ON slow	Cmd ON Right	cmd open
Input 12 High/low Activation	Active High	Active High	Active High	Active High	Active High	Active High	Active High	Active High	Active High	Active High	Active High
Input 13 Mapping	Not Used	Cmd ON Reverse	Reset Alarm	Cmd ON Left	Drawer position Test	Cmd ON Left	Reset Alarm	Cmd ON fast	Cmd ON fast	Cmd ON Left	Reset Alarm
Input 13 High/low Activation	N/A	Active High	Active High	Active High	Active High	Active High	Active High	Active High	Active High	Active High	Active High
Input 14 Mapping	External Fault 1	External Fault 1	External Fault 1	External Fault 1	External Fault 1	External Fault 1	External Fault 1	External Fault 1	External Fault 1	fb torque open	External Fault 1
Input 14 High/low Activation	Active High	Active High	Active High	Active High	Active High	Active High	Active High	Active High	Active High	Active Low	Active High
Input 15 Mapping	External Supervision	External Supervision	External Supervision	External Supervision	Drawer position Operation	External Supervision	External Supervision	Reset Alarm	External Supervision	fb torque close	External Supervision
Input 15 High/low Activation	Active Low	Active Low	Active Low	Active Low	Active High	Active Low	Active Low	Active High	Active Low	Active Low	Active Low
Input 16 Mapping	Emergency Stop	Emergency Stop	Emergency Stop	Emergency Stop	Emergency Stop	Emergency Stop	Emergency Stop	Emergency Stop	Emergency Stop	Emergency Stop	Emergency Stop
Input 16 High/low Activation	Active Low	Active Low	Active Low	Active Low	Active Low	Active Low	Active Low	Active Low	Active Low	Active Low	Active Low
Input 17 Mapping	Safety Circuit	Safety Circuit	Safety Circuit	Safety Circuit	Safety Circuit	Safety Circuit	Safety Circuit	Safety Circuit	Safety Circuit	Safety Circuit	Safety Circuit
Input 17 High/low Activation	Active Low	Active Low	Active Low	Active Low	Active Low	Active Low	Active Low	Active Low	Active Low	Active Low	Active Low
Input 18 Mapping	Mode Switch Local	Mode Switch Local	Mode Switch Local	Mode Switch Local	Mode Switch Local	Mode Switch Local	Mode Switch Local	Mode Switch Local	Mode Switch Local	Limit Open Feedback	Limit Open Feedback
Input 18 High/low Activation	Active High	Active High	Active High	Active High	Active High	Active High	Active High	Active High	Active High	Active Low	Active Low
Input 19 Mapping	Mode Switch Remote	Mode Switch Remote	Mode Switch Remote	Mode Switch Remote	Mode Switch Remote	Mode Switch Remote	Mode Switch Remote	Mode Switch Remote	Mode Switch Remote	Limit Close Feedback	Limit Close Feedback
Input 19 High/low Activation	Active High	Active High	Active High	Active High	Active High	Active High	Active High	Active High	Active High	Active Low	Active Low
Relay Output Mapping											
First Function Relay 42 Mapping	Contactor 1	Contactor 1	Contactor 1	Contactor 1	Contactor 1	Contactor 1	MCCB on	Contactor 1	Contactor 1	Contactor 1	Contactor 1
Second Function Relay 42 Mapping	None	None	None	None	None	None	None	None	None	None	None
First Function Relay 43 Mapping	ATEX Redundancy Output	Contactor 2	Contactor D	Contactor D	Bypass	Bypass	MCCB off	Contactor 2	Contactor 2	Contactor 2	Ready for Switch on
Second Function Relay 43 Mapping	None	None	None	None	None	None	None	None	None	None	None
First Function Relay 45 Mapping	Warning	ATEX Redundancy Output	Contactor Y	Contactor 2	ATEX Redundancy Output	Left	Reset	Contactor Y	ATEX Redundancy Output	ATEX Redundancy Output	Warning
Second Function Relay 45 Mapping	Failure (Output Flashing)	None	None	None	None	None	None	None	None	None	Failure (Output Flashing)
First Function Relay 22 Mapping	Local	Local	ATEX Redundancy Output	ATEX Redundancy Output	Local	ATEX Redundancy Output	Local	ATEX Redundancy Output	Local	Local	Local
Second Function Relay 22 Mapping	None	None	None	None	None	None	None	None	None	None	None

	Motor Starter Standard Configuration										
	EntelliPro ES5										
	Full-voltage non-reversing	Full-voltage reversing	Star-delta non-reversing	Star-delta reversing	Softstarter	Softstarter reversing	Breaker	Dahlander	Polechanger	Actuator	Solenoid Valve
First Function Relay 23 Mapping	ON 1 Feedback	ON 1 Feedback	ON 1 Feedback	Contactor Y	start	start	ON 1 Feedback	ON 1 Feedback	ON 1 Feedback	Limit Switch Right Feedback	ON 1 Feedback
Second Function Relay 23 Mapping	None	None	None	None	None	None	None	None	None	Run Right Flashing	None
First Function Relay 24 Mapping	Warning	ON 2 Feedback	Local	Local	Reset	Reset	Warning	ON 2 Feedback	ON 2 Feedback	Limit Switch Left Feedback	Warning
Second Function Relay 24 Mapping	None	None	None	None	None	None	None	None	None	Run Left Flashing	None
First Function Relay 25 Mapping	Ready to Switch ON	Ready to Switch ON	Ready to Switch ON	Ready to Switch ON	Ready to Switch ON	Ready to Switch ON)	Ready to Switch ON	Ready to Switch ON	Ready to Switch ON	Ready to Switch ON	Ready to Switch ON
Second Function Relay 25 Mapping	Ident Flashing	Ident Flashing	Ident Flashing	Ident Flashing	Ident Flashing	Ident Flashing	Ident Flashing	Ident Flashing	Ident Flashing	Ident Flashing	Ident Flashing
First Function Relay 26 Mapping	Failure	Failure	Failure	Failure	Failure	Failure (	Failure	Failure	Failure	Failure	Failure
Second Function Relay 26 Mapping	None	None	None	None	None	None	None	None	None	None	None

Table 2-7: EntelliPro ES5 Motor Starter Configuration

GE Industrial Solutions

EPOS Motor Management System
Chapter 3: Motor Protection

The EntelliPro ES provides the following protection functions:

- Thermal overload with n-times auto-reset
- Phase loss
- Phase unbalance
- Ground fault
- Overcurrent and stalled rotor protection
- Undercurrent
- Thermistor

3.1 Thermal Overload

Thermal overload is the primary protective function of the EntelliPro ES. The heating and cooling thermal model function reflects the stator and rotor heating and cooling from overload, phase loss, and unbalance conditions.

The motor heating rate is gauged by measuring the average current of the phases. The accumulated motor heating value is calculated continuously. When the motor is in overload state, the motor temperature and the accumulated motor heating value will rise. A trip occurs when the accumulated motor heating value reaches 100%.

When the motor is stopped and is cooling to an ambient temperature, the accumulated motor heating value decays to zero according to the selected cooling settings.

The thermal model consists of five key elements:

- Unbalance current biasing that accounts for negative-sequence heating.
- Hot/cold biasing that accounts for normal temperature rise.
- Overload curves in compliance with IEC 60947-4-1.
- Cooling rate that accounts for heat dissipation.
- Thermal protection n-times reset.

Each of these categories is described in the following sections.

NOTE

NOTE: If the EntelliPro ES is configured as an ATEX device, the thermal overload protection is enabled and set to generate a fault. It cannot be modified to generate a warning.

3.1.1 Unbalance and phase-loss biasing

Unbalanced phase currents (that is, negative-sequence currents) cause rotor heating in addition to the normal heating caused by positive-sequence currents. When the motor is running, the rotor rotates in the direction of the positive-sequence MMF wave at near synchronous speed. The induced rotor currents are at a frequency determined by the difference between synchronous speed and rotor speed, typically 2 to 4 Hz. At these low frequencies, the current flows equally in all parts of the rotor bars, right down to the inside portion of the bars at the bottom of the slots. On the other hand, negative-sequence stator current causes an MMF wave with a rotation opposite to rotor rotation, which induces a rotor current with a frequency approximately two times the line frequency (100 Hz for a 50 Hz system or 120 Hz for a 60 Hz system). The skin effect at this frequency restricts the rotor current to the outside portion of the bars at the top of the slots, causing a significant increase in rotor resistance and therefore, significant additional rotor heating. This extra heating is not accounted for in the thermal limit curves supplied by the motor manufacturer. These curves assume only positive-sequence currents from a perfectly balanced supply and balanced motor construction.

To account for this additional heating, the EntelliPro ES allows the thermal model to be biased with negative-sequence current. This biasing is accomplished by multiplying the average current by 1.43 in case of phase unbalance and 1.85 in case of phase loss.

3.1.2 Hot/cold biasing

When the motor is running with a constant load below the overload level, the motor will eventually reach a steady-state temperature that corresponds to a particular steady-state thermal capacity. As thermal capacity is used, the thermal capacity left in the motor to cover transient overloads is less than what is available when the motor is cold. The safe stall time (also known as locked-rotor time) is the time taken, with the rotor not turning, for the motor to heat to a temperature beyond which motor damage occurs at an unacceptable rate. The term cold refers to the state when the motor is at an ambient temperature, while hot refers to the state when the motor at the temperature reached when running at the rated load. The method that the thermal model uses to account for the pre-overload state is thus known as hot/cold biasing.

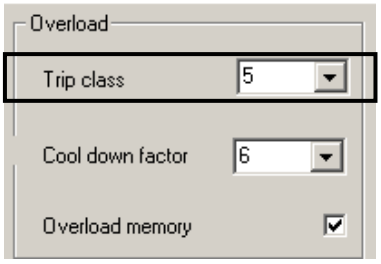
At power down, the thermal overload accumulator value, which defines the heating state of the motor, and the real time clock time stamp, are stored in on-board EEPROM. On the subsequent application of power, the accumulator value will be read and restored in the overload protection. The overload protection will use this value provided.

If a new time stamp is supplied by a Modbus or Profibus DP master, the time difference between the power down and power up events is calculated and a new accumulator value is generated.

3.1.3 Overload curve

The overload curve accounts for the rapid motor heating that occurs during stall, acceleration, and overload. Specifically, the overload curve controls the rate of increase of the accumulated motor heating value whenever the equivalent average motor heating current is greater than 1.12 times the full-load current setpoint.

EntelliPro ES supports eight overload curves, class 5, 10, 15, 20, 25, 30, 35, and 40, that are in compliance with IEC 60947-4-1. Each class corresponds to a maximum trip time allowed when the applied primary current is 7.2 times the EntelliPro ES IN setting. The trip-time accuracy is ±10% for up to 8 times the motor load and ±20% from 8 to 10 times the motor load.
The overload curve can be set in the WinESG parameterization/device settings panel shown in the illustration below, or Modbus function code 6 register 12.

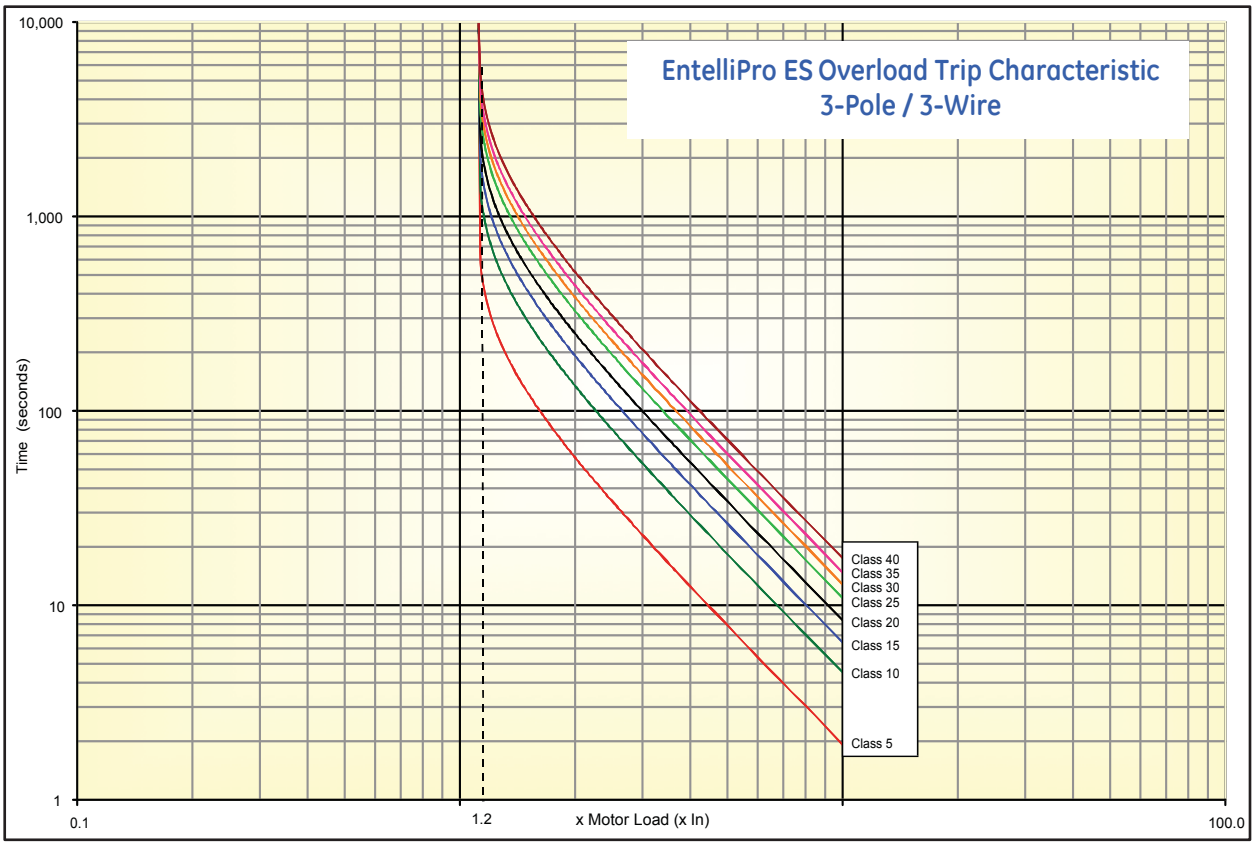


Figures 3-1 and 3-2, and Tables 3-1 and 3-2 show the trip-time curves for classes 5, 10, 15, 20, 25, 30, 35, and 40 under normal and phase loss conditions.

NOTE

NOTE: If a phase unbalance and/or phase loss is recognized, the EntelliPro ES speeds up the thermal model.

The primary average current is multiplied by 1.43 its original value in a phase-unbalance state and by 1.85 its original value in a phase-loss state.

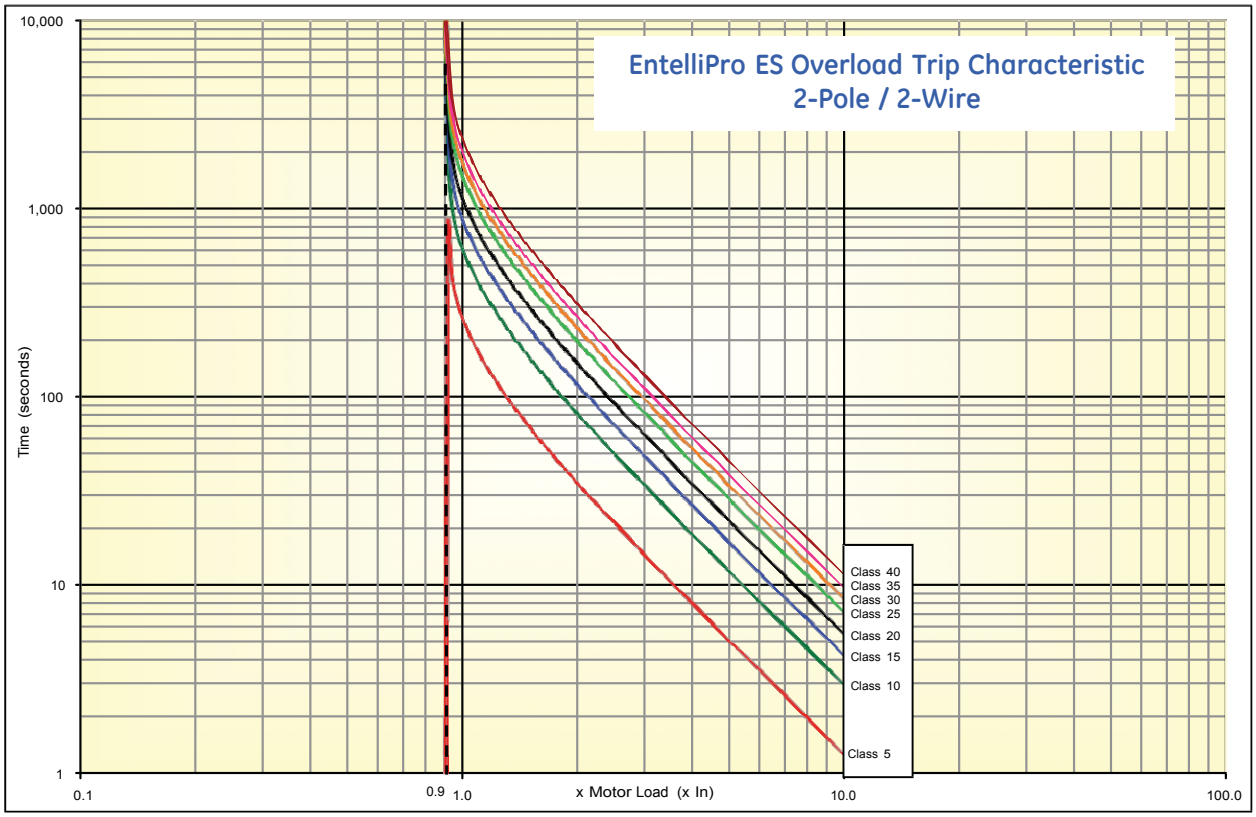


Current [x I_N]	Class E5 [sec]	Class E10 [sec]	Class E15 [sec]	Class E20 [sec]	Class E25 [sec]	Class E30 [sec]	Class E35 [sec]	Class E40 [sec]	Tolerance [%]
1.2	314.70	734.29	1048.99	1363.68	1783.28	2097.98	2412.67	2832.27	10
1.4	156.93	366.16	523.09	680.01	889.25	1046.17	1203.10	1412.33	10
1.6	103.43	241.33	344.75	448.18	586.08	689.50	792.93	930.83	10
1.8	75.21	175.49	250.70	325.91	426.19	501.40	576.61	676.90	10
2	57.80	134.86	192.66	250.46	327.53	385.33	443.12	520.19	10
2.5	34.41	80.29	114.70	149.11	194.99	229.40	263.81	309.69	10
3	23.26	54.10	77.85	101.91	133.65	155.70	178.76	209.50	10
3.5	16.79	39.02	56.31	73.91	97.03	112.62	129.22	151.34	10
4	12.74	29.56	42.80	56.34	74.06	85.60	98.14	114.86	10
4.5	10.02	23.22	33.74	44.56	58.66	67.48	77.30	90.40	10
5	8.11	18.75	27.36	36.26	47.81	54.71	62.62	73.16	10
5.5	6.71	15.48	22.68	30.19	39.86	45.37	51.87	60.55	10
6	5.65	13.01	19.10	24.31	31.97	37.52	43.16	50.43	10
6.5	4.83	11.10	16.43	20.76	27.33	32.06	36.89	43.06	10
7	4.18	9.59	13.40	17.96	23.67	27.76	31.94	37.25	10
7.2	3.90	9.08	12.78	17.00	22.42	26.28	30.25	35.26	10
8	3.20	7.39	10.40	13.88	18.33	21.47	24.71	28.76	20
9	2.60	5.89	8.40	11.09	14.68	17.18	18.90	22.98	20
10	2.30	5.20	7.40	9.10	12.19	14.13	16.27	18.85	20

Figure 3-1: EntelliPro ES trip time curves under normal condition

CAUTION

CAUTION: if protection above 10 times the motor current (I_N) is desired, rated motor current derating may be necessary. Refer to section 1.2.3 for additional information.



Current [x IN]	Class E5 [sec]	Class E10 [sec]	Class E15 [sec]	Class E20 [sec]	Class E25 [sec]	Class E30 [sec]	Class E35 [sec]	Class E40 [sec]	Tolerance [%]
1	267.42	623.99	891.41	1158.83	1515.39	1782.81	2050.24	2406.80	10
1.2	130.59	304.72	435.31	565.91	740.03	870.63	1001.22	1175.35	10
1.4	83.87	195.69	279.56	363.43	475.25	559.12	642.98	754.81	10
1.6	59.72	139.35	199.07	258.79	338.42	398.14	457.86	537.48	10
1.8	45.12	105.27	150.39	195.51	255.67	300.78	345.90	406.06	10
2	35.46	82.75	118.21	153.67	200.96	236.42	271.88	319.17	10
2.5	21.73	50.71	72.45	94.18	123.16	144.90	166.63	195.61	10
3	14.76	34.44	49.20	63.97	83.65	98.41	113.17	132.85	10
3.5	10.70	24.98	35.68	46.39	60.66	71.36	82.07	96.34	10
4	8.13	18.97	27.09	35.22	46.06	54.19	62.32	73.15	10
4.5	6.39	14.90	21.29	27.67	36.19	42.57	48.96	57.48	10
5	5.15	12.02	17.17	22.33	29.20	34.35	39.50	46.37	10
5.5	4.25	9.91	14.15	18.40	24.06	28.30	32.55	38.21	10
6	3.56	8.31	11.86	15.42	20.17	23.73	27.29	32.04	10
6.5	3.03	7.06	10.09	13.12	17.16	20.18	23.21	27.25	10
7	2.80	6.30	8.79	11.70	15.47	17.88	20.94	24.36	10
7.2	2.60	6.05	8.42	11.09	14.66	16.92	19.83	23.07	10
8	2.20	4.90	6.80	9.14	12.09	13.78	16.22	19.04	20
9	1.75	3.80	5.66	7.21	9.61	10.98	13.00	15.05	20
10	1.66	3.50	5.30	6.39	7.87	8.98	12.19	14.01	20

Figure 3-2: EntelliPro ES trip time curves under phase loss conditions

CAUTION

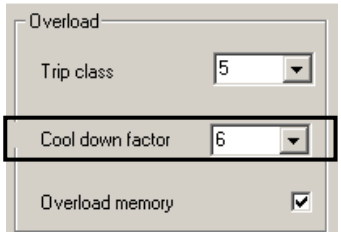
CAUTION: If protection above 10 times the motor current (I_N) is desired, rated motor current derating may be necessary. Refer to section 1.2.3 for additional information.

3.1.4 Cooling rate

The thermal cooling model causes the accumulated motor heating value to decrease exponentially when the steady-state accumulated motor heating value is less than the actual accumulated motor heating value. The cooling time constant (K) is programmable up to 15 times the time constant for the selected trip class. Figure 3-2 through Figure 3-9 show the thermal cooling model following a trip at time equal to 0, using trip class 5 through 40 and a K from 1 to 15.

When the accumulated motor heating value reaches 68%, the motor is considered to be in a cold operating state and the cooling stops.

The cool down factor can be set in the WinESG parameterization/device settings panel shown in the illustration below, or Modbus function code 6 register 12.

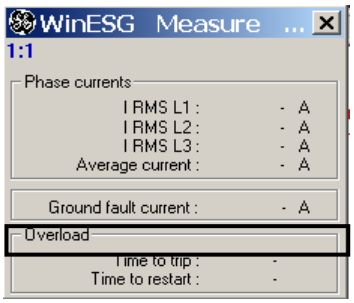


Example:

If the EntelliPro ES unit is set to class 5 and cool down factor to 1, it will take approximately 59 seconds after a trip for the motor to cool. If the cool down factor is set to 15, it will take approximately 889 seconds for the motor to cool and the reset to be allowed.

After an overload trip, the time to restart is available on WinESG measure panel shown in the illustration below, or Modbus function code 4 register 64 or Profibus class 1 telegram B2704.

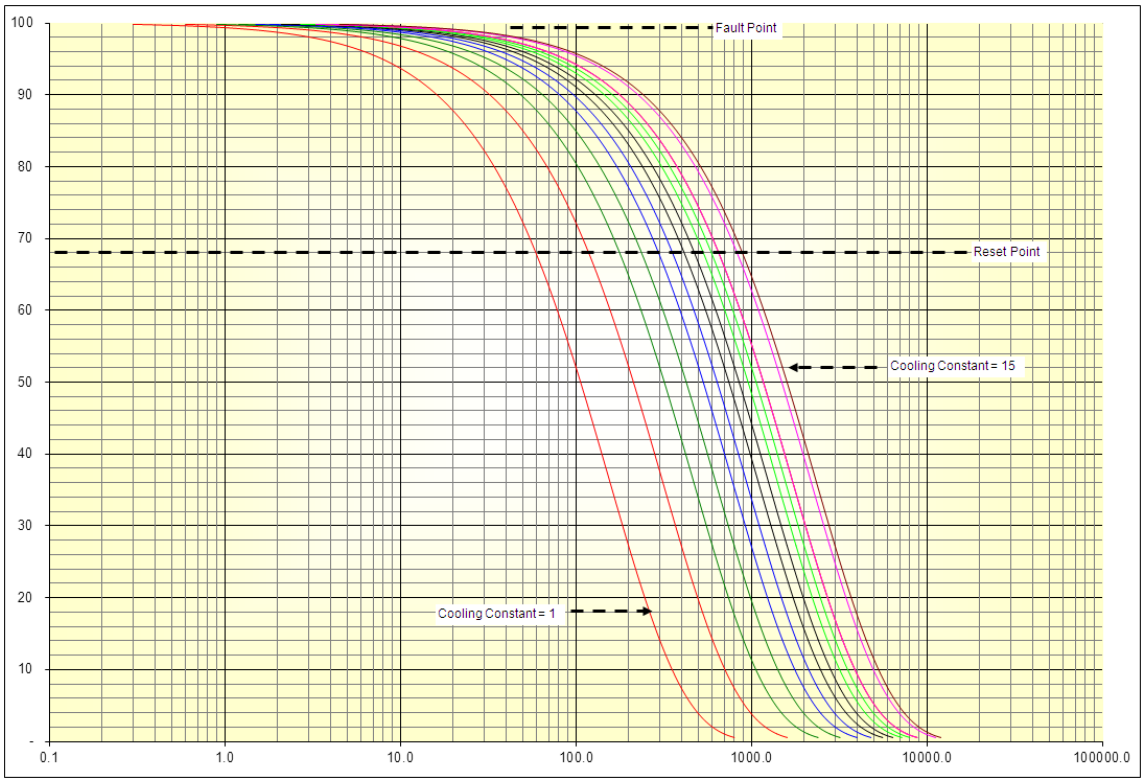
The accuracy is ±10%.



NOTE **NOTE:** Reset is not allowed until the motor is considered in cold state. Before restarting, the motor should be allowed to reach a cold state.

Figures 3-3 to 3-10 show the different cooling curves rate for each IEC trip time class.

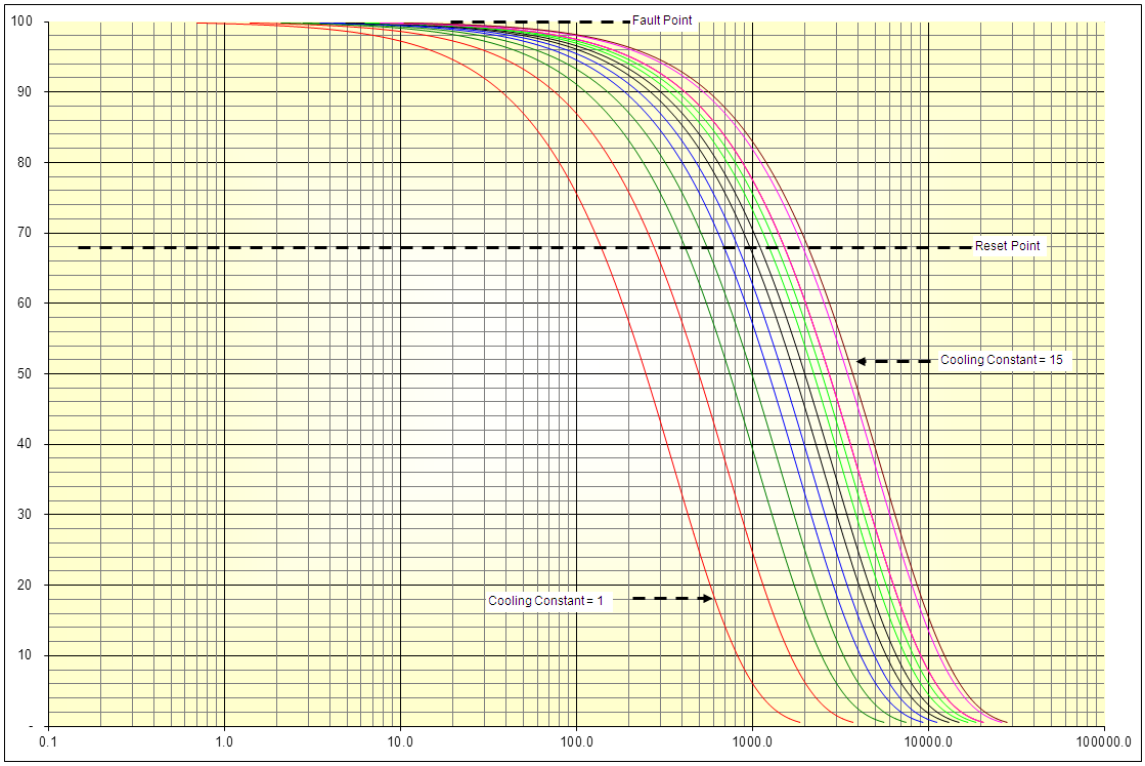
Refer to NEMA Standard MG10 for information regarding the required cool down time between successive starts.



Motor Heating	Class 5 K = 1	Class 5 K = 2	Class 5 K = 3	Class 5 K = 4	Class 5 K = 5	Class 5 K = 6	Class 5 K = 7	Class 5 K = 8	Class 5 K = 9	Class 5 K = 10	Class 5 K = 11	Class 5 K = 12	Class 5 K = 13	Class 5 K = 14	Class 5 K = 15
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90	16.2	32.4	48.6	64.8	81	97.2	113.4	129.6	145.8	162	178.2	178.2	178.2	226.8	243
80	34.2	68.4	102.6	136.8	171	205.2	239.4	273.6	307.8	342	376.2	376.2	376.2	478.8	513
70	54.75	109.5	164.25	219	273.75	328.5	383.25	438	492.75	547.5	602.25	602.25	602.25	766.5	821.25
60	78.45	156.9	235.35	313.8	392.25	470.7	549.15	627.6	706.05	784.5	862.95	862.95	862.95	1098.3	1176.75
50	106.35	212.7	319.05	425.4	531.75	638.1	744.45	850.8	957.15	1063.5	1169.85	1169.85	1169.85	1488.9	1595.25
40	140.7	281.4	422.1	562.8	703.5	844.2	984.9	1125.6	1266.3	1407	1547.7	1547.7	1547.7	1969.8	2110.5
30	184.8	369.6	554.4	739.2	924	1108.8	1293.6	1478.4	1663.2	1848	2032.8	2032.8	2032.8	2587.2	2772
20	247.05	494.1	741.15	988.2	1235.25	1482.3	1729.35	1976.4	2223.45	2470.5	2717.55	2717.55	2717.55	3458.7	3705.75
10	353.4	706.8	1060.2	1413.6	1767	2120.4	2473.8	2827.2	3180.6	3534	3887.4	3887.4	3887.4	4947.6	5301

Figure 3-3: Thermal cooling model when trip curve is set to IEC class5

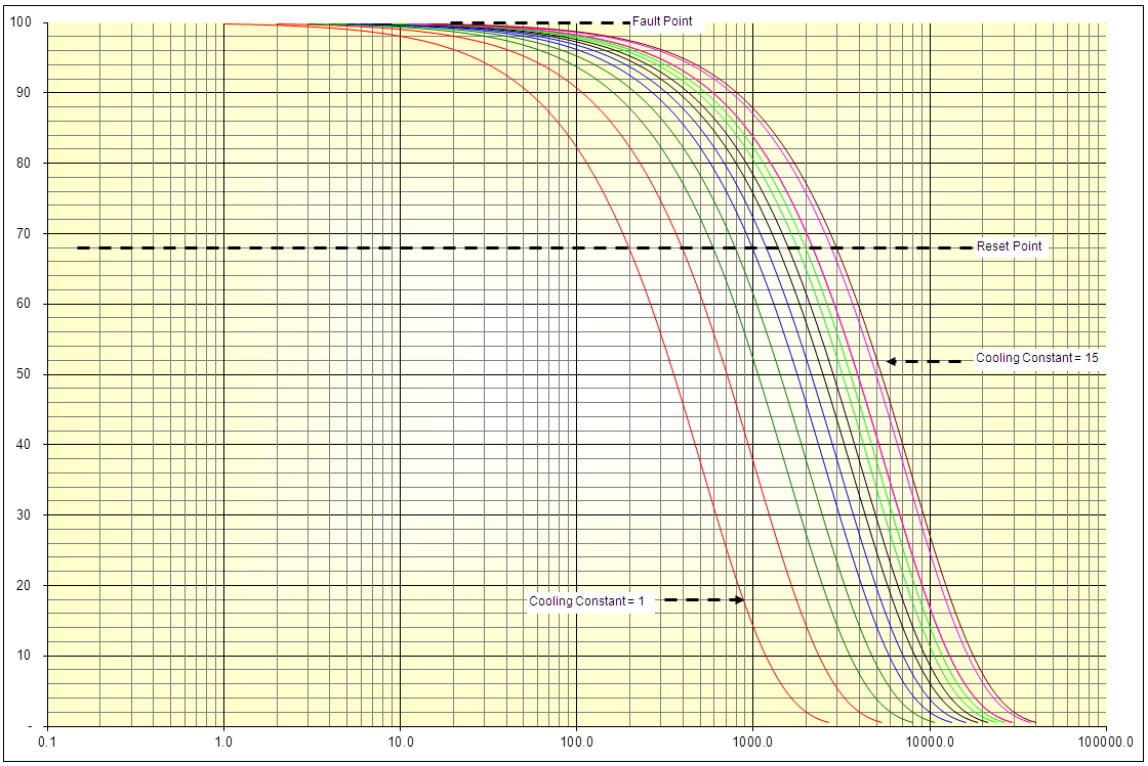
K = Cooling Factor
Units = seconds



Motor Heating	Class 10 K = 1	Class 10 K = 2	Class 10 K = 3	Class 10 K = 4	Class 10 K = 5	Class 10 K = 6	Class 10 K = 7	Class 10 K = 8	Class 10 K = 9	Class 10 K = 10	Class 10 K = 11	Class 10 K = 12	Class 10 K = 13	Class 10 K = 14	Class 10 K = 15
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90	37.8	75.6	113.4	151.2	189	226.8	264.6	302.4	340.2	378	415.8	415.8	415.8	529.2	567
80	79.8	159.6	239.4	319.2	399	478.8	558.6	638.4	718.2	798	877.8	877.8	877.8	1117.2	1197
70	127.75	255.5	383.25	511	638.75	766.5	894.25	1022	1149.75	1277.5	1405.25	1405.25	1405.25	1788.5	1916.25
60	183.05	366.1	549.15	732.2	915.25	1098.3	1281.35	1464.4	1647.45	1830.5	2013.55	2013.55	2013.55	2562.7	2745.75
50	248.15	496.3	744.45	992.6	1240.75	1488.9	1737.05	1985.2	2233.35	2481.5	2729.65	2729.65	2729.65	3474.1	3722.25
40	328.3	656.6	984.9	1313.2	1641.5	1969.8	2298.1	2626.4	2954.7	3283	3611.3	3611.3	3611.3	4596.2	4924.5
30	431.2	862.4	1293.6	1724.8	2156	2587.2	3018.4	3449.6	3880.8	4312	4743.2	4743.2	4743.2	6036.8	6468
20	576.45	1152.9	1729.35	2305.8	2882.25	3458.7	4035.15	4611.6	5188.05	5764.5	6340.95	6340.95	6340.95	8070.3	8646.75
10	824.6	1649.2	2473.8	3298.4	4123	4947.6	5772.2	6596.8	7421.4	8246	9070.6	9070.6	9070.6	11544.4	12369

Figure 3-4: Thermal cooling model when trip curve is set to IEC class 10.

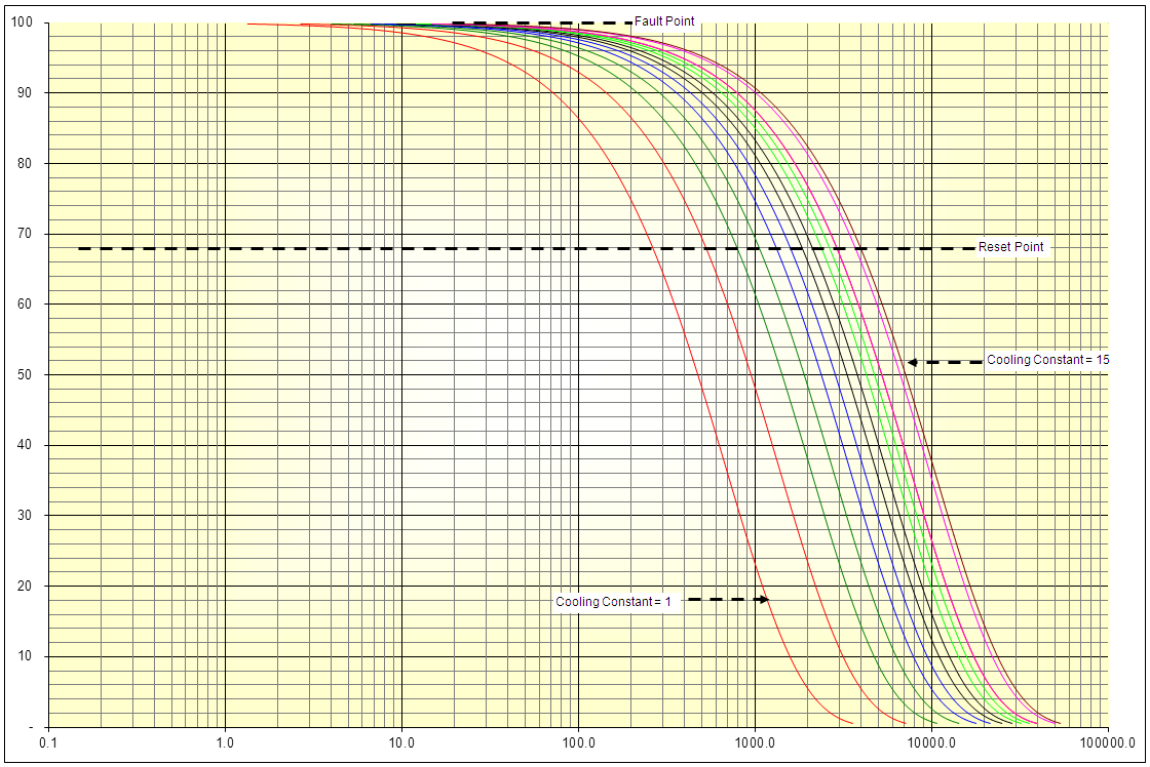
K = Cooling Factor
Units = seconds



Motor Heating	Class 15 K = 1	Class 15 K = 2	Class 15 K = 3	Class 15 K = 4	Class 15 K = 5	Class 15 K = 6	Class 15 K = 7	Class 15 K = 8	Class 15 K = 9	Class 15 K = 10	Class 15 K = 11	Class 15 K = 12	Class 15 K = 13	Class 15 K = 14	Class 15 K = 15
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90	54	108	162	216	270	324	378	432	486	540	594	594	594	756	810
80	114	228	342	456	570	684	798	912	1026	1140	1254	1254	1254	1596	1710
70	182.5	365	547.5	730	912.5	1095	1277.5	1460	1642.5	1825	2007.5	2007.5	2007.5	2555	2737.5
60	261.5	523	784.5	1046	1307.5	1569	1830.5	2092	2353.5	2615	2876.5	2876.5	2876.5	3661	3922.5
50	354.5	709	1063.5	1418	1772.5	2127	2481.5	2836	3190.5	3545	3899.5	3899.5	3899.5	4963	5317.5
40	469	938	1407	1876	2345	2814	3283	3752	4221	4690	5159	5159	5159	6566	7035
30	616	1232	1848	2464	3080	3696	4312	4928	5544	6160	6776	6776	6776	8624	9240
20	823.5	1647	2470.5	3294	4117.5	4941	5764.5	6588	7411.5	8235	9058.5	9058.5	9058.5	11529	12352.5
10	1178	2356	3534	4712	5890	7068	8246	9424	10602	11780	12958	12958	12958	16492	17670

Figure 3-5: Thermal cooling model when trip curve is set to IEC class 15.

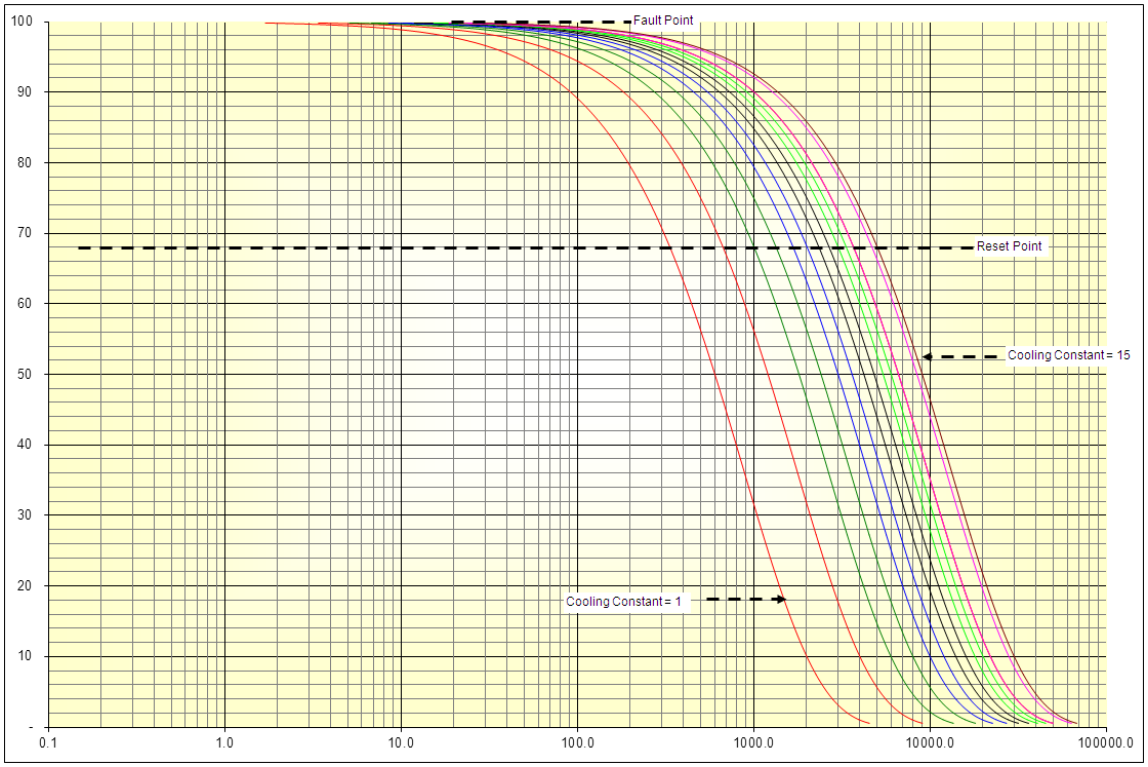
K = Cooling Factor
Units = seconds



Motor Heating	Class 20 K = 1	Class 20 K = 2	Class 20 K = 3	Class 20 K = 4	Class 20 K = 5	Class 20 K = 6	Class 20 K = 7	Class 20 K = 8	Class 20 K = 9	Class 20 K = 10	Class 20 K = 11	Class 20 K = 12	Class 20 K = 13	Class 20 K = 14	Class 20 K = 15
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90	72.36	144.72	217.08	289.44	361.8	434.16	506.52	578.88	651.24	723.6	795.96	795.96	795.96	1013.04	1085.4
80	152.76	305.52	458.28	611.04	763.8	916.56	1069.32	1222.08	1374.84	1527.6	1680.36	1680.36	1680.36	2138.64	22914
70	244.55	489.1	733.65	978.2	1222.75	1467.3	1711.85	1956.4	2200.95	2445.5	2690.05	2690.05	2690.05	3423.7	3668.25
60	350.41	700.82	1051.23	1401.64	1752.05	2102.46	2452.87	2803.28	3153.69	3504.1	3854.51	3854.51	3854.51	4905.74	5256.15
50	475.03	950.06	1425.09	1900.12	2375.15	2850.18	3325.21	3800.24	4275.27	4750.3	5225.33	5225.33	5225.33	6650.42	7125.45
40	628.46	1256.92	1885.38	2513.84	3142.3	3770.76	4399.22	5027.68	5656.14	6284.6	6913.06	6913.06	6913.06	8798.44	9426.9
30	825.44	1650.88	2476.32	3301.76	4127.2	4952.64	5778.08	6603.52	7428.96	8254.4	9079.84	9079.84	9079.84	11556.16	12381.6
20	1103.49	2206.98	3310.47	4413.96	5517.45	6620.94	7724.43	8827.92	9931.41	11034.9	12138.39	12138.39	12138.39	15448.86	16552.35
10	1578.52	3157.04	4735.56	6314.08	7892.6	9471.12	11049.64	12628.16	14206.68	15785.2	17363.72	17363.72	17363.72	22099.28	23677.8

Figure 3-6: Thermal cooling model when trip curve is set to IEC class 20.

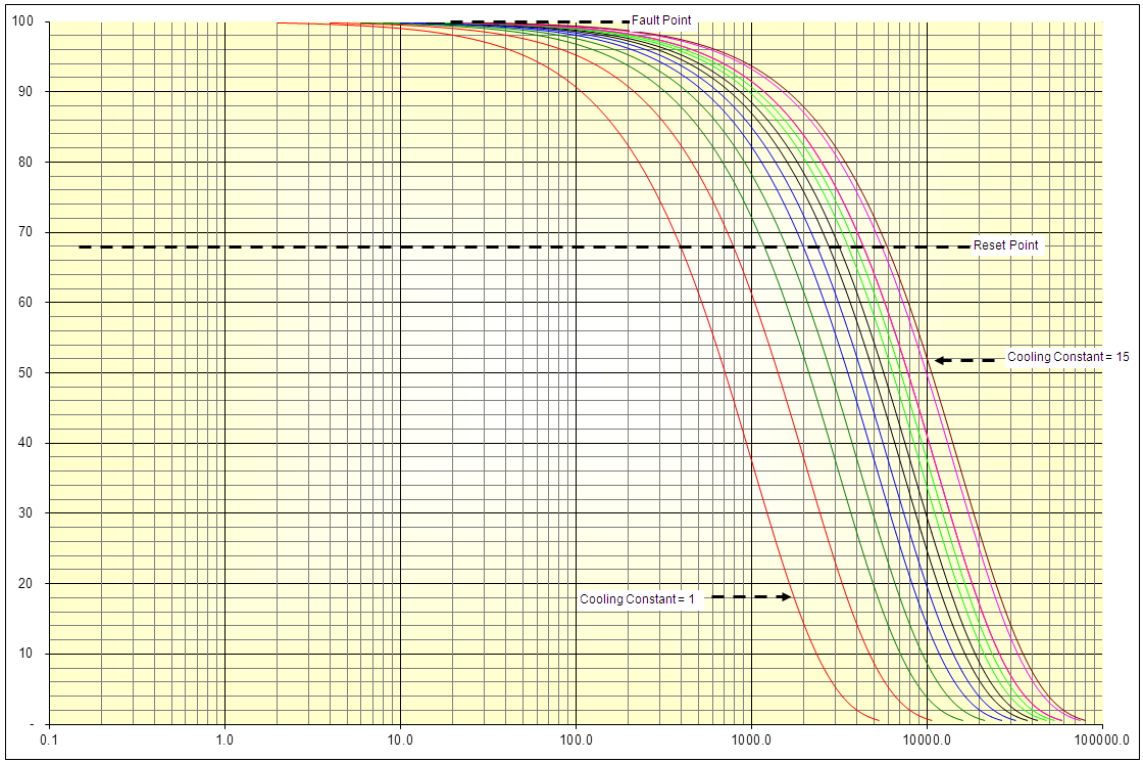
K = Cooling Factor
Units = seconds



Motor Heating	Class 25 K = 1	Class 25 K = 2	Class 25 K = 3	Class 25 K = 4	Class 25 K = 5	Class 25 K = 6	Class 25 K = 7	Class 25 K = 8	Class 25 K = 9	Class 25 K = 10	Class 25 K = 11	Class 25 K = 12	Class 25 K = 13	Class 25 K = 14	Class 25 K = 15
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90	918	183.6	275.4	367.2	459	550.8	642.6	734.4	826.2	918	1009.8	1009.8	1009.8	1285.2	1377
80	193.8	387.6	581.4	775.2	969	1162.8	1356.6	1550.4	1744.2	1938	2131.8	2131.8	2131.8	2713.2	2907
70	310.25	620.5	930.75	1241	1551.25	1861.5	2171.75	2482	2792.25	3102.5	3412.75	3412.75	3412.75	4343.5	4653.75
60	444.55	889.1	1333.65	1778.2	2222.75	2667.3	3111.85	3556.4	4000.95	4445.5	4890.05	4890.05	4890.05	6223.7	6668.25
50	602.65	1205.3	1807.95	2410.6	3013.25	3615.9	4218.55	4821.2	5423.85	6026.5	6629.15	6629.15	6629.15	8437.1	9039.75
40	797.3	1594.6	2391.9	3189.2	3986.5	4783.8	5581.1	6378.4	7175.7	7973	8770.3	8770.3	8770.3	11162.2	11959.5
30	1047.2	2094.4	3141.6	4188.8	5236	6283.2	7330.4	8377.6	9424.8	10472	11519.2	11519.2	11519.2	14660.8	15708
20	1399.95	2799.9	4199.85	5599.8	6999.75	8399.7	9799.65	11199.6	12599.55	13999.5	15399.45	15399.45	15399.45	19599.3	20999.25
10	2002.6	4005.2	6007.8	8010.4	10013	12015.6	14018.2	16020.8	18023.4	20026	22028.6	22028.6	22028.6	28036.4	30039

Figure 3-7: Thermal cooling model when trip curve is set to IEC class 25.

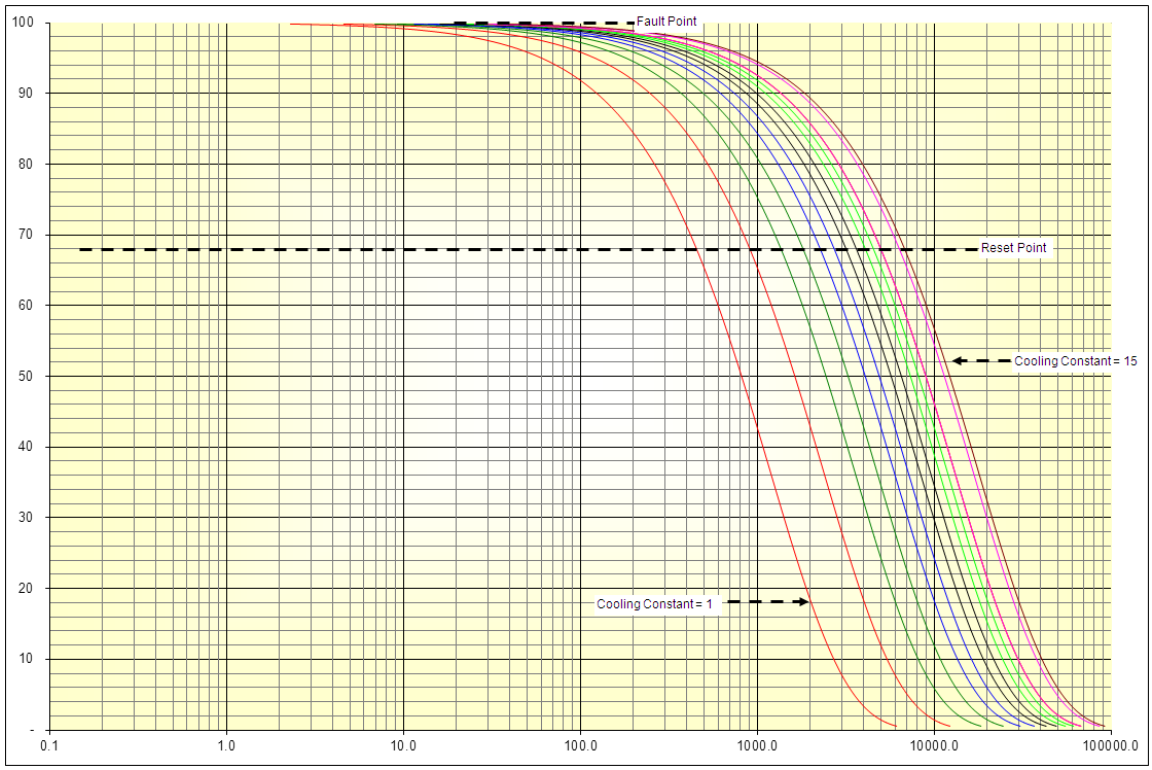
K = Cooling Factor
Units = seconds



Motor Heating	Class 30 K = 1	Class 30 K = 2	Class 30 K = 3	Class 30 K = 4	Class 30 K = 5	Class 30 K = 6	Class 30 K = 7	Class 30 K = 8	Class 30 K = 9	Class 30 K = 10	Class 30 K = 11	Class 30 K = 12	Class 30 K = 13	Class 30 K = 14	Class 30 K = 15
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90	108	216	324	432	540	648	756	864	972	1080	1188	1188	1188	1512	1620
80	228	456	684	912	1140	1368	1596	1824	2052	2280	2508	2508	2508	3192	3420
70	365	730	1095	1460	1825	2190	2555	2920	3285	3650	4015	4015	4015	5110	5475
60	523	1046	1569	2092	2615	3138	3661	4184	4707	5230	5753	5753	5753	7322	7845
50	709	1418	2127	2836	3545	4254	4963	5672	6381	7090	7799	7799	7799	9926	10635
40	938	1876	2814	3752	4690	5628	6566	7504	8442	9380	10318	10318	10318	13132	14070
30	1232	2464	3696	4928	6160	7392	8624	9856	11088	12320	13552	13552	13552	17248	18480
20	1647	3294	4941	6588	8235	9882	11529	13176	14823	16470	18117	18117	18117	23058	24705
10	2356	4712	7068	9424	11780	14136	16492	18848	21204	23560	25916	25916	25916	32984	35340

Figure 3-8: Thermal cooling model when trip curve is set to IEC class 30.

