TRANS-AMF.SYNCRO

AUTOMATIC GEN-SET CONTROLLER WITH TRANSFER SWITCHING & LOAD SHARING

User Manual

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EU DECLARATION OF CONFORMITY

Manufacturer's Name : EMKO ELEKTRONIK A.S.
Manufacturer's Address : DOSAB, Karanfil Sk., No:6,
16369 Bursa, TURKEY

This declaration is issued under the sole responsibility of the manufacturer.

Product Name	**: Synchronising & Automatic Mains Failure Unit**
Type Number	**: TRANS-AMF.SYNCRO**
Product Category	**: Electrical equipment for measurement, control and laboratory use**

The product(s) that are stated above are fully in conformity with the essential requirements of Council Directives:

2014 / 35 / EU The Low Voltage Directive

2014 / 30 / EU The Electromagnetic Compatibility Directive

This declaration is based on the full compliance of the products with the following European standards:

EN 61000-6-4:2007 EMC Generic Emission Standard for Industrial Environments

EN 61000-6-2:2005 EMC Generic Immunity Standard for Industrial Environments

EN 61010-1:2010 Safety Requirements for electrical equipment for measurement, control and laboratory use

EN 60947-6-1:2005/A1:2014 Low - voltage switchgear and controlgear - Part 6-1: Multiple function equipment - Transfer switching equipment

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When and Where Issued

02nd March 2017

BURSA-TURKEY

Authorized Signature

Name : Serpil YAKIN

Position : Quality Manager

1.Introduction

1.1 General Specifications

TRANS-AMF.SYNCRO is a synchronising & automatic mains failure unit for diesel, gas or gasoline generators.
The unit is designed to synchronise the one genset with the one mains supply. The unit controls the change over from mains supply to genset supply or runs genset in parallel with the mains to provide no-break, peak lopping and peak shaving power solutions.
The unit monitors J1939 ECU messages and provides remote start/stop control via J1939 protocol (supported some ECUs: Volvo EMS2, Volvo EDC4, Perkins, Scania, MAN MFR and standard messages).

General Specifications:
- Mains voltages and frequency measurements
- Generator voltages and frequency measurements
- Peak lopping (mains or genset)
- Power export to mains
- Mains de-coupling protection with R.O.C.O.F and vector shift methods
- Manual voltage/frequency adjustment
- Direct/Reverse Governor and AVR control
- Auto adjust feature for Governor and AVR
- Volts, frequency and phase matching
- Synchroscope display
- Logic Controller functionality for PLC
- Black or gray theme selection for 4.3" TFT LCD screen

The unit is extensively programmable through the front panel, with password protection on two levels. Operational parameters can also be monitored and controlled from a PC via a built-in USB communication port.

In the event that the engine fails to start on the first attempt, the attempt will be repeated a programmed number of times or until successful.

The unit monitors generator operation and gives warning of any faults that are detected.
If a fault is detected, the unit shuts down the engine and shows the failure message on the LCD display and activates the internal sounder.

1.2 Warranty

EMKO Elektronik warrants that the equipment delivered is free from defects in material and workmanship. This warranty is provided for a period of two years. The warranty period starts from the delivery date. This warranty is in force if duty and responsibilities which are determined in warranty document and instruction manual performs by the customer completely.

1.3 Maintenance

Repairs should only be performed by trained and specialized personnel. Cut power to the device before accessing internal parts.
Do not clean the case with hydrocarbon-based solvents (Petrol, Trichlorethylene etc.). Use of these solvents can reduce the mechanical reliability of the device. Use a cloth dampened in ethyl alcohol or water to clean the external plastic case.

2. Installation

Before beginning installation of this product, please read the instruction manual and warnings below carefully.

A visual inspection of this product for possible damage occured during shipment is recommended before installation. It is your responsibility to ensure that qualified mechanical and electrical technicians install this product.

If there is danger of serious accident resulting from a failure or defect in this unit , power off the system and seperate the electrical connection of the device from the system.

Keep the power off until all of the wiring is completed so that electric shock and trouble with the unit can be prevented.

2.1 Unit Configuration

The unit can be programmed using the buttons and LCD display on the front panel or PC Software.

2.2 Panel Mounting

The unit is designed for panel mounting. Fixing is by two screw fixings.
1- Insert the unit in the panel cut-out from the front.
2- Insert the fixings in the slotted at the corners of the unit and tighten the fixing screws to secure the unit against the panel.

During the equipment is putted in hole on the metal panel while mechanical installation some metal burrs can cause injury on hands, you must be careful.

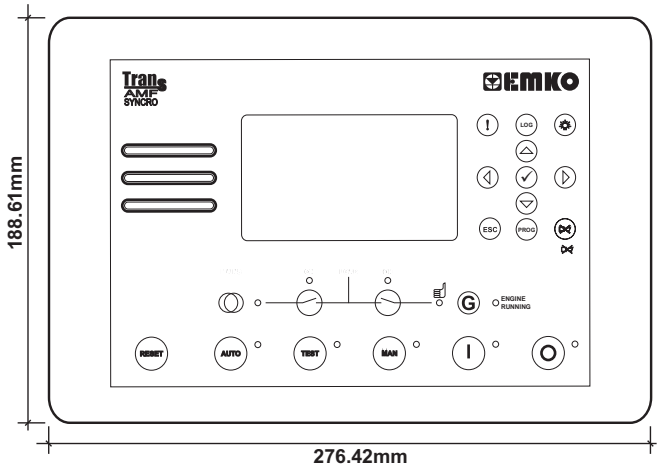


Figure 2.1 Front View

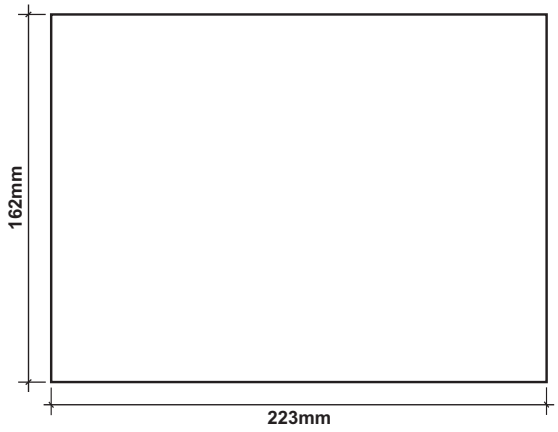
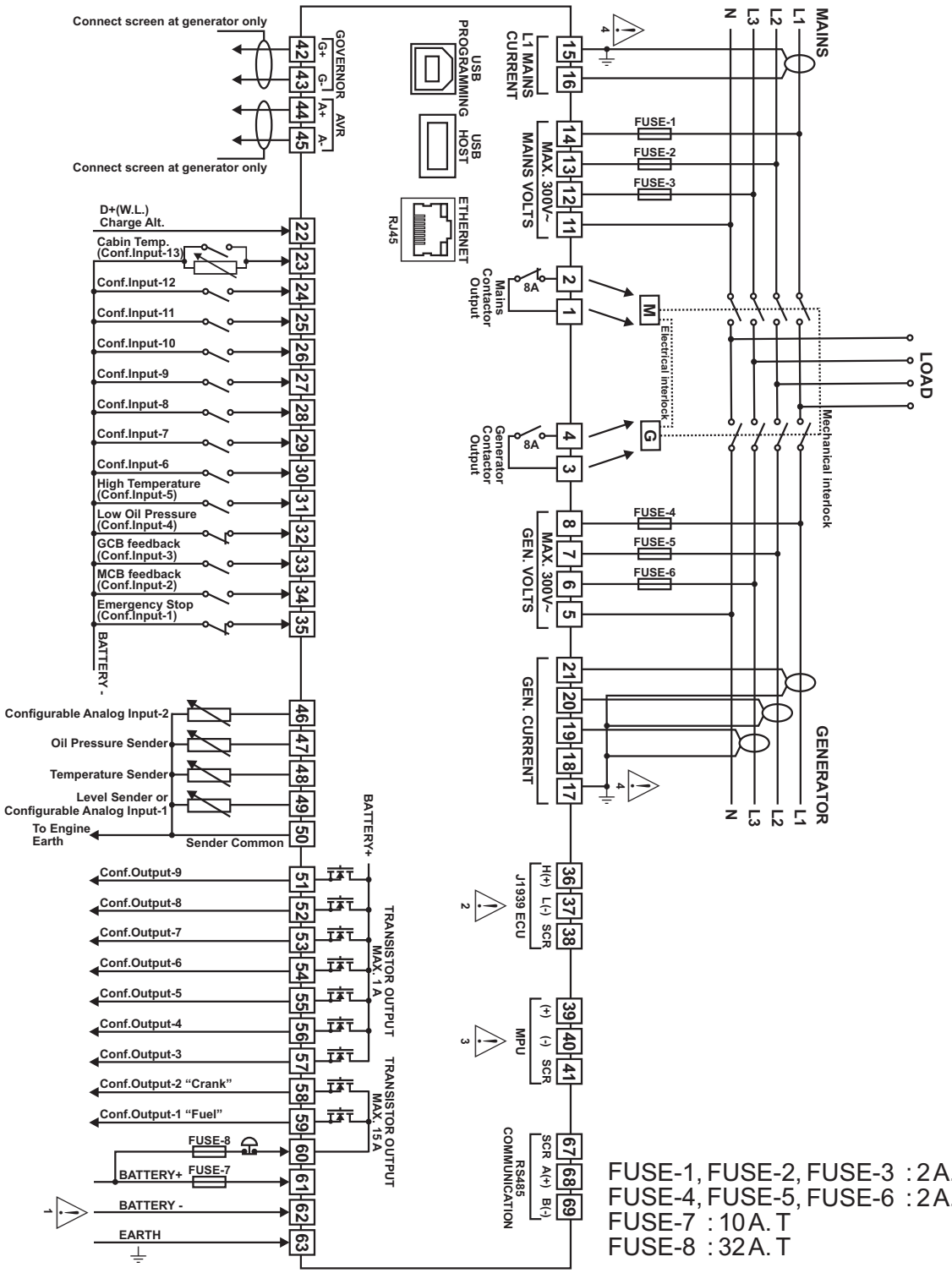


Figure 2.2 Panel Cut-Out

2.3 Electrical Connection

TRANS-AMF.SYNCRO three phase connections schematic



FUSE-1, FUSE-2, FUSE-3 : 2A. T
FUSE-4, FUSE-5, FUSE-6 : 2A. T
FUSE-7 : 10A. T
FUSE-8 : 32A. T

1- Connect the unit as shown in the appropriate diagram. Be sure to connect the battery supply the right way round.
2- The CAN interface requires that a 120 Ohms terminator is fitted to each end of the communications link. This termination resistor is fitted internally into the unit. So it is not required externally. Screened cable must be used for connecting the CAN, ensuring that the screen is grounded at one end ONLY.
3- Screened cable must be used for connecting the Magnetic Pickup, ensuring that the screen is grounded at one end ONLY.
4- Current transformers secondary should be grounded. The CT of 5VA is recommended. The unit has a burden of 0.5VA on the CT.

2.4 Governor Connection

2.4.1 INTERFACING TO GOVERNORS & ENGINE ECUs

This section details the interface connections between the Trans-Amf.Syncro controllers and the most popular Engine Speed governors used with diesel generating sets. If your particular type of Governor is not covered within this section, please contact our technical support department for advice.

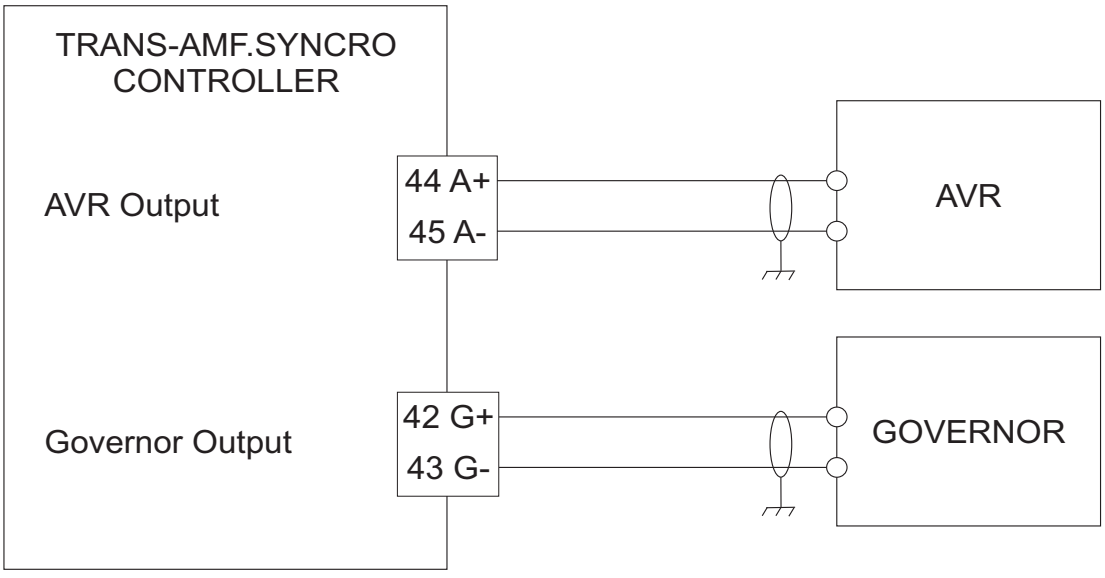
2.4.1.1 INTERFACING WITH TRANS-AMF.SYNCRO CONTROLLERS

The analogue Governor output provide an isolated, adjustable DC voltage level to connect into the control inputs of many governors. This replaces the manually operated or motorised potentiometers used in many synchronising and load sharing applications. The output is also suitable for connection to the load sharing controller inputs of many popular Governors. This enables the Trans-Amf.Syncro controller to adjust the Governor output to match the mains/bus and hence get the supplies into synchronism. The module is especially suited for use in active power sharing systems.

2.4.2 SPECIFICATIONS

Item	Value
Output type	Optically isolated DC voltage level
Isolation	Optically isolated to 1000V
Minimum output load	1000Ω

2.4.3 CONNECTION DETAILS

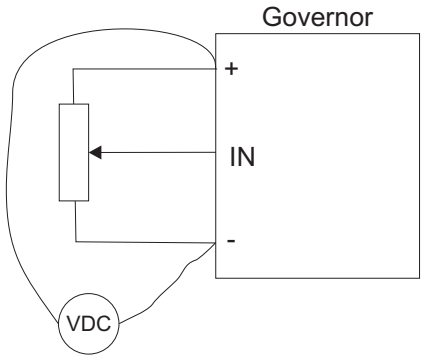


2.4.4 DETERMINING CONNECTIONS AND SETTINGS FOR GOVERNORS NOT LISTED IN THIS PUBLICATION

The following guide is intend to assist the user to determine where to connect to governors not listed in this document.

Additional it will assist you to find correctly setting for Governor output setting. Initial output value and output range value.

This diagram shows the remote adjust potentiometer is usually connected to the governor. The potentiometer adjust the voltage into the IN terminal between the voltage supplied at '-' and '+'.



To find the 'centre' and 'range' voltages accepted by the device's input, measure the DC voltage of terminal '+' in relation to terminal '-' as shown.

Example:
You measure 4V from '-' to '+'. Halving this voltage gives the centre voltage (2V). The range voltage setting will have a maximum value of 2V above or below the centre voltage. To determine the settings of initial value and range value (min. output and max. output) refer to the tables 1,2,3,4.

The TRANS-AMF.SYNCRO controller connects only to the "-" and "IN" terminals and provides the varying DC voltage to simulate the turning of a potentiometer. The analogue output terminals of the TRANS-AMF.SYNCRO controller are connected as follows.
Note that the "+" terminal of the governor/AVR is left unconnected.

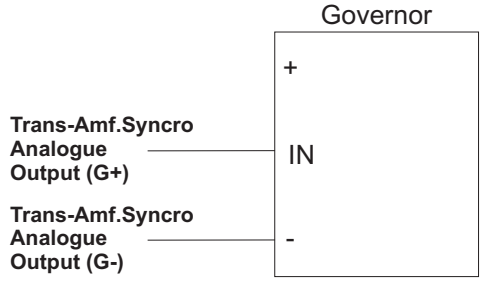


Table-1: Output range and initial output value for min. out parameter %0 and max. out parameter %100

Min Out	Max Out	Output Range	Initial Out
% 0 "-10 Vdc"	**% 100** "+10 Vdc"	-10 Vdc ...+10 Vdc	**% 0** "-10 Vdc"
			% 10 "-8 Vdc"
			% 20 "-6 Vdc"
			% 30 "-4 Vdc"
			% 40 "-2 Vdc"
			% 50 "0 Vdc"
			% 60 "2 Vdc"
			% 70 "4 Vdc"
			% 80 "6 Vdc"
			% 90 "8 Vdc"
			% 100 "10 Vdc"

Table-2: Output range and initial output value for min. out parameter %20 and max. out parameter %40

Min Out	Max Out	Output Range	Initial Out
% 20 "-6 Vdc"	**% 40** "-2 Vdc"	-6 Vdc ...-2 Vdc	**% 0** "-6.0 Vdc"
			% 10 "-5.6 Vdc"
			% 20 "-5.2 Vdc"
			% 30 "-4.8 Vdc"
			% 40 "-4.4 Vdc"
			% 50 "-4.0 Vdc"
			% 60 "-3.6 Vdc"
			% 70 "-3.2 Vdc"
			% 80 "-2.8 Vdc"
			% 90 "-2.4Vdc"
			% 100 "-2.0 Vdc"

Table-3: Output range and initial output value for min. out parameter %50 and max. out parameter %75

Min Out	Max Out	Output Range	Initial Out
% 50 "0 Vdc"	**% 75** "+5 Vdc"	0 Vdc ...+5 Vdc	**% 0** "0.0 Vdc"
			% 10 "0.5 Vdc"
			% 20 "1.0 Vdc"
			% 30 "1.5 Vdc"
			% 40 "2.0 Vdc"
			% 50 "2.5 Vdc"
			% 60 "3.0 Vdc"
			% 70 "3.5 Vdc"
			% 80 "4.0 Vdc"
			% 90 "4.5 Vdc"
			% 100 "5.0 Vdc"

Table-4: Output range and initial output value for min. out parameter %70 and max. out parameter %80

Min Out	Max Out	Output Range	Initial Out
% 70 "4 Vdc"	**% 80** "+6 Vdc"	4 Vdc ...+6 Vdc	**% 0** "4.0 Vdc"
			% 10 "4.2 Vdc"
			% 20 "4.4 Vdc"
			% 30 "4.6 Vdc"
			% 40 "4.8 Vdc"
			% 50 "5 Vdc"
			% 60 "5.2Vdc"
			% 70 "5.4 Vdc"
			% 80 "5.6 Vdc"
			% 90 "5.8 Vdc"
			% 100 "6.0 Vdc"

2.4.4.1 SCALE AND OUTPUT INITIAL VALUE SETTINGS FOR GOVERNOR OUTPUT:

1- Set to “09.01.001.Frequency Control” parameter as “*Passive*”.

2- Set to “09.01.003.Minimum Output Value” parameter as “*0.0%*”, and set to “09.01.004.Maximum Output Value” parameter as “*100.0%*”.

3- Set to “09.01.005.Initial Value” parameter as “*60.0%*”.

4- Set to “09.01.006.Output Direction” parameter as “*0-Positive*” and run generator on Manual mode.

5- The first thing to do is to determine the direction of the GOVERNOR. For this, “09.01.005.Initial Value” parameter increases slightly, for example by making “*65.0%*”, analyzing the changing frequency of the generator. Than, GOVERNOR is noted as “***Positive***” direction if there is increasing on the generator frequency, and it is noted as “***Negative***” direction if there is decreasing.

6- Ensure the running of the generator at “*48.0Hz*” frequency by changing “09.01.005.Initial Value” parameter. When generator runs at “*48.0Hz*” frequency, percentage value of the “09.01.005.Initial Value” parameter is noted as “***Scale-1***” value.

7- Ensure the running of the generator at “*52.0Hz*” frequency again by changing “09.01.005.Initial Value” parameter. When generator runs at “*52.0Hz*” frequency, percentage value of the “09.01.005.Initial Value” parameter is noted as “***Scale-2***” value and generator stops.

8- Set to “09.01.001.Frequency Control” parameter as “*Active*”.

9- Set to “09.01.003.Minimum Output Value” as “***Scale-1***” or “***Scale-2***” which is smaller than the percentage values are noted on steps 6th and 7th.

10- Set to “09.01.004.Maximum Output Value” as “***Scale-1***” or “***Scale-2***” which is bigger than the percentage values are noted on steps 6th and 7th.

11- Set to “09.01.005. Initial Value” parameter as “***50.0%***”.

12- If GOVERNOR direction is find out as “***Positive***” on the 5th step, set to “09.01.006.Output Direction” parameter as “***0-Positive***”, but if GOVERNOR direction is find out as “***Negative***” on the 5th step, set to “09.01.006.Output Direction” parameter as “***1-Negative***”.

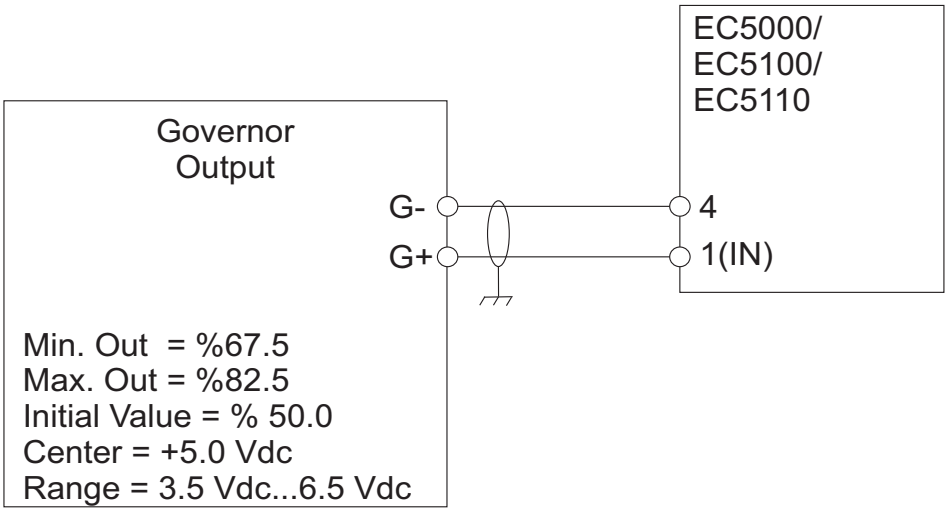
13- Run the generator on Manual mode again. Go to “GOVERNOR CONTROL” working page. At that page, when “**Frequency Set Value**” is “*50.0Hz*”, is observed that “**Frequency Actual Value**” is “*50.0Hz*” and “**Governor Output**” is approximately “*50.00%*”. Than, set to “**Frequency Set Value**” as “*52.0Hz*” by increment/decrement buttons. It is observed “**Governor Output**” and “**Frequency Actual Value**” are began to increasing. When “**Governor Output**” value reach to “*100.00%*” value by increasing, it is observed that “**Frequency Actual Value**” reach to “*52.0Hz*” by increasing too. After that, set to “**Frequency Set Value**” as “*48.0Hz*” by increment/decrement buttons. It is observed “**Governor Output**” and “**Frequency Actual Value**” are began to decreasing. When “**Governor Output**” value reach to “*0.00%*” value by decreasing, it is observed that “**Frequency Actual Value**” reach to “*48.0Hz*” by decreasing too. For the last time, set to “**Frequency Set Value**” as “*50.0Hz*” again. That means, GOVERNOR setting made with success anymore.

Note: It is recommended to fix the generator voltage to “*400Vac*” when setting the Governor.

2.4.5 TRANS-AMF.SYNCRO GOVERNOR OUTPUT CONNECTION TO SOME GOVERNOR MODULES

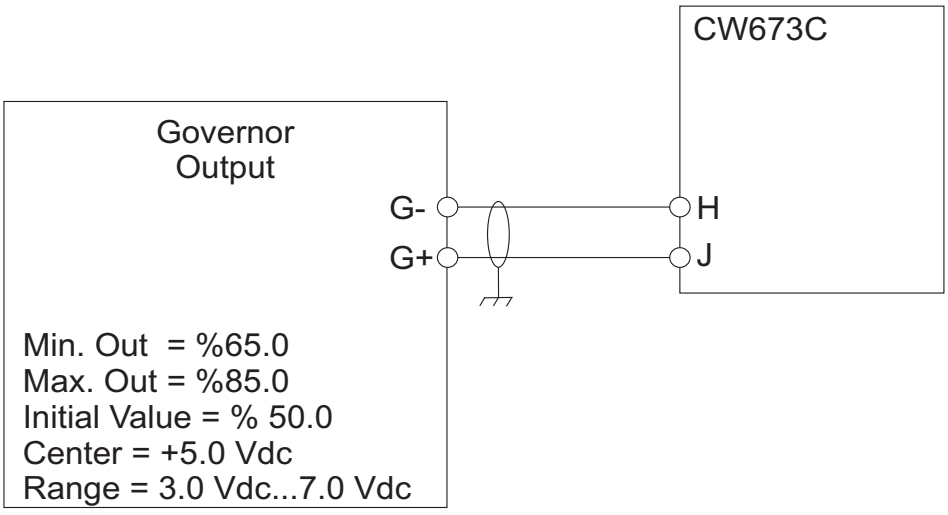
2.4.5.1 TRANS-AMF.SYNCRO TO AMBAC GOVERNOR CONNECTION

2.4.5.1.1 EC5000/ EC5100 / EC5110



Min. Out = %(50 + (+3.5V * 5)) = %(50 + (+17.5)) = %67.5
Max. Out = %(50 + (+6.5V * 5)) = %(50 + (+32.5)) = %82.5

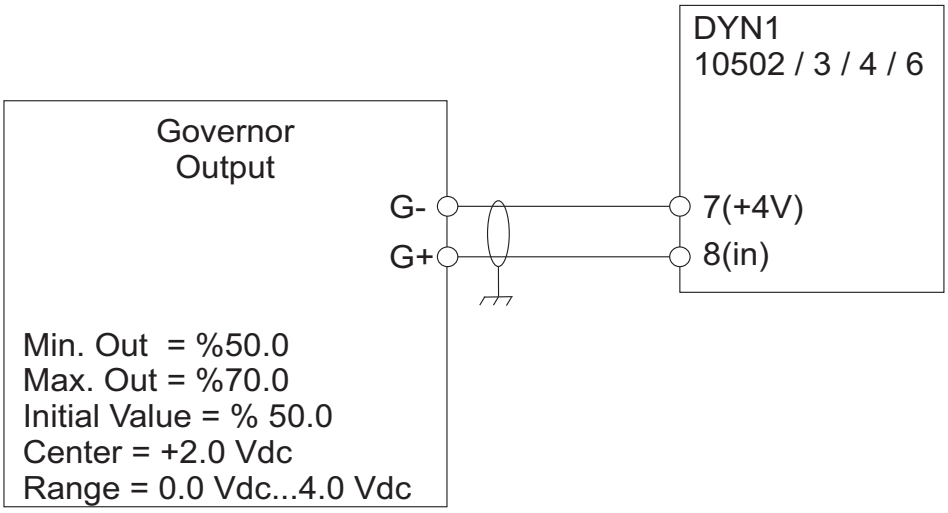
2.4.5.1.2 CW673C



Min. Out = %(50 + (+3.0V * 5)) = %(50 + (+15.0)) = %65.0
Max. Out = %(50 + (+7.0V * 5)) = %(50 + (+35.0)) = %85.0

