

InteliNano NT[®] Plus

Modular Gen-set Controller with Current Measurement

Compact Controller for Stand-by Operating Gen-sets

SW version 2.0.1.x, July 2015



Reference Guide

TABLE OF CONTENTS

1	Document information	3
1.1	Clarification of notation.....	3
1.2	Conformity Declaration.....	3
1.3	Important	3
1.4	Text	5
2	System Overview	6
2.1	General description	6
2.2	Configurability	6
3	Application Overview	7
3.1	AMF – Automatic Mains Failure start	7
3.2	MRS – Manual Remote Start	8
3.3	True RMS measurement.....	9
4	Installation and wiring.....	10
4.1	Mounting.....	10
4.2	Package contents.....	11
4.3	Terminal diagram	12
4.4	Power supply.....	13
4.5	D+.....	14
4.6	Voltage measurement and generator connection types	15
4.7	Current measurement	22
4.8	Binary inputs	23
4.9	Binary outputs	24
4.10	Analog inputs	25
5	Recommended Wiring.....	27
5.1	AMF application wiring diagram	27
5.2	MRS application wiring diagram	28
6	Controller Settings.....	29
6.1	Setup mode.....	29
7	Inputs and Outputs.....	33
7.1	Normally Open Contact.....	34

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ComAp, a.s.
Kundratka 17, 180 00 Praha 8, Czech Republic
Tel: +420 246 012 111, Fax: +420 266 316 647
E-mail: info@comap.cz, www.comap.cz



7.2	Normally Closed Contact	34
8	Outputs settings	35
8.1	Binary outputs IntelliNano ^{NT} Plus - default.....	35
8.2	Logical binary outputs	35
9	Inputs settings	44
9.1	Binary and analog inputs IntelliNano ^{NT} Plus - default	44
9.2	Logical binary and analog inputs	44
10	Setpoints.....	58
10.1	B - Basic settings	61
10.2	E - Engine parameters and protections	67
10.3	G - Generator protections	71
10.4	A – AMF (Auto Mains Failure) settings	73
11	ECU	75
11.1	CAN bus wiring	75
12	Alarms, Events and History Management.....	76
12.1	Events	78
12.2	Warnings	80
12.3	Shutdowns.....	82
12.4	ECU Messages	86
13	Technical data	87
13.1	Power supply.....	87
13.2	Operating conditions	87
13.3	Physical dimensions.....	88
13.4	Binary inputs	88
13.5	Binary outputs	88
13.6	Analog inputs	89
13.7	Generator/Mains measurements	89
13.8	Charging alternator preexcitation circuit	89
13.9	Communication interface	89
13.10	CAN interface.....	89

1 Document information

INTELI^{NT}® PLUS - REFERENCE GUIDE
 WRITTEN BY: ALES PETRIK, DANIEL SVANDA
 ©2015 COMAP LTD.
 KUNDRATKA 17, PRAHA 8, CZECH REPUBLIC
 PHONE: +420246012111, FAX: +420266316647
 WEB: [HTTP://WWW.COMAP.CZ](http://www.comap.cz), E-MAIL: [INFO@COMAP.CZ](mailto:info@comap.cz)

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	1.4	11.3.2013
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1.1 Clarification of notation

NOTE:

These boxes contain helpful tips, reminders, and other notes.

CAUTION!

These boxes call special attention to procedures or adjustments, which if done incorrectly can cause damage or equipment failure.

WARNING!

These boxes call special attention to important procedures or adjustments, which if done incorrectly could result in personal injury or death.

1.2 Conformity Declaration

	<p>The following described machine complies with the appropriate basic safety and health requirement of the EC Low Voltage Directive No: 73/23 / EEC and EC Electromagnetic Compatibility Directive 89/336 / EEC based on its design and type, as brought into circulation by us.</p>
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1.3 Important

SAVE THESE INSTRUCTION - This manual contains important instructions for the IntelliNano^{NT} controllers' family that shall be followed during installation and maintenance of the IntelliNano^{NT} genset controllers.

This manual is intended for use by gen-set control panel builders and parties concerned with installation, operation, and maintenance of the gen-set.

This manual describes the IntelliNano^{NT} Plus software, which is designed for single set, stand-by and island applications.

InteliNano-NT Plus, SW version 2.0.1.x, ©ComAp – July 2015

NOTE:

ComAp believes that all information provided herein is correct and reliable and reserves the right to update at any time. ComAp does not assume any responsibility for its use unless otherwise expressly undertaken.

NOTE:

SW and HW must be compatible otherwise some functions will be disabled.

NOTE:

Because of large variety of the **InteliNano^{NT}** parameters settings, it is not possible to describe all combinations. Some of the **InteliNano^{NT}**'s functions are subject of changes depend on SW version. The data in this manual only describes the product and is not intended as a warranty of performance or characteristics.

CAUTION!

Dangerous voltage

In no case touch the terminals for voltage measurement!
Always connect grounding terminals!

CAUTION!

All parameters are preset to initial values. But the set points in the “**Basic settings**” settings group **!!must!!** be adjusted before the first startup of the gen-set.

**!!! INCORRECT ADJUSTMENT OF BASIC PARAMETERS
CAN RESULT IN DAMAGE TO THE GEN-SET !!!**

The following instructions are for qualified personnel only. To avoid personal injury do not perform any action not specified in this User guide!!!

WARNING!

Every time the following **InteliNano^{NT}** controller terminals are disconnected:

- Mains voltage measuring and / or
- Binary output for MCB control and / or
- MCB Feedback

Disconnect power supply from the **InteliNano^{NT}** controller and/ or disconnect the binary outputs **Starter** and Fuel to avoid unexpected automatic start of gen-set and GCB closing!

WARNING!

Remote control

The **InteliNano^{NT}** controller can be controlled remotely. When working on the gen-set, ensure that remote start is disabled.

This is done by:

Disconnect input REM START/STOP

or

Disconnect output **Starter** and outputs **GCB Close/Open** and **MCB Close/Open**

1.4 Text

Stop

Nominal Voltage Ph-N

Fuel Solenoid

T15

Mains Return

Mains CCW Rotation

Start Fail

“Letters in the frame” buttons on the controller’s front panel

“*Italic*” set points

“*Italic*” input/output function

“*Italic*” controllers terminal

“*Italic*” event or ECU message

“*Italic*” warning alarm

“*Italic*” shutdown alarm

2 System Overview

2.1 General description

The **InteliNano^{NT} Plus** is an **Automatic Mains Fail** or **Manual Remote Start** controller for single generating sets operating in stand-by mode or as a prime mover. The **InteliNano^{NT}** supports electronic engines.

InteliNano^{NT} controllers are equipped with an intuitive graphic display, which together with extensive functionality set the new standard in gen-set controls.

The **InteliNano^{NT} Plus** can automatically start the gen-set, opens the MCB and closes the GCB upon mains failure. When the mains is restored, the controller automatically opens the GCB, closes the MCB, and stops the engine. This controller can also work as a controller for prime mover systems.

InteliNano^{NT} Plus supports diesel and gasoline engines.

The key features of **InteliNano^{NT}** are easy installation and intuitive operation. Users may choose between predefined configurations for typical applications and user-defined configurations for special applications.

2.2 Configurability

One of the key features of the controller is high level of adaptability to the needs of every particular application. This customization is accomplished in the configuration.

NOTE:

Use **NanoEdit** PC software to read configuration from the controller or disk, view it, modify it, and write the configuration to the controller or disk.

The firmware contains large number of binary inputs and outputs for all available. Configuration will be determined by application and hardware constraints. One of main tasks of the configuration is mapping of "logical" firmware inputs and outputs to the "physical" hardware input and output terminals.

A complete configuration consists of the following:

1. Mapping of logical [binary and analog inputs](#) (functions) to physical binary input terminals
2. Mapping of logical [binary outputs](#) (functions) to physical binary output terminals
3. Assigning sensor characteristics
4. Selecting of ECU type if an ECU is connected

The controller is delivered with a **default configuration, which should fit most standard applications**. The default configuration can be changed from controller's front panel or by using **NanoEdit** PC software. See **NanoEdit** documentation for details.

NOTE:

For connection with PC use integrated USB module. The controller can be powered directly from USB communication port. In this case the LCD backlight is turned off and all outputs are open

Once the configuration is modified (using PC) it can be stored in a file for reference or use with another controller. This configuration file is called the **archive** and has file extension ".ain". If the archive is saved while the PC is online with the controller, it will contain a full image (setpoints, measured values, and history log) of the controller at the moment of saving (except firmware).

The archive can then be used for the **cloning** of controllers, which means preparing controllers with identical configuration and settings.

3 Application Overview

3.1 AMF – Automatic Mains Failure start

The **InteliNano^{NT} Plus** can be used as an **AMF-controller** for single generating sets operating in stand-by mode. The **InteliNano^{NT}** supports electronic engines.

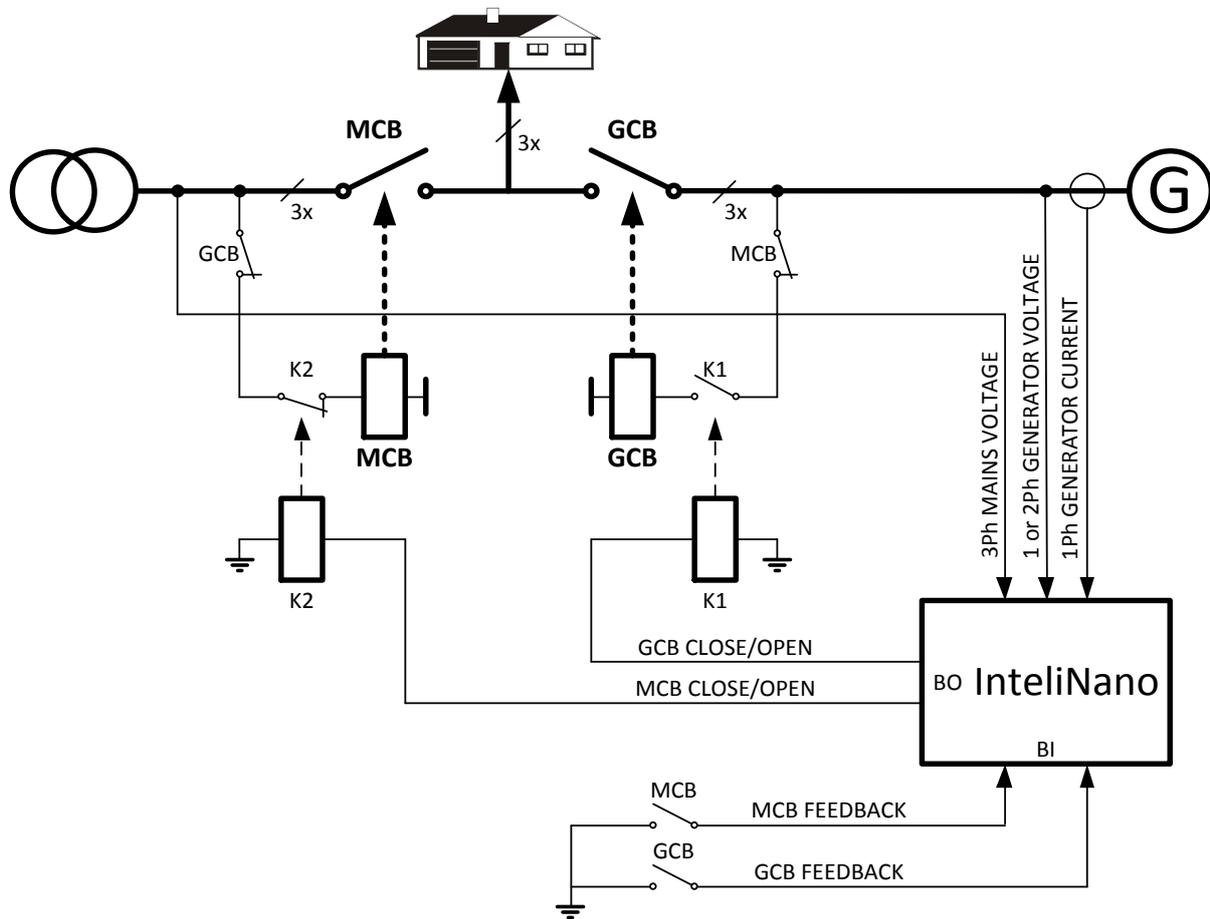


Figure 3.1

STAND-BY APPLICATION WITH TWO SEPARATE BREAKERS – GCB AND MCB WITH INTERLOCK

3.2 MRS – Manual Remote Start

The **InteliNano^{NT} Plus** can be used as an **MRS** controller with a generator circuit breaker – GCB (Figure 3.2) or without a breaker (Figure 3.3).

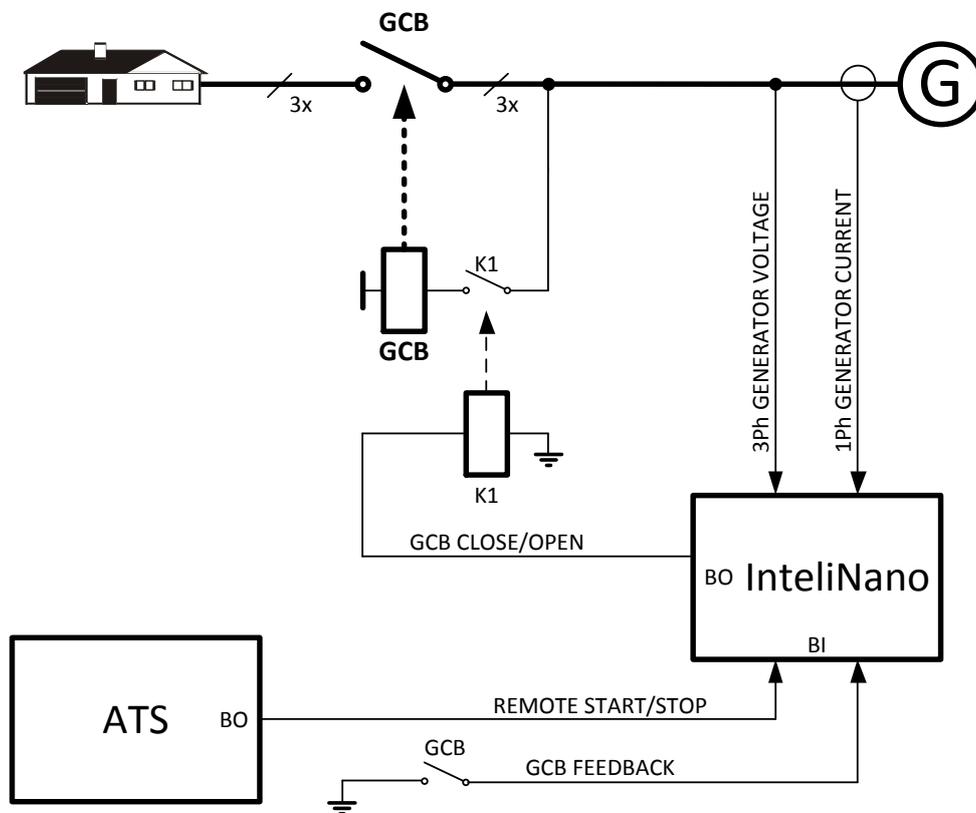


Figure 3.2
MRS APPLICATION WITH GCB CONTROL

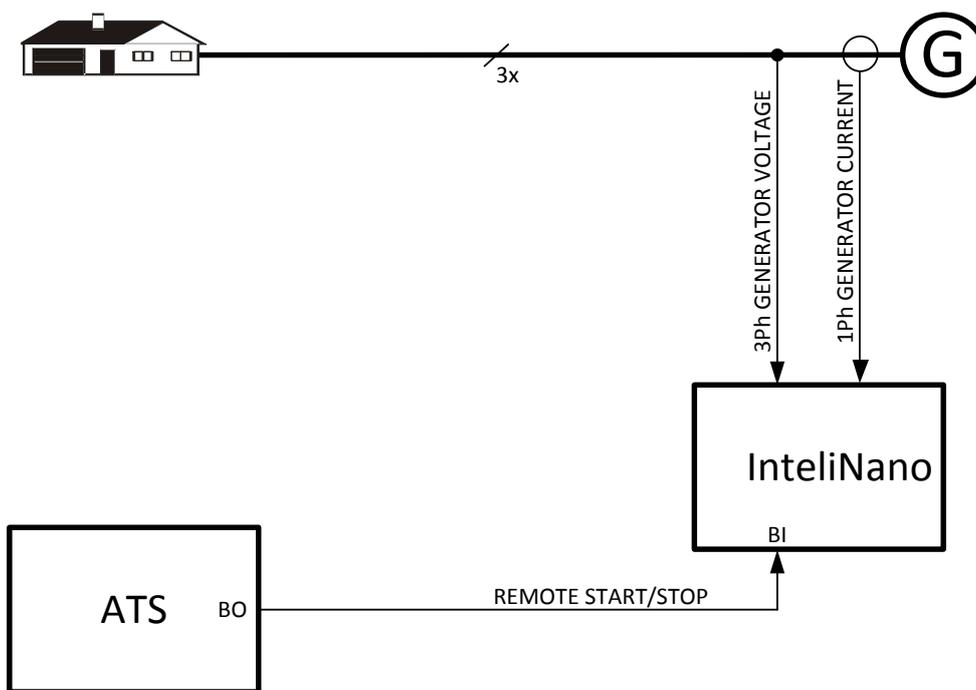


Figure 3.3
SIMPLE MRS APPLICATION

3.3 *True RMS measurement*

This controller measures AC values based on *True RMS* principle. This principle corresponds exactly to the physical definition of alternating voltage effective values. Under normal circumstances the mains voltage should have a pure sinusoidal waveform. However some nonlinear elements connected to the mains produce harmonic waveforms with frequencies of multiplies of the basic mains frequency and this may result in deformation of the voltage waveforms. The True RMS measurement **gives accurate readings** of effective values not only for pure sinusoidal waveforms, but also for deformed waveforms.

4 Installation and wiring

4.1 Mounting

The controller is to be mounted onto the switchboard or genset control panel door. Mounting cut-out size is 96x96mm. Use the screw holders included with the controller to mount the controller into the door as described on pictures below.

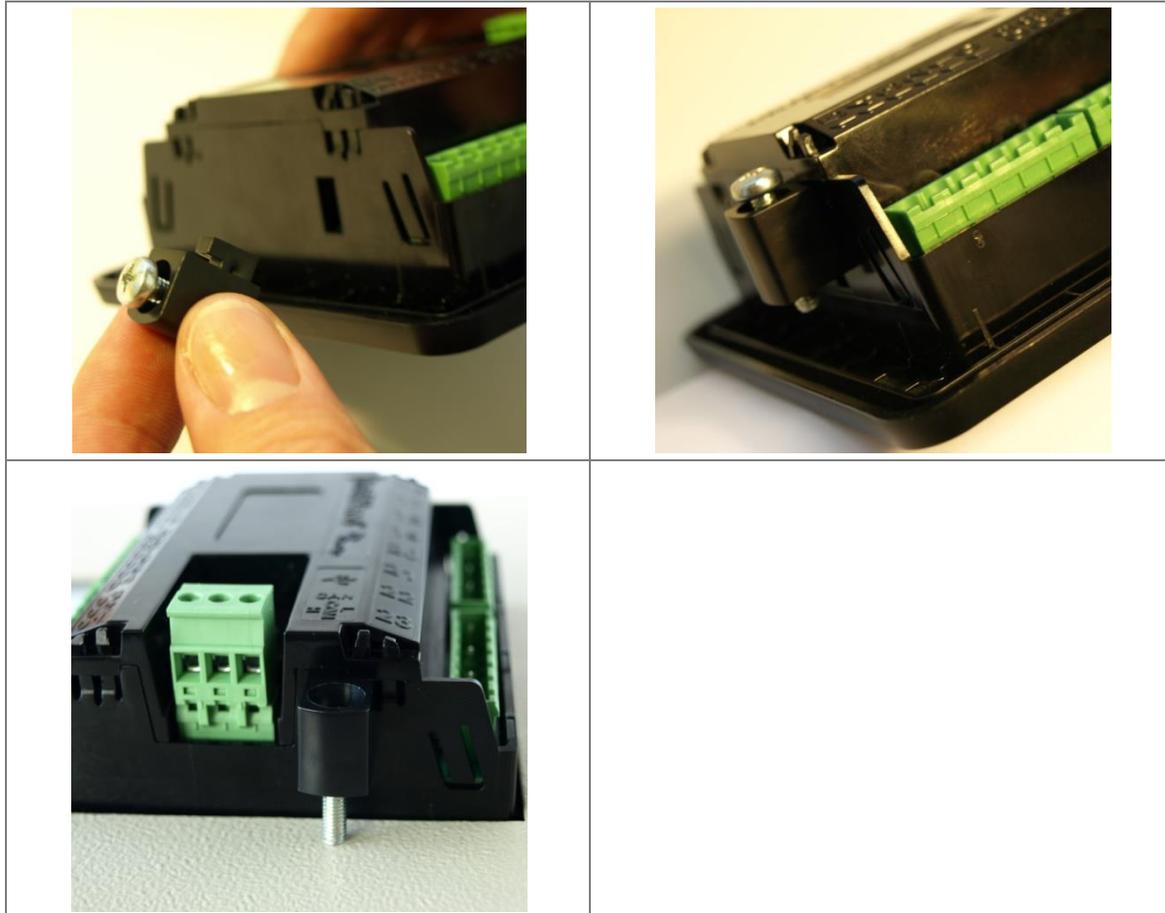


Figure 4.1
INTELI^{NANO}NT'S CHASSIS MOUNTING

4.2 **Package contents**

Accessories	Description	Optional / Obligatory
InteliNano^{NT} Plus	InteliNano^{NT} Plus controller unit	Obligatory
Fast User Guide	Fast User Guide for the InteliNano^{NT} Plus	Obligatory
GASKET 4x405	Gasket under the InteliNano^{NT} controller	Optional
Fixing clips	Two controller holders	Obligatory

4.3 Terminal diagram

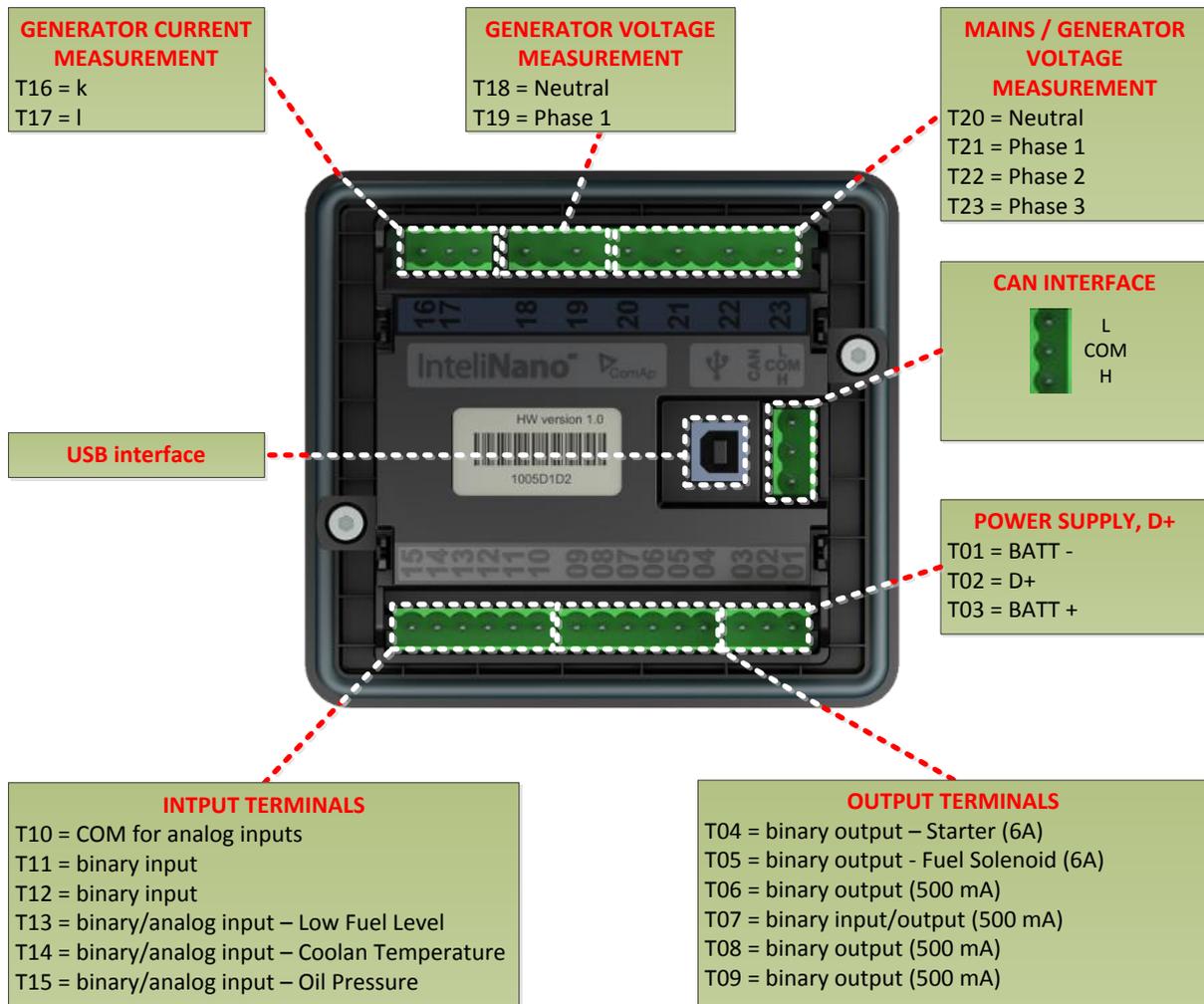


Figure 4.2
INTELINANO^{NT} PLUS TERMINALS DESCRIPTION

NOTE:

In case the IntelliNano Plus controller is used as MRS controller the terminals T20, T21, T22 and T23 are used for generator voltage measurement.