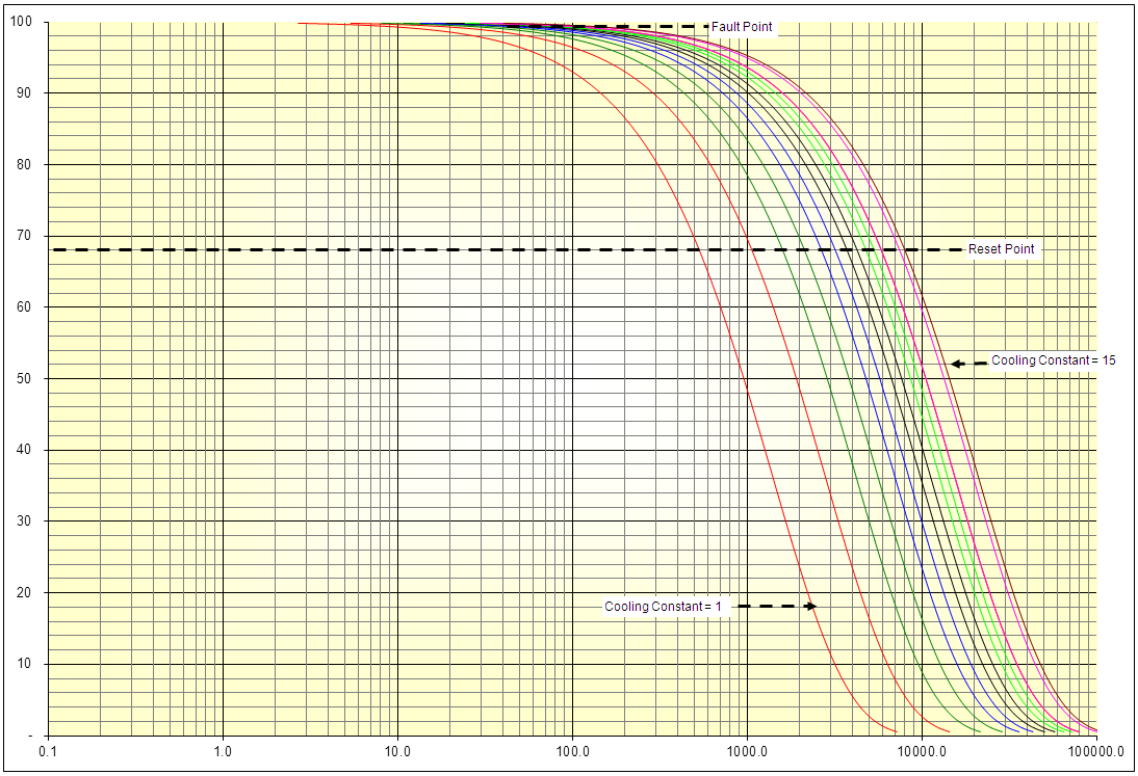
K = Cooling Factor
Units = seconds



Motor Heating	Class 35 K = 1	Class 35 K = 2	Class 35 K = 3	Class 35 K = 4	Class 35 K = 5	Class 35 K = 6	Class 35 K = 7	Class 35 K = 8	Class 35 K = 9	Class 35 K = 10	Class 35 K = 11	Class 35 K = 12	Class 35 K = 13	Class 35 K = 14	Class 35 K = 15
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90	124.2	248.4	372.6	496.8	621	745.2	869.4	993.6	1117.8	1242	1366.2	1366.2	1366.2	1738.8	1863
80	262.2	524.4	786.6	1048.8	1311	1573.2	1835.4	2097.6	2359.8	2622	2884.2	2884.2	2884.2	3670.8	3933
70	419.75	839.5	1259.25	1679	2098.75	2518.5	2938.25	3358	3777.75	4197.5	4617.25	4617.25	4617.25	5876.5	6296.25
60	601.45	1202.9	1804.35	2405.8	3007.25	3608.7	4210.15	4811.6	5413.05	6014.5	6615.95	6615.95	6615.95	8420.3	9021.75
50	815.35	1630.7	2446.05	3261.4	4076.75	4892.1	5707.45	6522.8	7338.15	8153.5	8968.85	8968.85	8968.85	11414.9	12230.25
40	1078.7	2157.4	3236.1	4314.8	5393.5	6472.2	7550.9	8629.6	9708.3	10787	11865.7	11865.7	11865.7	15101.8	16180.5
30	1416.8	2833.6	4250.4	5667.2	7084	8500.8	9917.6	11334.4	12751.2	14168	15584.8	15584.8	15584.8	19835.2	21252
20	1894.05	3788.1	5682.15	7576.2	9470.25	11364.3	13258.35	15152.4	17046.45	18940.5	20834.55	20834.55	20834.55	26516.7	28410.75
10	2709.4	5418.8	8128.2	10837.6	13547	16256.4	18965.8	21675.2	24384.6	27094	29803.4	29803.4	29803.4	37931.6	40641

Figure 3-9: Thermal cooling model when trip curve is set to IEC class 35.

K = Cooling Factor
Units = seconds



Motor Heating	Class 40 K = 1	Class 40 K = 2	Class 40 K = 3	Class 40 K = 4	Class 40 K = 5	Class 40 K = 6	Class 40 K = 7	Class 40 K = 8	Class 40 K = 9	Class 40 K = 10	Class 40 K = 11	Class 40 K = 12	Class 40 K = 13	Class 40 K = 14	Class 40 K = 15
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
90	145.8	291.6	437.4	583.2	729	874.8	1020.6	1166.4	1312.2	1458	1603.8	1603.8	1603.8	2041.2	2187
80	307.8	615.6	923.4	1231.2	1539	1846.8	2154.6	2462.4	2770.2	3078	3385.8	3385.8	3385.8	4309.2	4617
70	492.75	985.5	1478.25	1971	2463.75	2956.5	3449.25	3942	4434.75	4927.5	5420.25	5420.25	5420.25	6898.5	7391.25
60	706.05	1412.1	2118.15	2824.2	3530.25	4236.3	4942.35	5648.4	6354.45	7060.5	7766.55	7766.55	7766.55	9884.7	10590.75
50	957.15	1914.3	2871.45	3828.6	4785.75	5742.9	6700.05	7657.2	8614.35	9571.5	10528.65	10528.65	10528.65	13400.1	14357.25
40	1266.3	2532.6	3798.9	5065.2	6331.5	7597.8	8864.1	10130.4	11396.7	12663	13929.3	13929.3	13929.3	17728.2	18994.5
30	1663.2	3326.4	4989.6	6652.8	8316	9979.2	11642.4	13305.6	14968.8	16632	18295.2	18295.2	18295.2	23284.8	24948
20	2223.45	4446.9	6670.35	8893.8	11117.25	13340.7	15564.15	17787.6	20011.05	22234.5	24457.95	24457.95	24457.95	31128.3	33351.75
10	3180.6	6361.2	9541.8	12722.4	15903	19083.6	22264.2	25444.8	28625.4	31806	34986.6	34986.6	34986.6	44528.4	47709

Figure 3-10: Thermal cooling model when trip curve is set to IEC class 40.

K = Cooling Factor
Units = seconds

3.1.5 Overload protection n-times reset

EntelliPro ES has an n-times automatic reset function, which allows a defined number of automatic reset operations. The reset count will be automatically cleared when one hour elapses from the last overload trip.

The n-times can be set in the WinESG parameterization/alarm panel shown in the illustration below, or Modbus function code 6 register 45.

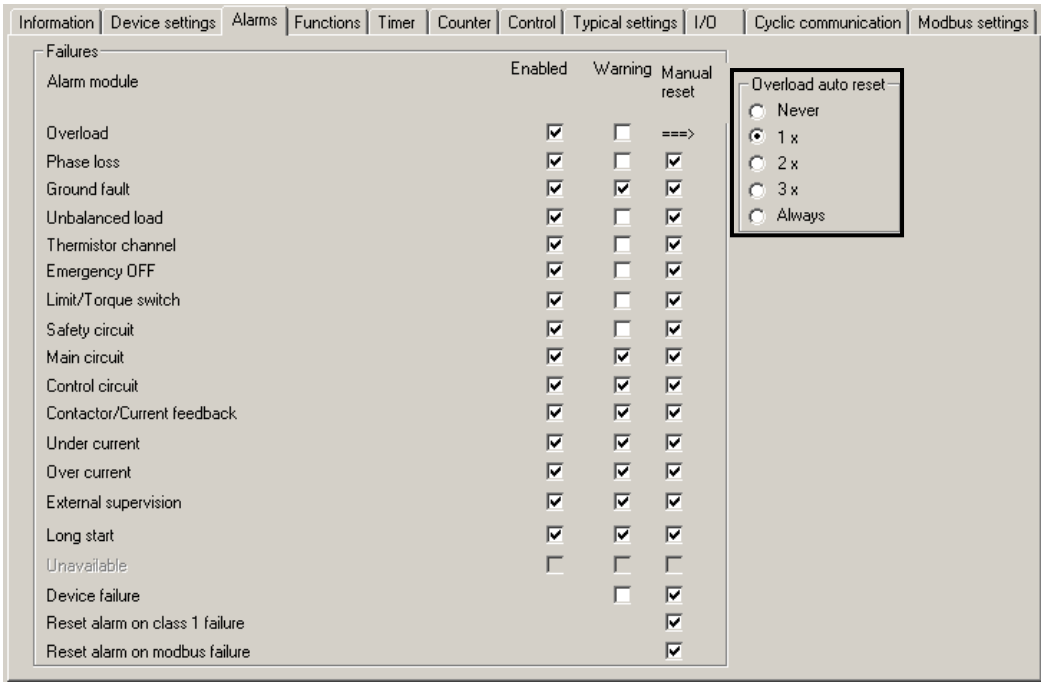


Figure 3-11 shows an example of the auto-reset count operation. In this particular example the auto reset is set to 2.

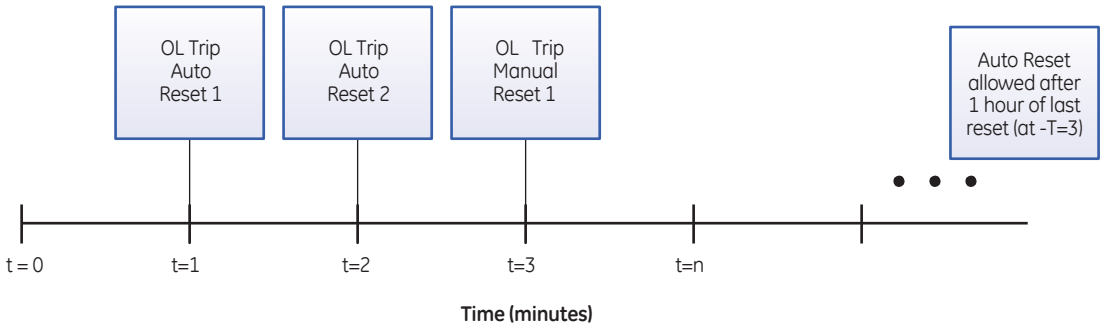


Figure 3-11 EntelliPro Auto-reset operation

For an ATEX configured device, the Auto-Reset parameter can be set to four different values: 0, 1, 2, and 3. For a non-ATEX configured device, the values allowed are from 0 to 65535. However any value greater than 3 indicates that Auto-Reset is always allowed.

When the auto-reset parameter is set to 0, the auto-reset is disabled and a manual reset is required after an overload trip.

When the auto-reset parameter is set to 1, the Auto-Reset is allowed after an overload trip occurred.

NOTE: auto reset will NOT be allowed for 1 hour after the last trip.

When the auto-reset parameter is set to 2, 2 auto-Resets are allowed after an overload trip occurred.

NOTE: auto reset will NOT be allowed for 1 hour after the second trip.

When the auto-reset parameter is set to 3, 3 auto-resets are allowed after an overload trip occurred.

NOTE: auto reset will NOT be allowed for 1 hour after the third trip.

The auto-reset can be set to higher values if ATEX is disabled. For settings above 4, auto-reset is always allowed.

NOTE: If the EntelliPro ES is configured as an ATEX device, the n-times reset cannot be set to “always” auto- reset.

3.1.6 Overload protection programmable settings

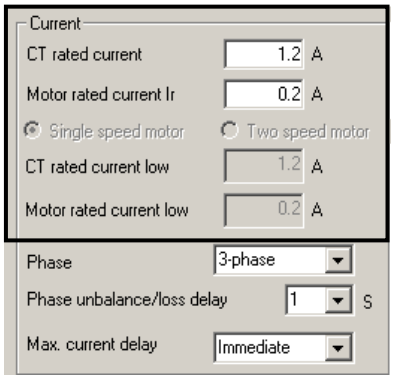
The EntelliPro ES motor trip and alarm overload setpoints may be viewed or changed through Modbus or Profibus DP communication protocols. GE offers a Profibus configuration application (WinESG), for easy set-up.

EntelliPro ES supports the use of two current transformer (CT rated current for single speed motor and CT rated current low for two speed motor) and two motor load (motor rated current and motor rated current low settings for protection.

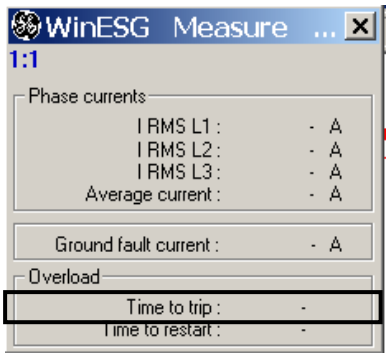
CT rated current low and motor rated current low are mainly used on two-speed motors applications such as Dahlander and pole changer typicals. In this case when command ON1 is issued, the EntelliPro protections are based on CT rated current and motor rated current, and when command ON2 is issued, the EntelliPro protections are based CT rated current low and motor rated current low.

All other overload settings apply to both CTs and motor loads values.

The current transformer and motor load ratings are set in WinESG parameterization/device settings panel shown in the illustration below or Modbus function code 06 registers 92 to 99.



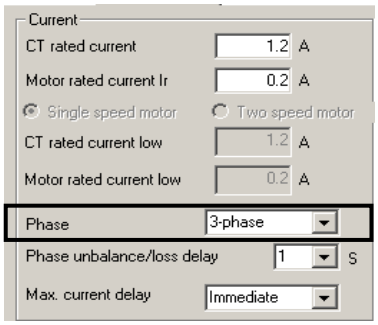
If the average motor current exceeds 120% of the rated motor current, the EntelliPro ES generates a time to trip value, which can be viewed in WinESG measure panel shown in illustration below, or Modbus function code 4 register 63 or Profibus class 1 telegram B2704



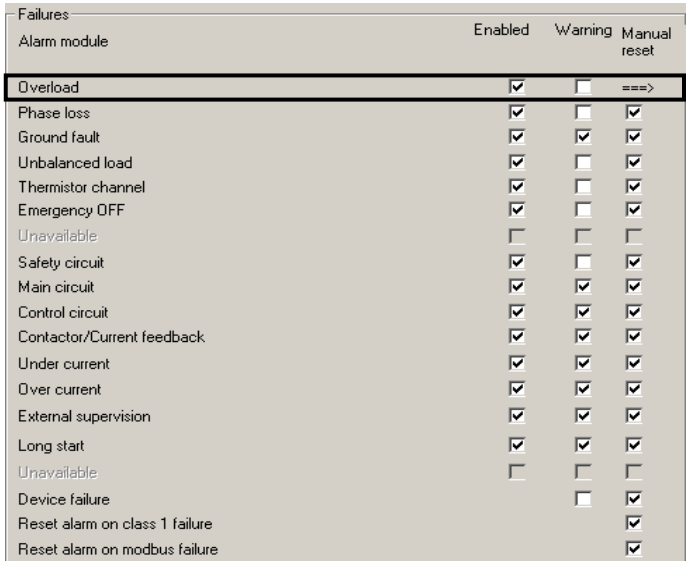
NOTE: When the current sensor is changed the motor load is automatically adjusted to 1/6 of the sensor. The motor load can then be set to any desired value not exceeding the sensor value.

CAUTION

CAUTION: Make sure the proper system phase is selected for the application. If having a three-phase system, 3-phase must be selected in WinESG parameterization/device settings panel shown in the illustration below or Modbus function code 6 register 5.



Thermal overload, as other protections, can be enabled or disabled, set as a warning or failure and requiring an auto or manual reset after a failure, in WinESG parameterization/alarms panel shown in illustration below or Modbus function code 6 registers 114 (enable/disable), 64 (warning/failure), and 63 (auto/manual reset).



NOTE

NOTE: For an ATEX configured device, overload protection cannot be disabled or set to warning

NOTE

NOTE: Before disabling any alarm module, the fault or warning related to this alarm must be reset first.

3.2 Phase loss and current unbalance

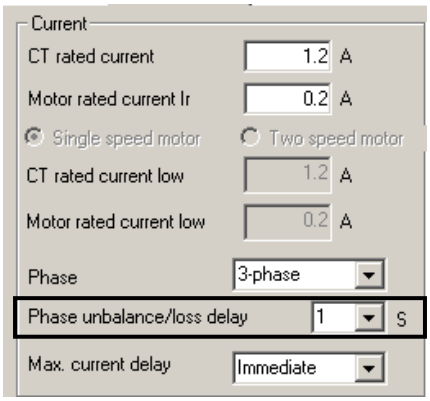
The Current Unbalance is detected whenever the minimum of the three phase currents is less than 70% of the maximum phase current (RMS value).

The Phase Loss is detected whenever the minimum of the three phase currents is less than 40% of the maximum phase current (RMS value).

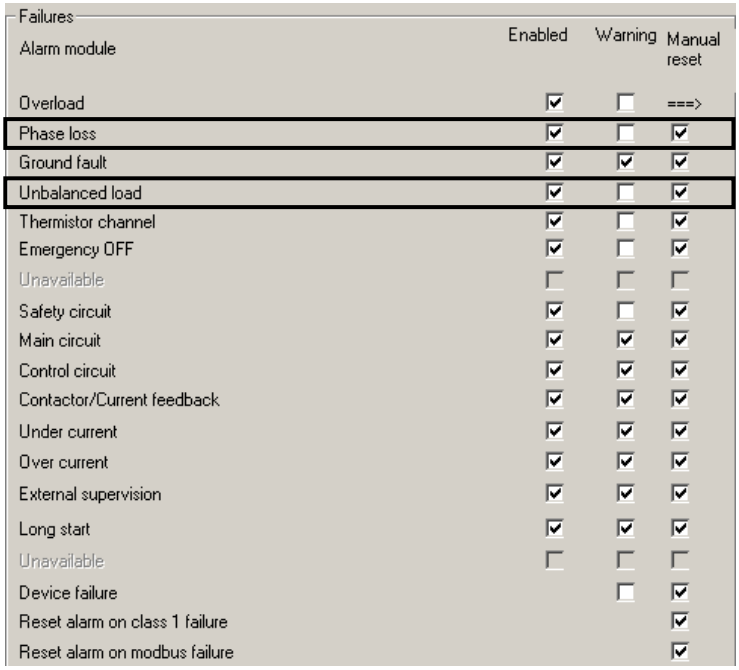
NOTE

NOTE: The phase unbalance and phase loss protections are only available on 3-phase systems. For non-ATEX certification systems, the delay time can be set from 1 to 15 seconds. For ATEX certified units, phase loss and unbalance are enabled, with faults occurring immediately. Phase loss cannot be modified to generate a warning in case of ATEX.

Phase unbalance and phase loss time delay are set in WinESG parameterization/device settings panel shown in the illustration below or Modbus function code 06 register 56.



Phase unbalance and phase loss can be enabled or disabled, set as a warning or failure and requiring an auto or manual reset after a failure, in WinESG parameterization/alarms panel shown in illustration below or Modbus function code 6 registers 114 (enable/disable), 64 (warning/failure), and 63 (auto/manual reset).

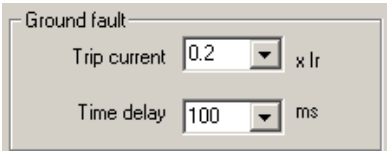


3.3 Ground fault

The ground fault function is designed for grounded networks. The ground fault current is derived by summing the CT's secondary currents.

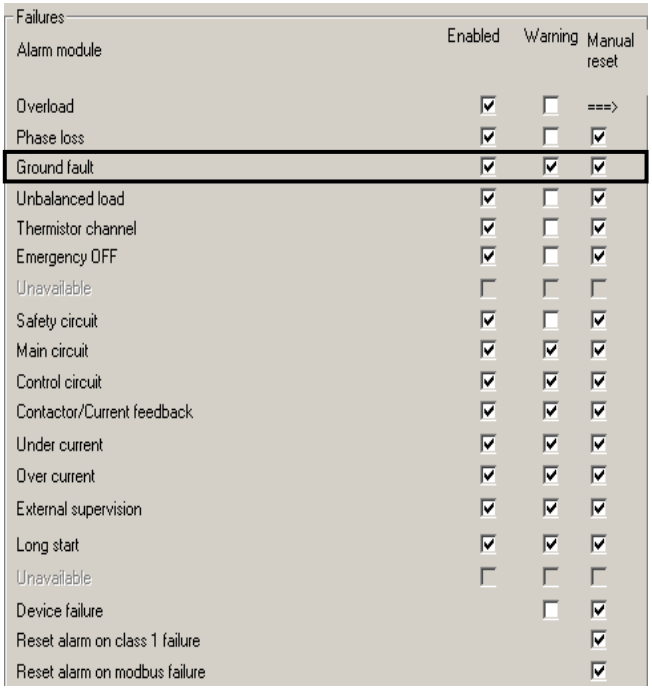
Ground fault is disabled when the average current falls below half of the motor load setting or exceeds 3 times the motor load setting.

Ground fault trip current and delay band are set in WinESG parameterization/device settings panel shown in the illustration below or Modbus function code 06 register 56.



Trip current is set from 0.2 to 1.0 x Ir in 0.1 increments. The time delay is set from 100 to 1000 msec in 100 msec increments.

Ground fault can be enabled or disabled, set as a warning or failure and requiring an auto or manual reset after a failure, in WinESG parameterization/alarms panel shown in illustration below or Modbus function code 6 registers 114 (enable/disable), 64 (warning/failure), and 63 (auto/manual reset).



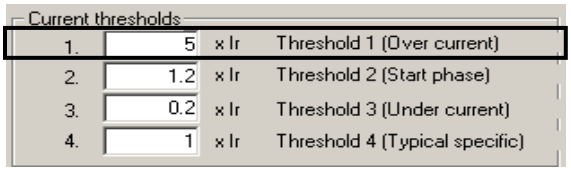
NOTE

NOTE: The polarity of the phase CTs is critical for the negative-sequence unbalance calculation, power measurement, and residual ground current detection (if used). GF is only available on 3-phase system.

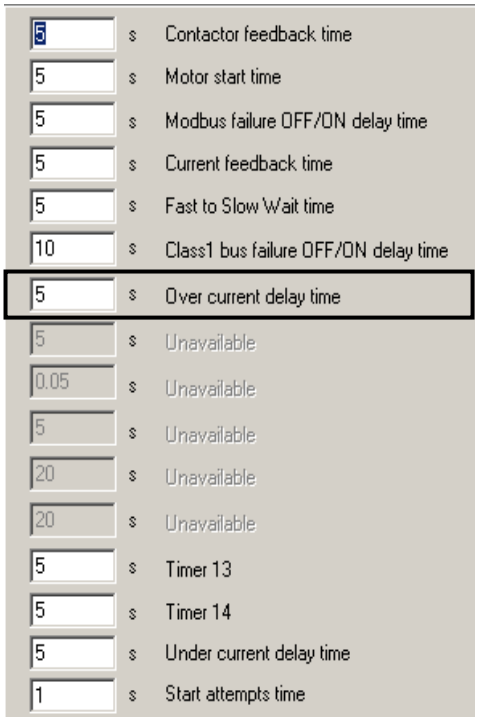
3.4 Over current and stalled rotor protection

This protection scheme addresses the starting inrush current and stalled-rotor current.

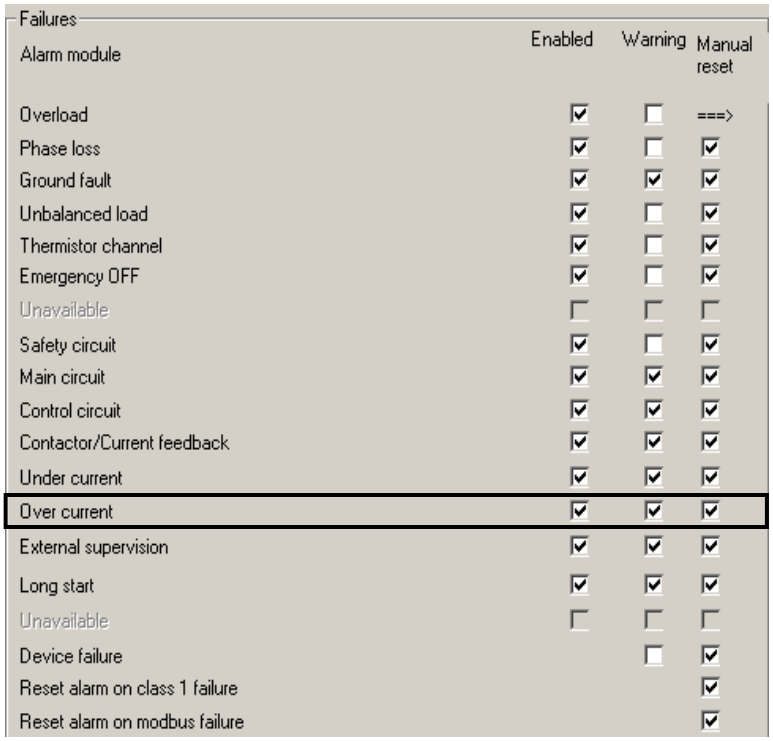
The over current and stalled rotor current threshold is set in WinESG parameterization/device settings panel shown in the illustration below or Modbus function code 06 register 18. The over current is settable from 100 to 800% of motor current (Ir)



If a current exceeds this current threshold for a pre-defined timer set in WinESG parameterization/timer panel shown in the illustration below or Modbus function code 06 register 32 a failure or warning will be generated depending on the alarm setting. The over current time is settable from 0.1 to 6553.5 seconds.



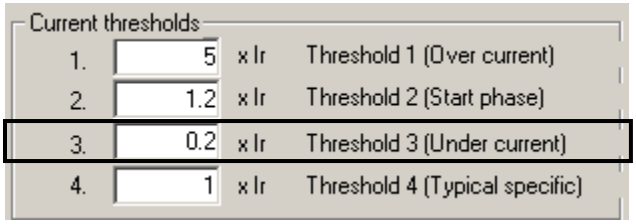
Overcurrent/stalled rotor protection can be enabled or disabled, set as a warning or failure and requiring an auto or manual reset after a failure, in WinESG parameterization/alarms panel shown in illustration below or Modbus function code 6 registers 114 (enable/disable), 64 (warning/failure), and 63 (auto/manual reset).



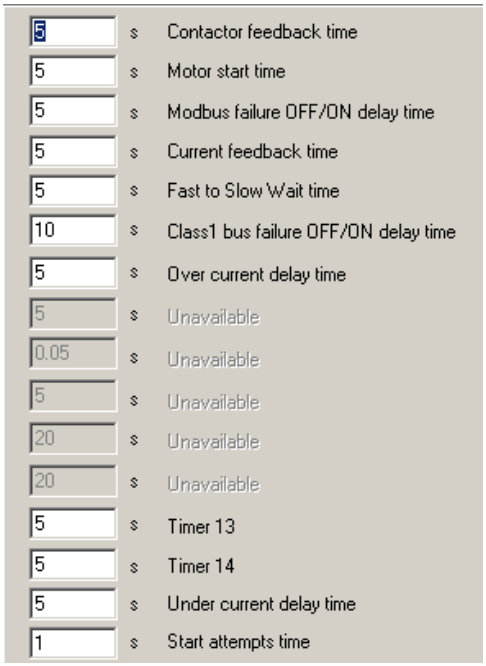
3.5 Undercurrent protection

The undercurrent function switches off the motor during an undercurrent condition.

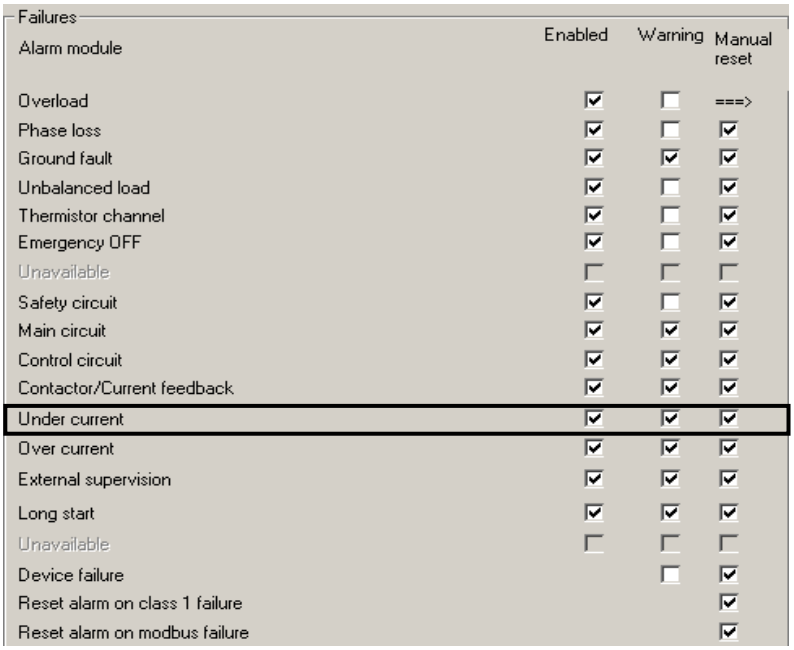
Under current threshold is set in WinESG parameterization/device settings panel shown in the illustration below or Modbus function code 06 register 20. The under current threshold is settable from 1 to 100% of motor load (Ir),



If a current falls below the under current threshold for a pre-defined timer set in WinESG parameterization/timer panel shown in the illustration below or Modbus function code 06 register 40 a failure or warning will be generated depending on the alarm setting. The over current time is settable from 0.1 to 6553.5 seconds.



Under current can be enabled or disabled, set as a warning or failure and requiring an auto or manual reset after a failure, in WinESG parameterization/alarms panel shown in illustration below or Modbus function code 6 registers 114 (enable/disable), 64 (warning/failure), and 63 (auto/manual reset).



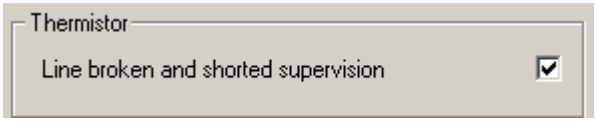
3.6 Thermistor (TMA)

The thermistor protection module protects a motor by evaluating a PTC resistor inside the motor. The system allows connection of 1, 3, or 6 thermistors in series, per IEC34-11-2.

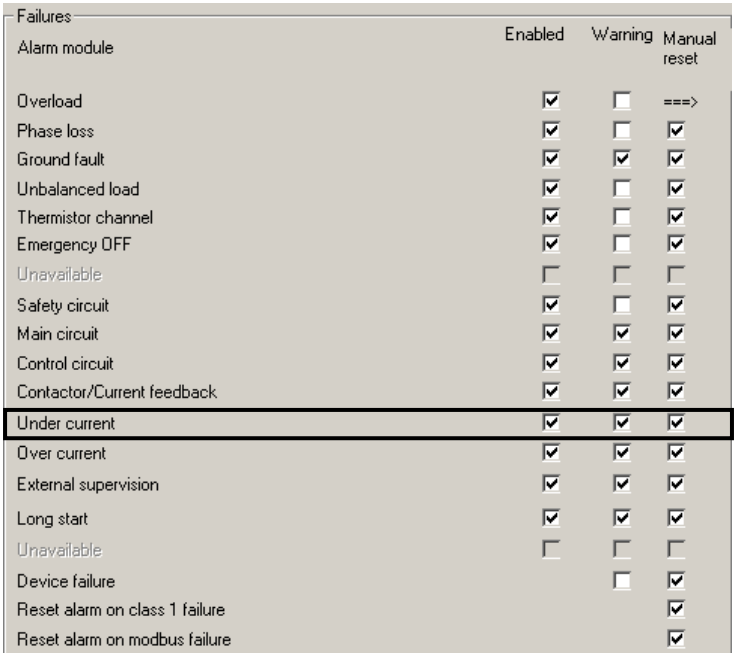
The main features of thermistor protection are as follows:

- Trip value is 3.6 kΩ.
- Reset value is 1.5 kΩ.
- Short-circuit value is approximately < 20 Ω.
- Broken wire value is approximately > 4k kΩ.

Thermistor short and open detection is set in the WinESG parameterization/typical settings panel shown in the illustration below or in Modbus function code 6 register 130 bit2. If set a warning or failure will be generated in case of short or open thermistor condition, depending on the alarm setting.



Thermistor can be enabled or disabled, set as a warning or failure and requiring an auto or manual reset after a failure, in WinESG parameterization/alarms panel shown in illustration below or Modbus function code 6 registers 114 (enable/disable), 64 (warning/failure), and 63 (auto/manual reset).



NOTE: For ATEX application, thermistor protection cannot be disabled or set to warning.

GE Industrial Solutions

EPOS Motor Management System
Chapter 4: Communication

The EntelliPro DP offers two communication protocols: Modbus RTU and Profibus DP over RS-485. They are independent and can run simultaneously.

4.1 Modbus RTU

Modbus is a master-slave protocol, which means that a single host or master device initiates and controls all communication with the other devices on the network. The hardware interface is implemented as two-wire RS-485. In a two-wire link, data are transmitted and received over the same lines. In such a half-duplex link, data are transmitted and received in separate time slices. Also, per the EIA-485 standard, the number of devices that can be connected on a single communication channel is limited to 32 (including the master).

Please refer to the EIA-485 standard for complete details of the physical interface including cabling, termination, and shielding.

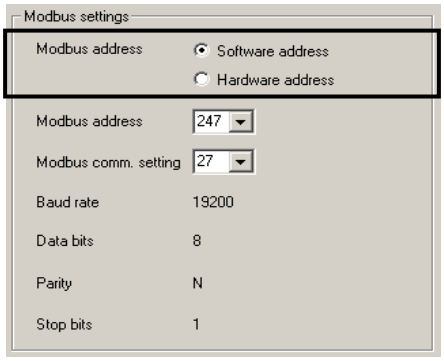
4.1.1 Modbus address setting

In a Modbus RTU Network, each EntelliPro ES module must have a unique address that can be set from 1 to 126. Address 0 is the broadcast address detected by all IEDs in the serial link. Addresses do not have to be sequential, but no two units can have the same address.

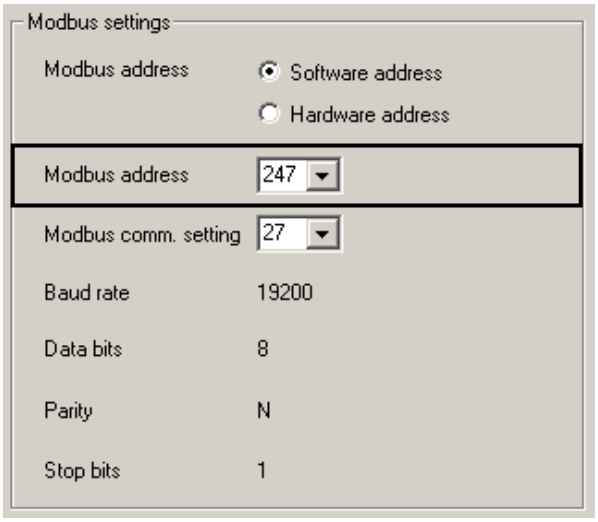
.

Generally, each unit added to the link uses the next higher address, starting at 1. The Modbus slave address can be set using the front-panel switches or using software. Figure 9-1 shows the switch setting and Modbus terminal connection.

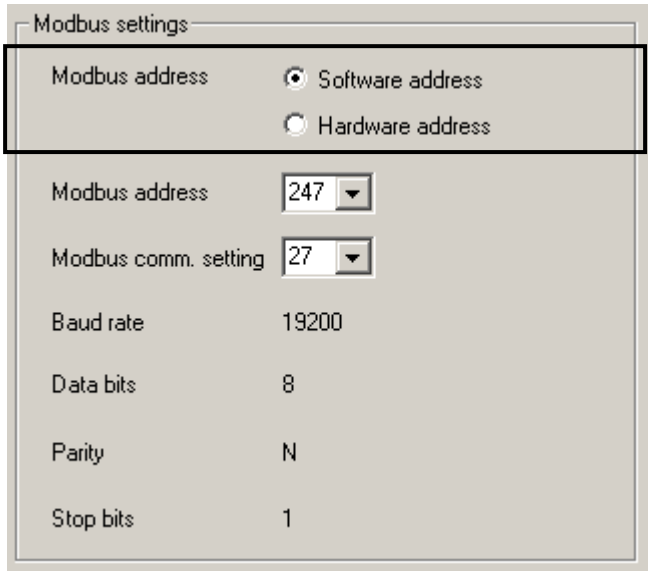
The Modbus slave address configuration (front switches-hardware or software) can be done In WinESG parameterization/Modbus setting panel shown In Illustration below or Modbus function code 6 register 102.



If the software address is selected, the address value can be set In WinESG parameterization/Modbus setting panel shown In Illustration below or Modbus function code 6 register 103.

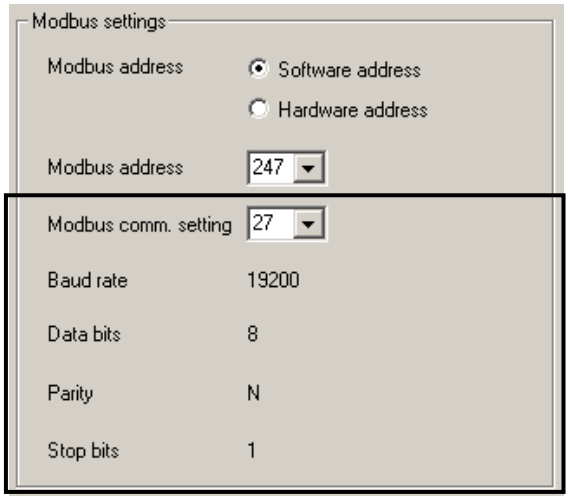


If Modbus address is misplaced or forgotten, the front left switch can be set to address "D" and the Entellipro ES will reset Modbus to address 247.



4.1.2 Modbus baud rate and port configuration

The EntelliPro supports the configured baud rate settings listed in Table 4-1, which can be set in WinESG parameterization/Modbus setting panel shown In Illustration below or Modbus function code 6 register 90.



The EntelliPro supports the configured baud rate settings listed in Table 4-1, which can be set via communications. The first number is the baud rate (300–19,200), the first digit after the dash is the number of data bits (fixed at 8), the letter represents the parity setting (N = none, E = even, O = odd), and the last digit is the stop bit.

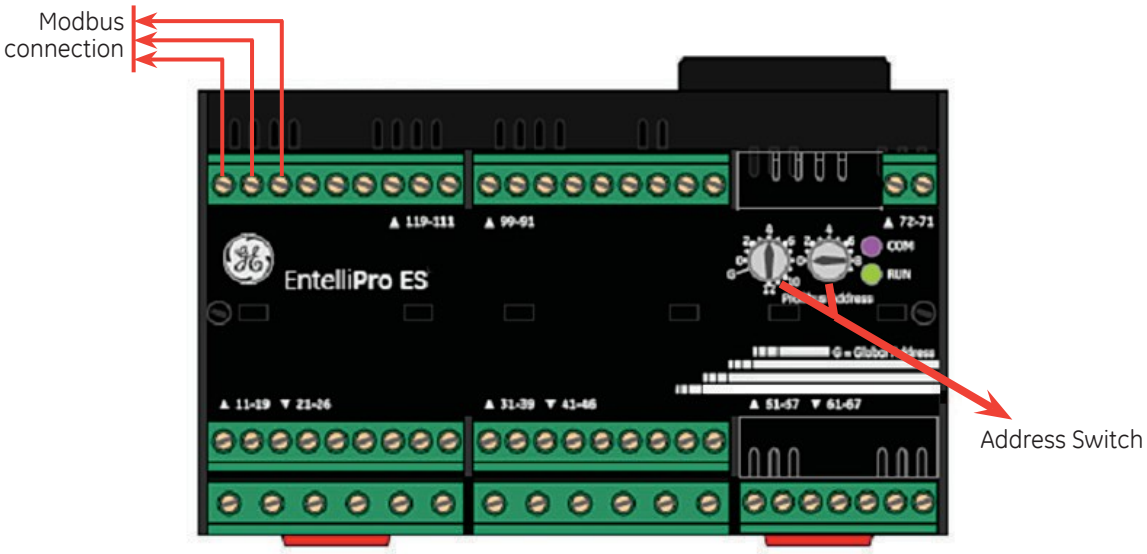


Figure 4-1: EntelliPro ES address switch settings and connection.

300-8N2	600-8N2	1200-8N2	2400-8N2	4800-8N2	9600-8N2	19200-8N2
300-8O1	600-8O1	1200-8O1	2400-8O1	4800-801	9600-801	19200-8O1
300-8E1	600-8E1	1200-8E1	2400-8E1	4800-8E1	9600-8E1	19200-8E1
300-8N1	600-8N1	1200-8N1	2400-8N1	4800-8N1	9600-8N1	19200-8N1

Table 4-1: EntelliPro baud rate settings.

4.1.3 Modbus function codes

The EntelliPro ES supports the following function codes;

03 Read Holding Registers
04 Read Input Registers
05 Force Single Coil
06 Preset Single Register
16 Preset Multiple Registers
20 Read General Reference
21 Write General Reference

4.1.4 Modbus topology

Figure 4-2 illustrates the standard two-wire Modbus topology. To minimize the effects of reflections from the ends of the RS-485 cable caused by impedance discontinuities in the system, a line-terminating resistor on the RC network must be placed near each end of the bus, as illustrated in Figure 4-2.

If one or more devices require polarization, one pair of resistors must be attached to the RS-485 balanced wire pair, as follows:

- Pull-up resistor to 5 V on the positive line
- Pull-down resistor to common on the negative line

These resistors must be between 450 and 650 Ω. The latter may allow a higher number of devices to be connected to the serial bus.

NOTE: Pull-up and pull-down resistors are recommended in an industrial environment.

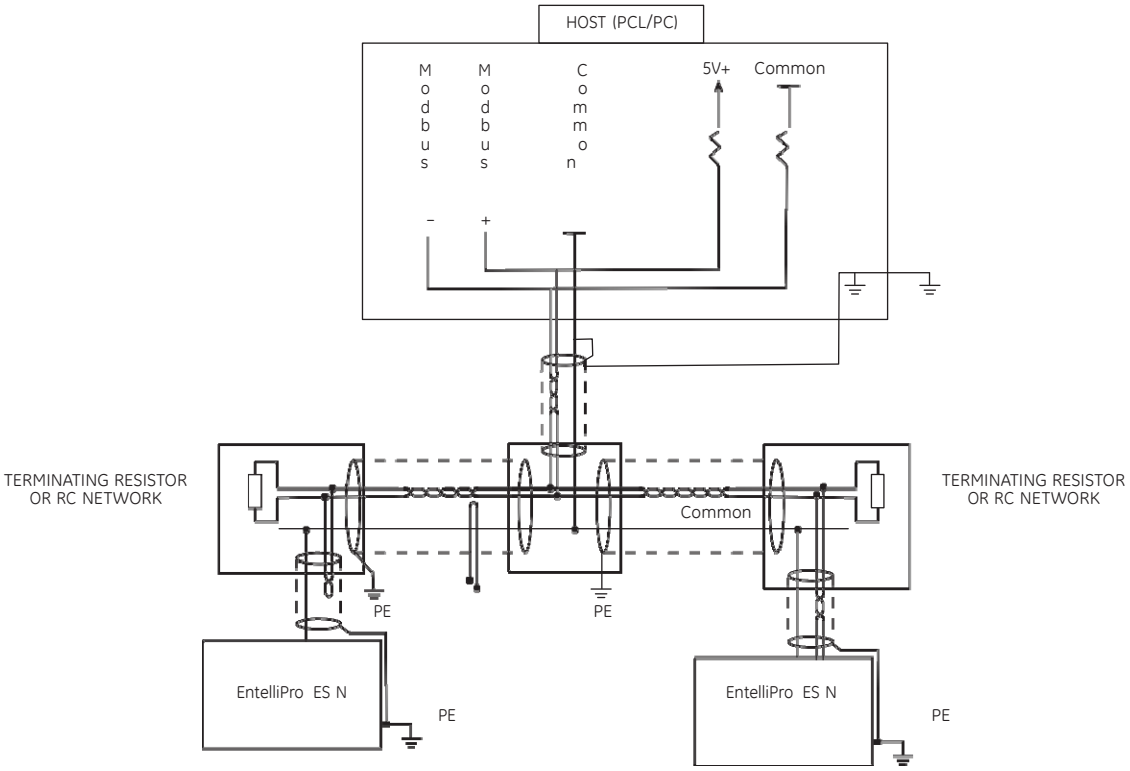


Figure 4-2: Two-wire Modbus topology.

4.1.5 RS-485 connections

On the upper left side of the EntelliPro ES is a nine-pin connector for the Modbus connection. A mating connector is included for customer connection. The pin assignments for the connector are shown in Figure 4-3 and section 2.1.1.4. If the EntelliPro ES is to be the first or last device on the RS-485 network, it must be terminated with a terminating resistor or RC network. Place the resistor or RC network between the appropriate + and - connections on the mating connector. (See section 4.1.6 for details on RS-485 termination).

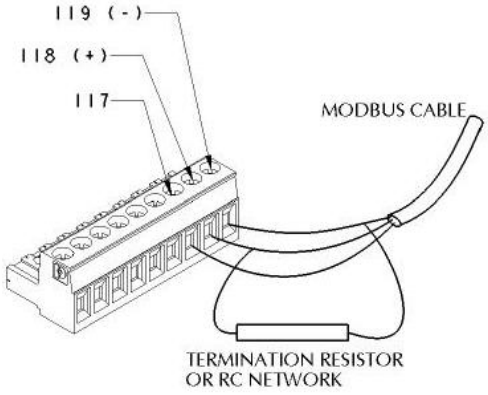


Figure 4-3: RS-485 connection.

Please study and follow the RS-485 grounding shielding considerations and termination rules in the following sections to ensure the correct operation of your Modbus segments.

4.1.6 RS-485 termination considerations

Per the EIA485 standard, every RS-485 network must be terminated at both ends. If the EntelliPro ES is the first device, place a 120 Ω, 1/2 W resistor between the + and - connectors of the RS-485 port. If the EntelliPro ES is the last device, place the resistor between the + and – connectors of the RS-485 port. Figure 4-3 illustrates appropriate termination of an RS-485 segment at the EntelliPro ES.

If the termination resistor power dissipation is an issue, then an RC termination should be considered to minimize the power dissipation. A 120 ohm/1/2W and 1nF/16-25V capacitor should be used.

4.1.7 Grounding shielding considerations

Figure 4-2 illustrates correct wiring for communications and shield grounding. Follow this example to create a secure grounding point for each device on the network. Any surge will dissipate locally without being carried up or down the network to other devices, thus minimizing the chance for damage to devices due to surge or EMI.

NOTE

NOTE: The EntelliPro ES's shield terminal is not directly grounded. If you wish to connect the RS-485 shield to ground at the EntelliPro ES, you must also make a connection from the shield terminal to the grounding screw on the EntelliPro ES. Use AWG #12–14 wire for this connection.

4.1.8 Implementation basics

The EntelliPro ES implements a subset of the Modicon Modbus RTU protocol standard. Modbus is a master-slave protocol, which means that a single host/master device initiates and controls all communication with the other devices on the network.

The hardware interface is implemented as two-wire RS-485. In a two-wire link, data are transmitted and received over the same lines. In such a half-duplex link, data are transmitted and received in separate time slices. Also, per the EIA-485 standard, the number of devices that can be connected on a single communication channel is limited to 32 (including the master).

4.1.9 Modbus RTU message format

The Modbus RTU protocol is strictly based upon a transaction scheme in which a master device generates a query and a slave device replies with a response. Each query and response message transaction consists of the following parts:

Device address	1 byte
Function code	1 byte
Data	N bytes
CRC	2 bytes
Dead time	3.5 bytes transmission time

These parts are as follows:

Device address – This is the first byte of each Modbus RTU transmission. The device address is a number limited to the range of 0–247 and is associated with a single device configured with a matching address. This device receives and processes the transmission from the master. Only the addressed slave device responds to a transmission beginning with this address. A device address of 0 indicates a broadcast command.

Function code – This is the second byte of each transmission and represents the commanded action to the slave device (for queries from the master) or the action that was taken by the slave device (for responses from the slave). Codes between 1 and 127 are defined as Modbus RTU functions. If a slave device responds with a function code with the most significant bit (MSB) equal to 1 (or equivalently a function code greater than 127), then the slave device did not perform the commanded action and is signaling an error response.

Data – This field contains a variable number of bytes, depending on the function performed. Data may contain addresses, actual values, or setpoints.

CRC – This is a two-byte error-checking code, known as a Cyclic Redundancy Check. The Modbus RTU standard requires each message to have a two-byte CRC (commonly known as CRC-16 for 16 bits of error checking) to be appended to every transmission.

If the EntelliPro ES detects a CRC error in a received Modbus message, the EntelliPro ES does not respond to the message. An error in the CRC calculation indicates that one or more bytes of the transmission were received incorrectly, so the entire transmission is ignored, preventing an unintended operation.

The CRC-16 calculation is an industry standard method used for error detection. An algorithm is included here to assist programmers in situations where no standard CRC-16 calculation routines are available.

4.1.10 EntelliPro ES Function Code

The following sections describe the Modbus function code supported by the EntelliPro ES.

4.1.10.1 Function code 03H

For the EntelliPro ES implementation of Modbus, this function code can be used to read any setpoints ("holding registers"). Holding registers are 16 bit (two byte) values transmitted high order byte first. Thus all EntelliPro ES Setpoints are sent as two bytes. The maximum number of registers that can be read in one transmission is 125.

The slave response to this function code is the slave address, function code, a count of the number of data bytes to follow, the data itself and the CRC. Each data item is sent as a two byte number with the high order byte sent first.