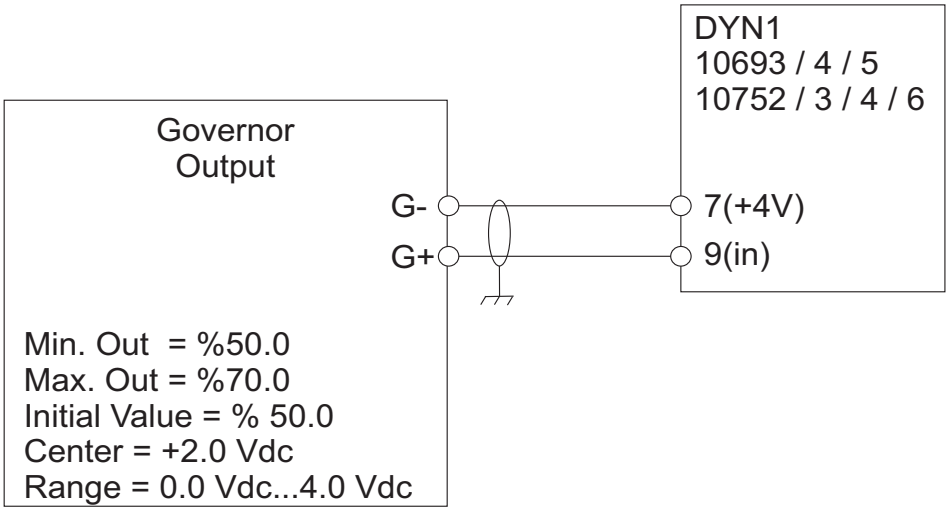
2.4.5.2 TRANS-AMF.SYNCRO TO BARBAR COLMAN GOVERNOR CONNECTION

2.4.5.2.1 DYN1 10502/ 10503 / 10504 / 10506



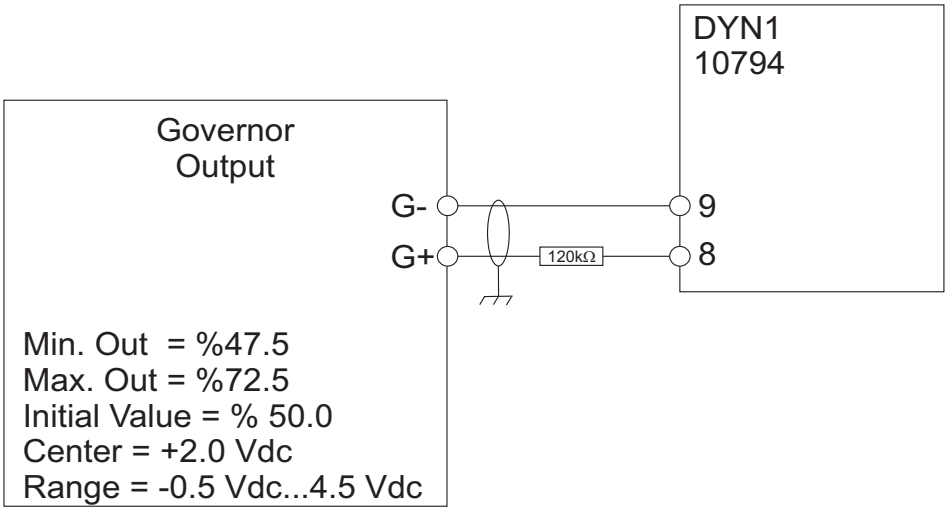
Min. Out = %(50 + (+0.0V * 5)) = %(50 + (+0.0)) = %50.0
Max. Out = %(50 + (+4.0V * 5)) = %(50 + (+20.0)) = %70.0

2.4.5.2.2 DYN 10693 / 10694 / 10695 / 10752 / 10753 / 10754 / 10756



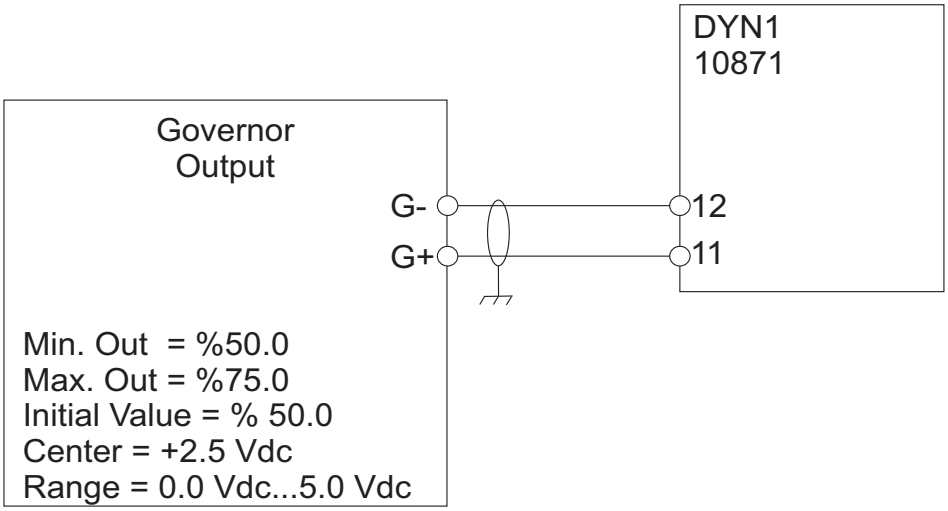
Min. Out = %(50 + (+0.0V * 5)) = %(50 + (+0.0)) = %50.0
Max. Out = %(50 + (+4.0V * 5)) = %(50 + (+20.0)) = %70.0

2.4.5.2.3 DYN1 10794



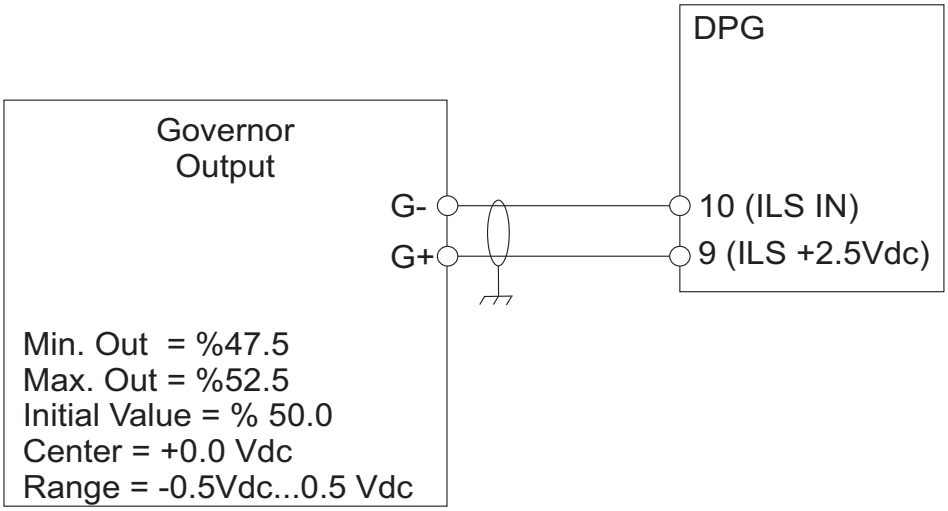
Min. Out = %(50 + (-0.5V * 5)) = %(50 + (-2.5)) = %47.5
Max. Out = %(50 + (+4.5V * 5)) = %(50 + (+22.5)) = %72.5

2.4.5.2.4 DYN1 10871



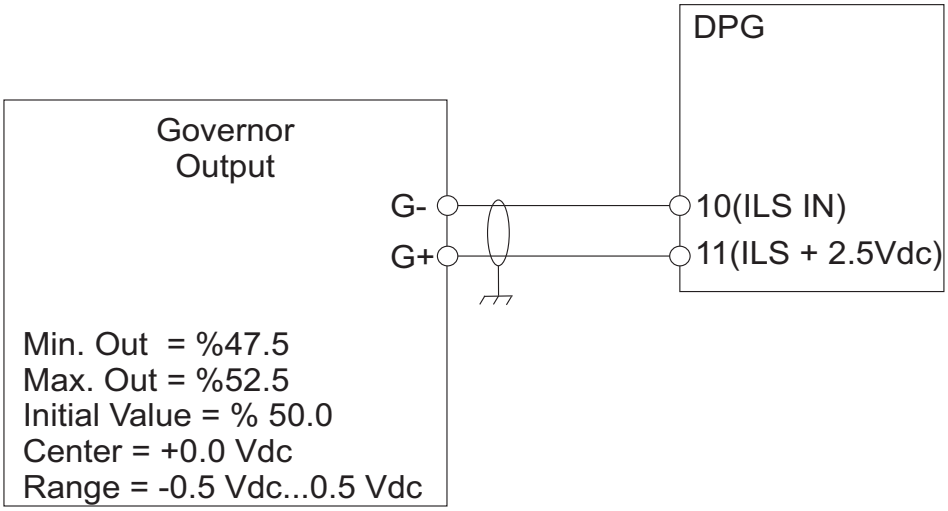
Min. Out = %(50 + (+0.0V * 5)) = %(50 + (+0.0)) = %50.0
Max. Out = %(50 + (+5.0V * 5)) = %(50 + (+25.0)) = %75.0

2.4.5.2.5 DPG 2201



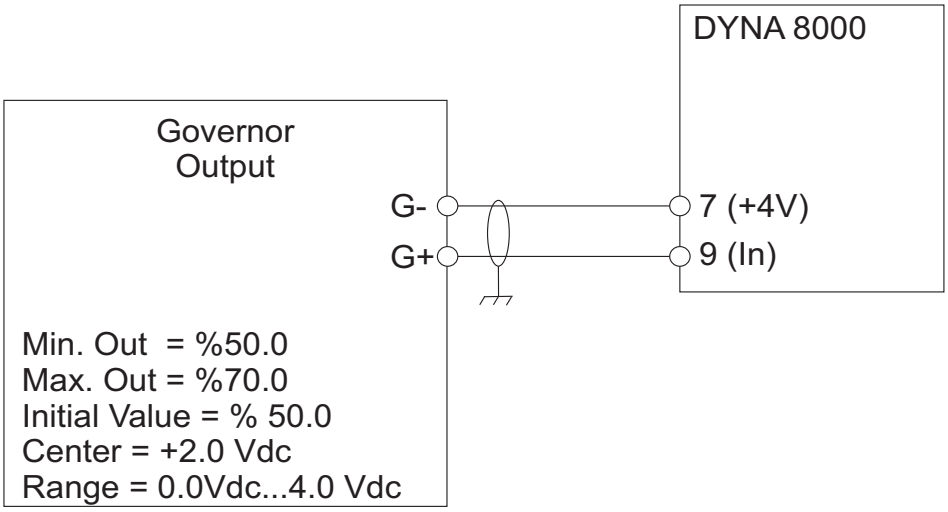
Min. Out = %(50 + (-0.5V * 5)) = %(50 + (-2.5)) = %47.5
Max. Out = %(50 + (+0.5V * 5)) = %(50 + (+2.5)) = %52.5

2.4.5.2.6 DPG 2401



Min. Out = %(50 + (-0.5V * 5)) = %(50 + (-2.5)) = %47.5
Max. Out = %(50 + (+0.5V * 5)) = %(50 + (+2.5)) = %52.5

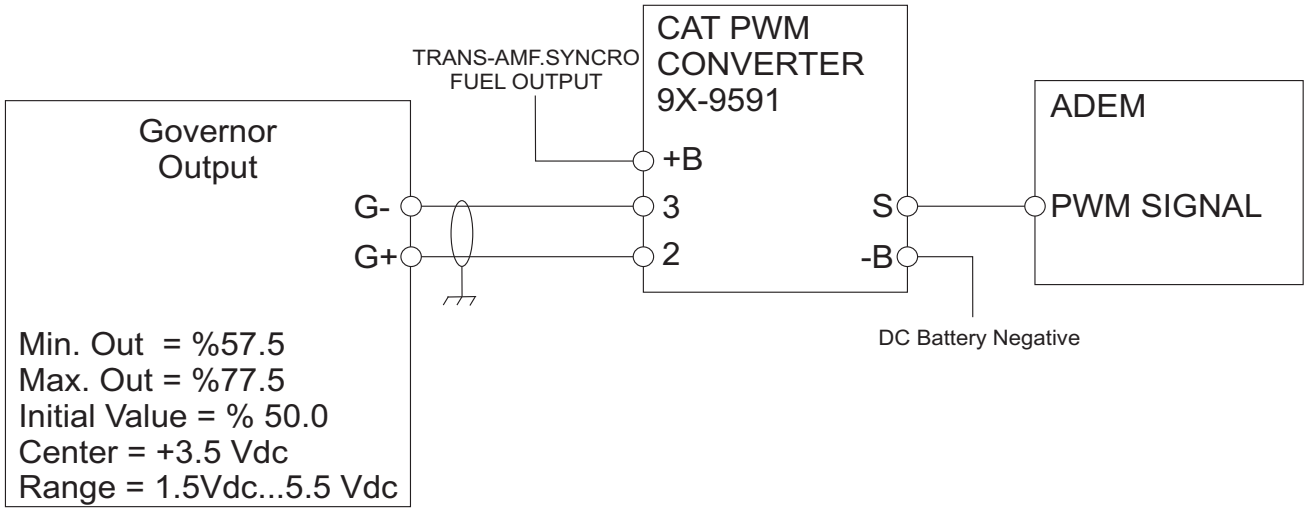
2.4.5.2.7 DYNA 8000



Min. Out = %(50 + (+0.0V * 5)) = %(50 + (+0.0)) = %50.0
Max. Out = %(50 + (+4.0V * 5)) = %(50 + (+20.0)) = %70.0

2.4.5.3 TRANS-AMF.SYNCRO TO CATERPILLAR GOVERNOR CONNECTION

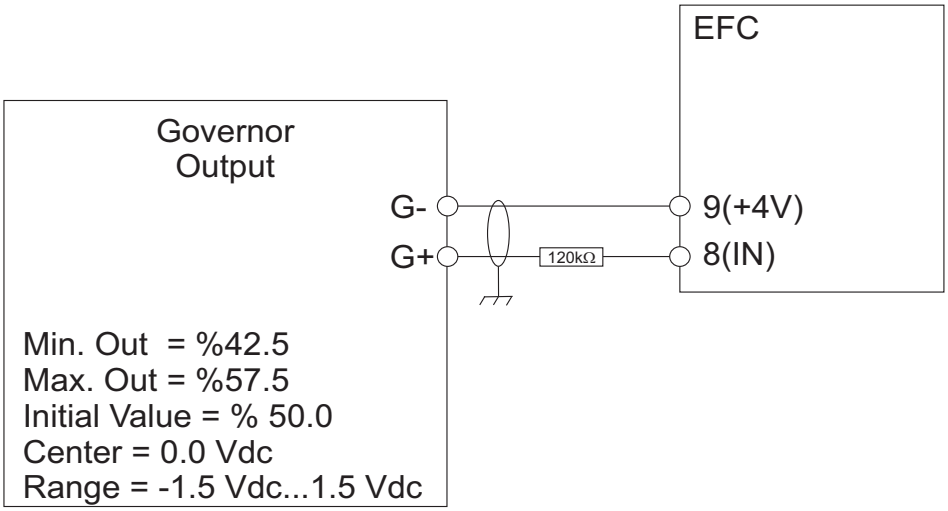
2.4.5.3.1 ADEM



Min. Out = %(50 + (+1.5V * 5)) = %(50 + (+7.5)) = %57.5
Max. Out = %(50 + (+5.5V * 5)) = %(50 + (+27.5)) = %77.5

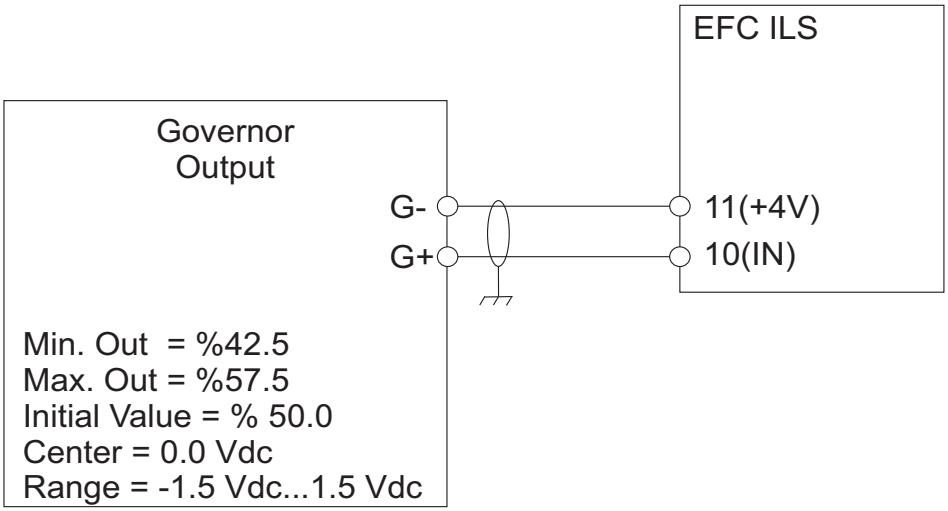
2.4.5.4 TRANS-AMF.SYNCRO TO CUMMINS GOVERNOR CONNECTION

2.4.5.4.1 EFC



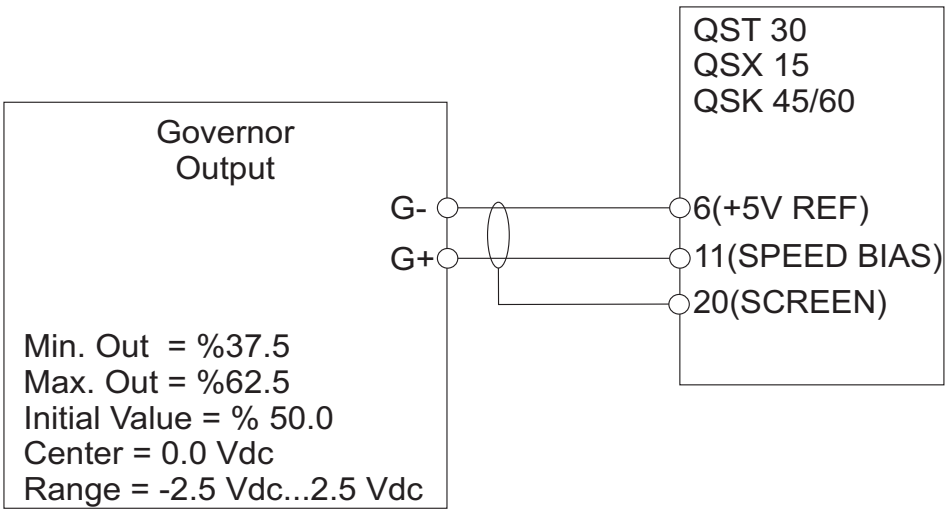
Min. Out = %(50 + (-1.5V * 5)) = %(50 + (-7.5)) = %42.5
Max. Out = %(50 + (+1.5V * 5)) = %(50 + (+7.5)) = %57.5

2.4.5.4.2 EFC WITH SMOKE LIMITING AND ILS



Min. Out = %(50 + (-1.5V * 5)) = %(50 + (-7.5)) = %42.5
Max. Out = %(50 + (+1.5V * 5)) = %(50 + (+7.5)) = %57.5

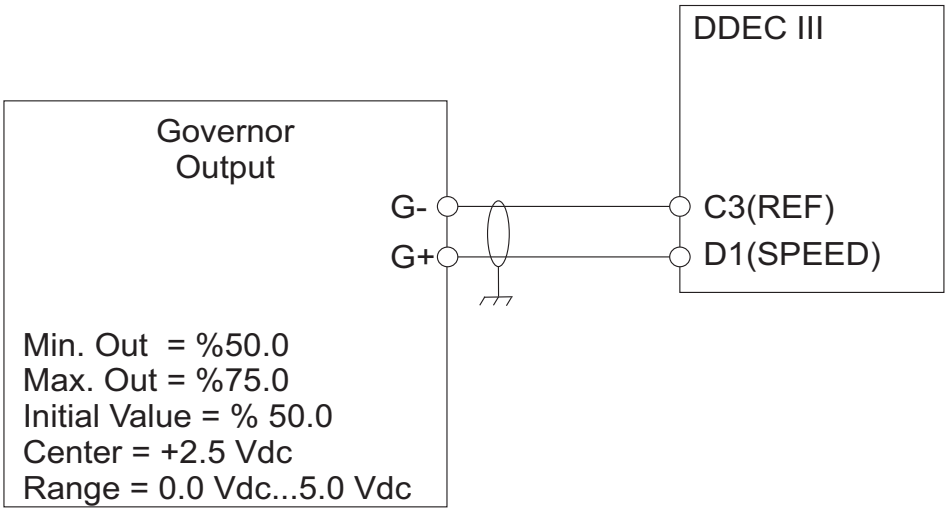
2.4.5.4.3 QST 30, QSX 15, QSK 45/60



Min. Out = %(50 + (-2.5V * 5)) = %(50 + (-12.5)) = %37.5
Max. Out = %(50 + (+2.5V * 5)) = %(50 + (+12.5)) = %62.5

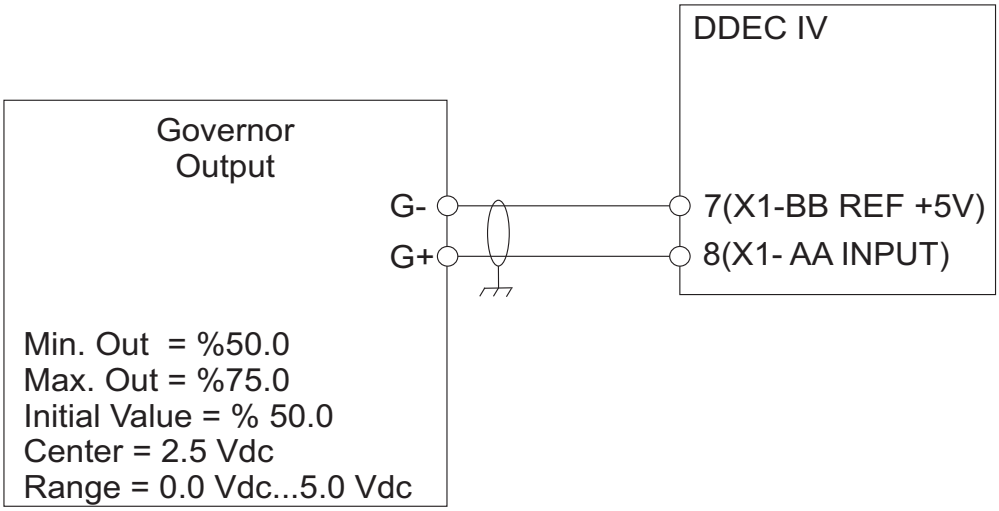
2.4.5.5 TRANS-AMF.SYNCRO TO DETROIT DIESEL GOVERNOR CONNECTION

2.4.5.5.1 DDEC III



Min. Out = %(50 + (0.0V * 5)) = %(50 + (0.0)) = %50.0
Max. Out = %(50 + (+5.0V * 5)) = %(50 + (+25.0)) = %75.0

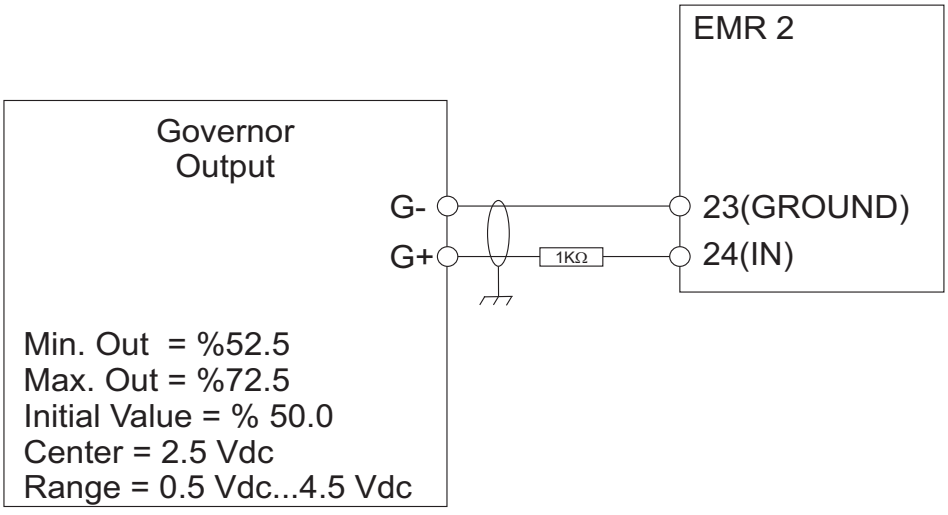
2.4.5.5.2 DDEC IV



Min. Out = %(50 + (0.0V * 5)) = %(50 + (0.0)) = %50.0
Max. Out = %(50 + (+5.0V * 5)) = %(50 + (+25.0)) = %75.0

2.4.5.6 TRANS-AMF.SYNCRO TO DEUTZ GOVERNOR CONNECTION

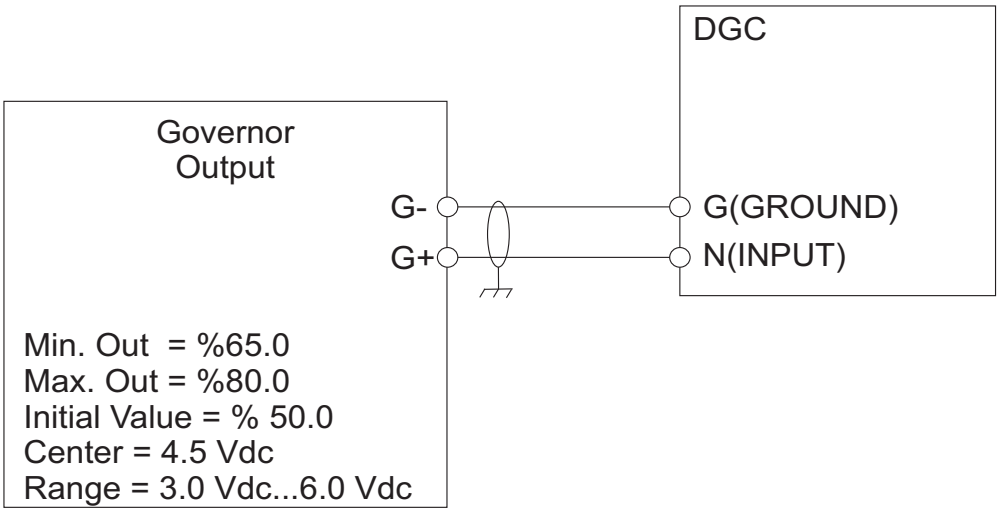
2.4.5.6.1 EMR 2 ELECTRONIC ENGINE GOVERNOR



Min. Out = %(50 + (+0.5V * 5)) = %(50 + (+2.5)) = %52.5
Max. Out = %(50 + (+4.5V * 5)) = %(50 + (+22.5)) = %72.5

2.4.5.7 TRANS-AMF.SYNCRO TO DOOSAN GOVERNOR CONNECTION

2.4.5.7.1 DGC

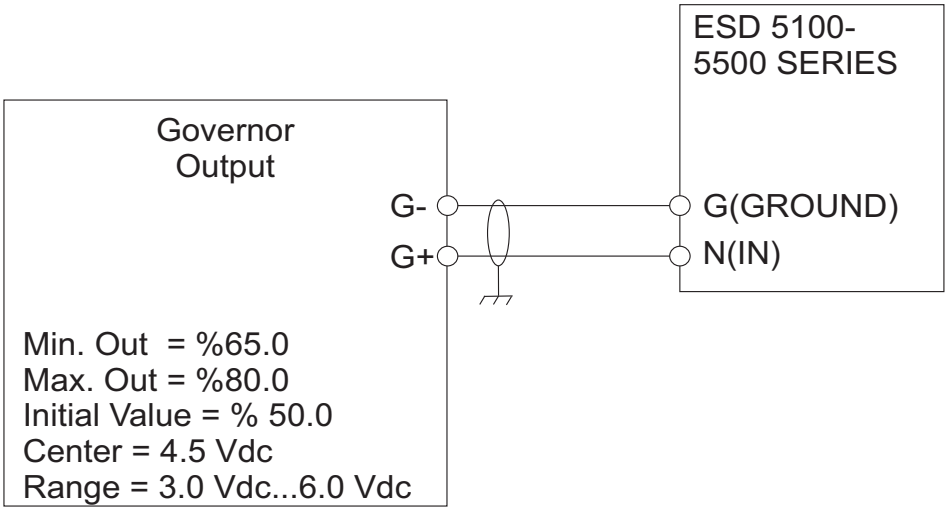


Min. Out = %(50 + (+3.0V * 5)) = %(50 + (+15.0)) = %65.0
Max. Out = %(50 + (+6.0V * 5)) = %(50 + (+30.0)) = %80.0

The DGC uses lower voltage on input N = higher speed. Therefore, we need to configure the Trans-Amf.Syncro controller to ‘reverse’ the polarity of the governor output.