4.4 Power supply

To ensure proper function:

It is strictly recommended to use power supply cable 2,5mm²!

Maximum continuous DC power supply voltage is 36 VDC. The **InteliNano^{NT}**'s power supply terminals are protected against large pulse power disturbances. When there is a potential risk of the controller being subjected to conditions outside its capabilities, an outside protection devise should be used.

For the connections with 12VDC power supply, the **InteliNano^{NT}** includes internal capacitors that allow the controller to continue operation during cranking if the battery voltage dip occurs. If the voltage before drop is 10V, after 100ms the voltage recovers to 5 V, the controller continues operating.

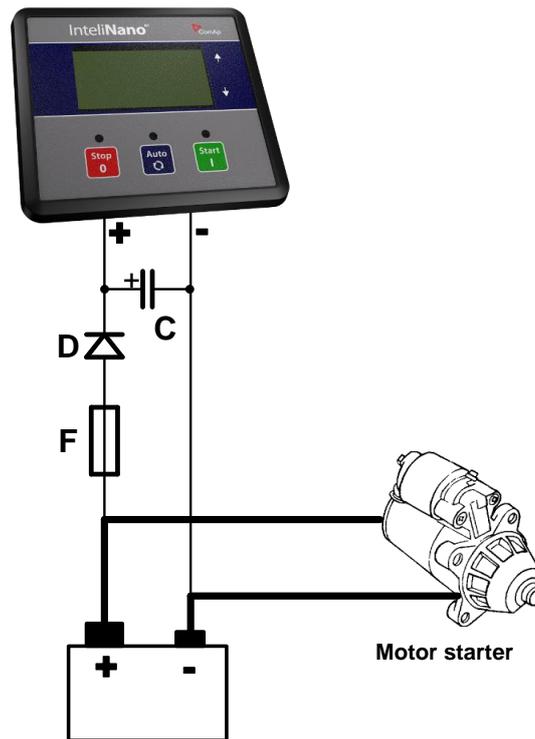


Figure 4.3

RECOMMENDED POWER SUPPLY WIRING

The capacitor size should be 5 000 µF to withstand 150ms voltage dip under following conditions: Voltage before the drop is 12V, after 150ms the voltage recovers to min. allowed voltage, i.e. 8V.

4.4.1 Power supply fusing

A 15-amp fuse should be connected in-line with the battery positive terminal to the controller and modules. The controller should never be connected directly to the starting battery. Fuse value and type depends on number of connected devices and wire length. Recommended fuse (not fast) type - T15A. Not fast due to internal capacitors charging during power up.

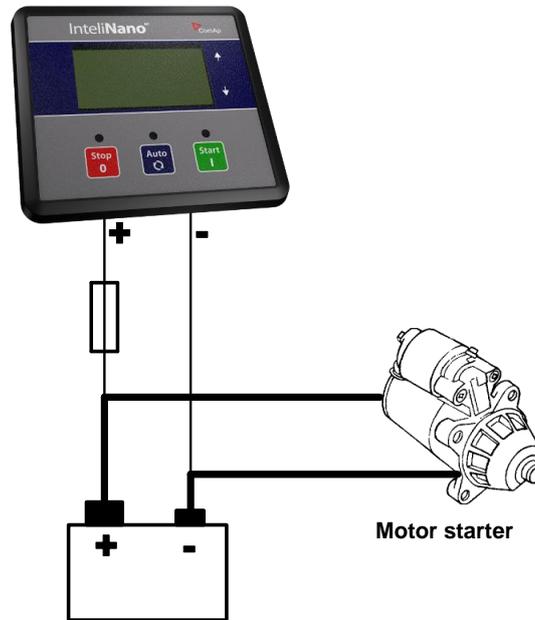


Figure 4.4
INTELINANO^{NT} PLUS POWER SUPPLY FUSING

4.5 D+

Charging alternator D+ output is on terminal **T02**.

D+ current is 100mA and is switched off after 5s when starter is disconnected.

WARNING!

IF THE D+ FEATURE IS NOT USED, CONNECT THIS TERMINAL TO BATTERY POSITIVE!

In case of charging alternator malfunction the warning **Low Battery (Charge Fail)** will appear in event log.

4.6 *Voltage measurement and generator connection types*

WARNING!

Risk of personal injury due to electric shock when manipulating the voltage terminals under voltage!
Be sure the terminals are not energized before beginning work.

Use 1.5 mm² cables for voltage measurement connection.

There are several voltage measurement connections for two different applications AMF and MRS. For more details see table below.

Application type	Mains Connection Type	Generator Connection Type
AMF	3 Phase 4 Wires	Line to Line
	3 Phase 3 Wires	Line to Line
	Split Phase	Line to Line
	Mono Phase	Line to Neutral
MRS	-	3 Phase 4 Wires
	-	3 Phase 3 Wires
	-	Split Phase
	-	Mono Phase

4.6.1 AMF application: 3 Phase 4 Wires

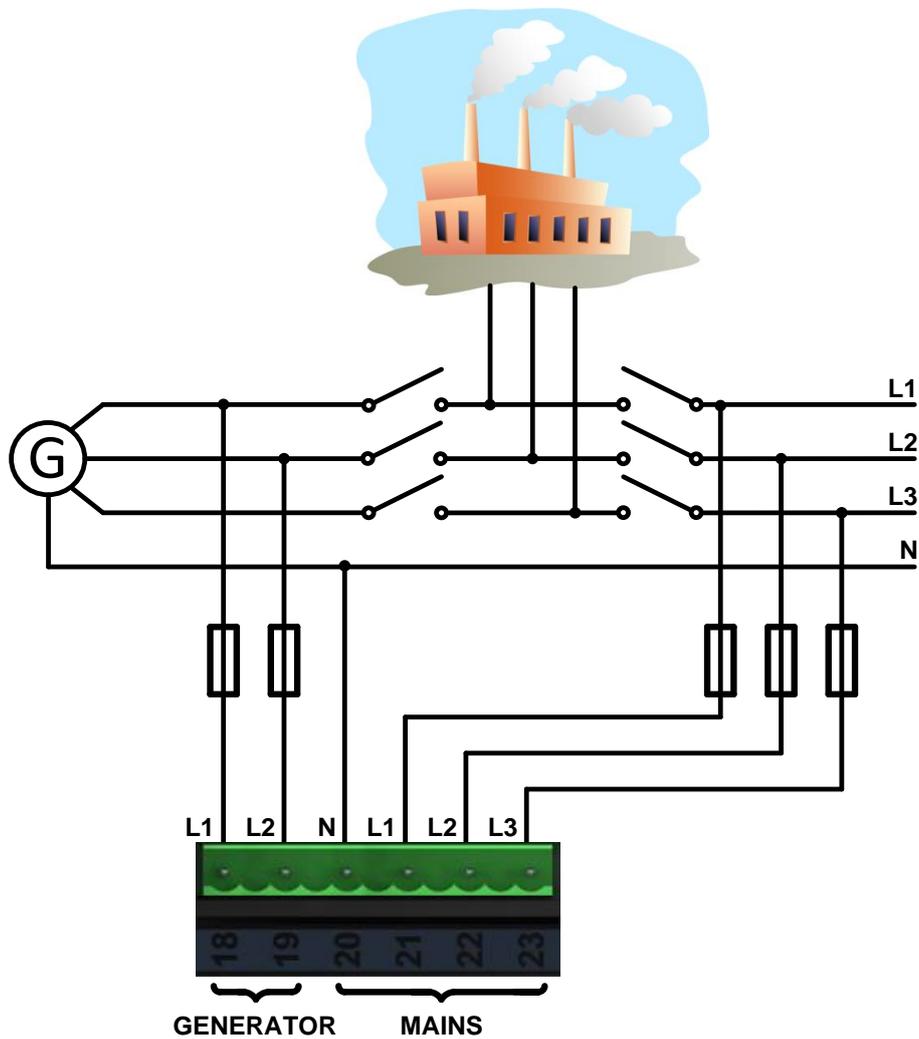


Figure 4.5
AMF APPLICATION 3 PHASE 4 WIRES TERMINALS CONNECTION

Three phase “wye” measurement – 3PY

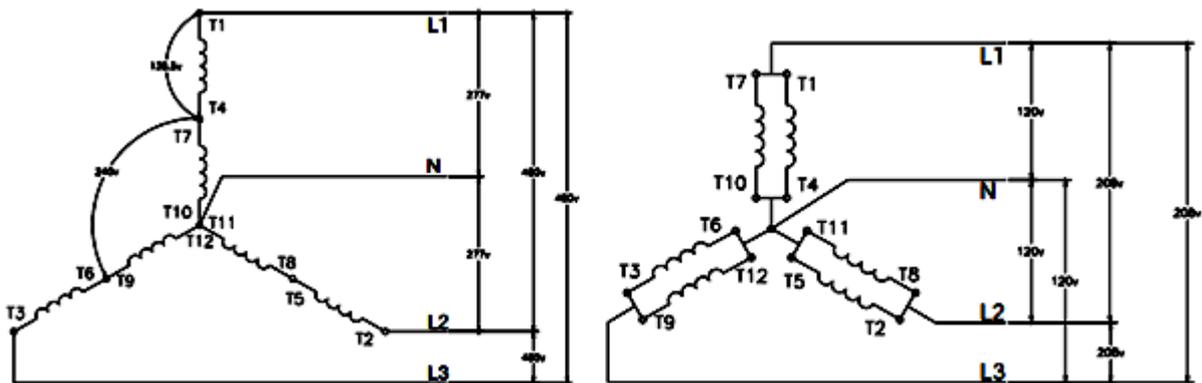


Figure 4.6
STAR CONNECTION

4.6.2 AMF application: 3 Phase 3 Wires

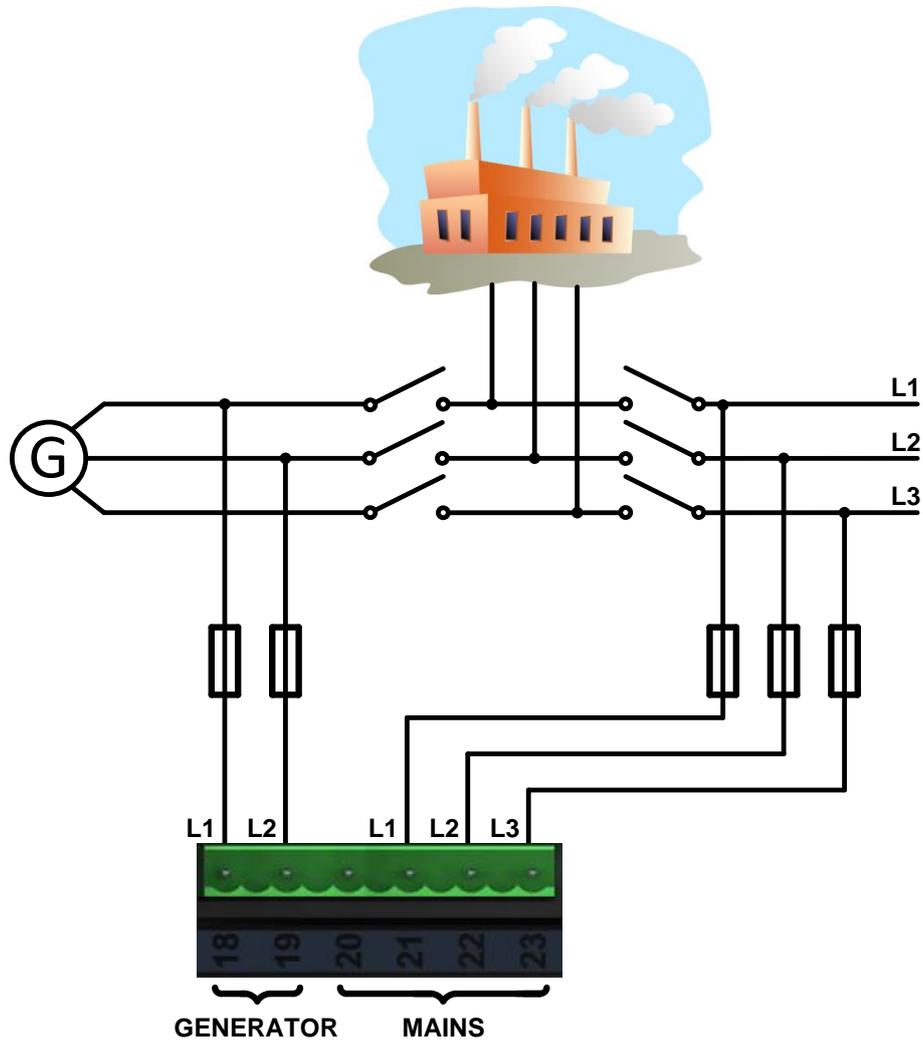


Figure 4.7

AMF APPLICATION 3 PHASE 3 WIRES & LINE TO LINE TERMINALS CONNECTION

Three phase “delta” measurement – 3PD

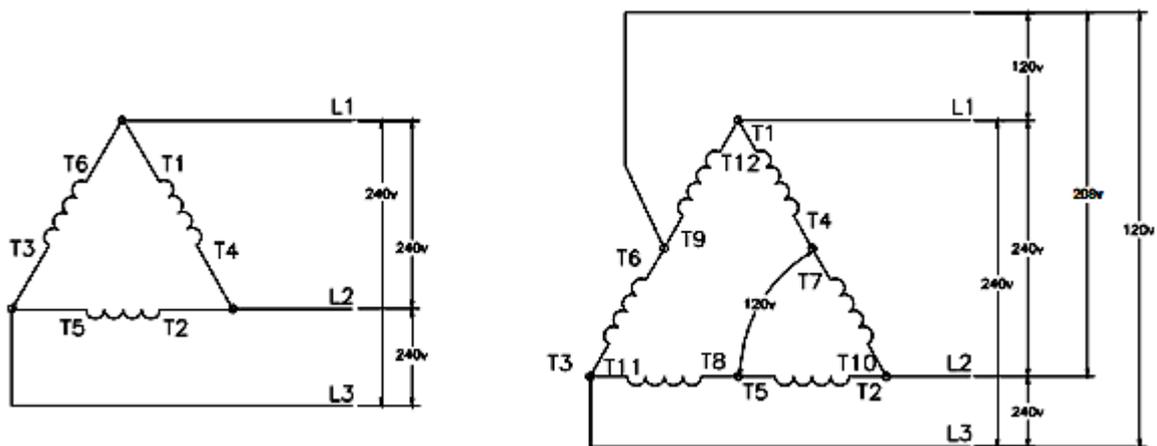


Figure 4.8

DELTA CONNECTION (LEFT), HIGH-LEG DELTA CONNECTION (RIGHT)

4.6.3 AMF application: Split Phase

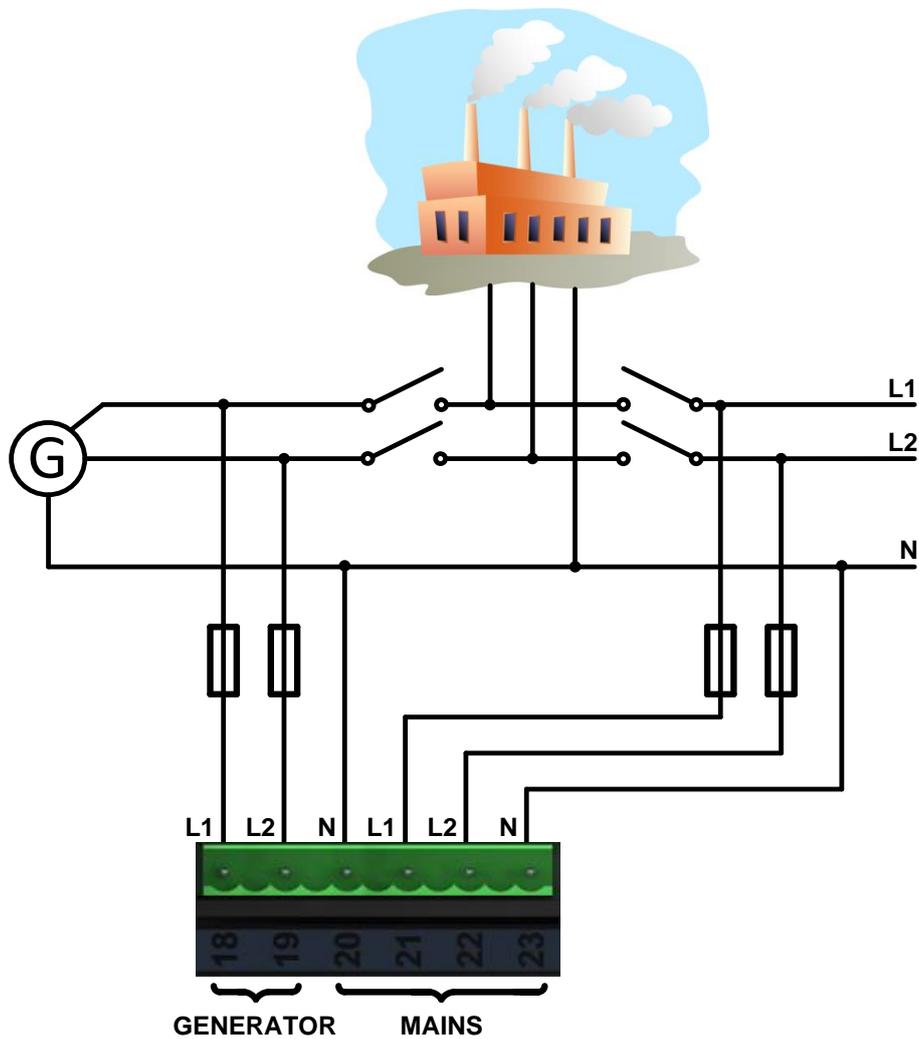


Figure 4.9
AMF APPLICATION SPLIT PHASE TERMINALS CONNECTION

Split-phase measurement – 1PH

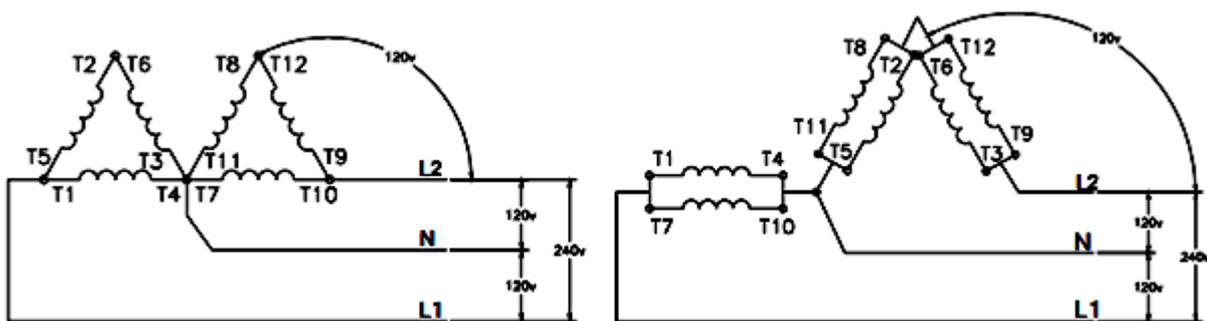


Figure 4.10
DOUBLE DELTA CONNECTION (LEFT), ZIG ZAG(DOG LEG) CONNECTION (RIGHT)

4.6.4 AMF application: Mono Phase

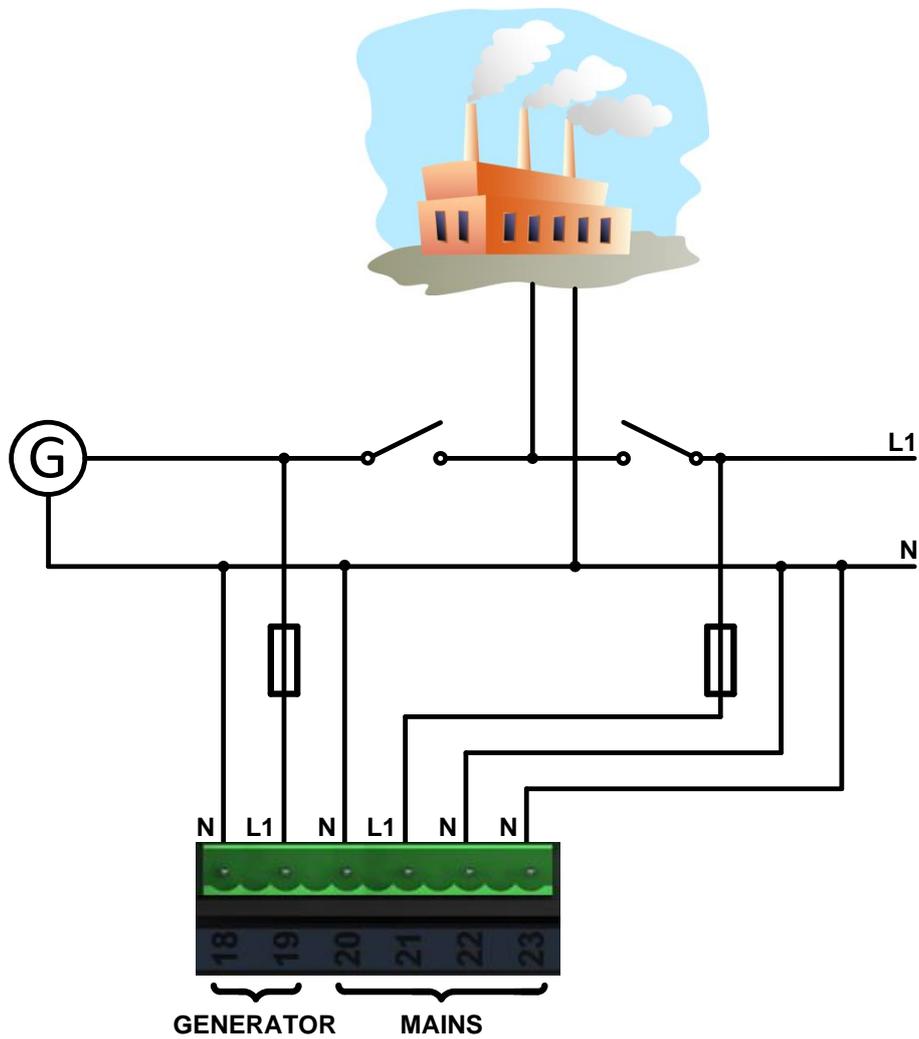


Figure 4.11
AMF APPLICATION MONO PHASE TERMINALS CONNECTION

Single-phase measurement – 1PH

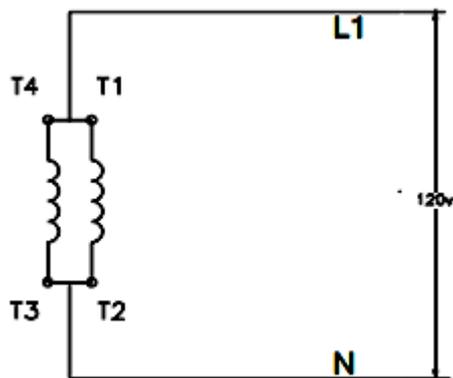


Figure 4.12
MONOPHASE CONNECTION

4.6.5 MRS application: 3 Phase 4 Wires

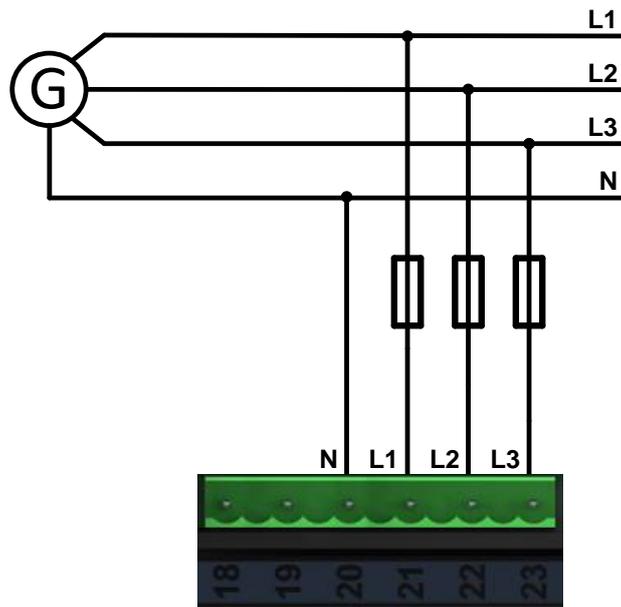


Figure 4.13
MRS APPLICATION 3 PHASE 4 WIRES TERMINALS CONNECTION

4.6.6 MRS application: 3 Phase 3 Wires

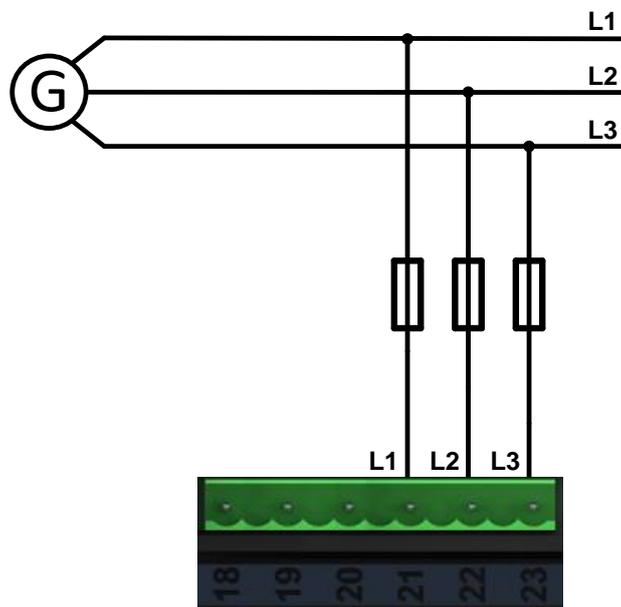


Figure 4.14
MRS APPLICATION 3 PHASE 3 WIRES TERMINALS CONNECTION

NOTE:

In case of Voltage Autodetect function and HIGH-LEG DELTA connection, the N (neutral) wire (in the diagram connected between T6 and T9) has to be connected to terminal T20.