For example, consider a request for slave II to respond with 3 registers starting at address 006B. For this example the register data in these addresses is as follows:

Address	Data
0002	0001
0003	0000
0004	0012

The master/slave packets have the following format:

MASTER TRANSMISSION	BYTES	EXAMPLE	DESCRIPTION
SLAVE ADDRESS	1	11	message for slave 17
FUNCTION CODE	1	03	read registers
DATA STARTING ADDRESS	2	00 6B	data starting at 006B
NUMBER OF SETPOINT	2	00 03	3 registers = 6 bytes total
CRC	2	78 87	CRC error code

SLAVE RESPONSE	BYTES	EXAMPLE	DESCRIPTION
SLAVE ADDRESS	1	11	message from slave 17
FUNCTION CODE	1	03	read registers
BYTE COUNT	1	06	3 registers = 6 bytes
DATA 1 (see definition above)	2	02 2B	value in address 006B
DATA 2 (see definition above)	2	00 00	value in address 006C
DATA 3 (see definition above)	2	00 64	value in address 006D
CRC	2	54 83	CRC error code

Table 4-2: Master/Slave Packet Format For Function Code 03H

4.1.10.2 Function Code 04H

Modbus Implementation: Read Input Registers

EntelliPro ES implementation: Read Actual Values

For the EntelliPro ES implementation of Modbus, this function code can be used to read any actual values ("input registers"). Input registers are 16 bit (two byte) values transmitted high order byte first. Thus all EntelliPro ES Actual Values are sent as two bytes. The maximum number of registers that can be read in one transmission is 125.

The slave response to this function code is the slave address, function code, a count of the data bytes to follow, the data itself and the CRC. Each data item is sent as a two byte number with the high order byte sent first.

For example, request slave 17 to respond with 1 register starting at address 0008. For this example the value in this register (0008) is 0000.

MASTER TRANSMISSION	BYTES	EXAMPLE	DESCRIPTION
SLAVE ADDRESS	1	11	message for slave 17
FUNCTION CODE	1	04	read registers
DATA STARTING ADDRESS	2	00 08	data starting at 0008
NUMBER OF ACTUAL VALUES	2	00 01	1 register = 2 bytes
CRC	2	B2 98	CRC error code

SLAVE RESPONSE	BYTES	EXAMPLE	DESCRIPTION
SLAVE ADDRESS	1	11	message from slave 17
FUNCTION CODE	1	04	read registers
BYTE COUNT	1	02	1 register = 2 bytes
DATA (see definition above)	2	00 00	value in address 0008
CRC	2	78 F3	CRC error code

Table 4-3: Master/Slave Packet Format For Function Code 04H

4.1.10.3 Function Code 05H

Modbus Implementation: Force Single Coil

EntelliPro ES Implementation: Execute Operation

This function code allows the master to request a EntelliPro ES to perform specific command operations.

For example, to request slave 17 to execute operation code 1 (reset), we have the following master/slave packet format:

Master Transmission	Bytes	Example	Description
SLAVE ADDRESS	1	11	message for slave 17
FUNCTION CODE	1	05	execute operation
OPERATION CODE	2	00 01	operation code 1
CODE VALUE	2	FF 00	perform function
CRC	2	DF 6A	CRC error code

Slave Response	Bytes	Example	Description
SLAVE ADDRESS	1	11	message from slave 17
FUNCTION CODE	1	05	execute operation
OPERATION CODE	2	00 01	operation code 1
CODE VALUE	2	FF 00	perform function
CRC	2	DF 6A	CRC error code

Table 4-4: Master/Slave Packet Format For Function Code 05H

The following table shows the command that can be initiated using function code 05.

Operation Code	Description
1	Contactor1 ON
2	Contactor2 ON
5	Contactors 1 & 2 OFF
6	Module Identification (request EntelliPro ES ID)
9[1]	Lock Switch Command
10	Switch to Local mode
11	Switch to Reset mode
65	Reset Overload Failure
66	Reset Phase Loss Failure
67	Reset Ground Fault Failure
68	Reset Unbalanced Load Failure
69	Reset Thermistor Failure
70	Reset Emergency stop Failure
71	Reset Limit Switch Failure
72	Reset Safety Circuit Failure
73	Reset Main Circuit Failure
74	Reset Control Circuit Failure
75	Reset Switch Position Failure
76	Reset Under Load Current Failure
77	Reset Overload Current Failure
78	Reset External Supervision Failure
79	Reset Long Start Failure
80	Reset Typical Specific Failure
81	Reset Overload Warning
82	Reset Phase Loss Warning
83	Reset Ground Fault Warning
84	Reset Unbalanced Load Warning
85	Reset Thermistor Warning
86	Reset Emergency stop Warning
87	Reset Limit Switch Warning
88	Reset Safety Circuit Warning
89	Reset Main Circuit Warning
90	Reset Control Circuit Warning
91	Reset Contactor Feedback Warning
92	Reset Under Load Current Warning

93	Reset Overload Current Warning
94	Reset External Supervision Warning
95	Reset Long Start Warning
96	Reset Typical Specific Warning
99	Reset Parameter Error
100	Reset Watchdog Error
101	Reset Timer Interrupt Error
102	Reset Current Measurement Ungauged Error
103	Reset NOV RAM EEPROM
104	Reset Current Measurement Error
105	Reset Start Atte,[t
106	Reset Thermistor Error
113	RESET Operation Hours
116	RESET Maximum Current
117	RESET Trip Current
119	RESET Overload Event Counter
120	CLEAR Analog Value Log
141[2]	Set Analog Value Log Manual Trigger
142	Stop Analog Value Log
144	Clear Overload Accumulator
179[3]	Read Real Time Clock Registers
180	Clear Event Log
181[4]	Write Real Time Clock Registers
184	Set factory default parameters
185	Save parameters in memory
188	Allow parameterization in running mode
189	Stop parameterization in running mode

1: If the local-remote-off switch is set to OFF, and an OFF command is received from a remote source, it will be ignored unless the lock switch is enabled.

2: When this command is issued, the manual trigger will occur. Input holding register 58 MUST be set to manual for this command to have any effect.

3: Value will be available on holding registers.

4; This command writes the Real Time Clock values in holding registers 76 to 83 to the EntelliPro RTC.

Table 4-5: Operation Codes for Function Code 05

4.1.10.4 Function Code 06H

Modbus Implementation: Preset Single Register

EntelliPro ES Implementation: Store Single Setpoint

This command allows the master to store a single setpoint into the memory of a EntelliPro ES. The slave response to this function code is to echo the entire master transmission.

For example, request slave 17 to store the value 2 in setpoint address 04 5C. After the transmission in this example is complete, setpoints address 04 5C will contain the value 00 02. The master/slave packet format is shown below:

Master Transmission	Bytes	Example	Description
SLAVE ADDRESS	1	11	message for slave 17
FUNCTION CODE	1	06	store single setpoint
DATA STARTING ADDRESS	2	04 5C	setpoint address 04 5C
DATA	2	00 02	data for setpoint address 04 5C
CRC	2	CB B9	CRC error code

Slave Response	Bytes	Example	Description
SLAVE ADDRESS	1	11	message from slave 17
FUNCTION CODE	1	06	store single setpoint
DATA STARTING ADDRESS	2	04 5C	setpoint address 04 5C
DATA	2	00 02	data stored in setpoint address 04 5C
CRC	2	CB B9	CRC error code

Table 4-6: Master/Slave Packet Format For Function Code 06H

NOTE: To save the written value in the memory thus preventing the loss of this data upon power cycle, operation code 185 (save paramerters in memory) using Modbus function code 05 must be executed.

4.1.10.5 Function Code 10H

Modbus Implementation: Preset Multiple Registers

EntelliPro ES Implementation: Store Multiple Setpoints

This function code allows multiple Setpoints to be stored into the EntelliPro ES memory. Modbus "registers" are 16-bit (two byte) values transmitted high order byte first. Thus all EntelliPro ES setpoints are sent as two bytes. The maximum number of Setpoints that can be stored in one transmission is dependent on the slave device. Modbus allows up to a maximum of 60 holding registers to be stored. The EntelliPro ES response to this function code is to echo the slave address, function code, starting address, the number of Setpoints stored, and the CRC.

For example, consider a request for slave 17 to store the value 00 02 to setpoint address 04 5C and the value 01 F4 to setpoint address 04 5D.
After the transmission in this example is complete, EntelliPro ES slave 17 will
have the following setpoints information stored: The master/slave packets have the following format:

Master Transmission	Bytes	Example	Description
SLAVE ADDRESS	1	11	message for slave 17
FUNCTION CODE	1	10	store setpoints
DATA STARTING ADDRESS	2	04 5C	setpoint address 04 5C
NUMBER OF SETPOINTS	2	00 02	2 setpoints = 4 bytes total
BYTE COUNT	1	04	4 bytes of data
DATA	1	00 02	data for setpoint address 04 5C
DATA	2	01 F4	data for setpoint address 04 5D
CRC	2	31 11	CRC error code

Slave Response	Bytes	Example	Description
SLAVE ADDRESS	1	11	message from slave 17
FUNCTION CODE	1	10	store setpoints
DATA STARTING ADDRESS	2	04 5C	setpoint address 04 5C
NUMBER OF SETPOINTS	2	00 02	2 setpoints
CRC	2	82 7A	CRC error code

Table 4-7: Master/Slave Packet Format For Function Code 10H

4.1.10.6 Function Code 14H

Modbus Implementation: Read File Record

EntelliPro Implementation: Read Full Event and Analog Data

This command allows the master to read a file containing the full 255 events and analog RMS data. All Request Data Lengths are provided in terms of number of bytes and all Record Lengths are provided in terms of registers.

Master Transmission	Bytes	Value
Slave Address	1	1 - 245
Function Code	1	0x14
Byte Count	1	0x07 to 0xF5
Reference Type	2	06
File Number	2	0x0001 (Read all 255 Events) 0x0002 (Read Current RMS)
Record Number	2	0x 0000 to 0x03E8
Register Length	2	0x0000 to 0 x 007B

Table 4-8: Function Code 14H

4.1.10.7 Function Code 15H

Modbus Implementation: Write File Record EntelliPro Implementation: Write "Custom" logic

This command allows the master to write a file containing the custom logic to the EntelliPro ES. This function code is used to perform a file record write. All Request Data Lengths are provided in terms of number of bytes and all Record Lengths are provided in terms of the number of 16-bit words.

Master Transmission	Bytes	Value
Slave Address	1	1 - 245
Function Code	1	0x15
Reference Type	1	06
File Number	2	0x03FF
Record Number	2	
Record Number	2	
Register Length	2 x N	

Table 4.9 Function Code 15H

4.1.11 Error Responses

When a EntelliPro ES detects an error other than a CRC error, a response will be sent to the master. The MSBit of the FUNCTION CODE byte will be set to 1 (i.e. the function code sent from the slave will be equal to the function code sent from the master plus 128). The following byte will be an exception code indicating the type of error that occurred. Transmissions received from the master with CRC errors will be ignored by the EntelliPro ES.

The slave response to an error (other than CRC error) will be:

Slave Address:	1 byte
Function Code:	1 byte (with MSbit set to 1)
Exception Code:	1 byte
Crc:	2 bytes

The EntelliPro ES implements the following exception response codes:

01 - Illegal Function	The function code transmitted is not one of the functions supported by the EntelliPro ES.
02 - Illegal Data Address	The address referenced in the data field transmitted by the master is not an allowable address for the EntelliPro ES.
03 - Illegal Data Value	The value referenced in the data field transmitted by the master is not within range for the selected data address.

4.1.12 Modbus Register Map

Function Code 03 - Read Holding Registers Function Code 06
- Write Holding Registers Function Code 16 Write Multiple Holding Registers

Holding Register	Modbus Size	Variable	Description	Min	Max	Step	Units	Scale	Format	Default
	16 bit	Basic Parameter Setting		0	255	1	n/a	n/a	Unsigned Integer	6
		Bit0 - 0 = (0-20mA) Analog Output selected 1 = (4 - 20mA)] - Analog Output selected	Selection of Analog Output type							
		Bit1 - [0 - OFF, 1 - ON] -- Overload Memory	1 means use store data in EEProm: - Trip condition -(trip or not for LT and Thermistor) - if trip condition is set in EEProm, motor cannot be started until the motor is cooled and warning or fault is reset. Reset cooling: - FC 06 register 13 set to zero - FC 05 register 144 0 means do not use EEPROM data - no faults or warnings are saved upon power down							
5		Bit2 - [0 - Immediate , 1 - Delayed] - Max Current	0 = perform max current monitoring immediately 1= delayed the max current monitoring by 2 minutes (after motor start)							
		Bit3 - Free								
		Bit4 - Debug Mode 0 = OFF 1 - ON -	Debug mode = ON - Additional Profibus DP telegram will be available: V4 retrofit = telegram B2721 V5 = telegram B40005							
		Bit5, Bit6 - Phase Selection 00 => 3-Phase 01 => 2-Phase (Bit5 = 1, Bit6 = 0) 10 => 1-Phase (Bit5 = 0, Bit6 = 1)	Number of phase selection							
		Bit7 - TwoSpeedMotor	Type of motor selection 0 - disable 1 - enable (use for pole changer and Dahlander typicals)							
6	16 bit	Bus Failure Behavior bit0 - bit 3 1 - Ignore - Profibus Class1 Failure 2 - Delayed OFF 3 - Delayed ON1 4 - Delayed ON2 bit 4 - bit 7 1 - Ignore - Modbus Failure 2 - Delayed OFF 3- Delayed ON1 4- Delayed ON2	Behavior of the EntelliPro ES upon Communication Bus Failure Delay Motor stop Delay Motor forward ON Delay Motor reverse ON Delay Motor stop Delay Motor forward ON Delay Motor reverse ON	0	255	1	n/a	n/a	Unsigned Integer	1
12	16 bit	Overload Delay 1 - Class5 2 - Class10 3 - Class15 4 - Class20 5 - Class25 6 - Class30 7 - Class35 8 - Class40	Overload Trip Class selection	1	8	1	n/a	n/a	Unsigned Integer	1
13	16 bit	Overload Cooling Constant	Cooling algorithm selection 0 = No thermal memory	0	15	1	n/a	n/a	Unsigned Integer	15
14	16 bit	Ground Fault Pick-Up		2	8	1	%	GF PU Setting x 10 2 = 20%	Unsigned Integer	2

Holding Register	Modbus Size	Variable	Description	Min	Max	Step	Units	Scale	Format	Default
15	16 bit	Ground Fault Delay		10	100	10	msec	GF Dly Setting x 10 10 = 100msec	Unsigned Integer	10
16 17	32 bit	Analog Output Value	If analog output is set to 0-20mA - the current set on this register corresponds to 20 mA. If analog is set to 4-20mA - the current set on this register corresponds to 20 mA.	10	520000	1	mA	10 mA Example: 10 = 100mA 100 = 1A	Unsigned Integer	20
18	16 bit	Overload / Locked Rotor / Stalled Rotator	Current threshold	100	800		%	Irated (motor load) * %	Unsigned Integer	20
19	16 bit	Start Phase Threshold	If a current exceed this threshold by a pre-defined timer set by Timer2, an alarm or fault will occur.	100	800		%	Irated (motor load) * %	Unsigned Integer	20
20	16 bit	Under current Threshold	If a current falls below this threshold by a pre-defined timer set by Timer15, an alarm or fault will occur. 0 = disabled	1	100		%	Irated (motor load) * %	Unsigned Integer	20
21	16 bit	Typical Specific Threshold	Current threshold used on actuator, solenoid valve, start-delta typicals	1	200		%	Irated (motor load) * %	Unsigned Integer	20
26	16 bit	Timer1	Maximum switch time (contactor feedback) allowed	1	65535	1	msec	Setting * 100 msec	Unsigned Integer	1
27	16 bit	Timer2	Motor start time	1	65535	1	msec	Setting * 100 msec	Unsigned Integer	1
28	16 bit	Timer3	Modbus Bus failure OFF/ON delay time	1	65535	1	msec	Setting * 100 msec	Unsigned Integer	1
29	16 bit	Timer4	Maximum switch time (current flow)	1	65535	1	msec	Setting * 100 msec	Unsigned Integer	1
30	16 bit	Timer5	Minimum switch over time	1	65535	1	msec	Setting * 100 msec	Unsigned Integer	1
31	16 bit	Timer6	Profibus Class 1 Bus failure OFF/ON delay time	1	65535	1	msec	Setting * 100 msec	Unsigned Integer	1
32	16 bit	Timer7	Blocked motor time/Overload/Locked Rotor/ Stalled Rotator	1	65535	1	msec	Setting * 100 msec	Unsigned Integer	1
33	16 bit	Timer8	Maximum Star time	1	65535	1	msec	Setting * 100 msec	Unsigned Integer	1
34	16 bit	Timer9	Star / Delta Switch over time	1	65535	1	msec	Setting * 10msec	Unsigned Integer	1
35	16 bit	Timer10	Maximum switch time limit switch	1	65535	1	msec	Setting * 100 msec	Unsigned Integer	1
36	16 bit	Timer11	Maximum soft starter time	1	65535	1	msec	Setting * 100 msec	Unsigned Integer	1
37	16 bit	Timer12	Maximum soft stop time/ max breaker ON	1	65535	1	msec	Setting * 100 msec	Unsigned Integer	1
38	16 bit	Timer13	Applicable to custom logic only	1	65535	1	msec	Setting * 100 msec	Unsigned Integer	1
39	16 bit	Timer14	Applicable to custom logic only	1	65535	1	msec	Setting * 100 msec	Unsigned Integer	1
40	16 bit	Timer15	Undercurrent delay	1	65535	1	msec	Setting * 100 msec	Unsigned Integer	1
41	16 bit	Timer16	Start Attempt	1	65535	1	msec	Setting * 100 msec	Unsigned Integer	1
42	16 bit	Count1 (Not used in EntelliPro ES retrofit version)	Applicable to custom logic only	1	65535	1			Unsigned Integer	1
43	16 bit	Count2 (Not used in EntelliPro ES retrofit version)	Applicable to custom logic only	1	65535	1			Unsigned Integer	1
44	16 bit	Count3 (Start Attempt Counter in V5)	Number of start attempts allowed within a specified time interval set by timer16 Example: Timer16 is set 10 secs - Count3 = 3 3 starts are allowed in 10 seconds interval	1	40	1			Unsigned Integer	10

Holding Register	Modbus Size	Variable	Description	Min	Max	Step	Units	Scale	Format	Default
56[1]	16 bit	Current Unbalance/Loss Delay	0-Disable	0	15	1	sec		Unsigned Integer	1
57	16 bit	Analog RMS value time interval	Time interval between analog value log samples Example: If set to 60 - every 60 secs a sample is recorded	1	60	1	sec		Unsigned Integer	1
58	16 bit	Analog RMS Value Trigger Bit0, Bit1, Bit2 - Event to stop storage 0 - Disable 1 - Trip 2 - Warning 3 - Switch ON 4 - Switch OFF 5 - Manual Bit 3 - 0 - 3/4 pre and 1/4 post trigger data 1 - 1/4 pre and 3/4 post trigger data Bit 4 - Reserved Bit 5 - Reserved Bit 6 - Reserved Bit 7 - Reserved	Trigger mechanism Number of pre and post trigger samples recorded.	0	15	1			Unsigned Integer	0
59	16 bit	Modbus Timeout Timer	Time allowed between Modbus messages until Modbus error is generated	1	120	1	sec		Unsigned Integer	
62	16 bit	Special Functions Bit0 = Default Configuration Bit1 = Disable alarm underload current Bit2 - Disable alarm overload current Bit3-4 Parameterization configuration Bit 5 - Ignore Phase loss during start phase Bit 6 - Ignore earth fault during start phase Bit 7 - Ignore Unbalance load during start phase Bit 8 to 11- Typical selection Bit 12 to 15 - Control mode variant selection	 If set to 1 - typical and control mode default configuration will be used. 0 0 - parameterization allowed via Profibus DP only when motor is in stop condition 0 1 - parameterization allowed via Profibus DP while motor is at any state. 1 0 - parameterization allowed via Profibus DP when draw out position is not in test or operation mode 11 - parameterization allowed via Profibus DP when the operation mode is not Remote or Local. Note: the Modbus operation mode selection is done using function code 05 - commands 10 or 11 1 - Ignored phase loss during start-up 0 - Do not ignore 1 - Ignored earth fault during start-up 0 - Do not ignore 1 - Ignored current unbalance during start-up 0 - Do not ignore 0xX0XX = DOL 0xX1XX = DOL Reverse 0xX2XX = Start Delta 0xX3XX = Start Delta Reverse 0xX4XX = Soft Starter 0xX5XX = Soft Starter Reverse 0xX6XX = Dahlander 0xX7XX = Pole Change Starter 0xX8XX = Breaker Control 0xX9XX = Solenoid Valve 0xXAXX = Actuator 0xXBXX = Custom Logic 1 - 6 - Refer to Chapter 2, Section 2.4.2	0	255	1			Unsigned Integer	

1: If ATEX is selected, the current unbalance/loss delay is automatically set to trip immediately.

Holding Register	Modbus Size	Variable	Description	Min	Max	Step	Units	Scale	Format	Default
63	16 bit	Reset Configuration BIT0 - Overload	 1 = Manual Reset required 0 = Auto Reset Note: The number of Auto reset is depending on the value set on holding register 45.	0	65535	1	0		Unsigned Integer	255
		BIT1 - Phase Loss	1 = Manual Reset required 0 = Auto Reset							
		BIT2 - Gf	1 = Manual Reset required 0 = Auto Reset							
		BIT3 - UnbalancedLoad	1 = Manual Reset required 0 = Auto Reset							
		BIT4 - Thermistor	1 = Manual Reset required 0 = Auto Reset							
		BIT5 - Emergencystop	1 = Manual Reset required 0 = Auto Reset							
		BIT6 - LimitSwitch	1 = Manual Reset required 0 = Auto Reset							
		BIT7 - SafetyCircuit	1 = Manual Reset required 0 = Auto Reset							
		BIT8 - MainCircuit	1 = Manual Reset required 0 = Auto Reset							
		BIT9 - ControlCircuit	1 = Manual Reset required 0 = Auto Reset							
		BIT10 - SwitchPosition	1 = Manual Reset required 0 = Auto Reset							
		BIT11 - UnderLoadCurrent	1 = Manual Reset required 0 = Auto Reset							
		BIT12 - OverLoadCurrent	1 = Manual Reset required 0 = Auto Reset							
		BIT13 - ExternalSupervision	1 = Manual Reset required 0 = Auto Reset							
		BIT14 - LongStart	1 = Manual Reset required 0 = Auto Reset							
		BIT15 - SoftStarter Feedback Failure MCC B2	1 = Manual Reset required 0 = Auto Reset							
64	16 bit	Protection / Input Configuration BIT0 - Overload	Protection and Input Alarm/Fault(trip) Configuration 1 = Warning - (Overload protection is configured as an alarm) 0 = Failure (Trip) - (Overload protection is configured as a Failure / Trip)	0	65535	1			Unsigned Integer	65280
		BIT1 - Phase Loss	1 = Warning 0 = Failure (Trip)							
		BIT2 - Ground fault	1 = Warning 0 = Failure (Trip)							
		BIT3 - Unbalanced Load	1 = Warning 0 = Failure (Trip)							
		BIT4 - Thermistor	1 = Warning 0 = Failure (Trip)							
		BIT5 - Emergency stop	1 = Warning 0 = Failure (Trip)							
		BIT6 - Limit Switch	1 = Warning 0 = Failure (Trip)							
		BIT7 - Safety Circuit	1 = Warning 0 = Failure (Trip)							
		BIT8 - Main Circuit	1 = Warning 0 = Failure (Trip)							
		BIT9 - Control Circuit	1 = Warning 0 = Failure (Trip)							
		BIT10 - Contactor Feedback	1 = Warning 0 = Failure (Trip)							
		BIT11 - Under Load Current	1 = Warning 0 = Failure (Trip)							
		BIT12 - Overload Current	1 = Warning 0 = Failure (Trip)							
		BIT13 - External Supervision	1 = Warning 0 = Failure (Trip)							
		BIT14 - Long Start	1 = Warning 0 = Failure (Trip)							
		BIT15 - Typical Specific	1 = Warning 0 = Failure (Trip)							
65	16 bit	Device Error Reset Configuration Bit0 - Reset Configuration of device Error	 Bit0 = 1 ->Manual reset is required 0 = Auto reset of error, 0 must be under 1	0	3	1			Unsigned Integer	2
		Bit1 - Device Error Configuration Bit2 - 15 - Free	Bit = 1 ->Warning 0 = Failure (Trip), 0 must be under 1							

Holding Register	Modbus Size	Variable	Description	Min	Max	Step	Units	Scale	Format	Default
76	16 bit	Time Sync Year	Values to write to Real Time Clock (RTC) Note:Function code 05 command 181 will be required after setting registers 76 thru 83.				Year		Unsigned Integer	
77	16 bit	Time Sync Month					Month		Unsigned Integer	
78	16 bit	Time Sync Date					Date		Unsigned Integer	
79	16 bit	Time Sync Day					Day		Unsigned Integer	
80	16 bit	Time Sync Hour					Hour		Unsigned Integer	
81	16 bit	Time Sync Minute					Minute		Unsigned Integer	
82	16 bit	Time Sync Second					Second		Unsigned Integer	
83	16 bit	Time Sync Tenths/Hundredths of Seconds					1/100th Second		Unsigned Integer	
90	16 bit	ModbusCommunicationSetting; 0 - ModbusComSetting_3008N2 1 - ModbusComSetting_6008N2 2 - ModbusComSetting_12008N2 3 - ModbusComSetting_24008N2 4 - ModbusComSetting_48008N2 5 - ModbusComSetting_96008N2 6 - ModbusComSetting_192008N2 7 - ModbusComSetting_3008O1 8 - ModbusComSetting_6008O1 9 - ModbusComSetting_12008O1 10 - ModbusComSetting_24008O1 11 - ModbusComSetting_48008O1 12 - ModbusComSetting_96008O1 13 - ModbusComSetting_192008O1 14 - ModbusComSetting_3008E1 15 - ModbusComSetting_6008E1 16 - ModbusComSetting_12008E1 17 - ModbusComSetting_24008E1 18 - ModbusComSetting_48008E1 19 - ModbusComSetting_96008E1 20 - ModbusComSetting_192008E1 21 - ModbusComSetting_3008N1 22 - ModbusComSetting_6008N1 23 - ModbusComSetting_12008N1 24 - ModbusComSetting_24008N1 25 - ModbusComSetting_48008N1 26 - ModbusComSetting_96008N1 27 - ModbusComSetting_192008N1	Set Baud Rate, Parity, Data Bits, Stop Bits Example: 3008N2 300 = Baud Rate 8 = Data Bits N = No Parity (E = Even Parity, O = Odd Parity) 2 = Stop Bits	0	27	1			Unsigned Integer	27
91	16 bit	Frequency	0 - 50Hz 1 - 60Hz	0	1	1			Unsigned Integer	
92 (L) 93 (H)	32 bit	Current Sensor Rating Low Speed (Ict_ lowspeed)	Sensor setting	10	65000	1	Amps	x100 120 = 1.2A	Unsigned Integer	120
94 (L) 95 (H)	32 bit	Motor Rating Low Speed	Motor Load setting	1/6*Ict_ lowspeed	Ict_ lowspeed	1	Amps	x100 20 = 0.2A	Unsigned Integer	20
96 (L) 97 (H)	32 bit	Current Sensor Rating High Speed (Ict_ highspeed)	Sensor settin g	10	65000	1	Amps	x100 120 = 1.2A	Unsigned Integer	120
98 (L) 99 (H)	32 bit	Motor Rating High Speed	Motor Load setting	1/6*Ict highspeed	Ict highspeed	1	Amps	x100 20 = 0.2A	Unsigned Integer	20
100	16 bit	Motor Feedback Enabled	Allows motor to start without any feedback 0 - No feedback required 1 - Feedback required Read Only register	0	1	1			Unsigned Integer	1
101	16 Bit	Event Read Index	Event to be displayed on input register 89 - 96 Modbus FC 04. Last event index is shown on input register112 - Modbus FC 04	0	249	1			Unsigned Integer	0
102	16 bit	Modbus Software / Front Switch Selection	0 - Use Modbus software address set on holding register 103 1 - Use Modbus address from the front switches	0	1	1			Unsigned Integer	1
103	16 bit	ModbusSlaveAddress	Modbus Software Slave address	1	247	1			Unsigned Integer	1
104	16 bit	Profibus_ID_Number	EntelliPro ES Retrofit = 0x0574 EntelliPro ES = 0x0500						Unsigned Integer	

NOTE: Interpretation of 32-bit value. Example register 91 (L = low word) = 1000 register 92 (H = high word) = 20. Convert both registers to HEX: regsiter 91 = 3E8, . register 92 = 14. Combine both HEX numbers = 143E8. Convert this number to decimal = 82920. This corresponds to 829.2A base on the x100 scale factor.

Holding Register	Modbus Size	Variable	Description	Min	Max	Step	Units	Scale	Format	Default
111	16 bit	Typical Specific Feature								
		bit 0 - ATEX_Activated	1 = ATEX Enable 0 - ATEX Disable							
		bit 1 - FeedbackViaContact_Activated	1 = Feedback relay signal is required Example: if Relay1 Output is mapped to Main Contactor 1 then input must be mapped to Main Contactor 1 Feedback and the system needs to be wired accordingly 0 = no feedback is required"							
		bit 2 - FeedbackVviaCurrent_Activated	1 = Current must exceed 10% of Motor load before Timer4 expires 0 = no feedback is required							
		bit 3 - AllowDirectDirectionSwitchOver	1 = A direct switchover is allowed after Timer5 expires 0 = no direct switch over"							
		bit 4 - CurrentDependingYDSwitchOver_ Activated	Only applicable to Start Delta Typical Prior to turn ON the Delta contactor, current must be above a threshold set on holding register 21 for amount of time set on Timer9"							
		bit 5 - SoftStopTime_Activated	Only applicable to Soft Starter An additional timer will be available when activated - Timer12 Digital output must be mapped appropriately"							
		bit 6 - BypassControl_Activated	Only applicable to Soft Starter Digital output must be mapped properly.							
		bit 7 - ExternalSoftStarterFault_Activated	Digital input must be mapped and link to holding register 64 bit13. If this digital input is activated a fault or alarm will occur.							
		bit 8 - MCCBTripped2Alarm_Activated	Digital input must be mapped and link to holding register 64 bit15. If this digital input is activated a fault or alarm will occur.							
		bit 9 - FeedbackMCCB_Activated	Digital input must be mapped and link to holding register 64 bit10. If this digital input is activated a fault or alarm will occur.							
		bit 10 - BreakerTripResetFromESS	Digital output must be mapped.							
		bit 11 - LimitSwitches_Activated	Only applicable to Solenoid & Actuator typicals 2 Digital inputs must be mapped and link to holding register 64 bit6 If this digital input is activated a fault or alarm will occur.							
		bit 12 - TorqueSwitch_Activated	Only applicable to Solenoid & Actuator typicals 2 Digital inputs must be mapped and link to holding register 64 bit15. If this digital input is activated a fault or alarm will occur.							
		bit 13 - SwitchOFFAtLimitSwitch	Only applicable to Actuator typical When set to 1 and the limit switch has been reached, the motor will be prevented from rotating on the same direction. When set to 0 - motor will be allowed to rotate on the same direction when limit switch is reached.							
		bit 14 - SwitchOFFAtTorqueSwitch	Only applicable to Actuator typical When set to 1 and the torque switch has been reached, the motor will be prevented from rotating on the same direction. When set to 0 - motor will be allowed to rotate on the same direction when torque switch is reached.							
		bit 15 - SwitchOFFAtCurrentThreshold	When set to 1 and current threshold is reached, the motor will be stopped and not allowed to rotate in the same direction. When set to 0 - motor will be allowed to rotate on the same direction when current threshold is reached.							

Holding Register	Modbus Size	Variable	Description	Min	Max	Step	Units	Scale	Format	Default
113	16 bit	ForceLocalRemote switch Bit 0: for local switch on Class1 failure. bit 1 - bit 3: Free bit 4 - bit 6 : Force local/remote switch to remote on Modbus Failure bit 7: Free	Switch setting upon Modbus and/or Profibus class1 Bus failure 0 = None - Switch remains as is 1 = Local on Profibus Class 1 failure 0 - None 1 - Local on Modbus failure 2 - Remote on Modbus failure 3 - OFF	0	127	1			Unsigned integer	10
114	16 bit	Protection - Inputs Enable / Disable bit 0 - Overload bit 1 - Phase LossL bit 2 - GF bit 3 - UnbalancedLoad bit 4 - Thermistor bit 5 - EmergencyStop bit 6 - LimitSwitch bit 7 - SafetyCircuit bit 8 - MainCircuit bit 9 - ControlCircuit bit10 - SwitchPosition bit 11 - UnderLoadCurrent bit 12 - OverloadCurrent bit 13 - ExternalSupervision bit 14 - CyclicCommunicationLoss bit 15 - LongStartTime	0 = Disable 1 = Enabled Example: If overload protection on holding register 64 is set to failure and this bit is set to 0, then the overload failure is ignored. If overload protection on holding register 64 is set to alarm, and this bit is set to 0, then the overload alarm is ignored. If overload protection on holding register 64 is set to failure and this bit is set to 1, then the overload failure is activated. If overload protection on holding register 64 is set to alarm, and this bit is set to 1, then the overload alarm is activated. This is applicable for the Bit 1 thru Bit 15	0	65535	1			Unsigned Integer	65471
115	16 bit	Remote Source & Local Remote Switch control Bit 0 - bit 2 1 - class1 2 - Modbus 3 - Hardwire Bit 4 - bit 6 1 - class1 2 - Modbus 3 - Hardwire 4 - Fixed Local 5 - Fixed Remote	Bit0 thru Bit2 defines the Remote source Bit4 thru Bit6 defines the source that controls the local/remote switch selection. Note: Fixed local is defined as Hardwire, Modbus, Profibusand 2	0	127	1			Unsigned Integer	34
116	16 bit	Bus Command Configuration bit 0 - Class1 enable/ disable bit 1 - Class1 n bit 0r (n+1) bit bit 2 - level/edge bit 3 - Inverted OFF / Non-Inverted OFF bit 4 - Class2 Enable/disable bit 5 - reserved bit 6 - Modbus Enable/disable	Enables the EntelliPro ES controls (ON/OFF/ Reset...) by different protocols If Profibus DP Class 1 is enabled then bits 1,2,3 must be set per the required operation Enables Profibus DP class 2 protocol to control the motor Enables Modbus protocol to control the motor.	0	127	1			Unsigned integer	92
117	16 bit	Hardwire Configuration Bit 0 - hardwire enable/ disable bit 1 - hardwire n bit 0r (n+1) bit bit 2 - hardwire level/edge	Allow EntelliPro ES control via hardware If Bit 0 is enables (2), bit 1 and 2 must be set	0	5				Unsigned integer	10244

NOTE

NOTE: Registers 115, 116 and 117 must be programmable sequentially, in order to get the expected configuration. Individual configuration of these registers will not give the expected configuration behavior.

Holding Register	Modbus Size	Variable	Description	Min	Max	Step	Units	Scale	Format	Default
118	16 bit	Digital Input[98 & 99] Setting example: Digital 0 is mapped to Reset alarm Input Signal = 14 Digital 1 is mapped to Reset alarm Input Signal = 15 1514 decimal = 0x0F0D Covert 0x0F0D to decimal (3853) Place 3853 into this register	Active High Configuration 01 = Contactor 1 ON Command 02 = Contactor 2 ON Command 03 = Contactor 1/2 OFF Command 04 = Contactor 1 Feedback / MCCB ON Feedback 05 = Contactor 2 Feedback / MCCB OFF Feedback 06 = Start Contactor Feedback Signal Breaker Charged Status Signal Bypass Feedback Limit Switch 2 Limit Switch Close 07 = Feedback 4 Delta Contactor Feedback Signal Soft Starter Up to Speed Feedback Torque Switch1 Torque Open/ Breaker tripped 2 08 = External Fault Signal 1 External Supervision Feedback 09 = Breaker ready for switch ON Torque Close Torque Switch 2 10 = Drawer Test Position Signal 11 = Drawer Operation Position Signal 12 = Remote Input Signal 13 = Local Input Signal 14 = Reset Alarms Input Signal 15 = Main Circuit Feedback 16 = Control Circuit Feedback 17 = Emergency Stop Signal 18 = Safety Circuitry Signal 19 = Limit Switch 1 Limit Switch Open Soft Starter External Fault Breaker Tripped 1 20 = External Fault Signal 2 Active Low Configuration 21 = Contactor 1 ON Command 22 = Contactor 2 ON Command 23 = Contactor 1/2 OFF Command 24 = Contactor 1 Feedback / MCCB ON Feedback 25 = Contactor 2 Feedback / MCCB OFF Feedback 26 = Start Contactor Feedback Signal Breaker Charged Status Signal Bypass Feedback Limit Switch 2 Limit Switch Close 27 = Feedback 4 Delta Contactor Feedback Signal Soft Starter Up to Speed Feedback Torque Switch1 Torque Open Breaker Tripped 2 28 = External Fault Signal 1 External Supervision Feedback 29 = Breaker Ready for Switch ON Torque Close Torque Switch 2 30 = Drawer Test Position Signal 31 = Drawer Operation Position Signal 32 = Remote Input Signal 33 = Local Input Signal 34 = Reset Alarms Input Signal 35 = Main Circuit Feedback 36 = Control Circuit Feedback 37 = Emergency Stop Signal 38 = Safety Circuitry Signal 39 = Limit Switch 1 Limit Switch Open Soft Starter External Fault Breaker Tripped 1 40 = External Fault Signal 2	1	65536	1			Unsigned Integer	10244

Holding Register	Modbus Size	Variable	Description	Min	Max	Step	Units	Scale	Format	Default
119	16 bit	DigitalInput[96 & 97]	See holding register 118 definition	1	40				Unsigned integer	8 996
120	16 bit	DigitalInput[94 & 95]	See holding register 118 definition	1	40				Unsigned integer	10021
121	16 bit	DigitalInput[11 & 93]	See holding register 118 definition	1	40				Unsigned integer	38
122	16 bit	DigitalInput[13 & 12]	See holding register 118 definition	1	40				Unsigned integer	0
123	16 bit	DigitalInput[15 & 14]	See holding register 118 definition	1	40				Unsigned integer	0
124	16 bit	DigitalInput[17 & 16]	See holding register 118 definition	1	40				Unsigned integer	0
125	16 bit	DigitalInput[19 & 18]	See holding register 118 definition	1	40				Unsigned Integer	0

Holding Register	Modbus Size	Variable	Description	Min	Max	Step	Units	Scale	Format	Default
126	16 bit	Digital Output - Motor Relay 41 Note: One of the three motor contact relay output must be mapped as a contactor (value 1 thru 5). When any motor contact relay is mapped as a contact then the rest of the output relays can be treated as a signal output and set to any value. Signal output can be dual mapped (first byte mapped to operation1, and 2nd byte mapped to a different operation) Example of mapping output 3 as a signal output relay Identification Feedback Status = 23 (first byte) Main Contactor 2 Feedback Status Flashing = 38 (second byte) Convert 3823 to HEX = 0x0EEF. Convert 0x0EEF to decimal - 3823 Place 3823 in the output 3 register Note: second byte has the highest priority when both are present	1 = Main Contactor 1 / Breaker ON / Slow Contactor 2 = Main Contactor 2 / Breaker OFF / Fast Contactor 3 = Start Contactor 3 / by pass Connector 4 = Delta Contactor 4 5 = Redundancy Contactor 6 = Main Contactor 1 Feedback Status 7 = Main Contactor 2 Feedback Status 8 = ESS_DP_Parameter_Mode 9 = Switch_Protected_Status 10 = Start_Attempt_Status 11 = Drawer_Ready_Status 12 = General Warning Status 13 = General Fault Status 14 = Safety Circuitry Status 15 = Local Switch Status 16 = Remote Switch Status 17 = Drawer test Mode Status 18 = Drawer operation Mode Status 19 = Limit Switch 1 Status 20 = Limit Switch 2 Status 21 = General Device Error Status 22 = Identification Feedback Status 23 = Class1 Failure 24 = Modbus Failure 25 = By Pass Contactor Switched ON Status 26 = Switching 1 progress Status 27 = Switching 2 progress Status 28 = Breaker Tripped2 Status 29 = Charger Status 30 = Torque Switching 1 Status 31 = Torque Switching 2 Status 32 = Start Phase Status 33 = Run Phase Status 34 = Thermistore Line Broken Status 35 = Thermistor Line Shorted Status 36 = Main Contactor 1 Feedback Status 37 = Main Contactor 2 Feedback Status Flashing 38 = ESS_DP_Parameter_mode 39 = Switch_protected_Status Flashing 40 = Start_Attempt_Status Flashing, 41 = Drawer_Ready_Status Flashing, 42 = General Warning Status Flashing 43 = General Fault Status Flashing 44 = Safety Circuitry Status Flashing 45 = Local Switch Status Flashing 46 = Remote Switch Status Flashing 47 = Drawer test Mode Status Flashing 48 = Drawer operation Mode Status Flashing 49 = Limit Switch 1 Status Flashing 50 = Limit Switch 2 Status Flashing 51 = General Device Error Status Flashing 52 = Identification Feedback Status Flashing 53 = Class1 Failure Flashing 54 = Modbus Failure Flashing 55 = By Pass Contactor Switched ON Status Flashing 56 = Switching 1 progress Status Flashing 57 = Switching 2 progress Status Flashing 58 = Breaker Tripped2 Status Flashing 59 = Charger Status Flashing 60 = Torque Switching 1 Status Flashing 61 = Torque Switching 2 Status Flashing 62 = Start Phase Status Flashing 63 = Run Phase Status Flashing 64 = Thermistore Line Broken Status Flashing 65 = Thermistor Line Shorted Status Flashing 66 = DIGITALOUTPUT4 / Soft Stop Relay 67 = DIGITALOUTPUT5 / Soft Start External Fault 68 = Digital Output 6, 69 = Digital Output 7 70 = Digital Output 8	1	71	1			Unsigned Integer	9
127	16 bit	Digital Output - Motor Relay 43	See Digital Output 0 for configuration and setting (Holding register 126)	1	71	1			Unsigned Integer	7
128	16 bit	Digital Output - Motor Relay 45	See Digital Output 0 for configuration and setting (Holding register 126)	1	71	1			Unsigned Integer	7
129	16 bit	Digital Output - Signal Relay 22	See Digital Output 0 for configuration and setting (Holding register 126)	1	71	1			Unsigned Integer	7

Holding Register	Modbus Size	Variable	Description	Min	Max	Step	Units	Scale	Format	Default
130	16 bit	Configuration Bits bit 0 - Class1BusFailureDetection bit 1 - ModbusBusFailureDetection bit 2 - ActivateThermistorLineBreakAnd ShortedSupervision bit 3 - ActivateDrawerPositionSupervision bit 4 - bit 5 - Remote Source Control OFF	 0 - disabled 1- enabled 0 - disabled 1- enabled 0 - disabled 1- enabled 0 - disabled 1- enabled If set to 1; Switch is set to LOCAL but and OFF command from Remote source is accepted	0	127				Unsigned Integer	5
132	16 bit	Firmware Version	Read only Definition: Firmware Version "000.000" => "HigherByte. LowerByte"						Unsigned Integer	0x01
134	16 bit	Free Logic Version[0 & 1]	Read only							0
135	16 bit	Free Logic Version[2 & 3]	Read only							0
136	16 bit	Free Logic Version[4 & 5]	Read only							0
162	16 bit	Serial Number[0 & 1]	Serial Number						Unsigned Integer	
163	16 bit	Serial Number[2 & 3]								
164	16 bit	Serial Number[4 & 5]								
165	16 bit	Serial Number[6 & 7]								
166	16 bit	Serial Number[8 & 9]								
167	16 bit	Serial Number[10 & 11]								
169 170	32 bit	Operating Hour	Hour of operation	0	4294967296	1	Hour		Unsigned Integer	
171 172	32 bit	Motor Start Counter	Number of Motor Start	0	4294967296	1			Unsigned Integer	
173 174	32 bit	Switch Counter[0]	Number of operation of motor contactor 41	0	4294967296	1			Unsigned Integer	
175 176	32 bit	Switch Counter[1]	Number of operation of motor contactor 42	0	4294967296	1			Unsigned Integer	
177 178	32 bit	Switch Counter[2]	Number of operation of motor contactor 43	0	4294967296	1			Unsigned Integer	
179 180	32 bit	Switch Counter[3]	Number of operation oof motor contactor 45. Mainly use on start-delta reverse typical	0	4294967296	1			Unsigned Integer	
181	16 bit	Thermal overloaf trip Counter	Thermal Overload Trip Counter	0	65536	1			Unsigned Integer	
182	16 bit	Thermistor Trip Counter	Thermistor Trip Counter	0	65536	1			Unsigned Integer	
183	16 bit	Ground Fault Sum trip Counter	Ground Fault Sum trip Counter	0	65536	1			Unsigned Integer	
184 185	32 bit	Non-Operation Hour	Hour of non-operation - motor stopped	0	65536	0	Hour		Unsigned Integer	
194	16 bit	Digital Output - Signal Relay 23	See Digital Output 0 for configuration and setting (Holding register 126)	1	71	1			Unsigned Integer	5
195	16 bit	DigitalOutput - Signal Relay 24	See Digital Output 0 for configuration and setting (Holding register 126)	1	71	1			Unsigned Integer	5
196	16 bit	DigitalOutput - Signal Relay 25	See Digital Output 0 for configuration and setting (Holding register 126)	1	71	1			Unsigned Integer	5
197	16 bit	DigitalOutput - Signal Relay 26	See Digital Output 0 for configuration and setting (Holding register 126)	1	71	1			Unsigned Integer	5
237	16 bit	ESS-type name[0 & 1]	Read Only Catalog Number						Unsigned Integer	
238	16 bit	EntelliPro ES-type name[2 & 3]								
239	16 bit	EntelliPro ES-type name[4 & 5]								
240	16 bit	EntelliPro ES-type name[6 & 7]								
241	16 bit	EntelliPro ES-type name[8 & 9]								
242	16 bit	EntelliPro ES-type name[10 & 11]								
243	16 bit	EntelliPro ES-type name[12 & 13]								
244	16 bit	EntelliPro ES-type name[14 & 15]								
245	16 bit	EntelliPro ES-type name[16 & 17]								
246	16 bit	EntelliPro ES-type name[18 & 19]								
247	16 bit	EntelliPro ES-type name[20 & 21]								

Function Code 04 - Read Input Registers

53 = Low byte / 54 = high byte

Input Register Address	Data Size	Parameter Name	Units	Scale	Format	Note
53 (L) 54 (H)	32 bit	Phase A Current (RMS)	mAmps		Unsigned Integer	53 = L = Low byte / 54 = H = high byte
55 (L) 56 (H)	32 bit	Phase B Current (RMS)	mAmps		Unsigned Integer	
57 (L) 58 (H)	32 bit	Phase C Current (RMS)	mAmps		Unsigned Integer	
59 (L) 60 (H)	32 bit	Average Phase Current (RMS)	mAmps		Unsigned Integer	
61 (L) 62 (H)	32 bit	Earth fault current (RMS)	mAmps		Unsigned Integer	
63	16 bit	Time to Trip	seconds		Unsigned Integer	
64	16 bit	Time to Reset	seconds		Unsigned Integer	
65 (L) 66 (H)	32 bit	Phase A Trip Current (RMS)	mAmps		Unsigned Integer	
67 (L) 68 (H)	32 bit	Phase B Trip Current (RMS)	mAmps		Unsigned Integer	
69 (L) 70 (H)	32 bit	Phase C Trip Current (RMS)	mAmps		Unsigned Integer	
71 (L) 72 (H)	32 bit	Average Trip Phase Current (RMS)	mAmps		Unsigned Integer	
73 (L) 74 (H)	32 bit	Max Phase A Current (HI 16 bits) (RMS)	mAmps		Unsigned Integer	
75 (L) 76 (H)	32 bit	Max Phase B Current (HI 16 bits) (RMS)	mAmps		Unsigned Integer	
77 (L) 78 (H)	32 bit	Max Phase C Current (HI 16 bits) (RMS)	mAmps		Unsigned Integer	
79	16 bit	Max Average Phase Current	mAmps		Unsigned Integer	
80	16 bit	Max GF Phase Current	mAmps			
81	16 bit	Time Year			Unsigned Integer	
82	16 bit	Time Month			Unsigned Integer	
83	16 bit	Time Date			Unsigned Integer	
84	16 bit	Time Day			Unsigned Integer	
85	16 bit	Time Hour			Unsigned Integer	
86	16 bit	Time Minute			Unsigned Integer	
87	16 bit	Time Second			Unsigned Integer	
88	16 bit	Time Tenths/Hundredths of Seconds			Unsigned Integer	

Input Register Address	Data Size	Parameter Name	Units	Scale	Format	Note
89	16 bit	Event Code 0 = Thermal Overload Fault 1 = Thermistor Fault 2 = Ground Fault Sum Fault 3 = Unbalanced Load Fault 4 = Phase Loss Fault 5 = Emergency Stop Fault 6 = Limit Switch Fault 7 = Safety Circuit Fault 8 = Main Circuit Fault 9 = Control Circuit Fault 10 = Switch Position Fault 11 = Underload Current Fault 12 = Overload Current Fault 13 = External Supervision Fault 14 = Long Start Time Fault 15 = Typical Specific Fault 16 = Thermal Overload Warning 17 = Thermistor Warning 18 = Ground Fault Sum Warning 19 = Unbalanced Load Warning 20 = Phase Loss Warning 21 = Emergency Stop Warning 22 = Limit Switch Warning 23 = Safety Circuit Warning 24 = Main Circuit Warning 25 = Control Circuit Warning 26 = Switch Position Warning 27 = Underload Current Warning 28 = Overload Current Warning 29 = External Supervision Warning 30 = Long Start Time Warning 31 = Typical Specific Warning 32 = Contactor 1 Feedback Status On 33 = Contactor 2 Feedback Status On 34 = ESS DP Parameter Mode On 35 = Switch Protected Status On 36 = Start Attempt Status On 37 = Drawer Ready Status On 38 = General Warning Status On 39 = General Fault Status On 40 = Safety Circuit Status On 41 = ESS DP Local Mode Status On 42 = ESS DP Remote Mode Status On 43 = Drawer Operation Mode Status On 44 = Drawer Test Mode Status On 45 = Limit Switch 1 Status On 46 = Limit Switch 2 Status On 47 = General Device Error Status On 48 = Feedback Identification Status On 49 = Class 1 Failure On 50 = Modbus Failure On 51 = Bypass Switched On Status On 52 = Switching 1 Progess Status On 53 = Switching 2 Progress Status On 54 = Breaker Tripped Status On 55 = Status Charged Status On 56 = Torque Switching 1 Status On 57 = Torque Switching 2 Status On 58 = Start Phase On 59 = Run Phase On 60 = Thermistor Line Broken 61 = Thermistor Line Shorted 62 = Reserved Status 30 On 63 = Reserved Status 31 On 64 = Parameter Error 65 = Watchdog Error 66 = EEPROM Error 67 = Start Attempt Error 68 = Thermistor Test Fail 69 = Modbus ON 1 On 70 = Modbus ON 2 On 71 = Class 1 ON 1 On 72 = Class 1 ON 2 On 73 = Class 1 OFF On 74 = Class 2 ON 1 On 75 = Class 2 ON 2 On 76 = Class 2 OFF On 77 = Hardwire ON 1 On 78 = Hardwire ON 2 On 79 = Hardwire OFF On 128 = Thermal Overload Fault Reset 129 = Thermistor Fault Reset 130 = Ground Fault Sum Fault Reset 131 = Unbalanced Load Fault Reset 132 = Phase Loss Fault Reset			Unsigned Integer	Indicates the event type base on Index selected on holding regsiter 101

Input Register Address	Data Size	Parameter Name	Units	Scale	Format	Note
89 (cont.)	16 bit	133 = Emergency Stop Fault Reset 134 = Limit Switch Fault Reset 135 = Safety Circuit Fault Reset 136 = Main Circuit Fault Reset 137 = Control Circuit Fault Reset 138 = Switch Position Fault Reset 139 = Underload Current Fault Reset 140 = Overload Current Fault Reset 141 = External Supervision Fault Reset 142 = Long Start Time Fault Reset 143 = Typical Specific Fault Reset 144 = Thermal Overload Warning Reset 145 = Thermistor Warning Reset 146 = Ground Fault Sum Warning Reset 147 = Unbalanced Load Warning Reset 148 = Phase Loss Warning Reset 149 = Emergency Stop Warning Reset 150 = Limit Switch Warning Reset 151 = Safety Circuit Warning Reset 152 = Main Circuit Warning Reset 153 = Control Circuit Warning Reset 154 = Switch Position Warning Reset 155 = Underload Current Warning Reset 156 = Overload Current Warning Reset 157 = External Supervision Warning Reset 158 = Long Start Time Warning Reset 159 = Typical Specific Warning Reset 160 = Contactor 1 Feedback Status Off 161 = Contactor 2 Feedback Status Off 162 = ESS DP Parameter Mode Off 163 = Switch Protected Status Off 164 = Start Attempt Status Off 165 = Drawer Ready Status Off 166 = General Warning Status Off 167 = General Fault Status Off 168 = Safety Circuit Status Off 169 = ESS DP Local Mode Status Off 170 = ESS DP Remote Mode Status Off 171 = Drawer Operation Mode Status Off 172 = Drawer Test Mode Status Off 173 = Limit Switch 1 Status Off 174 = Limit Switch 2 Status Off 175 = General Device Error Status Off 176 = Feedback Identification Status Off 177 = Class 1 Failure Off 178 = Modbus Failure Off 179 = Bypass Switched On Status Off 180 = Switching 1 Progess Status Off 181 = Switching 2 Progress Status Off 182 = Breaker Tripped Status Off 183 = Status Charged Status Off 184 = Torque Switching 1 Status Off 185 = Torque Switching 2 Status Off 186 = Start Phase Off 187 = Run Phase Off 188 = Thermistor Line Not Broken 189 = Thermistor Line Not Shorted 190 = Reserved Status 30 Off 191 = Reserved Status 31 Off 192 = Parameter No Error 193 = Watchdog No Error 194 = EEPROM No Error 195 = Start Attempt No Error 196 = Thermistor Test Not Fail 197 = Modbus ON 1 Off 198 = Modbus ON 2 Off 199 = Class 1 ON 1 Off 200 = Class 1 ON 2 Off 201 = Class 1 OFF Off 202 = Class 2 ON 1 Off 203 = Class 2 ON 2 Off 204 = Class 2 OFF Off 205 = Hardwire ON 1 Off 206 = Hardwire ON 2 Off 207 = Hardwire OFF Off			Unsigned Integer	Indicates the event type base on Index selected on holding regsiter 101
90	16 bit	Event Tenths/Hundredths of Seconds			Unsigned Integer	Event of Input register 89 date and time
91	16 bit	Event Seconds			Unsigned Integer	
92	16 bit	Event Minutes			Unsigned Integer	Event Time Stamp
93	16 bit	Event Hours			Unsigned Integer	Event Time Stamp
94	16 bit	Event Date			Unsigned Integer	Event Date
95	16 bit	Event Month			Unsigned Integer	Event Date
96	16 bit	Event Year			Unsigned Integer	Event Date
97	16 bit	"Analog RMS Value Log Data Ready 0 - Data Not Ready to be retrived 1 - Data Ready to be retrived"			Unsigned Integer	0 - Data not ready to be retrieved. 1 - Data ready to be retrieved.