2.4.5.8 TRANS-AMF.SYNCRO TO G.A.C (GOVERNOR AMERICA CORP.) GOVERNOR CONNECTION

2.4.5.8.1 5100 - 5500 SERIES

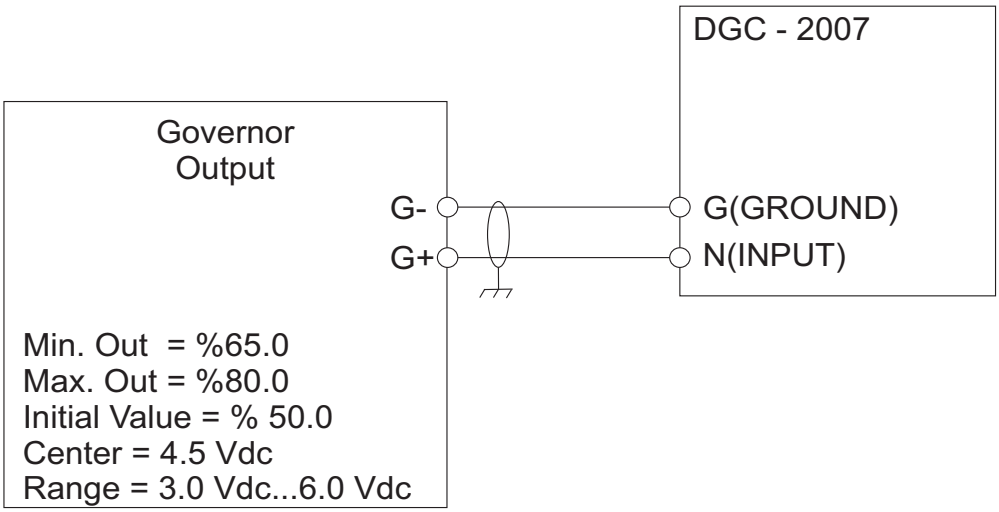


Min. Out = %(50 + (+3.0V * 5)) = %(50 + (+15.0)) = %65.0
Max. Out = %(50 + (+6.0V * 5)) = %(50 + (+30.0)) = %80.0

The 5100-5500 uses lower voltage on input N = higher speed. Therefore, we need to configure the Trans-Amf.Syncro controller to ‘reverse’ the polarity of the governor output.

2.4.5.9 TRANS-AMF.SYNCRO TO GHANA GOVERNOR CONNECTION

2.4.5.9.1 DGC-2007

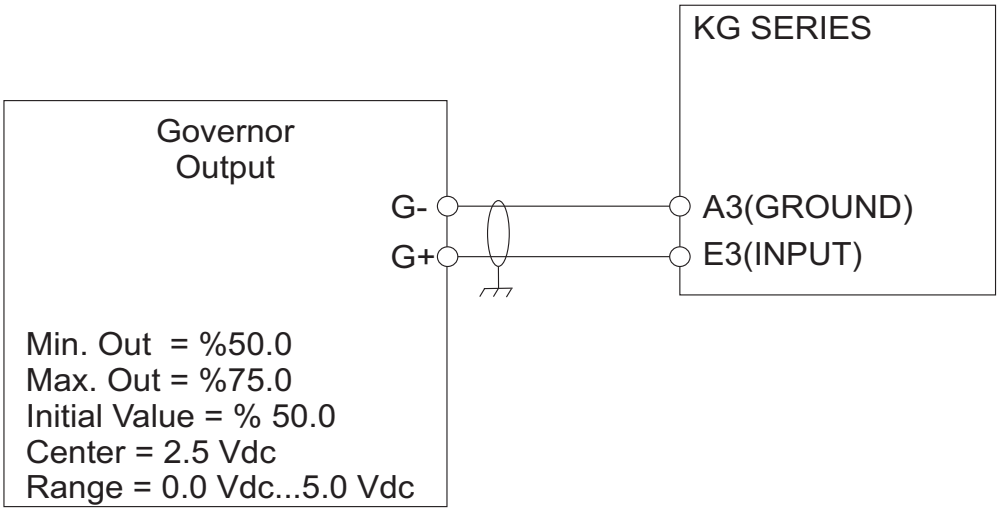


Min. Out = %(50 + (+3.0V * 5)) = %(50 + (+15.0)) = %65.0
Max. Out = %(50 + (+6.0V * 5)) = %(50 + (+30.0)) = %80.0

The DGC-2007 uses lower voltage on input N = higher speed. Therefore, we need to configure the Trans-Amf.Syncro controller to 'reverse' the polarity of the governor output.

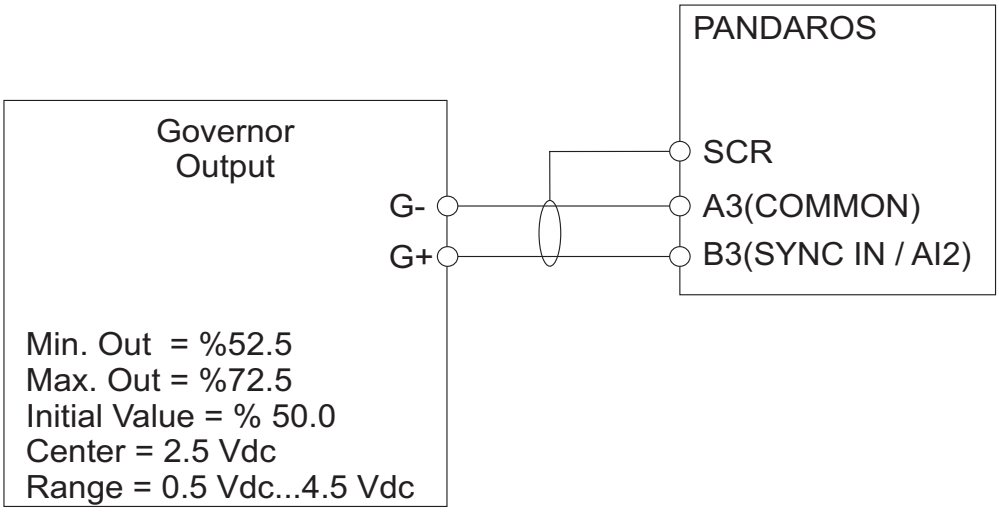
2.4.5.10 TRANS-AMF.SYNCRO TO HEINZMANN GOVERNOR CONNECTION

2.4.5.10.1 KG SERIES (6-04 TO 10-04)



Min. Out = %(50 + (0.0V * 5)) = %(50 + (0.0)) = %50.0
Max. Out = %(50 + (+5.0V * 5)) = %(50 + (+25.0)) = %75.0

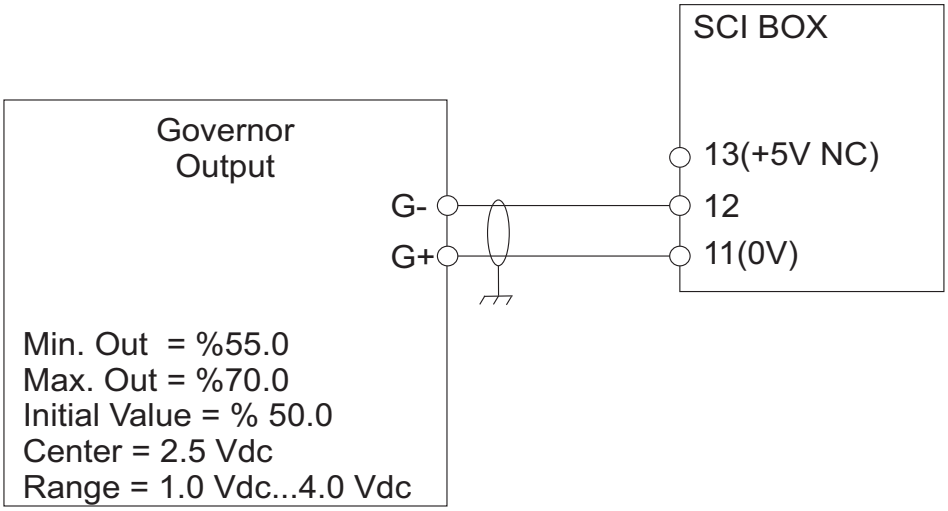
2.4.5.10.2 PANDAROS



Min. Out = %(50 + (+0.5V * 5)) = %(50 + (2.5)) = %52.5
Max. Out = %(50 + (+4.5V * 5)) = %(50 + (+22.5)) = %72.5

2.4.5.11 TRANS-AMF.SYNCRO TO IVECO GOVERNOR CONNECTION

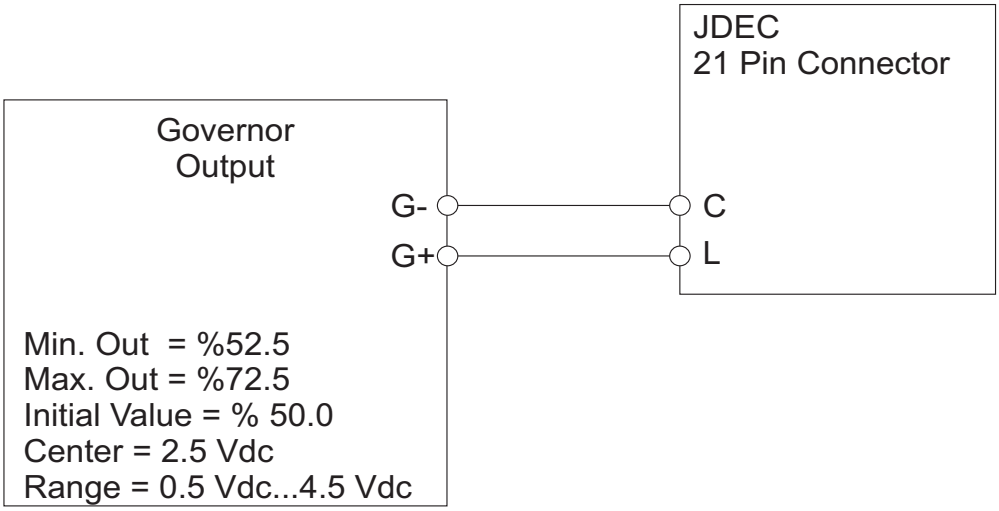
2.4.5.11.1 CURSOR 13TE2(WITH SCI BOX)



Min. Out = %(50 + (+1.0V * 5)) = %(50 + (+5.0)) = %55.0
Max. Out = %(50 + (+4.0V * 5)) = %(50 + (+20.0)) = %70.0

2.4.5.12 TRANS-AMF.SYNCRO TO JOHN DEERE GOVERNOR CONNECTION

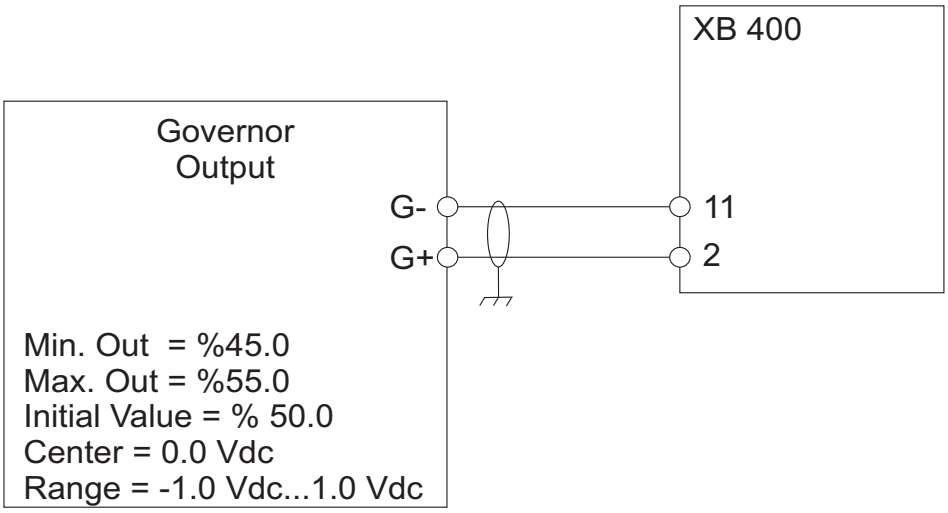
2.4.5.12.1 JDEC



Min. Out = %(50 + (+0.5V * 5)) = %(50 + (+2.5)) = %52.5
Max. Out = %(50 + (+4.5V * 5)) = %(50 + (+22.5)) = %72.5

2.4.5.13 TRANS-AMF.SYNCRO TO MITSUBISHI GOVERNOR CONNECTION

2.4.5.13.1 XB 400



Min. Out = %(50 + (-1.0V * 5)) = %(50 + (-5.0)) = %45.0
Max. Out = %(50 + (+1.0V * 5)) = %(50 + (+5.0)) = %55.0

2.4.5.14 TRANS-AMF.SYNCRO TO SCANIA GOVERNOR CONNECTION

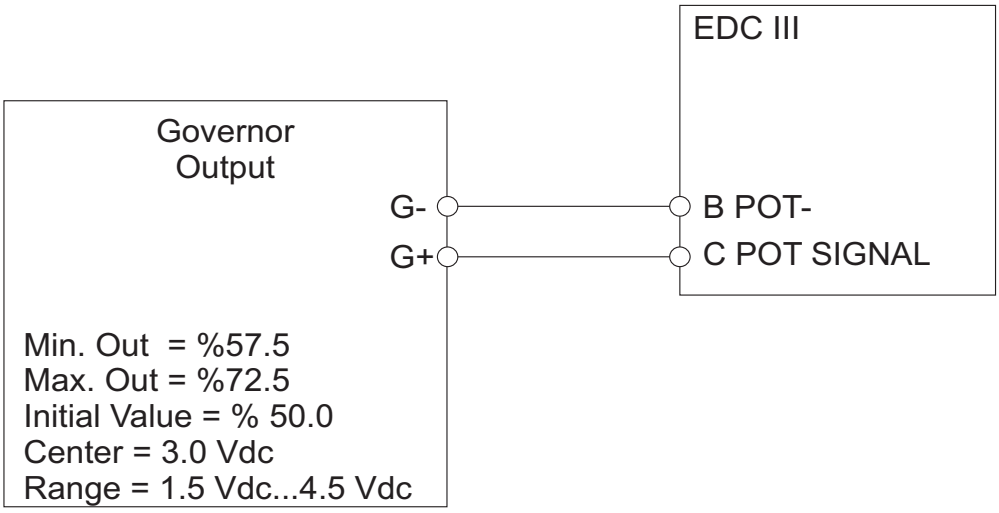
2.4.5.14.1 SCANIA S6

S6 electronic management system is fitted to the Scania electronic engines. Speed control of these engines is done automaticly via CAN-J1939 data link between the S6 and the Trans-AMF.SYNCRO controller. So there is no requirement to connect the analogue governor output terminals.

Min. Out = %(50 + (+1.0V * 5)) = %(50 + (+5.0)) = %55.0
Max. Out = %(50 + (+4.0V * 5)) = %(50 + (+20.0)) = %70.0

2.4.5.15 TRANS-AMF.SYNCRO TO VOLVO GOVERNOR CONNECTION

2.4.5.15.1 EDC III



Min. Out = %(50 + (+1.5V * 5)) = %(50 + (+7.5)) = %57.5
Max. Out = %(50 + (+4.5V * 5)) = %(50 + (+22.5)) = %72.5

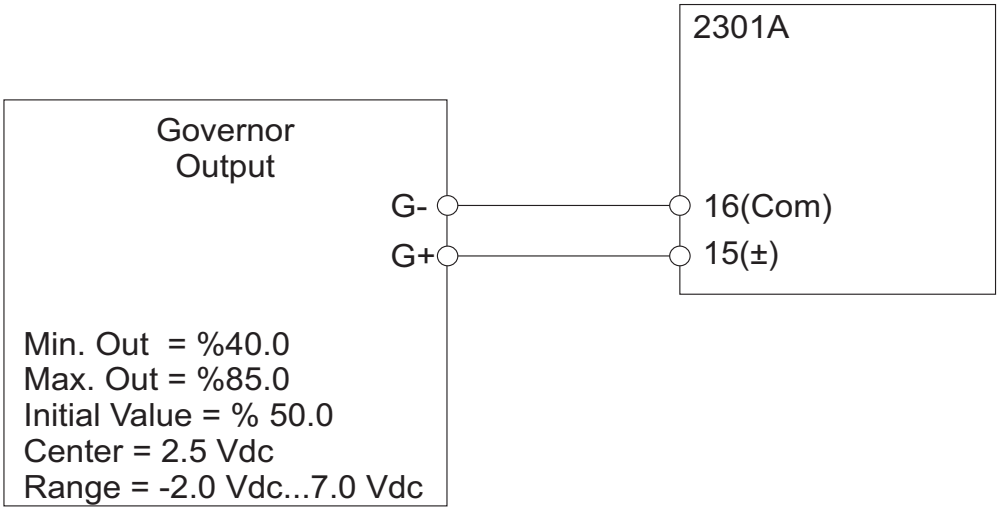
2.4.5.15.2 EMS2

EMS2 electronic management system is fitted to the Volvo TAD9 and TAD16 electronic engines. Speed control of these engines is done automaticly via CAN-J1939 data link between the EMS2 and the Trans-AMF.SYNCRO controller. So there is no requirement to connect the analogue governor output terminals.

Min. Out = %(50 + (+1.0V * 5)) = %(50 + (+5.0)) = %55.0
Max. Out = %(50 + (+4.0V * 5)) = %(50 + (+20.0)) = %70.0

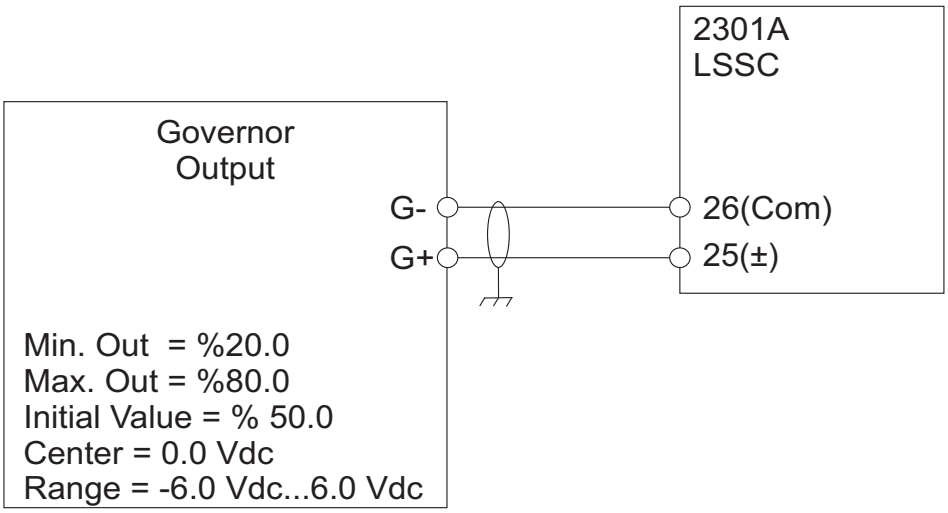
2.4.5.16 TRANS-AMF.SYNCRO TO WOODWARD GOVERNOR CONNECTION

2.4.5.16.1 2301A SPEED CONTROL



Min. Out = %(50 + (-2.0V * 5)) = %(50 + (-10.0)) = %40.0
Max. Out = %(50 + (+7.0V * 5)) = %(50 + (+35.0)) = %85.0

2.4.5.16.2 2301A LOW VOLTAGE LOAD SHARING & SPEED CONTROL (LSSC)



Min. Out = %(50 + (-6.0V * 5)) = %(50 + (-30.0)) = %20.0
Max. Out = %(50 + (+6.0V * 5)) = %(50 + (+30.0)) = %80.0

2.5 AVR Connection

2.5.1 INTERFACING TO AUTOMATIC VOLTAGE REGULATORS

This section details the interface connections between the Trans-Amf.Syncro controllers and the most popular Automatic Voltage Regulators (AVRs) used with diesel generating set alternators. If your particular type of AVR is not covered within this section, please contact our technical support department for advice.

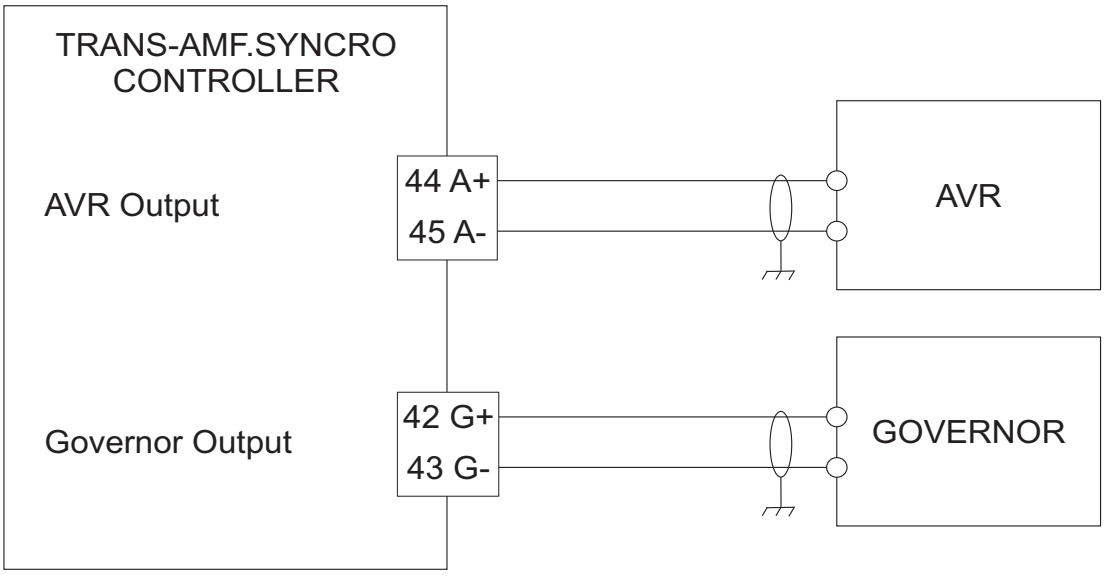
2.5.1.1 INTERFACING WITH TRANS-AMF.SYNCRO CONTROLLERS

The analogue AVR output provide an isolated, adjustable DC voltage level to connect into the control inputs of many automatic voltage regulators. This replaces the manually operated or motorised potentiometers used in many synchronising and load sharing applications. The module is also suitable for connection to the load sharing controller inputs of many popular AVRs. This enables the Trans-Amf.Syncro controller to adjust the alternator voltage output to match the mains/bus and hence get the supplies into synchronism. The module is especially suited for use in reactive power sharing systems.

2.5.2 SPECIFICATIONS

Item	Value
Output type	Optically isolated DC voltage level
Isolation	Optically isolated to 1000V
Minimum output load	1000Ω

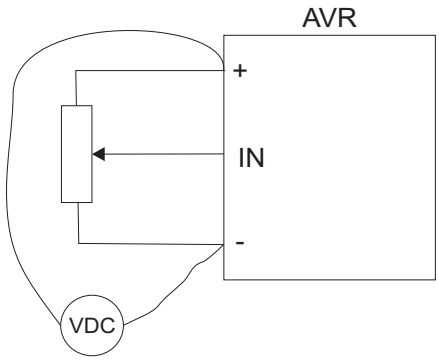
2.5.3 CONNECTION DETAILS



2.5.4 DETERMINING CONNECTIONS AND SETTINGS FOR AVRS NOT LISTED IN THIS PUBLICATION

The following guide is intended to assist the user to determine where to connect to AVRs not listed in this document. Additionally it will assist you to find the correct settings for initial output value and output range value.

This diagram shows how the remote adjust potentiometer is usually connected to the AVR. The potentiometer adjusts the voltage into the IN terminal between the voltages supplied at '-' and '+'. To find the 'centre' and 'range' voltages accepted by the device's input, measure the DC voltage of terminal '+' in relation to terminal '-' as shown.



For example, you measure 4V from '-' to '+'. Halving this voltage gives the centre voltage (2V). The range voltage setting will have a maximum value of 2V above or below the centre voltage.

To determine the settings of initial value and range value, refer to the table 5,6,7,8. The Trans-Amf.Syncro controller connects only to the "-" and "IN" terminals and provides the varying DC voltage to simulate the turning of a potentiometer.

The analogue output terminals of the Trans-Amf.Syncro controller are connected as follows. Note that the "+" terminal of the AVR is left unconnected.

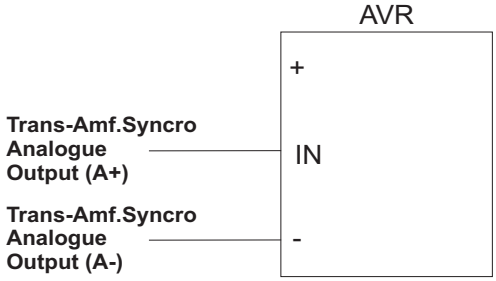


Table-5: Output range and initial output value for min. out parameter %0 and max. out parameter %100

Min Out	Max Out	Output Range	Initial Out
% 0 "-10 Vdc"	**% 100** "+10 Vdc"	-10 Vdc ...+10 Vdc	**% 0** "-10 Vdc"
			% 10 "-8 Vdc"
			% 20 "-6 Vdc"
			% 30 "-4 Vdc"
			% 40 "-2 Vdc"
			% 50 "0 Vdc"
			% 60 "2 Vdc"
			% 70 "4 Vdc"
			% 80 "6 Vdc"
			% 90 "8 Vdc"
			% 100 "10 Vdc"

Table-6: Output range and initial output value for min. out parameter %20 and max. out parameter %40

Min Out	Max Out	Output Range	Initial Out
% 20 "-6 Vdc"	**% 40** "-2 Vdc"	-6 Vdc ...-2 Vdc	**% 0** "-6.0 Vdc"
			% 10 "-5.6 Vdc"
			% 20 "-5.2 Vdc"
			% 30 "-4.8 Vdc"
			% 40 "-4.4 Vdc"
			% 50 "-4.0 Vdc"
			% 60 "-3.6 Vdc"
			% 70 "-3.2 Vdc"
			% 80 "-2.8 Vdc"
			% 90 "-2.4Vdc"
			% 100 "-2.0 Vdc"

Table-7: Output range and initial output value for min. out parameter %50 and max. out parameter %75

Min Out	Max Out	Output Range	Initial Out
% 50 "0 Vdc"	**% 75** "+5 Vdc"	0 Vdc ...+5 Vdc	**% 0** "0.0 Vdc"
			% 10 "0.5 Vdc"
			% 20 "1.0 Vdc"
			% 30 "1.5 Vdc"
			% 40 "2.0 Vdc"
			% 50 "2.5 Vdc"
			% 60 "3.0 Vdc"
			% 70 "3.5 Vdc"
			% 80 "4.0 Vdc"
			% 90 "4.5 Vdc"
			% 100 "5.0 Vdc"

Table-8: Output range and initial output value for min. out parameter %70 and max. out parameter %80

Min Out	Max Out	Output Range	Initial Out
% 70 "4 Vdc"	**% 80** "+6 Vdc"	4 Vdc ...+6 Vdc	**% 0** "4.0 Vdc"
			% 10 "4.2 Vdc"
			% 20 "4.4 Vdc"
			% 30 "4.6 Vdc"
			% 40 "4.8 Vdc"
			% 50 "5 Vdc"
			% 60 "5.2Vdc"
			% 70 "5.4 Vdc"
			% 80 "5.6 Vdc"
			% 90 "5.8 Vdc"
			% 100 "6.0 Vdc"

2.5.4.1 SCALE AND OUTPUT INITIAL VALUE SETTINGS FOR AVR OUTPUT:

1- Set to “09.02.001.Voltage Control” parameter as “*Passive*”.

2- Set to “09.02.003.Minimum Output Value” parameter as “*0.0%*”, and set to “09.02.004.Maximum Output Value” parameter as “*100.0%*”.

3- Set to “09.02.005.Initial Value” parameter as “*50.0%*”.

4- Set to “09.02.006.Output Direction” parameter as “*0-Positive*” and run generator on Manual mode.

5- The first thing to do is to determine the direction of the AVR. For this, “09.02.005.Initial Value” parameter increases slightly, for example by making “*55.0%*”, analyzing the changing voltage of the generator. Than, AVR is noted as “***Positive***” direction if there is increasing on the generator voltage, and it is noted as “***Negative***” direction if there is decreasing.

6- Ensure the running of the generator at “*380Vac*” voltage by changing “09.02.005.Initial Value” parameter. When generator runs at “*380Vac*” voltage, percentage value of the “09.02.005.Initial Value” parameter is noted as “***Scale-1***” value.

7- Ensure the running of the generator at “*420Vac*” voltage again by changing “09.02.005.Initial Value” parameter. When generator runs at “*420Vac*” voltage, percentage value of the “09.02.005.Initial Value” parameter is noted as “***Scale-2***” value and generator stops.