4.6.7 MRS application: Split Phase

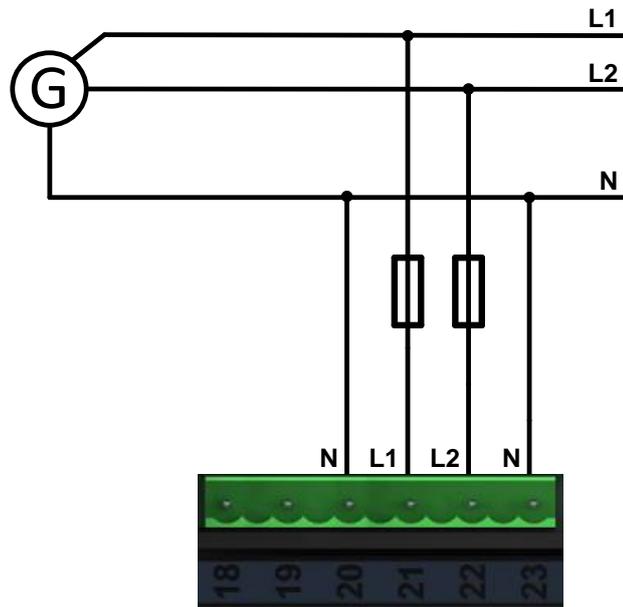


Figure 4.15
MRS APPLICATION SPLIT PHASE TERMINALS CONNECTION

4.6.8 MRS application: Mono Phase

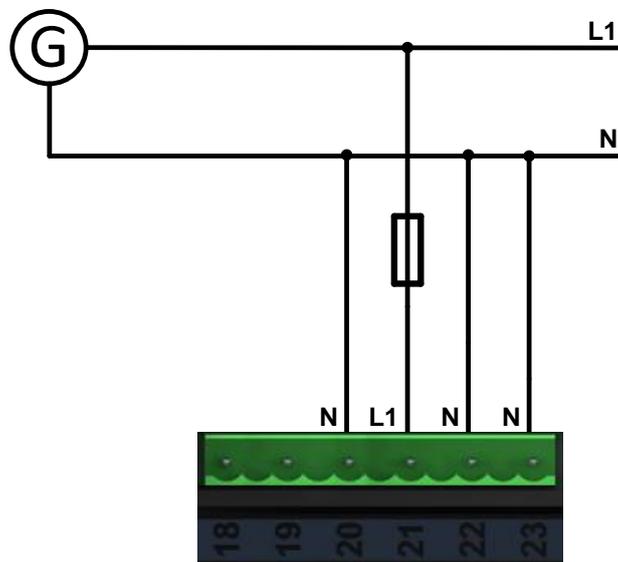


Figure 4.16
MRS APPLICATION MONO PHASE TERMINALS CONNECTION

4.7 Current measurement

WARNING!

Do not open secondary circuit of current transformers when primary circuit is closed!!! Open the primary circuit first!

To ensure proper function:

- 1) Use cables of 2,5mm²
- 2) Use transformers to 5A
- 3) Connect CT according to following drawings:

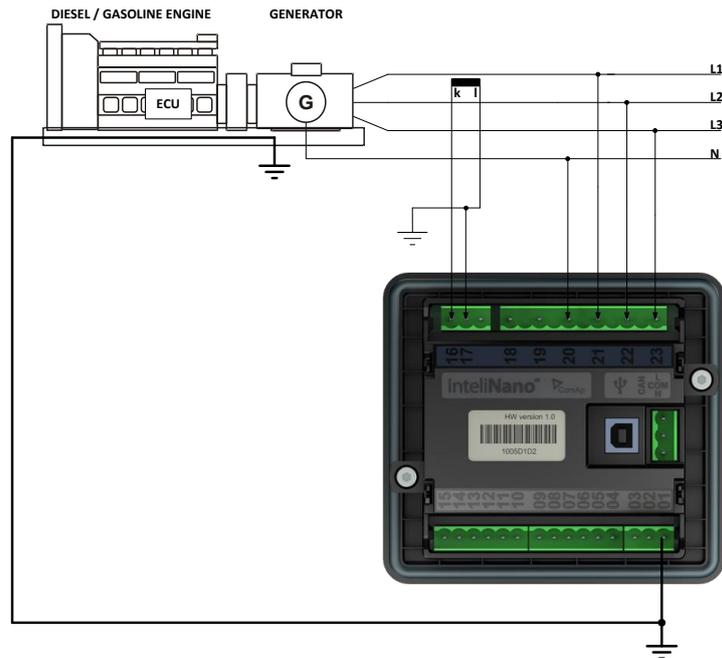


Figure 4.17
RECOMMENDED CT CONNECTION

NOTE:

There is no need to connect "1" terminal of CT to the ground.

4.8 Binary inputs

Use minimally 1 mm² cables for wiring of standard binary inputs.

NOTE:

Logical binary functions for each binary input have to be assigned during the configuration.

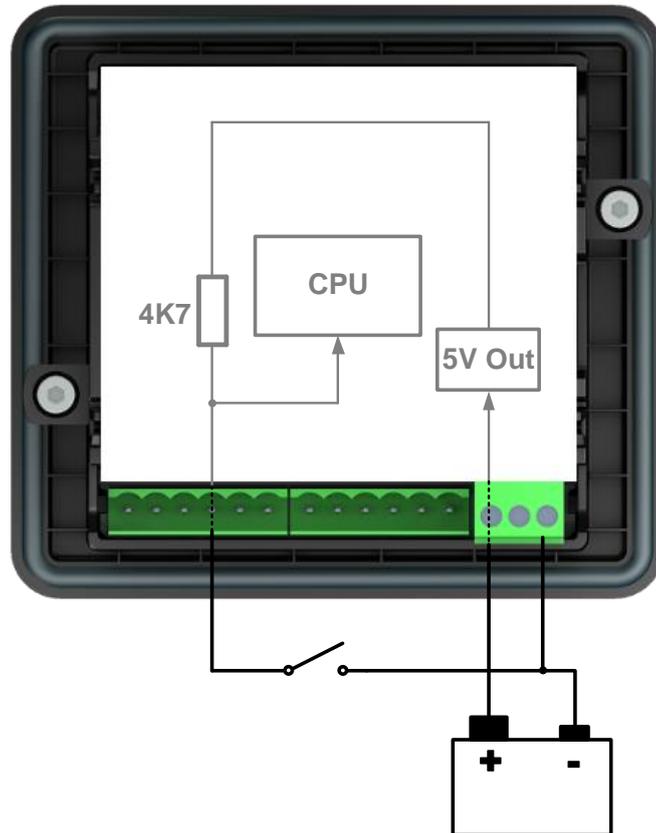


Figure 4.18
RECOMMENDED BINARY INPUTS WIRING

4.9 Binary outputs

Use minimal 1 mm² cables for wiring of binary outputs [T06](#), [T07](#), [T08](#) and [T09](#). 2,5 mm² cables are required for high current outputs [T04](#) and [T05](#). For more technical detail see chapter [13.5 Binary outputs](#).

WARNING!

Controller outputs switch high side! Never connect any analog sensor to this output to avoid sensor damage. All outputs are short circuit protected.

Use suppression diodes on all relays and other inductive loads!

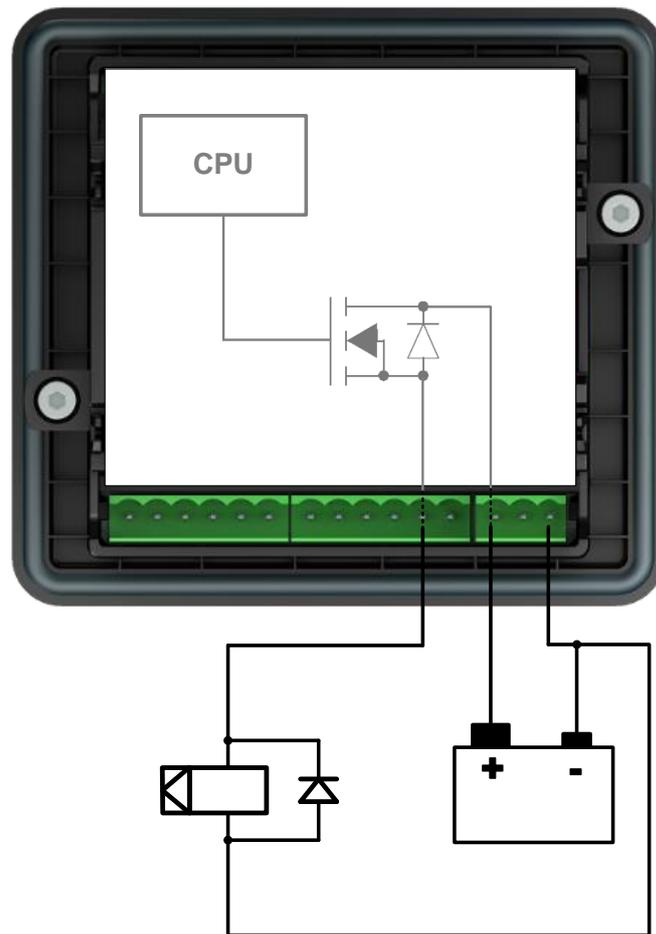


Figure 4.19

RECOMMENDED BINARY OUTPUT WIRING

4.10 Analog inputs

The analog inputs are designed for resistive automotive type sensors like VDO or DATCON. The sensors are connected either by one wire (the second pole is sensor body) or by two wires.

CAUTION!

In case of grounded sensors connect the terminal **T10** to the engine body as near the sensor as possible!

CAUTION!

In case of isolated sensors connect the terminal **T10** to the negative power supply terminal of the controller as well as the opposite poles of the sensors!

NOTE:

Value ##### is displayed when measured value is out of range or sensor's wire is broken.

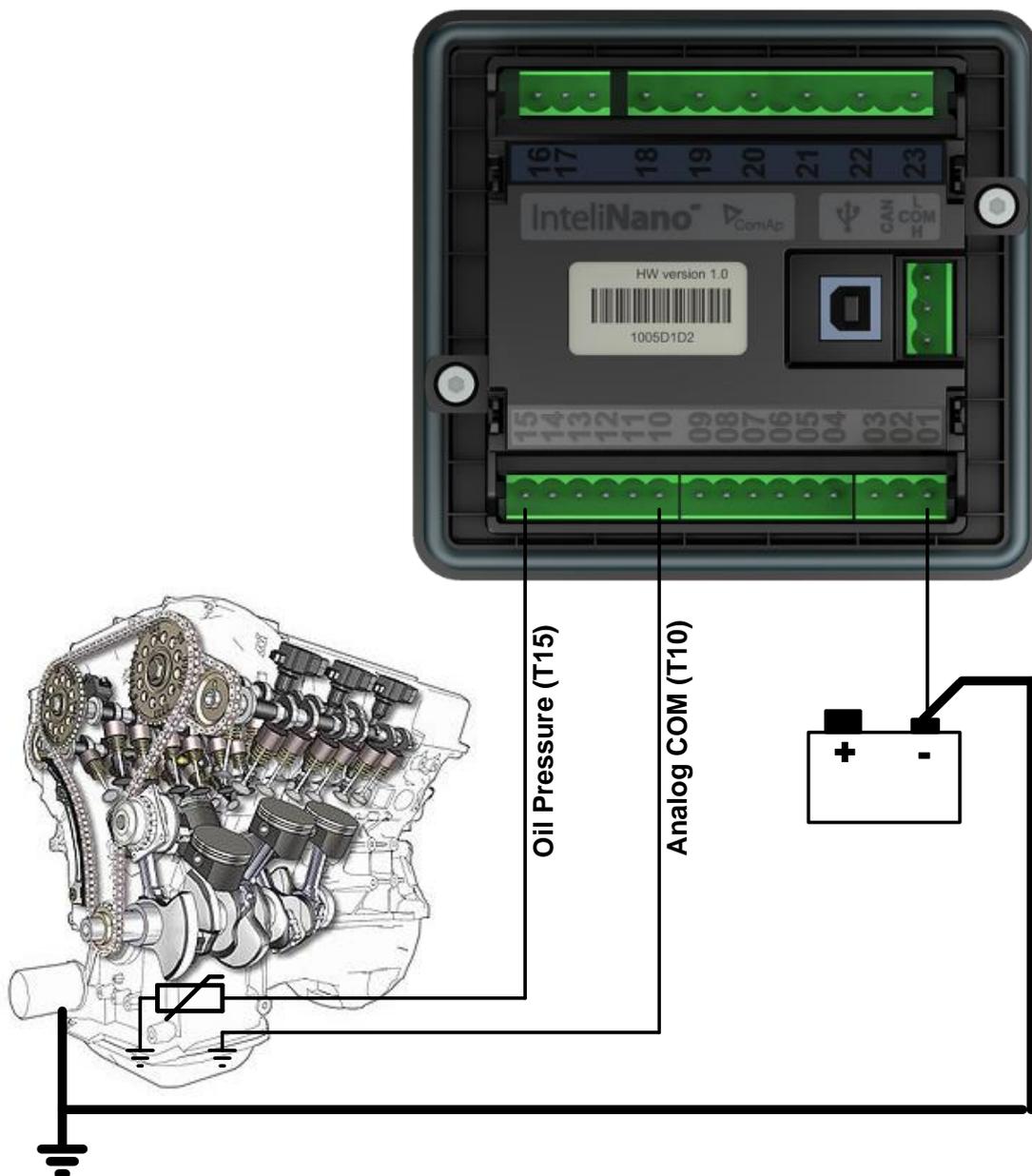


Figure 4.20

WIRING OF ANALOG INPUTS - GROUNDED SENSORS

IntelINano-NT Plus, SW version 2.0.1.x, ©ComAp – July 2015

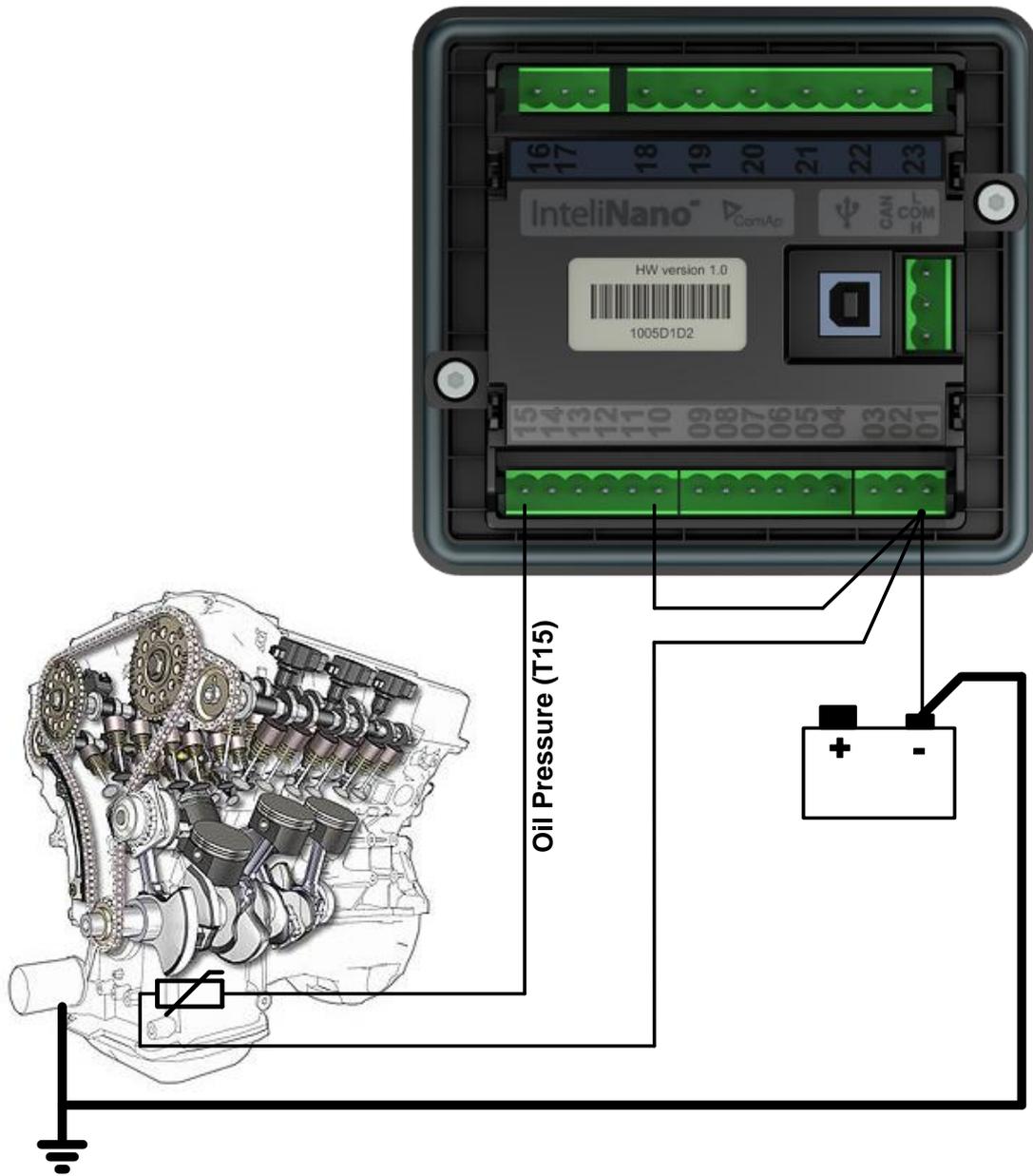


Figure 4.21
WIRING OF ANALOG INPUTS - ISOLATED SENSORS

5 Recommended Wiring

5.1 AMF application wiring diagram

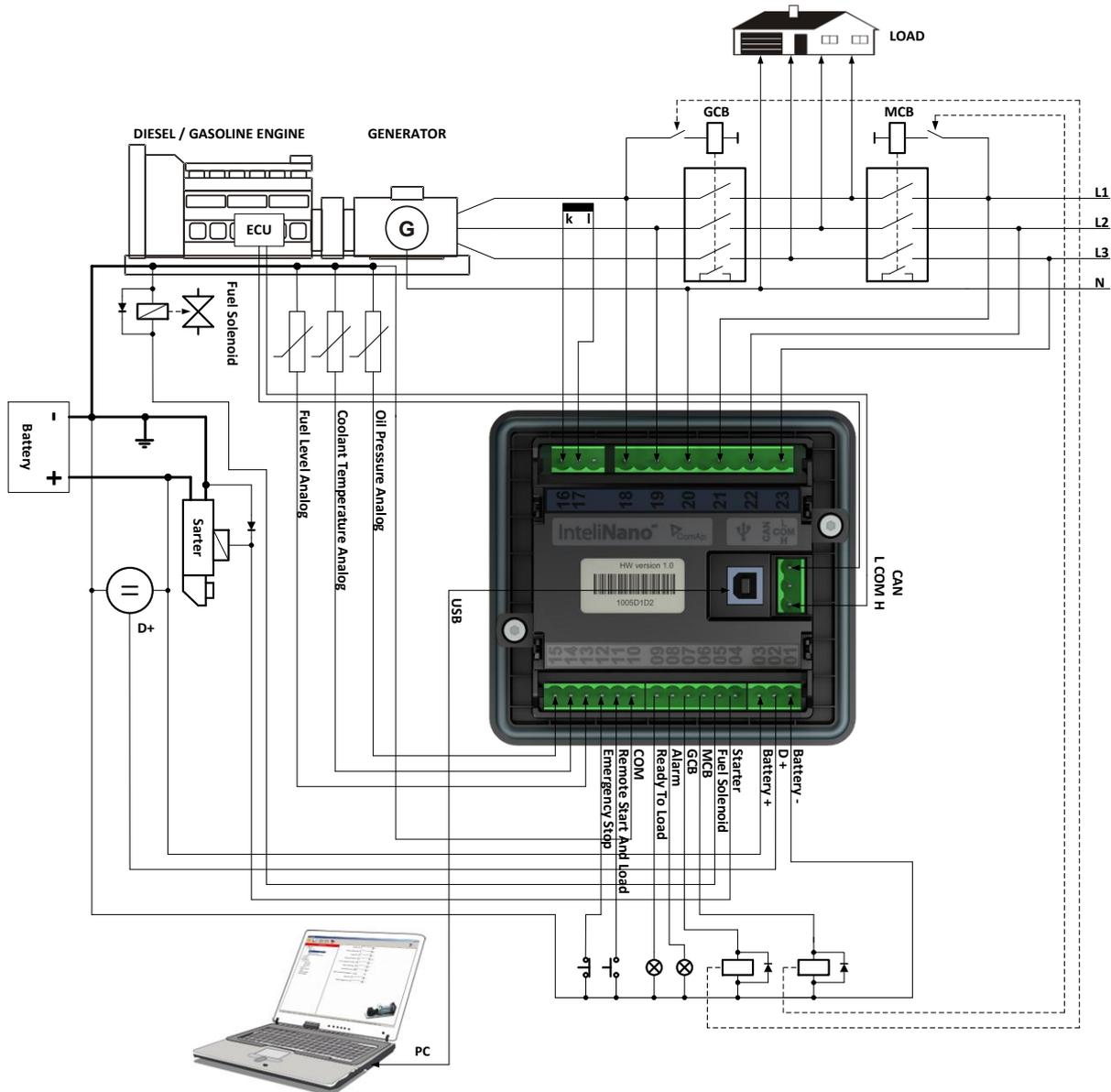


Figure 5.1
TYPICAL WIRING DIAGRAM OF AMF APPLICATION

NOTE:
MCB and GCB are recommended to be mechanically interlocked.

5.2 MRS application wiring diagram

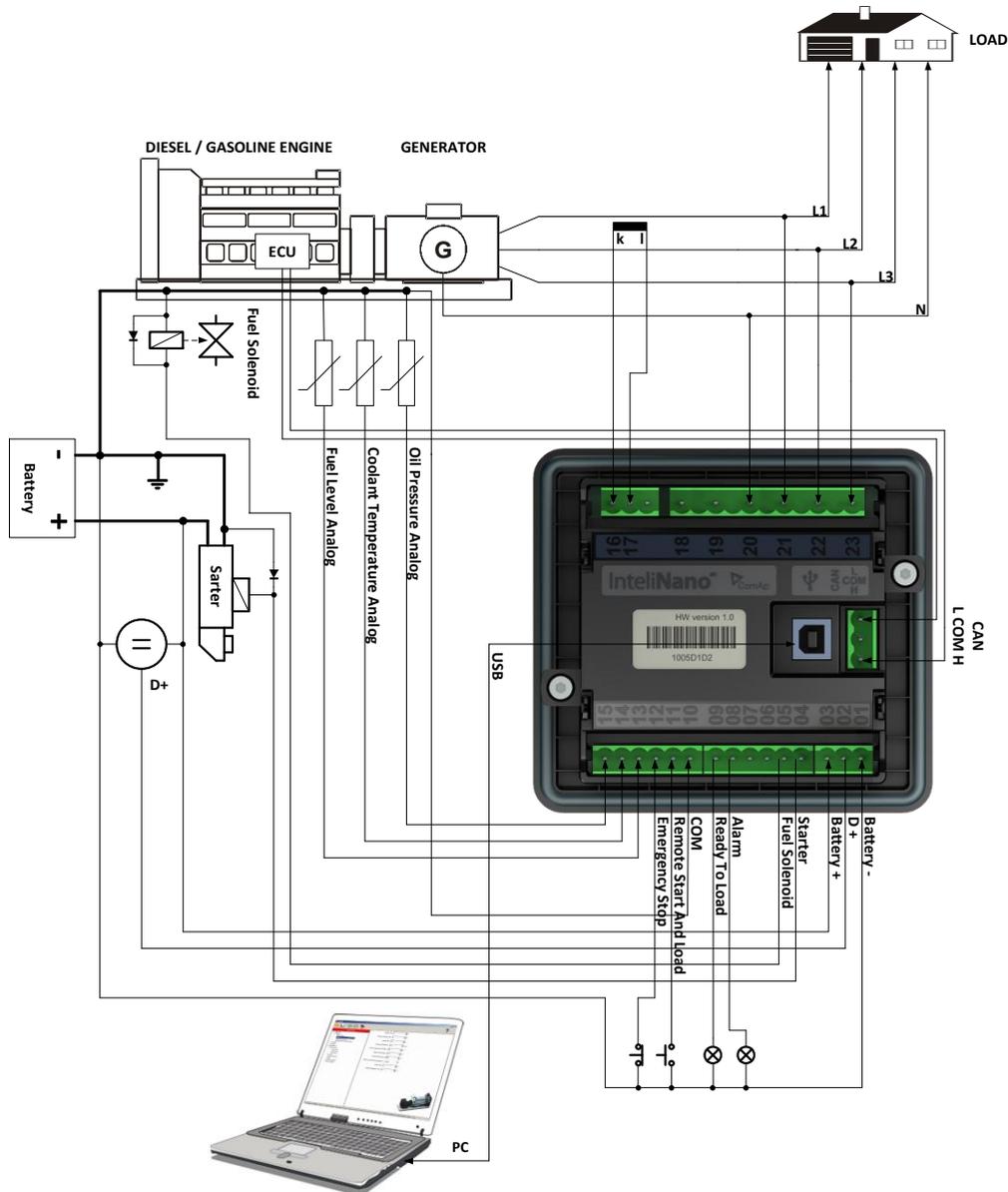


Figure 5.2
TYPICAL WIRING DIAGRAM OF MRS APPLICATION

6 Controller Settings

6.1 Setup mode

CAUTION!