Input Register Address	Data Size	Parameter Name	Units	Scale	Format	Note
100 101	32 bit	EntelliPro ES Status bit0 - Contactor1FeedbackStatus			Unsigned Integer	Status Definition When Relay 41 is turned ON , on receiving the feedback signal from of the the mapped input, the status will be set to 1
		bit1 - Contactor2FeedbackStatus				When Relay 43 is turned ON , on receiving the feedback signal from of the the mapped input, the status will be set to 1
		bit2 – ParameterModeStatus				When an OFF command is received by the Remote source, and the switch control is set to local, and the block local switch ON is actiavted, the status will be set to 1
		bit3 - SwitchProtectedStatus / BlockLocalSwitchON				When the Start attempts exceeds the parmeterized counter,the status will be set
		bit4 – StartAttempt				When there is no fault or device error, the local-remote-off switch position is set, drawer mode is selected and no OFF command is issued, status will be set to 1
		bit5 – DrawerReadyStatus				When any warning exist, the status will be set to 1
		bit6 – GeneralWarningStatus				When any fault exist, the status will be set to 1
		bit7 – GeneralFaultStatus				When there is safety circuit digital input, this bit would be set to 1
		bit8 - Safety circuitStatus				When the local-remote-off switch is set to local, the status will be set to 1 source
		bit9 - ESS_DPLocalModeStatus				When the local-remote-off switch is set to remote, the status will be set to 1 source
		bit10 - ESS_DPRemoteModeStatus				When drawer is in operation mode, the status will be set to 1
		bit11 - DrawerOperationMode Status				When drawer is in test mode, the status will be set to 1
		bit12 - DrawerTestModeStatus				When limit switch1 digital input is present, the status will be set to 1
		bit13 - LimitSwitch1Status				When limit switch2 digital input is present, the status will be set to 1
		bit14 - LimitSwitch2Status				When any of device error exist, the status will be set to 1
		bit15 – GeneralDeviceErrorStatus				When command is received to identify the EntelliPro ES, the status will be set to 1
		bit16 – Feedback_IdentificationStatus				When there is a Profibus Class1 failure, the status will be set to 1
		bit17 - Class1Failure				When there is a Modbus failure, the status will be set to 1
		bit18 - ModbusFailure				Typical Specific-- Need to have corresponding digital input
		bit19 - ByPassSwitchedON				When relay 41 is ON and no feedback is yet received, the status will be set to 1
		bit20 - Switching1Progress				When relay 43 is ON and no feedback is yet received, the status will be set to 1
		bit21 - Switching2Progress				Typical Specific-- Need to have corresponding digital input
		bit22 - BreakerTripped2				Typical Specific-- Need to have corresponding digital input
		bit23 -StatusCharged				Typical Specific-- Need to have corresponding digital input
		bit24 - TorqueSwitching1Progress				Typical Specific-- Need to have corresponding digital input
		bit25 - TorqueSwitching2Progress				
		bit26 -StartPhase				When the motor is in the start phase, the status will be set to 1
		bit27 -RunPhase				When the motor is in the run phase, the status will be set to 1
		bit28 - ThermistorLineBroken				When there is thermistor open failure, the status will be set to 1
		bit29 -Thermistor Line Shorted				When there is thermistor short failure, the status will be set to 1

Input Register Address	Data Size	Parameter Name	Units	Scale	Format	Note
102	16 bit	Fault Type BIT0 - Overload Failure (Trip) BIT1 - Phase Loss Failure (Trip) BIT2 - Gf Failure (Trip) (trip) BIT3 - Unbalanced Load Failure (Trip) BIT4 - Thermistor Failure (Trip) BIT5 - Emergency Stop Failure (Trip) BIT6 - LimitSwitch Failure (Trip) BIT7 - SafetyCircuit Failure (Trip) BIT8 - MainCircuit Failure (Trip) BIT9 - ControlCircuit Failure (Trip) BIT10 - SwitchPosition Failure (Trip) BIT11 - UnderLoadCurrent Failure (Trip) BIT12 - OverLoadCurrent Failure (Trip) BIT13 - ExternalSupervision Failure (Trip) BIT14 - LongStart Failure (Trip) BIT15 - TypicalSpecific Failure (Trip)			Unsigned Integer	"1 means the fault has occurred To clear the fault refer to FC 04 command 65-80"
103	16 bit	Warning Type BIT0 - OverloadWarning BIT1 - Phase Loss Warning BIT2 - GfWarning BIT3 - UnbalancedLoadWarning BIT4 - ThermistorWarning BIT5 - EmergencyStopWarning BIT6 - LimitSwitchWarning BIT7 - SafetyCircuitWarning BIT8 - MainCircuitWarning BIT9 - ControlCircuitWarning BIT10 - SwitchPositionWarning BIT11 - UnderLoadCurrentWarning BIT12 - OverLoadCurrentWarning BIT13 - ExternalSupervisionWarning BIT14 - LongStartWarning BIT15 - TypicalSpecificWarning			Unsigned Integer	"1 means the Alarm has occured To clear the fault refer to FC 04 command 81-96"
104	16 bit	Device Error Type BIT0 - Free BIT1 - Free BIT2 - ParameterError BIT3 - WatchdogError BIT4 - Free BIT5 - Free BIT6 - NOVRAM/EEPROMError BIT7 - Reserved BIT8 - Free BIT9 - Thermistor hardware BIT10 - 15 - Free			Unsigned integer	"1 means the Device Error has occured To clear the fault refer to FC 04 command 97-106"
110	16 bit	Profibus Slave Address			Unsigned Integer	
112	16 bit	Event Log Index Counter				Indicates the most recent event index in the event log.
113	16 bit	Counter1 Value				
114	16 bit	Counter2 Value				
115	16 bit	Counter3 Value				
116	16 bit	Counter4 Value				

4.2 Profibus

4.2.1 Definitions

To better understand this chapter some key definitions are described below:

Profibus DP (Process Field Bus)	An open standard based on EN 50170 for field bus communication with DP communication protocol. DP variant (decentralized periphery) is the high-speed communication. Profibus DP allows cyclic data transfer only between the automation device (master) and the peripheral devices in a network. The cyclic data transfer involves parameters, metering, and diagnostic, analog, and alarm data. See Table 4-12 for a complete list of cyclic telegrams.
Profibus DPV1	An extension of the DP protocol, which in addition to the cyclic communication, provides acyclic communication for parameterization, alarm, diagnostic, analog, RTC control, and control of the slaves.
A Profibus DP slave	Any peripheral device, such as EntelliPro ES DP, which processes information and sends its output to the Profibus class 1 and/or class 2 master. It must comply with EN 50 170 standard, Volume 2, Profibus.
Class 1 master	The main controller for the high-speed data exchange with its Profibus slave devices that is usually a programmable logic controller (PLC) or a PC running Profibus base logic.
Class 2 master	An optional Profibus master that is mainly used to set-up and monitor parameters during system commissioning. GE provides WinESG with full parameterization and diagnos tic capability, as a class 2 master. Please refer to Chapter 5 for WinESG set-up.
GSD	A device data (GSD), which is provided by GE on its website, that has the operational characteristic of the EntelliPro ES DP. It provides the system with an easier means to change communication options, diagnostic, metering among other parameters.

4.2.2 Profibus System concept

Figure 4.4 shows the the communication network system overview consisting of:

Profibus class 1 master (PLC or PC), with cyclic data exchange

Profibus class 2 master (WinESG), which provides acyclic data exchange

EntelliPro ES which are Profibus DP slaves

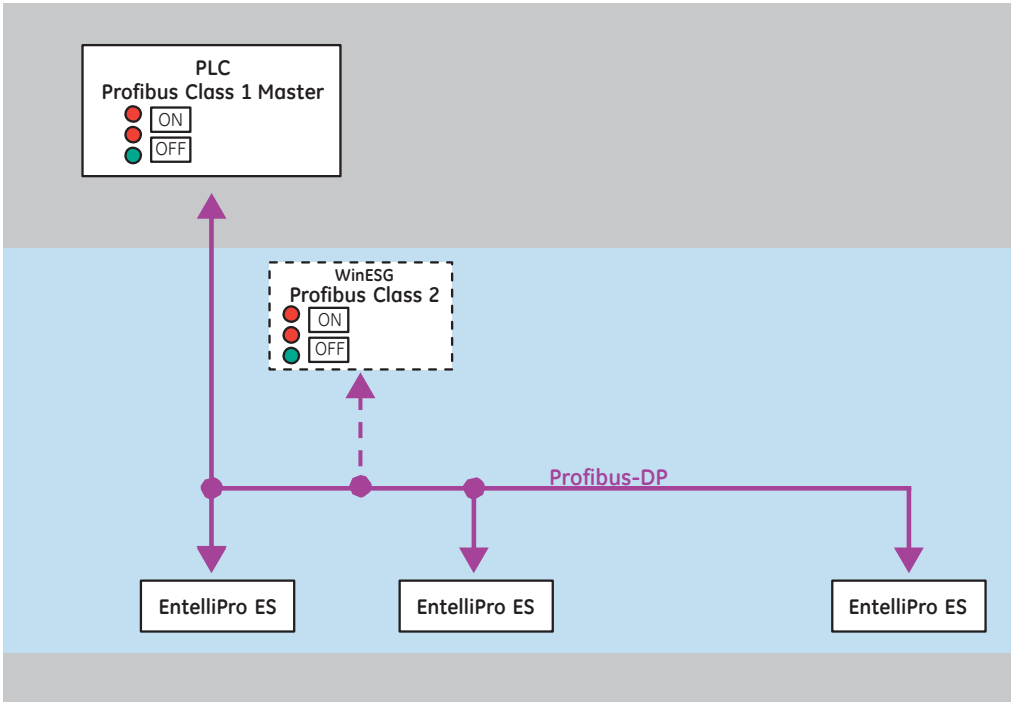


Figure 4-4: EntelliPro ES Network System

4.2.3 Profibus Interface

The EntelliPro ES supports DPV0 and DPV1 protocols, which is comprised of Cyclic and Acyclic data transfer.

The external connections through the Profibus interface (female D-sub connector) are as follows:

D-Sub Connector Pin	Connection (external device)
V–	Pin 5
L	Pin 8, line A (negative TX/RX)
H	Pin 3, line B (positive TX/RX)
V+	Pin 6

Table 4.10 Profibus interface external connections

The Communication LED indicates the status of Profibus interface:

LED	Color	Description
Communication	Solid amber	Cyclic communication ok
	Random flashing amber	Acyclic communication / Modbus communication
	Flashing one second ON one second OFF	No Profibus or Modbus communication or communication error

Table 4.11 Profibus LED indications

When used for Profibus, the Fieldbus port has the following characteristics:

Baud rate: 9600, 19200, 93750, 187500, 500000, 1.5M, 3M, 6M and 12M bps (with autodetect)

Address: 1 to 125 – settable through the front switches. Switches setting above 125, will default to 126.

Vendor ID: 0x500E

Data table size: Max_Data_Len = 162, Input_Data_Len = 144 bytes, Output_Data_Len = 18 bytes

The Profibus DP Master must read the GSD (Device Master Data) file of the EntelliPro ES for the purposes of configuration and parameterization. The GSD file for the EntelliPro ES is named GE500E.GSD and it is available on the WinESG CD.

4.2.4 Profibus termination

The Profibus port provides a 5V, so no external voltage is required (pin 5 (V-) and pin 6 (V+) of the 9-D connector). This 5Vdc can be used for an active termination.

4.2.5 Profibus DP-parameterization

The EntelliPro ES supports parameterization. The relay keeps its user parameter data / setpoints in a non-volatile memory and does not need device related parameterization during startup of the DP master. The EntelliPro ES WinESG user software is the best tool for user parameterization of the EntelliPro ES device. See Chapter 5 for the WinESG setup.

EntelliPro can be parameterized via Profibus Class 1 using Profibus parameterized service. In this case only default configurations are allowed.

4.2.6 Communication set up and station addresses

The Profibus-DPV1 basic configuration has one DP master and one DP slave. In a typical bus segment up to 32 stations can be connected (a repeater has to be used if more than 32 stations operate on a bus). The end nodes on a Profibus-DP network must be terminated to avoid reflections on the bus line.

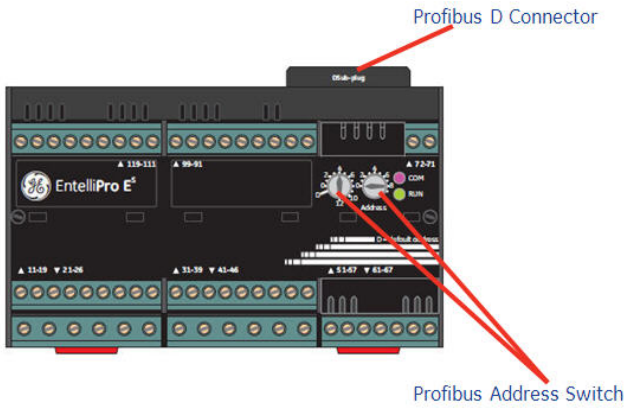
During projecting of the bus structure ensure that the bus line is segmented dependent upon the length of the branch lines, the maximum cable length, and the number of bus stations. The allowed lengths depends upon transmission speed and are indicated in the profi bus standard DIN 19245-3 and in other publications dealing with this topic.

The Profibus bus address (MAC ID) of the EntelliPro ES slave, which has a range from 1 to 125, can be set via the front cover switches. At power up, the EntelliPro ES reads its address from the two rotary switches on its front and initializes the bus communication. Changes of the station address take effect with the next reset or power up.

The EntelliPro ES supports autobaud. The available baud rates and other slave specific information needed for configuration are in the EntelliPro ES GSD file, which is used by a network configuration program.

To communicate with a Class 1 master (PLC) in a system, the EntelliPro ES GSD file is required.

Figure below shows the Profibus Profibus adress and connection.



When the left switch is set to "0" and the right switch is set to "7", Profibus address is equal to "7".

When the left switch is set to "8" and the right switch is set to "7", Profibus address is equal to "87".

When the switch position is set to "D" the Profibus address automatically defaults to "126.

NOTE

NOTE: The new Profibus address will only take affect after power cycle the EntelliPro ES. Two or more EntelliPro ES devices with the same address on the bus line, will generate a communication failure

4.2.7 Profibus DP Cyclic Data

The cyclic data is a fast process data transfer between the Profibus DP master and the slave which occurs once every DP cycle. EntelliPro ES is a modular device supporting up to 144 bytes of input data and 18 bytes of output data. Modules define a block size of input and output data to be read by the master, starting from offset zero. During the network configuration session, modules with varying sizes of input data are provided in the GSD file.

Table 4-12 shows the EntelliPro ES cyclic input and output data provided in the GSD file. Refer to section 4.2.10 for an example of master configuration.

	EntelliPro ES DP Data Objects		Length	Direction	
Data Type	**DP V0 (Cyclic)**		**(Byte)**	**Master**	**Slave**
Input	B 2	Identification telegram	34		<<==
Input	B 2720	Device ID telegram	36		<<==
Output	B 10008	Control telegram	4	==>>	
Input	B 20008	Status telegram	4		<<==
Input	B 30008	Fault telegram	2		<<==
Input	B 30264	Warning telegram	2		<<==
Input	B 30776	Unit failure telegram	2		<<==
Input	B 2704	Current measurement telegram	24		<<==
Input	B 2705	Fault current telegram	16		<<==
Input	B 2706	Maximum current telegram	16		<<==
Input	B 2707	Switch counter telegram	4		<<==
Input	B 2708	Operating hours telegram	4		<<==
Output	B 2701	Reset telegram	8	==>>	
Input	B 2721	Debug telegram	64		<<==
Output	B 2702	Set telegram	6	==>>	
Input	B 2709	Phase-current L1 telegram	4		<<==
Input	B 2710	Phase-current L2 telegram	4		<<==
Input	B 2711	Phase-current L3 telegram	4		<<==
Input	B 2712	Current average value telegram	4		<<==
Input	B 2713	Earth fault current telegram	4		<<==
	Additional Telegrams not applicable to EntelliPro ES as ESS-DP retrofit				
Input	B2734	Additional Counter for V5	43		<<==
Input	B40004	Dynamic Status data Block	2		<<==
Input	B40009	Debug ESSV5	4		<<==

Table 4-12: EntelliPro ES DP Input and output data

4.2.7.1 EntelliPro ES Cyclic Read Telegram Definitions

The following table shows the detailed input telegram definitions.

16-bit Reserved 0x0000 2

Size	Telegram Name	Description	Default	Bytes	Unit	Scale
	B2	**Identification Telegram**		**34**		
16-bit	Type Identifier	8 = ESS-DP V4 9 = bse3-7-dp (not applicable) 12 - EntelliPro ES	12	2		
16-bit	Software Release Measurement Processor	*Software revision (format high byte = x low byte = xxx - 1.002	0x0102	2		
16-bit	Reserved		0x0000	2		
8-bit * 6	Logic version	Free programming Logic ID		6		
16-bit	Reserved		0x0000	2		
16-bit	Reserved		0x0000	2		
8-bit * 18	Reserved		0	18		
	B2720	**Device ID Telegram**		**36**		
8-bit * 24	EntelliPro ES Service ID Telegram	EntelliPro Catalog depende		24		
	Format					
8-bit	1	(Format: 1, 2, 3 .....23, 24)				
8-bit	2					
8-bit	3					
8-bit						
8-bit '						
8-bit						
8-bit						
8-bit						
8-bit						
8-bit						
8-bit						
8-bit						
8-bit '						
8-bit						
8-bit						
8-bit						
8-bit						
8-bit						
8-bit						
8-bit						
8-bit	23					
8-bit	24					

*Software revision format: x.xxx most significant byte = x,

Size	Telegram Name	Description	Default	Bytes	Unit	Scale
8-bit * 12 8-bit 8-bit 8-bit 8-bit 8-bit 8-bit 8-bit 8-bit 8-bit 8-bit 8-bit 8-bit	Serial number format - 1 2 3 4 5 6 7 8 9 10 11 12	Serial Number dependent (Format 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12)		12		
4 * 8-bit	**B20008**	**Status Telegram**		**74**		
1	BIT0 - Contactor1 Feedback Status	1 indicates that contactor1 feedback input is received. Note that the input must be mapped - refer telegram B40001	Configuration dependent	4		
	BIT1 - Contactor2 Feedback Status	1 indicates that contactor2 feedback input is received. Note that the input must be mapped.				
	BIT2 - Parameter Mode Status	1 indicates that parameterization is allowed. This must be enabled to change telegram B2736 -46 bit 3/4:				
	BIT3 - Switch Protected Status	1 indicates: OFF command is received by the Remote source when switch is in LOCAL position, motor cannot be turned ON from the local source again till this bit cleared - set to zero Provided block Local switch ON feature is actiavted - can be activated on configuration telegram (40001 43 bit6 must be set)				
	BIT4 - Start Attempt Status	1 indicates the Start attempts has exceeded the parmeterized count.				
	BIT5 - Drawer Ready Status	1 indicates that the motor is ready to start (must be 1 for motor to start)				
	BIT6 - General Warning Status	1 indicates there is a general warning. Telegram B30264 provides additional warning details. To reset warning refer to write telegram B				
	BIT7 - General Fault Status	1 indicates there is a general failure. Telegram B30008 provides additional details.				

Size	Telegram Name	Description	Default	Bytes	Unit	Scale
2	BIT0 - Safety circuitStatus	1 indicates that safety circuit input is set. Input must be mapped.				
	BIT1 - EntelliPro Local Mode Status	1 indicates that switch position is set to local. If hardwire is contrlling the switch then digital input must be mapped.				
	BIT2- EntelliPro Remote Mode Status	1 indicates that Switch position is set to remote. Input must be mapped.				
	BIT3 - Drawer Operation Mode Status	1 indicates that drawer is in operation mode. Input must be mapped. Also configurion telegram B40001 43 bit 3 - ActivateDrawerPositionSupervision must be set.				
	BIT4- Drawer Test Mode Status	1 indicates that drawer is in test mode. Input must be mapped ActivateDrawerPositionSupervision must be set.				
	BIT5 - Limit Switch1 Status	1 indicates that limit switch 1 is set.				
	BIT6 - Limit Switch2 Status	1Indicates that limit switch2 is set.				
	BIT7- General Device Error Status	1 indicates there is a general device error.				
3	BIT0 - Feedback_IdentificationStatus	1 indicates the feedback from identification command - output must be mapped optional as soon as the ID command is issued this bit is set.				
	BIT1 - Class1Failure	1 indicates Profibus Class1 failure				
	BIT2 - ModbusFailure	1 indicates Modbus failure				
	BIT3 - ByPassSwitchedON	1 indicates by-pass switch on. Input must be mapped.				
	BIT4 - Switching1Progress	1 indicates switching is progress. Input must be mapped as well as the corresponding output.				
	BIT5 - Switching2Progress	1 indicates switching is progress. Input must be mapped as well as the corresponding output.				
	BIT6 - Breaker Tripped 2	1 indicates Breaker tripped. Input must be mapped.				
	BIT7 -Status Charged	1 indicates status charge. Input must be mapped.				
4	BIT0 - TorqueSwitching1Progress	1 indicates torque switching is in progress. Input must be mapped as well as the corresponding output.				
	BIT1 - TorqueSwitching2Progress	1 indicates torque switching is in progress. Input must be mapped as well as the corresponding output.				
	BIT2 -Start Phase	1 indicates the motor is in the start phase.				
	BIT3 -RunPhase	1 indicates that the morot is in the run phase.				
	BIT4 - ThermistorLineBroken	1 indicates thermistor line open.				
	BIT5-ThermistorLineShorted	1 indicates thermistor line shorted.				
	BIT6 - Free					
	BIT7 - Free					

Size	Telegram Name	Description	Default	Bytes	Unit	Scale
2 * 8-bit	B30008	Failure Telegram		2		
5	BIT0 - Overload Failure	1 indicates Overload Failure (Trip)				
	BIT1 - Phase Loss Failure	1 indicates Phase Loss Failure (Trip)				
	BIT2 - Ground Fault Failure	1 indicates Ground Fault Failure (Trip)				
6	BIT3 - Unbalanced Load Failure	1 indicates Phase Unbalance Failure (Trip)				
	BIT4 - Thermistor Failure	1 indicates Thermistor Failure (Trip)				
	BIT5 - Emergency Stop Failure	1 indicates Emergency Stop Failure (Trip). Input must be mapped.				
	BIT6 - Limit Switch Failure	1 indicates Limit Switch failure - applicable to solenoid & actuator typicals only.				
	BIT7 - Safety Circuit Failure	1 indicates safety circuit failure. Input must be mapped.				
	BIT0 - Main Circuit Failure	1 indicates Main circuit failure. Input must be mapped.				
	BIT1- Control Circuit Failure	1 indicates control circuit failure. Input must be mapped.				
	IT2 - Switch Position (relay feedback) Failure	1 indicates contactor feedback position failure. Input must be mapped.				
	BIT3 - Under Load Current Failure	1 indicates underload current failure (Trip).				
	BIT4 - Overload / lock rotor etc Current Failure	1 indicates overload/lock motor failure.				
	BIT5 - External Supervision Failure	1 indicates supervision circuit failure.				
	BIT6 - Long Start Failure	1 indicates long start.				
	BIT7 - Typical Specific Failure	Used on custom logic only.				
2 * 8-bit	B30264	Warning Telegram		2		
7	BIT0 - Overload Warning	1 indicates Overload warning				
	BIT1 - Phase Loss Warning	1 indicates Phase Loss warning				
	BIT2 - Ground Fault Warning	1 indicates Ground Fault warning				
	BIT3 - Unbalanced Load Warning	1 indicates Phase Unbalance warning				
	BIT4 - Thermistor Warning	1 indicates Thermistor warning				
	BIT5 - Emergency Stop Warning					
	BIT6 - Limit Switch Warning					
	BIT7 - Safety Circuit Warning					
8	BIT0 - Main Circuit Warning	1 indicates Overload warning				
	BIT1 - Control Circuit Warning	1 indicates Phase Loss warning				
	BIT2 - Contactor Feedback Warning	1 indicates Ground Fault warning				
	BIT3 - Under Load Current Warning	1 indicates Phase Unbalance warning				
	BIT4 - Over Load Current Warning	1 indicates Thermistor warning				
	BIT5 - External Supervision Warning					
	BIT6 - Long Start Warning					
	BIT7 - Typical Specific Warning					

Size	Telegram Name	Description	Default	Bytes	Unit	Scale
2 * 8-bit	B30776	Device Error Telegram		2		
9	BIT0 - Reserved BIT1 - Reserved BIT2 - Parameter Error BIT3 - Watchdog Error BIT4 - Free BIT5 - Free BIT6 - EEPROM Error BIT7 - Free	Free Free 1 indicates parameter error 1 indicates watchdog error Free Free 1 indicates EEPROM error Free	0x00			
10	BIT0-Start Attempt BIT1 - Thermistor Test BIT2 - Free BIT3 - Free BIT4 - Free BIT5 - Free BIT6 - Free BIT7 - Free	1 indicates that the number of start attempts has exceed the predefined value. 1 indicates thermistor hardware error has occurred.	0x00			
	B2704	Current Measurement	Note	Bytes	Unit	Scale
32-bit	RMS Phase current L1	Phase A Current measurement		4	mAmps	
32-bit	RMS Phase current L2	Phase B Current measurement		4	mAmps	
32-bit	RMS Phase current L3	Phase C Current measurement		4	mAmps	
32-bit	Phase current Average	Average Current measurement		4	mAmps	
32-bit	Phase current Ground fault	Ground Fault current measurement		4	mAmps	
16-bit	Time to trip	Time to trip		2	Seconds	
16-bit	Time to reset	Time to Reset (time must expire before reset)		2	Seconds	
	B2705	Trip (Failure) Telegram				
32-bit	RMS Trip current L1	Phase A Current at trip time		4	mAmps	
32-bit	RMS Trip current L2	Phase B Current at trip time		4	mAmps	
32-bit	RMS Trip current L3	PhaseC Current at trip time		4	mAmps	
32-bit	Trip current Average	Average Current at trip time		4	mAmps	
	B2706	Max Current Telegram				
32-bit	Maximum RMS current L1	Maximun Phase A Current measurement		4	mAmps	
32-bit	Maximum RMS current L2	Maximun Phase B Current measurement		4	mAmps	
32-bit	Maximum RMS current L3	Maximun Phase C Current measurement		4	mAmps	
32-bit	Maximum current Average	Maximum Average Current measurement		4	mAmps	
	B2707	Switch Counter Telegram				
32-bit	Switch Counter	Number of Motor Start	0x00	4		
	B2708	Operating Hours Telegram				
32-bit	Operating Hours	Hour of Motor operation	0x00	4	Hour	

Size	Telegram Name	Description	Default	Bytes	Unit	Scale
	B2721	Debug Telegram		64		
	Cyclic Control Byte 2	BE 16 15 14 13 12 11 10 9				
	Cyclic Control Byte 3	BE 24 23 22 21 20 19 18 17				
	Acyclic Control Byte 1	BEAC 16 15 14 13 12 11 10 9				
	Reset Failure Telegram Byte 1	BERS 8 7 6 5 4 3 2 1				
	Reset Failure Telegram Byte 2	BERS 16 15 14 13 12 11 10 9				
	Reset Warning Telegram Byte 1	BERW 8 7 6 5 4 3 2 1				
	Reset Warning Telegram Byte 2	BERW 16 15 14 13 12 11 10 9				
	Reset Device Error Telegram Byte 1	BERG 8 7 6 5 4 3 2 1				
	Reset Device Error Telegram Byte 2	BERG 16 15 14 13 12 11 10 9				
	Timer Expiry Flags Byte1	TA 8 7 6 5 4 3 2 1				
	Timer Expiry Flags Byte2	TA 16 15 14 13 12 11 10 9				
	Timer Start Flags Byte1	TE 8 7 6 5 4 3 2 1				
	Timer Start Flags Byte2	TE 16 15 14 13 12 11 10 9				
	Counter Expiry Flag	ZA - - - - 4 3 2 1				
	Counter Reset Flag	ZR 4 3 2 1 ZE4 3 2 1				
	MA_0;	MA 8 7 6 5 4 3 2 1				
	MA_1;	MA 16 15 14 13 12 11 10 9				
	MA_2;	MA 24 23 22 21 20 19 18 17				
	MS_0;	MS 8 7 6 5 4 3 2 1				
	MS_1;	MS 16 15 14 13 12 11 10 9				
	MS_2;	MS 24 23 22 21 20 19 18 17				
	MR_0;	MR 8 7 6 5 4 3 2 1				
	MR_1;	MR 16 15 14 13 12 11 10 9				
	MR_2;	MR 24 23 22 21 20 19 18 17				
	MA_3;	MA 32 31 30 29 28 27 26 25				
	MA_4;	MA 40 39 38 37 36 35 34 33				
	MA_5;	MA 48 47 46 45 44 43 42 41				
	MS_3;	ME 32 31 30 29 28 27 26 25				
	MS_4;	ME 40 39 38 37 36 35 34 33				
	MS_5;	ME 48 47 46 45 44 43 42 41				
	SEA_0;	SEA 8 7 6 5 4 3 2 1				
	SEA_1;	SEA 16 15 14 13 12 11 10 9				
	SEA_2;	SEA 24 23 22 21 20 19 18 17				
	SEA_3;	SEA 32 31 30 29 28 27 26 25				
	SEG_0;	SEG 8 7 6 5 4 3 2 1				
	SEG_1;	SEG 16 15 14 13 12 11 10 9				
	SEG_2;	SEG 24 23 22 21 20 19 18 17				
	SEG_3;	SEG 32 31 30 29 28 27 26 25				
	SE_0;	SE 8 7 6 5 4 3 2 1				
	SA_0;	SA 8 7 6 5 4 3 2 1				
	Special Fucntion_0	PMF 8 7 6 5 4 3 2 1				
	Special Fucntion_1	PMF 16 15 14 13 12 11 10 9				
	Reset Configuration_LO	PMQ 8 7 6 5 4 3 2 1				
	Reset Configuration_HIGH	PMQ 16 15 14 13 12 11 10 9				
	Protection / Input Configuration_LO	PMS 8 7 6 5 4 3 2 1				
	Protection / Input Configuration_HIGH	PMS 16 15 14 13 12 11 10 9				
	Config_ResetMode Selection	PM - - - - - - S17 Q17				
	Bus failure Behaviour	BV 8 7 6 5 4 3 2 1				
	Under Volatge Behavior	UV 8 7 6 5 4 3 2 1				
	Acyclic Control Byte2	BEAC 24 23 22 21 20 19 18 17				

Size	Telegram Name	Description	Default	Bytes	Unit	Scale
	B2734	Additonal Counter (not available on EntelliPro ES Retrofit version)		43		
32-bit	Contactor 1 Operations Counter			4		
32-bit	Contactor 2 Operations Counter			4		
32-bit	Contactor 3 Operations Counter			4		
32-bit	Contactor 4 Operations Counter			4		
16-bit	Thermal Overload trips Counter			2		
16-bit	Thermistor trips Counter			2		
16-bit	Ground Fault Sum Trip Counter			2		
32-bit	Hours of non-operation (Motor stopped hours)			4		
8-bit	Event Log Index Counter			1		
16-bit	Reserved			4		
16-bit	Reserved			4		
16-bit	Reserved			4		
16-bit	Reserved			4		
	B40009	Debug telegram		4		
8 bit	Modbus Control Byte1	BEAM 8 7 6 5 4 3 2 1				
8 bit	Modbus Control Byte2	BEAM 16 15 14 13 12 11 10 9				
8 bit	Modbus Control Byte 3	BEAM 24 23 22 21 20 19 18 17				
8 bit	Status Telegram- Byte4	BAM 32 31 30 29 28 27 26 25				

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4.2.7.3 EntelliPro ES Cyclic Write Telegram Definitions

The following table shows the detailed write telegram descriptions.

Size	Telegram Name	Description	Note	Bytes
	B10008	**Write Control Telegram**		**4**
	BE (Customer Logic)			4
	BIT0 - Switch command ON1	Setting this Bit to 1 will close contactor 41		
	BIT1 - Switch command ON2	Setting this Bit to 1 will close contactor 43		
	BIT2 - Reserved	Free		
	BIT3 - Reserved	Free		
	BIT4 - Switch command OFF	Setting this Bit to 1 will open contactor 41 and 43		
	BIT5 - Identification	Request to identify EntelliPro ES in a panel. Digital output must be mapped		
	BIT6 - Reserved	Free		
	BIT7 - Reserved for Master not available	Free		
	BIT8 - Switch command locked			
	BIT9 - SW-Operation mode switch Local	Operation mode set to Local (any local devices - Profibus class2, Modbus and/or hardwire) can control the contactors		
	BIT10 - SW-Operation mode switch Remote	Operation mode set to Remote (only the selected remove device can control the contactors		
	Reserved			
	Reserved			
	B2701	**Reset Telegram**		**8**
2 * 8-bit	Reset Fault	Reset Fault		2
1	BIT0 - Overload Failure	1 will reset specific fault		
	BIT1 - Phase Loss Failure			
	BIT2 - Ground Fault Failure			
	BIT3 - Unbalanced Load Failure			
	BIT4 - Thermistor Failure			
	BIT5 - Emergency stop Failure			
	BIT6 - Limit Switch Failure			
	BIT7 - Safety Circuit Failure			
2	BIT0 - Main Circuit Failure			
	BIT1- Control Circuit Failure			
	BIT2 - Switch Position Failure			
	BIT3 - UnderLoad Current Failure			
	BIT4 - Over Load Current Failure			
	BIT5 - External Supervision Failure			
	BIT6 - Long Start Failure			
	BIT7 - Typical Specific Failure			
2 * 8-bit	Reset Warning	Reset Warning		2
3	BIT0 - Overload Warning	1 will reset the specific warning		
	BIT1 - Phase Loss Warning			
	BIT2 - Ground Fault Warning			
	BIT3 - Unbalanced Load Warning			
	BIT4 - Thermistor Warning			
	BIT5 - Emergency stop Warning			
	BIT6 - Limit Switch Warning			
	BIT7 - Safety Circuit Warning			
4	BIT0 - Main Circuit Warning			
	BIT1- Control Circuit Warning			
	BIT2 - Switch Position Warning			
	BIT3 - UnderLoad Current Warning			
	BIT4 - Over Load Current Warning			
	BIT5 - External Supervision Warning			
	BIT6 - Long Start Warning			
	BIT7 - Typical Specific Warning			

Size	Telegram Name	Description	Default	Bytes
2 * 8-bit	Reset Device Errors	Reset Device Errors		2
5	BIT0 - Reserved	1 will reset the specific error		
	BIT1 - Reserved			
	BIT2 - Reset Parameter Error			
	BIT3 - Reset Watchdog Error			
	BIT4 - Reset Timer Interrupt Error			
	BIT5 - Reserved			
	BIT6 - Reset EEPROM Error			
	BIT7 - Reserved			
6	BIT0 - Reset Start Attempt			
	BIT1 - Reset Thermistor Hardwire Error			
	BIT2- BIT7 - Reserved			
8-bit	RESET Firmware	Reset Firmware Parameters		1
	BIT0 - Reset operation hours (motor)			
	BIT1 - Reset switching cycle counter (motor)			
	BIT2 - Reserved			
	BIT3 - Reset Maximum Current			
	BIT4 - Reset Minimum Current			
	BIT5 - Reset time stamp			
	BIT6 - Reset Overload memory			
	BIT7 - Clear Analog Value Log	This command is required to re-start the log		
8-bit	FIRMWARERESET_1			1
	BIT0 - Stop Analog Logging			
	BIT1 - Reset Contactors 41 Operations Counter			
	BIT2 - Reset Contactors 42 Operations Counter			
	BIT3 - Reset Contactors 43 Operations Counter			
	BIT4 - Reset Contactors 4 Operations Counter			
	BIT5 - Reset Thermistor trips Counter			
	BIT6 - Reset Ground Fault Sum Trip Counter			
	BIT7 - Reset Hours of non-operation (Motor stopped hours)			
	B2702	**Set Value Telegram**		**6**
16-bit	Parameter Select			2
	1- Operation Hours	Set the Operation Hours		
	2- Switch Counter	Set the Switch Counter (for which contactor)		
	3- Reserved			
	4- Reserved			
	5- Reserved			
	6- Reserved			
	7- Reserved			
	Added for ESS-DP V5			
	8 - Contactors 1 Operations Counter			
	9 - Contactors 2 Operations Counter			
	10 - Contactors 3 Operations Counter			
	11 - Contactors 4 Operations Counter			
	12 - Thermal Overload trips Counter (2-bytes only)			
	13 - Thermistor trips Counter (2-bytes only)			
	14 - Ground Fault Sum Trip Counter (2-bytes only)			
	15 - Hours of non-operation (Motor stopped hours)			
32-bit	Set Value	Set value to the specific parameter selected		4

4.2.8 Profibus DP Cyclic Data

The cyclic data is a fast process data transfer between the Profibus DP master and the slave, which occurs once in every DP cycle. EntelliPro ES is a modular device supporting up to 144 bytes of input data and 18 bytes of output data.

Modules define a block size of input and output data to be read by the master, starting from offset zero. During the network configuration session, modules with varying sizes of input data are provided in the GSD file.

The following table shows the EntelliPro ES cyclic input and output data provided in the GSD file. Refer to section 4.2.10 for an example of master configuration.

4.2.9 Diagnostic Data

EntelliPro ES supports both slave mandatory – 6-bytes system wide standardized – and slave specific extended diagnostic data. The table below shows the system standard diagnostic 6-bytes.

Byte	Description
1	Station Status 1
2	Station Status 2
3	Station Status 3
4	Diagnostic master address
5	Identification number (high byte)
6	Identification number (high byte)

The EntelliPro ES extended diagnostic is composed of 34 tables. Below table shows the system extended diagnostic 34-bytes (7 thru 40)

Byte	Description
7	User diagnostic data length
8,9	Diagnostic state
10	Free
11,12	D0-D1 – parameterization status Parameterization Data Flash Data Status
13	D2
14	D3
15	D4
16	D5
17	D6
18	D7
19	D8
20	D9
21	D10
22	D11
23	D12
24	D13
25,26	D14-15 (device text)
27	D16 (not applicable to EntelliPro ES retrofit)
28	D17 (free)
29	D18 (free)
30	D19 (free)
31	D20 (free)
32	D21 (free)
33, 34	Diagnostic fault configuration buffer size
35, 36	Diagnostic fault telegram (B30008)
37, 38	Diagnostic warning telegram (B30264)
39,40	Diagnostic device error telegram (B30776)

4.2.10 Profibus Protocol communication set-up

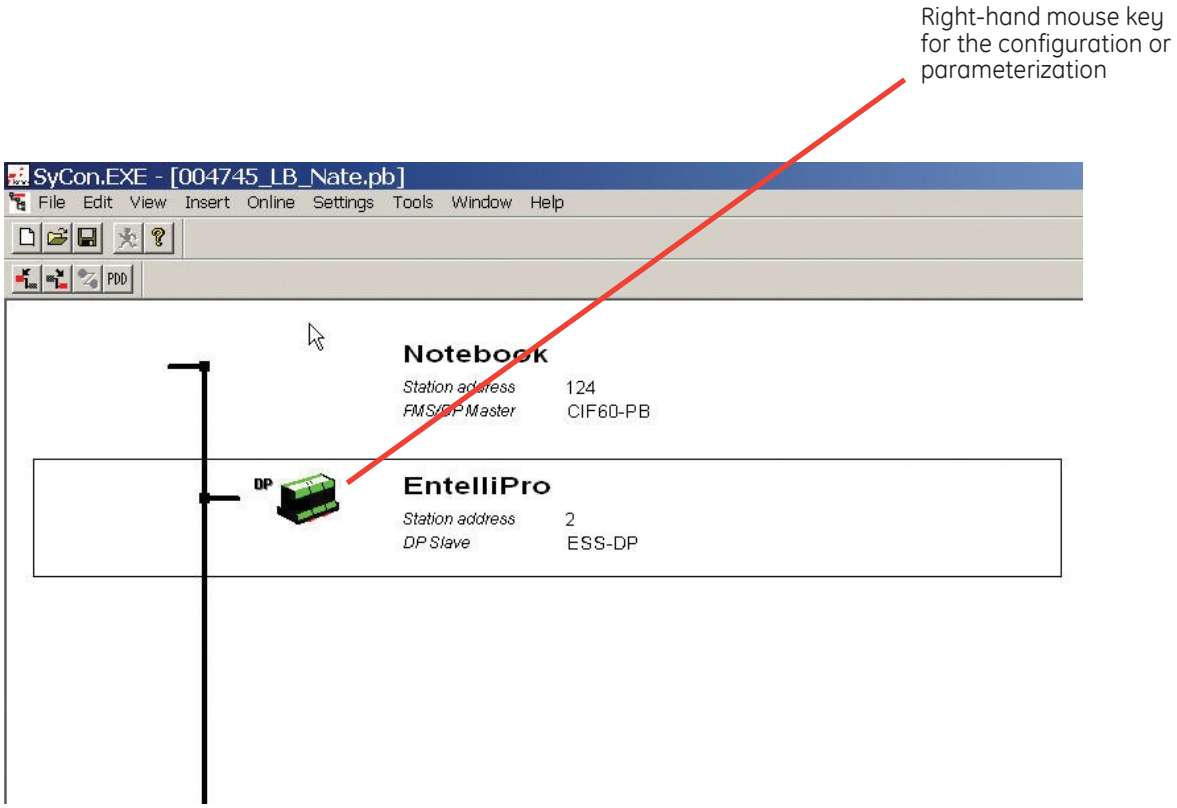
The configuration and parameterization of the EntelliPro ES is to be performed with the fielbus configurator of the bus master. Following the configuration and parameterization with the 'SyCon' configuration tool for CIF communication cards (Hilscher) is described as an example.

The following steps must be systematically taken for proper installation:

Installation of the SyCon on a PC. A licensed version must be available.

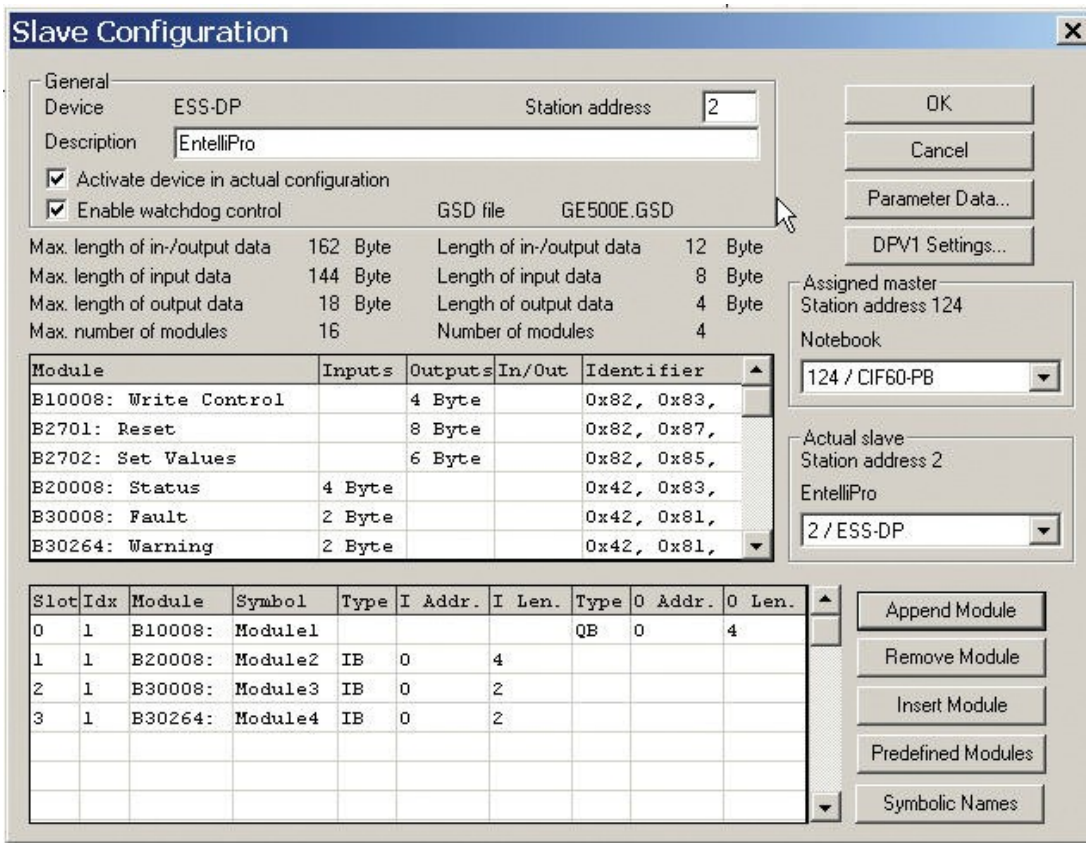
Installation of a Profibus communication component

A Pentium II with 64MB RAM is a prerequisite.

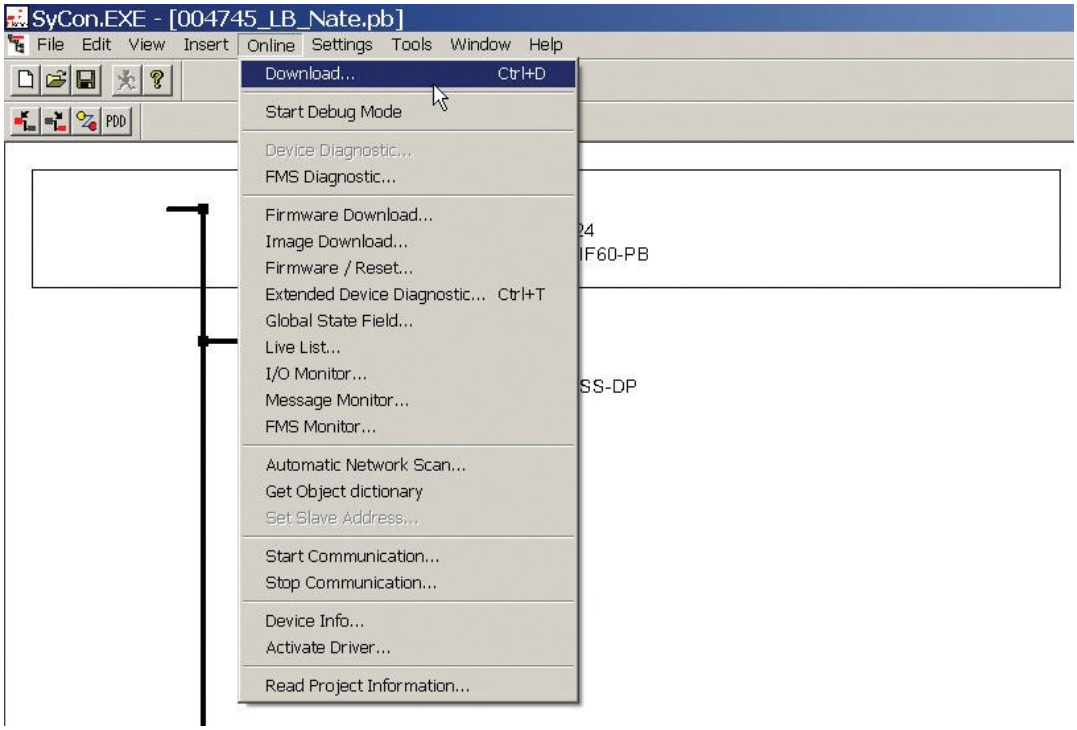


For a Master- slave configuration, a master is defined, which must fit to the Profibus component to be installed. The slaves are inserted to suit the EntelliPro ES installed in the switch board and fitted with an address. During insertion of the EntelliPro ES the GSD file will be loaded automatically.

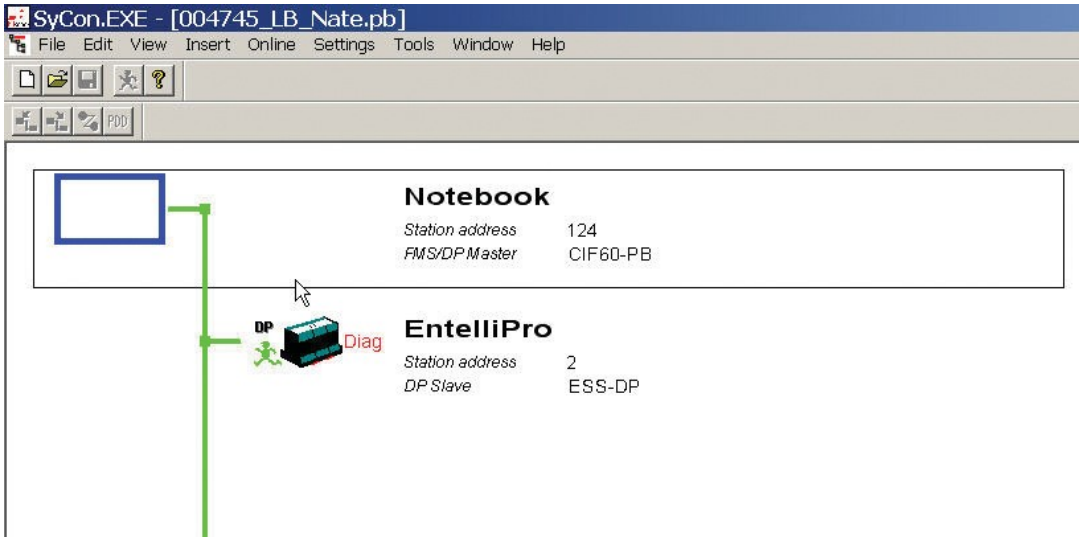
Append the desired module telegram. The telegram selection list is in the GSD file.



After completion of configuration and parameterization, data must be sent to the master component by means of a download:



The menu item ´Online` and ´Start Debug Mode` is to be used to check whether the EntelliPro ES has accepted the parameters. If all lines are green, the communication is free from defects, if lines to slaves are red, the cause can be found by an extended diagnosis.



4.2.11 Profibus-DP Class1 parameterizing

When starting the EntelliPro ES using Profibus-DP, the Profibus Class1 (PB-C1) master sends parameters to the EntelliPro ES device. This Profibus-DP Set_Param service can also include device-specific parameters, to change the EntelliPro behavior. These specific parameters can be adjusted in the PB-Class1 master configurator software tool. For this the EntelliPro ES GSD file is needed. It is part of the documentation CD.