8- Set to “09.02.001.Voltage Control” parameter as “*Active*”.

9- Set to “09.02.003.Minimum Output Value” as “***Scale-1***” or “***Scale-2***” which is smaller than the percentage values are noted on steps 6th and 7th.

10- Set to “09.02.004.Maximum Output Value” as “***Scale-1***” or “***Scale-2***” which is bigger than the percentage values are noted on steps 6th and 7th.

11- Set to “09.02.005. Initial Value” parameter as “***50.0%***”.

12- If AVR direction is find out as “***Positive***” on the 5th step, set to “09.02.006.Output Direction” parameter as “***0-Positive***”, but if AVR direction is find out as “***Negative***” on the 5th step, set to “09.02.006.Output Direction” parameter as “***1-Negative***”.

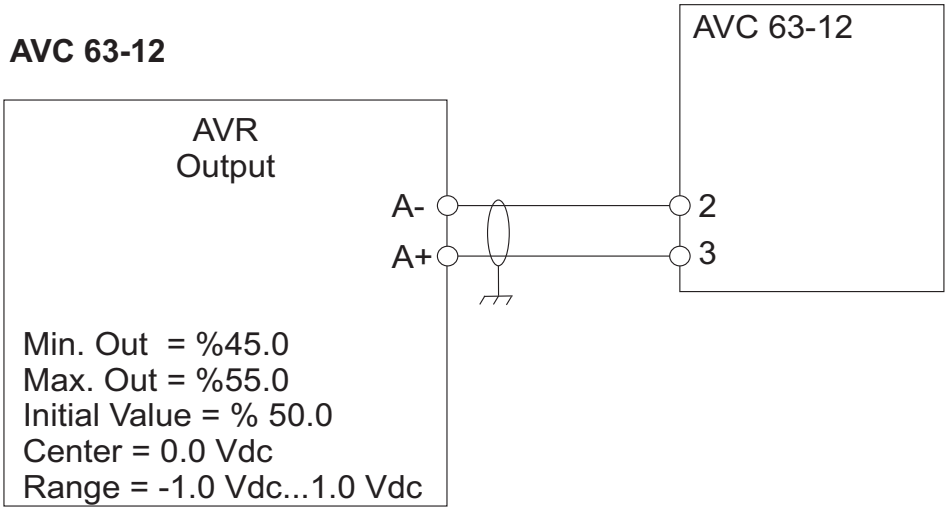
13- Run the generator on Manual mode again. Go to “AVR CONTROL” working page. At that page, when “**Voltage Set Value**” is “*400Vac*”, is observed that “**Voltage Actual Value**” is “*400Vac*” and “**AVR Output**” is approximately “*50.00%*”. Than, set to “**Voltage Set Value**” as “*420Vac*” by increment/decrement buttons. It is observed “**AVR Output**” and “**Voltage Actual Value**” are began to increasing. When “**AVR Output**” value reach to “*100.00%*” value by increasing, it is observed that “**Voltage Actual Value**” reach to “*420Vac*” by increasing too. After that, set to “**Voltage Set Value**” as “*380Vac*” by increment/decrement buttons. It is observed “**AVR Output**” and “**Voltage Actual Value**” are began to decreasing. When “**AVR Output**” value reach to “*0.00%*” value by decreasing, it is observed that “**Voltage Actual Value**” reach to “*380Vac*” by decreasing too. For the last time, set to “**Voltage Set Value**” as “*400Vac*” again. That means, AVR setting made with success anymore.

Note: It is recommended to fix the generator frequency to “*50.0Hz*” when setting the AVR.

2.5.5 TRANS-AMF.SYNCRO AVR OUTPUT CONNECTION TO SOME AVR MODULES

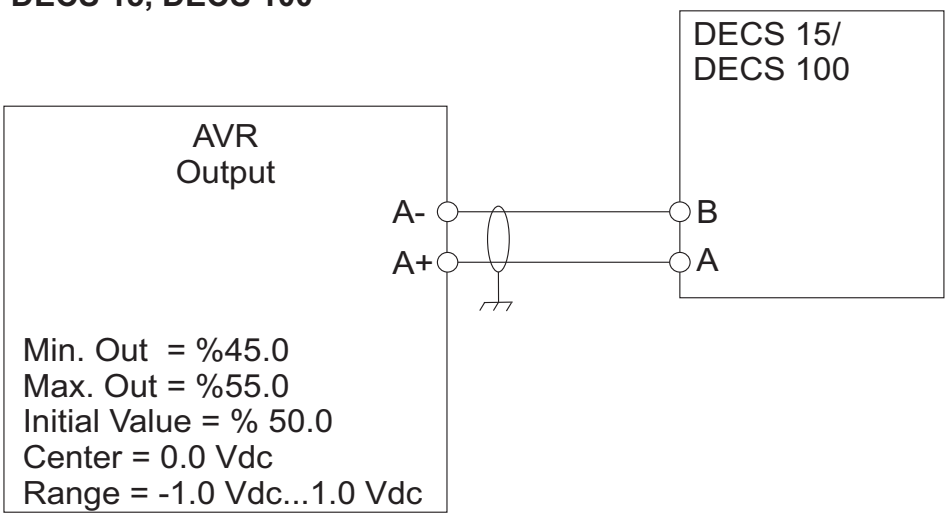
2.5.5.1 TRANS-AMF.SYNCRO TO BASLER AVR CONNECTION

2.5.5.1.1 AVC 63-12



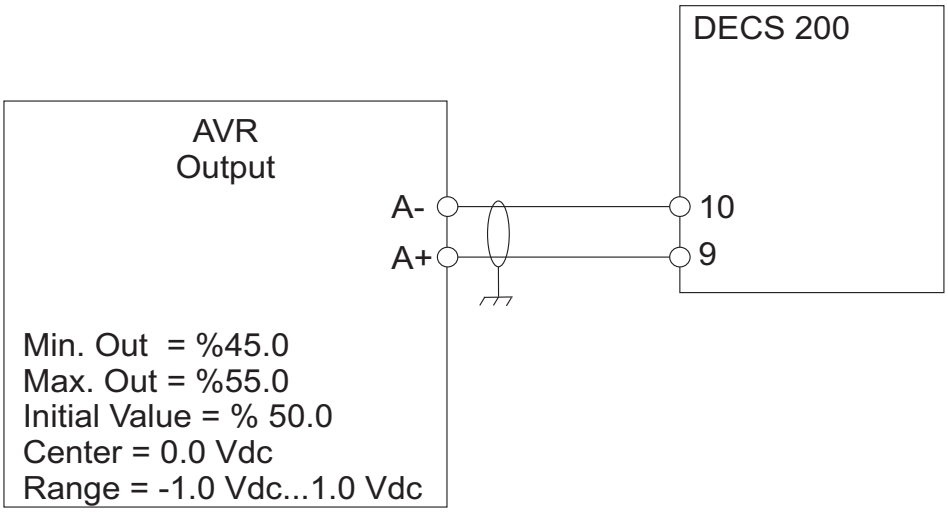
Min. Out = %(50 + (-1.0V * 5)) = %(50 + (-5.0)) = %45.0
Max. Out = %(50 + (+1.0V * 5)) = %(50 + (+5.0)) = %55.0

2.5.5.1.2 DECS 15, DECS 100



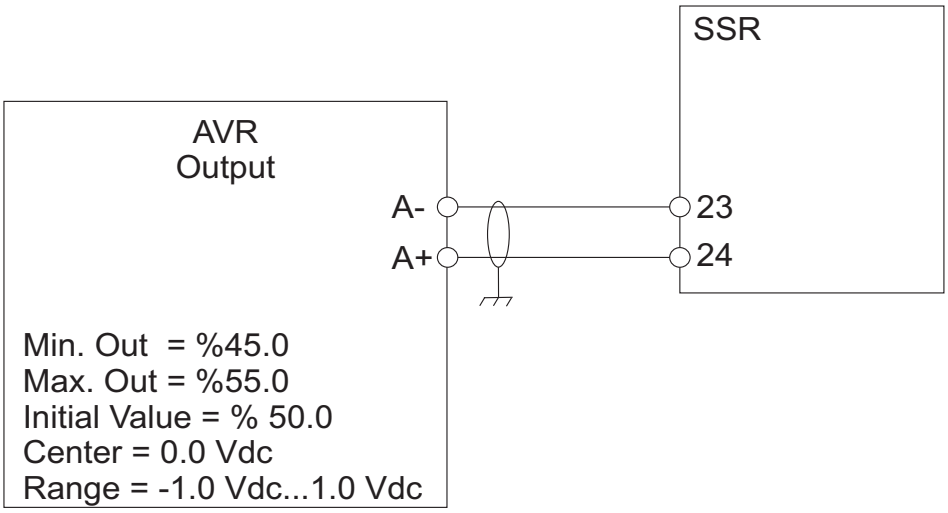
Min. Out = %(50 + (-1.0V * 5)) = %(50 + (-5.0)) = %45.0
Max. Out = %(50 + (+1.0V * 5)) = %(50 + (+5.0)) = %55.0

2.5.5.1.3 DECS 200



Min. Out = %(50 + (-1.0V * 5)) = %(50 + (-5.0)) = %45.0
Max. Out = %(50 + (+1.0V * 5)) = %(50 + (+5.0)) = %55.0

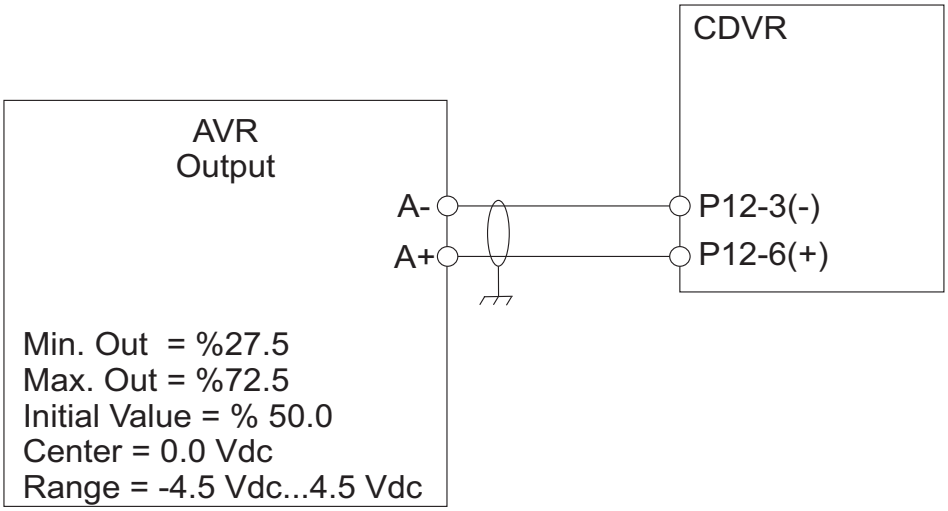
2.5.5.1.4 SSR



Min. Out = %(50 + (-1.0V * 5)) = %(50 + (-5.0)) = %45.0
Max. Out = %(50 + (+1.0V * 5)) = %(50 + (+5.0)) = %55.0

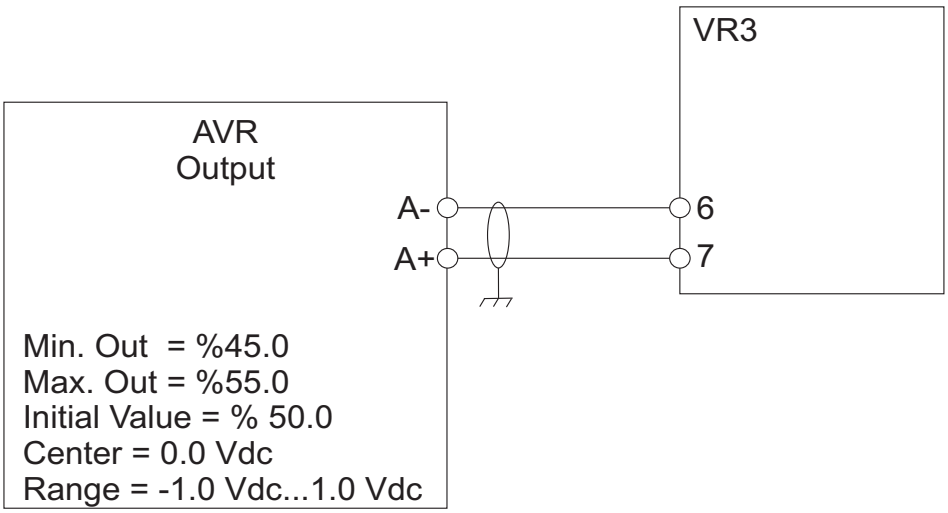
2.5.5.2 TRANS-AMF.SYNCRO TO CATERPILLAR AVR CONNECTION

2.5.5.2.1 CDVR



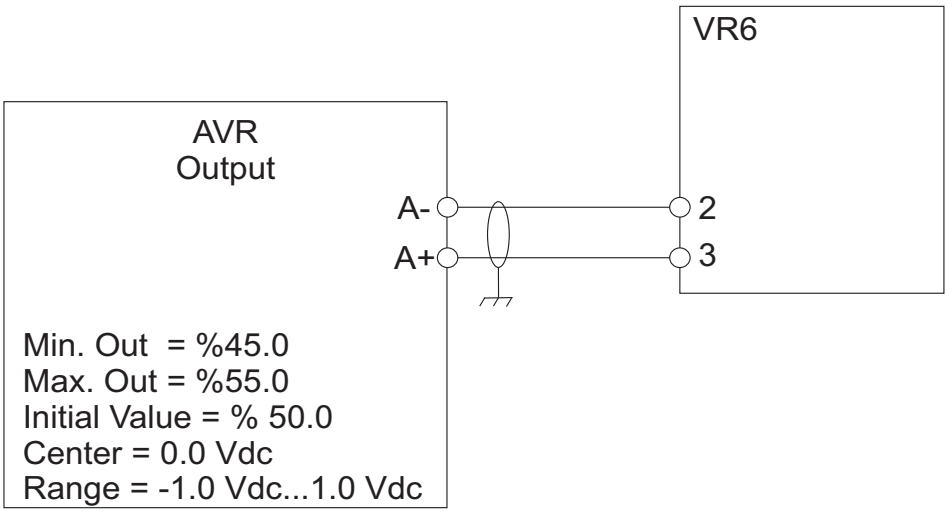
Min. Out = %(50 + (-4.5V * 5)) = %(50 + (-22.5)) = %27.5
Max. Out = %(50 + (+4.5V * 5)) = %(50 + (+22.5)) = %72.5

2.5.5.2.2 VR3



Min. Out = %(50 + (-1.0V * 5)) = %(50 + (-5.0)) = %45.0
Max. Out = %(50 + (+1.0V * 5)) = %(50 + (+5.0)) = %55.0

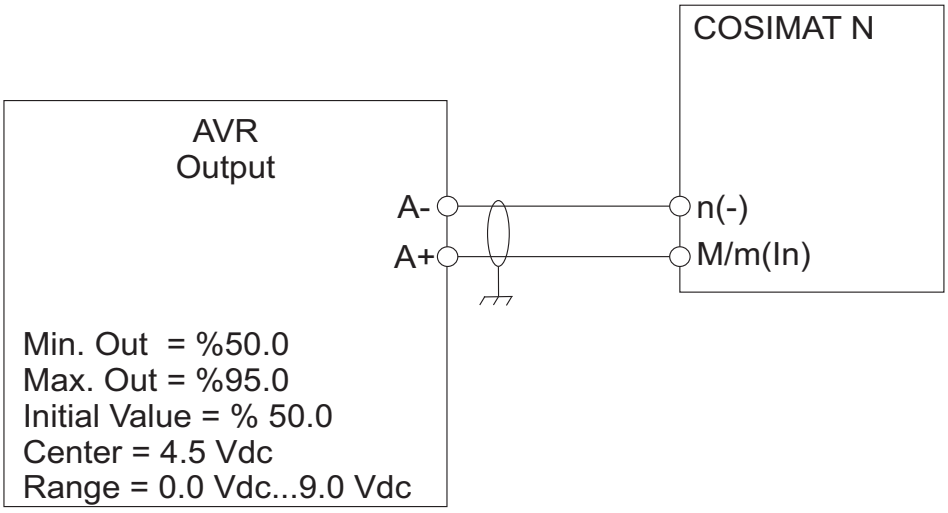
2.5.5.2.3 VR6



Min. Out = %(50 + (-1.0V * 5)) = %(50 + (-5.0)) = %45.0
Max. Out = %(50 + (+1.0V * 5)) = %(50 + (+5.0)) = %55.0

2.5.5.3 TRANS-AMF.SYNCRO TO COSIMAT AVR CONNECTION

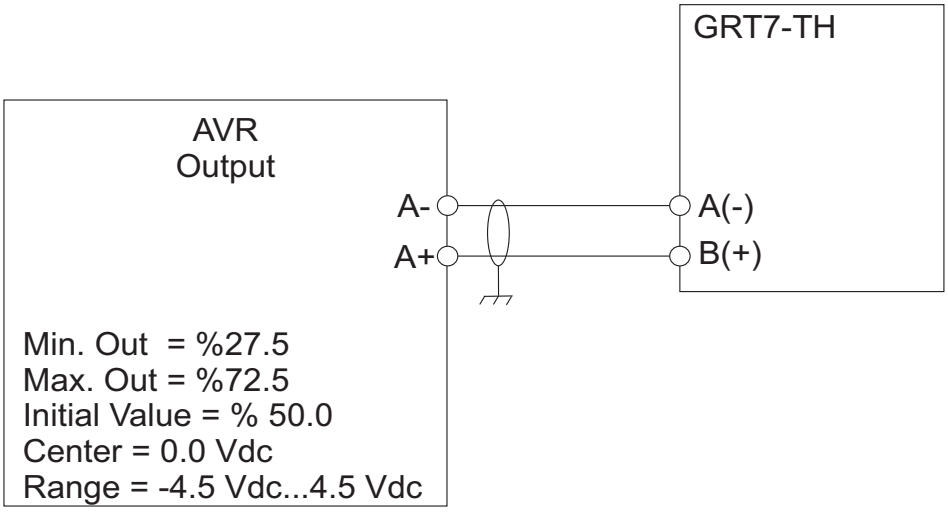
2.5.5.3.1 COSIMAT N



Min. Out = %(50 + (0.0V * 5)) = %(50 + (0.0)) = %50.0
Max. Out = %(50 + (+9.0V * 5)) = %(50 + (+45.0)) = %95.0

2.5.5.4 TRANS-AMF.SYNCRO TO GRAMEYER AVR CONNECTION

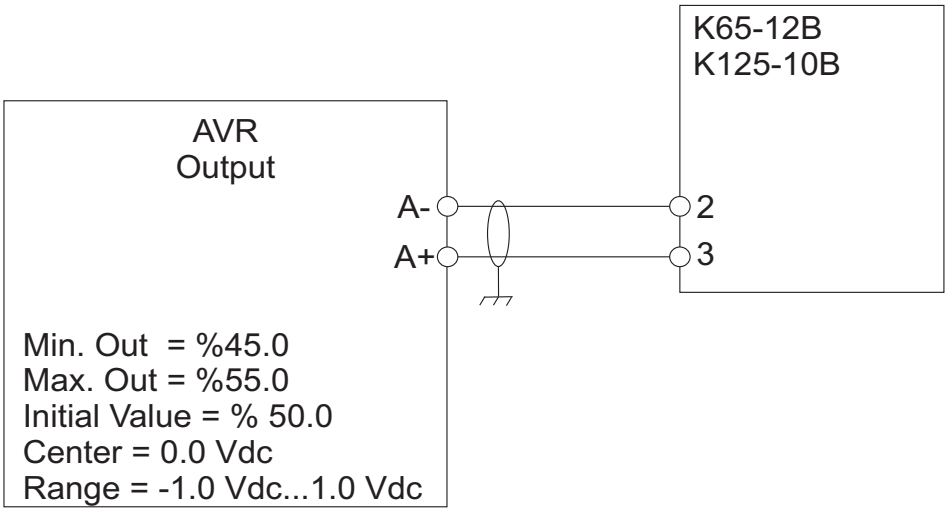
2.5.5.4.1 GRT7-TH



Min. Out = %(50 + (-4.5V * 5)) = %(50 + (-22.5)) = %27.5
Max. Out = %(50 + (+4.5V * 5)) = %(50 + (+22.5)) = %72.5

2.5.5.5 TRANS-AMF.SYNCRO TO KATO AVR CONNECTION

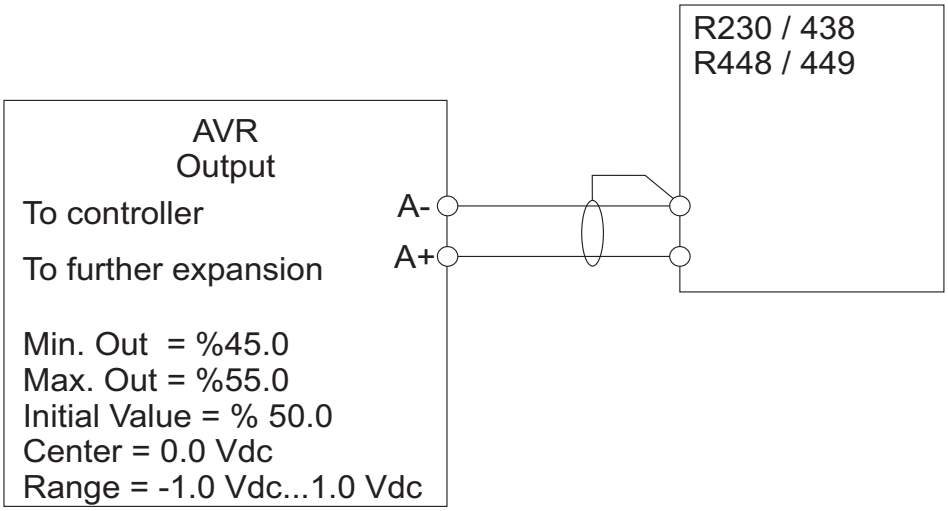
2.5.5.5.1 K65-12B, K125-10B



Min. Out = %(50 + (-1.0V * 5)) = %(50 + (-5.0)) = %45.0
Max. Out = %(50 + (+1.0V * 5)) = %(50 + (+5.0)) = %55.0

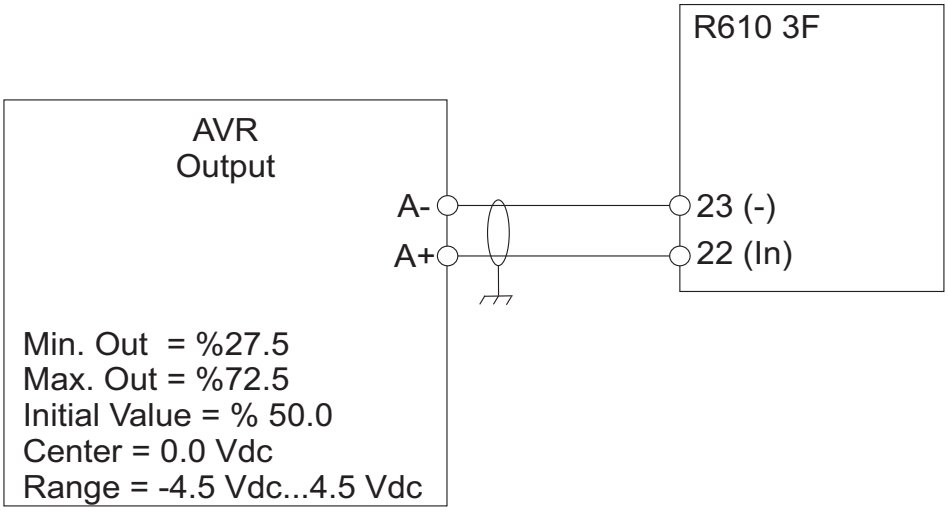
2.5.5.6 TRANS-AMF.SYNCRO TO LEROY SOMER AVR CONNECTION

2.5.5.6.1 R230 / R438 /R448 / R449



Min. Out = %(50 + (-1.0V * 5)) = %(50 + (-5.0)) = %45.0
Max. Out = %(50 + (+1.0V * 5)) = %(50 + (+5.0)) = %55.0

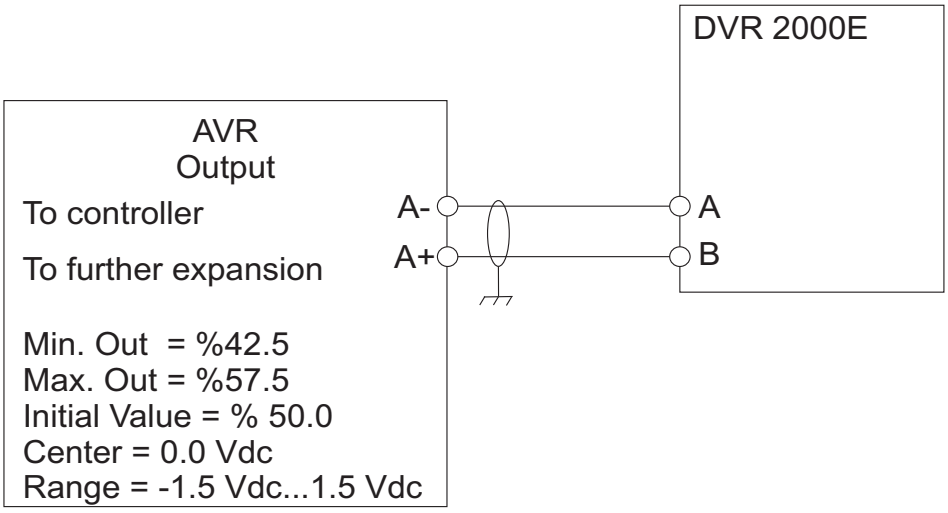
2.5.5.6.2 R610 3F



Min. Out = %(50 + (-4.5V * 5)) = %(50 + (-22.5)) = %27.5
Max. Out = %(50 + (+4.5V * 5)) = %(50 + (+22.5)) = %72.5

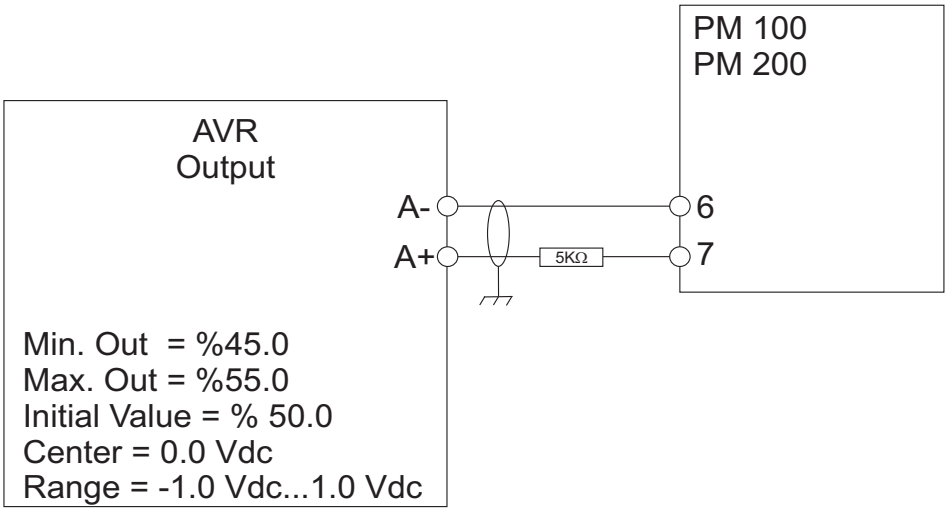
2.5.5.7 TRANS-AMF.SYNCRO TO MARATHON AVR CONNECTION

2.5.5.7.1 MAGNAMAX DVR2000E



Min. Out = %(50 + (-1.5V * 5)) = %(50 + (-7.5)) = %42.5
Max. Out = %(50 + (+1.5V * 5)) = %(50 + (+7.5)) = %57.5