Controller must be in manual mode before you can enter the controller's setup mode. Use button **Auto** for switching between **Auto** and **Manual** mode. Green LED above button **Auto** is turned off when the controller is in Manual mode.

If you have not configured custom initialization (init) screen then press and hold **Stop** button, then briefly press **▲** button then **Auto** (Figure 6.1).

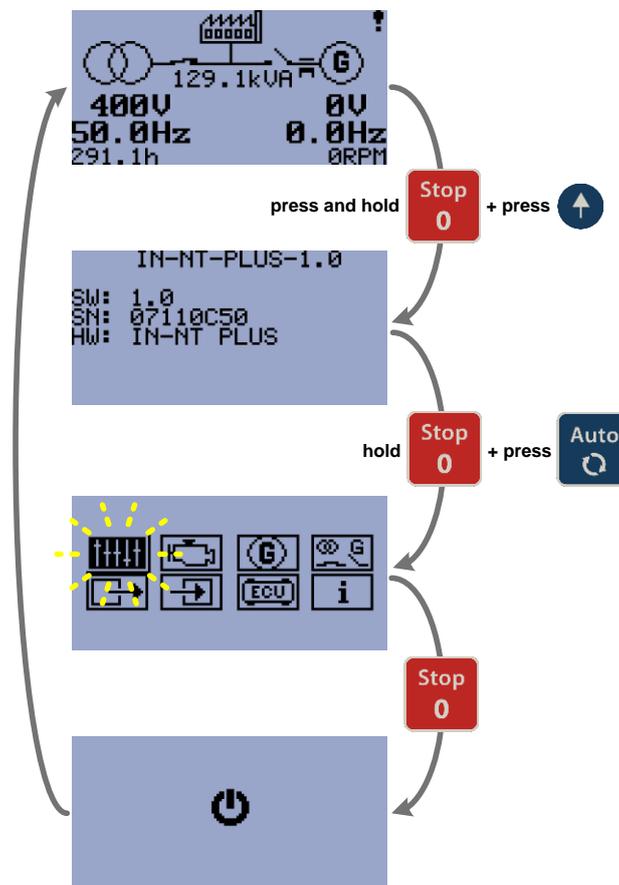


Figure 6.1

ENTRY TO SETUP MODE (WITHOUT CUSTOM SCREEN)

If you have already created your own init screen then press and hold **Stop** button and then press briefly press **▲**, the custom init screen will appear, keep holding the **Stop** button. Then press **▼** to switch LCD to default init screen and then press **Auto** (Figure 6.2).

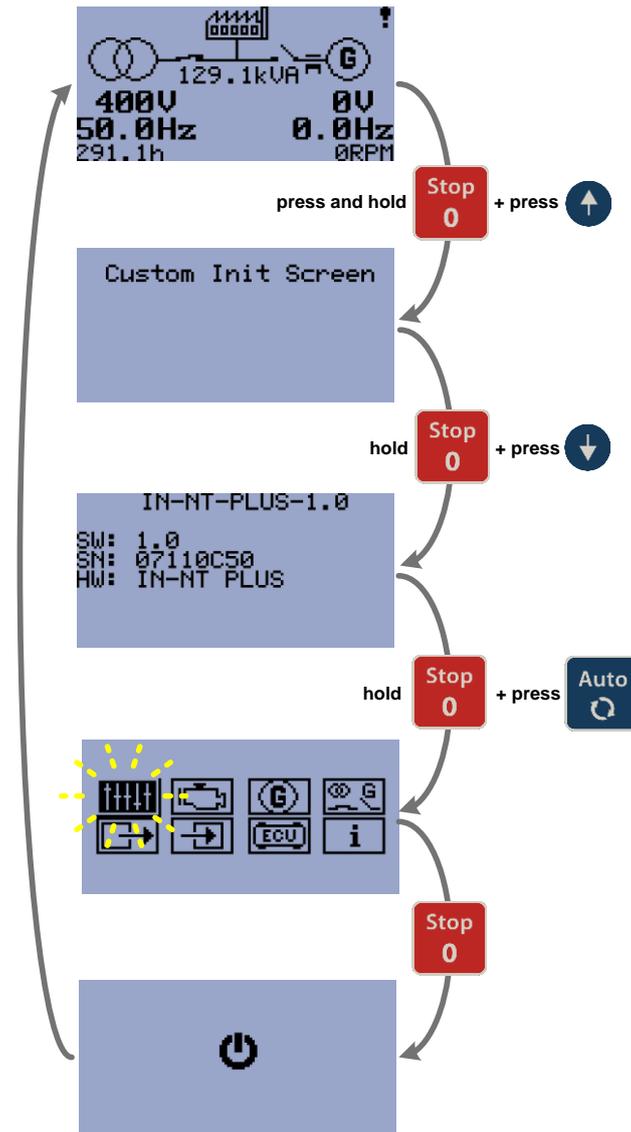


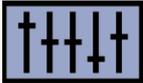
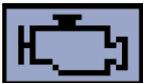
Figure 6.2
ENTRY TO SETUP MODE (WITH CUSTOM SCREEN)

NOTE:

The controller will automatically switch to Setup mode when there is a problem with the CRC or there is an incompatibility between firmware and archive version. This situation can occur when you upgrade a firmware. If this occurs, verify that all setpoints are properly configured.



Figure 6.3
SETUP SCREEN (AMF ENABLED)

	<u>Basic settings</u>
	<u>Engine parameters and protections</u>
	<u>Generator protections</u>
	<u>AMF(Auto Mains Failure) settings</u>
	<u>Outputs settings</u>
	<u>Inputs settings</u>
	<u>ECU setting</u>
	Info

To move up and down in the setup menu use ▲ and ▼ buttons. Press **Start** button to select or **Stop** button for exit (Figure 6.4).

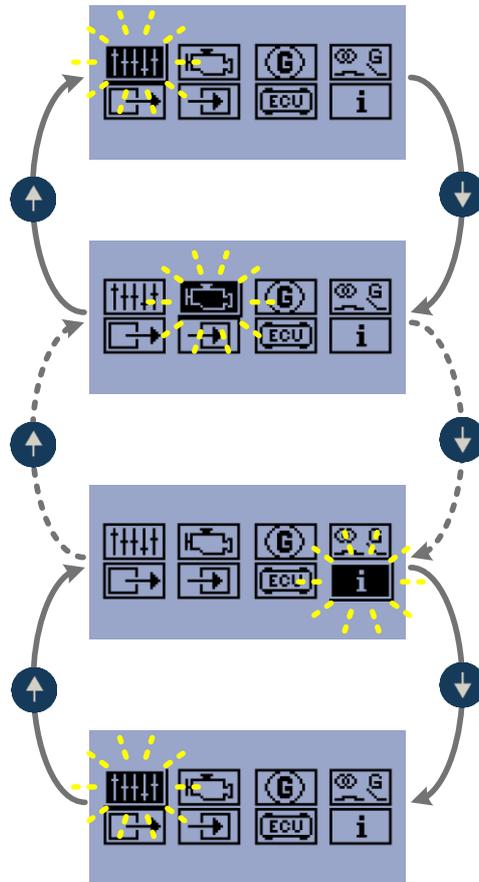


Figure 6.4
SETUP MENU ORGANIZATION

To apply all changes return to the main setup menu and restart the controller by pressing the **Stop** button.

7 Inputs and Outputs

In the table below you can see which logical function can be assigned to physical binary or analog input or binary output. Each logical input or output function has unique code. Input code's first letter is "I" output code's letter is "O". Summary of all logical input function is in chapter [Logical binary and analog inputs](#), summary of logical output function is in [Logical binary outputs](#).

Each logical binary input and output can be configured as [Normally Open](#) (NO) or [Normally Close](#) (NC)

Terminal	Type	Direction	Inputs
			Input function assignment
T07	binary	input/output	I00 , I01 , I04 , I05 , I06 , I07 , I10 , I11 , I12 , I13 , I14 , I15 , I20 , I22 , I24 , I29
T11	binary	input	I00 , I01 , I02 , I03 , I04 , I05 , I06 , I07 , I10 , I11 , I12 , I13 , I14 , I15 , I20 , I22 , I24 , I29
T12	binary	input	I00 , I01 , I04 , I05 , I06 , I07 , I10 , I11 , I12 , I13 , I14 , I15 , I20 , I22 , I24 , I29
T13	binary/analog	input	I00 , I01 , I04 , I05 , I06 , I07 , I10 , I11 , I12 , I13 , I14 , I15 , I20 , I21 , I22 , I23 , I24 , I25 , I29
T14	binary/analog	input	I00 , I01 , I04 , I05 , I06 , I07 , I10 , I11 , I12 , I13 , I14 , I15 , I20 , I21 , I22 , I23 , I24 , I25 , I29
T15	binary/analog	input	I00 , I01 , I04 , I05 , I06 , I07 , I10 , I11 , I12 , I13 , I14 , I15 , I20 , I21 , I22 , I23 , I24 , I25 , I29

Terminal	Type	Direction	Outputs
			Input function assignment
T04	binary	output	O00 , O01 , O02 , O03 , O04 , O05 , O06 , O07 , O08 , O09 , O10 , O11
T05	binary	output	O00 , O02 , O03 , O04 , O05 , O06 , O07 , O08 , O09 , O10 , O11
T06	binary	output	O00 , O02 , O03 , O04 , O05 , O06 , O07 , O08 , O09 , O10 , O11
T07	binary	input/output	O00 , O02 , O03 , O04 , O05 , O06 , O07 , O08 , O09 , O10 , O11
T08	binary	output	O00 , O02 , O03 , O04 , O05 , O06 , O07 , O08 , O09 , O10 , O11
T09	binary	output	O00 , O02 , O03 , O04 , O05 , O06 , O07 , O08 , O09 , O10 , O11

NOTE:

All inputs except for [Fuel Level Analog](#), [Coolant Temperature Analog](#) and [Oil Pressure Analog](#) can be configured to the **InteliNano^{NT}** controller terminal number [T11](#), [T12](#), [T13](#), [T14](#), [T15](#) and shared input/output terminal [T07](#). All outputs except [Starter](#), can be configured to terminal [T04](#), [T05](#), [T06](#), [T07](#), [T08](#) and [T09](#). Binary output [Starter](#) can be configured only to high current output terminal [T04](#).

7.1 *Normally Open Contact*

Normally Open Contact represents a standard opened contact – no voltage on output terminal and no passing current from/to binary input terminal. When the contact is opened the controller reads logical 0 (L) on the binary input. When contact is closed the controller reads a logical 1 (H).

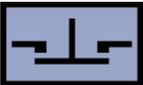
In this case 0V on the binary output represents a logical 0 (L) Battery positive voltage on the output represents a logical 1 (H).

	Normally Open Contact – output
	Normally Open Contact – input button

7.2 *Normally Closed Contact*

Normally Closed Contact (inverted) represents a closed contact – positive voltage on output terminal or passing current from/to binary input terminal. When the contact is opened the controller reads logical 1 (H) on the binary input. When the contact is closed the controller reads a logical 0 (L).

In this case 0V on binary output represents a logical 1 (H). Battery positive voltage on the output represents a logical 0 (L).

	Normally Closed Contact – output
	Normally Closed Contact – input button

8 Outputs settings

8.1 Binary outputs IntelliNano^{NT} Plus - default

[T04 Starter](#)

[T05 Fuel Solenoid](#)

[T06 GCB Close/Open](#)

[T07 MCB Close/Open](#)

[T08 Alarm](#)

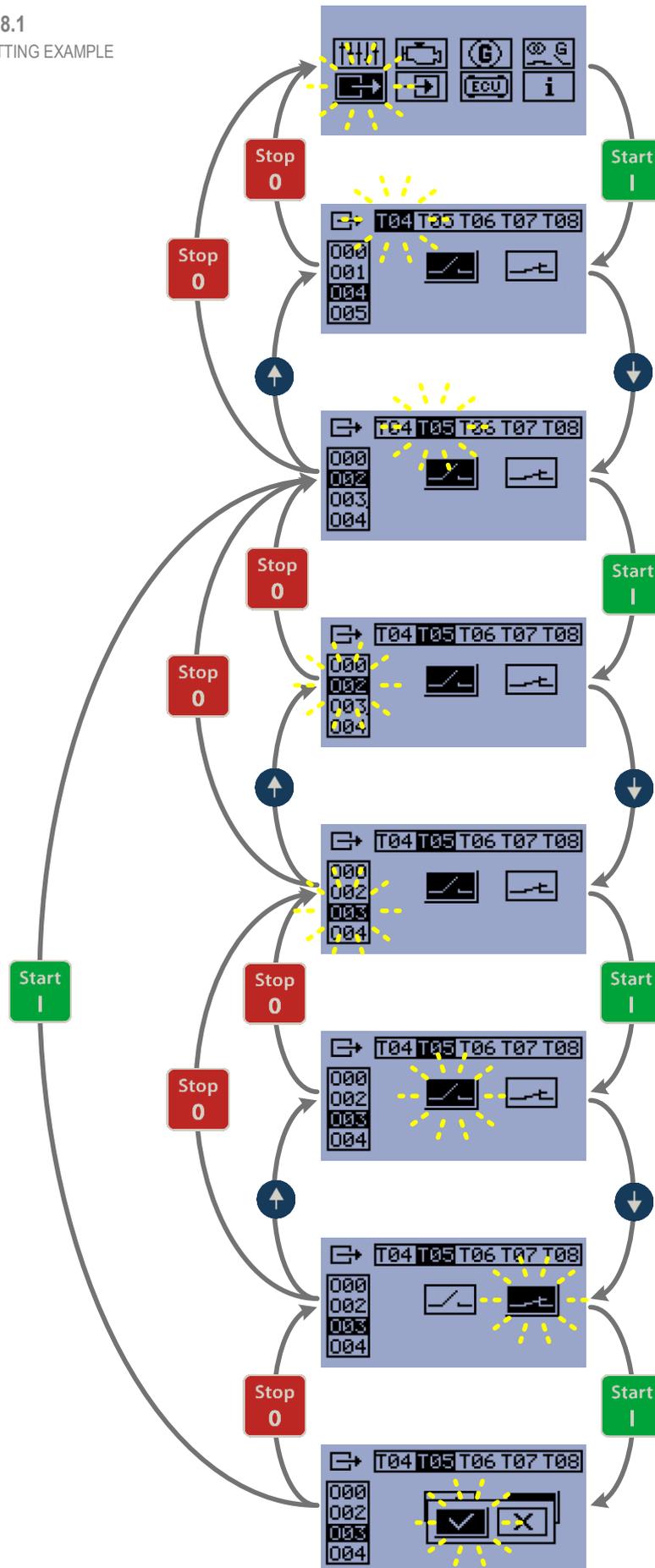
[T09 Ready To Load](#)

8.2 Logical binary outputs

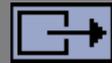
Output code	Output name	Type	Terminal assignment
<u>O00</u>	<u>Not Used</u>	binary	<u>T04 , T05, T06, T07, T08, T09</u>
<u>O01</u>	<u>Starter</u>	binary	<u>T04</u>
<u>O02</u>	<u>Fuel Solenoid</u>	binary	<u>T05, T06, T07, T08, T09</u>
<u>O03</u>	<u>Stop Solenoid</u>	binary	<u>T05, T06, T07, T08, T09</u>
<u>O04</u>	<u>Alarm</u>	binary	<u>T04, T05, T06, T07, T08, T09</u>
<u>O05</u>	<u>GCB Close/Open</u>	binary	<u>T04, T05, T06, T07, T08, T09</u>
<u>O06</u>	<u>MCB Close/Open</u>	binary	<u>T04, T05, T06, T07, T08, T09</u>
<u>O07</u>	<u>Ready To Load</u>	binary	<u>T04, T05, T06, T07, T08, T09</u>
<u>O08</u>	<u>Prestart</u>	binary	<u>T04, T05, T06, T07, T08, T09</u>
<u>O09</u>	<u>ECU Power Relay</u>	binary	<u>T04, T05, T06, T07, T08, T09</u>
<u>O10</u>	<u>Choke</u>	binary	<u>T04 , T05, T06, T07, T08, T09</u>
<u>O11</u>	<u>Glow Plugs</u>	binary	<u>T04 , T05, T06, T07, T08, T09</u>

For the configuration of outputs use the PC software, **NanoEdit**, or switch controller to setup mode. **Figure 8.1** is an example of how to configure a binary output via the controller's screen. First select an output terminal. Then use ▲ and ▼ buttons to select a function. Then press **Start** button to confirm the selection. Lastly press **Stop** button to return. Then choose a logical function ([O00](#) - [O09](#)) and select contact type ([Normally Open contact](#) or [Normally Closed contact](#)) and confirm the change.

Figure 8.1
BINARY OUTPUT SETTING EXAMPLE

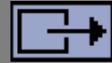


000 Not Used

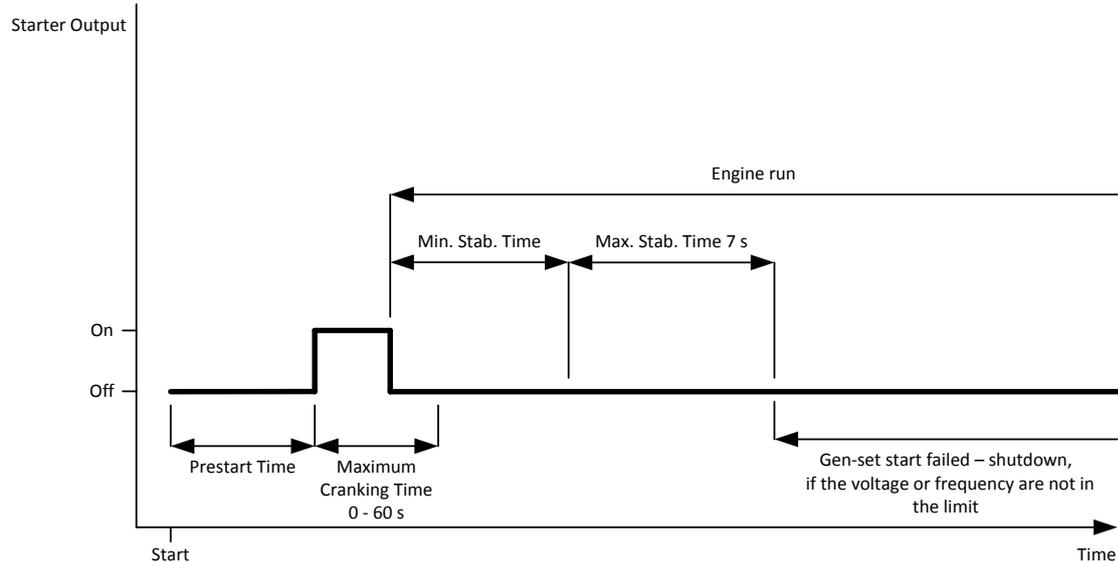
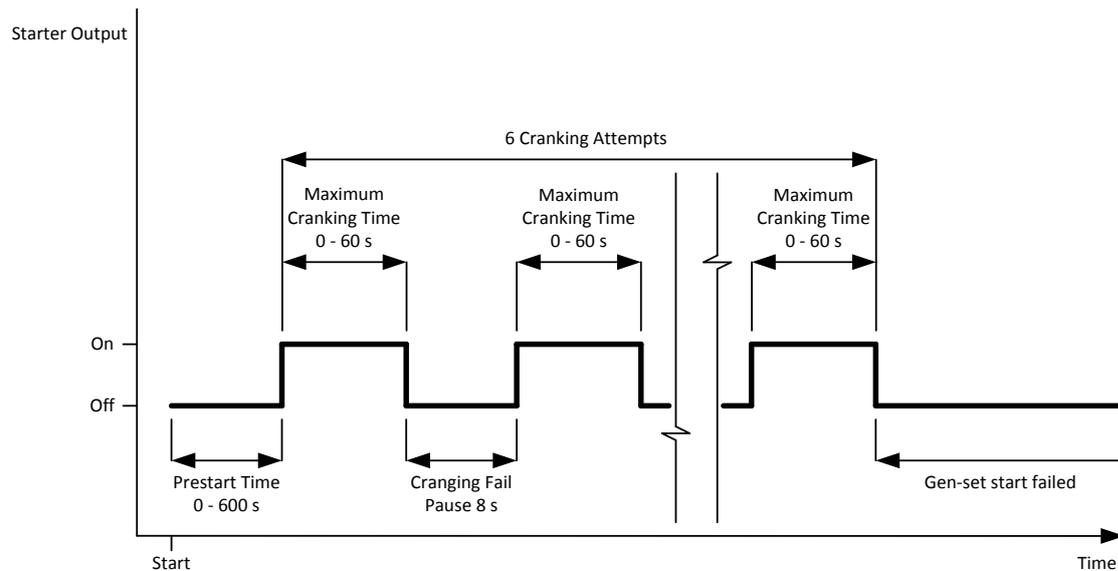


Output has no function. Use this configuration when output is not connected.

001 Starter



This output is dedicated for starter motor control. The number of cranking attempts is 6.



The starter output become inactive when one of following conditions is reach or exceeded.

RPM \geq 25% of nominal RPM (1500RPM=50Hz; 1800RPM=60Hz)

or

[Oil Pressure Analog](#) \geq 3 bar (43 PSI), only when [Oil Pressure Starter Disengagement](#) is enabled

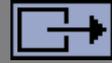
or

[Low Oil Pressure](#) input is opened, only when [Oil Pressure Starter Disengagement](#) is enabled

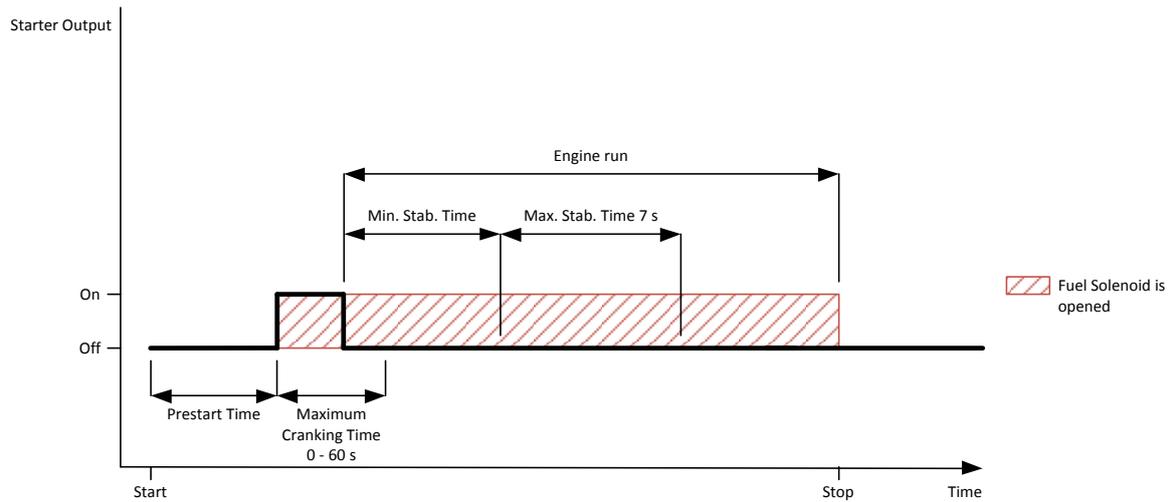
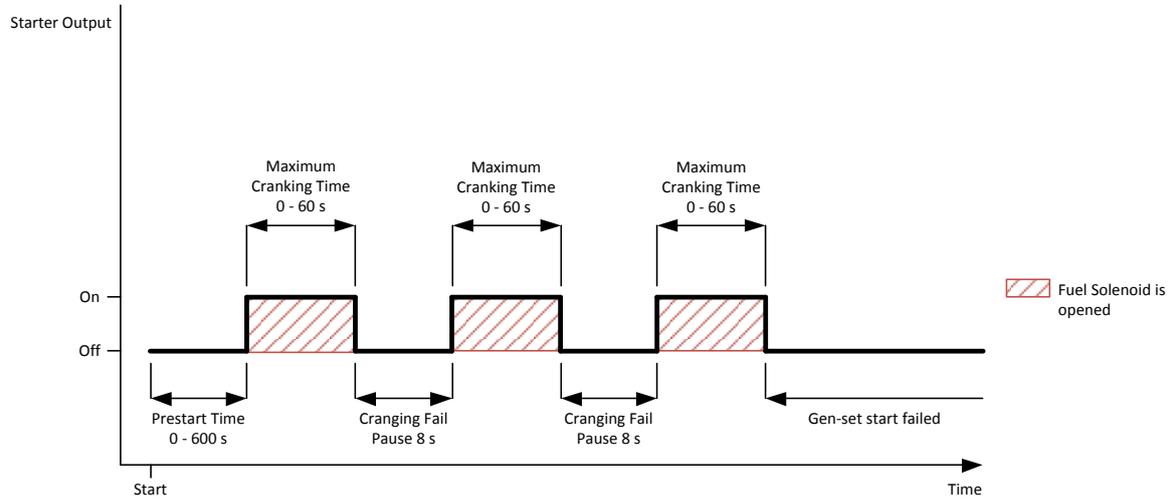
or

voltage on D+ terminal \geq 80% of battery voltage for 1 s or longer

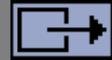
002 Fuel Solenoid



This output is dedicated to control the fuel solenoid (valve). The output is closed in the same time as [Starter](#) output and remains closed while the engine is running.