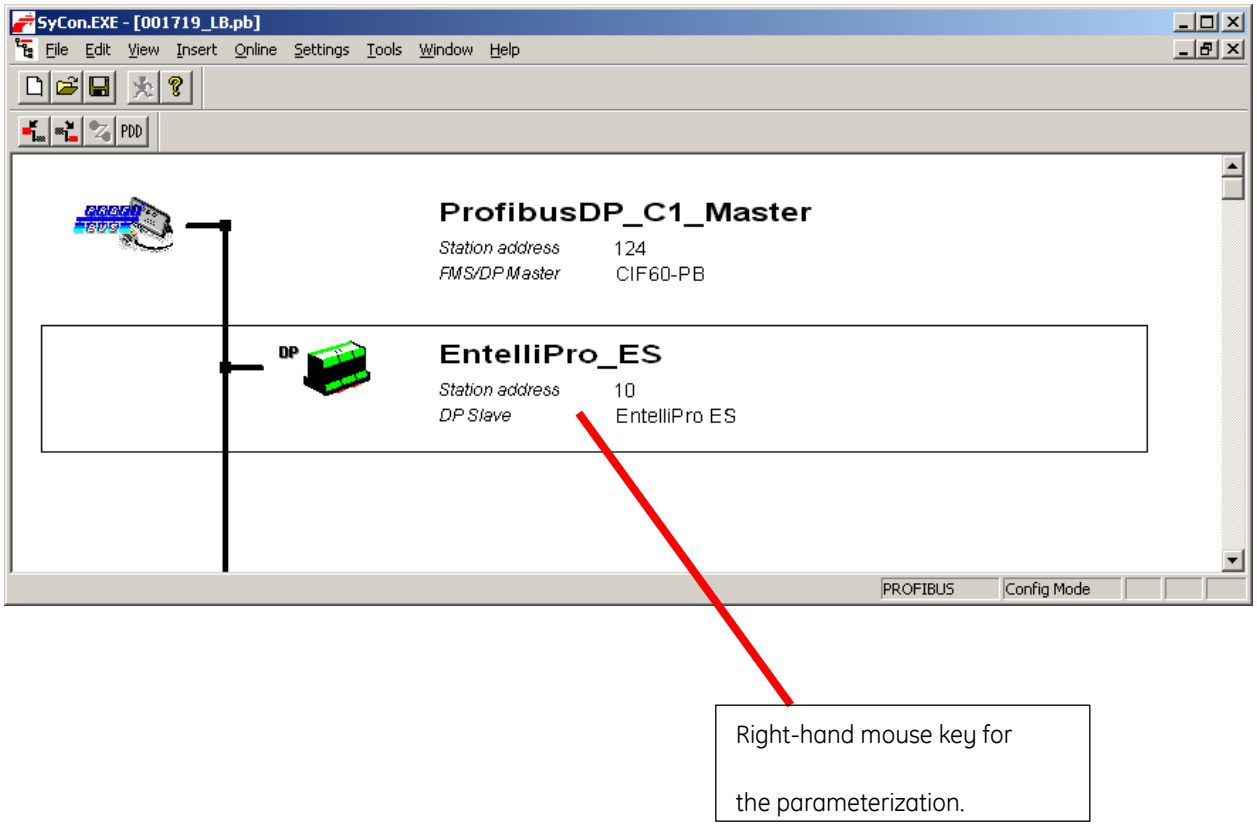
The Profibus-DP Class1 parameterizing (Profibus-DP service "Set_Param" from standard) is shown witht he PB configuration tools "System Configurator" (SyCon) from the company Hilscher - www.Hilscher.com

Each PB-C1 master device has a similar Configuration Tool to install the cyclic parameterization and configuration values.

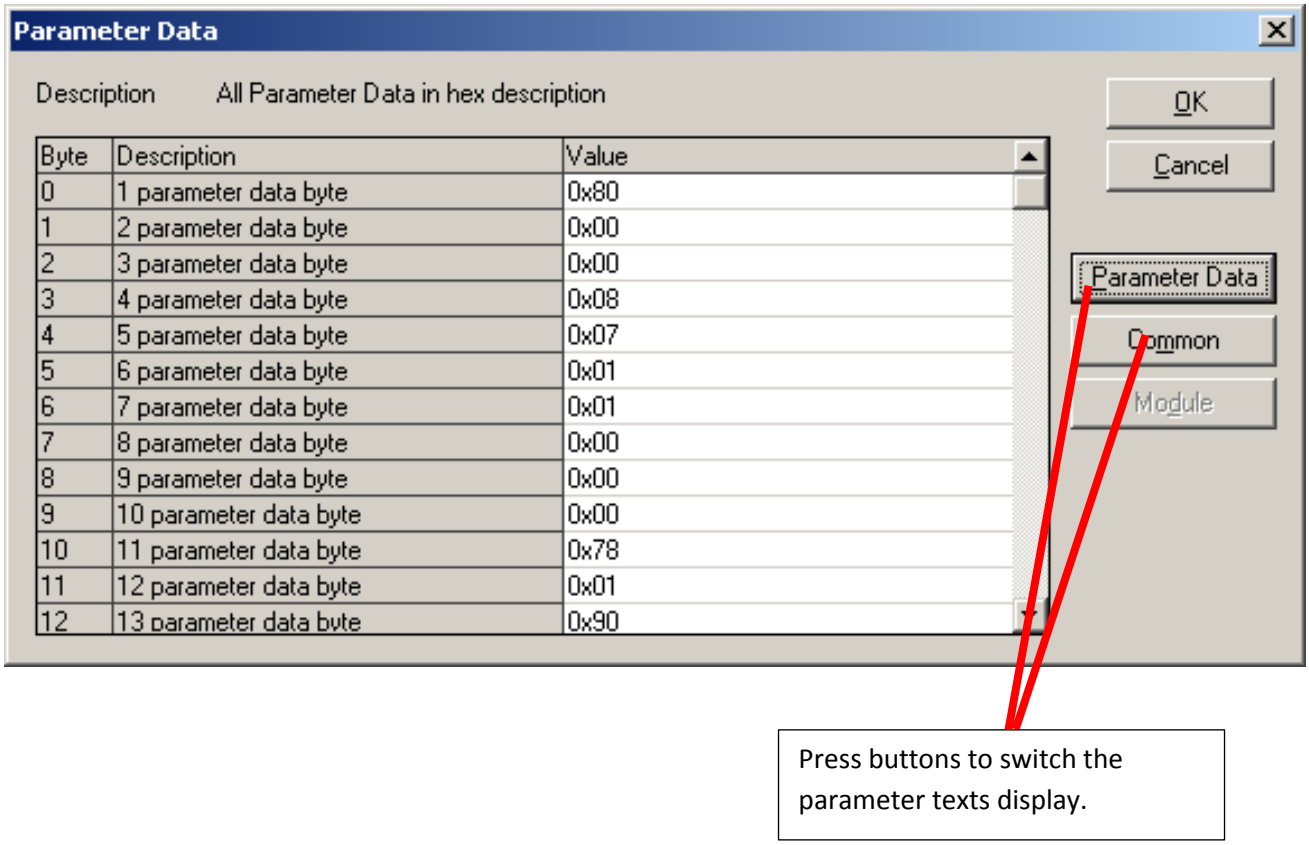
The Profibus-DP Class1 parameterization is deactivated in the presetting of the Profibus-DP GSD file.

If you use the EntelliPro ES to protect the motor in potentially explosive atmospheres (ATEX) it's mandatory to set the ATEX relevant parameters to the required value. See ATEX configuration in chapter 2.2.1.6.

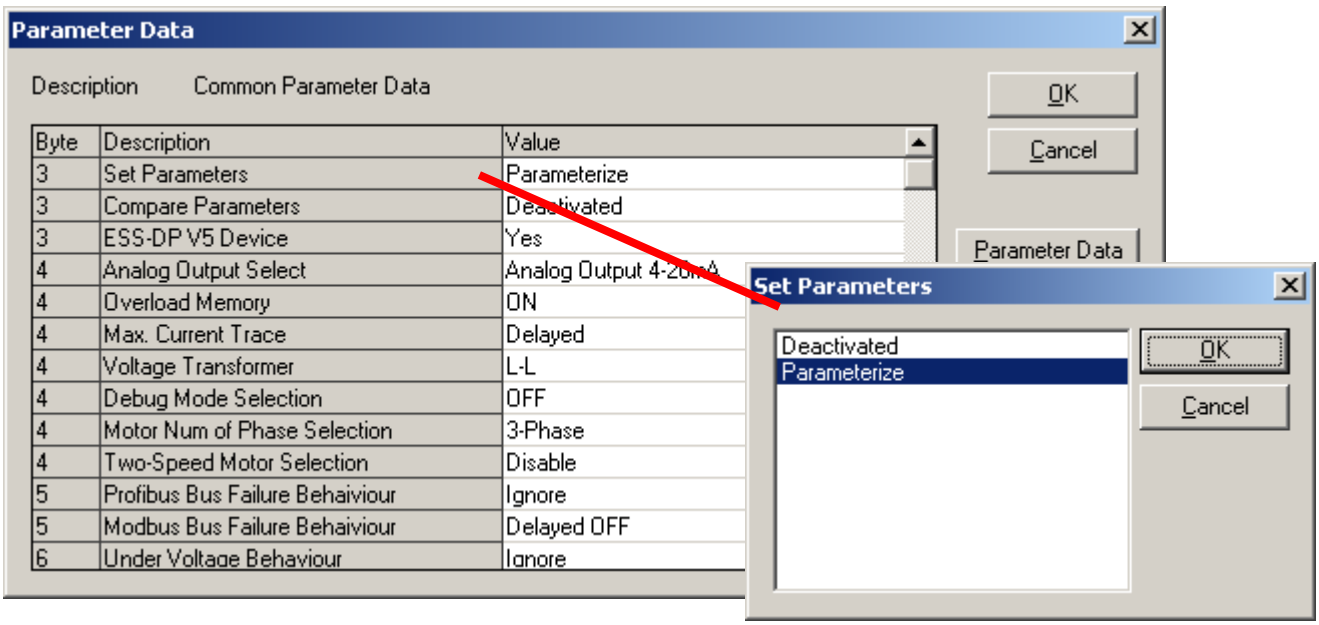
Figure below shows the SYCon main window. The SyCon main window shows the master and slave configuration (device name, device address and device type) of the Profibus-DP line.



To do the parameterization from Profibus-DP Class1 master, select the correct EntelliPro ES device. Using the right-hand mouse key or double clicking, the device parameter list can be opened.



The Parameter list appears in a new window.

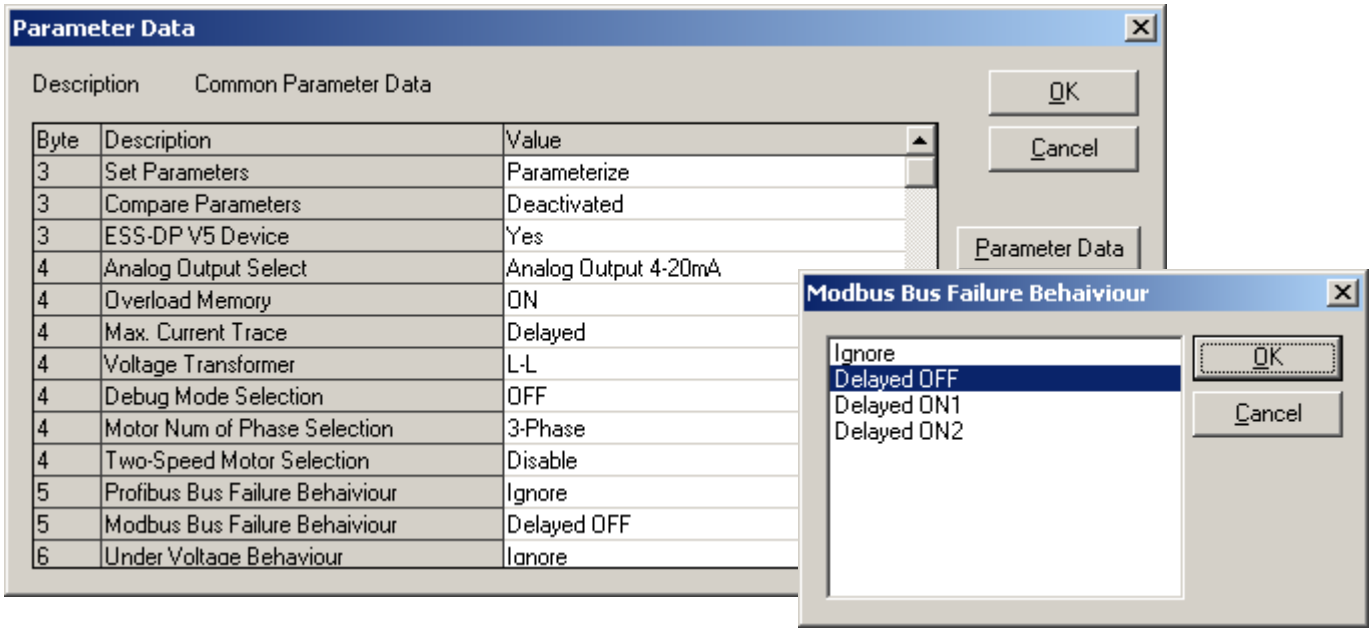


The presetting value of the Profibus-DP Class1 parameterization is deactivated.

To activate the PB-C1 parameterization, the parameter value “Set Parameters” is set to “Parameterize”.

NOTE: If the parameter "Set Parameters" is deactivated, the EntelliPro ES device will ignore the settings and accept the settings stored in EntelliPro ES.

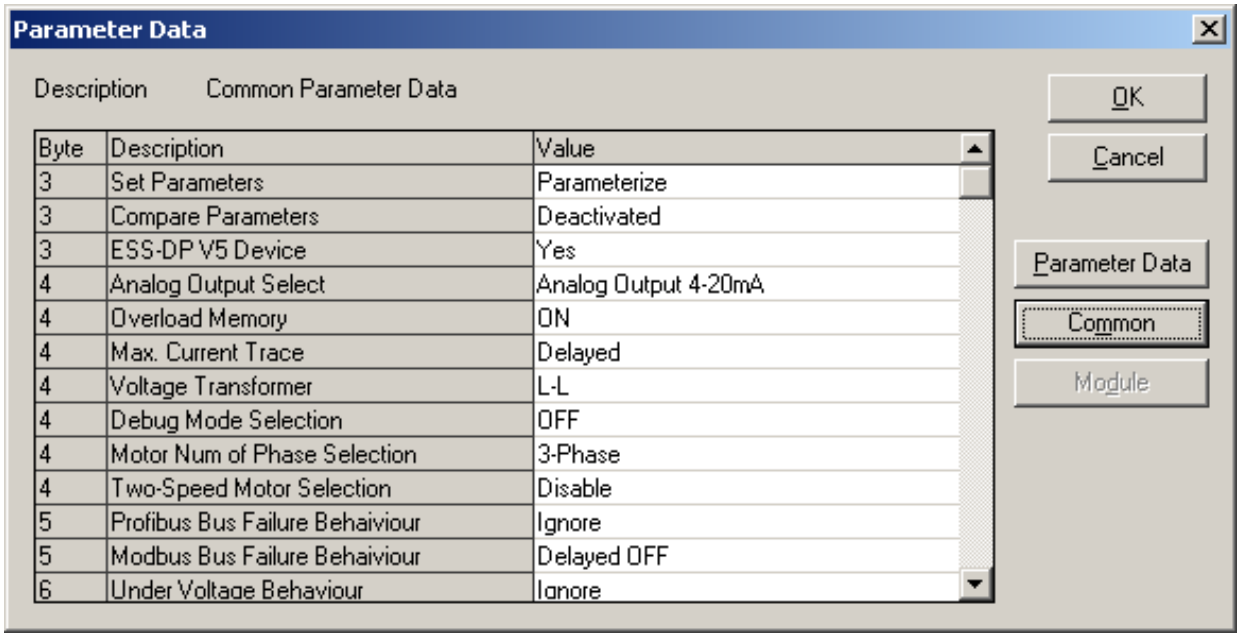
NOTE: If the parameter "Set Parameters" is activated, the EntelliPro ES device accepts the settings into the internal memory. Existing parameters in the EntelliPro ES will be overwritten.



Select the Parameter by double clicking the left mouse button. A parameter input window for the selected parameter appears. See sample with "Modbus Bus Failure Behaviour". The user will see an entry list of all valid inputs.

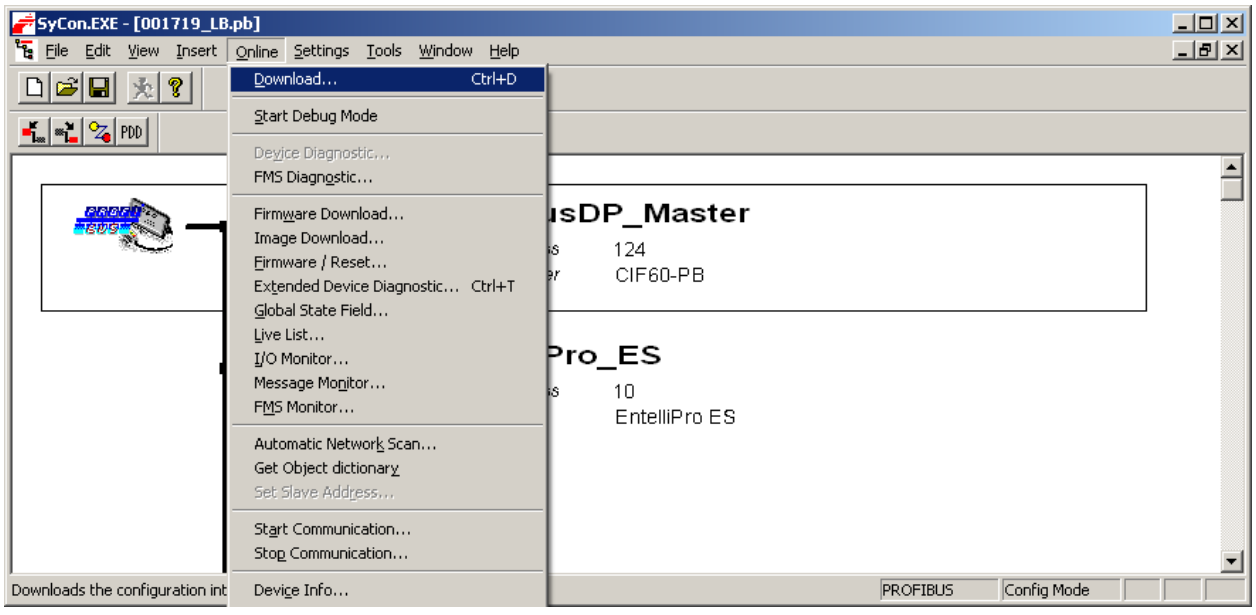
The user selects a value by selecting that value with mouse and clicking "Ok" button.

NOTE: An error will be generated if an invalid value is set.



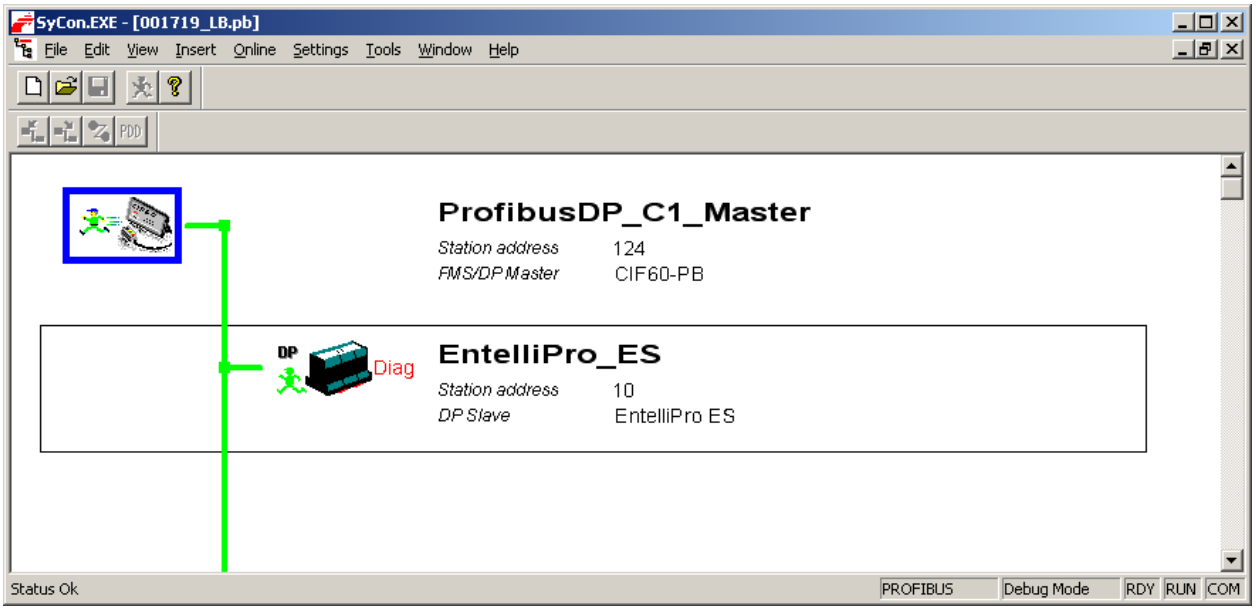
After completion of parameterization, the data must be sent to the master component by means of a download.

The menu item ´Online` and ´Start Debug Mode` is to be used to check whether the EntelliPro ES has accepted the parameters. If all lines are green, the communication is free from defects. If lines to slaves are red, the cause can be found through an extended diagnosis.

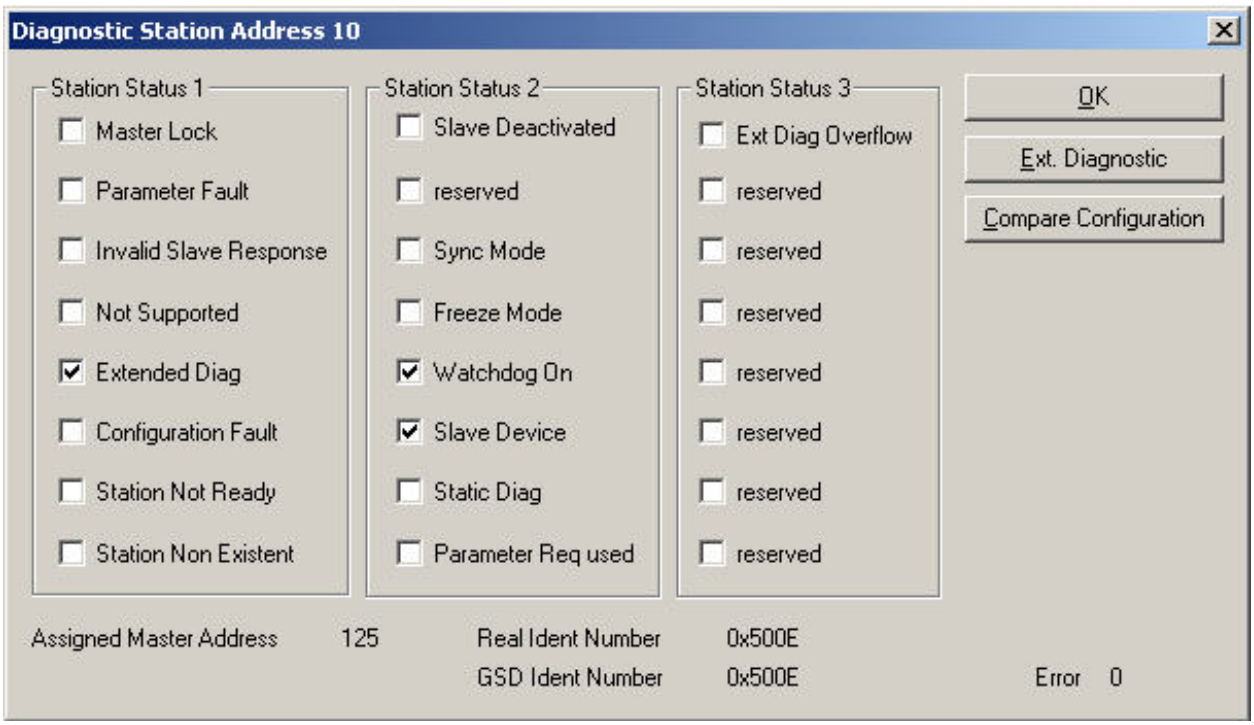


Profibus-DP communication is not running and no data change is possible.

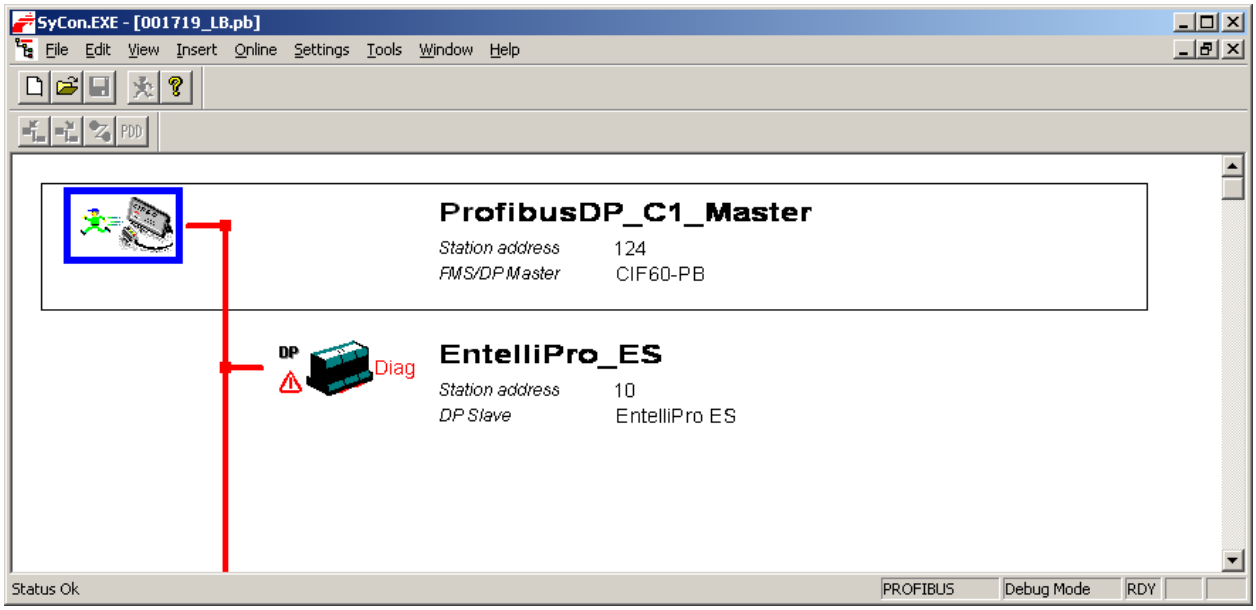
The Profibus-DP line is green, all parameters and configuration is ok. The cyclic Profibus-DP communication is running and the configured data change is possible



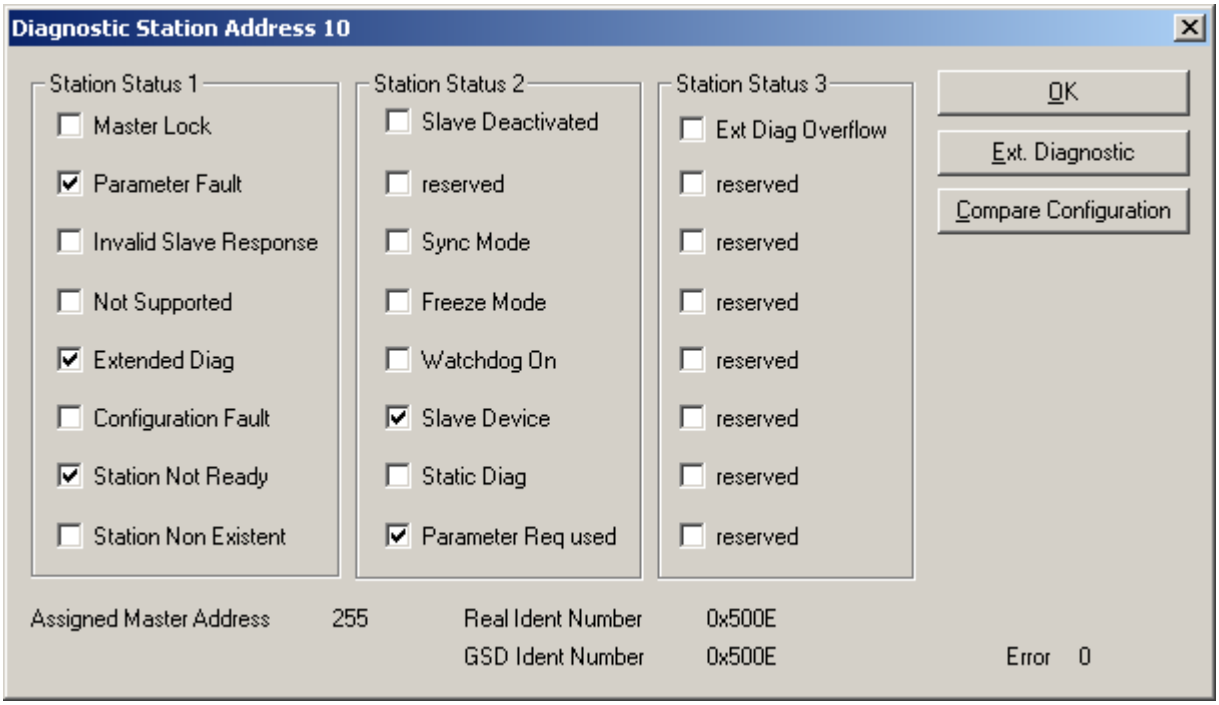
To see the current status of the EntelliPro ES device, click on the device. The correspondence diagnostic window opens showing an overview of the cyclic Profibus-DP communication. Data such as status information, assigned PB-C1 master and Profibus-DP Ident Number are shown per the figure below.



When the Profibus-DP line is red, this indicates an error in parameter values or configuration has occured. The Cyclic Profibus-DP communication is not running and no data change is possible.

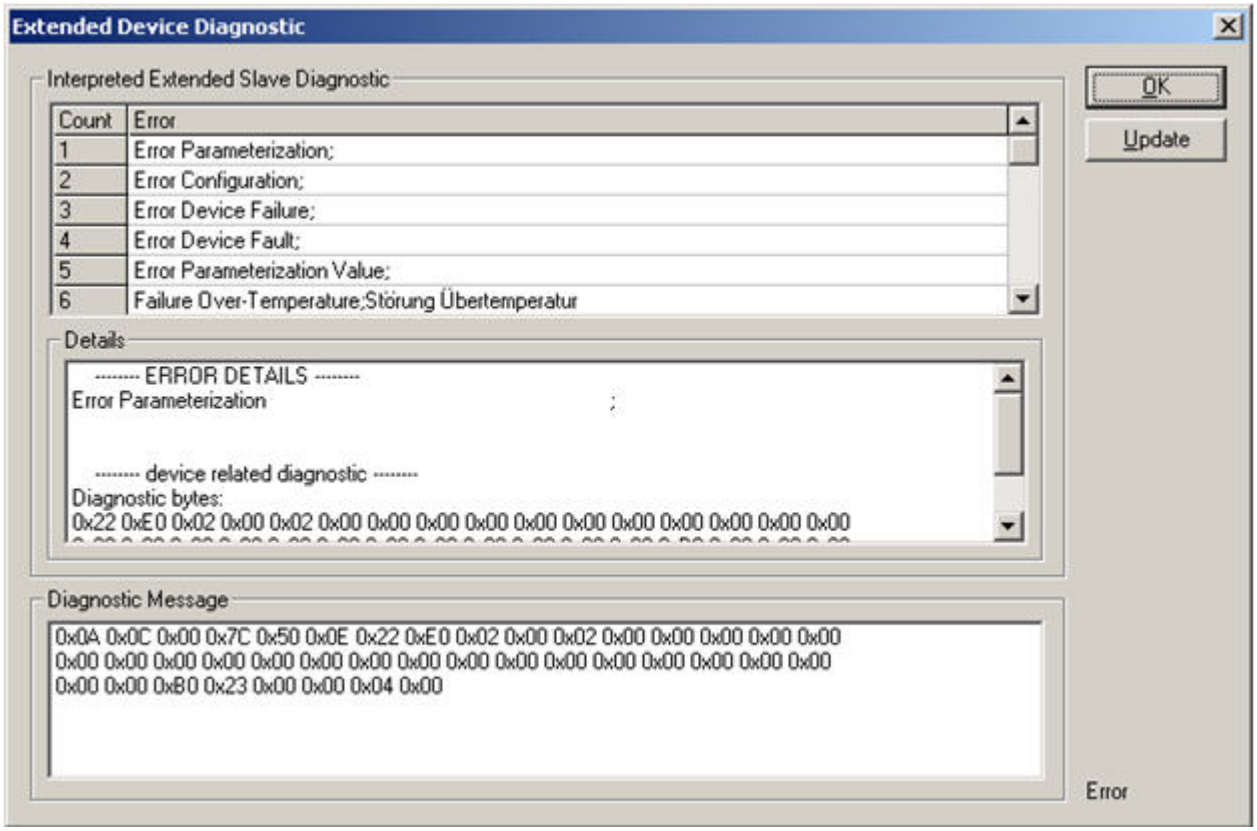


To investigate the parameter status click on the EntelliPro ES device. When the diagnostic window for the correspondence device opens, it shows that there is a "Parameter Fault".



To get more information click the button “Ext. Diagnostic”. The following window appears with more helpful information about the current device status to correct all errors.

When all errors are eliminated and the data is downloaded into the PB-C1 master device, the Profibus-DP line in SyCon tool will turn green as shown before.



GE Industrial Solutions

EPOS Motor Management System

Chapter 5: WinESG

WinESG is a Profibus base software package that allows a computer to be used for set-up and monitoring of the EntelliPro ES relay, ESS DP relay and and bse 3/4-7rms trip units.

The OPC server on a Profibus-DPV1 application does the data transfer. WinESG acts as a client to the OPC server on Microsoft Windows 2000, Windows XP or Windows 7 operating system.

A PCI Profibus master universal card and the OPC server from Softing are required.

The WinESG CD, GE part number 720020, and Softing Profibus card and OPC server, GE part numbers 720031 thru 720037 can be purchased thru GE.

The CD contains the WinESG isntallation file, GSD files, OPC Server and Client Controls which must be installed on the PC.

Contact Softing directly for additional technical information related to the Profibus hardware interface installation and the OPC server at www.softing.com.

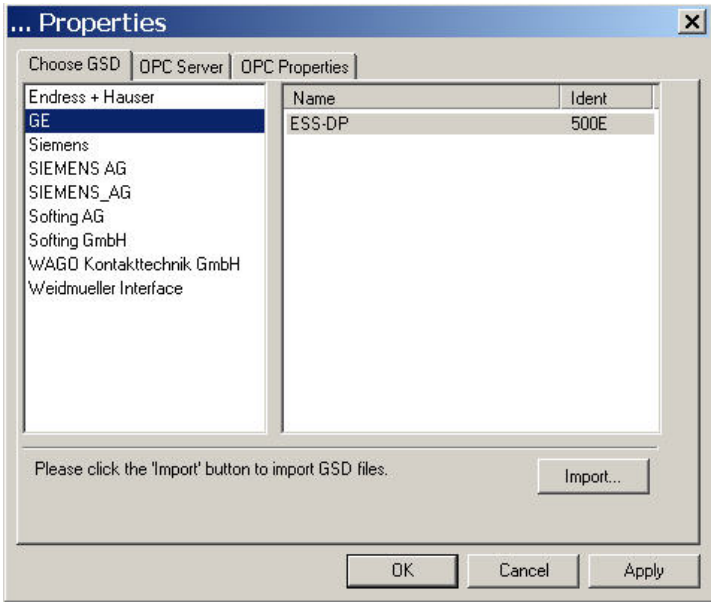
The following steps must be taken to configure the OPC server prior to opening the WinESG:

NOTE: Before opening the OPC configurator ensure that the WinESG application is closed.

Step 1: Copy the Entellipro ES GSD file **GE500E.GSD** into C:\Program Files\Softing\PROFIBUS\configurator\GSD directory.

Step 2: Open the Profibus configurator application (which comes with OPC server), by selecting Start, Programs, Softing PROFIBUS and Configurator.

Step 3: From the **Options** menu, open the **Settings** window and select the **Choose GSD** tab to select the apropriate GSD file.



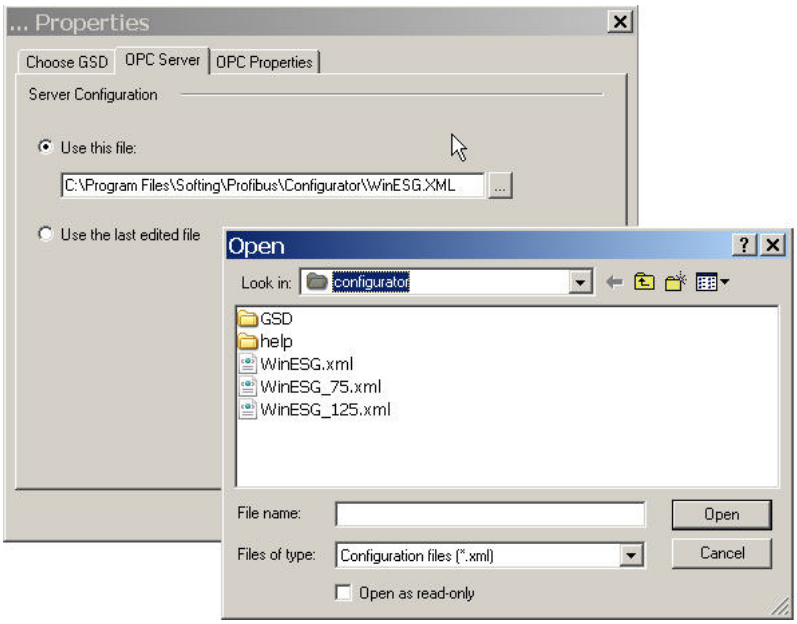
Step 4: From the **Options** menu, open the **Settings** window and select the **OPC Server** tab.

Browse the directory (C:\Program files \ Softing \ PROFIBUS \ Configurator) to select the appropriate XML

WinESG.xml has four configurable slave devices. Slaves adress from 1 to 4.
WinESG_75 has 75 configurable slave devices. Slaves adress from 1 to 75.
WinESG_125 has 125 configurable slave devices. Slaves adress from 1 to 125.

Users can create their own XML file from the pre-defined list with spefic number of slaves.

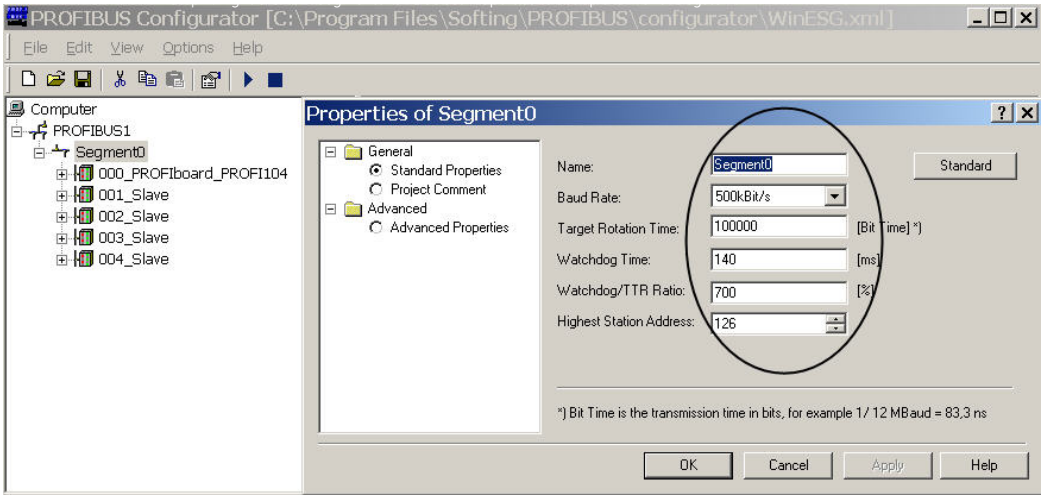
if "Use the last edited file" is selected the OPC Server automatically opens the last saved configuration file when starting up.



NOTE

NOTE: The standard value in prepared XML files is set to "Use the last edited file".

Step 5: Right click on "Segment0" and select Properties to set up the Profibus system. The WinESG Profibus -DP parameter must fit to the Profiibus-DP C1 communication parameter in SCADA system else communication problems can appear.



Step 6: Save the project by selecting File, Save.

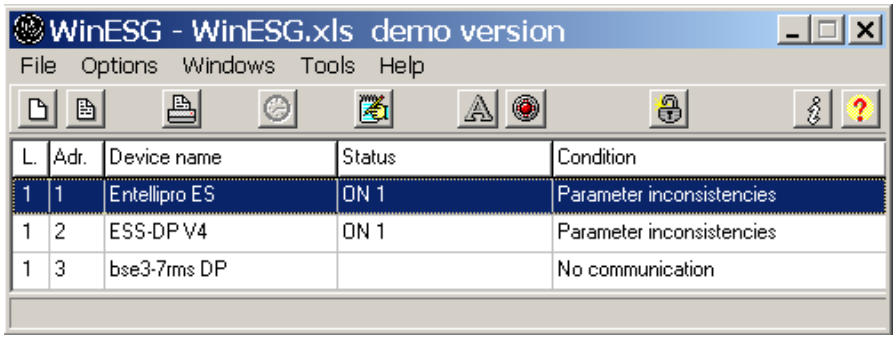
NOTE

NOTE: The configuration must not be activated when WinESG starts up. The WinESG will start the OPC server automatically.

NOTE

NOTE: WinESG only communicates with Profibus-DP devices, which are included in the Softing OPC configuration.

WinESG main panel shown In the Illustration below, displays all field devices connected on the network with their line number, device address, name, status of the contactor and any warnings or failures. A maximum of 32 devices can be displayed in the panel. A scrollbar is provided to view other devices. The main panel has the following menus: file, options, windows, tools, and help.



Before the EntelliPro ES shows up in the main panel the device must be configured. Refer to sections 5.1.1 and 5.1.2.

5.1 File menu

The following options can be selected from the file dropdown menu: new, open, copy, print, configuration, and exit.

New – creates new database file. Database contains EntelliPro settings. Settings from the database can be downloaded to the EntelliPro ES. EntelliPro Es settings can be read and saved into the new database also.

Open file - opens an existing database

Copy File - copies the content from one database to another

Print – prints the database file

Configuration – configures the WinESG and the slave device

Two types of configurations are available: WinESG and Slave Devices

NOTE **NOTES:** The WinESG database should ONLY be copied using the WinESG copy function.

5.1.1 WinESG Configuration

To configure WinESG, select the file menu, click configuration, and then click WinESG.

English, German, French, Spanish, Italian, Portuguese and Russian, languages; and automatic parameterization, off, 1 trial, 2 trials, 3 trials, 4 trials and 5 trials, can be selected.

Automatic parameterization activates or deactivates the automatic parameterization function for connected field devices.

This function tries to overwrite the parameters in the field devices with the parameters out of WinESG database when they are different. You can select how often WinESG should try, when the field device does not accept the new parameters. The selectable values are off to 5 trials.

A green "A" in the main window shows that automatically parameterization is switched on.

CAUTION

CAUTION: Automatic parameterization overwrites settings in the field devices. Make sure that your database contains the right settings. If you add new devices to the busline, they will be parameterized.

If you change the database automatic parameterization will be switched off. You have to switch on manually again.

Figure 5-1 shows the WinESG configuration panel.

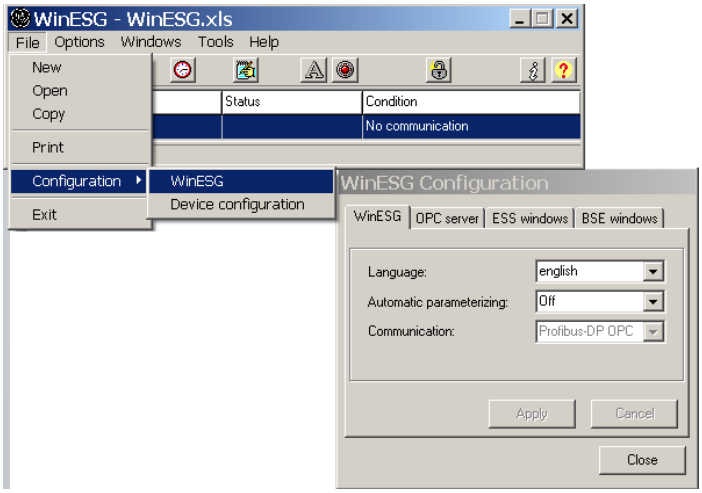


Figure 5.1: WinESG configuration panel

5.1.2 Slave Device Configuration

To add a slave devices in the system, select the file menu, click configuration, and then click device configuration.

Check the edit box and the EntelliPro ES button on the WinESG device configuration panel. Double click on the slave address number to select the device(s) to be added. A blue highlighted address indicates the device is selected for configuration with WinESG. To disable a selected device click on its address. Click ok when completed.

To add additional Bus line, check edit box, then right click on the existing Bus line (PROFIBUS1.). A pop up menu will appear that allows for the addition.

Figure 5-2 shows the WinESG slave configuration panel.

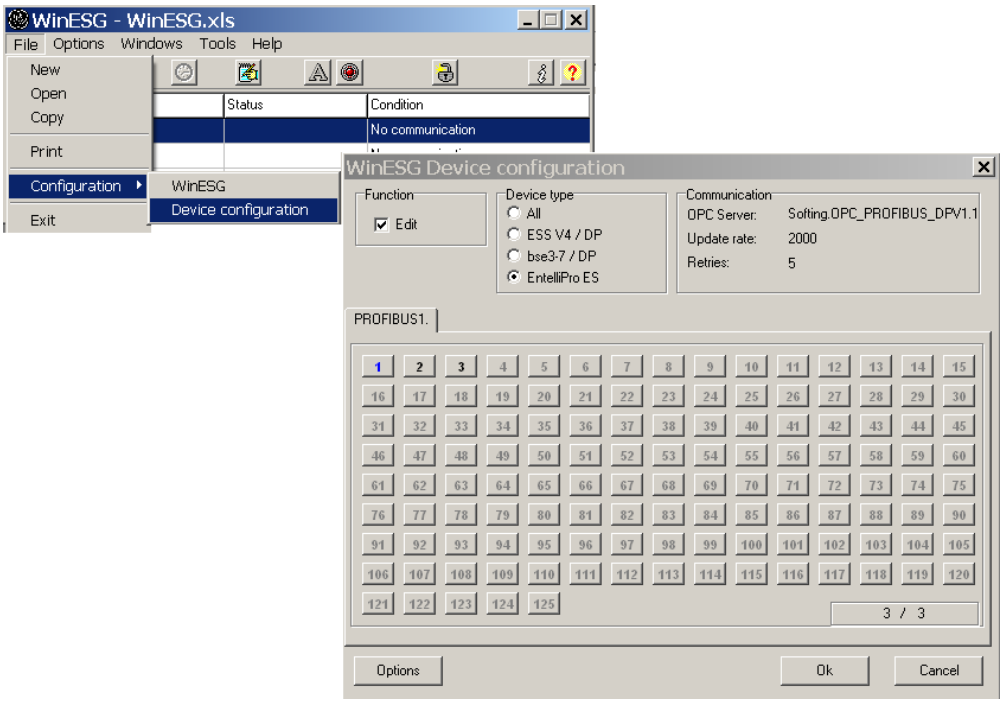


Figure 5-2: WinESG slave configuration panel

NOTE

NOTE: For WinESG device control and data visualization, the profibus-DP devive must be included in the OPC Server configuration.

5.2 Options Menu

The Options menu contains six sub-menus. For details of each refer to the help menu.

The Options menu contains six sub-menus: Alarm protocol, Access protection, Alarms, Time synchronization, Read all parameters and Send all parameters, shown in figure 5.3.

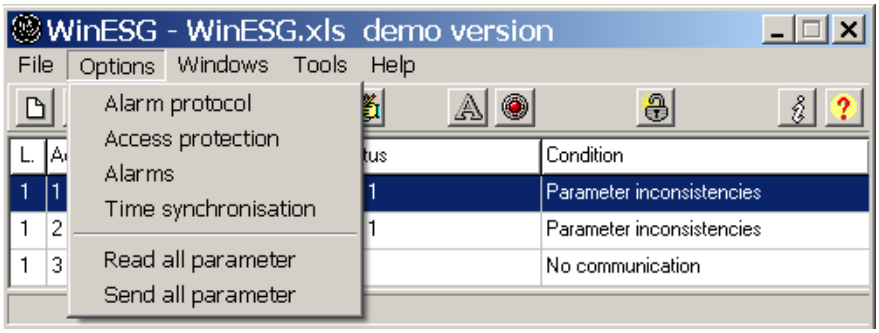
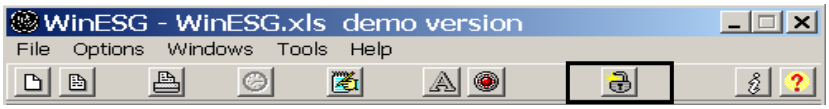


Figure 5-3: WinESG windows menu panel options

NOTE

NOTE: The lock symbol, shown in the illustration below, in the main menu opens the Access protection panel.



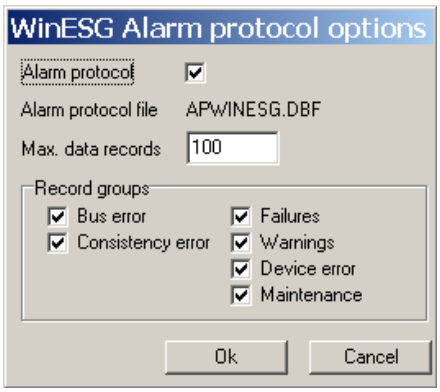
5.2.1 Alarm protocol panel

In the Alarm protocol panel, shown in the Illustration below, the alarms can be activated.

Alarm protocol: if selected all incoming alarms from the selected record groups are stored in the file.

Alarm protocol file: file where the alarms will be stored.

Max data records: maximum number of alarms that can be saved in the database. If the numbers of alarms exceed this value the oldest value will be overwritten.



CAUTION

CAUTION: A change of maximum data record in an existing alarm protocol trace causes a break in the serial number of the entries in the database.

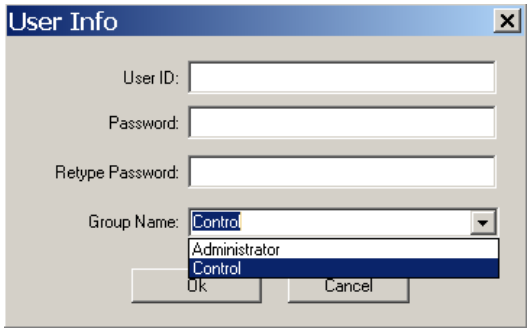
5.2.2 Access protection panel

In the Access protection panel, shown in the illustration below, user can set login settings, password and prevent unauthorized access. If you start the WinESG for the first time and no user with administrator rights is defined, the message "The user protection is to be defined" is displayed. In this state you can log in as administrator with the user name "GEPC" and the password "EPOS".

Change current access mode: access mode can be changed when the login name and password are entered.

Time: if Enable Protection is selected, the WinESG will switch to viewing mode after this time expires.

Add user: user can be entered and the access protection defined, shown in the illustration below.



Two groups name can be defined:

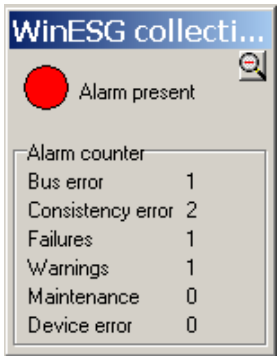
Administrator: full access rights: WinESG function, editing the user list, activate or deactivate the enable protection and time.

Control: with limit access rights: WinESG function, and the right to change the password.

WinESG functions are defined as: closing WinESG, changing database, changing alarm protocol settings, saving parameters, copying parameters, device configuration, control commands, reset of diagnostic and measuring values.

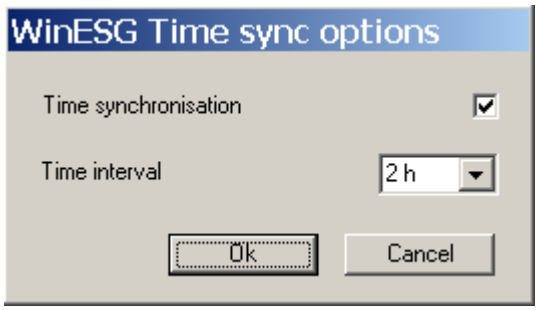
5.2.3 Alarm panel

The Alarm panel, shown in the illustration below, shows the number of alarms in the system.



5.2.4 Time synchronization panel

In the Time synchronisation panel, shown in the configuration below, when the time synchronization is selected, the PC operating time is sent to the EntelliPro ES based on time interval selected.



5.2.5 Read all parameters

When Read all parameters is selected all parameters in the configured field device only, will be read.