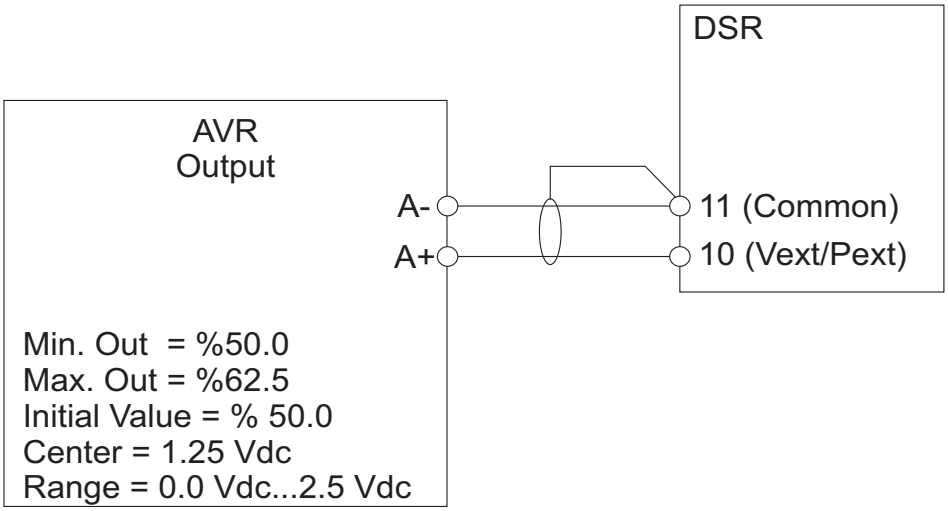
2.5.5.7.2 PM100 / PM 200



Min. Out = %(50 + (-1.0V * 5)) = %(50 + (-5.0)) = %45.0
Max. Out = %(50 + (+1.0V * 5)) = %(50 + (+5.0)) = %55.0

2.5.5.8 TRANS-AMF.SYNCRO TO MECC ALTE S.P.A AVR CONNECTION

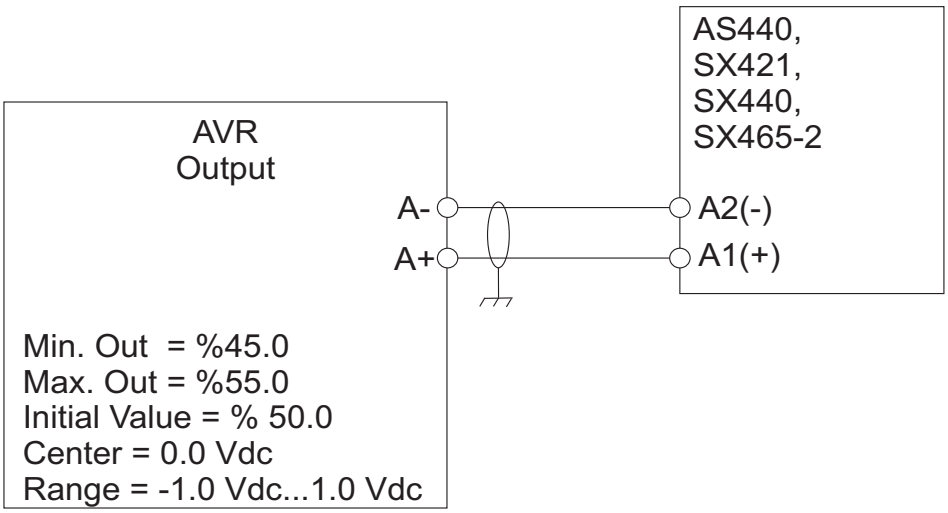
2.5.5.8.1 DSR DIGITAL REGULATOR



Min. Out = %(50 + (0.0V * 5)) = %(50 + (0.0)) = %50.0
Max. Out = %(50 + (+2.5V * 5)) = %(50 + (+12.5)) = %62.5

2.5.5.9 TRANS-AMF.SYNCRO TO NEWAGE INTERNATIONAL AVR CONNECTION

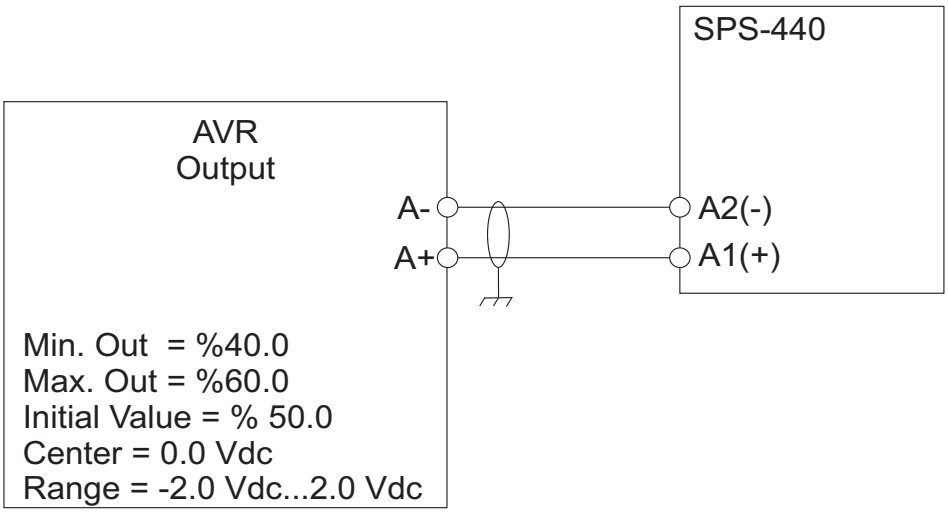
2.5.5.9.1 AS440, SX421, SX440, SX465-2



Min. Out = %(50 + (-1.0V * 5)) = %(50 + (-5.0)) = %45.0
Max. Out = %(50 + (+1.0V * 5)) = %(50 + (+5.0)) = %55.0

2.5.5.10 TRANS-AMF.SYNCRO TO SPS AVR CONNECTION

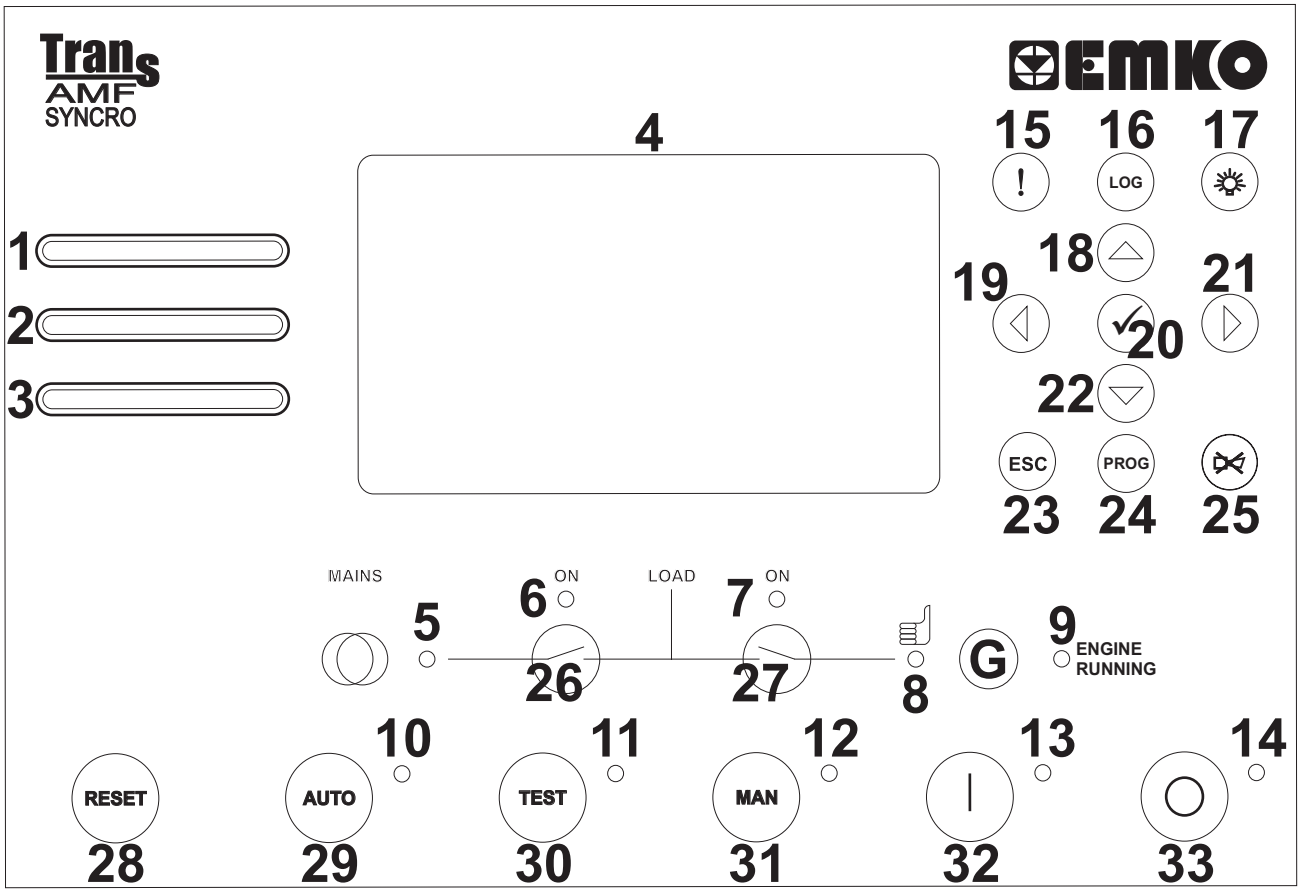
2.5.5.10.1 SPS-440



Min. Out = %(50 + (-2.0V * 5)) = %(50 + (-10.0)) = %40.0
Max. Out = %(50 + (+2.0V * 5)) = %(50 + (+10.0)) = %60.0

3. Front Panel Description And Accessing To The Parameters

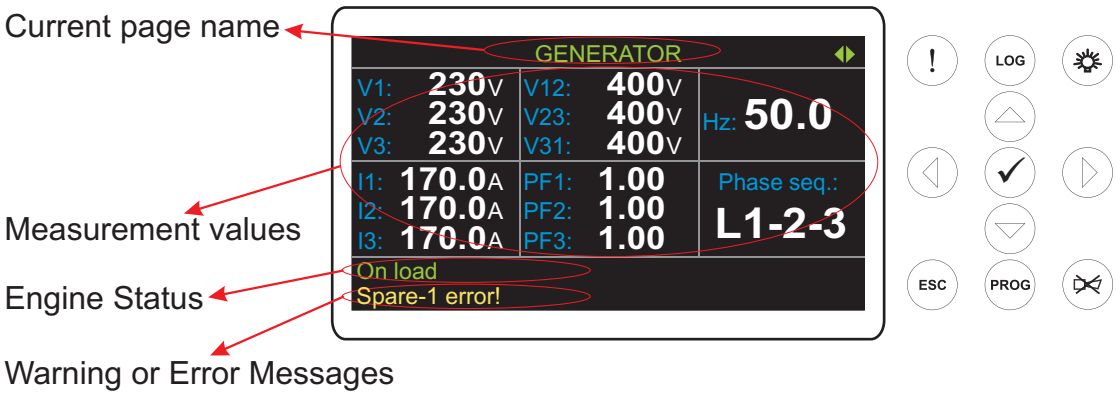
3.1 Front Panel Description



Number	Comment
1	This LED indicates that a "Shutdown" alarm was detected.
2	This LED indicates that a "Warning" alarm was detected
3	This LED indicates that a "Maintenance" alarm was detected
4	This LCD display is used for displaying the electrical measurements during normal operation, and editing/inspecting programming parameters in program mode.
5	This LED indicates that mains voltage and frequency is within limits.
6	This LED shows that the load is supplied from the mains.
7	This LED shows that the load is supplied from the generator.
8	This LED indicates that generator voltage and frequency is within limits and is ready to take over the load.
9	This LED indicates that the engine has started and is running.
10	This LED shows that the unit is in the AUTO mode.
11	This LED shows that the unit is in the TEST mode.
12	This LED shows that the unit is in the MANUAL mode.
13	In the MAN, AUTO and TEST modes, this LED indicates that the engine is starting up or is running.
14	This LED shows that the unit is in the STOP mode.
15	Warning and Alarm messages shortcut button.
16	Event Logs shortcut button.
17	The LAMP TEST button illuminates all LED indicators.

Number	Comment
18	This button is used for showing previous parameters on the currently selected page in normal operation. In Programming mode, it operates as an Up button (changing cursor position) or Increment button (increase parameter value).
19	This button is used for showing previous page in normal operation. In Programming mode, it operates as an Left button (changing cursor position).
20	This button is used for entering parameter edit section and saving parameter value in programming mode.
21	This button is used for showing next page in normal operation. In Programming mode, it operates as an Right button (changing cursor position).
22	This button is used for showing next parameters on the currently selected page in normal operation. In Programming mode, it operates as an Down button (changing cursor position) or Decrement button (decrease parameter value).
23	The Escape button is used for exit previous section in programming mode.
24	When this button is pressed, the unit goes into its PROGRAMMING Mode.
25	This button will silence the alarm horn after a failure has been detected. Additionaly in Manual mode when held pressed for 5 seconds, the unit will switch to GOV & AVR AUTO ADJUST mode.
26	This button opens or closes the mains circuit breaker (MCB) on manual mode.
27	This button opens or closes the generator circuit breaker (GCB) on manual mode.
28	This button will reset the controller after a failure has been detected.
29	The AUTO button is used for changing operating mode of the unit to the AUTO Mode.
30	The TEST button is used for changing operating mode of the unit to the TEST Mode.
31	The MAN button is used for changing operating mode of the unit to the MANUAL Mode.
32	The START button is used for starting the engine when the unit is in the Manual Mode.
33	The STOP button is used for changing operating mode of the unit to the STOP Mode. The generator is stopped.

LCD display Description



480x272 pixels 4.3" colored TFT.

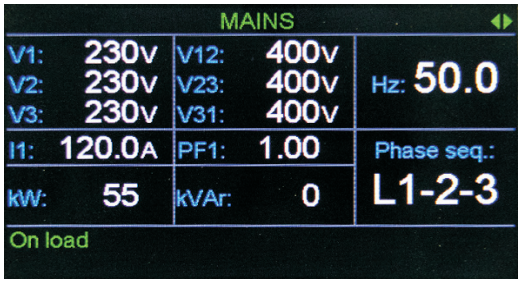
Use the Next and Previous buttons to select which Data display page (screen) is to be displayed.

When the Alarm (!) shortcut button is pressed, the Warning & Alarm display page is displayed.

When the Event log (LOG) shortcut button is pressed, the Event Log display page is displayed.

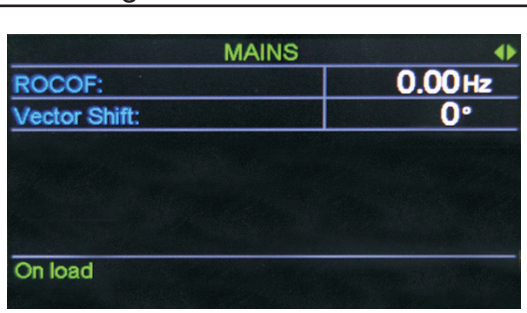
Data display pages on the LCD display;

Mains Page1:



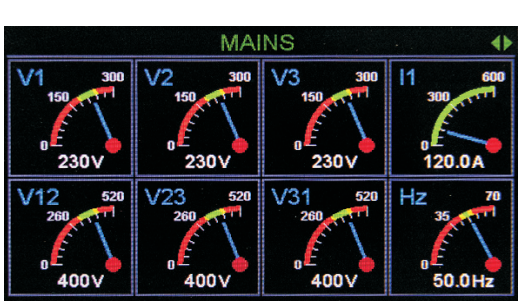
V1, V2, V3: Mains voltage L1-N, L2-N, L3-N
V12: Mains voltage L1-L2
V23: Mains voltage L2-L3
V31: Mains voltage L3-L1
I1: Mains current L1
PF1: Mains power factor L1
Hz: Mains frequency
Phase seq.: Mains phase sequence
kW: Mains total active power
kVAr: Mains total reactive power

Mains Page2:



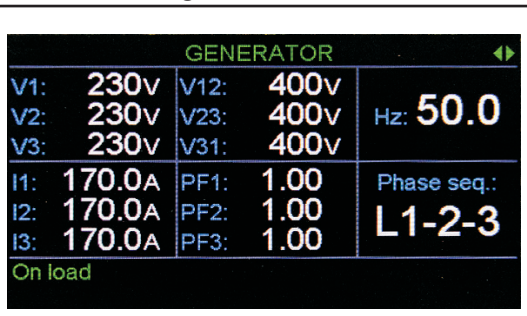
ROCOF: Rate of change of mains frequency
Vector Shift: Vector shift of mains frequency

Mains Page3:



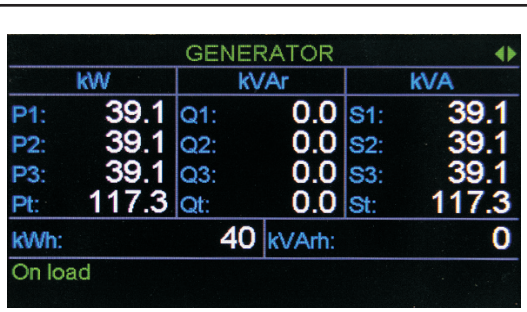
V1: Mains voltage L1-N
V2: Mains voltage L2-N
V3: Mains voltage L3-N
I1: Mains current L1
V12: Mains voltage L1-L2
V23: Mains voltage L2-L3
V31: Mains voltage L3-L1
Hz: Mains frequency

Generator Page1:



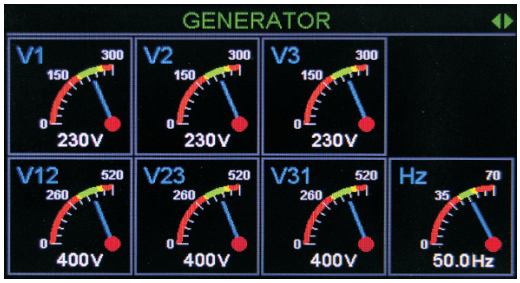
V1, V2, V3: Generator voltage L1-N, L2-N, L3-N
V12: Generator voltage L1-L2
V23: Generator voltage L2-L3
V31: Generator voltage L3-L1
I1, I2, I3: Generator current L1, L2, L3
PF1, PF2, PF3: Generator power factor L1, L2, L3
Hz: Generator frequency
Phase seq.: Generator phase sequence

Generator Page2:



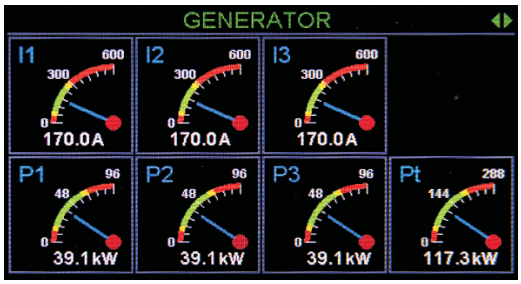
P1, P2, P3: Generator active power L1, L2, L3
Pt: Generator total active power
Q1, Q2, Q3: Generator reactive power L1, L2, L3
Qt: Generator total reactive power
S1, S2, S3: Generator apparent power L1, L2, L3
St: Generator total apparent power
kWh: Generator active energy
KVArh: Generator reactive energy

Generator Page3:



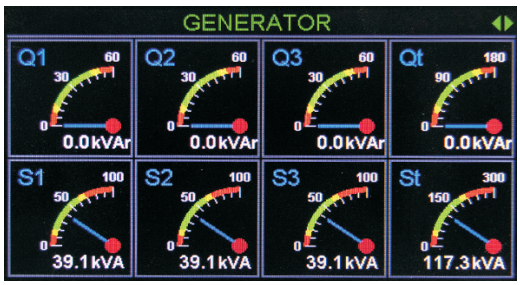
V1: Generator voltage L1-N
V2: Generator voltage L2-N
V3: Generator voltage L3-N
V12: Generator voltage L1-L2
V23: Generator voltage L2-L3
V31: Generator voltage L3-L1
Hz: Generator frequency

Generator Page4:



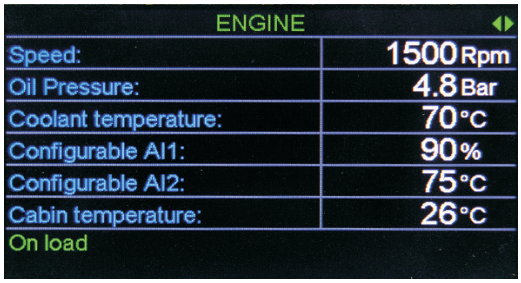
I1: Generator current L1
I2: Generator current L2
I3: Generator current L3
P1: Generator active power L1
P2: Generator active power L2
P3: Generator active power L3
Pt: Generator total active power

Generator Page5:



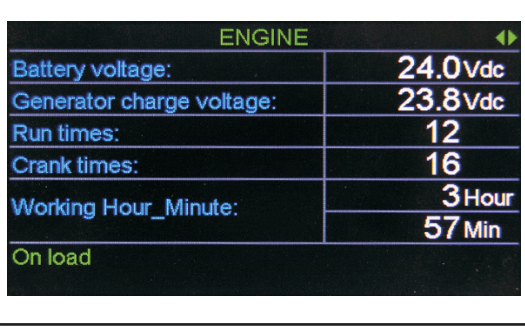
Q1: Generator reactive power L1
Q2: Generator reactive power L2
Q3: Generator reactive power L3
Qt: Generator total reactive power
S1: Generator apparent power L1
S2: Generator apparent power L2
S3: Generator apparent power L3
St: Generator total apparent power

Engine Page1:



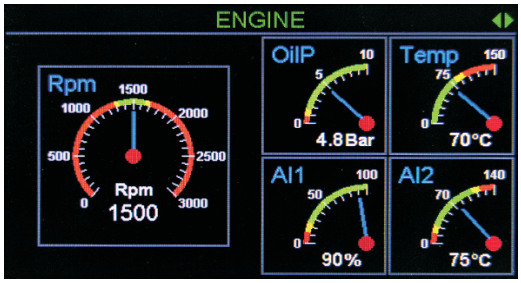
Speed: Engine speed
Oil pressure: Oil pressure sender input value
Coolant temperature: Coolant temperature sender input value
Configurable AI1: Configurable Analog Input-1 value
Configurable AI2: Configurable Analog Input-2 value
Cabin temperature: Cabin temperature

Engine Page2:



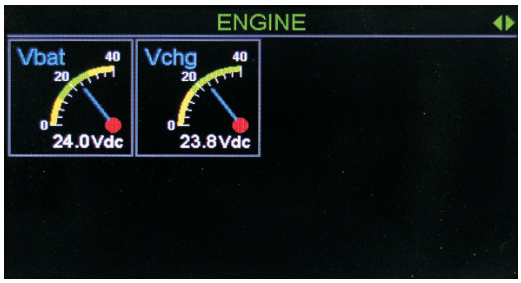
Battery voltage: Battery supply voltage
Generator charge voltage: Charge generator voltage
Run times: Number of generator runs
Crank times: Number of generator starts
Working Hour_Minute: Engine running time (Hour and Minute)

Engine Page3:



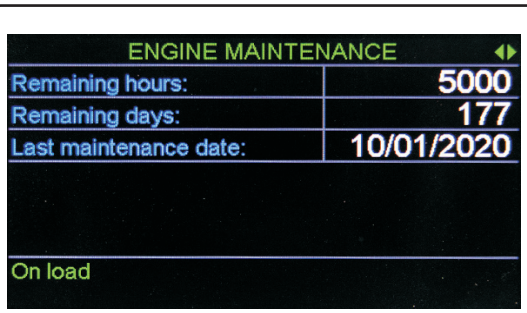
Rpm: Engine speed
OilP: Oil pressure sender input value
Temp: Coolant temperature sender input value
AI1: Configurable Analog Input-1 value
AI2: Configurable Analog Input-2 value

Engine Page4:



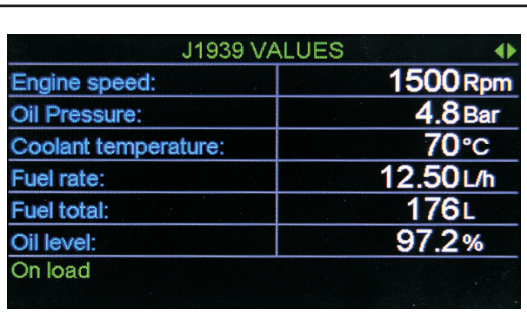
Vbat: Battery supply voltage
Vchg: Charge generator voltage

Engine Maintenance Page:



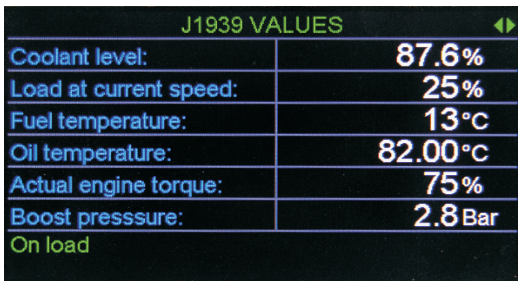
Remaining hours: The remaining hour for maintenance
Remaining days: The remaining day for maintenance
Last maintenance date: The last maintenance date

J1939 Values Page1:



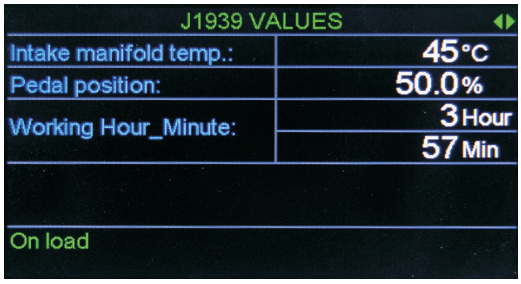
Engine speed: Engine speed via J1939
Oil pressure: Oil pressure via J1939
Coolant temperature: Coolant temperature via J1939
Fuel rate: Fuel rate via J1939
Fuel total: Fuel total via J1939
Oil level: Oil level via J1939

J1939 Values Page2:



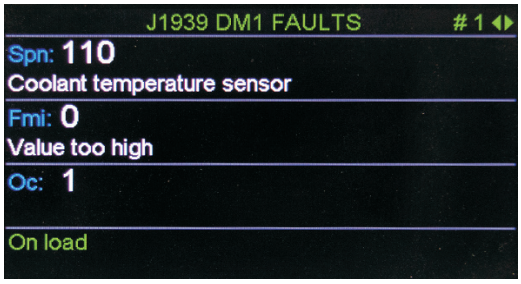
Coolant level: Coolant level via J1939
Load at current speed: Load at current speed via J1939
Fuel temperature: Fuel temperature via J1939
Oil temperature: Oil temperature via J1939
Actual engine torque: Actual engine torque via J1939
Boost pressure: Boost pressure via J1939

J1939 Values Page3:



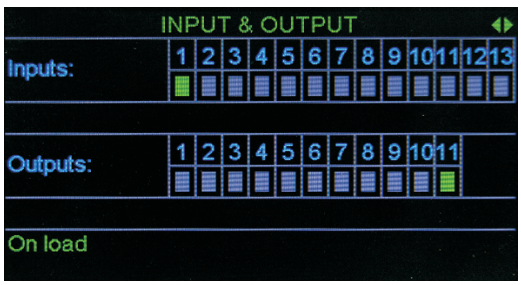
Intake manifold temp.: Intake manifold temperature via J1939
Pedal position: Accelerator pedal position via J1939
Working Hour_Minute: Working hour and minute via J1939

J1939 DM1 Faults Page:



Spn: Suspect parameter number (e.g. SPN = 110 corresponds to coolant temperature sensor)
Fmi: Failure mode identifier (e.g. FMI = 0 means value too high)
Oc: Occurrence count (if OC = 0, no alarm is present)
The first 10 active alarm messages (Active Diagnostic Trouble Codes - DM1) with SPN, FMI, and OC are displayed). If more than one active fault condition is present, all of them is displayed sequencely by pressing Next and Previous buttons.