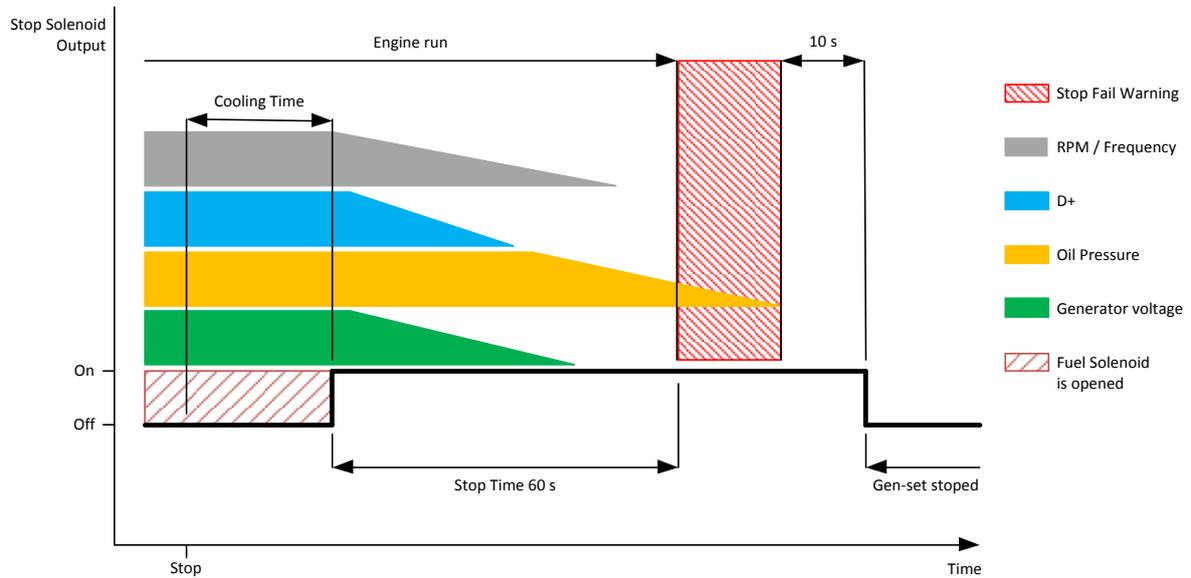
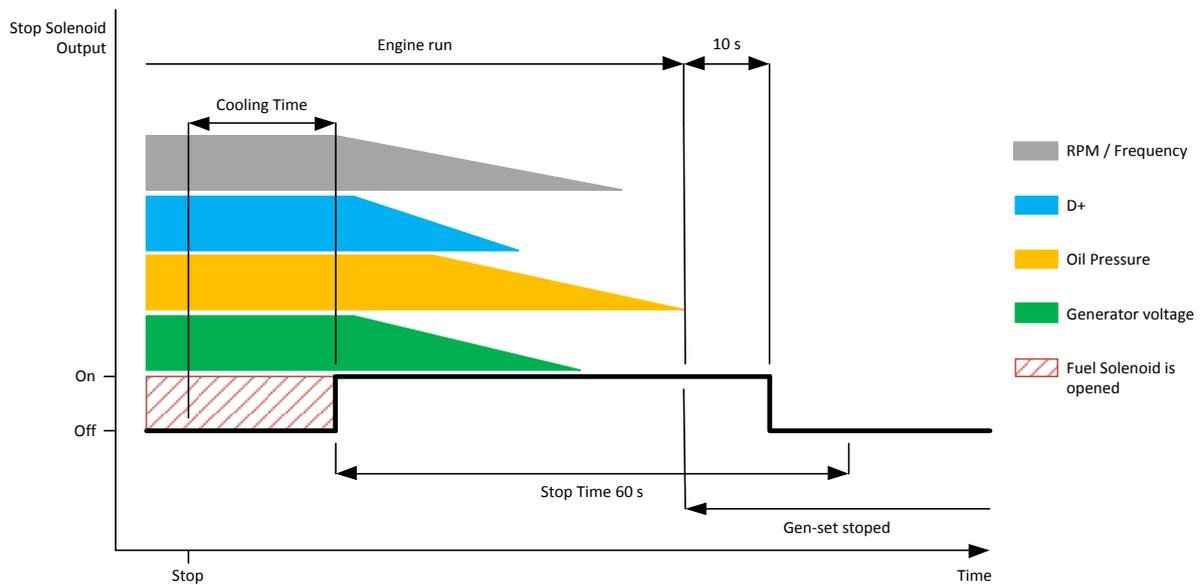
003 Stop Solenoid



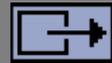
This output is dedicated to control the stop solenoid (valve). The output closes when an engine stop command is received and remains active until the gen-set is stopped.

The engine is stopped if:

- **RPM < 2**
and
- **Generator voltage < 10V**
and
- **Oil pressure < 3 Bar. (43 PSI)**

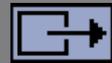


04 Alarm

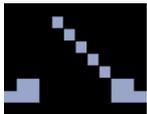


The output is to be used for external alarm indication. The output is active when at least one unconfirmed and active alarm is present in the event log.

005 GCB Close/Open



This output is to be used for a contactor control in case a contactor is used in the GCB position. GCB position is indicated on the mains screen when feedback is configured. Wrong breaker / contactor position is indicated on mains screen also.

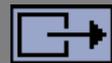


GCB is opened but has to be close.



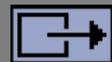
GCB is closed but has to be open.

006 MCB Close/Open



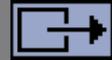
This output is to be used for a contactor control in case a contactor is used in the MCB position. Output is configured as close-off! When the binary output is inactive (open) the MCB is on-state, when binary output is active (close) the MCB is open. Output can also be configured with inverse output logic – (NC).

007 Ready To Load

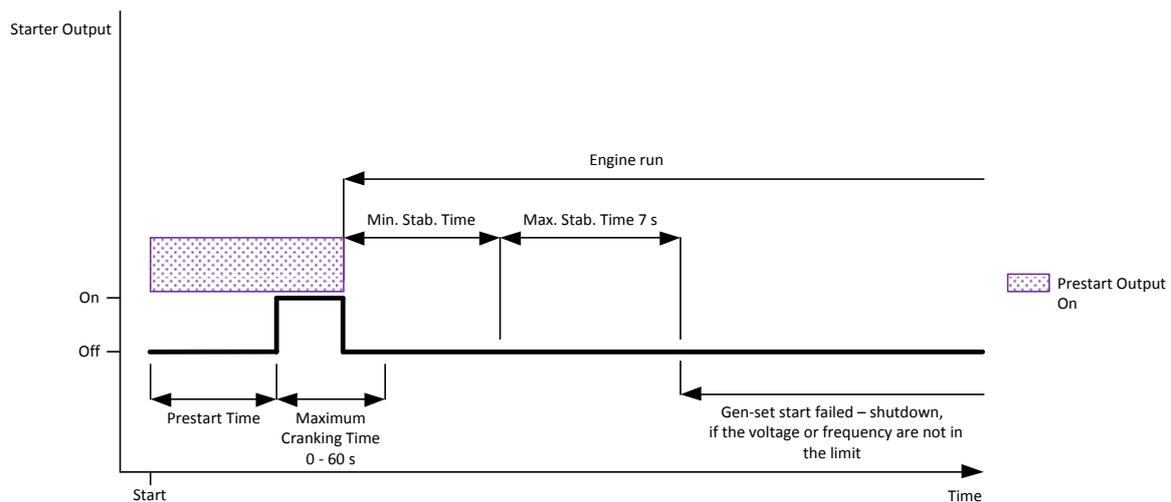
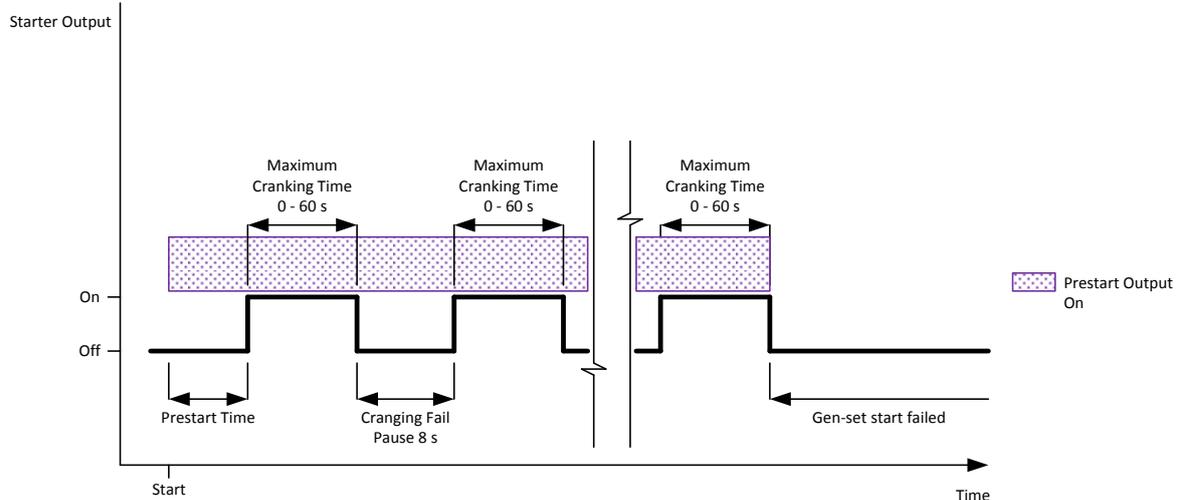


The output is activated when gen-set is running and all electrical values are in limits and no shutdown alarms are active - it is possible to close GCB or it is already closed. The output opens during cooling state or when emergency stop or any shutdown is active.

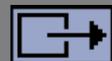
O08 Prestart



The output is activated while engine is cranking, but prior to the engine start. It is deactivated when 25% of Nominal RPM speed is reached. This output is typically used for pre-heat or pre-lubrication.



O09 ECU Power Relay

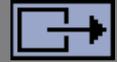


This output is to be used for "keyswitch" input to the ECU. If the particular ECU does not have keyswitch or similar input, it can be used for control of DC power for the ECU. The output closes together with [O08 Prestart](#) and remains closed while the engine is running. It is opened when a stop command is received. (I.e. together with the [O02 Fuel Solenoid](#)).

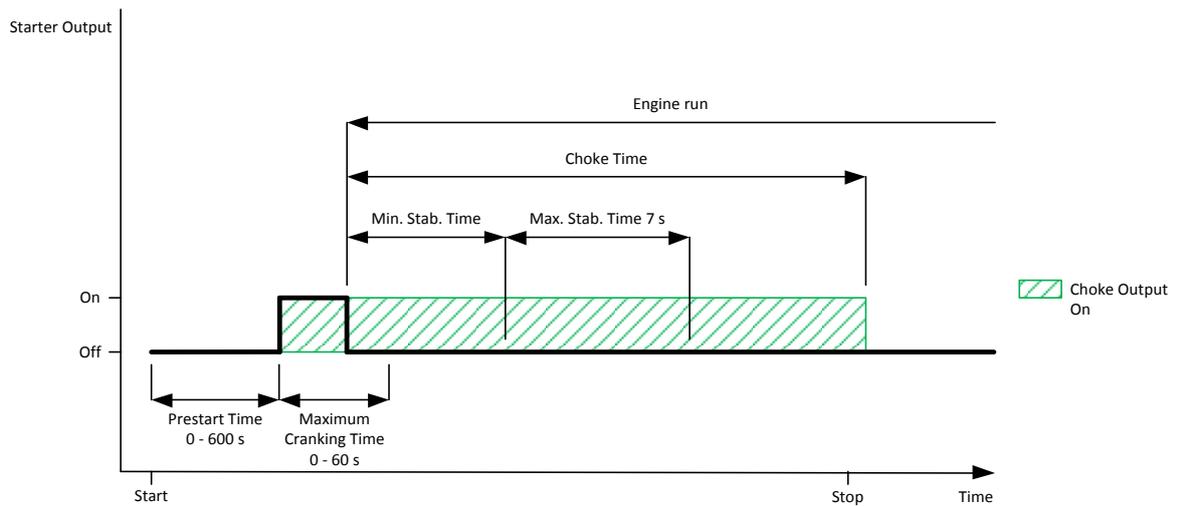
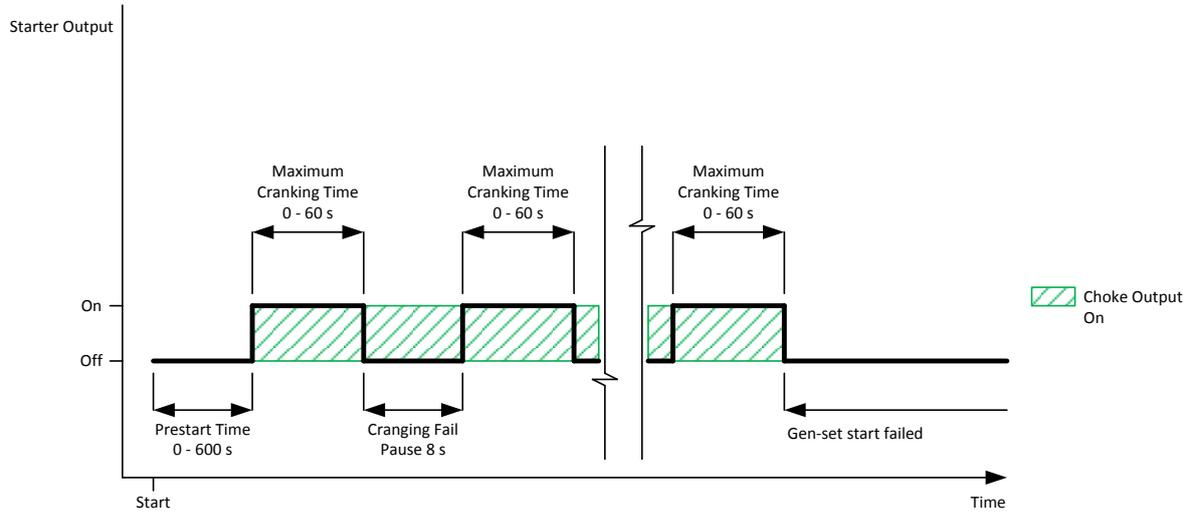
NOTE:

The controller does not evaluate the communication failure alarm during the period when this output is not active.

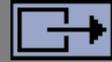
O10 Choke



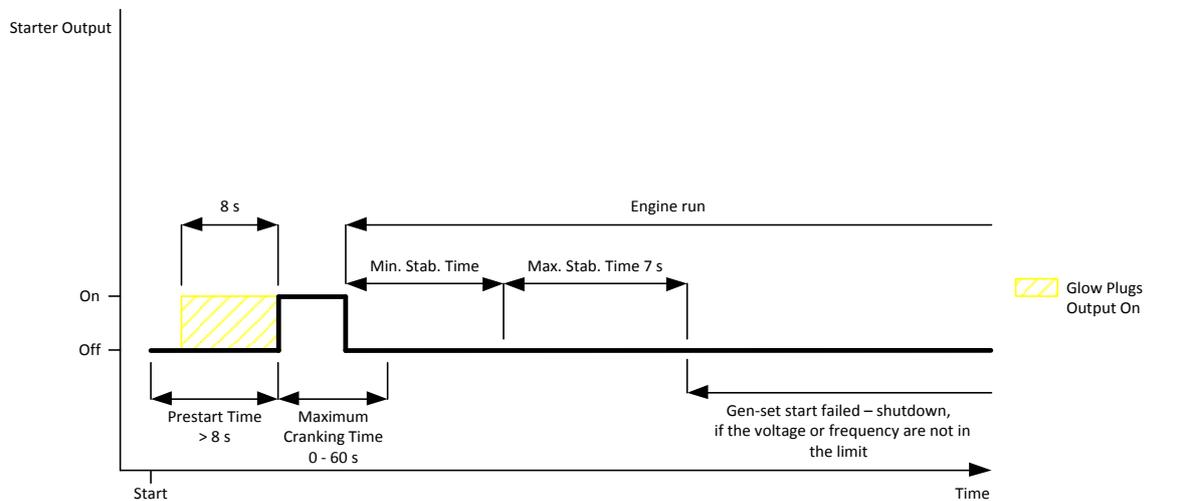
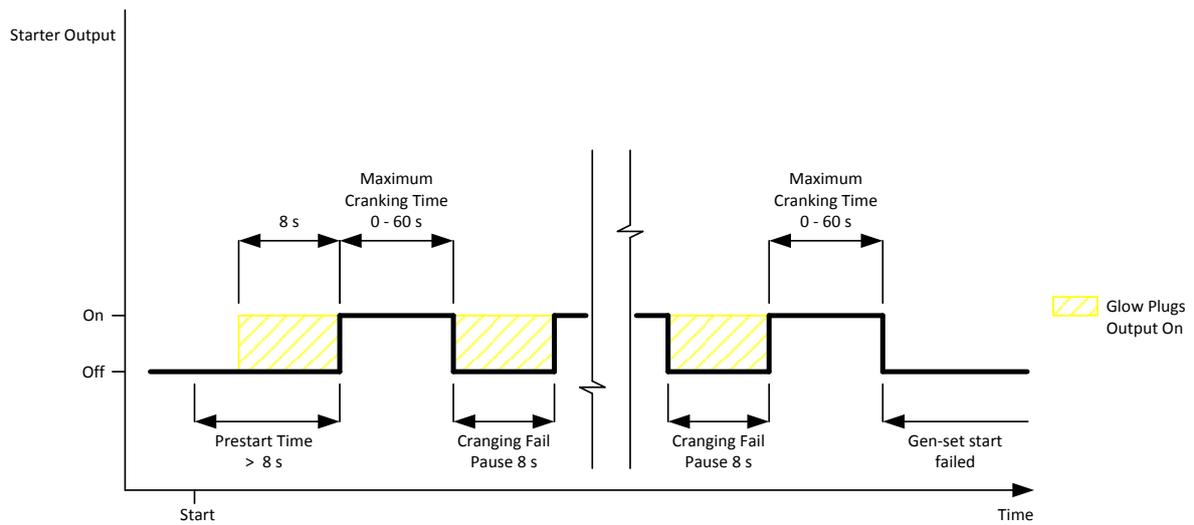
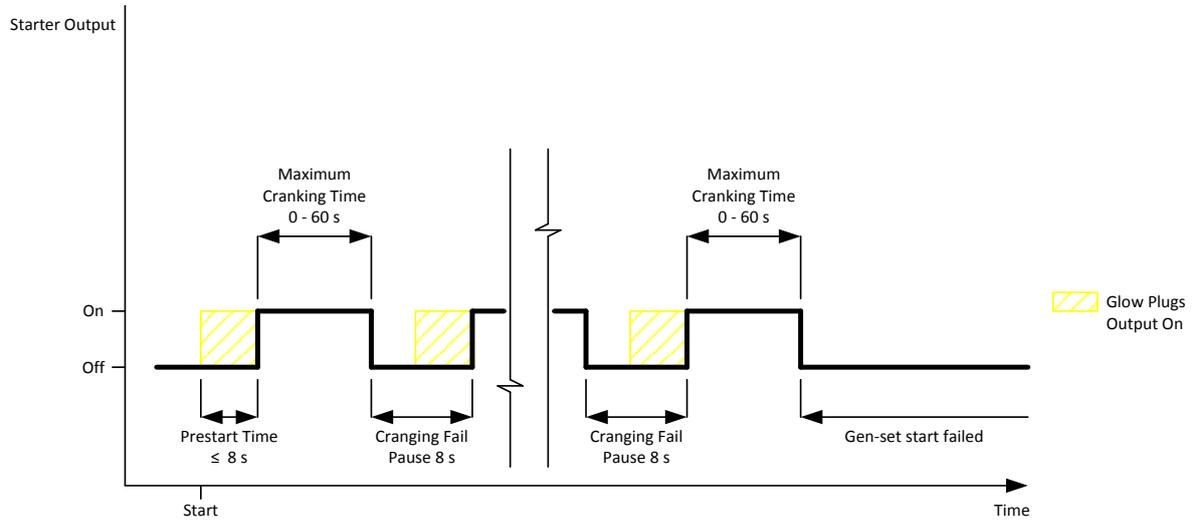
The output is activated while engine is cranking and between cranking attempts. Choke Time (timer) will start on engine run. The Choke output will close when Choke Time elapsed.



011 Glow Plugs



This output is activated before each cranking procedure for Prestart Time but maximally for 8s!



9 Inputs settings

9.1 Binary and analog inputs IntelliNano^{NT} Plus - default

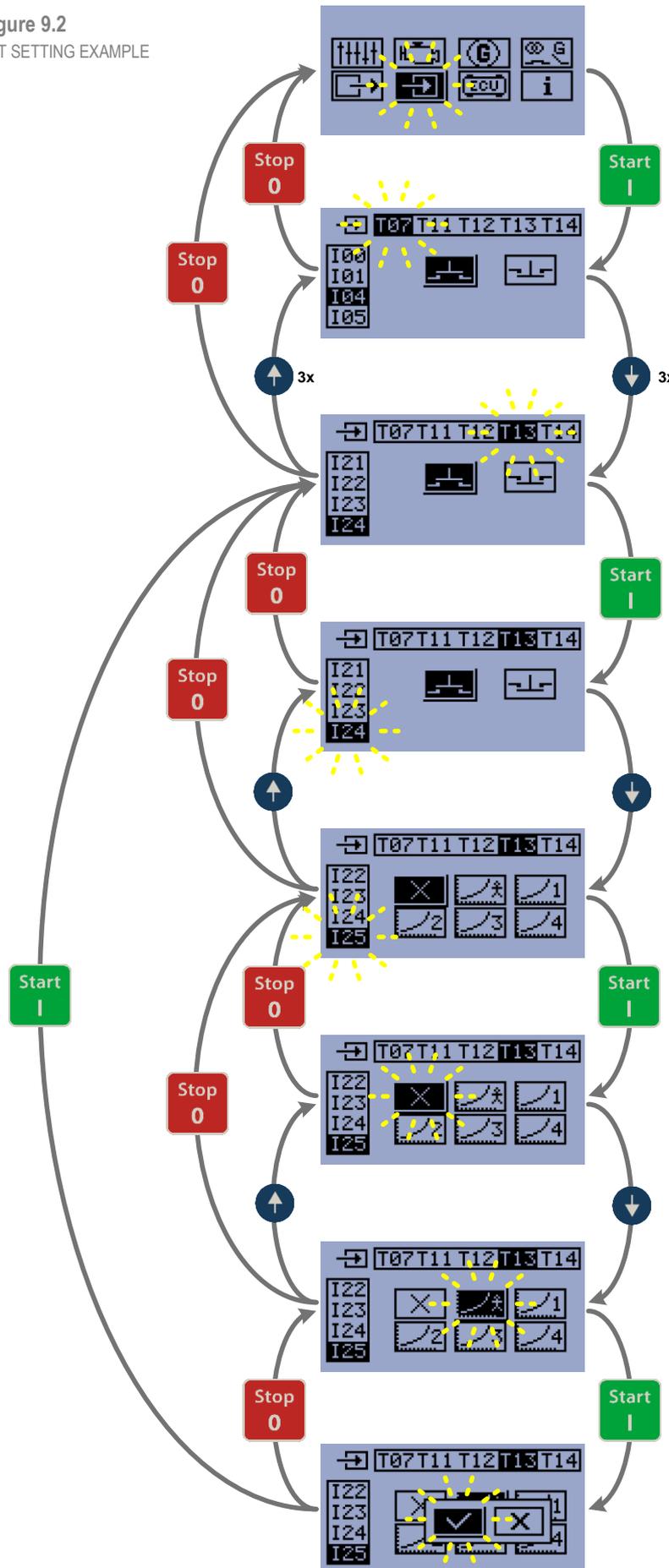
- T07** [Not Used \(I00\)](#) – terminal is configured as output
- T11** [Remote Start And Load \(I03\)](#) – [Normally Open contact](#)
- T12** [Emergency Stop \(I01\)](#) – [Normally Close contact](#)
- T13** [Fuel Level Analog \(I21\)](#) – VDO Level %
- T14** [Coolant Temperature Analog \(I25\)](#) – VDO 40-120 °C
- T15** [Oil Pressure Analog \(I23\)](#) – VDO 10 bar

9.2 Logical binary and analog inputs

Input code	Input name	Type	Terminal assignment
I00	Not Used	binary	T07, T11, T12, T13, T14, T15
I01	Emergency Stop	binary	T07, T11, T12, T13, T14, T15
I02	Remote Start/Stop	binary	T11
I03	Remote Start And Load	binary	T11
I04	Access Lock	binary	T07, T11, T12, T13, T14, T15
I05	AMF Blocked	binary	T07, T11, T12, T13, T14, T15
I06	MCB Feedback	binary	T07, T11, T12, T13, T14, T15
I07	GCB Feedback	binary	T07, T11, T12, T13, T14, T15
I10	External Warning 1	binary	T07, T11, T12, T13, T14, T15
I11	External Warning 2	binary	T07, T11, T12, T13, T14, T15
I12	External Warning 3	binary	T07, T11, T12, T13, T14, T15
I13	External Shutdown 1	binary	T07, T11, T12, T13, T14, T15
I14	External Shutdown 2	binary	T07, T11, T12, T13, T14, T15
I15	External Shutdown 3	binary	T07, T11, T12, T13, T14, T15
I20	Low Fuel Level	binary	T07, T11, T12, T13, T14, T15
I21	Fuel Level Analog	analog	T13, T14, T15
I22	Low Oil Pressure	binary	T07, T11, T12, T13, T14, T15
I23	Oil Pressure Analog	analog	T13, T14, T15
I24	High Coolant Temperature	binary	T07, T11, T12, T13, T14, T15
I25	Coolant Temperature Analog	analog	T13, T14, T15
I29	Fuel Level SD	binary	T07, T11, T12, T13, T14, T15

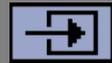
For the configuration of inputs use the PC software, **NanoEdit**, or switch the controller to setup mode. This is an example of how to configure a binary input via the controller's screen. First select an input terminal. Then use  and  buttons to select a function. Then press  button to confirm the selection. Lastly press  button to return. Then choose a logical function ([I00-I20](#), [I22](#) and [I24](#)) and select contact type ([Normally Open contact](#) or [Normally Closed contact](#)) and confirm change. **Figure 9.2** is an example of how to configure a binary input as analog.