5.2.6 Send all parameters

When Send all parameters is selected all parameters in the screen will be written to the configured field device only.

5.3 Windows menu

The Windows menu contains eight sub-menus: Control, Parameterizing, Char (characteristic), Diagnostic, Measure, Alarms, Debug, and Analog data capture, shown in figure 5.4.

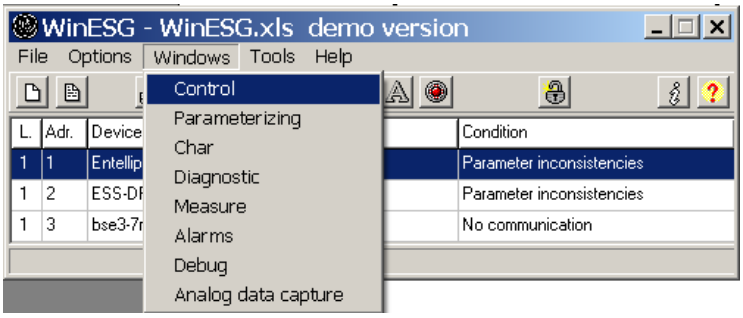


Figure 5-4: WinESG windows menu panel options

5.3.1 Control Panel

The control panel gives the user the ability to view the status of the EntelliPro ES, contactors and drawer and to control the motor operation.

Refer to Figure 5-5 for the WinESG control panel contactor operation.

The first row indicates the number of the bus line, bus address and device identification text.

In the next line the drive status is shown as symbol and as text:

Red Symbol = motor ON
Green Symbol = motor OFF

Next line is the control buttons:


ON1


ON2


OFF

ON 2 is used for two-speed motors. For direct starters this button has no meaning.

Pressing these buttons, commands are sent to the device, independently of its status. Whether the control command is accepted or not depends on the logic program of the EntelliPro ES.

If the device identification box is checked and the output is mapped to identification the respective relay will close. Refer to Figure 5-5 for the WinESG control panel contactor operation.

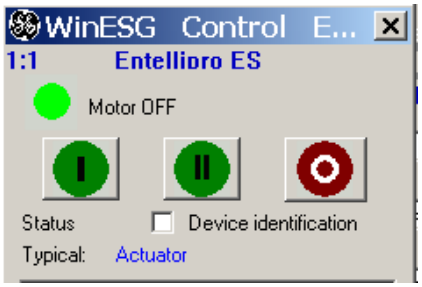


Figure 5-5: WinESG control panel contactor operation

The lower part of the control panel provides the EntelliPro ES status and the capability to reset faults, warnings, and device errors. A red highlight indicates a function is active. To view the fault,warning, or device error details click on details as shown in the Figure 5-6. To reset a particular fault,select the fault and click reset.

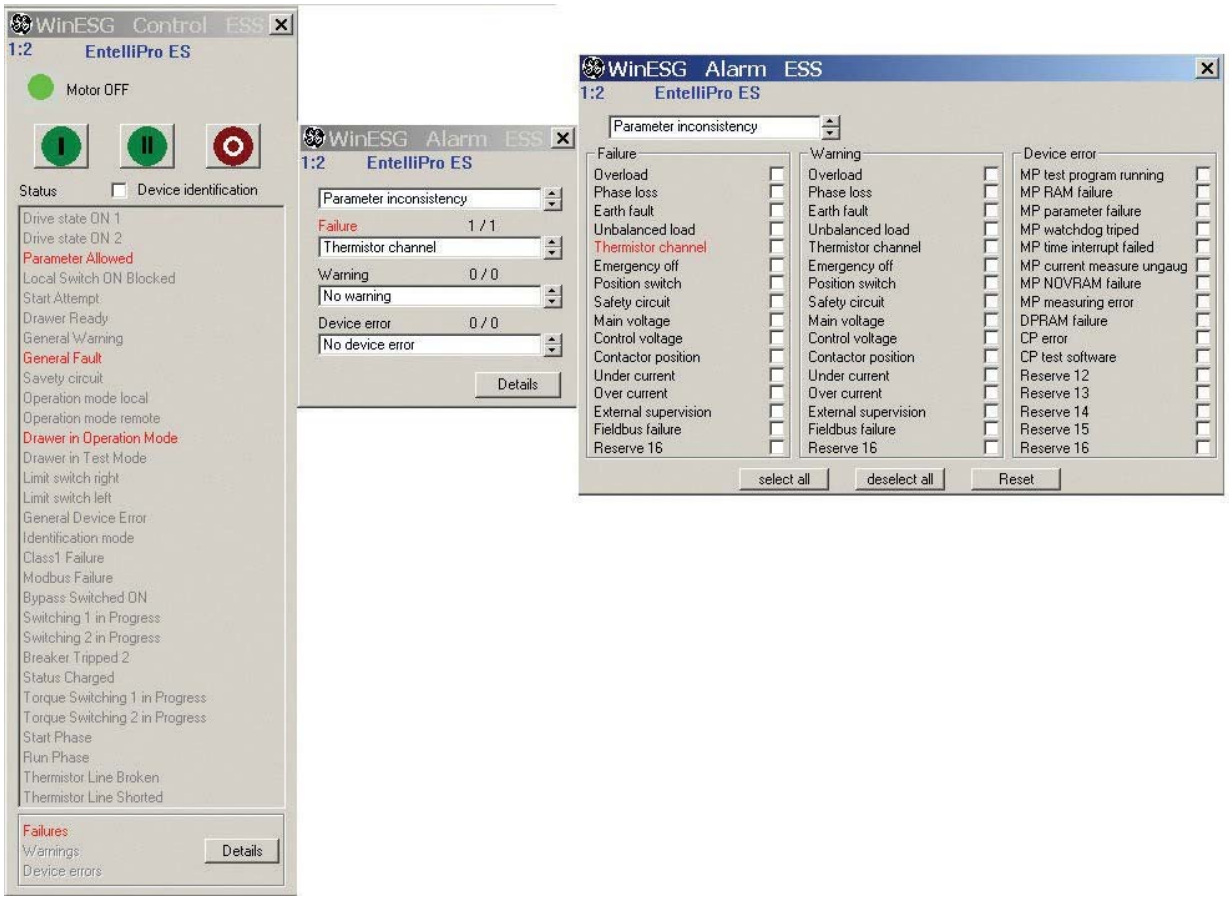


Figure 5-6: WinESG view and reset faults

5.3.2 Parameterization

The parameterization panel is mainly used to monitor and configure various EntelliPro ES functional parameters. The panel is comprised of the following sub-panels: Info, device settings, alarms, functions , timer, counter, control, typical settings, I/O's, Cyclic communication, and Modbus settings.

5.3.2.1 Parameterization Info panel

The info panel provides a method to set and identify the location of the EntelliPro ES in the gear. The info panel also provides the hardware identification, which includes the power supply voltage, number of inputs and outputs.

In addition this panel provides a means to write and read parameters from EntelliPro ES, load parameters from database to the WinESG, set WinESG default parameters, copy parameters from one EntelliPro ES to another, print the database loaded in the WinESG and save the contents of the WinESG to a database. Refer to figure 5-7 for the WinESG parameterization info panel.

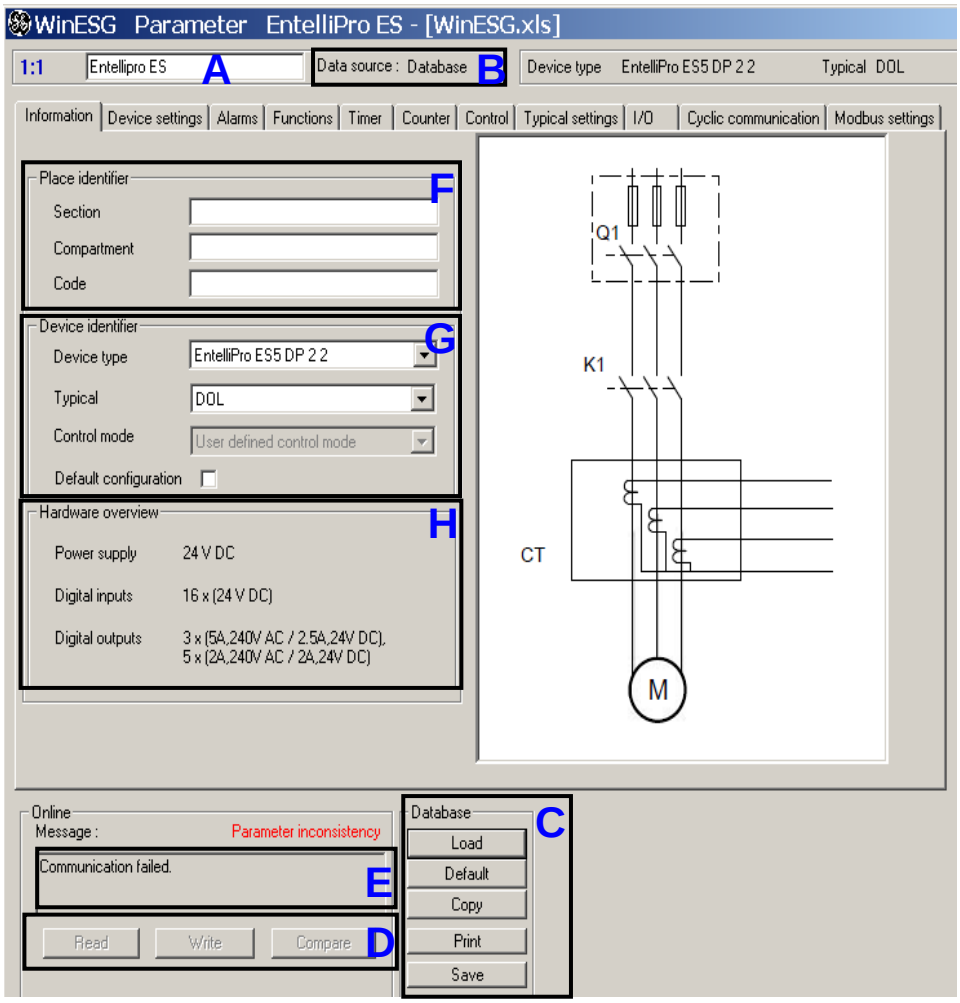


Figure 5-7: WinESG parameterization info panel

The first row, illustration A, shows the number of bus line, bus address and device identification.

In illustration B the origin of the data in the screen is shown:

Database: screen parameters match database parameters.

Field: screen parameters match device parameters.

Default: default values are shown.

Modified: parameters are been modified.

NOTE **NOTE:** After opening the window, parameters are automatically loaded from the WinESG database.

In illustration C operating elements for saving and loading parameters are shown.

Load: load database parametrs to the screen.

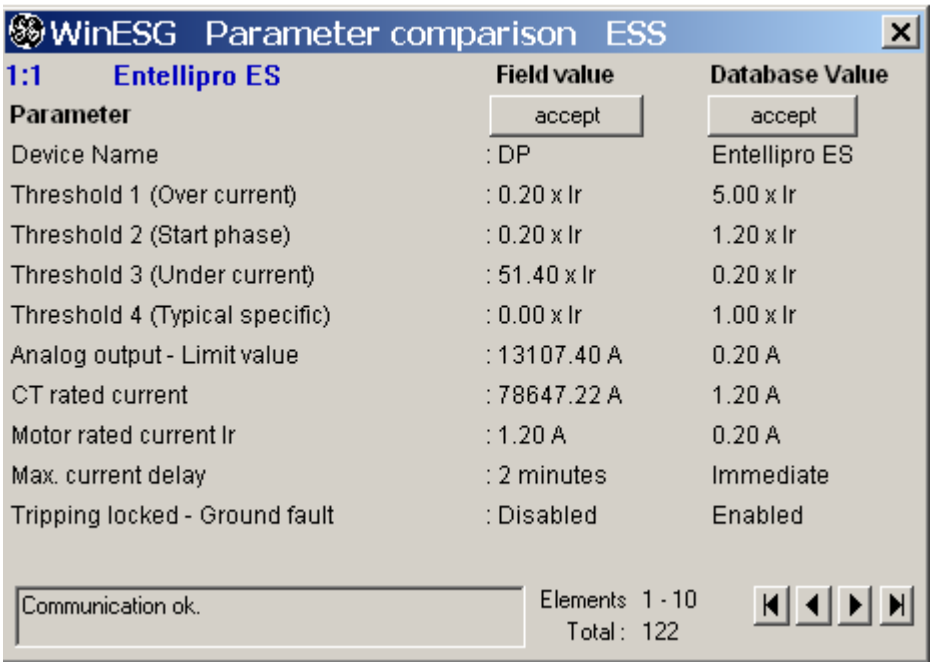
Default values: fills the screen with default values.

Copy : opens the copy dialog.

Save: writes data from WinESG screen to database.

In illustration D, the user can read and write parameters from and to the field device. All parameters are set once. In addition WinESG compares parameters from the field device to its database cyclically. If any parameter does not match parameter inconsistency is displayed. To remove parameter inconsistency a compare can be done and parameters from either filed dveice or database can be accepted. As shown in the illustration below.

NOTE **NOTE:** After any write it is recommend that a read be done to make sure parameters are properly saved.



Successful writing is displayed in the message area, shown in illustration E. The writing can be invalid, if there is no communication, or the device is not ready for parameterization or one or more parameters are out of limit.

Illustration F shows the Place Identifier, which allows the user to indentify the unit in the system. Each text can be 20 characters long.

Illustration G shows the Device Identifier.

Device Type:	catalog number of the device.
Typical:	selection of the typical. Refer to section 2.3 for additional information. If Custom Logic is selelected EntelliPro power must be cycled.
Control Mode:	selection of control variant. Refer to section. 2.2.2 for additional information
Default Configuration:	allows the selection of the 6 pre-defined control type, and it configures the device with a set of factory pre-programmed parameters. These pre-programmed parameters can be changed if default configuration is unselected. Refer to section 2.2.2 for additional information

Illustration H shows the Hardware Overview, which provides power supply, number of inputs and outputs ratings.

NOTE: If the drive typical is set to "Fully free logic", the Profibus Class 2 data interface of the free logic must follow the EntelliPro ES standard, otherwise the data in the WinESG might be incorrect.

CAUTION: Writing parameters to the device changes the protection and control behavior of the EntelliPro ES, and can result in operating the contactor(s).

5.3.2.2 Parameterization Device Setting panel

The device setting panel provides a method to configure the current transformer, motor load, overload trip class and cooling factor, ground fault threshold and time delay, current threshold, analog output, analog output limit value, current threshold, number of phases, phase unbalance delay, analog value interval, stop analog storage event, pre-post trigger values. Refer to figure 5-8 for the WinESG parameterization device setting panel.

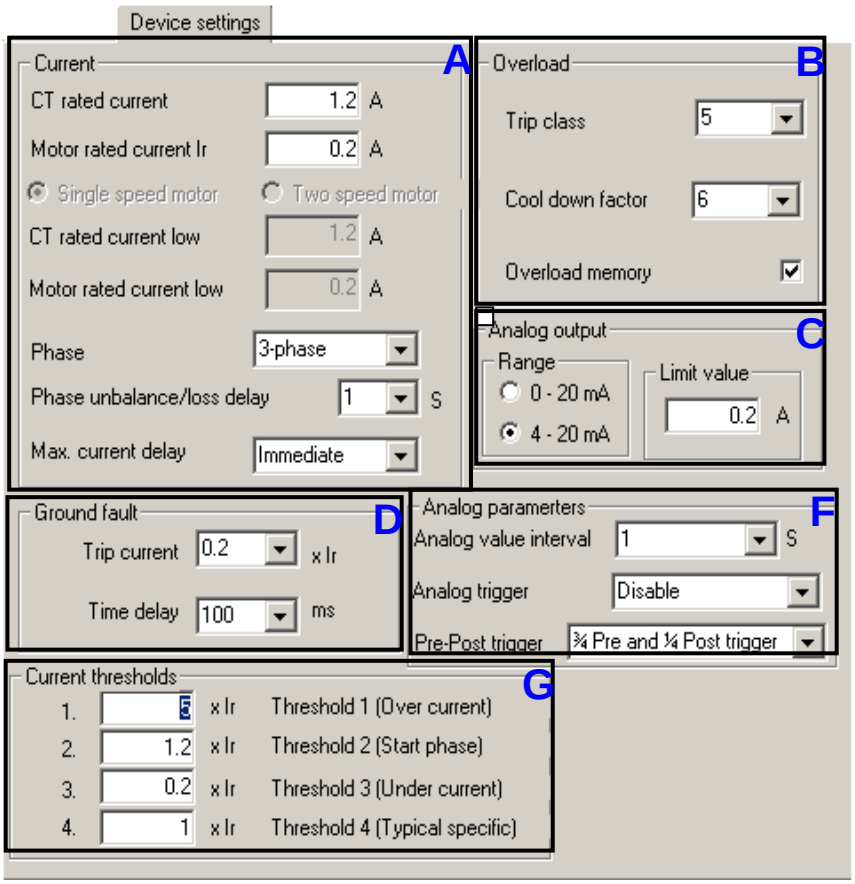


Figure 5-8: WinESG parameterization device setting panel

Illustration A shows the current setting.

CT rated current (Ict): current transformer (CT) primary current. It is the upper value of the CT range divided by the feed-thru factor. The feed-thru factor is how often the primary conductor is fed through the CT. For single conductor CT the value on the label used. The maximum allowed C current is 6400A.

Table below shows the CT rated current in Ampere for different CTs and feed-thru factors.

	Feed-thru Factors				
	1	2	3	4	8
Entellipro CT8	8	4	2.67	2	1
Entellipro CT32	32	16	10.67	8	4
Entellipro CT64	64	32	21.33	16	8
Entellipro CT630	630	315	210	157.50	78.75

Motor rated current (Ir): settable in the range of 1 to 1/6 x Ict. This value is used for overload, ground fault, and current thresholds protections

Two Speed motor: only applicable for two-speed motors (Dahlander, Pole changer typicals). When applicable a second CT and motor current can be set for the additional speed. All other parameters are applicable to both speeds.

Phase: select the system type: 3-Phase, 2-Phase, and 1-Phase.

Phase unbalance/loss delay: select the delay time when phase unbalance or phase loss fault or warning is issued. Selectable from 1 to 15 seconds. When ATEX is selected the time is fixed to immediate.

Max current delay: time delay before the maximum current will be measured.
Immediate: maximum current will be measured and displayed upon motor starts.
2-minute: maximum current will be measured and displayed 2 minutes after the motor has started.
Maximum current measurement and display are continuous operations for as long as the motor is in running state.

Illustration B shows the thermal overload function, which reflects the warming up or cooling down of the motor in a mathematical heat model.

Trip Class: Eight tripping classes per IEC 60947 can be set. The trip time depends on the trip class and the current. The trip class is the time in seconds in which the EntelliPro ES trips in case of 7.2 times the motor rated current, as shown below. Refer to section 3.1.3 for the trip time curves.
Class 5 within 5 seconds
Class 10 within 10 seconds
Class 15 within 15 seconds
Class 20 within 20 seconds
Class 25 within 25 seconds
Class 30 within 30 seconds
Class 35 within 35 seconds
Class 40 within 40 seconds

Cool down factor: extends the time until the motor can be turned ON after an overload trip. Selectable from 0 to 15. Zero disables this function. For ATEX application zero cannot be selected. Refer to section 3.1.4 for additional information

Overload memory: if selected, the motor heat value, overload trip and TMA trip are stored in non-volatile memory upon power failure. They will be restored when power is applied and the EntelliPro ES will require a reset.

CAUTION: For motors in explosion hazardous areas the overload protective function must not be disabled.

Illustration C shows the analog output function. EntelliPro ES provides a 0-20 mA or 4-20 mA output function. An ampere meter can be connected and the measured current corresponds to the mean value of the three phase currents.

Limit value: set the primary current value that correspond to 20 mA at the output. For example, if set to 20A and the primary current is 20 A the output current will be 20 mA.

Illustration D shows the ground fault function. Three phase currents are added to calculate the RMS value of the ground fault current. Ground fault is only activated, when the mean value of the three phases currents is within the range of 0.5 to 3 times the rated motor current.

Trip current:	set from 0.2 to 0.8 times the rated motor current in steps of 0.1
Trip delay:	set from 100 to 1000 ms. in steps of 100 ms

Illustration E shows the analog parameters.

Analog value interval:	time interval between RMS analog data capture. The data is displayed in the analog data capture window. Settable from 1s to 60 seconds.
Analog trigger:	mode to trigger the RMS analog data capture.

Disable:	disables the RMS analog capture
Trip:	any fault triggers the RMS analog capture
Warning:	any warning triggers the RMS analog capture
Switch ON:	start command triggers the RMS analog capture
Switch OFF:	stop command triggers the RMS analog capture
Manual:	press start recording in the analog capture window

Pre-Post trigger:	indicate the number of pre and post trigger data.

Illustration F shows the current threshold. Four current thresholds can be parameterized in the range of 0.2 to 8 times the rated motor current. These values are compared to the average motor load current.

5.3.2.3 Parameterization Alarms panel

The alarm panel provides a means to enable and disable protections, set protections and inputs as fault or warning, and set the number of allowable auto resets after an overload trip. Refer to Figure 5-9 for the WinESG parameterization alarms panel.

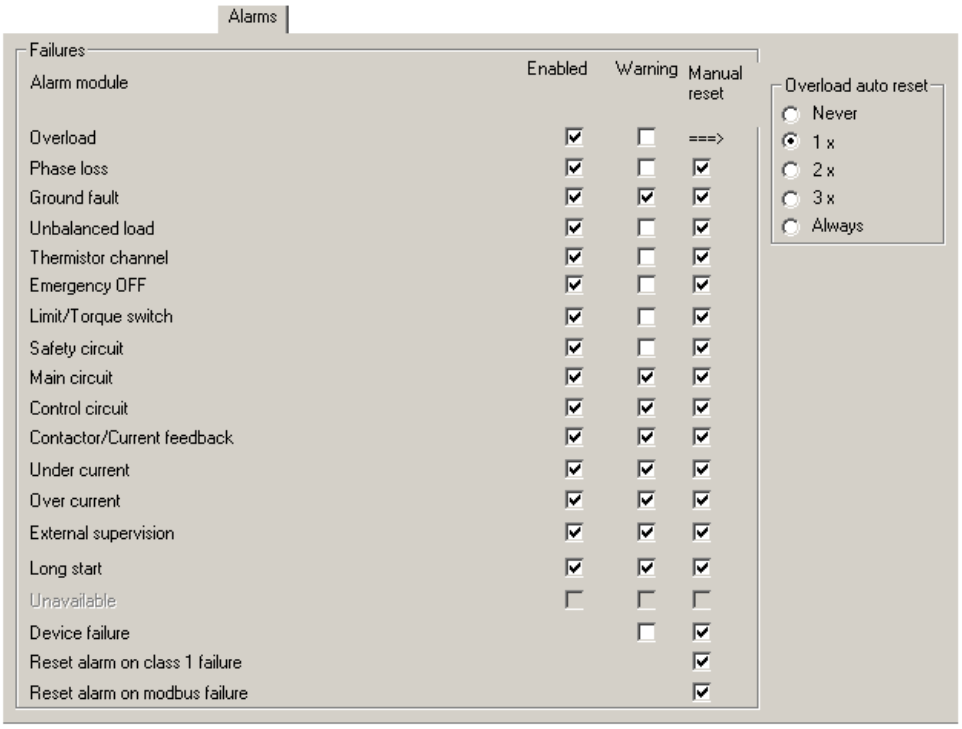
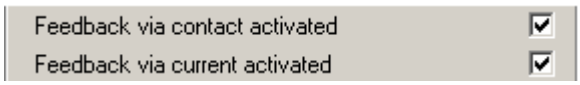


Figure 5-9: WinESG parameterization alarm panel

Warning:	when active, a specific fault will not open the motor contactor. A warning will be provided on the control screen.
Manual reset:	fault or warning will require a manual reset. The reset can be done via Modbus function code 5 registers 65 to 106, Profibus class 1 telegram B2701 or WinESG control panel.
Overload auto reset:	number of auto-reset allowed after an overload fault. This number is reset after 1 hour without overload failure

NOTE: For proper operation of Contactor/Current feedback either Feedback via contact activated or Feedback via current activated in the WinESG parameterization/Typical settings panel must be set. Refer to the illustration below.



CAUTION

CAUTION: For protecting motors in explosive areas, only the values n = 0, 1, 2, 3 are allowed.

5.3.2.4 Parameterization Function panel

The function panel provides a means to define motor operation during start-up, enable the debug screen, and select the type of parameterization. Refer to figure 5-10 for the WinESG parameterization function panel.

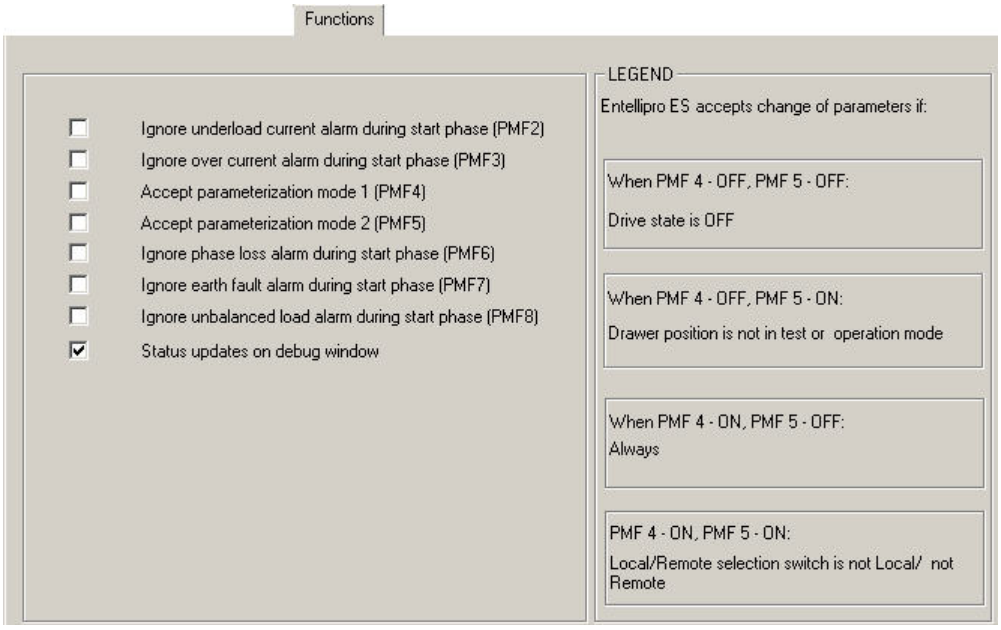


Figure 5-10-: WinESG parameterization function panel

Parameterization definition:

Parameterization Mode 1:	Parameterization Mode 2:	Operation
Disabled	Disabled	Parameterization allowed only when motor is in stop condition
Enabled	Disabled	Parameterization allowed via Profibus while motor is at any state.
Disabled	Enabled	Parameterization allowed via Profibus when draw out position is not in test or operation mode
Enabled	Enabled	Parameterization allowed via Profibus when the operation mode is not Remote or Local.

Status updates on debug window: allow viewing of logic variables in the debug panel

CAUTION: Debug panel should only be enabled for testing purpose. On normal operation It should be disabled.

5.3.2.5 Parameterization Timer panel

Timer panel – The timer panel provides a means for setting the 16 timers available on EntelliPro ES. The timers can be adjusted within the range of 0.1 to 6553.5 seconds.

Refer to Figure 5-11 for the WinESG parameterization timer panel.

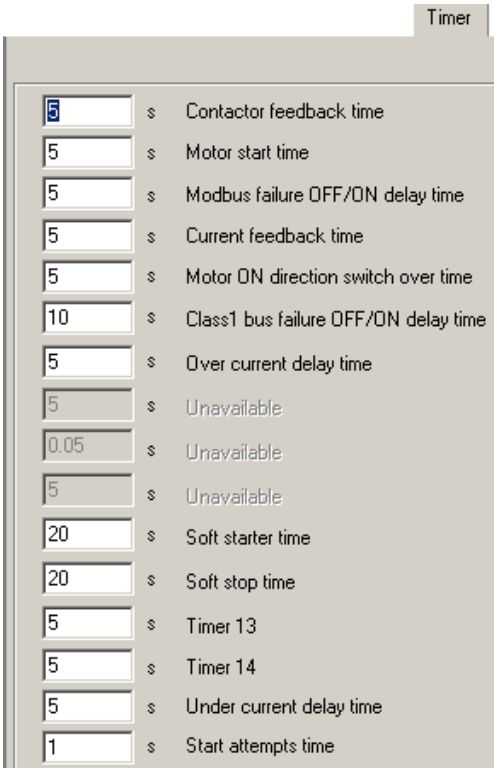


Figure 5-11-: WinESG parameterization timer panel

Contactor feedback time:	fault or warning is indicated if contactor feedback (current or contactor) is not received within this time.
Motor start time:	fault or warning is indicated if a current is above the start phase threshold for the set amount of time.
Modbus failure OFF/ON delay time:	fault or warning is indicated if a Modbus failure exists after this time expires. Modbus timeout time must be set in Modbus register 59.
Current feedback time:	fault or warning is indicated if a current is below 0.2 * Ir for the set amount of time after a start.
Motor ON direction switch over time:	use mainly on two-speed motor. Transition from one speed to the other will only occur after this time expires.
Class 1 failure OFF/ON delay time:	fault or warning is indicated if a Profibus class 1 failure exists after this time expires.
Over current delay time:	fault or warning is indicated if a current is above over current threshold for the set amount of time.

Soft starter time:	use on soft starter typical. Transition to by-pass will occur after this time expires.
Soft stop time:	use on soft starter typical. Transition from by-pass to soft starter stop control will occur after this time expires.
Under current delay time:	fault or warning is indicated if a current is below under current threshold for the set amount of time.
Start attempts time:	indicates the allowable time to make the number of start attempts set in start attempt counter (Counter 3).

5.3.2.6 Parameterization Counter panel

The counter panel provides a means for setting two parameterizable counters: Counter 1 and Counter 2. They are selectable from 0 to 65535 in steps of 1. Details are available in logic documentation. Counter 3 is used for Start attempt counter, and it is settable from 1 to 40. This is the number of start attempts allowed within a specified timer (Start attempts time). Refer to Figure 5-12 for the WinESG parameterization counter panel.

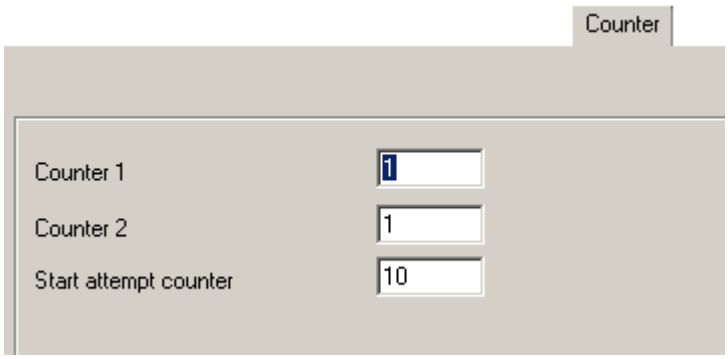


Figure 5-12-: WinESG parameterization counter panel

5.3.2.7 Parameterization Control panel

The control panel provides a means for setting the controls of the local/remote switch, the remote and local devices and the device behavior In case of fault. Refer to figure 5-13 for the WinESG parameterization control panel.

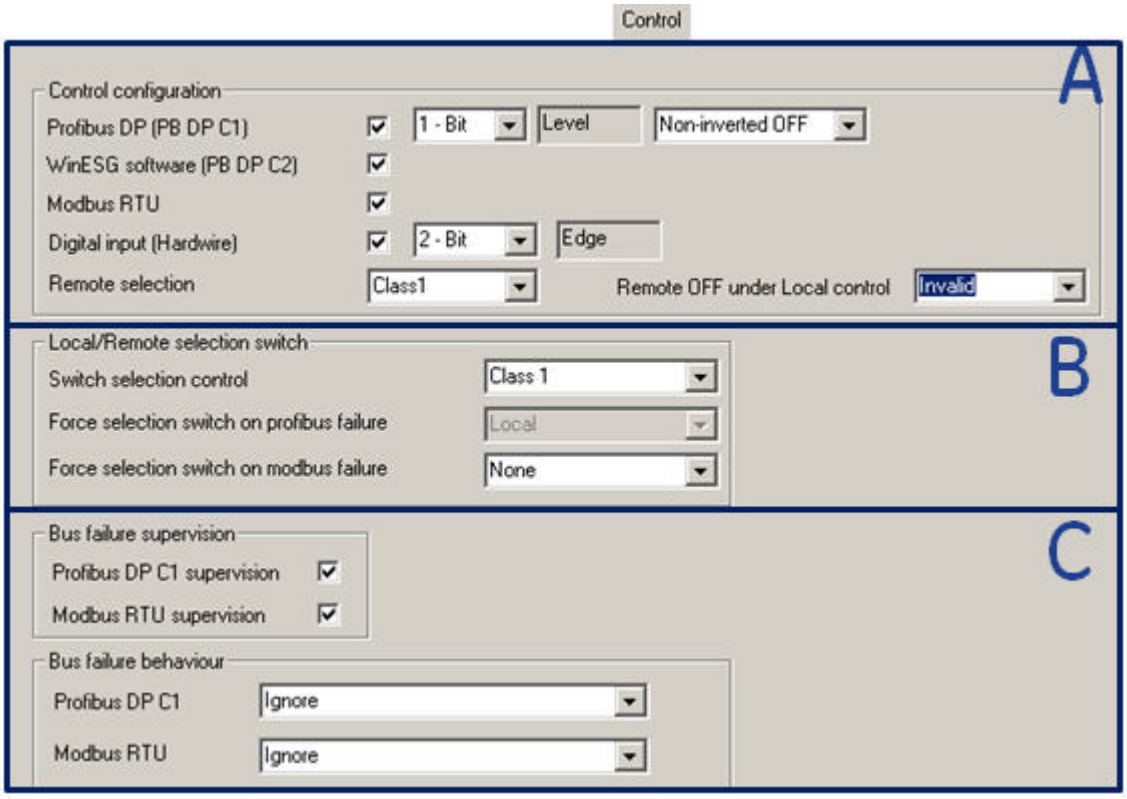


Figure 5-13-: WinESG parameterization control panel

Control configuration in illustration A enables and disables the source, defines the sources as local or remote, and defines the mode of operation of the source (1-bit or 2-bit). Only one source can be set as a remote. The rest, if enabled, will be automatically set as local.

Profibus DP (PB DP C1):	Profibus class 1 cyclic communication such as PLC, can be set as 1-Bit (level) or 2-Bit (edge), Inverted OFF or Non-Inverted OFF.
1 – Bit:	ON-bit (telegram B10008 bit0 or bit1) will turn the motor ON and OFF.
2-Bit:	ON-bit (telegram B10008 bit0 or bit1) will turn the motor ON and OFF-bit (telegram B10008 bit0 or bit14) will turn motor off.
Inverted OFF:	active low signal (0) is valid OFF command.
Non-Inverted OFF:	active high signal (1) is valid OFF command.
Remote selection:	selects the remote source – Profibus class 1, Modbus or hardwire
Remote OFF in Local control:	valid - Remote source can stop a motor invalid - Remote source cannot stop a motor

NOTE **NOTE:** if Profibus Class 1 is enabled it is assigned as a remote.

NOTE **NOTE:** When changing from 1-bit to 2-bit it is recommended that the power be re-cycled.

NOTE **NOTE:** If hardwire is set to 1-bit and remote source is hardware it is not recommend to keep remote Off valid, since it is an invalid combination.

Local / Remote selection switch in illustration B allows the setting of a source that controls the local-remote switch

Switch selection control:	The following sources can be selected: Class 1, Modbus, Hardwire, Fixed local, or Fixed Remote. The selected source determines if local or remote sources control the motor operation (ON/OFF). Refer to section 2.2.1 for additional information.

If Bus failure supervision for the specific protocol in illustration C, is selected the bus failure behavior can be defined. Bus failure behavior indicates the reaction of EntelliPro ES in case of communication failure.

Ignore:	contactor stays ON or OFF if bus failure appears.
Delayed OFF:	contactor switches OFF after a specific time delay set on Modbus failure OFF/ON delay timer and/or Class 1 failure OFF/ON delay time.
Delayed ON1:	ON1 command is issued after a specific time delay set on Modbus failure OFF/ON delay time and/or Class 1 failure OFF/ON delay time. Use on two-speed motor.
Delayed ON2:	ON2 command is issued after a specific time delay set on Modbus failure OFF/ON delay time and/or Class 1 failure OFF/ON delay time. Use on two-speed motor.

5.3.2.8 Parameterization Typical settings panel

The typical setting panel provides a means for the activation and deactivation of the ATEX, thermistor line broken or short, feedback via current or contact, and other settings related to the typical operation. Refer to figure 5-14 for the WinESG parameterization typical settings panel.

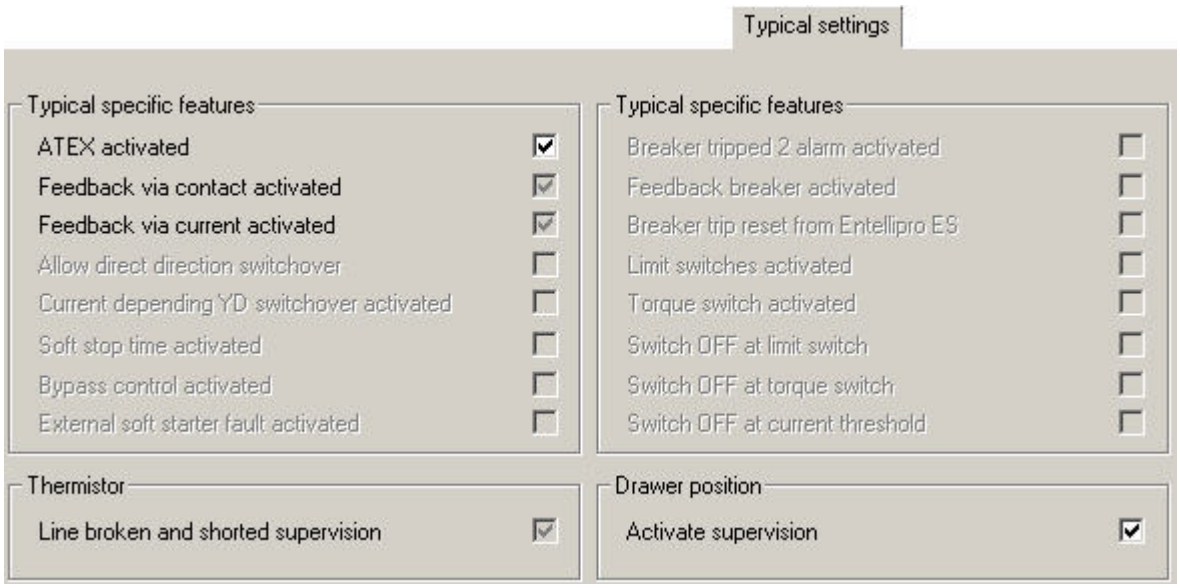


Figure 5-14: WinESG parameterization typical setting panel

ATEX activated: if active, overload, phase loss and unbalance cannot be disabled and set to warning and there is not a delay band for phase loss and unbalance. The maximum allowed auto-reset Is 3. Thermistor protection is enabled and set to failure.

Feedback via contact activated: if active, a fault or warning is generated if hardwire input is not received within the contact feedback timer.

Feedback via current activated: if active, a fault or warning is generated if the current does not exceed 0.2 * Ir within the contact feedback time.

Allow direct direction switchover: applicable only to two-speed motor (Dahlander and pole changer). If active the direction can be changed without the OFF command, after the switchover timer expires.

For other settings definition refer to the typical description in section 2.3

Drawer position: activate the drawer supervision. In order to turn ON the motor the drawer must be ready i.e. the local or remote control source must be defined and set, all faults must be clear, the drawer must be set to either test or operation.

If the activate drawer activation supervision is enabled, the motor can only be turn ON if the drawer is set to operation or test mode.

If the activate drawer activation supervision is disabled, the motor can be turn ON irrespective of the drawer being set to test or operation. .

Thermistor line broken/short supervision: enable the thermistor open and short protection i.e. a thermistor warning or a fault will be generated in case of thermistor open or short.

5.3.2.9 I/O's panel

The I/O panel provides a mean for mapping the inputs and outputs. Refer to figure 5-15 for the WinESG parameterization I/O panel. The mapping can be changed by unselecting the default configuration in the parameterization/Information panel.

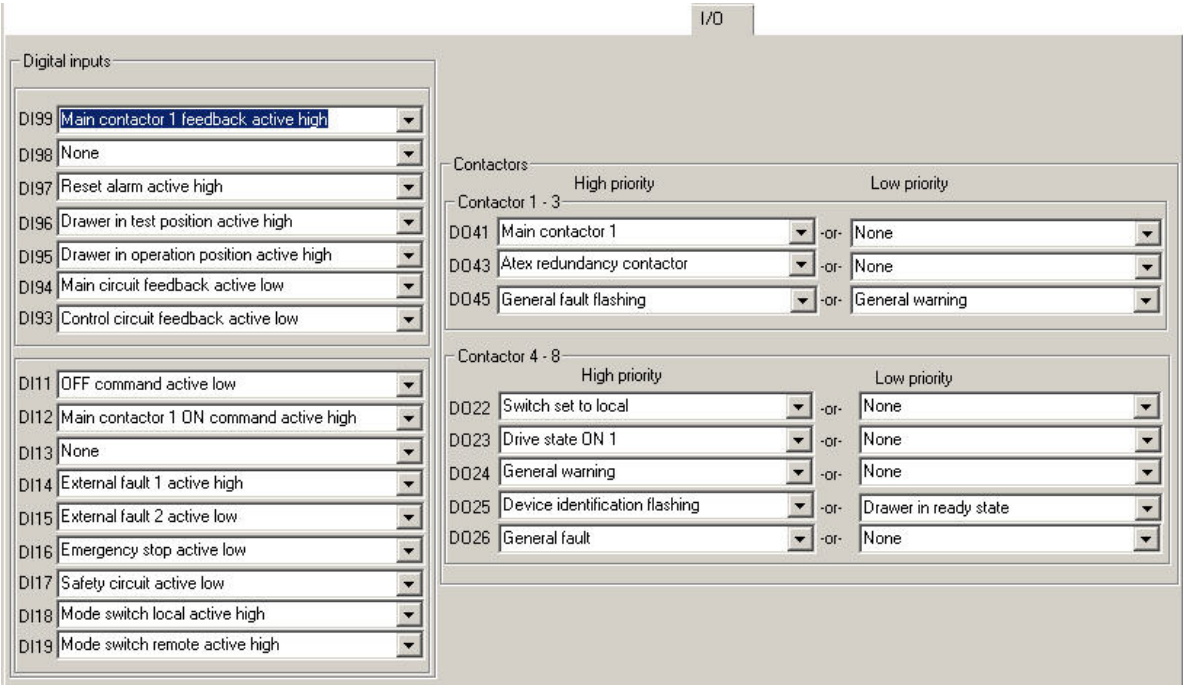


Figure 5-15: WinESG parameterization I/O panel

Inputs can be mapped to following as active high or active low:

Main contactor 1 ON command, Main contactor 2 ON command, OFF command, Main contactor 1 feedback, Main contactor 2 I feedback, External fault 1, External fault 2, Drawer in operation position, Drawer in test position, Mode switch remote, Mode switch local, Reset alarm, Main circuit feedback, Control circuit feedback, Emergency stop, safety circuit.

Same input should NOT be mapped to active high and low at the same time.

Output relays can be mapped to following as solid on or flashing

hingMain contactor 1, Main contactor 2, ATEX redundancy contactor, Parameter allowed, Switch protected, Start attempt exceeded, Drawer is ready state, General warning, General fault, Safety circuit, Switch set to local, Switch set to remote, Drawer in operation Drawer in test mode, General device error, Device identification, profibus class 1 failure, Modbus failure, Thermistor broken, Thermistor shorted, Main contactor 1 switching in progress, Main contactor 2 switching in progress, Motor is start phase Motor in run phase.

CAUTION

CAUTION: Do not assign outputs as flashing in both low priority, and high priority. Do not assign same input as active low and high.

5.3.2.10 Parameterization Cyclic panel

The cyclic panel enables the customer to select parameters to be viewed over Profibus class 1 master. Refer to Figure 5-16 for the WinESG parameterization cyclic communication panel.

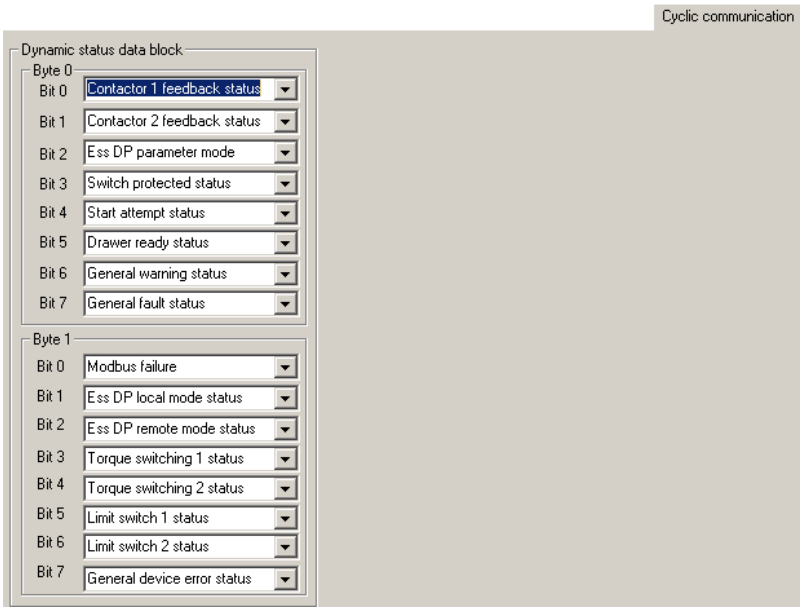


Figure 5-16: WinESG parameterization cyclic panel

The following parameters status can be mapped to the Dynamic status data block:

Contactor 1 feedback, Contactor 2 feedback, Parameter mode, Switch protected, Star attempt, Drawer ready, General warning, General Fault, Safety circuit, Local mode, Remote mode, Drawer operational mode, Drawer test mode, Limit switch 1, Limit switch 2, General device error, Feedback identification, profibus class 1 failure, Modbus failure, Switching 1 in progress, Switching 2 in progress, Breaker tripped 2, Breaker charged, Torque switching 1, Torque switching 2, Start phase, Run phase, Thermistor line broken, Thermistor line, Overload failure, Phase loss failure, Ground fault failure, Unbalalanced load failure, Thermistor channel failure, Emergency OFF failure, Limit switch failure, Safety circuit failure, Main voltage failure, Contactor feedback failure, Under current failure, Over current failure, External supervision failure, Overload warning, Phase loss warning, Ground fault warning, Unbalalanced load warning, Emergency OFF warning, Limit switch warning, Safety circuit warning, Main voltage warning, Contactor feedback warning, Under current warning, Over current warning, External supervision warning.

5.3.2.11 Parameterization Modbus setting panel

The Modbus panel provides a means for selecting software or hardware Modbus address. If a software address is selected, it can be entered in the Modbus panel. If a hardware address is selected, the EntelliPro ES uses the front switches. In addition the appropriate baud rate, data bits, parity and stop bits can be set. Refer to Figure 5-17 for the WinESG parameterization Modbus panel.

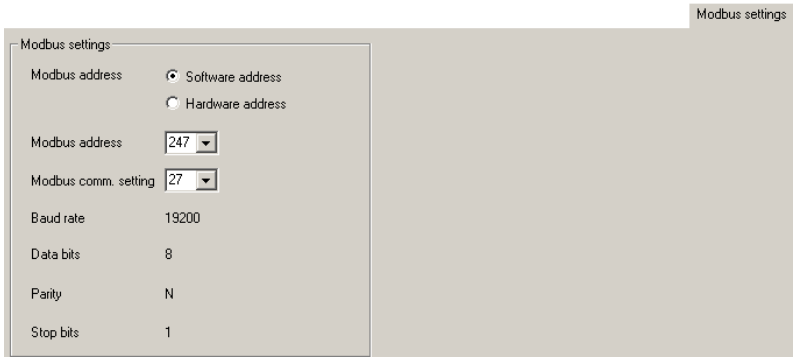


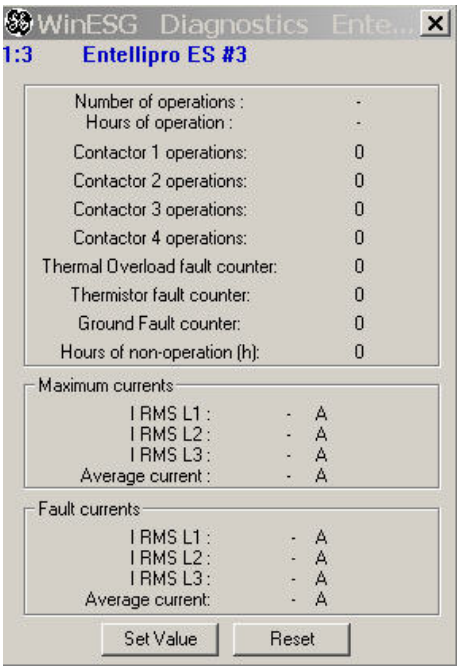
Figure 5-17: WinESG parameterization Modbus setting panel

5.3.2.12 Char (Characteristic) panel

The characteristic (Char) window shown below, displays the device type (catalog), unit serial number, software version and the fully flexible logic version if available.

5.3.2.13 Diagnostic panel

The diagnostic panelshown below, shows the operations counters, trip information, maximum currents, and fault currents. The operations counters can be set by pressing "set value" or reset by pressing the "Reset" button.



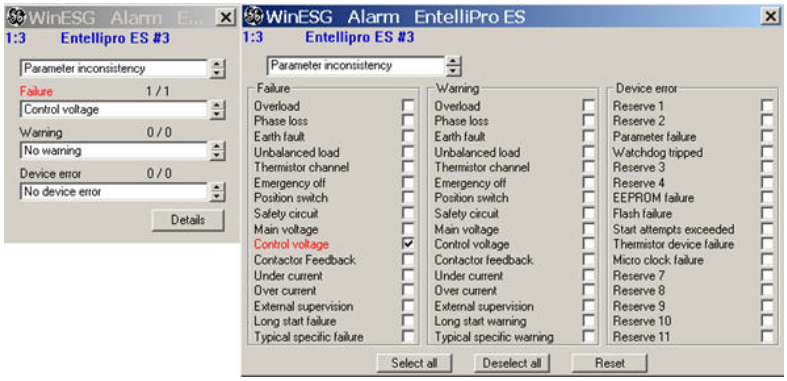
5.3.2.14 Measure panel

The measure panel shows the phases and average RMS currents, ground fault currents, time to trip and time to reset.

NOTE **NOTE:** Motor cannot start if the time to reset is non-zero.

5.3.2.15 Alarm panel

The alarm panel shown below, provides the EntelliPro ES status and the capability to reset faults, warnings and device errors. To view fault, warning, and device error details click on Details. To reset a particular fault, the fault type must be selected then click Reset.



5.3.3 Debug panel

The debug panel provides a means to fully test the custom logic. It shows the actual state of the EntelliPro ES logic variables. The data is only valid when the parameter "debug mode" is activated in the parameterization/function panel window.

NOTE

NOTE: The debug mode should be activated only for test purposes.

The value of the variable is displayed in colour with the following meaning:

Red: variable is TRUE.

Black: variable is FALSE.

Grey: status unknown (check communication)

Refer to Figure 5-18 for the WinESG debug panel.