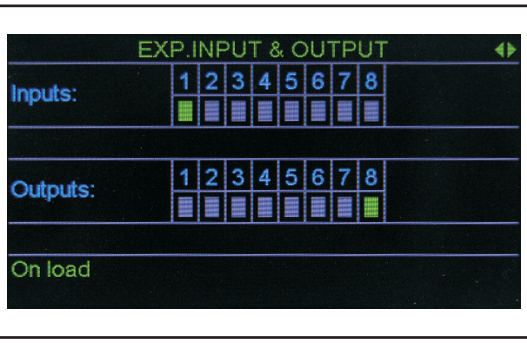
Input & Output Status Page:



Inputs: Input status information. If an input is active, the related box is displayed as "green", otherwise "gray".
1: Conf. in-1, **2:** Conf. in-2, **3:** Conf. in-3,
4: Conf. in-4, **5:** Conf. in-5, **6:** Conf. in-6,
7: Conf. in-7, **8:** Conf. in-8, **9:** Conf. in-9,
10: Conf. in-10, **11:** Conf. in-11, **12:** Conf. in-12,
13: Conf. in-13

Outputs: Output status information. If an output is active, the related box is displayed as "green", otherwise "gray".
1: Conf. out-1, **2:** Conf. out-2, **3:** Conf. out-3,
4: Conf. out-4, **5:** Conf. out-5, **6:** Conf. out-6,
7: Conf. out-7, **8:** Conf. out-8, **9:** Conf. out-9,
10: Mains contactor, **11:** Gen. contactor

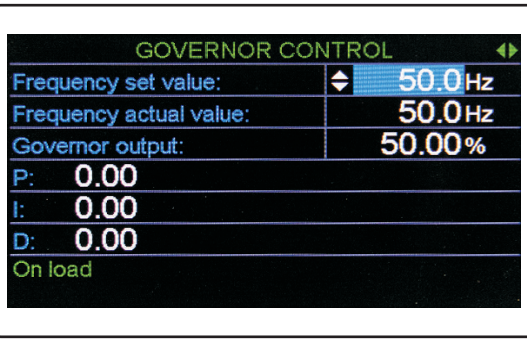
Exp. Input & Output Status Page:



Inputs: Exp. input status information. If an input is active, the related box is displayed as "green", otherwise "gray".
1: Exp. conf. in-1, **2:** Exp. conf. in-2, **3:** Exp. conf. in-3,
4: Exp. conf. in-4, **5:** Exp. conf. in-5, **6:** Exp. conf. in-6,
7: Exp. conf. in-7, **8:** Exp. conf. in-8.

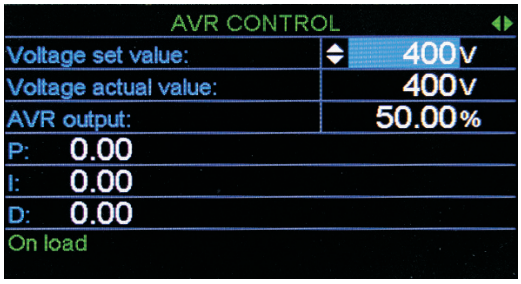
Outputs: Exp. output status information. If an output is active, related box is displayed as "green", otherwise "gray".
1: Exp. conf. out-1, **2:** Exp. conf. out-2, **3:** Exp. conf. out-3,
4: Exp. conf. out-4, **5:** Exp. conf. out-5, **6:** Exp. conf. out-6,
7: Exp. conf. out-7, **8:** Exp. conf. out-8.

Governor Control Page:



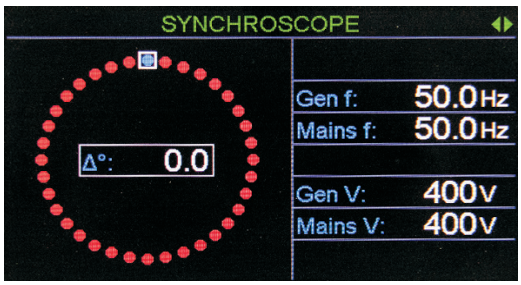
Frequency set value: Manual frequency control set
Frequency actual value: Frequency actual value
Governor output: Governor output actual value
P: Proportional
I: Integral
D: Derivative

AVR Control Page:



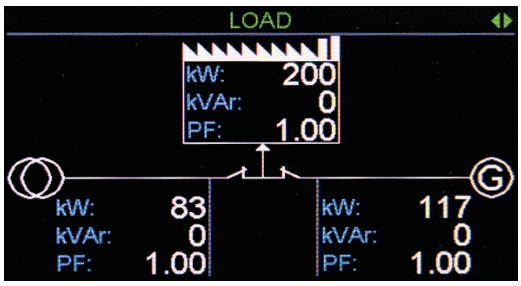
Voltage set value: Manual voltage control set
Voltage actual value: Voltage actual value
AVR output: AVR output actual value
P: Proportional
I: Integral
D: Derivative

Synchroscope Page:



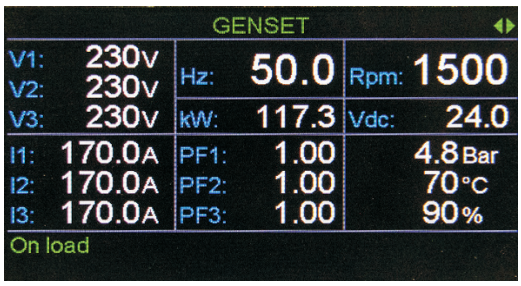
Gen f: Generator frequency
Mains f: Mains frequency
Gen V: Generator voltage
Mains V: Mains voltage
Δ°: The difference between generator phase and mains phase

Load Sharing Page:



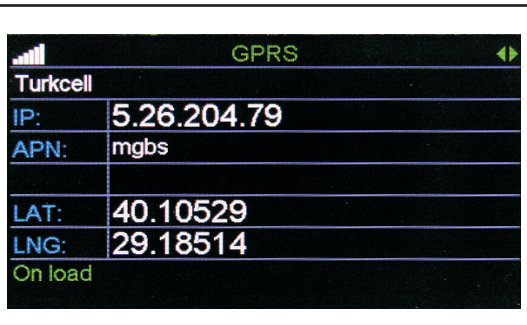
Load kW: Load total active power
Load kVAr: Load total reactive power
Load PF: Load average power factor
Mains kW: Mains total active power
Mains kVAr: Mains total reactive power
Mains PF: Mains average power factor
Generator kW: Generator total active power
Generator kVAr: Generator total reactive power
Generator PF: Generator average power factor

GenSet Page:



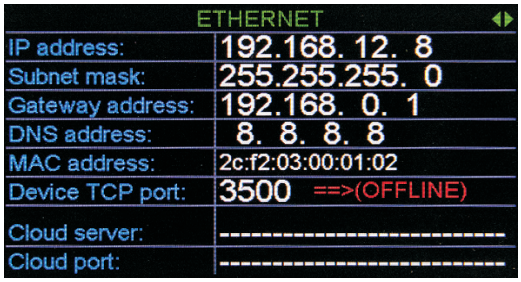
V1, V2, V3: Generator voltage L1-N, L2-N, L3-N
I1, I2, I3: Generator current L1, L2, L3
Hz: Generator frequency
kW: Generator total active power
PF1, PF2, PF3: Generator power factor L1, L2, L3
Rpm: Engine speed
Vdc: Battery supply voltage
Bar: Oil pressure sender input value
°C: Coolant temperature sender input value
%: Configurable Analog Input-1 value

GPRS Page:



Signal Quality: Signal Quality level indicator
Operator Name: Operator name
IP: Device IP value
APN: Access point name of the operator
LAT: Latitude value of device's position
LNG: Longtitude value of device's position

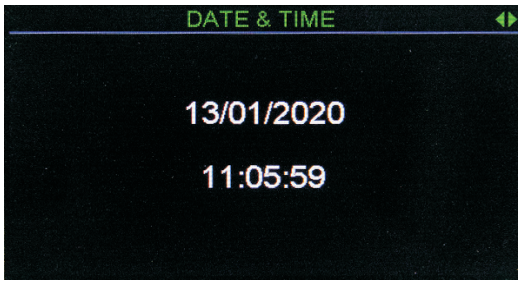
Ethernet Page:



IP address: Device IP address.
Subnet mask: Subnet mask.
Gateway address: Gateway IP address.
DNS address: DNS address.
MAC address: Device MAC address.
Device TCP port: Device TCP port number.

Cloud server: Cloud server name.
Cloud port: Cloud port number.

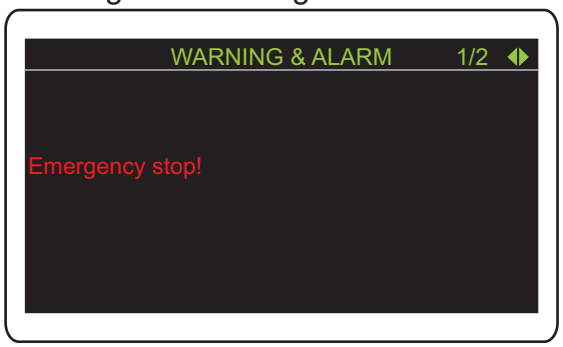
Date & Time Page:



Date: Day, Month, Year.
Time: Hour, minute, second.

Warning & Alarm display pages on the LCD display;

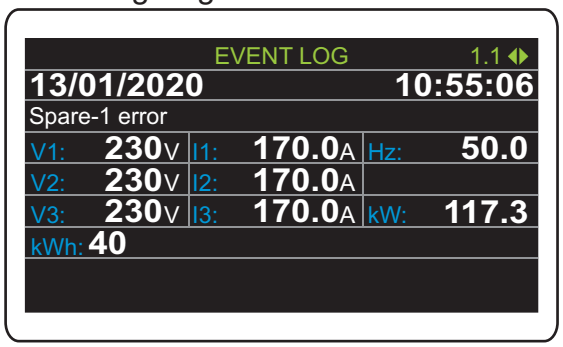
Warning & Alarm Page:



1/2: The first message of current alarms.
Emergency stop!: This message indicates that an emergency stop alarm has occurred.

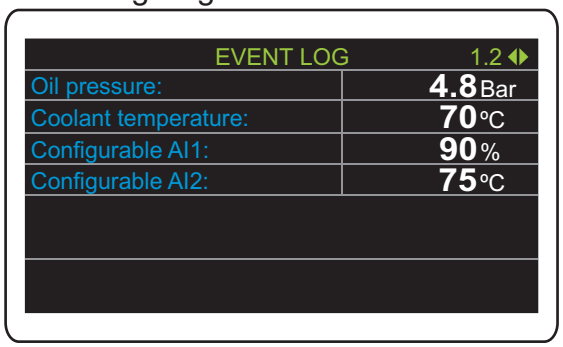
Event Log display pages on the LCD display;

Event Log Page1:



1.1: The first page of related event log
Spare-1 error: This message indicates that a spare-1 alarm has occurred. (Event history: 13/01/2020 date, 10:55:06 time).
V1, V2, V3: Generator voltage L1-N, L2-N, L3-N
I1, I2, I3: Generator current L1, L2, L3
Hz: Generator frequency
kW: Generator total active power
kWh: Generator active energy

Event Log Page2:

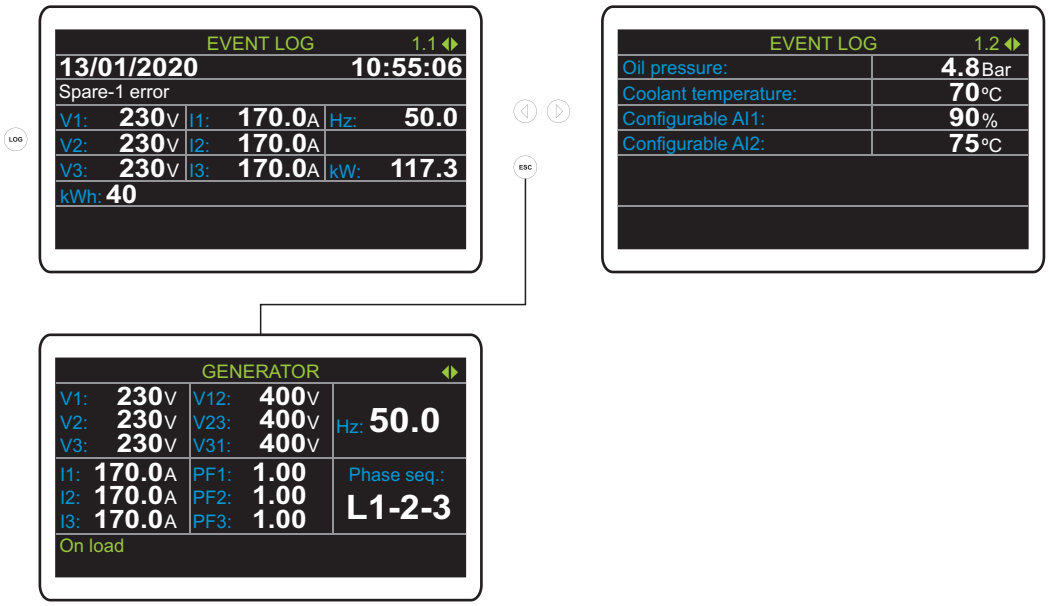


1.2: The second page of related event log
Oil pressure: Oil pressure sender input value
Coolant temperature: Coolant temperature sender input value
Configurable AI1: Configurable Analog Input-1 value
Configurable AI2: Configurable Analog Input-2 value

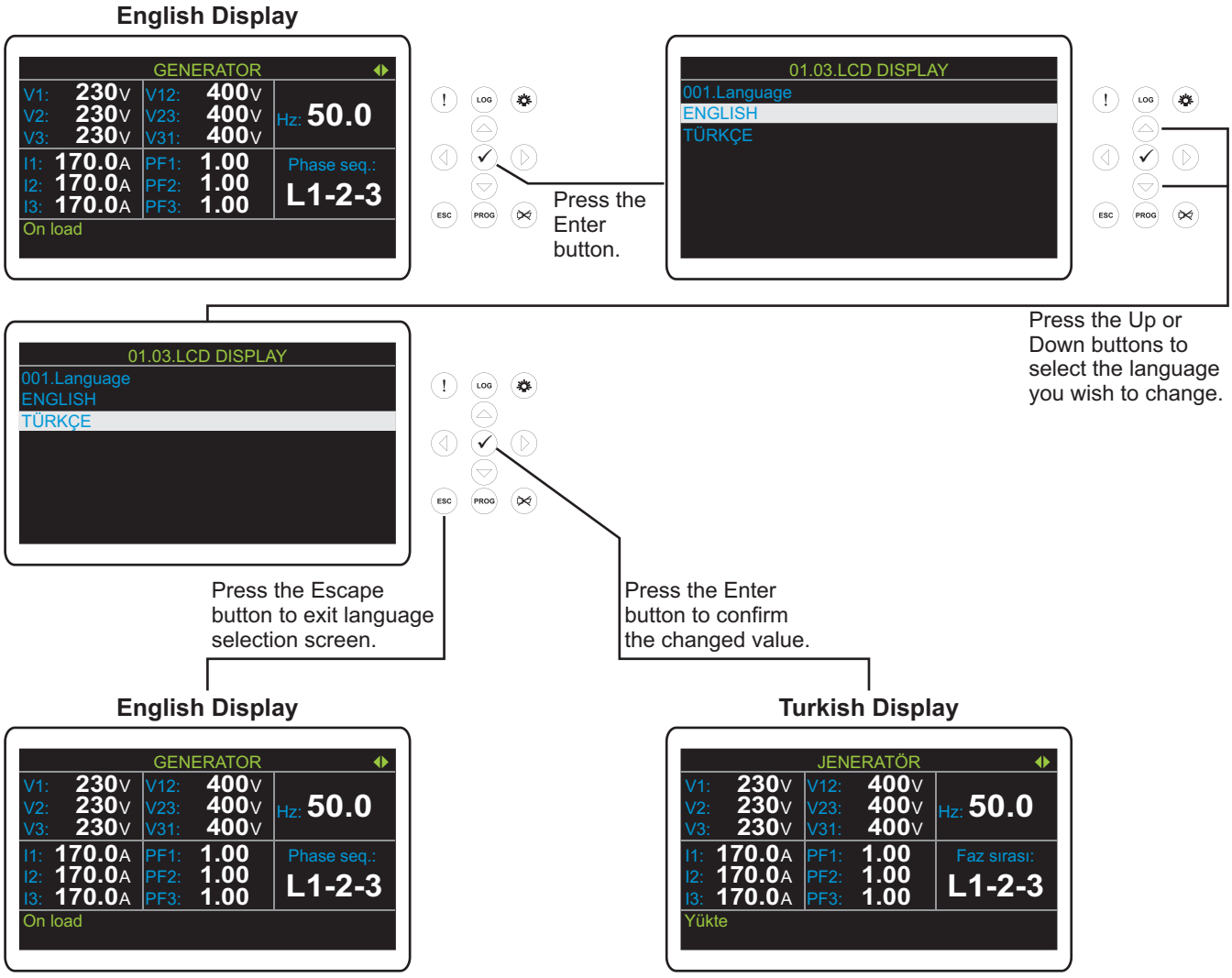
Example-1: Displaying all Data display pages.

Example-2: Displaying all Warning&Alarm display pages

Example-3: Displaying all Event Log display pages

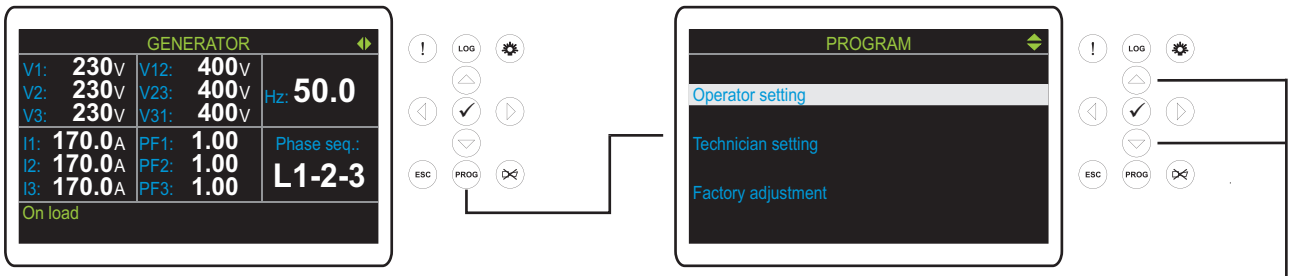


LCD display language selection



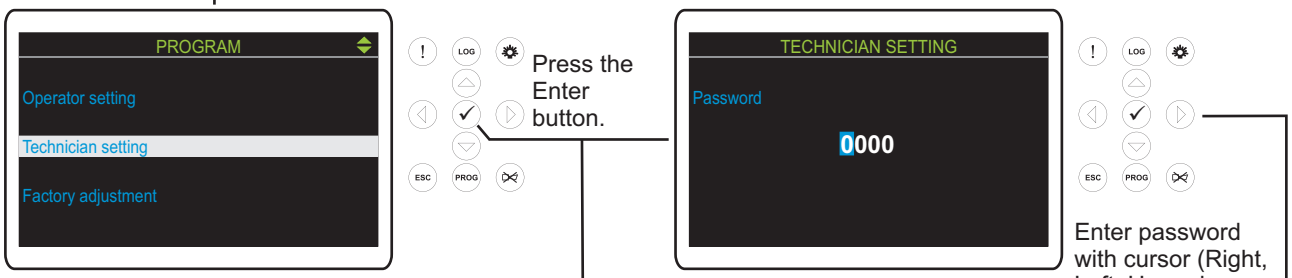
3.2 Changing And Saving Parameters Values

Operation Screen



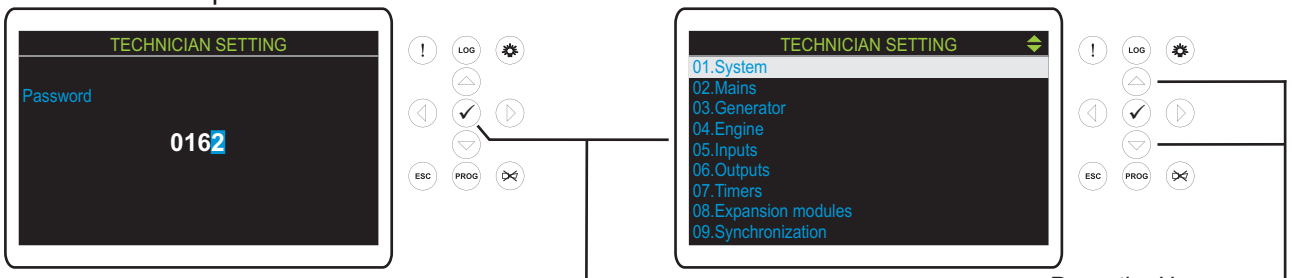
When the Prog button is pressed, the parameters section is asked for accessing to parameters.

Press the Up or Down buttons to select the section you wish to view/change.



Press the Enter button.

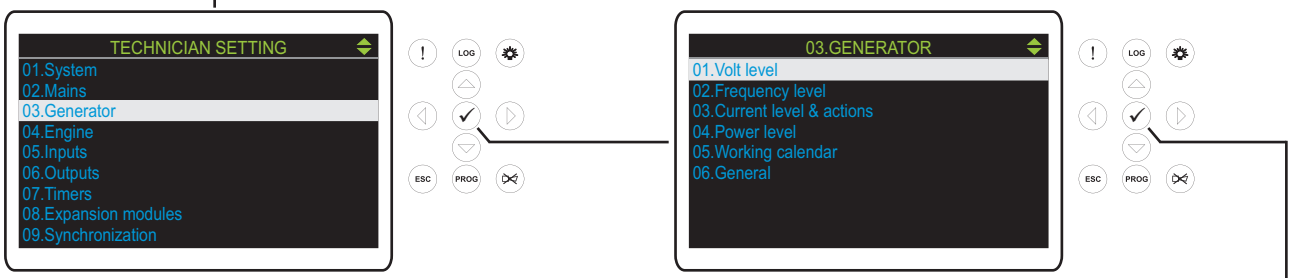
Enter password with cursor (Right, Left, Up and Down) buttons.



Note1: If Enter button is pressed and the technician password is zero, Password screen is ignored.

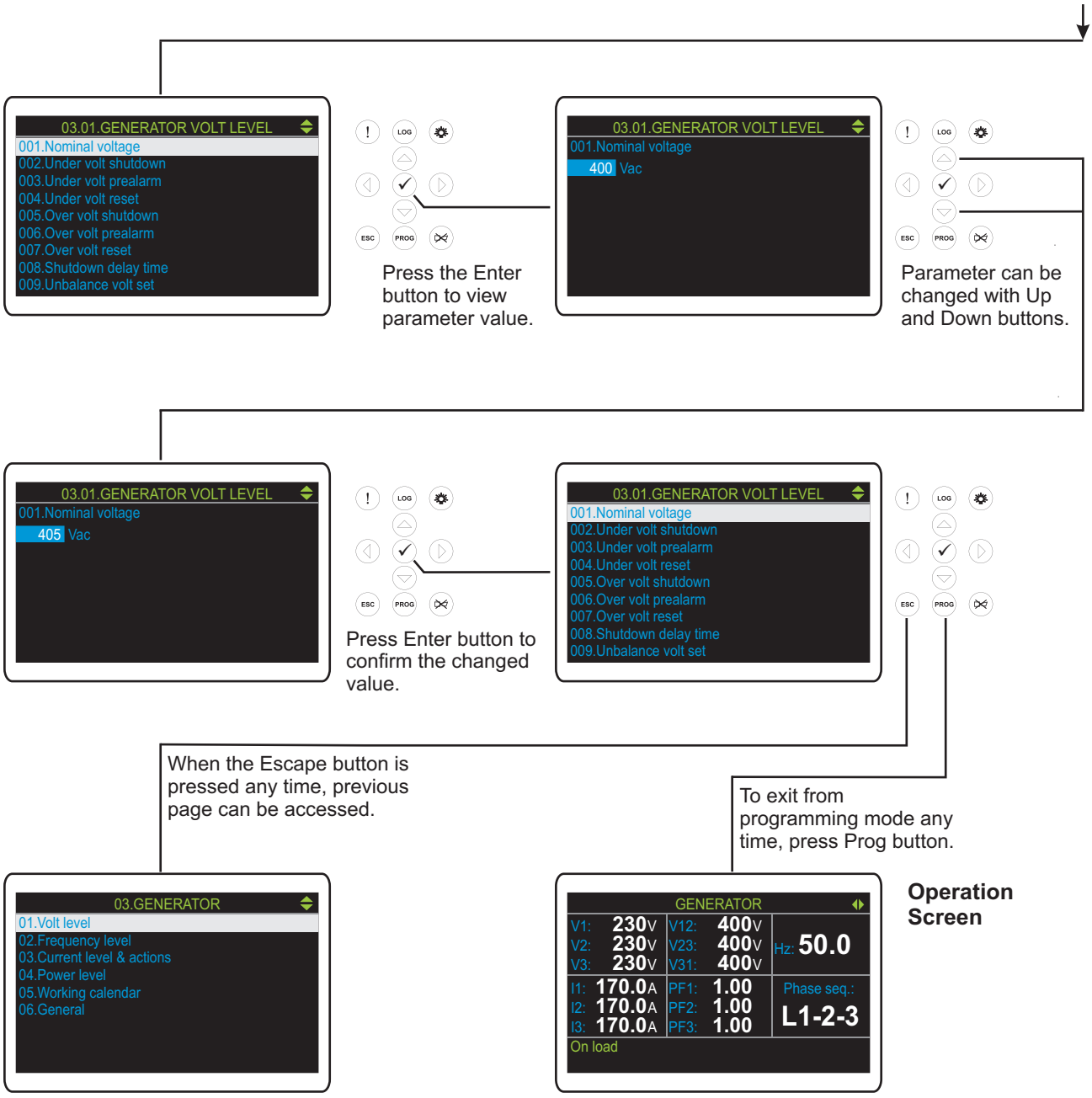
Press the Enter button to confirm password. If the password is incorrect, the unit will drop out of program mode.

Press the Up or Down buttons to select the main parameter group you wish to view/change.



Press Enter button to access to all parameters page in currently main parameter group.

Press Enter button to access to all parameters in currently parameter page.


03.01.GENERATOR VOLT LEVEL
001.Nominal voltage
002.Under volt shutdown
003.Under volt prealarm
004.Under volt reset
005.Over volt shutdown
006.Over volt prealarm
007.Over volt reset
008.Shutdown delay time
009.Unbalance volt set
Press the Enter button to view parameter value.
03.01.GENERATOR VOLT LEVEL
001.Nominal voltage
400 Vac
Parameter can be changed with Up and Down buttons.
03.01.GENERATOR VOLT LEVEL
001.Nominal voltage
405 Vac
Press Enter button to confirm the changed value.
03.01.GENERATOR VOLT LEVEL
001.Nominal voltage
002.Under volt shutdown
003.Under volt prealarm
004.Under volt reset
005.Over volt shutdown
006.Over volt prealarm
007.Over volt reset
008.Shutdown delay time
009.Unbalance volt set
When the Escape button is pressed any time, previous page can be accessed.
To exit from programming mode any time, press Prog button.
03.GENERATOR
01.Volt level
02.Frequency level
03.Current level & actions
04.Power level
05.Working calendar
06.General
GENERATOR
V1: 230V
V2: 230V
V3: 230V
V12: 400V
V23: 400V
V31: 400V
Hz: 50.0
I1: 170.0A
I2: 170.0A
I3: 170.0A
PF1: 1.00
PF2: 1.00
PF3: 1.00
Phase seq.:
L1-2-3
On load
Operation Screen

4. Operation

Selection of the unit's operating mode is done via the mode buttons on the front panel or via the remote monitoring and control software.

4.1 Stop Mode

The Stop mode is activated by pressing the "Stop" button.

In this mode, the unit will remove the generator circuit breaker (GCB) from load before remove the start request from the genset.

Any latched alarms that have been cleared are reset when this mode is entered.

The genset will not be started by the unit when in this mode. If remote start signals are given or the mains supply fails, the start request is not sent to the genset until the Auto mode is entered.

The mains circuit breaker (MCB) will be energized (if the "02.03.002.Mains failure at stop mode" parameter is selected as "Disable") or will be energized or de-energized according to the mains is OK or not (if the "02.03.002.Mains failure at stop mode" parameter is selected as "Enable").

4.2 Manual Mode

The Manual mode is activated by pressing the "Man" button.

This mode allows the user to start and stop the genset manually, and change the state of the mains circuit breaker (MCB) and the generator circuit breaker (GCB).

4.2.1 Manual Start

When in manual mode, the genset will not start automatically.

To begin the genset starting sequence;

- Press the "Start"button.

- The unit will initiate the start sequence (the Fuel Solenoid is energised, and then 2 second later, the Starter Motor is engaged).

- The genset will run and then the "Genset Okay" Led on the unit will light on.

- Now, the load may be transferred manually by using the MCB and GCB buttons.

If the soft transfer mode is active;

Press the GCB button. Firstly the genset will synchronize to the mains, then the load is ramped to the genset and the mains circuit breaker (MCB) is de-energized.

Press the MCB button. Firstly the genset will synchronize to the mains, then the load is ramped to the mains and the generator circuit breaker (GCB) is de-energized.