Figure 9.2
ANALOG INPUT SETTING EXAMPLE



InteliNano-NT Plus, SW version 2.0.1.x, ©ComAp – July 2015

I00 Not Used



Input has no function. Use this configuration when binary or analog input is not connected.

Hint:

T07 T07 is input-output terminal. Primarily it is configured as an output. To configure as an input, assign the function **I00 Not Used** in the output configuration.

I01 Emergency Stop



This input will activate the built-in **Emergency Stop** alarm. It is recommended to use a **Normally Close** button for this input.

If this binary input is activated, the left red LED above **Stop** button will blink, the general shutdown symbol will be displayed on LCD's upper right corner, **Emergency Stop** symbol will be displayed on event log with running hours stamp and shut down procedure will occur. For more details see Shutdown procedure in chapter **12 Alarm, Events and History Management**.

CAUTION!

This is a software function only.

I02 Remote Start/Stop



This input is an external request for engine run. It is active in **Auto** mode only.

In MRS mode the controller starts the engine and keeps GCB open.

In AMF mode the controller starts the engine and keeps GCB open. Only when mains fail occur GCB is automatically closed.

NOTE:

The **Remote Start/stop** can be configured only on terminal **T11** This is also used for waking the controller from "Zero Power" mode.

I03 Remote Start And Load



The **Remote Start And Load** input can be used only when the controller is in **Auto** mode.

In AMF mode this input starts the engine and transfers the load to the generator after all engine and generator parameters are within tolerance (open MCB and close GCB). When this input is deactivated the controller will transfer the load back to mains and stop the engine.

In MRS mode this input starts engine and closes the GCB (only when is configured). When this input is deactivated the controller will open the breaker (only when is configured) and stop the engine.

NOTE:

The **Remote Start And Load** can be configured only on terminal **T11**. This is also used for waking the controller from "Zero Power" mode.

I04 Access Lock

When this input is closed, no setpoints can be adjusted from controller's front panel and gen-set mode (**Manual - Auto**) cannot be changed.

Access Lock does not protect setpoints and mode changing from **NanoEdit**. Also history is accessible.

Access Lock is also functionless in case that the controller is in setup mode.

I05 AMF Blocked

When this input is closed, the automatic start of the gen-set at Mains failure is blocked. If the gen-set is running, the GCB is opened, and gen-set stops. This input doesn't affect the mains circuit breaker.

I06 MCB Feedback

This input indicates whether MCB is closed or opened. Available only in AMF mode.

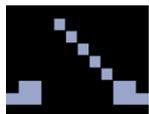
I07 GCB Feedback

This is an input from the generator circuit breaker. If the input is active, the controller will consider the GCB as closed and vice versa. If the GCB is not in expected position, the alarm **GCB Fail** will occur. For more details see [Shutdown](#) procedure in chapter [12 Alarm, Events and History Management](#).

NOTE:

The feedback time limit is 5s.

GCB position is indicated on the mains screen when feedback is configured. Wrong breaker / contactor position is indicated on mains screen also.



GCB is opened but has to be close.



GCB is closed but has to be open

I10 External Warning 1

If this binary input is activated the red LED above **Stop** button will blink, general warning symbol will be displayed on LCD's upper right corner and **External Warning 1** symbol will be displayed on event log with running hours stamp. This alarm is only warning. For more details see [Warning](#) procedure in chapter [12 Alarm, Events and History Management](#).

I11 External Warning 2



If this binary input is activated the red LED above **Stop** button will blink, general warning symbol will be displayed on LCD's upper right corner and **External Warning 2** symbol will be displayed on event log with running hours stamp. This alarm is only warning. For more details see [Warning](#) procedure in chapter [12 Alarm, Events and History Management](#).

I12 External Warning 3



If this binary input is activated left red LED above **Stop** button will blink, general warning symbol will be displayed on LCD's upper right corner and **External Warning 3** symbol will be displayed on event log with running hours stamp. This alarm is only warning. For more details see [Warning](#) procedure in chapter [12 Alarm, Events and History Management](#).

I13 External Shutdown 1



When this binary input is activated the red LED above **Stop** button will blink, general shutdown symbol will be displayed on LCD's upper right corner, **External Shutdown 1** symbol will be displayed on event log with running hours stamp, and the shutdown procedure will occur. For more details see [Shutdown](#) procedure in chapter [12 Alarm, Events and History Management](#).

CAUTION!

This is a software function only.

I14 External Shutdown 2



When this binary input is activated the red LED above **Stop** button will blink, general shutdown symbol will be displayed on LCD's upper right corner, **External Shutdown 2** symbol will be displayed on event log with running hours stamp, and the shutdown procedure will occur. For more details see [Shutdown](#) procedure in chapter [12 Alarm, Events and History Management](#).

CAUTION!

This is a software function only.

I15 External Shutdown 3

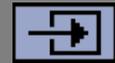


When this binary input is activated the red LED above **Stop** button will blink, general shutdown symbol will be displayed on LCD's upper right corner, **External Shutdown 3** symbol will be displayed on event log with running hours stamp, and the shutdown procedure will occur. For more details see [Shutdown](#) procedure in chapter [12 Alarm, Events and History Management](#).

CAUTION!

This is a software function only.

I20 Low Fuel Level



When this binary input is activated the red LED above **Stop** button will blink, the general warning symbol will be displayed on LCD's upper right corner, and **Low Fuel Level** symbol will be displayed on event log with running hours stamp. This alarm is only warning. For more details see [Warning](#) procedure in chapter [12 Alarm, Events and History Management](#).

NOTE:

Input has 10s delay.

I21 Fuel Level Analog



Analog input for fuel level measurement. When measured value exceeds the preset threshold, the left red LED above **Stop** button will blink, the general warning symbol will be displayed on LCD's upper right corner, and fuel level symbol will be displayed on event log with running hours stamp. This alarm is only warning. For more details see [Warning](#) procedure in chapter [12 Alarm, Events and History Management](#).

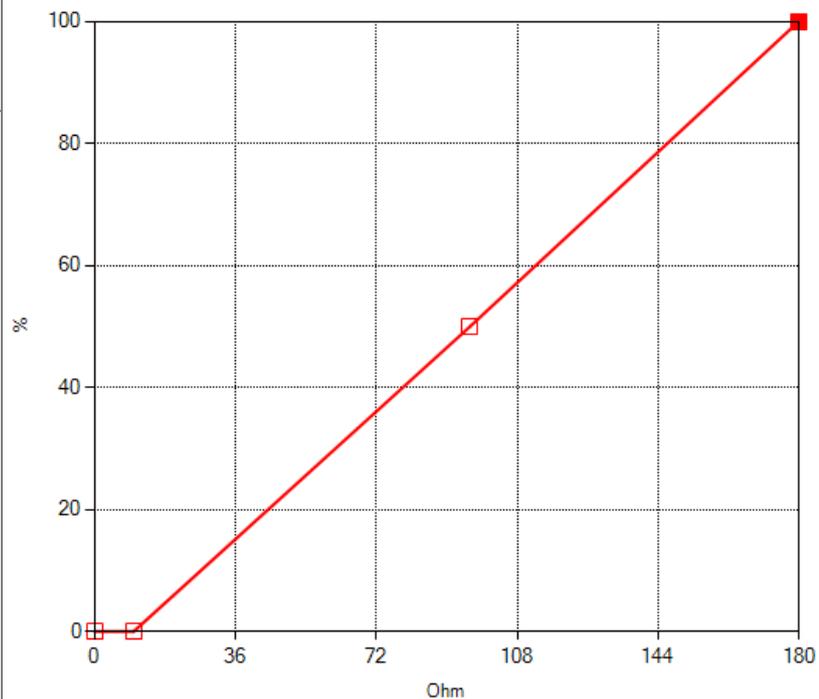
Alarm threshold is 20% of measurement range. You can choose one from two preset resistive sensors (VDO, Datcon) or you can create your own sensor curve.

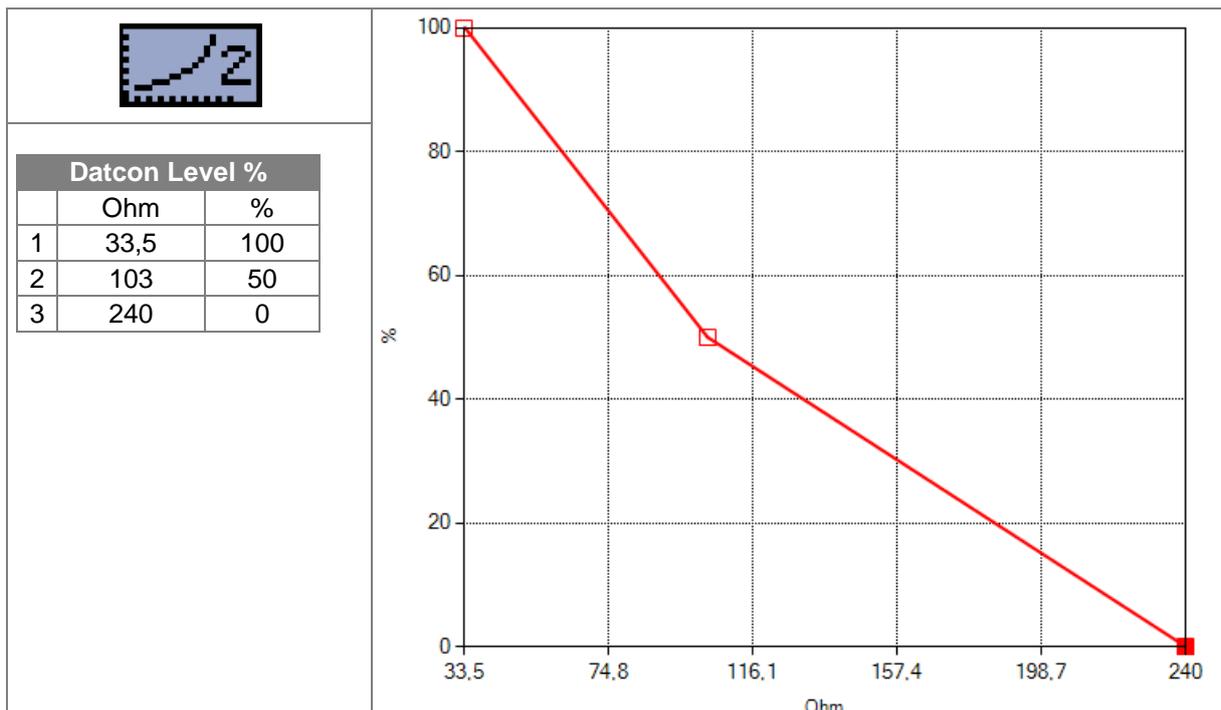
NOTE:

Input has 10s delay.



VDO Level %		
	Ohm	%
1	0	0
2	10	0
3	96	50
4	180	100





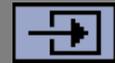
122 Low Oil Pressure



When this binary input is activated the red LED above **Stop** button will blink, the general shutdown symbol will be displayed on LCD's upper right corner, the oil pressure symbol will be displayed on event log with running hours stamp, and the shutdown procedure will occur. For more details see [Shutdown](#) procedure in chapter [12 Alarm, Events and History Management](#).

Evaluation of the protection is delayed for 1s.

123 Oil Pressure Analog



Analog input for oil pressure measurement. When the measured value exceeds the preset threshold the red LED above **Stop** button will blink, the general shutdown symbol will be displayed on LCD's upper right corner, the oil pressure symbol will be displayed on event log with running hours stamp and the shutdown procedure will occur. For more details see [Shutdown](#) procedure in chapter [12 Alarm, Events and History Management](#).

Default threshold is 1 Bar of measurement range. You can choice one from five default resistive sensors (VDO, Datcon) or you can create your own sensor curve.

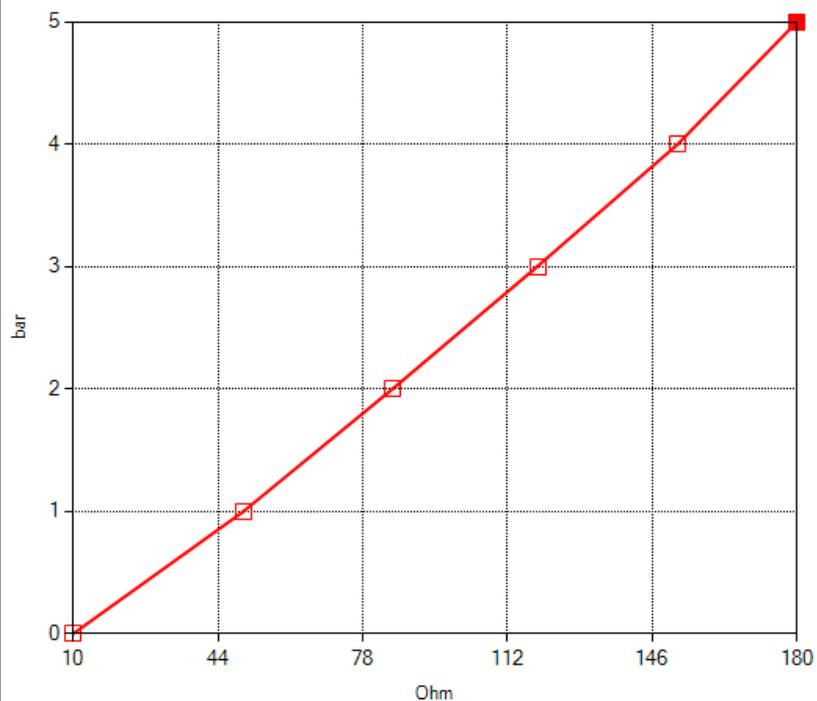
You can setup shutdown threshold ([E04 Oil Pressure Shutdown](#)) in Engine parameters and protection group.

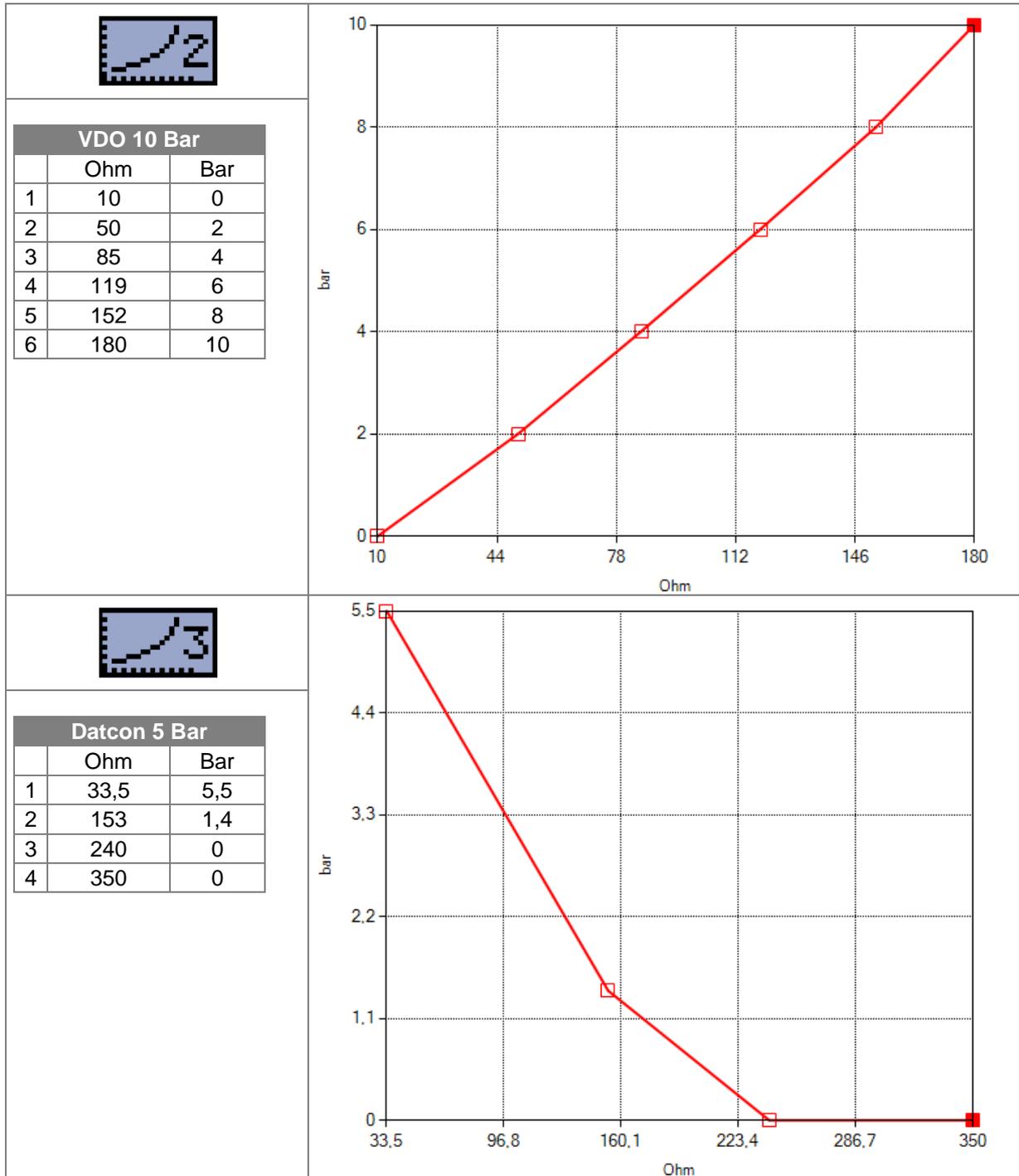
NOTE:

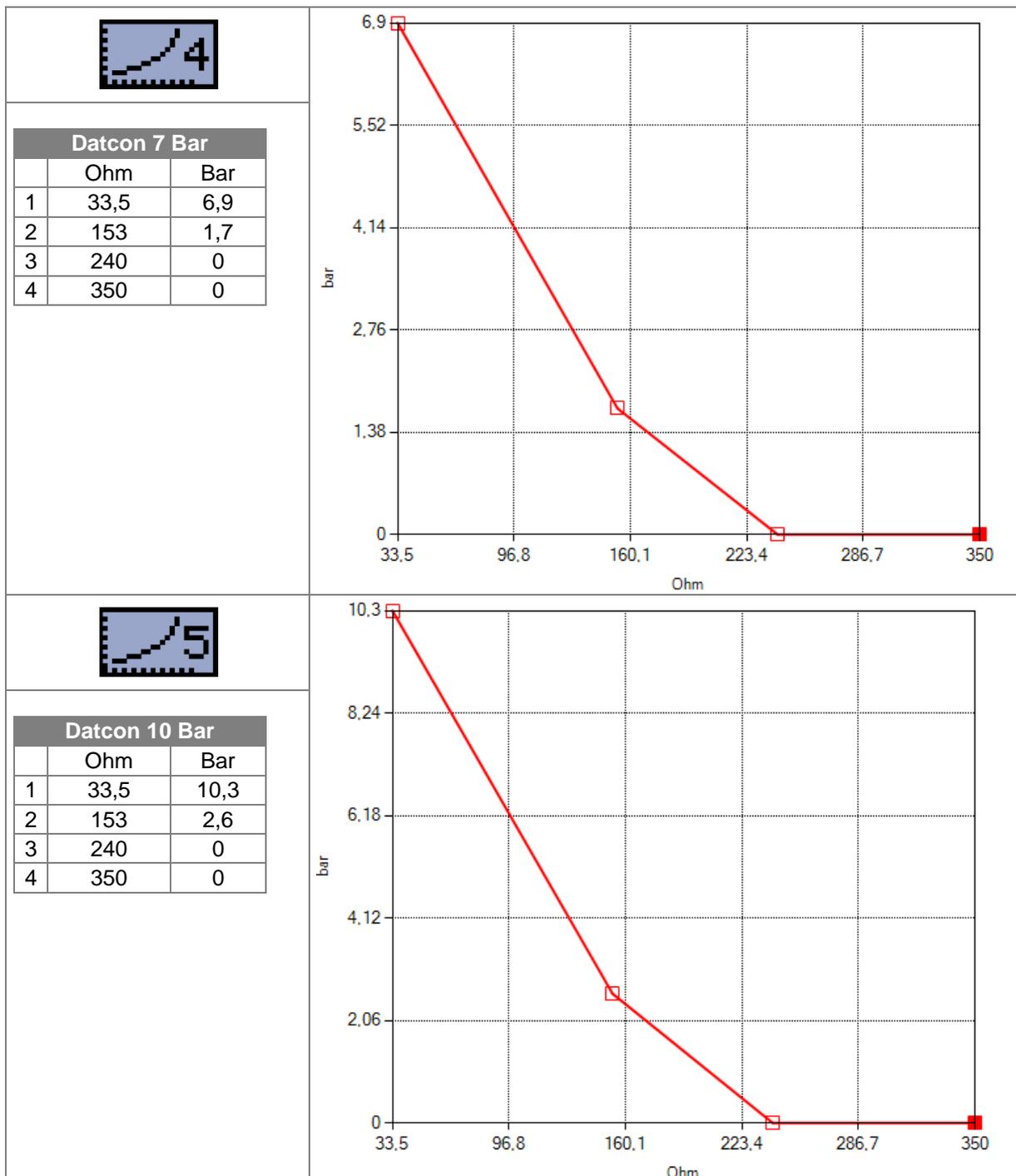
Input has 3s delay.



VDO 5 Bar		
	Ohm	Bar
1	10	0
2	50	1
3	85	2
4	119	3
5	152	4
6	180	5



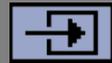




124 High Coolant Temperature

When this external binary input is activated the red LED above **Stop** button will blink, the general shutdown symbol will be displayed on LCD's upper right corner, the Coolant Temperature symbol will be displayed on event log with running hours stamp, and the shutdown procedure will occur. For more details see [Shutdown](#) procedure in chapter [12 Alarm, Events and History Management](#).

125 Coolant Temperature Analog



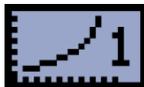
Analog input for coolant temperature measurement. When the measured value exceeds the preset threshold, the red LED above **Stop** button will blink, the general shutdown symbol will be displayed on the LCD's upper right corner, the coolant temperature symbol will be displayed on event log with running hours stamp, and the shutdown procedure will occur. For more details see [Shutdown](#) procedure in chapter [12 Alarm, Events and History Management](#).

Default threshold is 90°C. You can choose one from four default resistive sensors (VDO, Datcon) or you can create your own sensor curve.

You can setup shutdown threshold ([E05 Coolant Temperature Shutdown](#)) in Engine parameters and protection group.

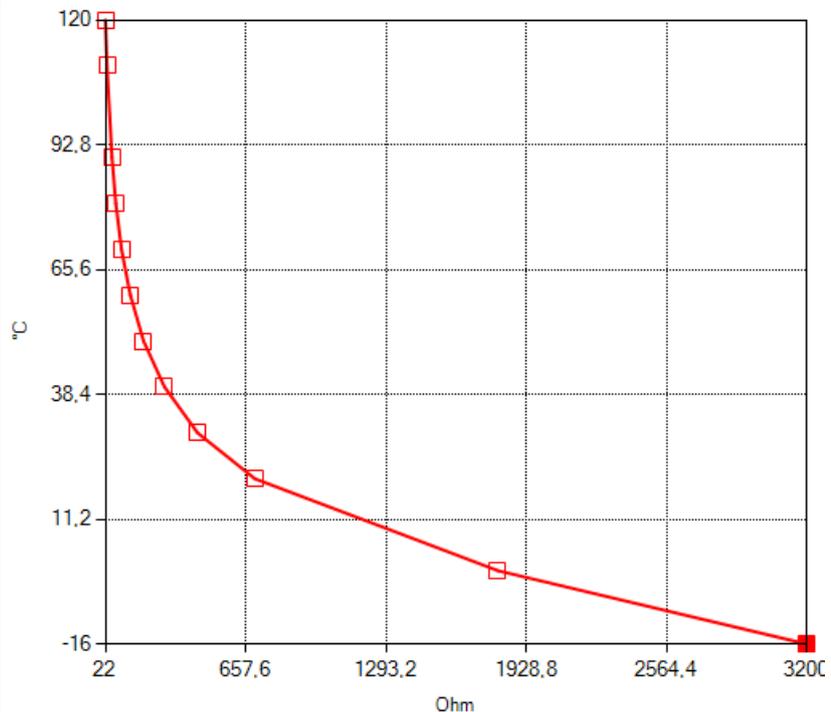
NOTE:

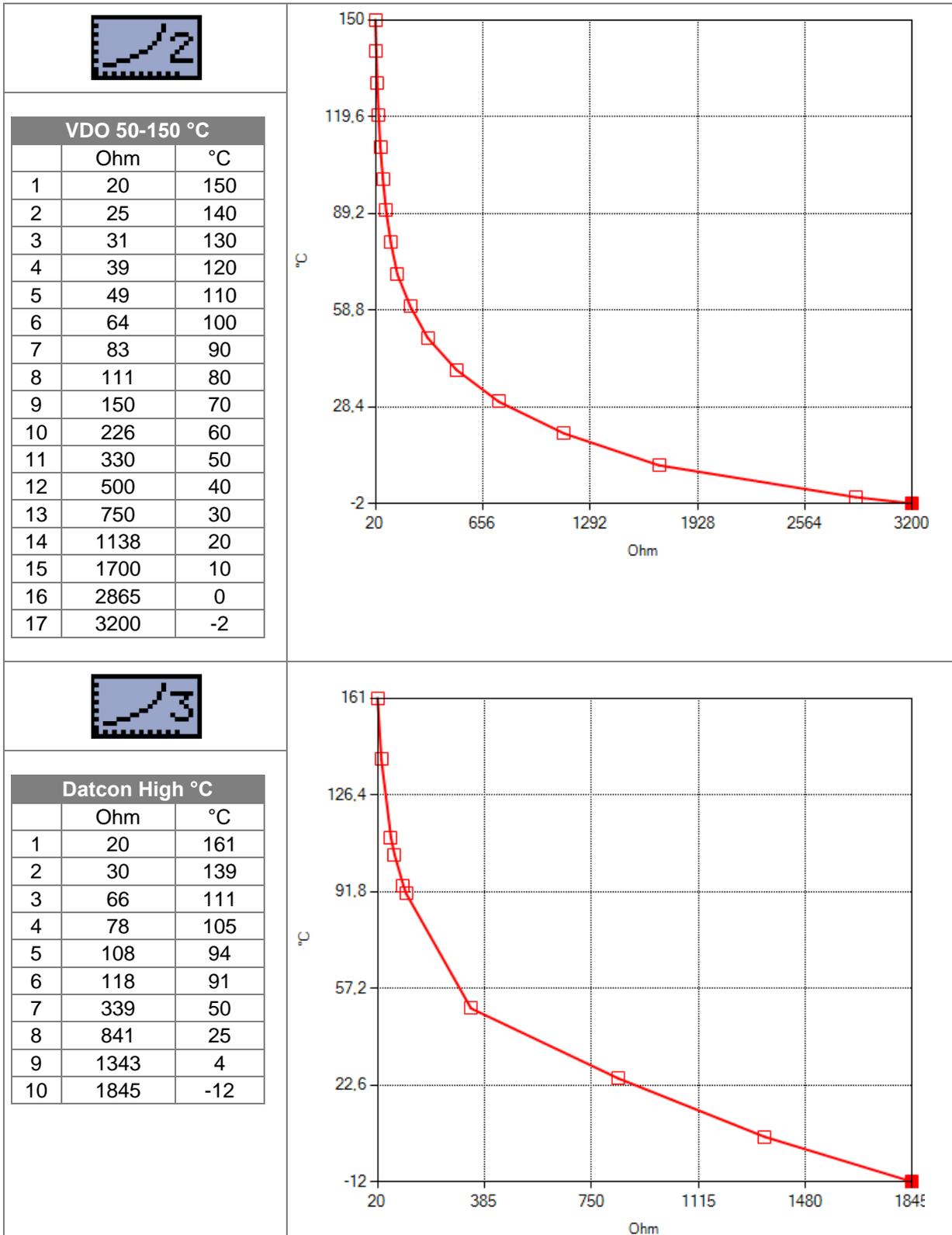
Input has 5s delay.