WinESG Debug EntelliPro ES

1:1 Entellipro ES

DI	BE	BEAC	BEAM	BERS	BERG	BAM	BAS	BAG	TE	MS	MR	MA	ME	MA	SEA	SEG	PMF	PMQ	PMS
11	1	1	1	1	1	1	1	1	1	1	1	1	25	25	1	1	1	1	1
12	2	2	2	2	2	2	2	2	2	2	2	2	26	26	2	2	2	2	2
13	3	3	3	3	3	3	3	3	3	3	3	3	27	27	3	3	3	3	3
14	4	4	4	4	4	4	4	4	4	4	4	4	28	28	4	4	4	4	4
15	5	5	5	5	5	5	5	5	5	5	5	5	29	29	5	5	5	5	5
16	6	6	6	6	6	6	6	6	6	6	6	6	30	30	6	6	6	6	6
17	7	7	7	7	7	7	7	7	7	7	7	7	31	31	7	7	7	7	7
18	8	8	8	8	8	8	8	8	8	8	8	8	32	32	8	8	8	8	8
19	9	9	9	9	9	9	9	9	9	9	9	9	33	33	9	9	9	9	9
	10	10	10	10	10	10	10	10	10	10	10	10	34	34	10	10	10	10	10
93	11	11	11	11	11	11	11	11	11	11	11	11	35	35	11	11	11	11	11
94	12	12	12	12	12	12	12	12	12	12	12	12	36	36	12	12	12	12	12
95	13	13	13	13	13	13	13	13	13	13	13	13	37	37	13	13	13	13	13
96	14	14	14	14	14	14	14	14	14	14	14	14	38	38	14	14	14	14	14
97	15	15	15	15	15	15	15	15	15	15	15	15	39	39	15	15	15	15	15
98	16	16	16	16	16	16	16	16	16	16	16	16	40	40	16	16	16	16	16
99	17	17	17	BERW		17	BAW		TA	17	17	17	41	41	17	17		17	17
DO	18	18	18	1		18	1		1	18	18	18	42	42	18	18	UV	BV	
22	19	19	19	2		19	2		2	19	19	19	43	43	19	19	1	1	
23	20	20	20	3		20	3		3	20	20	20	44	44	20	20	2	2	
24	21	21	21	4		21	4		4	21	21	21	45	45	21	21	3	3	
25	22	22	22	5		22	5		5	22	22	22	46	46	22	22	4	4	
26	23	23	23	6		23	6		6	23	23	23	47	47	23	23	5	5	
	24	24	24	7		24	7		7	24	24	24	48	48	24	24	6	6	
41				8		25	8		8				SE	SA	25	25	7	7	
43				9		26	9		9				1	1	26	26	8	8	
45				10		27	10		10	ZE	ZA	ZR	2	2	27	27			
				11		28	11		11	1	1	1	3	3	28	28			
				12		29	12		12	2	2	2	4	4	29	29			
				13		30	13		13	3	3	3	5	5	30	30			
				14		31	14		14	4	4	4	6	6	31	31			
				15		32	15		15				7	7	32	32			
				16			16		16				8	8					

Figure 5-18: WinESG parameterization debug panel

Table 5-1 below shows the full debug register definitions.

Element	Type	Size	Description	Notes
PMS1	Input	bit	Overload Alarm	
PMS2	Input	bit	Phase loss Alarm	
PMS3	Input	bit	Ground fault Alarm	
PMS4	Input	bit	Unbalanced load Alarm	
PMS5	Input	bit	Thermistor Alarm	
PMS6	Input	bit	Emergency stop Alarm	
PMS7	Input	bit	Limit switch Alarm	
PMS8	Input	bit	Safety circuit Alarm	
PMS9	Input	bit	Main circuit Alarm	
PMS10	Input	bit	Control circuit Alarm	
PMS11	Input	bit	Contactor feedbak Alarm	
PMS12	Input	bit	under load current Alarm	
PMS13	Input	bit	over load current Alarm	
PMS14	Input	bit	External supervision Alarm	
PMS15	Input	bit	Long Start Time Alarm	
PMS16	Input	bit	Torque switches Alarm	
PMS17	Input	bit	Device failure Alarm	
PMQ1	Input	bit	Overload Manual Reset	
PMQ2	Input	bit	Phase loss Manual Reset	
PMQ3	Input	bit	Ground fault Manual Reset	
PMQ4	Input	bit	Unbalanced load Manual Reset	
PMQ5	Input	bit	Thermistor Manual Reset	
PMQ6	Input	bit	Emergency stop Manual Reset	
PMQ7	Input	bit	Limit switch Manual Reset	
PMQ8	Input	bit	Safety circuit Manual Reset	
PMQ9	Input	bit	Main circuit Manual Reset	
PMQ10	Input	bit	Control circuit Manual Reset	
PMQ11	Input	bit	Contactor feedbak Manual Reset	
PMQ12	Input	bit	under load current Manual Reset	
PMQ13	Input	bit	over load current Manual Reset	
PMQ14	Input	bit	External supervision Manual Reset	
PMQ15	Input	bit	Long Start Time Manual Reset	
PMQ16	Input	bit	Torque switches Manual Reset	
PMQ17	Input	bit	Device failure Manual Reset	
PMQ18	Input	bit	Profibus Class1 failure. Manual Reset	
PMQ19	Input	bit	Modbus failure. Manual Reset	
PMF1	Input	bit	Default Configuration	Use on motor starter typicals only
PMF2	Input	bit	Disable alarm underload current	Use on motor starter typicals only
PMF3	Input	bit	Disable alarm overload current	Use on motor starter typicals only
PMF4	Input	bit	Accept parameterization mode	Use on motor starter typicals only
PMF5	Input	bit	Reserved	
PMF6	Input	bit	Ignore Phase loss during start phase	Use on motor starter typicals only
PMF7	Input	bit	Ignore earth fault during start phase	Use on motor starter typicals only
PMF8	Input	bit	Ignore Unbalance load during start phase	Use on motor starter typicals only
PMF9	Input	bit	Motor Starter Typical selection	Use on motor starter typicals only
PMF10	Input	bit	Reserved	
PMF11	Input	bit	Reserved	
PMF12	Input	bit	Reserved	
PMF13	Input	bit	Control mode variant selection	Use on motor starter typicals only
PMF14	Input	bit	Reserved	
PMF15	Input	bit	Reserved	
PMF16	Input	bit	Reserved	
DI 11	Input	bit	Input 11 State	
DI 12	Input	bit	Input 12 State	

Element	Type	Size	Description	Notes
DI 13	Input	bit	Input 13 State	
DI 14	Input	bit	Input 14 State	
DI 15	Input	bit	Input 15 State	
DI 16	Input	bit	Input 16 State	
DI 17	Input	bit	Input 17 State	
DI 18	Input	bit	Input 18 State	
DI 19	Input	bit	Input 19 State	
DI 33	Input	bit	Input 93 State	
DI 34	Input	bit	Input 94 State	
DI 35	Input	bit	Input 95 State	
DI 36	Input	bit	Input 96 State	
DI 37	Input	bit	Input 97 State	
DI 38	Input	bit	Input 98 State	
DI 39	Input	bit	Input 99 State	
D041	Output	bit	Relay 41 State	
D043	Output	bit	Relay 43 State	
D045	Output	bit	Relay 45 State	
D022	Output	bit	Relay 22 State	
D023	Output	bit	Relay 23 State	
D024	Output	bit	Relay 24 State	
D025	Output	bit	Relay 25 State	
D026	Output	bit	Relay 26 State	
BE1	Input	Bit	Profibus cyclic data - Command ON1	
BE2	Input	Bit	Profibus cyclic data - Command ON2	
BE3	Input	Bit	Reserved	
BE4	Input	Bit	Reserved	
BE5	Input	Bit	Profibus cyclic data - Command OFF	
BE6	Input	Bit	Profibus cyclic data - Identification	
BE7	Input	Bit	Reserved	
BE8	Input	Bit	Reserved	
BE9	Input	Bit	Profibus cyclic data - Lock switch command	
BE10	Input	Bit	Profibus cyclic data - Operation mode set to Local	
BE11	Input	Bit	Profibus cyclic data - Operation mode set to Remote	
BE12	Input	Bit	Reserved	
BE13	Input	Bit	Reserved	
BE14	Input	Bit	Reserved	
BE15	Input	Bit	Profibus cyclic data - Reset all alarms and device errors	
BE16	Input	Bit	Reserved	
BE17	Input	Bit	Reserved	
BE18	Input	Bit	Reserved	
BE19	Input	Bit	Reserved	
BE20	Input	Bit	Reserved	
BE21	Input	Bit	Reserved	
BE22	Input	Bit	Reserved	
BE23	Input	Bit	Reserved	
BE24	Input	Bit	Reserved	
BEAC1	Input	Bit	Profibus acyclic data - Command ON1	
BEAC2	Input	Bit	Profibus acyclic data - Command ON2	
BEAC3	Input	Bit	Reserved	
BEAC4	Input	Bit	Reserved	
BEAC5	Input	Bit	Profibus acyclic data - Command OFF	
BEAC6	Input	Bit	Profibus acyclic data - Identification	
BEAC7	Input	Bit	Reserved	
BEAC8	Input	Bit	Reserved	
BEAC9	Input	Bit	Profibus acyclic data - Lock switch command	
BEAC10	Input	Bit	Reserved	

Element	Type	Size	Description	Notes
BEAC11	Input	Bit	Reserved	
BEAC12	Input	Bit	Reserved	
BEAC13	Input	Bit	Reserved	
BEAC14	Input	Bit	Reserved	
BEAC15	Input	Bit	Reserved	
BEAC16	Input	Bit	Reserved	
BEAC17	Input	Bit	Reserved	
BEAC18	Input	Bit	Reserved	
BEAC19	Input	Bit	Reserved	
BEAC20	Input	Bit	Reserved	
BEAC21	Input	Bit	Reserved	
BEAC22	Input	Bit	Reserved	
BEAC23	Input	Bit	Reserved	
BEAC24	Input	Bit	Reserved	
BEM1	Input	Bit	Modbus data - Command ON1	
BEM2	Input	Bit	Modbus data - Command ON2	
BEM3	Input	Bit	Reserved	
BEM4	Input	Bit	Reserved	
BEM5	Input	Bit	Reserved	
BEM6	Input	Bit	Modbus data - Identification	
BEM7	Input	Bit	Reserved	
BEM8	Input	Bit	Reserved	
BEM9	Input	Bit	Modbus data - Lock switch command	
BEM10	Input	Bit	Modbus data - Operation mode switch set to Local	
BEM11	Input	Bit	Modbus data - Operation mode switch set to Remote	
BEM12	Input	Bit	Reserved	
BEM13	Input	Bit	Reserved	
BEM14	Input	Bit	Reserved	
BEM15	Input	Bit	Reserved	
BEM16	Input	Bit	Reserved	
BEM17	Input	Bit	Reserved	
BEM18	Input	Bit	Reserved	
BEM19	Input	Bit	Reserved	
BEM20	Input	Bit	Reserved	
BEM21	Input	Bit	Reserved	
BEM22	Input	Bit	Reserved	
BEM23	Input	Bit	Reserved	
BEM24	Input	Bit	Reserved	
BERS1	Input	Bit	Overload Failure Reset Command	
BERS2	Input	Bit	Phase loss Failure Reset Command	
BERS3	Input	Bit	Ground fault Failure Reset Command	
BERS4	Input	Bit	Unbalanced load Failure Reset Command	
BERS5	Input	Bit	Thermistor Failure Reset Command	
BERS6	Input	Bit	Emergency stop Failure Reset Command	
BERS7	Input	Bit	Limit switch Failure Reset Command	
BERS8	Input	Bit	Safety circuit Failure Reset Command	
BERS9	Input	Bit	Main circuit Failure Reset Command	
BERS10	Input	Bit	Control circuit Failure Reset Command	
BERS11	Input	Bit	Contactor feedbak Failure Reset Command	
BERS12	Input	Bit	Under load current Failure Reset Command	
BERS13	Input	Bit	Over load current Failure Reset Command	
BERS14	Input	Bit	External supervision Failure Reset Command	
BERS15	Input	Bit	Long Start Time Failure Reset Command	
BERS16	Input	Bit	Typical Specific Failure Reset Command	

Element	Type	Size	Description	Notes
BERW1	Input	Bit	Overload Warning Reset Command	
BERW2	Input	Bit	Phase loss Warning Reset Command	
BERW3	Input	Bit	Ground fault Warning Reset Command	
BERW4	Input	Bit	Unbalanced load Warning Reset Command	
BERW5	Input	Bit	Thermistor Warning Reset Command	
BERW6	Input	Bit	Emergency stop Warning Reset Command	
BERW7	Input	Bit	Limit switch Warning Reset Command	
BERW8	Input	Bit	Safety circuit Warning Reset Command	
BERW9	Input	Bit	Main circuit Warning Reset Command	
BERW10	Input	Bit	Control circuit Warning Reset Command	
BERW11	Input	Bit	Contactor feedbak Warning Reset Command	
BERW12	Input	Bit	under load current Warning Reset Command	
BERW13	Input	Bit	over load current Warning Reset Command	
BERW14	Input	Bit	External supervision Warning Reset Command	
BERW15	Input	Bit	Long Start Time Warning Reset Command	
BERW16	Input	Bit	Typical Specific Warning Reset Command	
BERG1	Input	Bit	Test Program MP Failure Reset Command	
BERG2	Input	Bit	RAM Failure Reset Command	
BERG3	Input	Bit	Parameter Failure Reset Command	
BERG4	Input	Bit	Watchdog Reset Command	
BERG5	Input	Bit	Timer Interrupt Failure Reset Command	
BERG6	Input	Bit	Current Measurement Ungauged Reset Command	
BERG7	Input	Bit	EEPROM Failure Reset Command	
BERG8	Input	Bit	Current Measurement Reset Command	
BERG9	Input	Bit	tart Attempt Reset Command	
BERG10	Input	Bit	Thermistor Hardware Reset Command	
BERG11	Input	Bit	Reserved	
BERG12	Input	Bit	Reserved	
BERG13	Input	Bit	Reserved	
BERG14	Input	Bit	Reserved	
BERG15	Input	Bit	Reserved	
BERG16	Input	Bit	Reserved	
HBAM1	Output	Bit	Feedback ON1 Status	
HBAM2	Output	Bit	Feedback ON2 Status	
HBAM3	Output	Bit	Parameter Mode Status	
HBAM4	Output	Bit	Switch Protected Status / Block Local Switch ON Status	
HBAM5	Output	Bit	Start Attempt Status	
HBAM6	Output	Bit	Drawer Ready Status	
HBAM7	Output	Bit	General Warning Status	
HBAM8	Output	Bit	General Fault Status	
HBAM9	Output	Bit	Safety circuit Status	
HBAM10	Output	Bit	Local Mode Status	
HBAM11	Output	Bit	Remote Mode Status	
HBAM12	Output	Bit	Drawer in Operation Mode Status	
HBAM13	Output	Bit	Drawer in Test Mode Status	
HBAM14	Output	Bit	Limit switch 1 Status	
HBAM15	Output	Bit	Limit switch 2 Status	
HBAM16	Output	Bit	General Device Error Status	
HBAM17	Output	Bit	Feedback Identification Status	
HBAM18	Output	Bit	Failure Profibus class 1 Status	
HBAM19	Output	Bit	Failure Modbus Status	
HBAM20	Output	Bit	By pass Switched ON (Typical Specific) Status	
HBAM21	Output	Bit	Switching right in progress Status	
HBAM22	Output	Bit	Switching feft in progress Status	
HBAM23	Output	Bit	Breaker tripped2 (Typical Specific) Status	

Element	Type	Size	Description	Notes
HBAM24	Output	Bit	Charge Status (Typical Specific) Status	
HBAM25	Output	Bit	Torque switch 1 (Typical Specific) Status	
HBAM26	Output	Bit	Torque switch 2 (Typical Specific) Status	
HBAM27	Output	Bit	Start Phase Status	
HBAM28	Output	Bit	Run Phase Status	
HBAM29	Output	Bit	Thermistor line broken Status	
HBAM30	Output	Bit	Thermistor line shorted Status	
HBAM31	Output	Bit	Reserved	
HBAM32	Output	Bit	Reserved	
HBAS1	Output	Bit	Overload Failure Status	
HBAS2	Output	Bit	Phase loss Failure Status	
HBAS3	Output	Bit	Ground fault Failure Status	
HBAS4	Output	Bit	Unbalanced load Failure Status	
HBAS5	Output	Bit	Thermistor Failure Status	
HBAS6	Output	Bit	Emergency stop Failure Status	
HBAS7	Output	Bit	Limit switch Failure Status	
HBAS8	Output	Bit	Safety circuit Failure Status	
HBAS9	Output	Bit	Main circuit Failure Status	
HBAS10	Output	Bit	Control circuit Failure Status	
HBAS11	Output	Bit	Contactor feedbak Failure Status	
HBAS12	Output	Bit	Under load current Failure Status	
HBAS13	Output	Bit	Over load current Failure Status	
HBAS14	Output	Bit	External supervision Failure Status	
HBAS15	Output	Bit	Long Start Time Failure Status	
HBAS16	Output	Bit	Typical Specific Failure Status	
HBAW1	Output	Bit	Overload Warning Status	
HBAW2	Output	Bit	Phase loss Warning Status	
HBAW3	Output	Bit	Ground fault Warning Status	
HBAW4	Output	Bit	Unbalanced load Warning Status	
HBAW5	Output	Bit	Thermistor Warning Status	
HBAW6	Output	Bit	Emergency stop Warning Status	
HBAW7	Output	Bit	Limit switch Warning Status	
HBAW8	Output	Bit	Safety circuit Warning Status	
HBAW9	Output	Bit	Main circuit Warning Status	
HBAW10	Output	Bit	Control circuit Warning Status	
HBAW11	Output	Bit	Contactor feedbak Warning Status	
HBAW12	Output	Bit	Under load current Warning Status	
HBAW13	Output	Bit	Over load current Warning Status	
HBAW14	Output	Bit	External supervision Warning Status	
HBAW15	Output	Bit	Long Start Time Warning Status	
HBAW16	Output	Bit	Typical Specific Warning Status	
HBAG1	Output	Bit	Test Program MP Failure Status	
HBAG2	Output	Bit	RAM Failure Status	
HBAG3	Output	Bit	Parameter Failure Status	
HBAG4	Output	Bit	Watchdog Failure Status	
HBAG5	Output	Bit	Timer Interrupt Failure Status	
HBAG6	Output	Bit	Current Measurement Ungauged Status	
HBAG7	Output	Bit	EEPROM Failure Status	
HBAG8	Output	Bit	Current Measurement Status	
HBAG9	Output	Bit	Start Attempt Status	
HBAG10	Output	Bit	Thermistor Hardware Status	
HBAG11	Output	Bit	Reserved	
HBAG12	Output	Bit	Reserved	
HBAG13	Output	Bit	Reserved	
HBAG14	Output	Bit	Reserved	

Element	Type	Size	Description	Notes
HBAG15	Output	Bit	Reserved	
HBAG16	Output	Bit	Reserved	
SEA1 & SEG1	Input / Output	Bit	Overload	
SEA2 & SEG2	Input / Output	Bit	Overload pre warning	
SEA3 & SEG3	Input / Output	Bit	Thermistor	
SEA4 & SEG4	Input / Output	Bit	Ground fault	
SEA5 & SEG5	Input / Output	Bit	Phase loss	
SEA6 & SEG6	Input / Output	Bit	Unbalanced load	
SEA7 & SEG7	Input / Output	Bit	Bus failure stored- Class1	
SEA8& SEG8	Input / Output	Bit	Modbus Failure	
SEA9 & SEG9	Input / Output	Bit	Current threshold 1	
SEA10 & SEG10	Input / Output	Bit	Current threshold 2	
SEA11 & SEG11	Input / Output	Bit	Current threshold 3	
SEA12 & SEG12	Input / Output	Bit	Current threshold 4	
SEA13 & SEG13	Input / Output	Bit	Thermistor line broken	
SEA14 & SEG14	Input / Output	Bit	Thermistor line shorted	
SEA15 & SEG15	Input / Output	Bit	Reserved	
SEA16 & SEG16	Input / Output	Bit	Reserved	
SEA17 & SEG17	Input / Output	Bit	Test Program MP Failure	
SEA18 & SEG18	Input / Output	Bit	RAM Failure	
SEA19 & SEG19	Input / Output	Bit	Parameter Failure	
SEA20 & SEG20	Input / Output	Bit	Device Failure Watchdog Trip	
SEA21 & SEG21	Input / Output	Bit	Device Failure Timer Interrupt	
SEA22 & SEG22	Input / Output	Bit	Current Measurement Ungauged Failure	
SEA23 & SEG23	Input / Output	Bit	EEPROM Failure	
SEA24 & SEG24	Input / Output	Bit	Current Measurement Failure	
SEA25 & SEG25	Input / Output	Bit	Start Phase	
SEA26 & SEG26	Input / Output	Bit	Run Phase	
SEA27 & SEG27	Input / Output	Bit	Current Feedback Threshold	
SEA28 & SEG28	Input / Output	Bit	Long Start Time	
SEA29 & SEG29	Input / Output	Bit	Reserved	
SEA30 & SEG30	Input / Output	Bit	Reserved	
SEA31 & SEG31	Input / Output	Bit	Reserved	
SEA32 & SEG32	Input / Output	Bit	Reserved	
MA1,MR1 & MS1	Input - RS FLipFlop	Bit	Set ON 1	
MA2	Input - RS FLipFlop	Bit	Set ON 2	
MA3	Input - RS FLipFlop	Bit	Reserved	Use on motor starter typicals only
MA4	Input - RS FLipFlop	Bit	Internal command ON 1	Use on motor starter typicals only
MA5	Input - RS FLipFlop	Bit	Internal command ON 2	Use on motor starter typicals only
MA6	Input - RS FLipFlop	Bit	Internal command OFF	Use on motor starter typicals only
MA7	Input - RS FLipFlop	Bit	Flank marker ON1 for cyclic interface	Use on motor starter typicals only
MA8	Input - RS FLipFlop	Bit	Flank marker ON2 for cyclic interface	Use on motor starter typicals only
MA9	Input - RS FLipFlop	Bit	Flank marker OFF for cyclic interface	Use on motor starter typicals only
MA10	Input - RS FLipFlop	Bit	Flank marker ON1 for acyclic interface	Use on motor starter typicals only
MA11	Input - RS FLipFlop	Bit	Flank marker ON2 for acyclic interface	Use on motor starter typicals only
MA12	Input - RS FLipFlop	Bit	Flank marker OFF for acyclic interface	Use on motor starter typicals only
MA13	Input - RS FLipFlop	Bit	Reserved	Use on motor starter typicals only
MA14	Input - RS FLipFlop	Bit	Flank marker ON1 for Modbus interface	Use on motor starter typicals only
MA15	Input - RS FLipFlop	Bit	Flank marker ON2 for Modbus interface	Use on motor starter typicals only
MA16	Input - RS FLipFlop	Bit	Flank marker OFF for Modbus interface	Use on motor starter typicals only
MA17	Input - RS FLipFlop	Bit	Flank marker ON1 for hardwire interface	Use on motor starter typicals only
MA18	Input - RS FLipFlop	Bit	Flank marker ON2 for hardwire interface	Use on motor starter typicals only
MA19	Input - RS FLipFlop	Bit	Flank marker OFF for hardwire interface	Use on motor starter typicals only

Element	Type	Size	Description	Notes
MA20	Input - RS FLipFlop	Bit	Reserved	Use on motor starter typicals only
MA21	Input - RS FLipFlop	Bit	Reserved	Use on motor starter typicals only
MA22	Input - RS FLipFlop	Bit	Reserved	Use on motor starter typicals only
MA23	Input - RS FLipFlop	Bit	Reserved	Use on motor starter typicals only
MA24	Input - RS FLipFlop	Bit	Reserved	Use on motor starter typicals only
MA25	Input - T FlipFlop	Bit	Emergency stop	Use on motor starter typicals only
MA26	Input - T FlipFlop	Bit	Limit switch	Use on motor starter typicals only
MA27	Input - T FlipFlop	Bit	Safety circuit	Use on motor starter typicals only
MA28	Input - T FlipFlop	Bit	Main circuit	Use on motor starter typicals only
MA29	Input - T FlipFlop	Bit	Control circuit	Use on motor starter typicals only
MA30	Input - T FlipFlop	Bit	Switch position	Use on motor starter typicals only
MA31	Input - T FlipFlop	Bit	under load current	Use on motor starter typicals only
MA32	Input - T FlipFlop	Bit	over load current	Use on motor starter typicals only
MA33	Input - T FlipFlop	Bit	External supervision	Use on motor starter typicals only
MA34	Input - T FlipFlop	Bit	AlarmModule16	Use on motor starter typicals only
MA35	Input - T FlipFlop	Bit	General fault	Use on motor starter typicals only
MA36	Input - T FlipFlop	Bit	Reserved	Use on motor starter typicals only
MA37	Input - T FlipFlop	Bit	Reserved	Use on motor starter typicals only
MA38	Input - T FlipFlop	Bit	Reserved	Use on motor starter typicals only
MA39	Input - T FlipFlop	Bit	Reserved	Use on motor starter typicals only
MA40	Input - T FlipFlop	Bit	Reserved	Use on motor starter typicals only
MA41	Input - T FlipFlop	Bit	Flank marker ON1 at Modbus communication loss	Use on motor starter typicals only
MA42	Input - T FlipFlop	Bit	Flank marker ON2 at Modbus communication loss	Use on motor starter typicals only
MA43	Input - T FlipFlop	Bit	Flank marker OFF at Modbus communication loss	Use on motor starter typicals only
MA44	Input - T FlipFlop	Bit	Reset alarms caused by Modbus failure	Use on motor starter typicals only
MA45	Input - T FlipFlop	Bit	Reset alarms caused by Profibus class 1 failure	Use on motor starter typicals only
MA46	Input - T FlipFlop	Bit	Flank marker ON1 at Cyclic communication loss	Use on motor starter typicals only
MA47	Input - T FlipFlop	Bit	Flank marker ON2 at Cyclic communication loss	Use on motor starter typicals only
MA48	Input - T FlipFlop	Bit	Flank marker OFF at Cyclic communication loss	Use on motor starter typicals only
TE1	Output	Bit	Max. switch time (contactor feedback)	Use on motor starter typicals only
TE2	Output	Bit	Motor start time	Use on motor starter typicals only
TE3	Output	Bit	Bus failure OFF/ON delay time - modbus	Use on motor starter typicals only
TE4	Output	Bit	Maximun switch time (current flow)	Use on motor starter typicals only
TE5	Output	Bit	Minimum switch over time	Use on motor starter typicals only
TE6	Output	Bit	Bus failure OFF/ON delay time - Profibus class1	Use on motor starter typicals only
TE7	Output	Bit	Blocked motor time	Use on motor starter typicals only
TE8	Output	Bit	Maximum Y time	Use on motor starter typicals only
TE9	Output	Bit	YD Switch over time(10ms resolution)	Use on motor starter typicals only
TE10	Output	Bit	Maximun switch time (limit switch)	Use on motor starter typicals only
TE11	Output	Bit	Maximun soft starter time	Use on motor starter typicals only
TE12	Output	Bit	Maximun soft stop time	Use on motor starter typicals only
TE13	Output	Bit	Phase loss delay	Use on motor starter typicals only
TE14	Output	Bit	Unbalance load delay	Use on motor starter typicals only
TE15	Output	Bit	Undercurrent delay	Use on motor starter typicals only
TE16	Output	Bit	Overcurrent delay	Use on motor starter typicals only
TA1	Input	Bit	Maximun switch time (contactor feedback) - Timer	Use on motor starter typicals only
TA2	Input	Bit	Motor start time - Timer	Use on motor starter typicals only
TA3	Input	Bit	Bus failure OFF/ON delay time - modbus - Timer	Use on motor starter typicals only
TA4	Input	Bit	Maximum switch time (current flow) - Timer	Use on motor starter typicals only
TA5	Input	Bit	Minimum switch over time - Timer	Use on motor starter typicals only
TA6	Input	Bit	Bus failure OFF/ON delay time - Profibus class1 - Timer	Use on motor starter typicals only
TA7	Input	Bit	Blocked motor time - Timer	Use on motor starter typicals only
TA8	Input	Bit	Maximum Y time - Timer	Use on motor starter typicals only
TA9	Input	Bit	YD Switch over time (10ms resolution) - Timer	Use on motor starter typicals only

Element	Type	Size	Description	Notes
TA10	Input	Bit	Maximun switch time (limit switch) - Timer	Use on motor starter typicals only
TA11	Input	Bit	Maximun soft starter time - Timer	Use on motor starter typicals only
TA12	Input	Bit	Maximunsoft stop time - Timer	Use on motor starter typicals only
TA13	Input	Bit	Phase loss delay - Timer	Use on motor starter typicals only
TA14	Input	Bit	Unbalance load delay - Timer	Use on motor starter typicals only
TA15	Input	Bit	Undercurrent delay - Timer	Use on motor starter typicals only
TA16	Input	Bit	Overcurrent delay - Timer	Use on motor starter typicals only
ZA1	Input	Bit	Counter 1 Expired Flag	
ZA2	Input	Bit	Counter 2 Expired Flag	
ZA3	Input	Bit	Counter 3 Expired Flag	
ZA4	Input	Bit	Counter 4 Expired Flag	
ZE1	Output	Bit	Counter 1 Start Flag	
ZE2	Output	Bit	Counter 2 Start Flag	
ZE3	Output	Bit	Counter 3 Start Flag	
ZE4	Output	Bit	Counter 4 Start Flag	
ZR1	Output	Bit	Reset Counter 1	
ZR2	Output	Bit	Reset Counter 2	
ZR3	Output	Bit	Reset Counter 3	
ZR4	Output	Bit	Reset Counter 4	
SE1	Input	Bit	0.5 Hz Flag	
SE2	Input	Bit	1Hz Flag	
SE3	Input	Bit	Reserved	
SA1	Input	Bit	Contactor closure Counter Enabled Flag	Use on customized logic only
SA2	Output	Bit	Motor Speed Flag	Use on customized logic only
SA3	Output	Bit	Parameteriztion Allowed Flag	Use on customized logic only
SA4	Input	Bit	Reserved	

Table 5-1 Debug registers definitions

5.4 Tools Menu

The following options can be selected from the dropdown menu: event protocol, analog data capture and free logic download.

5.4.1 Event Protocol

The event log panel provides a means to view the event of all EntelliPro in the system with its associate time stamp. Refer to Figure 5-19 for the WinESG event log panel.

Date: date of the event

Time: time of the event

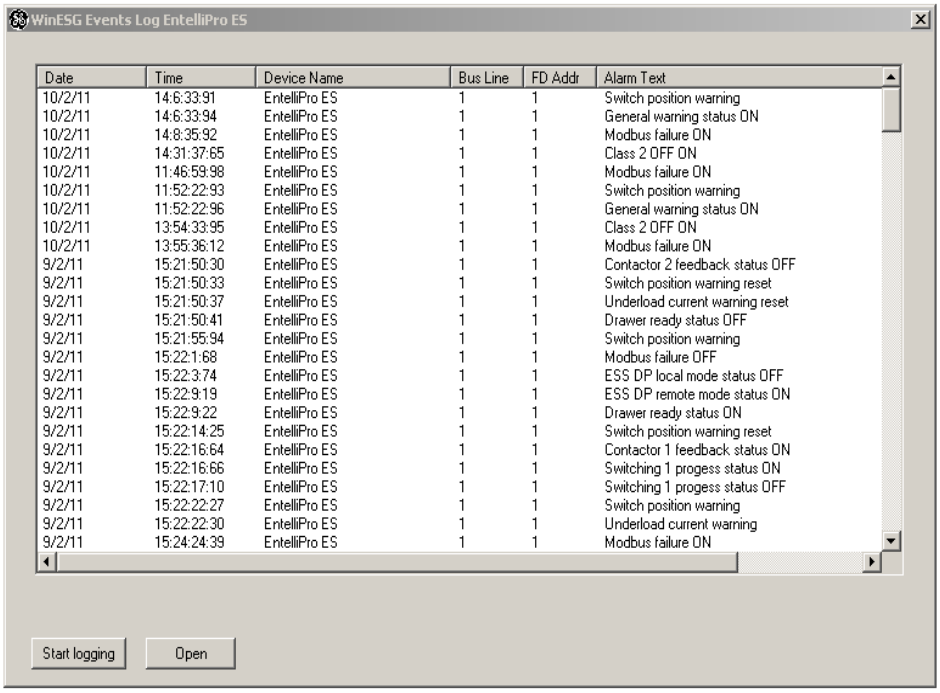
Device name: name of the device

Bus line: device connected Bus line

FD Address: device Profibus address

Alarm text : alarm text message

Events can be sorted by date by clicking the date. Press the "Start logging" button to start the logging process. Previous events saved in a file can be retrieved using the open button.



Date	Time	Device Name	Bus Line	FD Addr	Alarm Text
10/2/11	14:6:33:91	EntelliPro ES	1	1	Switch position warning
10/2/11	14:6:33:94	EntelliPro ES	1	1	General warning status ON
10/2/11	14:8:35:92	EntelliPro ES	1	1	Modbus failure ON
10/2/11	14:31:37:65	EntelliPro ES	1	1	Class 2 OFF ON
10/2/11	11:46:59:98	EntelliPro ES	1	1	Modbus failure ON
10/2/11	11:52:22:93	EntelliPro ES	1	1	Switch position warning
10/2/11	11:52:22:96	EntelliPro ES	1	1	General warning status ON
10/2/11	13:54:33:95	EntelliPro ES	1	1	Class 2 OFF ON
10/2/11	13:55:36:12	EntelliPro ES	1	1	Modbus failure ON
9/2/11	15:21:50:30	EntelliPro ES	1	1	Contactor 2 feedback status OFF
9/2/11	15:21:50:33	EntelliPro ES	1	1	Switch position warning reset
9/2/11	15:21:50:37	EntelliPro ES	1	1	Underload current warning reset
9/2/11	15:21:50:41	EntelliPro ES	1	1	Drawer ready status OFF
9/2/11	15:21:55:94	EntelliPro ES	1	1	Switch position warning
9/2/11	15:22:1:68	EntelliPro ES	1	1	Modbus failure OFF
9/2/11	15:22:3:74	EntelliPro ES	1	1	ESS DP local mode status OFF
9/2/11	15:22:9:19	EntelliPro ES	1	1	ESS DP remote mode status ON
9/2/11	15:22:9:22	EntelliPro ES	1	1	Drawer ready status ON
9/2/11	15:22:14:25	EntelliPro ES	1	1	Switch position warning reset
9/2/11	15:22:16:64	EntelliPro ES	1	1	Contactor 1 feedback status ON
9/2/11	15:22:16:66	EntelliPro ES	1	1	Switching 1 progess status ON
9/2/11	15:22:17:10	EntelliPro ES	1	1	Switching 1 progess status OFF
9/2/11	15:22:22:27	EntelliPro ES	1	1	Switch position warning
9/2/11	15:22:22:30	EntelliPro ES	1	1	Underload current warning
9/2/11	15:24:24:39	EntelliPro ES	1	1	Modbus failure ON

Figure 5-19: WinESG Event protocol panel

5.4.2 Analog Data Capture panel

The analog data capture panel provides a means to view phases A, B, and C, and average currents of RMS samples based on trigger configuration set on the parameterization/device setting panel. If the trigger is set to Manual, by pressing the "Start recording" button the current can be viewed. Refer to figure 5-20 for the WinESG RMS analog current.

Data is automatically saved in a file. Previous saved waveforms can be retrieved using the "Open" button. Right, left, zoom in, and zoom out buttons are provided to navigate thru the data.

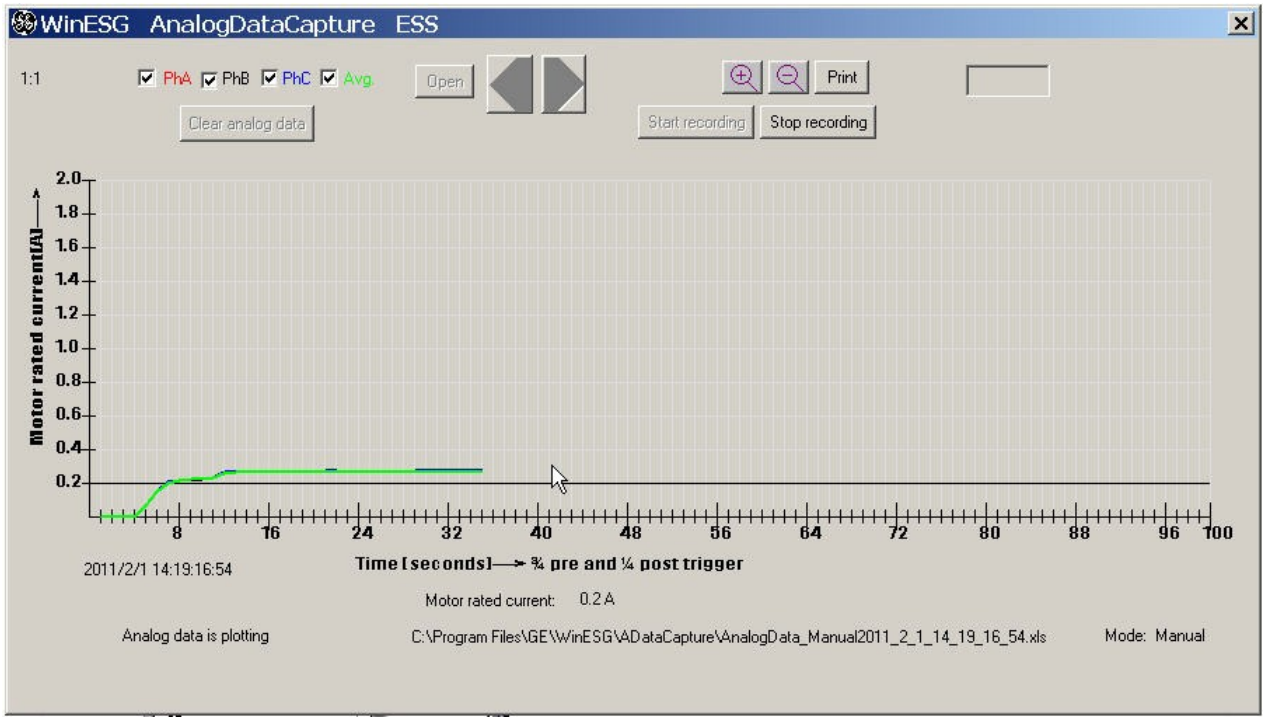


Figure 5-20: WinESG analog data capture panel

5.4.3 Flexible logic download panel

The flexible logic download panel provides a means to download the custom logic. GE will provide custom logic upon receiving an order. Refer to figure 5-21 for the WinESG custom logic download.

The following procedure must be followed to download the fully flexible logic:

Select Bus line on which EntelliPro ES device is connected.

Select the device address

Browse to select the mot file

Click "Download free logic

If successful a green line parallel to the device address will be shown. Multiple devices can be selected.

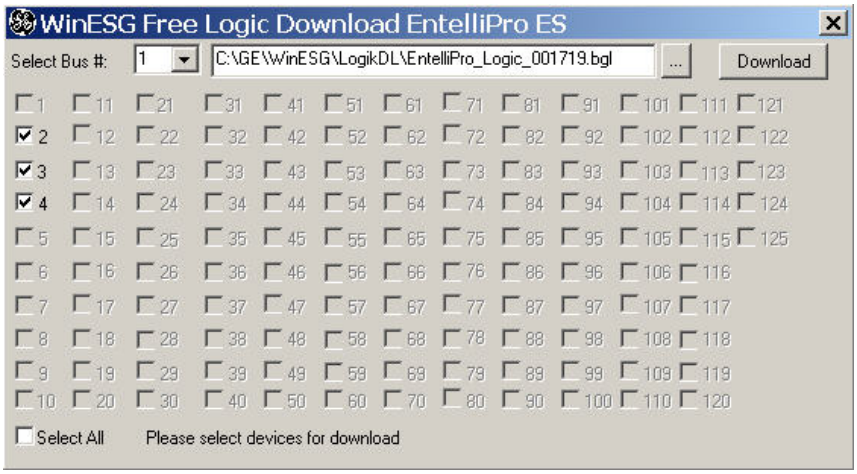


Figure 5-20: WinESG Flexible logic download panel

NOTE: After the flexible logic download the EntelliPro ES power must be re-cycle. Also if the download is stopped during the downloading process the EntelliPro ES must be re-cycle.

GE Industrial Solutions

EPOS Motor Management System

Chapter 6: EntelliPro CP3 and CP5 application

6.1 EntelliPro CP3 Main panel

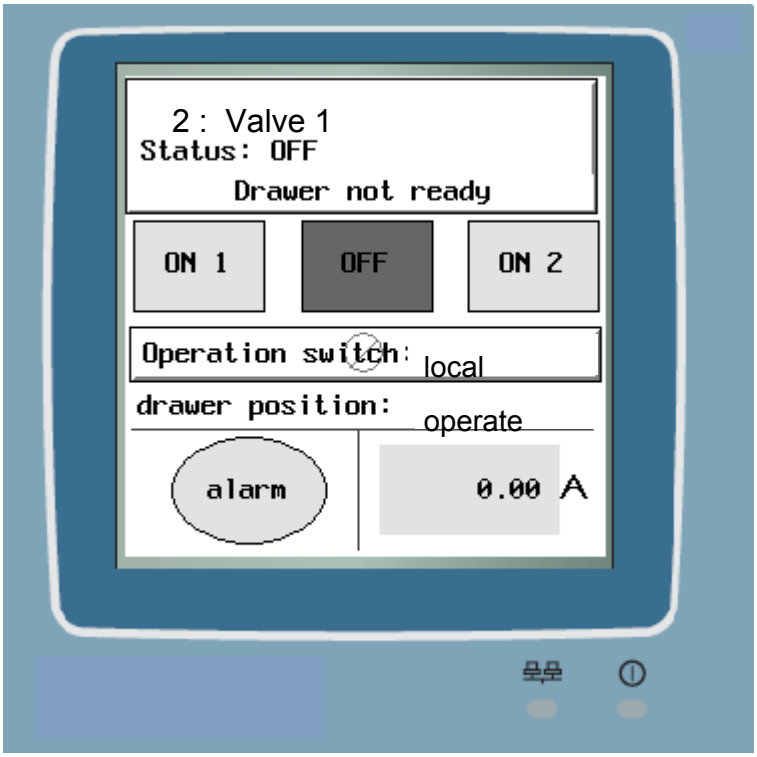
The EntelliPro CP3 device is a touch control display integrated into the Motor Control Center MCC for local control; alarm handling; and visualization the device status, values, and parameter settings.

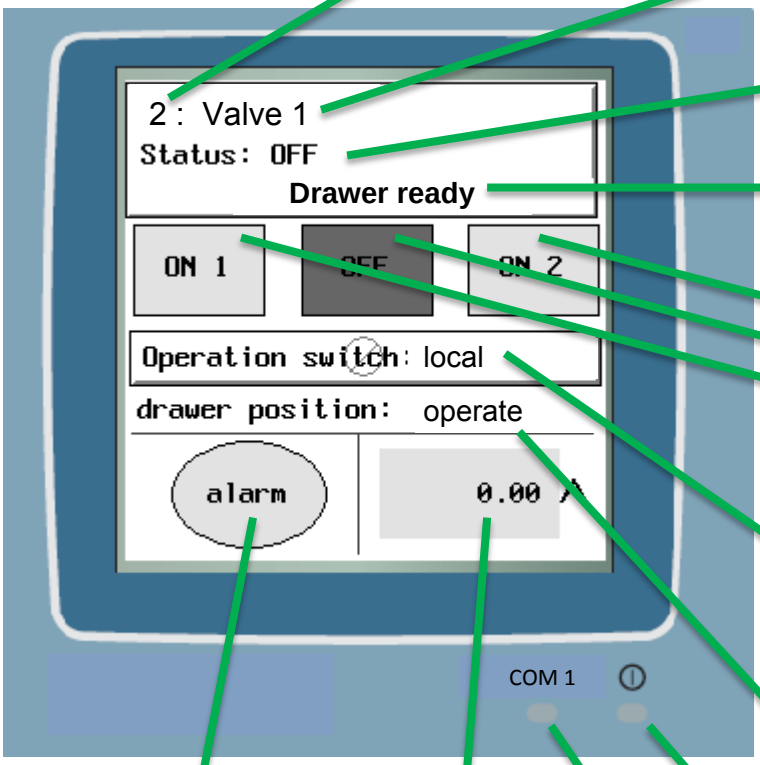
EntelliPro ES parameters cannot be set via the main panel.

The EntelliPro CP3 application has been created to operate and handle the 11 pre-programmed drive typical, such as DOL , DOL Reverse, Star Delta, Star Delta reverse, Soft starter, Soft starter reverse, Breaker control, Dahlander, Pole changing starter, Solenoid valve, and Actuator.

NOTE **NOTE:** If the drive typical value is set to "Fully free logic," the Modbus data interface of the free logic must follow the EntelliPro ES standard. Otherwise the data in the EntelliPro CP application might be incorrect.

The next two figures show the Entellipro CP3 main panel and parameters descriptions.





Profibus-DP address of the connected EntelliPro ES device

Device text of the connected motor / breaker / starter ...

Current status of the branch

Ready message of the branch

Background color informs the current branch status

Current status of the operation switch “off”, “local” or “remote”

Displays the status drawer position switch

Power LED

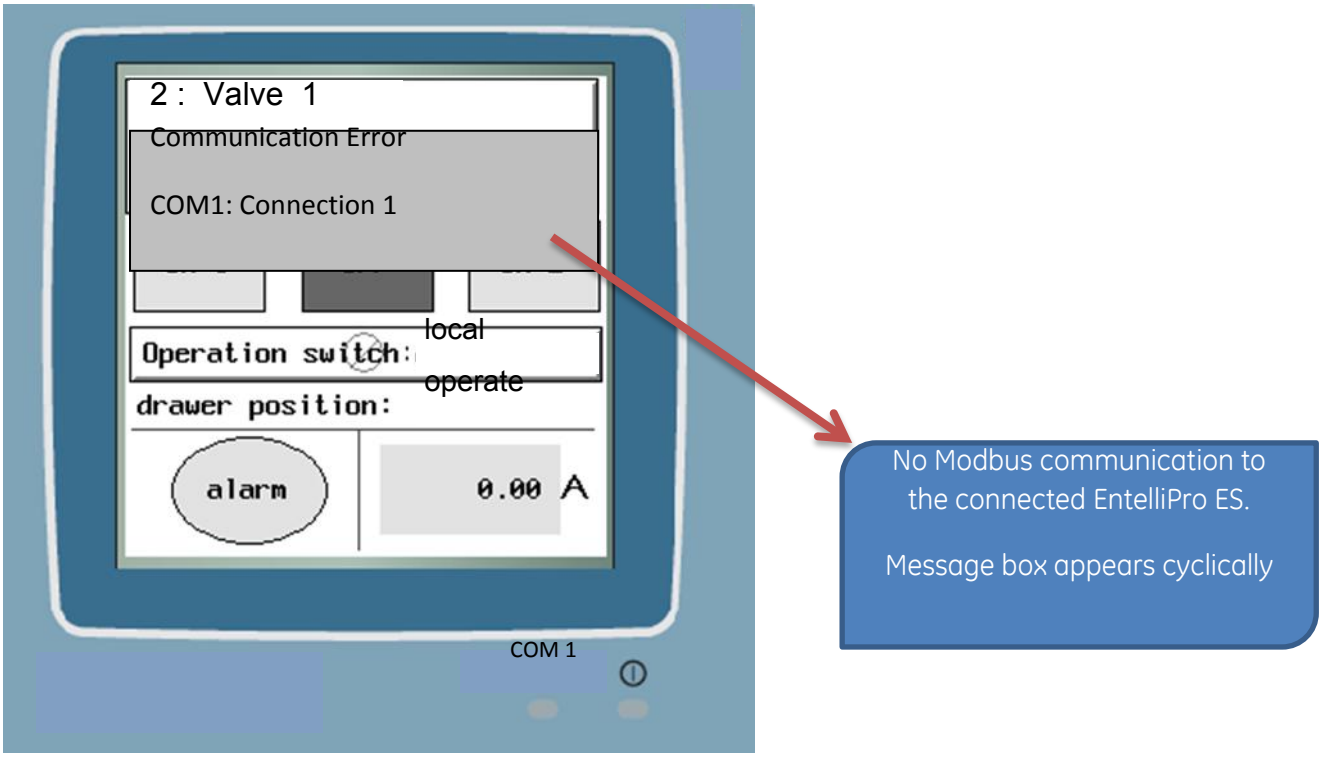
Modbus COM LED

Displays the mean current of the branch

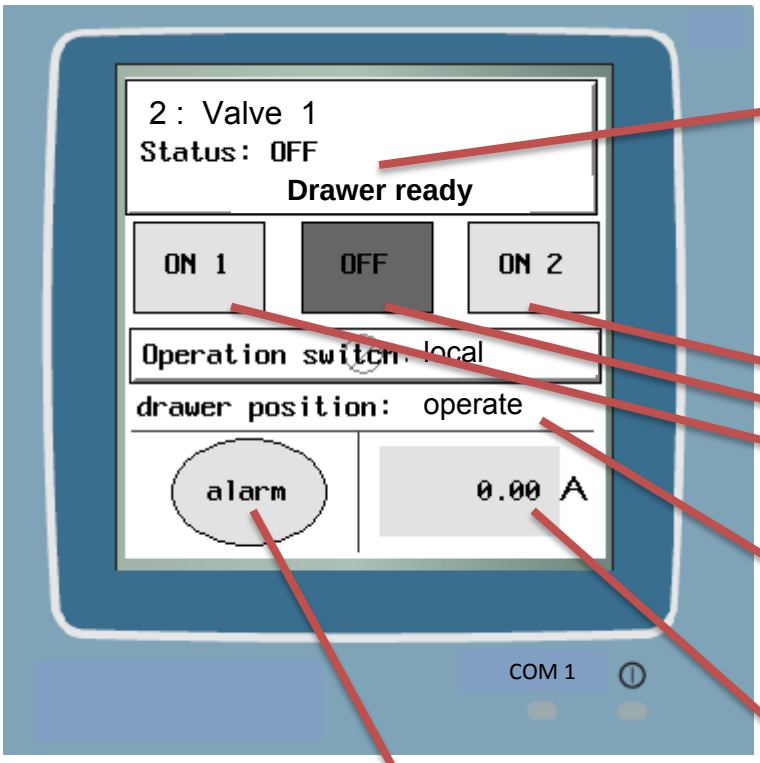
Displays the current alarm status by flashing “Failures” or “Warnings”

If "Communication Error" appears in the message box, there is no communication to the EntelliPro ES.

When a communication error is reported, check for missing cable connections and appropriate Modbus address settings. See section 6.2 for additional settings information.



The buttons in the figure below, are used to control the EntelliPro ES device and to switch into sub screens.



Button to switch into the launch menu screen

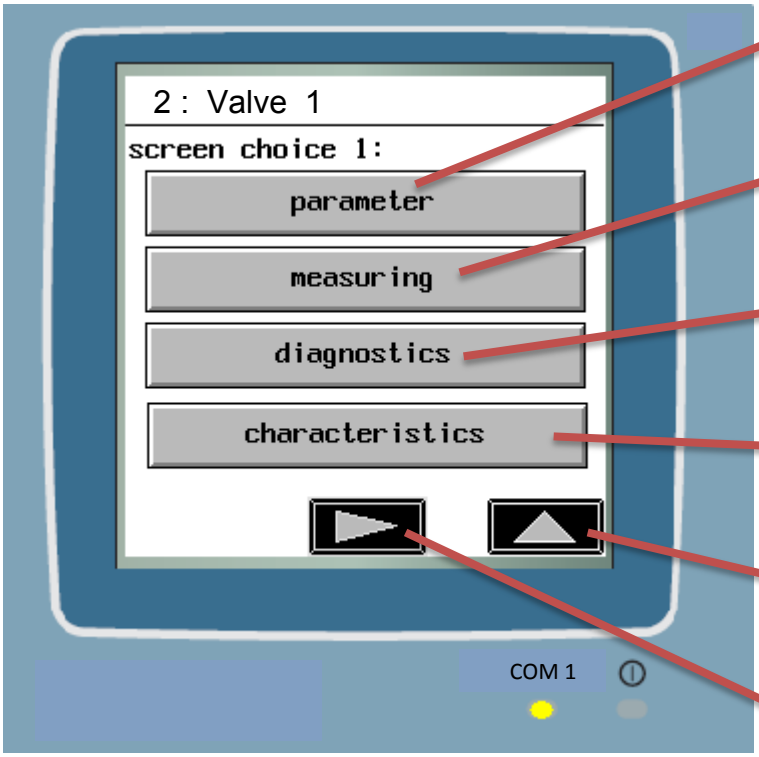
Button to switch the device "ON" and OFF"

Button to switch into the "Set operation switch" screen.
Only available in Modbus selection switch mode configuration.