4.2.2 Manual Stop

To begin the genset stopping sequence;

- Press the "Stop" button.

- The generator circuit breaker (GCB) will de-energized.

- The genset will run off load during the engine cooling period.

- The Fuel Solenoid will de-energized.

- The genset will stop.

4.3 Auto Mode

The Auto mode is activated by pressing the “Auto” button.

This mode allows the genset to be automatically started and stopped and run parallel to the mains without the need for user intervention.

4.3.1 Auto Start Sequence

If the unit is in auto mode and there is a starting request, the start sequence will begin.

The starting requests may be from the following sources;

- Mains supply out of limits.

- High mains load condition (when the “09.10.003.Load control mode” parameter is configured as automatic peak lopping system like that “0-Import Power”).

- When the “09.10.003.Load control mode” parameter is configured as always parallel operation like that “1-Export Power” or “2-Contant Power”.

- Activation of an configurable input that has been configured to “0-Remote start on load” or “1-Remote start off load”.

- Activation of an configurable input that has been configured to “2-Auxiliary mains failure”.

- Activation of the exercise scheduler.

- Activation of the informed mains interruption feature.

If a start request is still present at the end of the start delay timer;

- The unit will initiate the start sequence (the Fuel Solenoid is energised, and then 2 second later, the Starter Motor is engaged).

- The genset will run and then the “Genset Okay” Led on the unit will light on.

- Now, the load is transferred automatically. If required, the genset is first synchronised with the mains supply. Also, the load ramping occurs when required.

- The unit controls the genset to provide the configured power (according to the contents of the “09.10.003.Load control mode" and “09.10.004.Load control set" parameters) to the load or mains supply.

4.3.2 Auto Stop Sequence

If there are no starting requests at the end of the return delay timer;

- The load is transferred back from the genset to the mains supply.

- The genset will run off load during the engine cooling period.

- The Fuel Solenoid will de-energized.

- The genset will stop.

4.4 Test Mode

The Test mode is activated by pressing the “Test” button.

This mode allows for testing of the genset off load. All alarm circuits will operate so that any faults will be reported. If a mains failure occurs while the unit is in this mode, the unit will revert to Auto mode and will transfer the load to the genset.

5. Parameters

5.1 Operator Parameters

5.1.1 Mains

02.01.MAINS VOLT LEVEL (*Mains->Volt level*)		Min	Max	Default	Unit
001.Under volt trip	Mains Under Voltage	60	600	320	V~
002.Under volt return	Mains Under Voltage Return	60	600	340	V~
003.Over volt trip	Mains Over Voltage	60	600	440	V~
004.Over volt return	Mains Over Voltage Return	60	600	420	V~

The unit uses the above parameters to decide whether the mains is okay or fail.

If the mains voltage is above the "Over volt trip" parameter or is below the “Under volt trip" parameter, the "Mains Okay Led" will light off.
If the mains voltage is below the "Over volt return" parameter and is above the “Under volt return" parameter, the "Mains Okay Led" will light on.

In Automatic mode, the unit uses these parameters to switch the load between the mains and genset.

02.02.MAINS FREQ. LEVEL (*Mains->Frequency level*)		Min	Max	Default	Unit
001.Under freq trip	Mains Under Frequency	20.0	75.0	45.0	Hz
002.Under freq return	Mains Under Frequency Return	20.0	75.0	48.0	Hz
003.Over freq trip	Mains Over Frequency	20.0	75.0	55.0	Hz
004.Over freq return	Mains Over Frequency Return	20.0	75.0	52.0	Hz

The unit uses the above parameters to decide whether the mains is okay or fail.

If the mains frequency is above the "Over freq trip" parameter or is below the “Under freq trip" parameter, the "Mains Okay Led" will light off.
If the mains frequency is below the "Over freq return" parameter and is above the “Under freq return" parameter, the "Mains Okay Led" will light on.

In Automatic mode, the unit uses these parameters to switch the load between the mains and genset.

5.1.2 Generator

03.01.GENERATOR VOLT LEVEL (*Generator->Volt level*)		Min	Max	Default	Unit
001.Nominal voltage	Nominal Voltage	60	600	400	V~
002.Under volt shutdown	Under Voltage Shutdown	60(dis)	600	320	V~
003.Under volt prealarm	Under Voltage Pre-Alarm	60(dis)	600	340	V~
004.Under volt reset	Under Voltage Pre-Alarm Reset	60	600	350	V~
005.Over volt shutdown	Over Voltage Shutdown	60	600	470	V~
006.Over volt prealarm	Over Voltage Pre-Alarm	60(dis)	600	450	V~
007.Over volt reset	Over Voltage Pre-Alarm Reset	60	600	430	V~
008.Shutdown delay time	Voltage Shutdown Delay Time	0.0	10.0	2.0	Sec
009.Unbalance volt set	Unbalance Volt Set	0	230	20	V~

Note: dis = disable

03.02.GENERATOR FREQ LEVEL (*Generator->Frequency level*)		Min	Max	Default	Unit
001.Nominal frequency	Nominal Alternator Frequency	30.0	75.0	50.0	Hz
002.Under freq shutdown	Under Frequency Shutdown	30.0(dis)	75.0	43.0	Hz
003.Under freq prealarm	Under Frequency Pre-Alarm	30.0(dis)	75.0	45.0	Hz
004.Under freq reset	Under Frequency Pre-Alarm Reset	30.0	75.0	46.0	Hz
005.Over freq shutdown	Over Frequency Shutdown	30.0(dis)	75.0	58.0	Hz
006.Over freq prealarm	Over Frequency Pre-Alarm	30.0(dis)	75.0	55.0	Hz
007.Over freq reset	Over Frequency Pre-Alarm Reset	30.0	75.0	54.0	Hz
008.Shutdown delay time	Frequency Shutdown Delay Time	0.0	10.0	2.0	Sec

03.03.GENERATOR CUR LEVEL (*Generator->Current level*)		Min	Max	Default	Unit
001.Under current set	Under Current Set	0	9999	0	A~
002.Under current prealarm	Under Current Pre-Alarm	0(dis)	9999	dis	A~
003.Under current reset	Under Current Pre-Alarm Reset	0	9999	5	A~
006.Over current set	Over Current Set	0	9999	9999	A~
007.Over current prealarm	Over Current Pre-Alarm	0(dis)	9999	dis	A~
008.Over current reset	Over Current Pre-Alarm Reset	0	9999	9980	A~

03.04.GEN POWER LEVEL (*Generator->Power level*)		Min	Max	Default	Unit
001.Under power set	Under Power Set	0	9999	0	kVA
002.Under power prealarm	Under Power Pre-Alarm	0(dis)	9999	dis	kVA
003.Under power reset	Under Power Pre-Alarm Reset	0	9999	5	kVA
006.Over power set	Over Power Set	0	9999	0	kVA
007.Over power prealarm	Over Power Pre-Alarm	0(dis)	9999	dis	kVA
008.Over power reset	Over Power Pre-Alarm Reset	0	9999	0	kVA
011.Reverse power set	Reverse Power Set	-9999	0	-30	kW
014.Excitation loss set	Excitation Loss Set	-9999	0	-100	KVAr

03.05.GEN WORKING CALENDAR (*Generator->Working calendar*)		Min	Max	Default	Unit
001.Disable/enable select	Calendar Disable or Enable	DISBL/ENABL		DISBL	
002.Start time on Monday	Calendar Start Time on Monday	0.00	23.59	0.00	H.Min
003.Stop time on Monday	Calendar Stop Time on Monday	0.00	23.59	23.59	H.Min
004.Start time on Tuesday	Calendar Start Time on Tuesday	0.00	23.59	0.00	H.Min
005.Stop time on Tuesday	Calendar Stop Time on Tuesday	0.00	23.59	23.59	H.Min
006.Start time on Wednesday	Calendar Start Time on Wednesday	0.00	23.59	0.00	H.Min
007.Stop time on Wednesday	Calendar Stop Time on Wednesday	0.00	23.59	23.59	H.Min
008.Start time on Thursday	Calendar Start Time on Thursday	0.00	23.59	0.00	H.Min
009.Stop time on Thursday	Calendar Stop Time on Thursday	0.00	23.59	23.59	H.Min
010.Start time on Friday	Calendar Start Time on Friday	0.00	23.59	0.00	H.Min
011.Stop time on Friday	Calendar Stop Time on Friday	0.00	23.59	23.59	H.Min
012.Start time on Saturday	Calendar Start Time on Saturday	0.00	23.59	0.00	H.Min
013.Stop time on Saturday	Calendar Stop Time on Saturday	0.00	23.59	23.59	H.Min
014.Start time on Sunday	Calendar Start Time on Sunday	0.00	23.59	0.00	H.Min
015.Stop time on Sunday	Calendar Stop Time on Sunday	0.00	23.59	23.59	H.Min

Note: dis = disable

5.2 Technician Parameters

5.2.1 System

01.01.SYSTEM NETWORK (*System->Network*)		Min	Max	Default	Unit
001.Mains CT ratio	Mains Current Transformer Ratio	1	9999	100	
002.Generator CT ratio	Gen. Current Transformer Ratio	1	9999	100	
003.PT ratio	Voltage Transformer Ratio	0.1	500.0	1.0	
004.Type of AC system	0- 1 Phase 2 Wire 1- 3 Phase 4 Wire 2- 2 Phase 3 Wire L1-L2 3- 2 Phase 3 Wire L1-L3	0	3	1	
005.Phase sequence	System Phase Sequence	DISBL, L123, L321		L123	
006.Generator kVA rating	Generator kVA rating	0	9999	150	kVA
007.Power unit	Power unit	kVA/kW		kVA	
008.Mains kW rating	Mains kW Rating	0	9999	300	kW

Mains Current Transformer Ratio (001.Mains CT ratio)
Mains current transformer's transfer ratio (Primary current/Secondary current) value must be entered to this parameter.

Example:
If Current Transformer Primary=500A and Current Transformer Secondary=5A, Current Transformer Ratio should be entered CT Primary/CT Secondary=100.

Generator Current Transformer Ratio (002.Generator CT ratio)
Generator current transformer's transfer ratio (Primary current/Secondary current) value must be entered to this parameter.

Example:
If Current Transformer Primary=500A and Current Transformer Secondary=5A, Current Transformer Ratio should be entered CT Primary/CT Secondary=100.

Voltage Transformer Ratio (003.PT ratio)
Defines the scaling factor applied to voltage readout and associated fault conditions.
This PT ratio is for additional voltage transformers mounted the unit.

Type of AC System (004.Type of AC System)
This parameter is used to detail the type of AC system to which the unit is connected:
1 phase 2 wire, 3 phase 4 wire, 2 phase 3 wire L1-L2, 2 phase 3 wire L1-L3.

System Phase Sequence (005.Phase sequence)
DISABLE: the mains and generator phase sequence checking disabled.

L123 or L321: if the mains phase sequence is faulty, the "Mains phase sequence wrong" warning is given and the mains contactor is deenergized. if the generator phase sequence is faulty, the "Generator phase sequence wrong" warning is given.

Generator kVA Rating Set (006.Generator kVA rating)
This parameter specifies the generator apparent power rating, which is used as a reference value for the power protection functions.

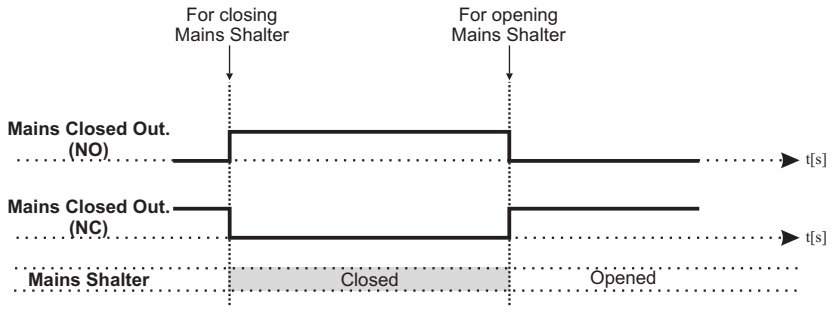
Power Unit (007.Power unit)
This parameter is used to select whether the power protection is done in "kW" or "kVA".

Mains kW Rating (008.Mains kW rating)
This parameter specifies the mains active power rating, which is used as a reference value for related functions. This parameter is used for many functions including mains power and load share functions.

01.02.BREAKERS (*System->Breakers*)		Min	Max	Default	Unit
001.Type of Breaker	Hardware Breaker Selection	0	3	0	
002.Gen.close breaker cont.type	Gen.Close Breaker Contact Type	NO / NC		NO	
003.Gen.close breaker relay type	Gen. Close Breaker Relay Type	NOR / PULS		0	
004.Generator close timer	Generator Close Timer	1	250	5	Sec
005.Gen.open breaker relay type	Gen. Open Breaker Relay Type	NOR / PULS		0	
006.Generator open timer	Generator Open Timer	1	250	5	Sec
007.Mains close breaker cont.type	Mains Close Breaker Cont. Type	NO / NC		NO	
008.Mains close breaker relay type	Mains Close Breaker Relay Type	NOR / PULS		0	
009.Mains close timer	Mains Close Timer	1	250	5	Sec
010.Mains open breaker relay type	Mains Open Breaker Relay Type	NOR / PULS		0	
011.Mains open timer	Mains Open Timer	1	250	5	Sec
012.Breaker close pulse time	Breaker Close Pulse Time	0.0	10.0	0.5	Sec
013.Breaker open pulse time	Breaker Open Pulse Time	0.0	10.0	0.5	Sec
014.Transfer time	Transfer Time	0	250	2	Sec
015.Spring loading time	Spring Loading Time	0	250	3	Sec
016.Retry number	Retry Number	1	250	5	

Hardware Breaker Selection (001.Type of Breaker)
0- Breakers: Mains and Generator breakers have only close drives and if close drive off, breaker will open.
Parameters; GEN CLOSE BREAKER CONTACT TYPE, GEN CLOSE TIMER(if gen closed input selected), GEN OPEN TIMER(if gen closed input selected), MAINS CLOSE BREAKER CONTACT TYPE, MAINS CLOSE TIMER(if mains closed input selected), MAINS OPEN TIMER(if mains closed input selected), TRANSFER TIME.

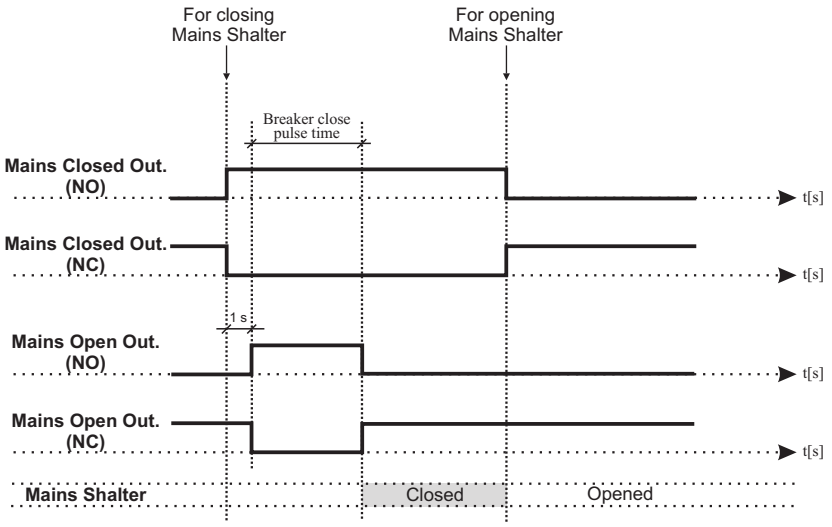
Example: If Hardware Breaker Selection parameter is selected as 0;



1- User Configured: Mains and Generator breakers have only close drives, when want to breaker close, close breaker output on and after 1 sec. open breaker output on and after breaker close pulse time open breaker output will off. When want to breaker open, close breaker output and open breaker output will off.
Parameters; GEN CLOSE BREAKER CONTACT TYPE, GEN CLOSE TIMER(if gen closed input selected), GEN OPEN TIMER(if gen closed input selected), MAIN CLOSE BREAKER CONTACT TYPE, MAINS CLOSE TIMER(if mains closed input selected), MAINS OPEN TIMER(if mains closed input selected),BREAKER CLOSE PULSE TIME, TRANSFER TIME.

Note-1 : NO / NC : Normally Open / Normally Close
2 : NOR / PULS : Normal / Pulse

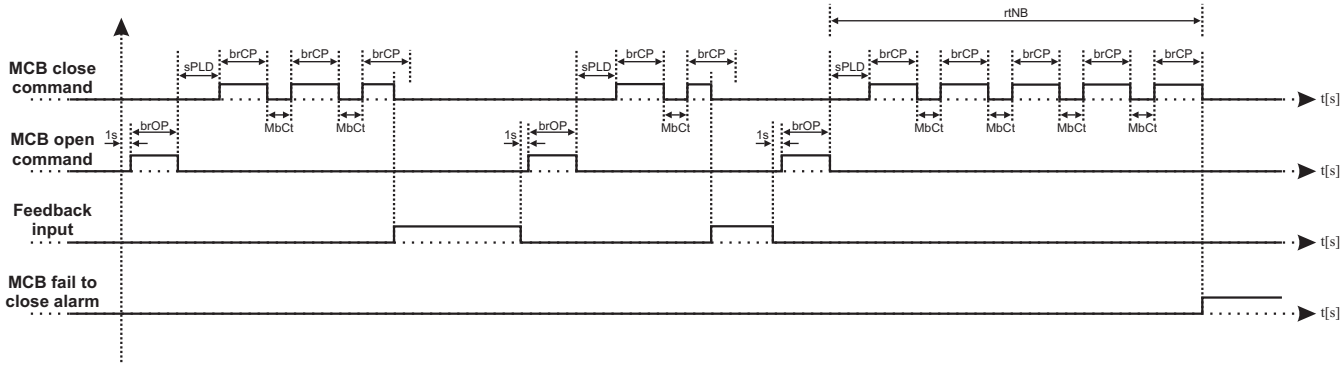
Example: If Hardware Breaker Selection parameter is selected as 1;



2- Motorised Breakers (Compact Type): User can select this option for the compact type breakers. Parameters; GEN CLOSE BREAKER CONTACT TYPE, GEN CLOSE BREAKER RELAY TYPE, GEN CLOSE TIMER(if gen closed input selected), GEN OPEN BREAKER RELAY TYPE, GEN OPEN TIMER(if gen closed input selected), MAINS CLOSE BREAKER CONTACT TYPE, MAINS CLOSE BREAKER RELAY TYPE, MAINS CLOSE TIMER(if mains closed input selected), MAINS OPEN BREAKER RELAY TYPE, MAINS OPEN TIMER(if mains closed input selected), BREAKER CLOSE PULSE TIME(if Gen Close Breaker Relay Type or Main Close Breaker Relay Type parameter is selected as 1), BREAKER OPEN PULSE TIME(if Gen Open Breaker Relay Type or Main Open Breaker Relay Type parameter is selected as 1), TRANSFER TIME, SPRING LOADING TIME, RETRY NUMBER.

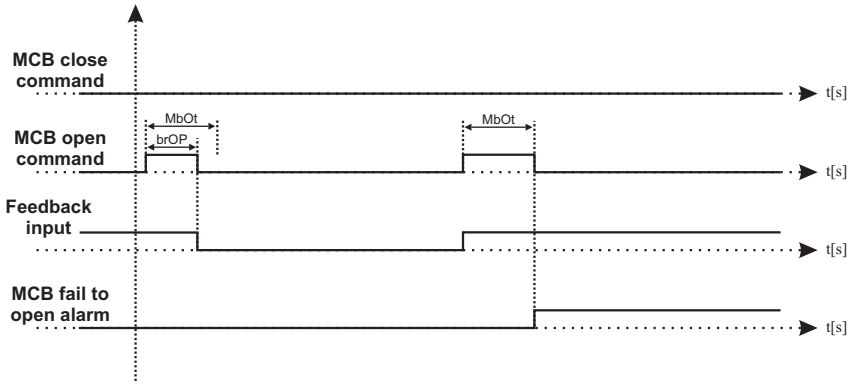
Example-1: MCB Close Diagram.
If Hardware Breaker Selection parameter is selected as 2 (motorised breakers (compact type)), MAINS CLOSE BREAKER RELAY TYPE parameter is selected as 1 (PULSE) and MAINS OPEN BREAKER RELAY TYPE parameter is selected as 1 (PULSE);

MbCt: Mains close timer
brCP: Breaker close pulse time
brOP: Breaker open pulse time
sPLD: Spring loading time
rtNB: Retry number



Example-2: MCB Open Diagram.
If Hardware Breaker Selection parameter is selected as 2 (motorised breakers (compact type)), MAINS CLOSE BREAKER RELAY TYPE parameter is selected as 1 (PULSE) and MAINS OPEN BREAKER RELAY TYPE parameter is selected as 1 (PULSE);

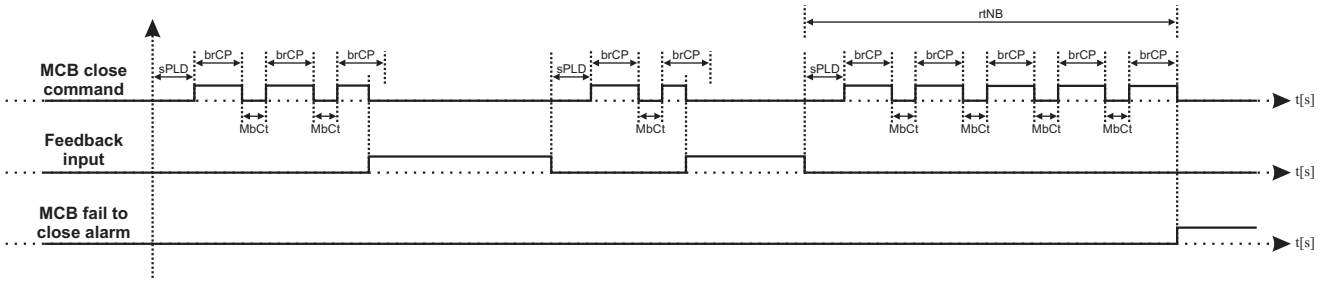
MbOt: Mains open timer
brOP: Breaker open pulse time



3- Motorised Breakers (Open Type): User can select this option for the open type breakers. Parameters; GEN CLOSE BREAKER CONTACT TYPE, GEN CLOSE BREAKER RELAY TYPE, GEN CLOSE TIMER(if gen closed input selected), GEN OPEN BREAKER RELAY TYPE, GEN OPEN TIMER(if gen closed input selected), MAINS CLOSE BREAKER CONTACT TYPE, MAINS CLOSE BREAKER RELAY TYPE, MAINS CLOSE TIMER(if mains closed input selected), MAINS OPEN BREAKER RELAY TYPE, MAINS OPEN TIMER(if mains closed input selected), BREAKER CLOSE PULSE TIME(if Gen Close Breaker Relay Type or Main Close Breaker Relay Type parameter is selected as 1), BREAKER OPEN PULSE TIME(if Gen Open Breaker Relay Type or Main Open Breaker Relay Type parameter is selected as 1), TRANSFER TIME, SPRING LOADING TIME, RETRY NUMBER.

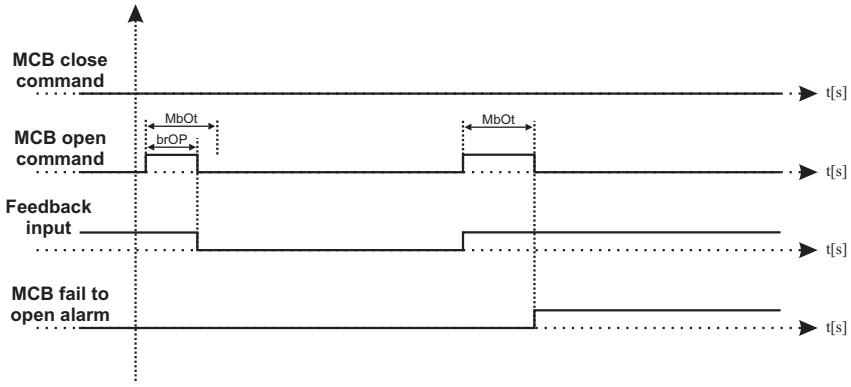
Example-1: MCB Close Diagram.
If Hardware Breaker Selection parameter is selected as 3 (motorised breakers (open type)), MAINS CLOSE BREAKER RELAY TYPE parameter is selected as 1 (PULSE) and MAINS OPEN BREAKER RELAY TYPE parameter is selected as 1 (PULSE);

MbCt: Mains close timer
brCP: Breaker close pulse time
sPLD: Spring loading time
rtNB: Retry number



Example-2: MCB Open Diagram.
If Hardware Breaker Selection parameter is selected as 3 (motorised breakers (open type)), MAINS CLOSE BREAKER RELAY TYPE parameter is selected as 1 (PULSE) and MAINS OPEN BREAKER RELAY TYPE parameter is selected as 1 (PULSE);

MbOt: Mains open timer
brOP: Breaker open pulse time



Gen Close Timer (004.Gen.close timer)
This is used to monitor the closure of the generator contactor or breaker. It will only operate if an auxiliary input is configured as 'Generator Closed Auxiliary' and connected to the auxiliary on the generator contactor or breaker. Once a generator closed signal is issued the 'gen close timer' is initiated. Should the 'Generator Closed Auxiliary' input become active the timer the 'gen close timer' is cancelled. If the timer expires and the 'Generator Closed Auxiliary' has not become active the module will issue a 'generator failed to close' alarm.

Gen Open Timer (006.Gen.open timer)
This is used to monitor the opening of the generator contactor or breaker. It will only operate if an auxiliary input is configured as 'Generator Closed Auxiliary' and connected to the auxiliary on the generator contactor or breaker. Once a generator open signal is issued the 'gen open timer' is initiated. Should the 'Generator Closed Auxiliary' input become in-active the timer 'gen open timer' is cancelled. If the timer expires and the 'Generator Closed Auxiliary' has not become in-active the module will issue a 'generator failed to open' alarm.

Mains Close Timer (009.Mains close timer)
This is used to monitor the closure of the mains contactor or breaker. It will only operate if an auxiliary input is configured as 'Mains Closed Auxiliary' and connected to the auxiliary on the mains contactor or breaker. Once a mains closed signal is issued the 'mains close timer' is initiated. Should the 'Mains Closed Auxiliary' input become active the timer the 'mains close timer' is cancelled. If the timer expires and the 'Mains Closed Auxiliary' has not become active the unit will issue a 'mains failed to close' alarm.

Mains Open Timer (011.Mains open timer)
This is used to monitor the opening of the mains contactor or breaker. It will only operate if an auxiliary input is configured as 'Mains Closed Auxiliary' and connected to the auxiliary on the mains contactor or breaker. Once a mains open signal is issued the 'mains open timer' is initiated. Should the 'Mains Closed Auxiliary' input become in-active the timer the 'mains open timer' is cancelled. If the timer expires and the 'Mains closed auxiliary' has not become in-active the unit will issue a 'mains failed to open' alarm.

Breaker Close Pulse Time (012.Breaker close pulse time)
This is used to determine the duration of the Mains and Generator close signals. This timer is only used if Pulsed outputs are configured to be used.

Breaker Open Pulse Time (013.Breaker open pulse time)
This is used to determine the duration of the Mains and Generator close signals. This timer is only used if Pulsed outputs are configured to be used.

Transfer Time (014.Transfer time)
This is used to allow for fixed duration transfer breaks when switching from mains to genset and back. It can be used to ensure that the supply is removed from the load for fixed period of time to allow pumps/motors to come to rest etc.

Spring Loading Time (015.Spring loading time)
When the unit give open command to the (GCB or MCB) breaker and after that the unit want to give close command the same breaker, this time for between open and close commands, because if there is no delay between open and close commands can be problem the motorized switches.

Retry Number (016.Retry number)
The unit try to close (GCB or MCB) breaker number of this parameter. If each try there is no close feedback, after last try the alarm will be activated.

01.03.LCD DISPLAY (***System->LCD display***)		**Min**	**Max**	**Default**	**Unit**
001.Language	Language Selection	ENGLISH/TURKISH		ENGLISH	
002.Auto scroll time	Auto Scroll Time	0(dis)	250	0	Sec
003.Auto scroll number	Auto Scroll Number	1	22	5	
004.Err. mesg scroll time	Scroll Time For Error Messages	1	250	2	Sec
005.Theme selection	Theme Selection: 0-Black theme, 1-Gray theme	0	1	0	

Language Selection (001.Language)
Language selection: English or Turkish.