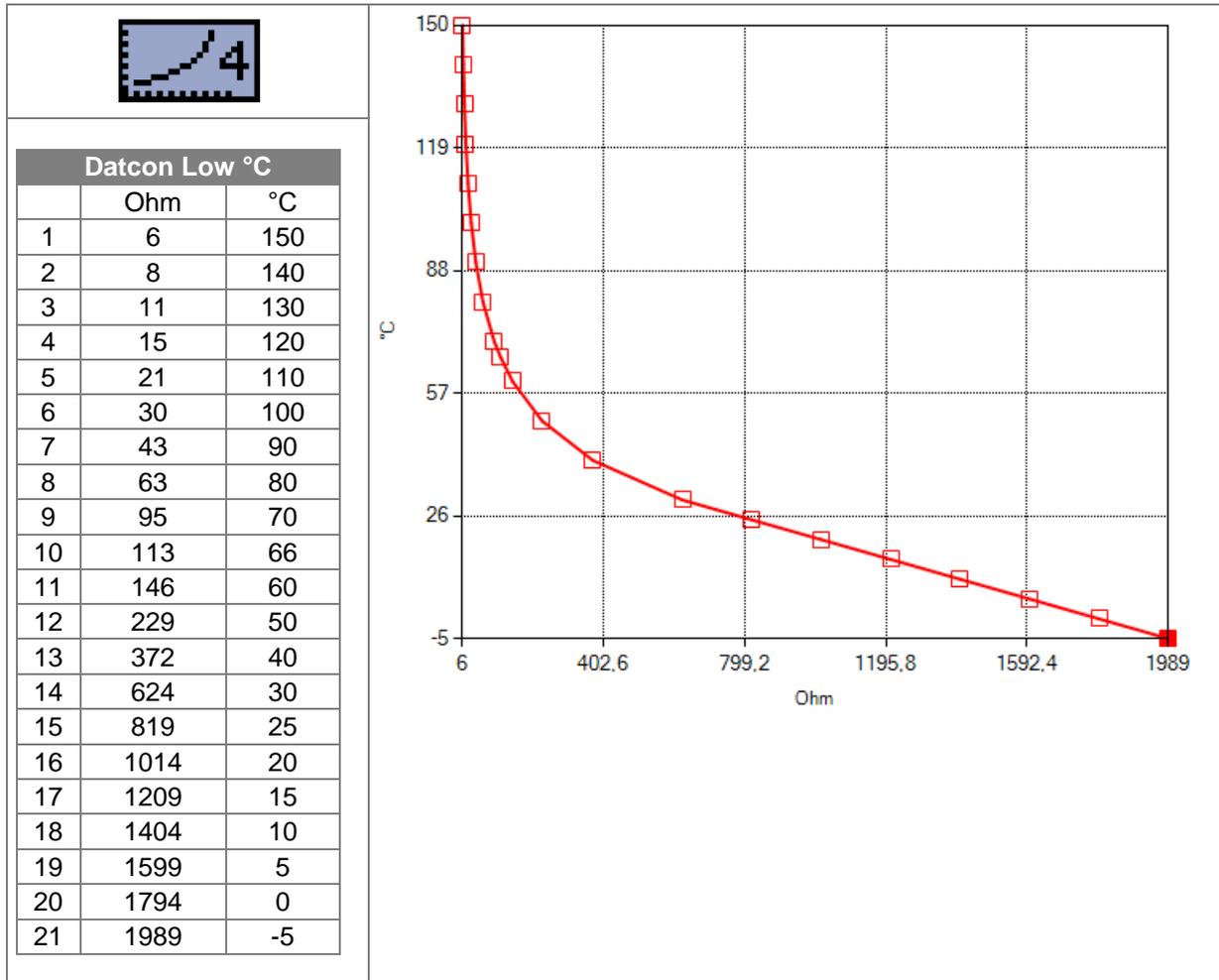


VDO 40-120 °C

	Ohm	°C
1	22	120
2	29	110
3	52	90
4	69	80
5	95	70
6	135	60
7	195	50
8	290	40
9	440	30
10	700	20
11	1800	0
12	3200	-16







129 Fuel Level SD 

When this binary input is activated the red LED above **Stop** button will blink, the general warning symbol will be displayed on LCD's upper right corner. Fuel Level SD symbol will be displayed on event log with running hours stamp and shutdown procedure will occur.

Input has 10s delay.

10 Setpoints

Setpoints are analog, binary, or special data objects that are used for adjusting the controller to the specific environment or application. Setpoints are separated into groups according to their function. Setpoints can be adjusted from the controller's front panel or from a PC. **Figure 10.1** is an example of how to change the Nominal Frequency from 50Hz to 60Hz via controller's front panel.

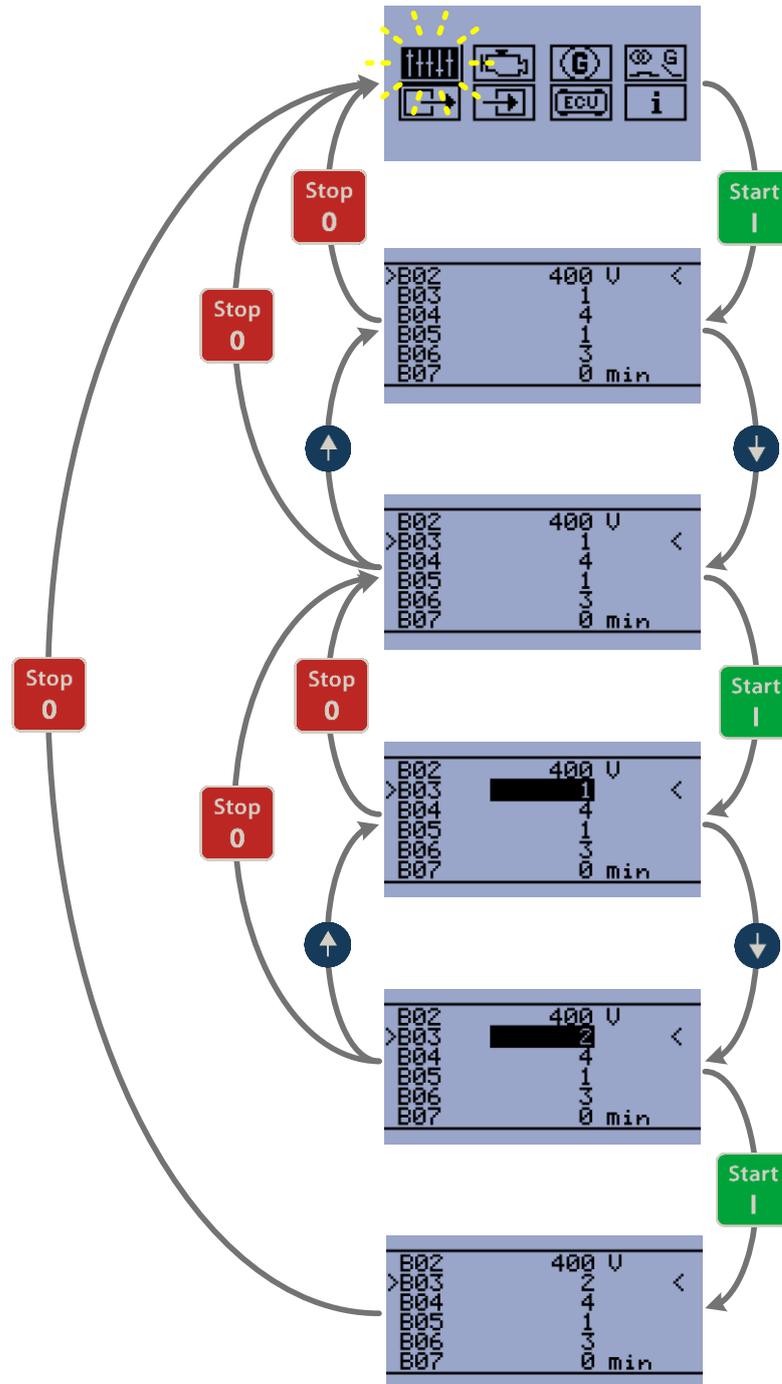


Figure 10.1
NOMINAL FREQUENCY SETUP EXAMPLE



Basic settings

Setpoint code	Setpoint name
<u>B01</u>	<u>Nominal Voltage Ph-N</u>
<u>B02</u>	<u>Nominal Voltage Ph-Ph</u>
<u>B03</u>	<u>Nominal Frequency</u>
<u>B04</u>	<u>Connection Type</u>
<u>B05</u>	<u>Units Format</u>
<u>B06</u>	<u>AMF Function</u>
<u>B07</u>	<u>Zero Power Mode Delay</u>
<u>B08</u>	<u>Light Tower Mode</u>
<u>B09</u>	<u>Nominal Current</u>
<u>B10</u>	<u>CT Ratio</u>
<u>B11</u>	<u>Nominal RPM</u>



Engine parameters and protections

Setpoint code	Setpoint name
<u>E01</u>	<u>Prestart Time</u>
<u>E02</u>	<u>Maximum Cranking Time</u>
<u>E03</u>	<u>Cooling Time</u>
<u>E04</u>	<u>Oil Pressure Shutdown</u>
<u>E05</u>	<u>Coolant Temperature Shutdown</u>
<u>E15</u>	<u>Fuel Level Shutdown</u>
<u>E06</u>	<u>Battery Undervoltage</u>
<u>E07</u>	<u>Warning Maintenance</u>
<u>E08</u>	<u>Oil Pressure Starter Disengagement</u>
<u>E09</u>	<u>Choke Time</u>
<u>E10</u>	<u>Minimal Stabilization Time</u>
<u>E11</u>	<u>Starting RPM</u>



Generator protections

Setpoint code	Setpoint name
<u>G01</u>	<u>Generator Overvoltage Shutdown</u>
<u>G02</u>	<u>Generator Undervoltage Shutdown</u>
<u>G03</u>	<u>Generator Overfrequency Shutdown</u>
<u>G04</u>	<u>Generator Underfrequency Shutdown</u>
<u>G05</u>	<u>Generator Short Circuit Shutdown</u>
<u>G06</u>	<u>Generator Short Circuit Delay</u>



AMF(Auto Mains Failure) settings

Setpoint code	Setpoint name
<u>A01</u>	<u>Emergency Start Delay</u>
<u>A02</u>	<u>Mains Return Delay</u>
<u>A03</u>	<u>Mains Overvoltage</u>
<u>A04</u>	<u>Mains Undervoltage</u>
<u>A05</u>	<u>Mains Overfrequency</u>
<u>A06</u>	<u>Mains Underfrequency</u>

10.1 B - Basic settings

B01 Nominal Voltage Ph-N



Units:	Volts [V]
Step:	1V
Range:	80 – 480 V
Default value:	230V

Nominal system voltage (phase to neutral). This setpoint can be hidden depending on the connection type (setpoint [B04 Connection Type](#)). You can setup this value only if you will choose the connection type as Mono phase or Split phase - [B04 Connection Type](#) (1; 2).

B02 Nominal Voltage Ph-Ph



Units:	Volts [V]
Step:	1V
Range:	80 – 600 V
Default value:	400V

Nominal system voltage (phase to phase). This setpoint can be hidden depending on the connection type (setpoint [B04 Connection Type](#)). You can setup this value only if you will choose the connection type as 3Ph3Wire or 3Ph4Wire - [B04 Connection Type](#) (3; 4).

B03 Nominal Frequency



Units:	
Step:	
Range:	1,2
Default value:	1

Nominal system frequency.

Setpoint code	Value	Meaning
B03	1	50Hz
B03	2	60Hz

B04 Connection Type



Units:	
Step:	
Range:	1,2,3,4,5
Default value:	4

Generator winding connection.

Setpoint code	Value	Meaning
B04	1	Mono Phase
B04	2	Split Phase
B04	3	3Ph3Wire
B04	4	3Ph4Wire
B04	5	Autodetect

Mono Phase: MONOPHASE,
Single-phase measurement – 1PH

Split Phase: DOUBLE DELTA Connection, Split Phase,
Single-phase measurement – 1PH

3Ph3Wire: DELTA Connection, 3 Phase without neutral - 3 Wires,
Three phase “delta” measurement – 3PD

3Ph4Wire: STAR Connection, 3 phases and neutral - 4 wires,
Three phase “wye” measurement – 3PY

Autodetect:

	High-Leg Delta	L1 \geq 100V; L1 \leq 140V L2 \geq 140V L3 \geq 100V; L3 \leq 140V
or		
	3Ph4Wire or 3Ph3Wire	L1 \geq 100V L2 \geq 100V L3 \geq 100V
or		
	Split Phase	L1 \geq 100V L2 \geq 100V L3 \leq 20V
or		
	Mono Phase	L1 \geq 100V L2 \leq 20V L3 \leq 20V
or		

Voltage Autodetect shutdown

NOTE:

The Autodetect option is available only when **B06 AMF Function** is disabled!

B05 Units Format



Units:	
Step:	
Range:	1,2
Default value:	1

This setpoint is affecting unit format for pressure and temperature.

Setpoint code	Value	Meaning	Pressure	Temperature
B05	1	Metric unit format	bar	°C
B05	2	US unit format	PSI	°F

When you change this setpoint all values will be automatically recalculated including user definable sensor curve for analog input

B06 AMF Function



Units:	
Step:	
Range:	1,2
Default value:	2

When AMF Function is disabled than the system is working as MRS controller and setpoints related to AMF function are hidden.

Setpoint code	Value	Meaning
B07	1	Disable
B07	2	Enable

Controller main screens in AMF mode (AMF Function enabled)

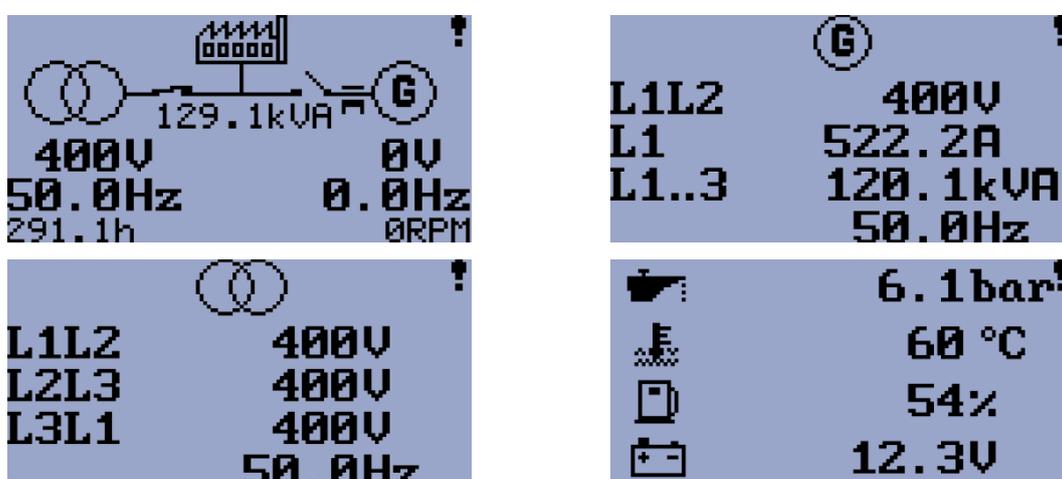


Figure 10.2
AMF SCREENS

Controller main screens in MRS mode (AMF Function disabled)



Figure 10.3
MRS SCREENS

B07 Zero Power Mode Delay



Units:	minutes [min]
Step:	1 minute
Range:	0-360 minutes
Default value:	0

The controller is switched to Zero Power Mode when there is no user interaction with the controller for the preset time. Zero Power Mode is disabled in AMF mode. Value 0 also disables this function. For the controller wake up press button **Start** or activate input **T11**. The controller will not switch to Zero Power Mode if any alarm is active.

B08 Light Tower Mode



Units:	
Step:	
Range:	1,2
Default value:	1

This setpoint is available only when **B06 AMF Function** is disabled. When this setpoint is enabled, the controller is switched to special operation mode. First screen was changed and generator voltage measurement is hides in this operation mode.

Setpoint code	Value	Meaning
E08	1	Disable
E08	2	Enable

- First main screen shows battery voltage, running hours and engine status (stop, starting/stopping, run) via symbol in light tower reflector (upper left corner).
- Second screen shows all analog values which are available. (Oil Pressure, Coolant Temperature; Fuel Level and Battery Voltage)
- Last screen is event log.

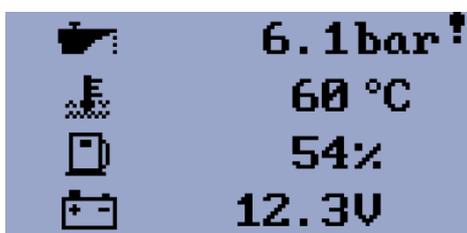


Figure 10.4
LIGHTTOWER SCREENS

B09 Nominal Current



Units:	Ampere [A]
Step:	1 A
Range:	1 – 1000 A
Default value:	50 A

It is nominal generator current. This value is used as a base for [Generator Short Circuit](#) alarm (shutdown). For overcurrent limit set the setpoint [Generator Short Circuit Shutdown](#). Nominal Current can be different from generator rated current value.

B10 CT Ratio



Units:	Ampere [A]
Step:	A / 5 A
Range:	1 – 5000 A
Default value:	50 A

Gen-set phases current transformers ratio.

For CT Ratio < 50 the values of power and current are displayed in a controller with one decimal.
For CT Ratio ≥ 50 the values of power and current are displayed in a controller with integral numbers.

B11 Nominal RPM



Units:	RPM
Step:	1
Range:	100-4000
Default value:	1500

Nominal engine speed.

10.2 E - Engine parameters and protections

E01 Prestart Time

Units:	seconds [s]
Step:	1s
Range:	0-600s
Default value:	2

Time of closing of the [008 Prestart](#) output prior to the engine start.
Set to zero if you want to leave the output [008 Prestart](#) open.

E02 Maximum Cranking Time

Units:	seconds [s]
Step:	1s
Range:	0-60s
Default value:	5

Maximum duration when the starter motor is energized.

E03 Cooling Time

Units:	seconds [s]
Step:	1s
Range:	0-3600s
Default value:	30

Runtime of the unloaded gen-set to cool the engine before stop.

E04 Oil Pressure Shutdown

Units:	Bar [Bar]
Step:	0,1 Bar
Range:	0-10 Bar
Default value:	1 Bar
Delay:	3 s

Shutdown threshold level for [I23 Oil Pressure Analog](#) input.

E05 Coolant Temperature Shutdown

Units:	degree Celsius [°C]
Step:	1 °C
Range:	0 -150 °C
Default value:	90 °C
Delay:	5 s

Shutdown threshold level for [I25 Coolant Temperature Analog](#) input.

E15 Fuel Level Shutdown



Units:	%
Step:	1
Range:	0 - 20
Default value:	10

When this protection is activated the red LED above **Stop** button will blink, the general shutdown symbol will be displayed on LCD's upper right corner. Fuel Level SD symbol will be displayed on event log with running hours stamp and the shutdown procedure will occur.

Input has 10s delay.

E06 Battery Undervoltage



Units:	Volts [V]
Step:	0,1 V
Range:	8 – 40 V
Default value:	11,5 V
Delay:	30 s

Warning threshold for **Low Battery** voltage.

E07 Warning Maintenance



Units:	hours [h]
Step:	1 h
Range:	0 – 10000 h
Default value:	9999 h

Counts down when the engine is running. When the counter reaches zero, an alarm will appear. When the value 10000 is set, than the Maintenance function is disabled and counter will not count. Counter value will not appear in the controller's statistics. Maximum value for running countdown is 9999. **Warning Maintenance** will appear when counter time has elapsed.

E08 Oil Pressure Starter Disengagement



Units:	
Step:	
Range:	1,2
Default value:	1

When this setpoint is enabled, the controller will use **Low Oil Pressure** or **Oil Pressure Analog** signal for starter disengagement. Starter will disengaged when oil pressure reach starting oil pressure or binary input **Low Oil Pressure** will be opened (**Normally Open** contact) or closed (**Normally Close** contact).

When is disabled then only RPM (frequency), generator voltage or D+ will be used for starter disengagement.

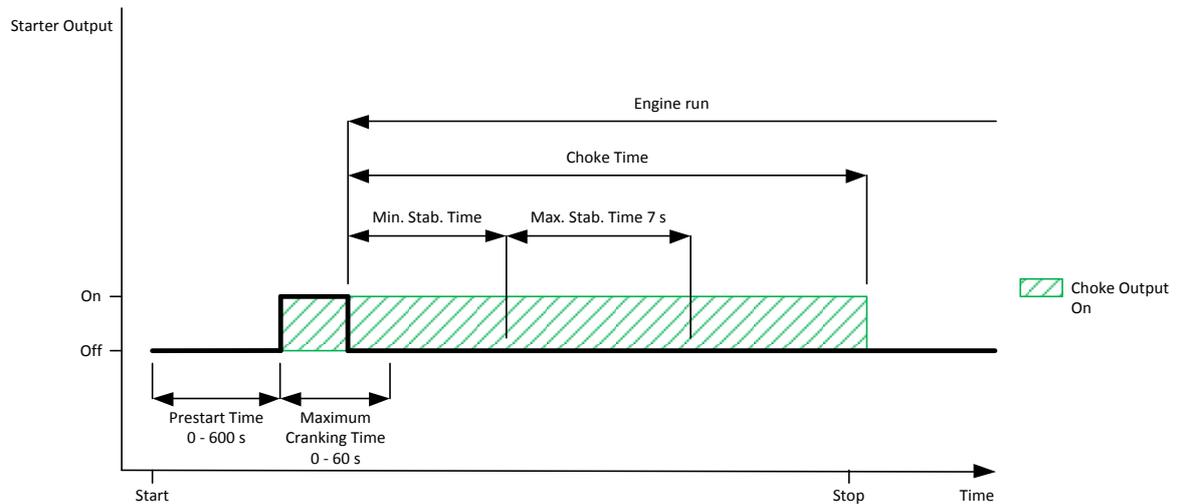
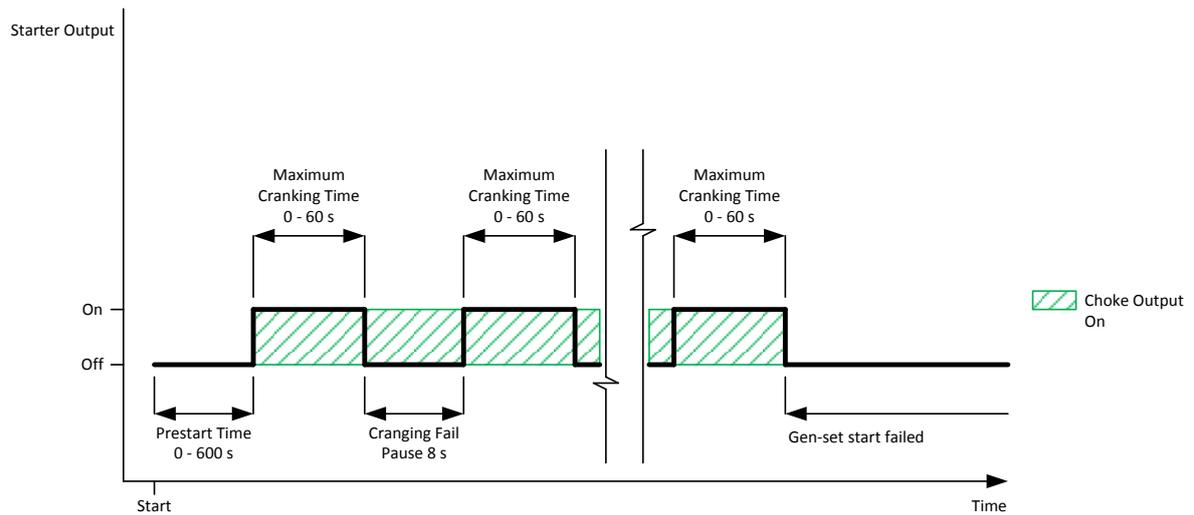
Setpoint code	Value	Meaning
E08	1	Disable
E08	2	Enable

E09 Choke Time



Units:	seconds [s]
Step:	1 s
Range:	0 – 3600 s
Default value:	0 s

Choke output timer. The timer is started on engine run.