Button to switch into the current measuring display

Button to switch into the alarm handling screens "Failures" and "Warnings"

The following two figures show the menu screen selections and descriptions



Button to switch into the parameter screen

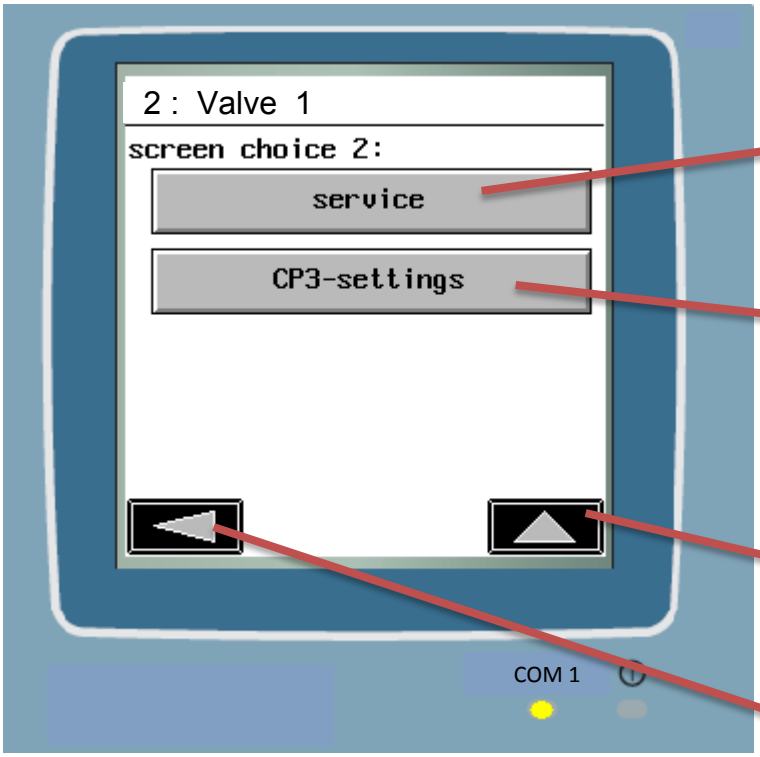
Button to switch into the measurement screen

Button to switch into the diagnostic screen

Button to switch into the characteristics screen

Button to switch back to previous menu

Button to switch to next selection menu



Button to switch into the service screen (not available)

Button to switch into the EntelliPro CP3 setting screen

Button to switch back to previous menu

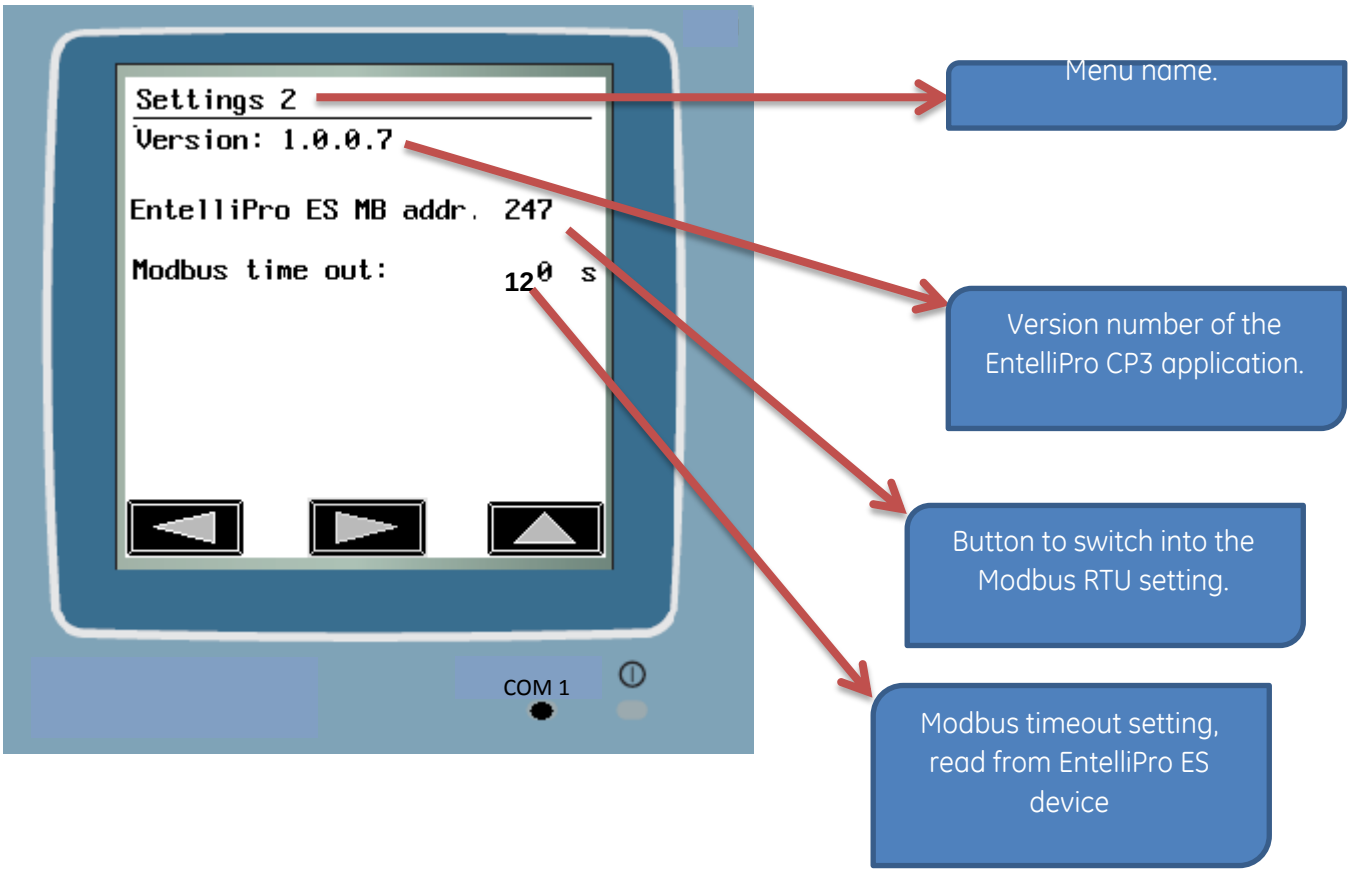
Button to switch to previous screen selection

6.2 EntelliPro CP3 application setting

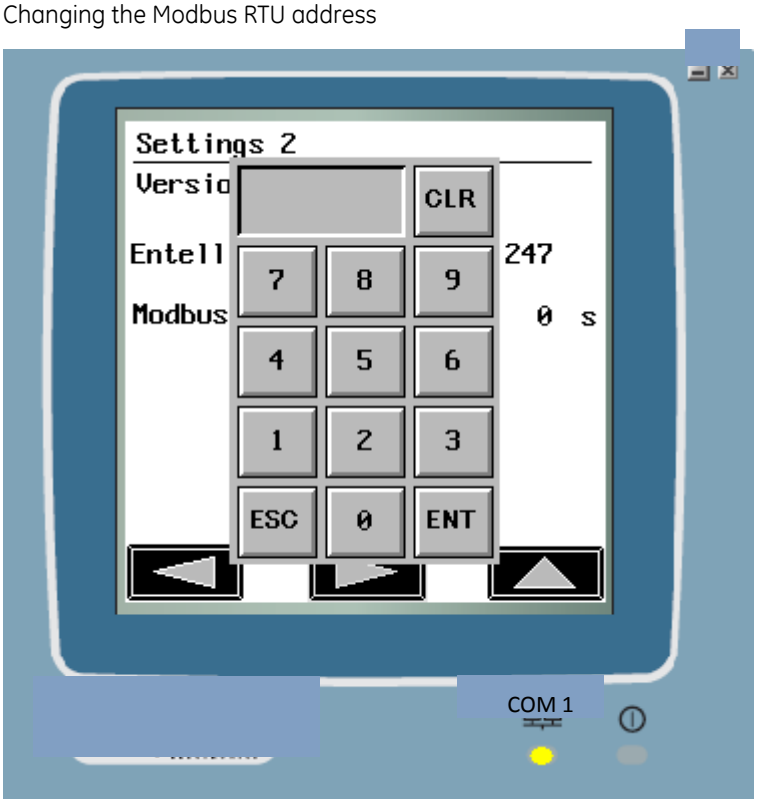
Screen "Settings 2" shows the application version number, the current Modbus address, and the current Modbus timeout time in seconds.

This timeout value can be set in the EntelliPro ES device. This value is shown if the Modbus communication is connected.

To establish a communication between the EntelliPro CP and the EntelliPro ES, the Modbus address must set to the same Modbus address as in EntelliPro ES device. To change the address, click on the Modbus address number.



Changing the Modbus RTU address



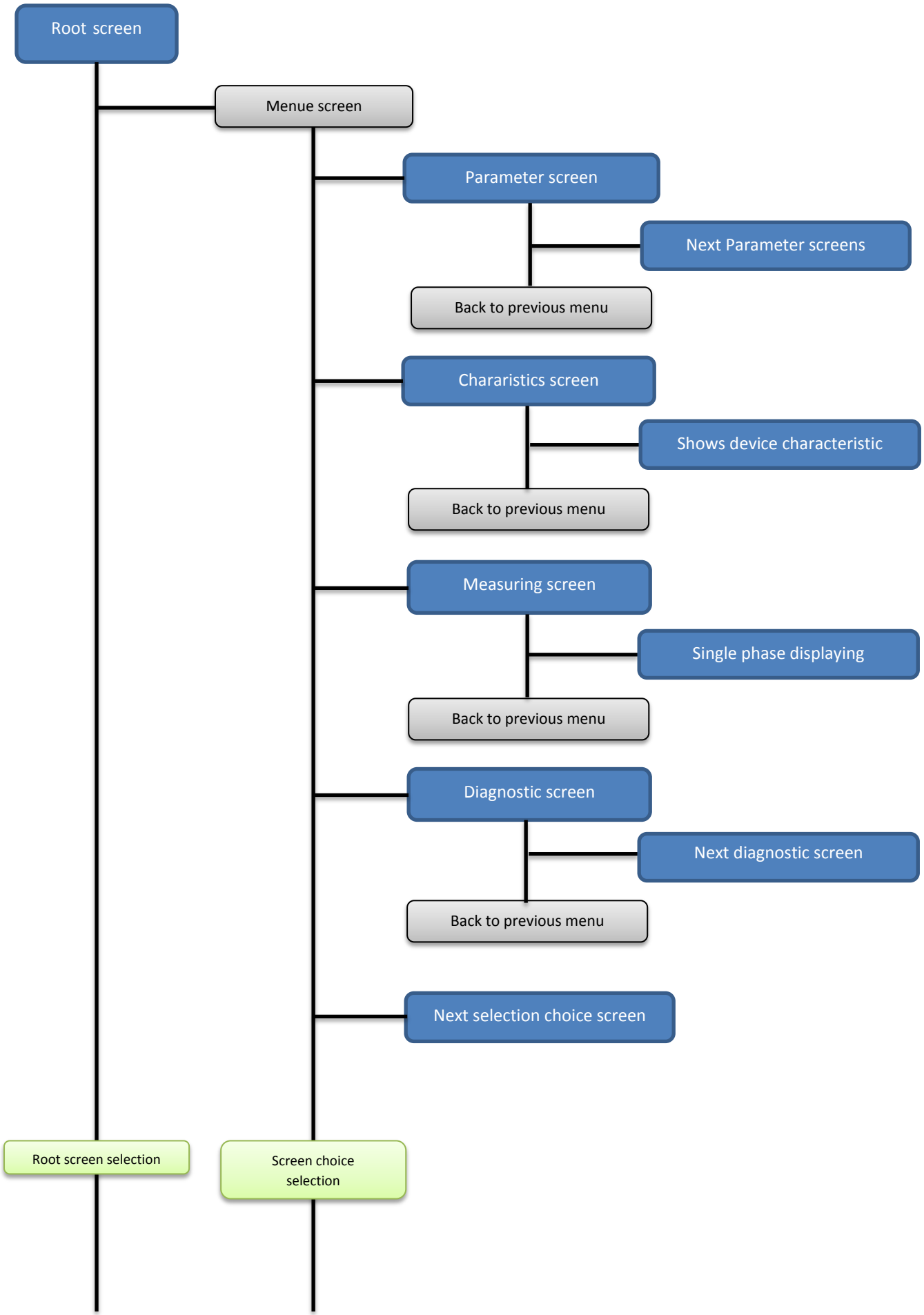
The input of a new address is protected with a user level password "22222222".

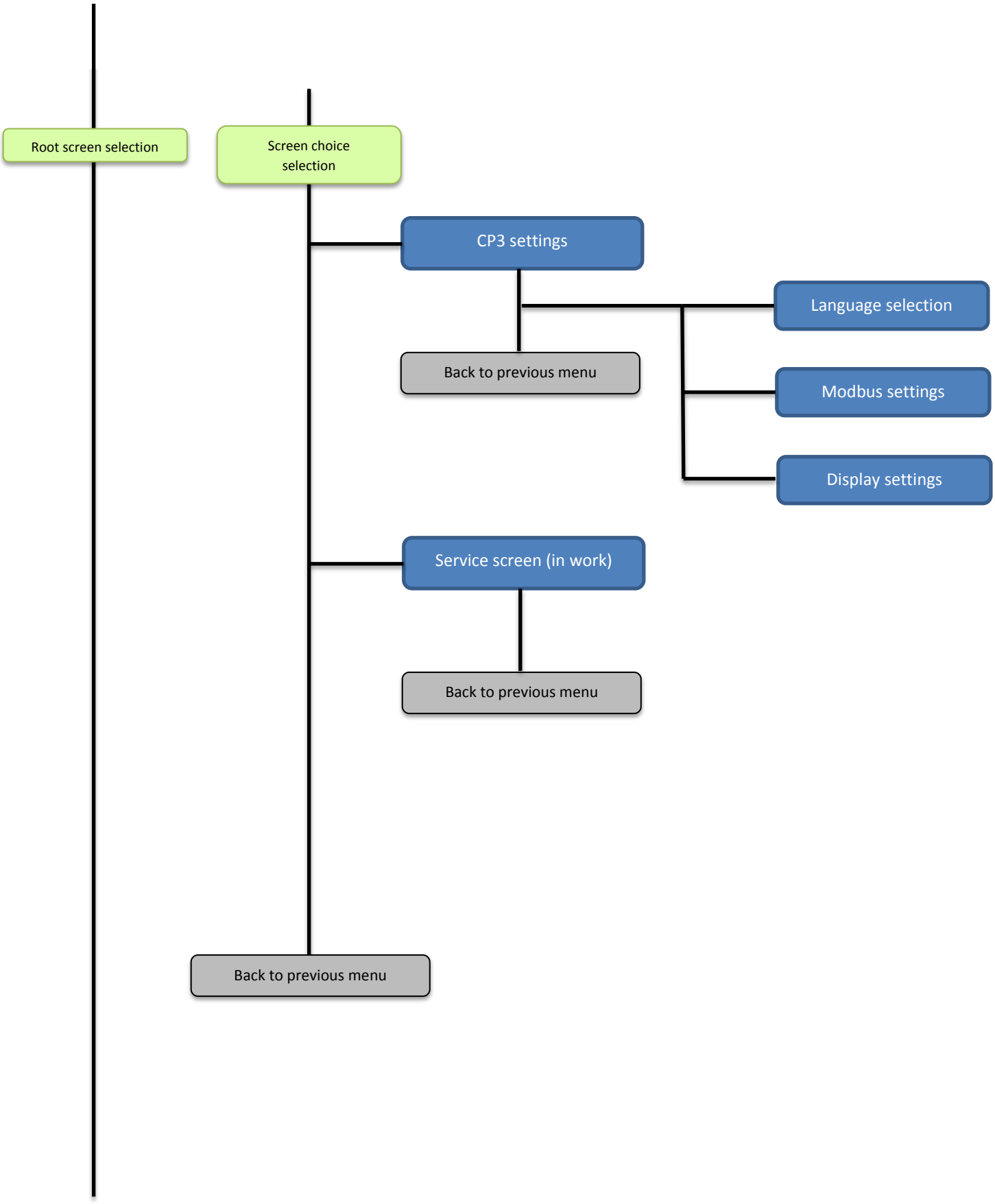
The Modbus RTU address range is 1 thru 247.
The address is stored permanently in the CP3 panel.

6.3 EntelliPro CP3 screen saver display

This screen appears in the application after a period of time without a user handling. The backlight will also switch off after an extended time of inactivity. The application screen resumes when the user touchs the display.

6.4 EntelliPro CP3 application tree structure




Root screen selection
Screen choice selection
CP3 settings
Language selection
Back to previous menu
Modbus settings
Display settings
Service screen (in work)
Back to previous menu
Back to previous menu

6.5 EntelliPro CP5 Main panel

The EntelliPro CP5 device is a touch control display integrated into the Motor Control Center MCC for local control; alarm handling and visualization the device status, values, and parameter settings.

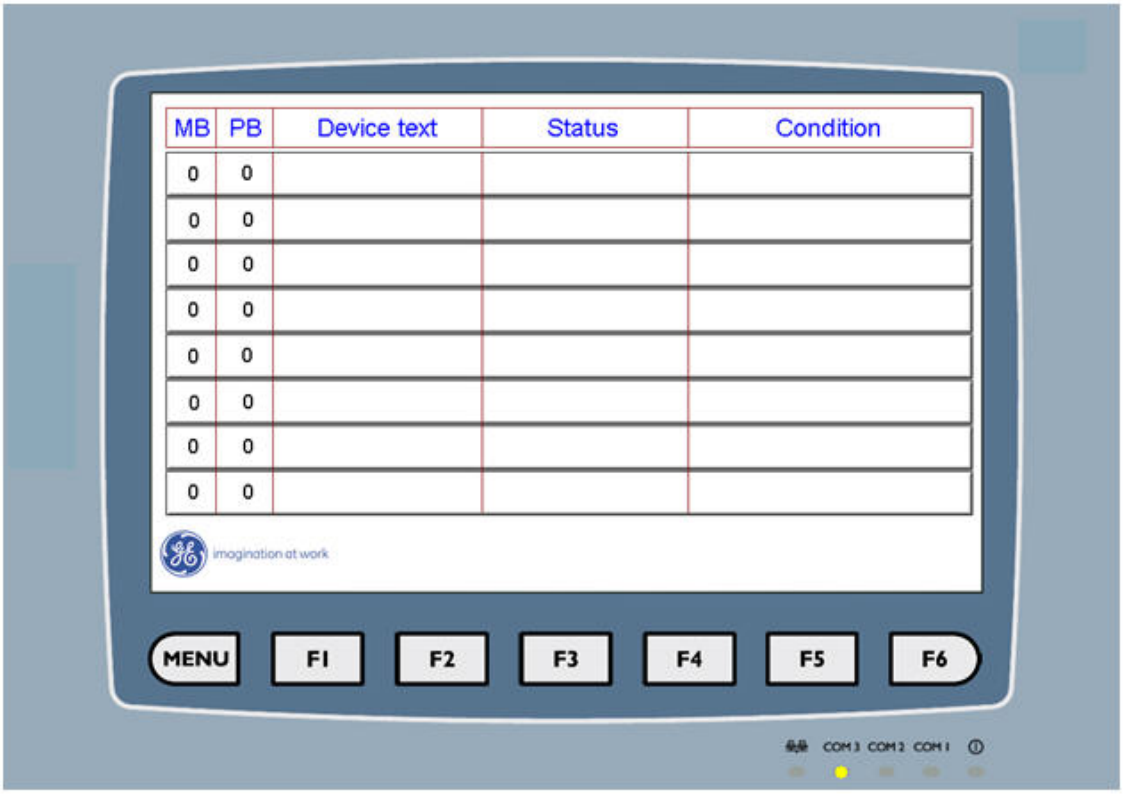
The EntelliPro CP5 application has been created to opearte and handle the pre-programmed drive typical, such as DOL, DOL reverse, Star delta, Star delta reverse, Soft starter, Soft starter reverse, Dahlander, Pole changing starter, Solenoid valve, and Actuator

NOTE

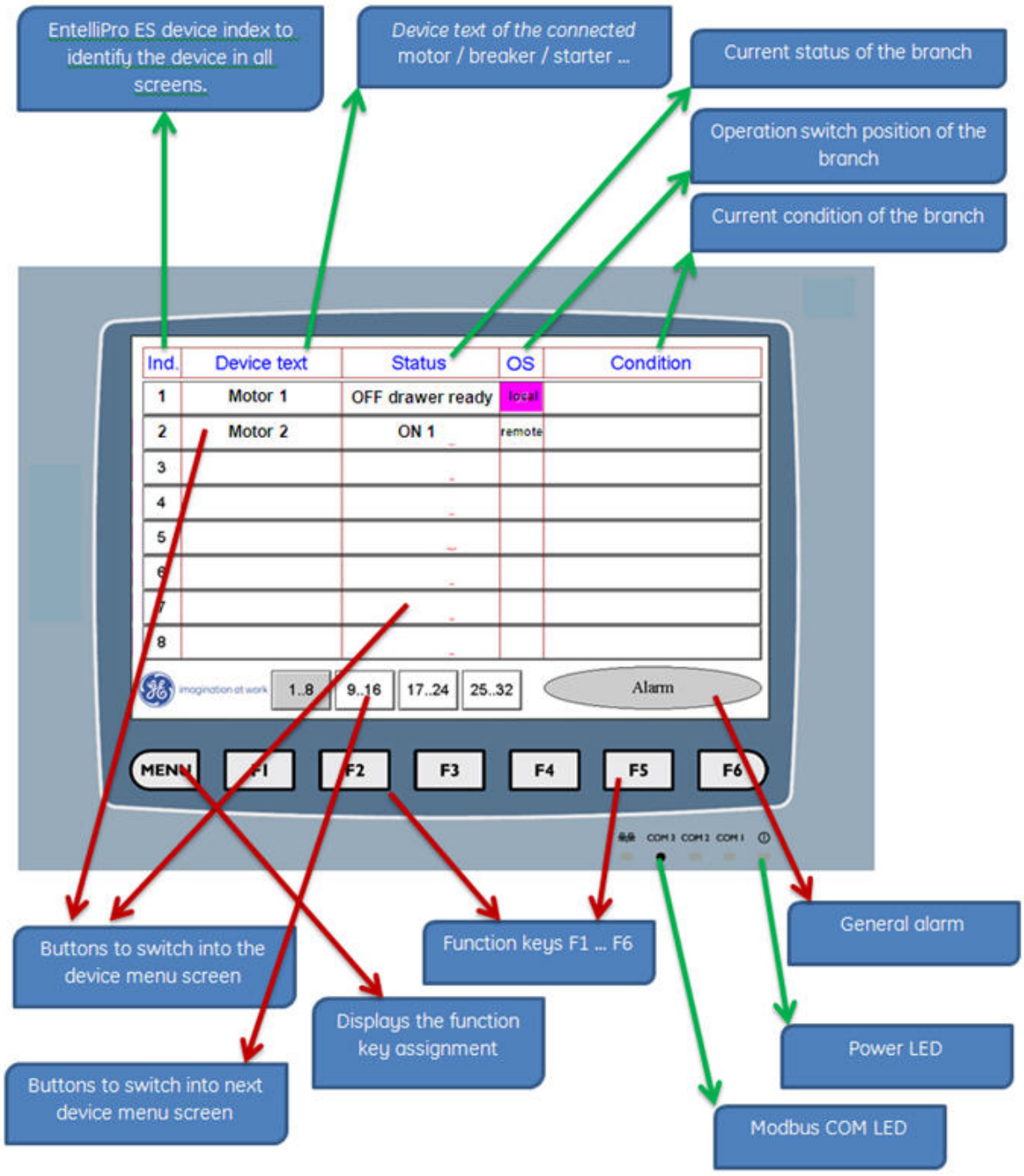
NOTE: If the drive typical value is set to "Fully free logic," the Modbus data interface of the free logic must follow the EntelliPro ES standard. Otherwise the data in the EntelliPro CP application might be incorrect.

The next two figures show the Entellipro CP5 main panel.

Each row in the root screen below shows information about one EntelliPro ES device. The row assignment must be done in the device configuration screen. The columns shows the Modbus address (MB), the Profibus-DP address (PB), the device text, the device status, and the device condition, respectively.

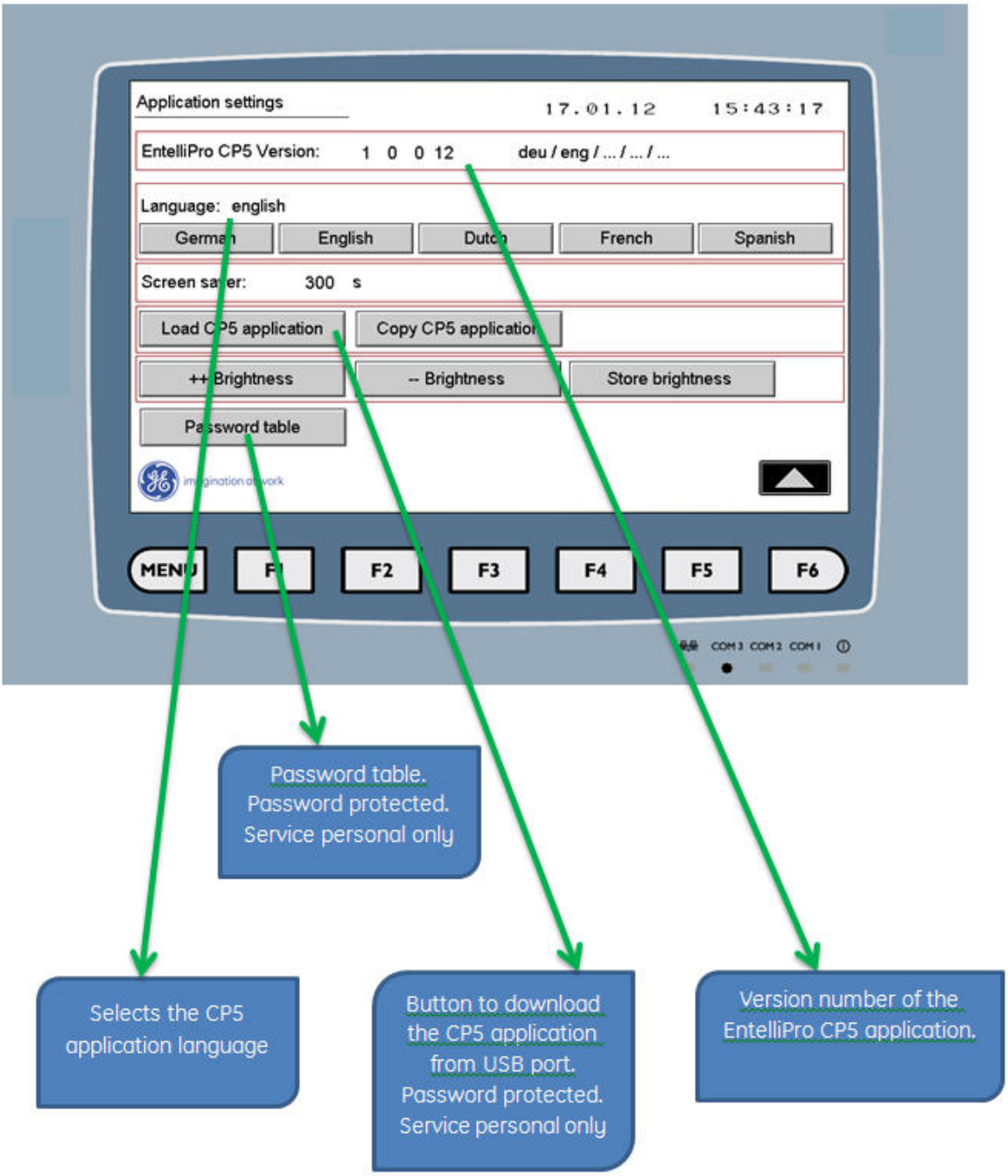


Each row in the root screen below shows information about one EntelliPro ES device. The row assignment must be done in the device configuration screen. The columns show the device index, which appears on all menus, the device text, the device status, and the device condition, respectively.



6.6 EntelliPro CP5 application setting

The application setting menu, shown in the figure below can be accessed by pressing function key “F4” from root menu.

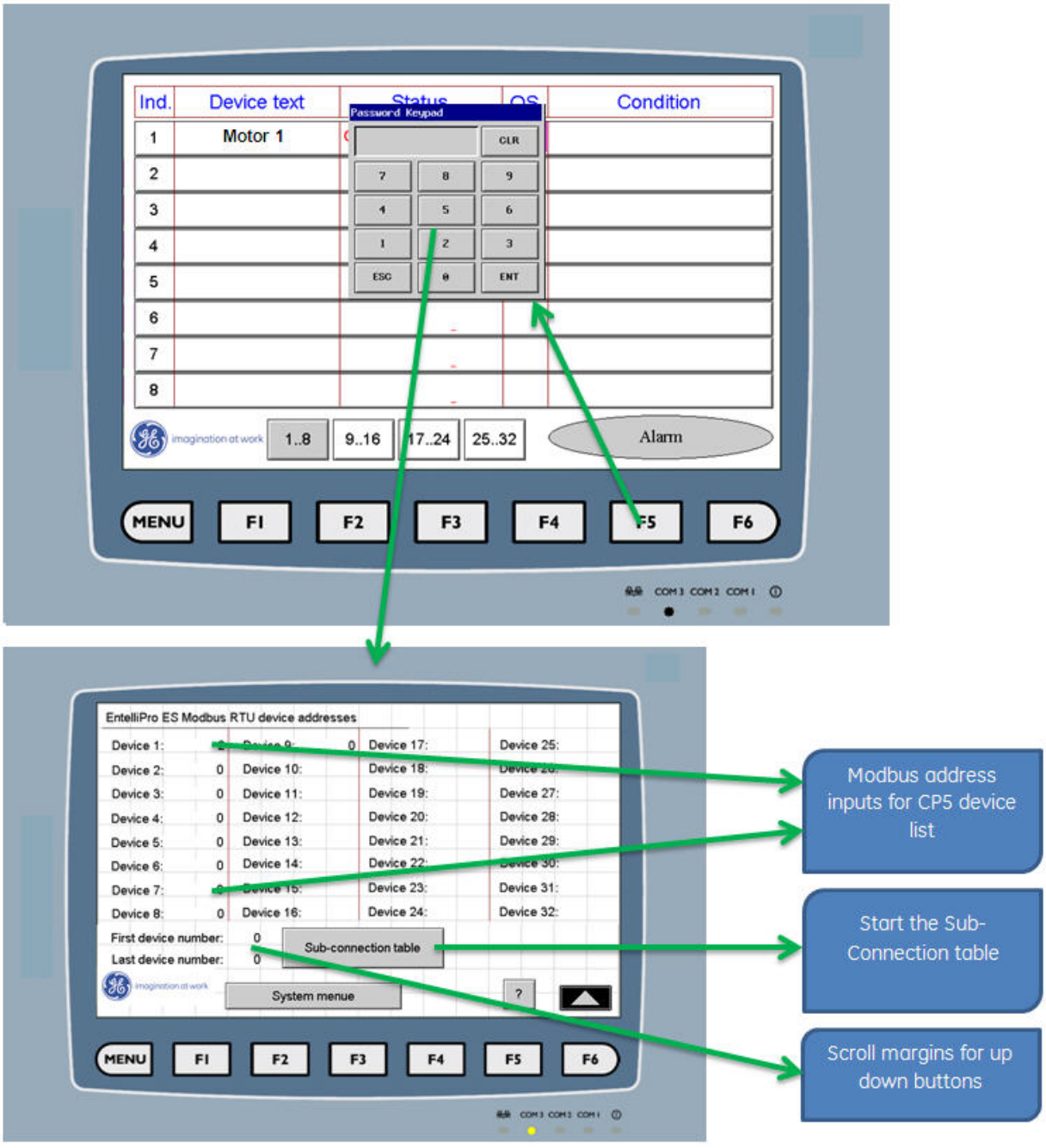


6.7 EntelliPro CP5 device addresses

The device setting menu, shown in the figure below, can be accessed by pressing function key "F5" from root menu. For each device in the system, a unique a Modbus RTU address must be assigned. No two devices can have the same address.

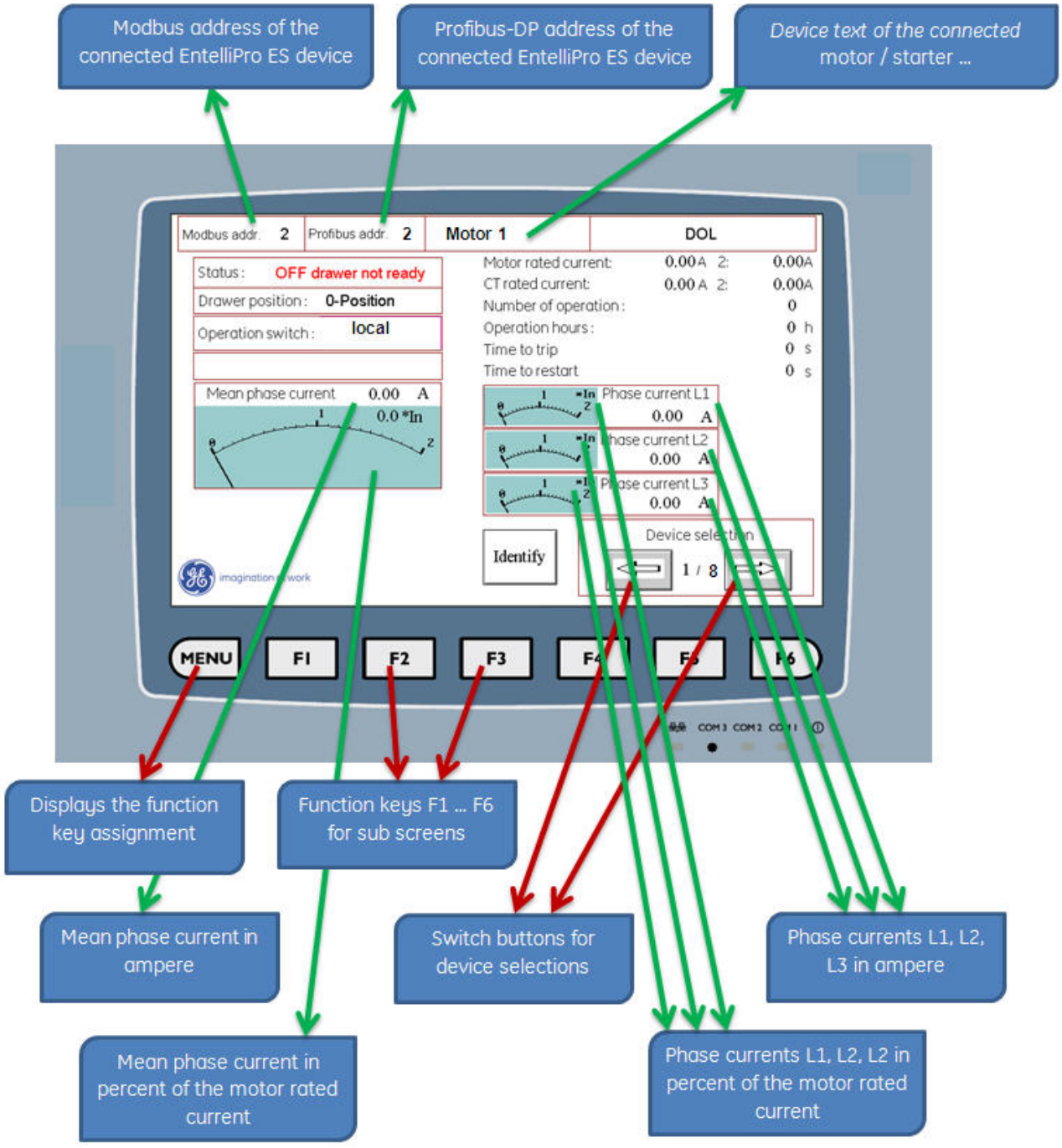
The "Device configuration" setting is protected with a user level password "22222222".

The Modbus RTU address range is 1 to 247. All addresses are stored permanently in the CP5 panel. These addresses are used when EntelliPro CP5 starts.



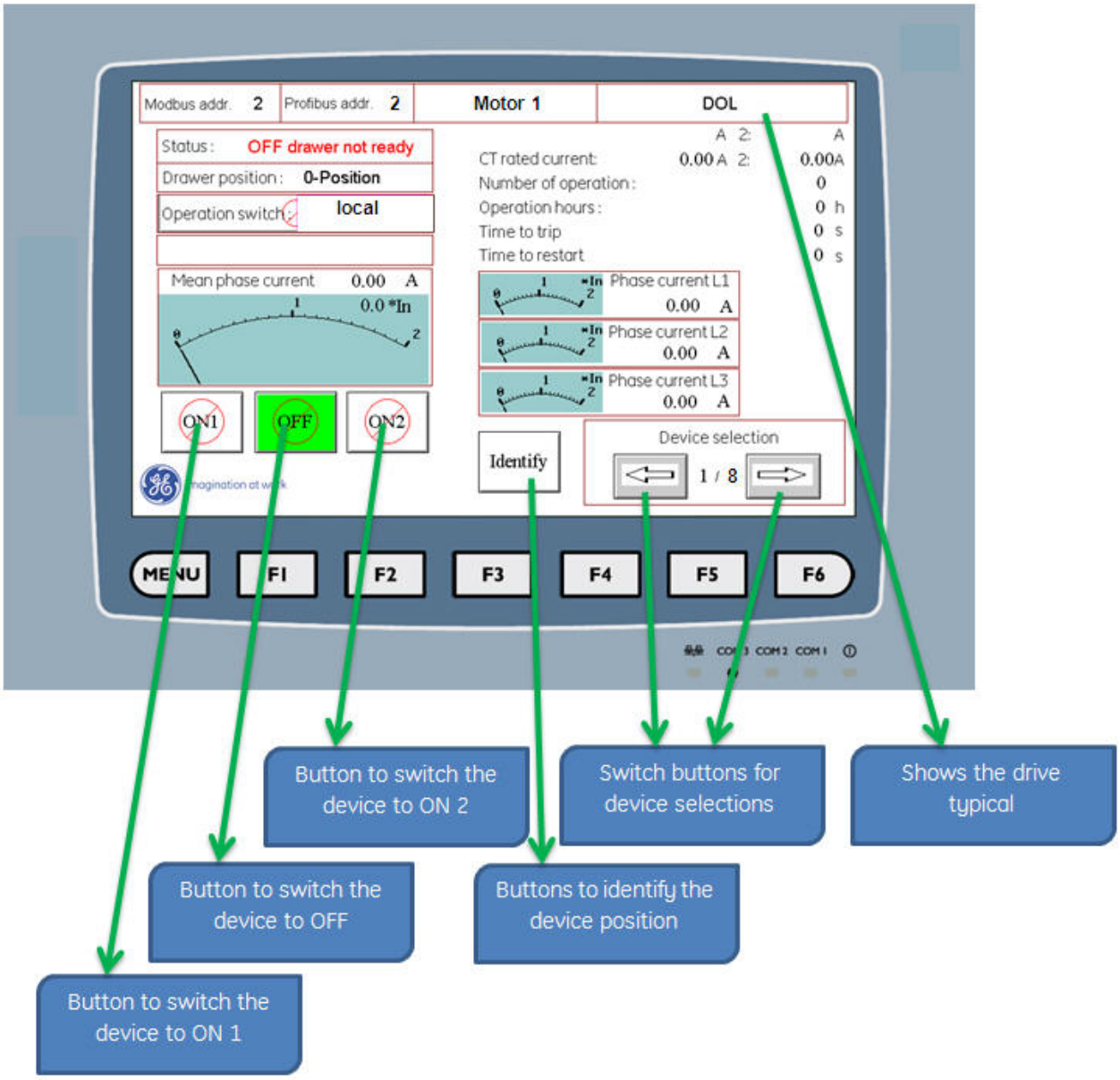
6.8 EntelliPro CP5 device screen

The device setting menu, shown in the figure below, can be accessed by touching the device row on the main screen. All information related to the particular device is made available.



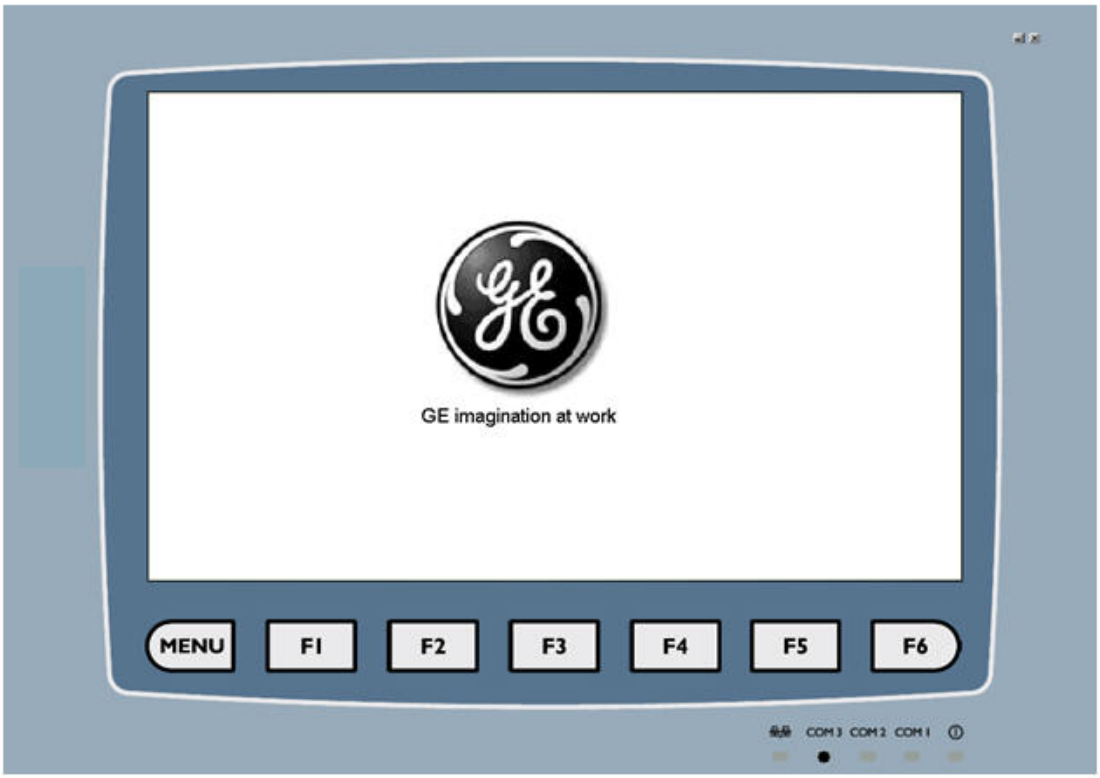
6.8 EntelliPro CP5 control screen

The screen shown in the figure below, controls the assigned EntelliPro ES device when the device is configured to local control.



6.10 EntelliPro CP5 screen saver display

This screen appears in the application after a period of time without a user handling. The backlight will also switch off after an extended time of inactivity. The application screen resumes when the user touchs the display.

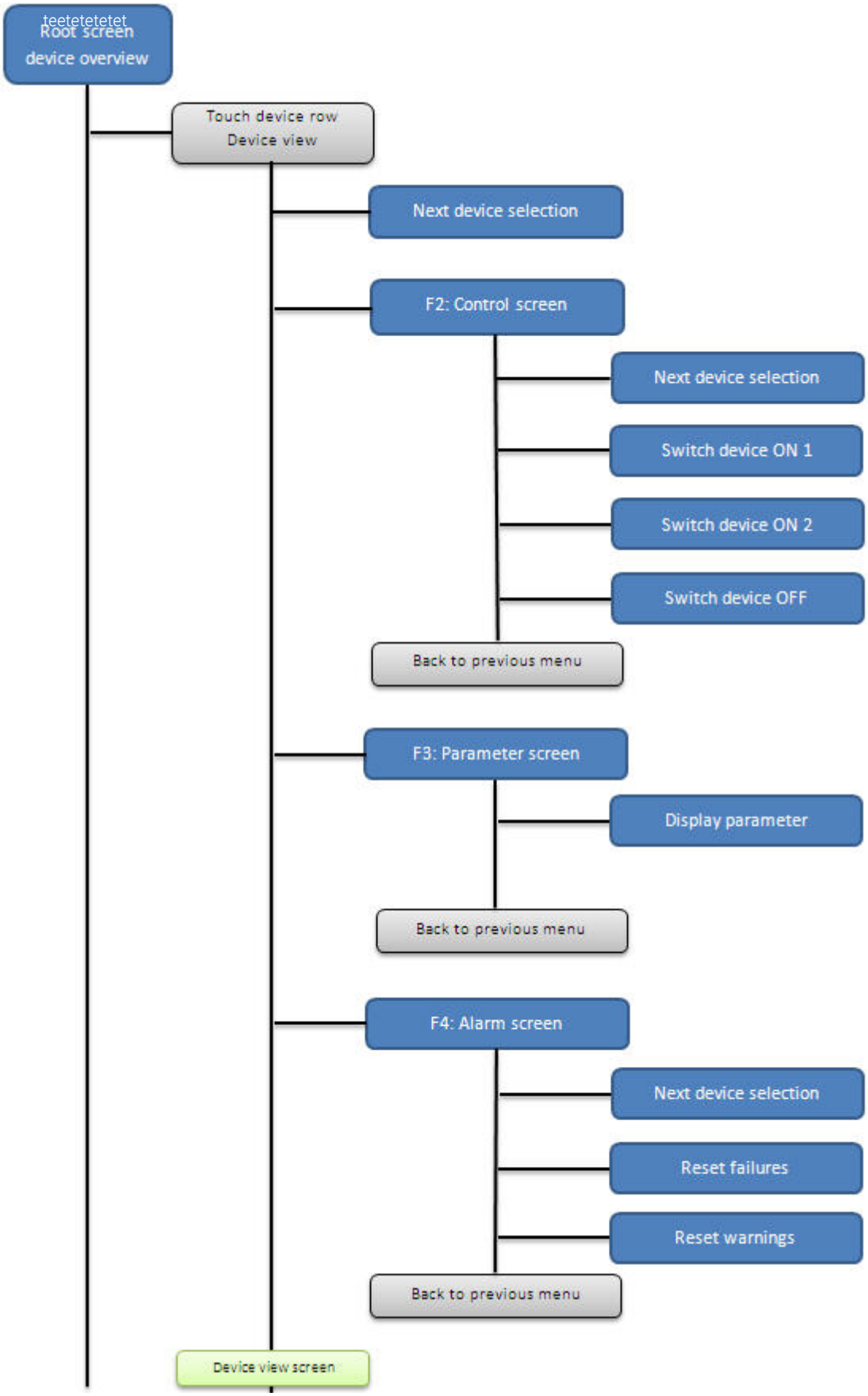


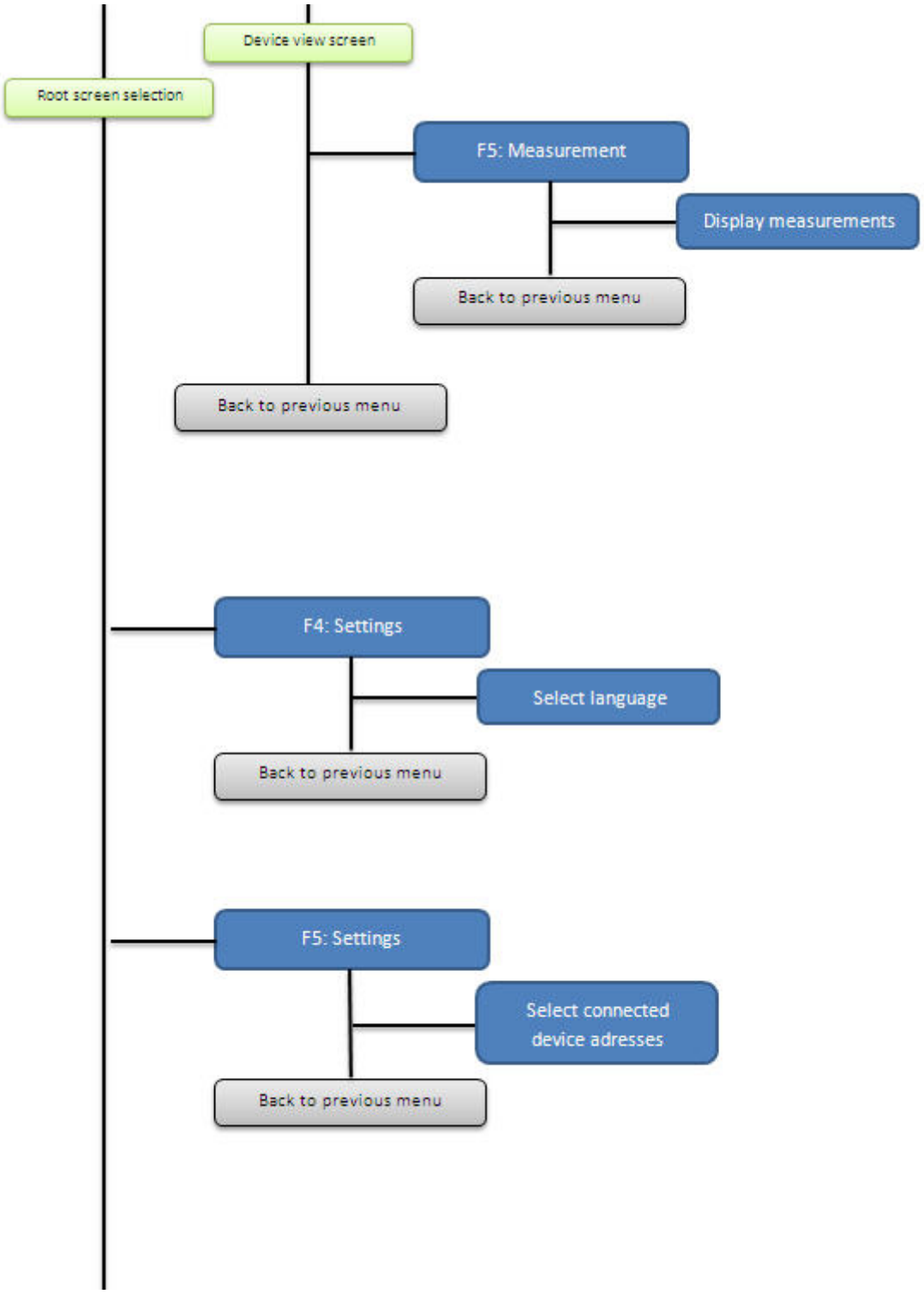
6.11 EntelliPro CP5 installation

The EntelliPro CP5 has three communication (COM) ports on the back side. The communication port COM3 is used for the Modbus communication with the EntelliPro CP5 application. Pin3 of the COM3 port is the Modbus DataP signal and Pin6 is the DataN signal. Application downloads are done via the COM1 port.

A complete description of the EntelliPro CP5 panel can be found in the WEB - www.beijerelectronics.com.

6.12 EntelliPro CP5 application tree structure




Root screen selection
Device view screen
F5: Measurement
Display measurements
Back to previous menu
Back to previous menu
F4: Settings
Select language
Back to previous menu
F5: Settings
Select connected device adresses
Back to previous menu

GE Industrial Solutions

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Chapter 7: Revision / Service / Sales

			AFTER SALES		TECHNOLOGY		MAQ	
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2-07-12	03	Update CP chapter			N Vicente		_	
5-05-11	02	Add Entellipro CP chapter			N Vicente		_	
2-18-11	01	Inital Release			N Vicente		_	
DATE	REV	Description	draw		check		permit	

Revision										
Page										
02 Revision										
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Revision	-	-	-	-	-	-	-	-	-	-
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ME07, MEG, MEY

ME... 06

ME00/05, M series

Spectronic SP/SPE, L, S

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M23, M80, APU30/50

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SV18, SV 90

Vynconstruct, OK Center

System4

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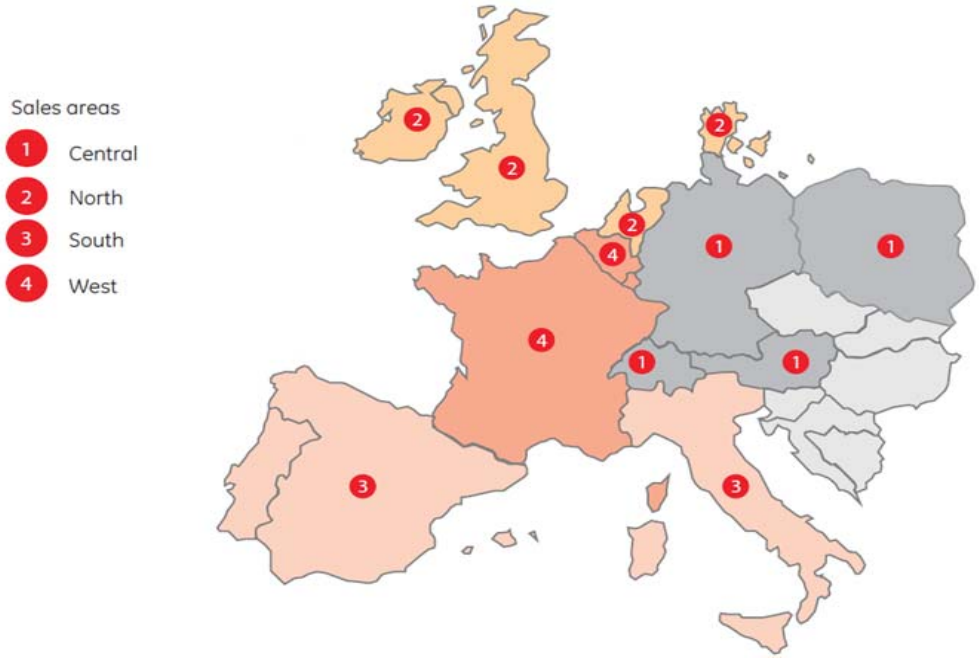

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