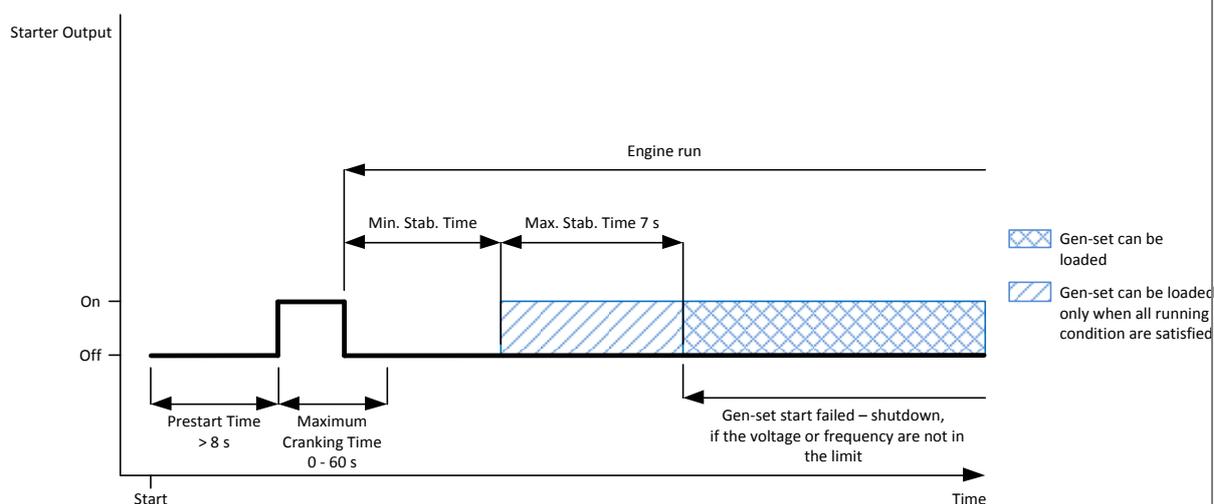


E10 Minimal Stabilization Time



Units:	seconds [s]
Step:	1 s
Range:	1 – 300 s
Default value:	3 s
Delay:	

Minimum time after reaching of defined level of RPM to the closing GCB.



E11 Starting RPM



Units:	%
Step:	1
Range:	5 – 60
Default value:	25

When Starting RPM are reached controller stops cranking. (Starter is disengaged.)

10.3 G - Generator protections

G01 Generator Overvoltage Shutdown

Units:	percentage [%]
Step:	1 %
Range:	G02 Generator Undervoltage Shutdown – 200 %
Default value:	110 %
Delay:	3 s

Threshold for generator overvoltage. All three phases are evaluated. Maximum value is used. **Generator Overvoltage** alarm will appear when output voltage exceed preset threshold and [shutdown procedure](#) will start.

G02 Generator Undervoltage Shutdown

Units:	percentage [%]
Step:	1 %
Range:	0 – G01 Generator Overvoltage Shutdown %
Default value:	70 %
Delay:	3 s

Threshold for generator undervoltage. All three phases are evaluated. Minimum value is used. **Generator Undervoltage** alarm will appear when output voltage exceed preset threshold and [shutdown procedure](#) will start.

G03 Generator Overfrequency Shutdown

Units:	percentage [%]
Step:	0,1 %
Range:	G04 Generator Underfrequency Shutdown – 130 %
Default value:	110 %
Delay:	3 s

Threshold for **Generator Overfrequency** alarm, relative to the nominal frequency (setpoint [B03 Nominal Frequency](#)).

G04 Generator Underfrequency Shutdown

Units:	percentage [%]
Step:	0,1 %
Range:	0 – G03 Generator Overfrequency Shutdown %
Default value:	85 %
Delay:	3 s

Threshold for **Generator Underfrequency** alarm, relative to the nominal frequency (setpoint [B03 Nominal Frequency](#)).

G05 Generator Short Circuit Shutdown

Units:	percentage [%]
Step:	1 % of <u>Nominal Current</u>
Range:	100 – 500 %
Default value:	150 %
Delay:	<u>Generator Short Circuit Delay</u>

Generator Short Circuit shutdown occurs when generator current exceed preset current limit longer than Generator Short Circuit Delay.

G06 Generator Short Circuit Delay

Units:	seconds [s]
Step:	0,01 s
Range:	0 – 10,00 s
Default value:	0 s
Delay:	

Delay for the **Generator Short Circuit** alarm. The limit for this alarm is adjustable by setpoint Generator Short Circuit Shutdown.

10.4 A – AMF (Auto Mains Failure) settings

A01 Emergency Start Delay

Units:	seconds [s]
Step:	1 s
Range:	0 – 600 s
Default value:	5

Delay between the mains failure and the automatic start of the gen-set to an AMF operation.

A02 Mains Return Delay

Units:	seconds [s]
Step:	1 s
Range:	1 – 3600 s
Default value:	20 s

This is a "mains stabilization" time. Timer begins when mains returns. If the mains are continuously healthy for this period, the controller will finish the AMF operation.

A03 Mains Overvoltage

Units:	percentage [%]
Step:	1 % of nominal system voltage
Range:	A04 Mains Undervoltage – 150%
Default value:	110 %
Delay:	0,1 s

Threshold for detection of mains failure due to overvoltage. The setpoint is adjusted relative to the nominal system voltage (setpoint [B01 Nominal Voltage Ph-N](#) or [B02 Nominal Voltage Ph-Ph](#) depending on [B04 Connection Type](#) setting).

A04 Mains Undervoltage

Units:	percentage [%]
Step:	1 % of nominal system voltage
Range:	50 – A03 Mains Overvoltage
Default value:	60 %
Delay:	0,1 s

Threshold for detection of mains failure due to overvoltage. The setpoint is adjusted relative to the nominal system voltage (setpoint [B01 Nominal Voltage Ph-N](#) or [B02 Nominal Voltage Ph-Ph](#) depending on [B04 Connection Type](#) setting).

A05 Mains Overfrequency



Units:	percentage [%]
Step:	1 %
Range:	A06 Mains Underfrequency – 150 %
Default value:	102 %
Delay:	0,1 s

Threshold for detection of mains failure due to overfrequency. The setpoint is adjusted relative to the system nominal frequency (setpoint [B03 Nominal Frequency](#)).

A06 Mains Underfrequency



Units:	percentage [%]
Step:	1 %
Range:	50 – A05 Mains Overfrequency %
Default value:	98 %
Delay:	0,1 s

Threshold for detection of mains failure due to underfrequency. The setpoint is adjusted relative to the system nominal frequency (setpoint [B03 Nominal Frequency](#)).

11 ECU

For ECU configuration you have to use PC software NanoEdit. It is impossible to configure ECU via controller's front fascia.

If ECU is configured simultaneously with analog inputs ([Fuel Level Analog](#), [Oil Pressure Analog](#), [Coolant Temperature Analog](#)) value from analog measurement will be displayed and used for protection.

If ECU is configured simultaneously with binary inputs ([Low Fuel Level](#), [Low Oil Pressure](#), [High Coolant Temperature](#)) value from ECU will be displayed. For protections is used value from ECU and binary input signal. For more detail see example.

ECU configured	Analog input	Binary input	Protections from	Displayed value from
yes	no	no	ECU	ECU
yes	yes	no	analog input	analog input
yes	no	yes	ECU or binary input	ECU
yes	yes	yes	analog or binary input	analog input
no	no	yes	binary input	binary input status

11.1 CAN bus wiring

The wiring of CAN bus communication should be provided so that following rules are kept:

- Maximal length of the CAN bus depends on the communication speed. For the speed of 250kbps, which is used on the CAN for communication with ECU the maximal length is 200m.
- The bus must be wired in linear form with termination resistors at both ends. No nodes except on the controller terminals are allowed.
- Use cable with following parameters:

Cable type	Shielded twisted pair
Impedance	120Ω
Propagation velocity	>= 75% (delay <= 4.4 ns/m)
Wire crosscut	>= 0.25mm ²
Attenuation (@1MHz)	<= 2dB/100m

12 Alarms, Events and History Management

Following alarms and records are available:

- [Event](#)
- [Warnings](#)
- [Shutdowns](#)
- [ECU Messages](#)

Four records can be displayed simultaneously on the LCD screen. Total capacity is 10 records. The **Figure 12.1** is an example of how the history is organized. The last screen in this example is showing the four latest events.

To view further history records press  button see **Figure 12.1**. For alarm (shutdown) confirmation press **Stop** button.

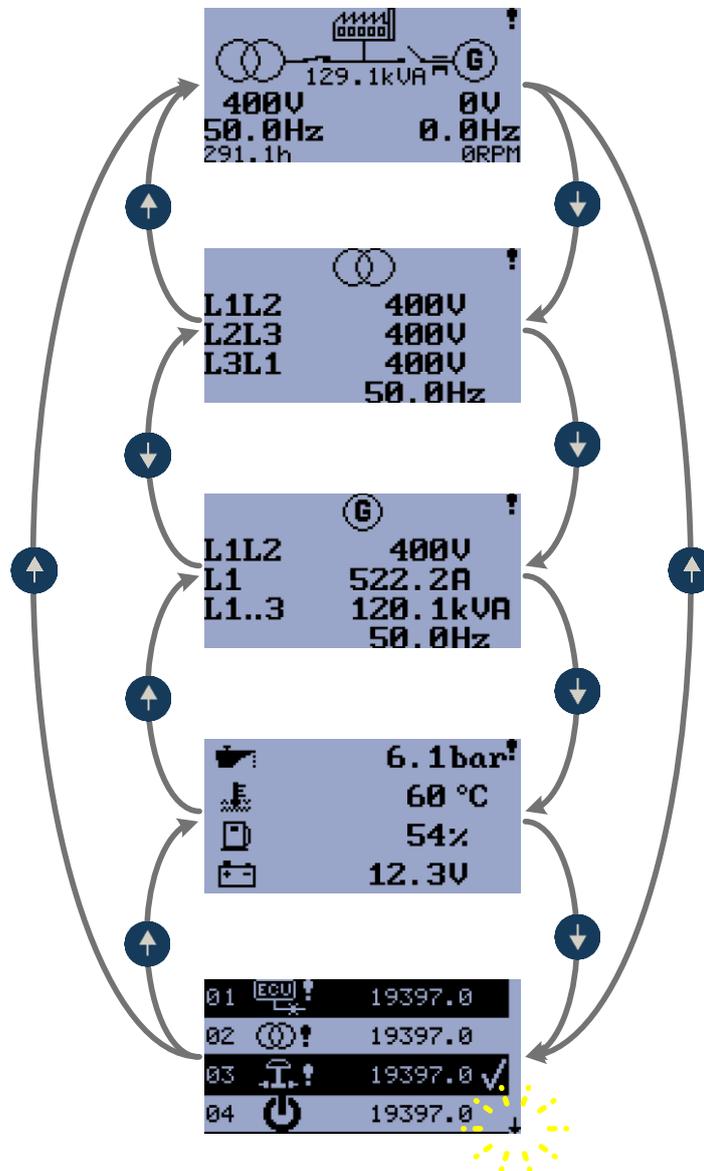


Figure 12.1

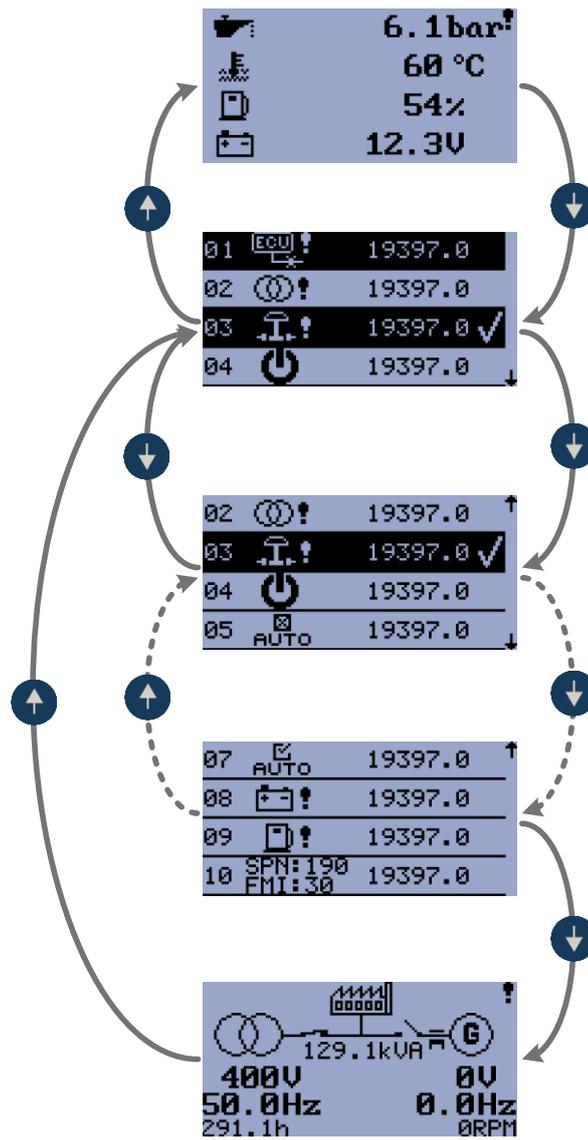


Figure 12.2

12.1 Events

Every event listed in table below is saved in history with running hours stamp see **Figure 12.3**.



Figure 12.3
EVENT – POWER ON

Possible Events

	<p>Mains Return Mains has returned. All mains parameters are within the preset range.</p>
	<p>Mains Fail Mains failure detection depends on Auto mains failure setpoints.</p>
	<p>Manual Start Engine was manually started by pressing button Start in Manual mode.</p>
	<p>Remote Start Engine was remotely started via input terminal's function I02 Remote Start/Stop or I03 Remote Start And Load. The controller is in Auto mode.</p>
	<p>AMF Start Engine was automatically started because of mains failure. The controller is in Auto mode.</p>
	<p>Manual Stop Engine was manually stopped by pressing button Stop in Manual mode.</p>
	<p>Remote Stop Engine was remotely stopped via input terminal's function I02 Remote Start/Stop or I03 Remote Start And Load. The controller is in Auto mode.</p>

	<p>AMF Stop Engine was automatically stopped because of transfer to mains. The controller is in Auto mode.</p>
	<p>Auto On Auto mode is active.</p>
	<p>Auto Off Auto mode is inactive</p>
	<p>Power On The controller is turned on.</p>
	<p>Island Operation Load is powered from generator.</p>

12.2 Warnings

12.2.1 Active warning

When a warning occurs, [O04 Alarm](#) output will close and the red LED above **Stop** button will blink. Warning symbol will blink in the upper-right corner of the LCD and the proper warning symbol will be displayed in the history with running hours stamp. Active warning can't be confirmed. See list of [possible warnings](#).



Figure 12.4
ACTIVE WARNING – LOW BATTERY

12.2.2 Inactive warning

When a warning becomes inactive, [O04 Alarm](#) output will open, the red LED above **Stop** button will stop blinking, and the warning symbol  on main screen will go out.



Figure 12.5
INACTIVE WARNING – LOW BATTERY

12.2.3 Possible warnings

	<p>Warning Maintenance</p> <p>The service interval is determined by the setpoint E07 Maintenance. The protection becomes active when the engine running hours reach this value.</p>
	<p>Low Battery (Charging Fail)</p> <p>This warning comes up if the battery voltage is lower than preset Battery Undervoltage limit for longer than 30s. This warning also comes up when charging alternator fail.</p>
	<p>Low Fuel Level</p> <p>This warning occurs when analog input Fuel Level is below 20% or binary input Fuel Level is closed longer than 10s.</p>
	<p>External Warning 1</p> <p>This warning occurs when external warning 1 input is activated.</p>

	<p>External Warning 2</p> <p>This warning occurs when external warning 2 input is activated.</p>
	<p>External Warning 3</p> <p>This warning occurs when external warning 3 input is activated.</p>
	<p>ECU Communication Error</p> <p>This warning is activated when the ECU (if configured) is not communicating and all values from ECU show #####.</p>
	<p>MCB Fail</p> <p>Failure of mains circuit breaker.</p>
	<p>Mains CCW Rotation</p> <p>Wrong mains phase sequence.</p>

12.3 Shutdowns

12.3.1 Shutdown procedure

The InteliNano^{NT} Plus controller opens outputs [005 GCB Close/Open](#), [001 Starter](#), [008 Prestart](#) and [002 Fuel Solenoid](#) and closes [003 Stop Solenoid](#) to stop the engine immediately. [004 Alarm](#) output is closed. Active or not confirmed protection disables start.

12.3.2 Active unconfirmed shutdown

When a shutdown occurs, the [Shutdown procedure](#) will start, the red LED above **Stop** button blinks, the shutdown symbol  will blink in the upper right corner of LCD, and the proper shutdown symbol is displayed in history with running hours stamp. The record in history is negative, see **Figure 12.6**. See list of [possible shutdown alarms](#). For shutdown alarm confirmation press **Stop** button.



Figure 12.6
ACTIVE UNCONFIRMED SHUTDOWN – EMERGENCY STOP

12.3.3 Active confirmed shutdown

When an active shutdown is confirmed the red LED above the **Stop** button stops blinking. The record in history stays negative with confirmation symbol at the end. [004 Alarm](#) output is open.



Figure 12.7
ACTIVE CONFIRMED SHUTDOWN – EMERGENCY STOP

12.3.4 Inactive unconfirmed shutdown

[004 Alarm](#) output is closed, red LED above **Stop** button blinks. Shutdown symbol  is displayed in upper-right corner of the LCD, and proper warning symbol is displayed in history with running hours stamp. See **Figure 12.8**. See list of [possible shutdown alarms](#). For shutdown alarm confirmation press **Stop** button



Figure 12.8
INACTIVE UNCONFIRMED SHUTDOWN – EMERGENCY STOP

12.3.5 Inactive confirmed shutdown

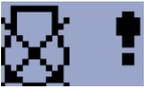
004 Alarm output is opened. It is possible to start engine when all shutdowns are inactive and confirmed.

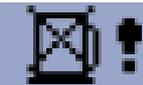


Figure 12.9
INACTIVE CONFIRMED SHUTDOWN – EMERGENCY STOP

12.3.6 Possible shutdown alarms

	<p>Emergency Stop The binary input Emergency Stop was activated.</p>
	<p>Overspeed The protection comes active if the speed is greater than 115% of nominal engine RPM, which is derived from generator frequency.</p>
	<p>Underspeed Low engine RPM. This alarm will be issued when the gen-set is running and then stops by itself, i.e. the RPM drops under the nominal engine RPM. The underspeed alarm starts to be evaluated 5 sec after successful gen-set start and is being evaluated all the time the Fuel Solenoid is on.</p>
	<p>Low Oil Pressure Engine will stop when oil pressure declined to or less than 1 bar or binary input I22 Low Oil Pressure is active.</p>
	<p>High Coolant temperature Engine will stop when temperature of coolant exceed <i>Coolant Temperature Shutdown</i> threshold.</p>
	<p>External Shutdown 1</p>
	<p>External Shutdown 2</p>

	<p>External Shutdown 3</p>
	<p>GCB Fail Failure of generator circuit breaker.</p>
	<p>Generator Overvoltage Generator will stop when output voltage exceeds the preset threshold G01 Generator Overvoltage Shutdown.</p>
	<p>Generator Undervoltage Generator will stop when output voltage drops below the preset threshold G02 Generator Undervoltage Shutdown.</p>
	<p>Generator Overfrequency The generator frequency is out of limits given by setpoints G03 Generator Overfrequency Shutdown and G04 Generator Underfrequency Shutdown.</p>
	<p>Generator Underfrequency The generator frequency is out of limits given by setpoints G03 Generator Overfrequency Shutdown and G04 Generator Underfrequency Shutdown.</p>
	<p>Generator CCW Rotation Incorrect generator phase sequence.</p>
	<p>Start Fail Gen-set start failed.</p>
	<p>Stop Fail Gen-set stop failed.</p>
	<p>Battery Flat If the controller loses power during starting sequence due to bad battery condition, it will not try to start again and will activate this protection.</p>

	<p><i>Voltage Autodetect</i></p> <p>If generator voltage measured doesn't correspond with predefined values for particular connection type when Autodetect value for <i>B04 Connection Type</i> is used.</p>
	<p><i>Generator Short Circuit</i></p> <p>If the generator generator current exceed preset current limit.</p>
	<p><i>Fuel Level SD</i></p> <p>This shutdown occurs when analog input Fuel Level is below shutdown level or binary input Fuel Level SD is closed longer than 10s.</p>

12.4 *ECU Messages*



10 SPN: 190 19397.0
FMI: 30

Figure 12.10
ECU MESSAGE

	<p><i>ECU Message</i></p> <p>Diagnostic messages are read and displayed in the history behind the ECU Warning symbol. For Standard J1939 SPN (Suspect Parameter Number) and FMI (Failure Mode Identifier) are shown.</p> <p>Detail SPN/FMI code specification see in:</p> <ul style="list-style-type: none"> • SAE Truck and Bus Control and Communications Network Standards Manual, SAE HS-1939 Publication • Or refer to corresponding engine manufacturer's ECU error codes list. <p>Complete list of text diagnostic messages for each ECU can be found in ComAp Electronic Engines Support manual.</p>
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13 Technical data

13.1 Power supply

Power supply range	6-36VDC				
Power supply drop-out immunity	100ms				
Power consumption	Supply voltage (V)		Power consumption (mA)		
			+25°C	-30°C	+70°C
	36		35	37	37
	30		39	41	41
	24		45	48	47
	18		57	57	59
	12		84	80	85
	10		100	103	101
	8		126	121	128
	6		202	199	204
4		295	288	319	
	Low voltage detection				
	Minimal operating supply voltage	6,66 / 7,33	6,74 / 7,39	6,73 / 7,45	
		2,3	2,5	2,4	
Zero Power Mode consumption	Supply voltage (V)		Power consumption (µA)		
			+25°C	-30°C	+70°C
	36		344	354	555
	30		208	195	374
	24		153	143	292
	18		115	107	222
	8		52	48	48

13.2 Operating conditions

Operating temperature	-20... 70°C
Operating humidity	95% non-condensing (IEC/EN 60068-2-30)
Protection degree (front panel)	IP65 - with GASKET 4x405 only IP50 - without gasket
Storage temperature	-30... 80°C

13.3 *Physical dimensions*

Dimensions	118x108x40mm (WxHxD)
Weight	
Mounting cutout size	96x96mm (WxH)
Recommended torque for holders	15 – 20 cN*m

13.4 *Binary inputs*

Number of binary inputs	up to 6
Galvanic insulation	Not insulated
Closed contact voltage	<2V
Open contact voltage	>3,5V
Input resistance	1,5 kΩ

13.5 *Binary outputs*

Total number of binary outputs	up to 6*
Number of low current binary outputs	4
Number of high current binary outputs	2
Galvanic insulation	Not insulated
Type	Transistor, switching to positive supply terminal
Operating voltage	8-36VDC
Switching current of low current binary output	500mA (suppression diodes required for inductive loads)
Switching current of high current binary output	6A - long term (Maximum load inductance is 500mH, 10A - short term suppression diodes required for inductive loads!)
Total output current	10A – long term 15A – short term

NOTE:

One low current (500mA) binary output – **T07** can be configured as binary input .

13.6 *Analog inputs*

Number of analog inputs	up to 3
Galvanic insulation	Not insulated
Electrical range	0-2500 Ω
Resolution	0,1 Ω
Supported sensor types	Predefined: VDO 10Bar, VDO Temperature, VDO Fuel level User defined: 10 points non-linear sensors can be defined by the user
Precision	2% \pm 3 Ω

13.7 *Generator/Mains measurements*

Measurement inputs	3ph generator voltage, 3ph mains voltage
Measurement type	True RMS
Voltage range	480V Ph-Ph (277V Ph-N)
Max. measured voltage	340V Ph-N
Voltage accuracy	1 %
Current range	5 A
Max. measured current	10 A
Current accuracy	less than 2% from the range
Frequency range	40-70 Hz, measured from L1
Frequency accuracy	1 %

13.8 *Charging alternator preexcitation circuit*

Excitation current	100 mA
Charging fail threshold	80% of U_{supply}

13.9 *Communication interface*

USB (device)	On the board
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13.10 *CAN interface*

Type	CAN bus
Galvanic insulation	No
Baud rate	250kbps
Bus length	max. 200m
Termination resistor	120Ohm, built-in, jumper activated
Type	CAN bus,
Baud rate	250kbps
Bus length	max. 200m

Termination resistor	120Ohm, built-in, jumper activated
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13.10.1 Recommended CAN cables

- Belden 3082A DeviceBus for Allen-Bradley DeviceNet
- Belden 3083A DeviceBus for Allen-Bradley DeviceNet
- Belden 3084A DeviceBus for Allen-Bradley DeviceNet
- Belden 3085A DeviceBus for Allen-Bradley DeviceNet
- Belden 3086A DeviceBus for Honeywell SDS
- Belden 3087A DeviceBus for Honeywell SDS
- Lapp Cable Unitronic Bus DeviceNet Trunk Cable
- Lapp Cable Unitronic Bus DeviceNet Drop Cable
- Lapp Cable Unitronic Bus CAN
- Lapp Cable Unitronic-FD Bus P CAN UL/CSA