Auto Scroll Time (002.Auto scroll time)
The scroll time between all data display pages.

Auto Scroll Number (003.Auto scroll number)
The number of data display pages that will be scrolled.

Scroll Time For Error Messages (004.Err. mesg scroll time)
Error messages are displayed the last line of LCD Display. If more than one error condition is present, each of them is displayed during time defined by Auto Scroll Timer parameter.

Theme Selection (005.Theme selection)
The background color of the LCD screen can be selected as black or gray with this parameter.

01.04.SERIAL COMMUNICATION (***System->Serial Comm.***)		**Min**	**Max**	**Default**	**Unit**
001.Slave address	Slave Address	1	247	1	
002.Baud rate	Baud Rate: 0 - 1200 baud 1 - 2400 baud 2 - 4800 baud 3 - 9600 baud 4 - 19200 baud 5 - 38400 baud	0	5	3	
005.Timeout	Timeout	0(dis)	999	3	Min

Slave Address (001.Slave address)
This parameter is used for the ModBus Slave ID.

Baud Rate (002.Baud rate)
This parameter is used for the ModBus communication speed. Baud rate adjustable from 1200-38400.

Timeout (005.Timeout)
This parameter is used for the modem hardware reset. If the data communication is interrupted and this situation continues as this parameter, the modem hardware reset is performed.

01.05.RS485 COMMUNICATION (*System->RS 485 Comm.*)		Min	Max	Default	Unit
001.Slave address	Slave Address	1	247	1	
002.Baud rate	Baud Rate: 0 - 1200 baud 1 - 2400 baud 2 - 4800 baud 3 - 9600 baud 4 - 19200 baud 5 - 38400 baud	0	5	3	
005.ASCII/RTU selection	ModBus ASCII/RTU Selection	ASCII / RTU		ASCII	

Slave Address (001.Slave address)
This parameter is used for the ModBus Slave ID.

Baud Rate (002.Baud rate)
This parameter is used for the ModBus communication speed. Baud rate adjustable from 1200-38400.

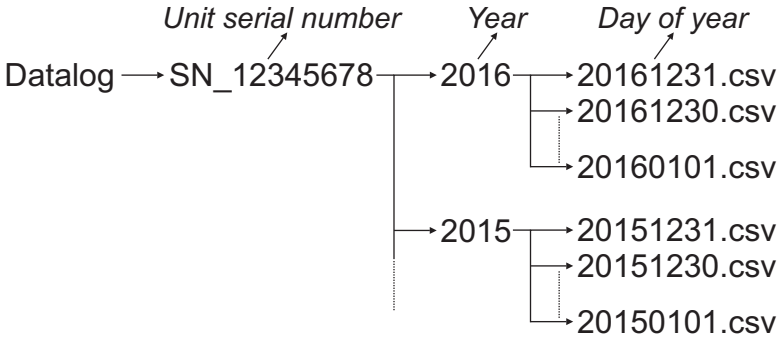
ModBus ASCII/RTU Selection (005.ASCII/RTU selection)
This parameter is used for the ModBus communication protocol.

01.06.DATA LOGGING (*System->Data logging*)		Min	Max	Default	Unit
001.Data log memory	Data Logging Memory	0-Disable 1-Internal memory 2-External USB Host		1	
002.Data log period	Data log Period	0.1	999.9	1.0	Min

Data logging:
The unit will log data in either an internal memory or an external USB host according to the selection of “Data log memory” parameter.

The logging period is adjustable between “0.1” and “999.9” minutes via the “Data log period” parameter.

The log directory structure is in an external USB host;



The below registers are logged;

Mains V1, Mains V2, Mains V3 and Mains frequency,
Generator V1, Generator V2, Generator V3 and Generator frequency,
Generator I1, Generator I2, Generator I3,
Generator kWh,
Oil pressure, J1939 oil pressure,
Coolant temperature, J1939 coolant temperature,
Configurable analogue input-1,
Configurable analogue input-2,
Cabin temperature,
Battery voltage,
Working hour&minute

01.07.DATE & TIME SET (*System->Date & time set*)		Min	Max	Default	Unit
001.Year	Year	0	99		
002.Month	Month	1	12		
003.Day	Date	1	31		
004.Week	Day of week	1	7		
005.Hour	Hour	0	23		
006.Minute	Minute	0	59		
007.Second	Second	0	59		

Day of week (004.Week)
1=Monday, 2=Tuesday, 3=Wednesday, 4=Thursday, 5=Friday, 6=Saturday, 7=Sunday.

01.08.DEFAULT SETTINGS (*System->Default settings*)		Min	Max	Default	Unit
001.Save setting to def.	Save setting to default	YES / NO		NO	
002.Reset default sets	Reset default sets	YES / NO		NO	
003.Reset factory sets	Reset factory sets	YES / NO		NO	

Save setting to default (001.Save setting to def.)
If this parameter is selected as “Yes”, the unit’s currently parameters save as default sets.
After this parameter is reset automatically to “No”.

Reset default sets (002.Reset default sets)
If this parameter is selected as “Yes”, the unit’s parameters back to default sets.
After this parameter is reset automatically to “No”.

Reset factory sets (003.Reset factory sets)
If this parameter is selected as “Yes”, the unit’s parameters back to factory sets.
After this parameter is reset automatically to “No”.

01.09.PASSWORD SETTINGS (*System->Password settings*)		Min	Max	Default	Unit
001.Operator password	Operator Password	0	9999	0	
002.Technician password	Technician Password	0	9999	0	

Operator Password (001.Operator password)
Use this option to change the Operator password. This password allows access to operator parameters section.

Technician Password (002.Technician password)
Use this option to change the Technician password. It allows access to both operator and technician parameters section.

01.10.ETHERNET SETTINGS (*System->Ethernet settings*)		Min	Max	Default	Unit
001.Tcp client mode	Tcp Client Mode	ENABL/DISBL		DISBL	

Tcp Client Mode (001.Tcp client mode)
DISABLE: Client mode is disabled.

ENABLE: Client mode is enabled. The unit will be send a connection request to the server (PC or Cloud) using the built-in ethernet port.

Note: dis = disable

5.2.2 Mains

02.01.MAINS VOLT LEVEL (*Mains->Volt level*)		Min	Max	Default	Unit
001.Under volt trip	Mains Under Voltage	60	600	320	V~
002.Under volt return	Mains Under Voltage Return	60	600	340	V~
003.Over volt trip	Mains Over Voltage	60	600	440	V~
004.Over volt return	Mains Over Voltage Return	60	600	420	V~

The unit uses the above parameters to decide whether the mains is okay or fail.

If the mains voltage is above the "Over volt trip" parameter or is below the “Under volt trip" parameter, the "Mains Okay Led" will light off.
If the mains voltage is below the "Over volt return" parameter and is above the “Under volt return" parameter, the "Mains Okay Led" will light on.

In Automatic mode, the unit uses these parameters to switch the load between the mains and genset.

02.02.MAINS FREQ. LEVEL (*Mains->Frequency level*)		Min	Max	Default	Unit
001.Under freq trip	Mains Under Frequency	20.0	75.0	45.0	Hz
002.Under freq return	Mains Under Frequency Return	20.0	75.0	48.0	Hz
003.Over freq trip	Mains Over Frequency	20.0	75.0	55.0	Hz
004.Over freq return	Mains Over Frequency Return	20.0	75.0	52.0	Hz

The unit uses the above parameters to decide whether the mains is okay or fail.

If the mains frequency is above the "Over freq trip" parameter or is below the “Under freq trip" parameter, the "Mains Okay Led" will light off.
If the mains frequency is below the "Over freq return" parameter and is above the “Under freq return" parameter, the "Mains Okay Led" will light on.

In Automatic mode, the unit uses these parameters to switch the load between the mains and genset.

02.03.MAINS ACTIONS (*Mains->Actions*)		Min	Max	Default	Unit
001.Mains failure detection	Mains Failure Detection En/Dis	ENABL/DISBL		ENABL	
002.Mains failure at stop mode	Look Mains Failure at Stop Mode	ENABL/DISBL		ENABL	
003.Always return delay	Always Look Mains Return Delay	ENABL/DISBL		DISBL	

Mains Failure Detection En/Dis (001.Mains failure detection)
ENABLE: The unit will monitor the mains supply. If the mains supply go out side of limits, the unit will initiate its automatic mains failure sequence. (If no inputs is selected as a remote start)

DISABLE: The unit will not monitor the mains supply.

Look Mains Failure at Stop Mode En/Dis (002.Mains failure at stop mode)
ENABLE: As soon as the unit detects a mains failure the mains circuit breaker (MCB) will be opened to remove the supply from the load. This is to prevent damage to the load in case of single-phase failure.

DISABLE: In the event of a mains failure the unit will attempt to maintain the supply to the load for the incoming AC mains supply until the generator is available to go on load. In the event of a generator failure the unit will default back to the incoming AC mains supply.

Always Look Mains Return Delay (003.Always return delay)
ENABLE: The unit will always wait the Mains Return Delay parameter before transferring the load back to mains.

DISABLE: The unit will wait the Mains Return Delay parameter while only the generator is available to go on load before transferring the load back to mains.

5.2.3 Generator

03.01.GENERATOR VOLT LEVEL (*Generator->Volt level*)		Min	Max	Default	Unit
001.Nominal voltage	Nominal Voltage	60	600	400	V~
002.Under volt shutdown	Under Voltage Shutdown	60(dis)	600	320	V~
003.Under volt prealarm	Under Voltage Pre-Alarm	60(dis)	600	340	V~
004.Under volt reset	Under Voltage Pre-Alarm Reset	60	600	350	V~
005.Over volt shutdown	Over Voltage Shutdown	60	600	470	V~
006.Over volt prealarm	Over Voltage Pre-Alarm	60(dis)	600	450	V~
007.Over volt reset	Over Voltage Pre-Alarm Reset	60	600	430	V~
008.Shutdown delay time	Voltage Shutdown Delay Time	0.0	10.0	2.0	Sec
009.Unbalanve volt set	Unbalance Volt Set	0	230	20	V~
010.Unbalance volt actions	Unbalance Volt Actions: 0- Disable, 1- Warning, 2- Electrical Trip, 3- Shutdown.	0(dis)	3	dis	
011.Unbalance volt actions delay	Unbalance Volt Actions Delay Time	0	99	2	Sec

03.02.GENERATOR FREQ LEVEL (*Generator->Frequency level*)		Min	Max	Default	Unit
001.Nominal frequency	Nominal Alternator Frequency	30.0	75.0	50.0	Hz
002.Under freq shutdown	Under Frequency Shutdown	30.0(dis)	75.0	43.0	Hz
003.Under freq prealarm	Under Frequency Pre-Alarm	30.0(dis)	75.0	45.0	Hz
004.Under freq reset	Under Frequency Pre-Alarm Reset	30.0	75.0	46.0	Hz
005.Over freq shutdown	Over Frequency Shutdown	30.0(dis)	75.0	58.0	Hz
006.Over freq prealarm	Over Frequency Pre-Alarm	30.0(dis)	75.0	55.0	Hz
007.Over freq reset	Over Frequency Pre-Alarm Reset	30.0	75.0	54.0	Hz
008.Shutdown delay time	Frequency Shutdown Delay Time	0.0	10.0	2.0	Sec

03.03.GEN CUR LEVEL & ACT (*Generator->Current level & act.*)		Min	Max	Default	Unit
001.Under current set	Under Current Set	0	9999	0	A~
002.Under current prealarm	Under Current Pre-Alarm	0(dis)	9999	dis	A~
003.Under current reset	Under Current Pre-Alarm Reset	0	9999	5	A~
004.Under current actions	Under Current Actions: 0- Disable, 1- Warning, 2- Electrical Trip, 3- Shutdown.	0(dis)	3	dis	
005.Under actions delay time	Under Current Actions Delay Time	0	99	2	Sec
006.Over current set	Over Current Set	0	9999	9999	A~
007.Over current prealarm	Over Current Pre-Alarm	0(dis)	9999	dis	A~
008.Over current reset	Over Current Pre-Alarm Reset	0	9999	9980	A~
009.Over current actions	Over Current Actions: 0- Disable, 1- Warning, 2- Electrical Trip, 3- Shutdown.	0(dis)	3	dis	
010.Over actions delay time	Over Current Actions Delay Time	0	99	5	Sec
011.Short circuit current	Short Circuit Current Set	0	9999	9999	A~
012.Earth fault current	Earth Fault Current Set	0	9999	100	A~
013.Earth fault current actions	Earth Fault Current Actions: 0- Disable, 1- Warning, 2- Electrical Trip, 3- Shutdown.	0(dis)	3	dis	
014.E.F. actions delay time	Earth Fault Current Actions Delay Time	0	99	2	Sec
015.Unbalance load set	Unbalance Load Set	0	9999	0	A~
016.Unbalance load actions	Unbalance Load Actions: 0- Disable, 1- Warning, 2- Electrical Trip, 3- Shutdown.	0(dis)	3	dis	
017.Unbalance load actions delay	Unbalance Load Actions Delay Time	0	99	2	Sec

03.04.GEN POWER LEVEL (*Generator->Power level*)		Min	Max	Default	Unit
001.Under power set	Under Power Set	0	9999	0	kVA
002.Under power prealarm	Under Power Pre-Alarm	0(dis)	9999	dis	kVA
003.Under power reset	Under Power Pre-Alarm Reset	0	9999	5	kVA
004.Under power actions	Under Power Actions 0 - Disable 1 - Warning 2 - Electrical Trip 3 - Shutdown	0(dis)	3	0(dis)	
005.Under actions delay time	Under Power Action Delay Time	0	99	2	Sec
006.Over power set	Over Power Set	0	9999	0	kVA
007.Over power prealarm	Over Power Pre-Alarm	0(dis)	9999	dis	kVA
008.Over power reset	Over Power Pre-Alarm Reset	0	9999	0	kVA
009.Over power actions	Over Power Actions 0 - Disable 1 - Warning 2 - Electrical Trip 3 - Shutdown	0(dis)	3	0(dis)	
010.Over actions delay time	Over Power Action Delay Time	0	99	2	Sec
011.Reverse power set	Reverse Power Set	-9999	0	-30	kW
012.Reverse power actions	Reverse Power Actions 0 - Disable 1 - Warning 2 - Electrical Trip 3 - Shutdown	0(dis)	3	2	
013.Reverse power act.delay time	Reverse Power Action Delay Time	0	99	6	Sec
014.Excitation loss set	Excitation Loss Set	-9999	0	-100	KVAr
015.Excitation loss actions	Excitation Loss Actions 0 - Disable 1 - Warning 2 - Electrical Trip 3 - Shutdown	0(dis)	3	0(dis)	
016.Excitation loss act.delay time	Excitation Loss Action Delay Time	0	99	2	Sec

03.05.GEN WORKING CALENDAR (*Generator->Working calendar*)		Min	Max	Default	Unit
001.Disable/enable select	Calendar Disable or Enable	DISBL/ENABL		DISBL	
002.Start time on Monday	Calendar Start Time on Monday	0.00	23.59	0.00	H.Min
003.Stop time on Monday	Calendar Stop Time on Monday	0.00	23.59	23.59	H.Min
004.Start time on Tuesday	Calendar Start Time on Tuesday	0.00	23.59	0.00	H.Min
005.Stop time on Tuesday	Calendar Stop Time on Tuesday	0.00	23.59	23.59	H.Min
006.Start time on Wednesday	Calendar Start Time on Wednesday	0.00	23.59	0.00	H.Min
007.Stop time on Wednesday	Calendar Stop Time on Wednesday	0.00	23.59	23.59	H.Min
008.Start time on Thursday	Calendar Start Time on Thursday	0.00	23.59	0.00	H.Min
009.Stop time on Thursday	Calendar Stop Time on Thursday	0.00	23.59	23.59	H.Min
010.Start time on Friday	Calendar Start Time on Friday	0.00	23.59	0.00	H.Min
011.Stop time on Friday	Calendar Stop Time on Friday	0.00	23.59	23.59	H.Min
012.Start time on Saturday	Calendar Start Time on Saturday	0.00	23.59	0.00	H.Min
013.Stop time on Saturday	Calendar Stop Time on Saturday	0.00	23.59	23.59	H.Min
014.Start time on Sunday	Calendar Start Time on Sunday	0.00	23.59	0.00	H.Min
015.Stop time on Sunday	Calendar Stop Time on Sunday	0.00	23.59	23.59	H.Min

Calendar Disable or Enable (001.Disable/enable select)
DISABLE: The unit will not monitor the working calendar parameters. If the mains supply go out side of limits, the unit will initiate automatic mains failure sequence.

ENABLE: The unit will monitor the working calendar parameters. If the mains supply go out side of limits, the unit will initiate automatic mains failure sequence only within the set “Start and Stop time parameters”.

Note-1: If the “Start time parameter” of any day is set to "0.00" and the “Stop time parameter” is set to "23.59", the unit will initiate automatic mains failure sequence when the mains supply go out side of limits within that day.

Note-2: If the “Start and Stop time parameters” of any day are set the same, the unit will not initiate automatic mains failure sequence when the mains supply go out side of limits within that day.

03.06.GENERATOR GENERAL (*Generator->General*)		Min	Max	Default	Unit
001.Sensing option gen.frequency	Sensing Opt Generator Frq En/Dis	ENABL/DISBL		ENABL	
002.Sensing option pickup&flywheel	Sensing Opt Pickup En/Dis&Flywheel	0(dis)	1000	DISBL	
003.All warning are latch	All Warnings Are Latched En/Dis	ENABL/DISBL		DISBL	

Sensing Options Generator Frq En/Dis (001.Sensing option gen.frequency)
ENABLE: Speed sensing will be derived from the generator output frequency.

DISABLE: Speed sensing not will be derived from the generator output frequency.

Sensing Options Pickup En/Dis & Flywheel (002.Sensing option pickup&Flywheel)
DISABLE: Speed sensing will not be derived from the magnetic pickup.

1-1000: Speed sensing will be derived from the magnetic pickup and the number is flywheel teeth on the engine.

All Warnings Are Latched En/Dis (003.All warning are latch)
ENABLE: Warnings and pre-alarms will latched when triggered. To reset the alarm either an external reset must be applied to one of the inputs or the 'Reset' pushbutton operated, once the triggering condition has cleared.

DISABLE: Normal operation, the warnings and pre-alarms (except spare inputs, because they have their latching or non-latching selections) will automatically reset once the triggering condition has cleared.

5.2.4 Engine

04.01.ENGINE START OPTIONS (*Engine->Starting options*)		Min	Max	Default	Unit
001.Horn prior to start	Audible Alarm Prior To Starting	ENABL/DISBL		DISBL	
002.Number of start attempts	Number Of Start Attempts	1	10	3	
003.Cranking time	Cranking Time	1	99	5	Sec
004.Crank rest time	Crank Rest Time	5	99	10	Sec
005.Pickup fail delay	Pickup Sensor Fail Delay	0.1	10.0	3.0	Sec

Audible Alarm Prior To Starting En/Dis (001.Horn prior to start)
ENABLE: The audible alarm will sound before the engine starts. The sounder will become active once the start delay is initialised, it will remain active until either the engine reaches crank disconnect speed or pre-heat timers are cancelled.

Number Of Start Attempts (002.Number of start attempts)
This value is the number of times the module will attempt to start the generator. Should the generator start the module will not attempt further starts. If the generator does not start after the final attempt, the module will give a 'Fail to start' alarm.

Cranking Time (003.Cranking time)
This is the maximum amount of time that the module will energise the starter motor for during starting attempts once the starter has engaged.

Crank Rest Time (004.Crank rest time)
This is the amount of time the module will wait for between start attempts. This is to allow the starter motor to cool and the starter batteries to recover.

Note: dis = disable

04.02.ENG.CRANK DISCONNECT(*Engine->Crank disconnect*)		Min	Max	Default	Unit
001.Generator frequency	Generator Frequency	10.0	75.0	30.0	Hz
002.Engine speed	Engine RPM	100	6000	500	RPM
003.Generator volt	Generator Voltage	60 (dis)	600	300	V~
004.Alternator charge volt	Charge Alternator Voltage	6.0 (dis)	30.0	dis	V⎓
005.Oil pressure enable/disable	Oil Pressure Enable/Disable	ENABL/DISBL		DISBL	
006.Oil pressure value	Oil Pressure Value	1.0	30.0	1.0	BAR
007.Check oil press. before start	Check Oil Pressure Before Start	ENABL/DISBL		ENABL	

The parameters in this page are used for engine started signals. If any of the selected signals appears, the unit assumes that the engine has started.

Generator Frequency (001.Generator frequency)
If the generator frequency over than 30.0 Hz, the unit assumes that the engine has started and the unit stop cranking.

Engine RPM (002.Engine speed)
If the generator speed over than 500 Rpm, the unit assumes that the engine has started and the unit stop cranking.

Generator Voltage (003.Generator volt)
If the generator voltage over than 300 Vac, the unit assumes that the engine has started and the unit stop cranking.

Charge Alternator Voltage (004.Alternator charge volt)
If the charge alternator voltage over than 6.1 Vdc, the unit assumes that the engine has started and the unit stop cranking. **Note:** If the charge generator input (terminal #22) is disconnect, this parameter selected as disabled (6.0 Vdc).

Oil Pressure Enable/Disable (005.Oil pressure enable/disable)
This parameter is used for to activate of the crank disconnect on oil pressure feature.

Oil Pressure Value (006.Oil pressure value)
If the oil pressure sender over than this value, the unit assumes that the engine has started and the unit stop cranking.

Check Oil Pressure Before Start (007.Check oil press. before start)
If this parameter is enabled, the unit will not be allowed to crank if the oil pressure isn't seen as being low.

04.03.ENGINE SPEED SETS (*Engine->Speed settings*)		Min	Max	Default	Unit
001.Nominal speed	Nominal Speed	500	5000	1500	RPM
002.Under speed shutdown	Under Speed Shutdown	500(dis)	5000	dis	RPM
003.Under speed prealarm	Under Speed Prealarm	500(dis)	5000	dis	RPM
004.Under speed reset	Under Speed Prealarm Reset	500	5000	500	RPM
005.Over speed shutdown	Over Speed Shutdown	500(dis)	5000	dis	RPM
006.Over speed prealarm	Over Speed Prealarm	500(dis)	5000	dis	RPM
007.Over speed reset	Over Speed Prealarm Reset	500	5000	500	RPM
008.Shutdown delay time	Speed Shutdown Delay Time	0.0	10.0	2.0	Sec

The parameters in this page are used for the generator speed low and high alarms.

Note: dis = disable

04.04.ENGINE PLANT BATTERY (*Engine->Plant battery*)		Min	Max	Default	Unit
001.Under volt	Undervolts Warning	6.0(dis)	30.0	10.0	V⎓
002.Under volt reset	Undervolts Warning Reset	6.0	30.0	10.5	V⎓
003.Under volt delay	Undervolts Delay	0.0	9.9	2.0	Sec
004.Over volt	Undervolts Warning	6.0(dis)	30.0	30.0	V⎓
005.Over volt reset	Overvolts Warning Reset	6.0	30.0	29.5	V⎓
006.Over volt delay	Overvolts Delay	0.0	9.9	2.0	Sec
007.Alternator charge warning	Charge Alternator Warning	6.0(dis)	30.0	dis	V⎓

The parameters in this page are used for the battery voltage low and high alarms and the charge alternator voltage warning.

04.05.CANBUS ECU (*Engine->CanBus ECU*)		Min	Max	Default	Unit
001.Baud rate	Baud Rate: 0 - 20 1 - 50 2 - 100 3 - 125 4 - 250 5 - 500 6 - 800 7 - 1.000	0	7	4	kBaud
002.J1939 ECU type	J1939 ECU Type Selection: 0 - Disable 1 - Standard 2 - Volvo EMS1 3 - Volvo EMS2 4 - Volvo EMS2b 5 - Volvo EDC3 6 - Volvo EDC4 7 - Deutz EMR2 8 - Deutz EMR3 9 - Perkins 1300 10 - Perkins ADEM3 11 - Perkins ADEM4 12 - Scania S6 13 - MAN MFR 14 - Cummins ISB 15 - Cummins CM570 16 - Cummins CM850 17 - Cummins CM2150E 18 - Cummins CM2250 19 - Detroit DDEC 20 - John Deere 21 - MTU ADEC 22 - MTU ECU8 23 - MTU ECU8 SAM 24 - Yuchai	0(dis)	24	dis	
003.Device address	Device Address	0	255	17	
004.SPN version	SPN version	1	3	1	
005.ECU remote control	ECU Remote Control	ENABL/DISBL		ENABL	
006.Speed control enable	Speed Control	ENABL/DISBL		ENABL	
007.Oil pressure control enable	Oil Pressure Control	ENABL/DISBL		DISBL	
008.Temperature control enable	Coolant Temp. Control	ENABL/DISBL		DISBL	
009.Speed set point	Speed Set Point Selection	1500 / 1800		1500	RPM
010.Speed correction	Speed Correction Value	0	100	50	%

Baud Rate (001.Baud rate)
It defines the used Baud rate.

Note: All participants on the CAN bus must use the same Baud rate.

J1939 ECU Type Selection (002.J1939 ECU type)
The J1939 interface of this unit can be operated with different ECUs. This parameter determines the operating mode of the used ECUs. If this parameter is selected as “disable”, No messages will be sent or received.

Note: Volvo EMS2 engine types: TAD734, TAD940, TAD941, TAD1640, TAD1641, TAD1642.
Volvo EDC3 engine types: TAD1240, TAD1241, TAD1242.
Volvo EDC4 engine types: TD520, TAD520, TD720, TAD720, TAD721, TAD722.
Perkins ADEM3 / ADEM4 engine types: 2306, 2506, 1106, 2806.
Scania S6 engine types: DC 9, DC 12, DC 16.
MAN MFR ECU type: EDC7.
Cummins ISB engine type: QSM11.
Cummins CM570 engine type: QSX15.
Cummins CM850, Cummins CM2150E, Cummins CM2250 engine types: QSB5, QSB7, QSL9, QSK50, QSK60, QSK19, QSK38.
MTU ADEC engine types: Series 2000, 4000.
MTU UCU8 engine types: Series 1600.

ECU Device Address (003.Device address)
The unit sends J1939 request and control messages with this ID. It must be changed for different ECU types according to the following table. The ECU listens only to control messages, if they are sent to the correct address.

Volvo EMS1, Volvo EMS2, Volvo EMS2b, Volvo EDC3	*Volvo EDC4, Deutz EMR2, Deutz EMR3*	*Perkins 1300, Perkins ADEM3, Perkins ADEM4*	*Scania S6*	*MAN MFR*
17	3	43	39	253

Cummins ISB, Cummins CM570, Cummins CM850, Cummins CM2150E, Cummins CM2250	*Detroit DDEC*	*John Deere*	*MTU ADEC, MTU ECU8 SAM*	*MTU ECU8*	*Yuchai*
220	231	3	1	234	3

SPN Version (004.SPN version)
There are 4 different Suspect Parameter Number versions with J1939 protocol. The device has ability to detecting version 4 automatically. Therefore, this parameter is important to show alarm messages correctly except version 4.

Note: Changing above mentioned parameter becomes only effective after restarting the unit.

ECU Remote Control Via J1939 (005.ECU remote control)
If this parameter is selected as “Enable”, The unit sends remote control messages to the ECU if the selected ECU type is supporting the J1939 Remote control Messages. Available messages are engine start-stop, 50/60 Hz selection or Idle mode. For some ECUs;

Parameter	Volvo EMS1, Volvo EMS2, Volvo EMS2b, Volvo EDC3	Volvo EDC4, Deutz EMR2, Deutz EMR3	Perkins 1300, Perkins ADEM3, Perkins ADEM4	Scania S6	MAN MFR	Standard
Remote Start	Yes	No	No	Yes	Yes	No
Remote Stop	Yes	No	No	Yes	Yes	No
50/60 Hz Selection	Yes	No	No	Yes	No	No
Idle Mode	Yes	No	No	Yes	Yes	No

Parameter	Cummins ISB, Cummins CM570, Cummins CM850, Cummins CM2250	Cummins CM2150E	Detroit DDEC	John Deere	MTU ADEC, MTU ECU8 MTU ECU8 SAM	Yuchai
Remote Start	Yes	No	No	No	Yes	No
Remote Stop	Yes	No	No	No	Yes	No
50/60 Hz Selection	Yes	Yes	No	No	Yes	No
Idle Mode	Yes	Yes	No	No	No	No

If this parameter is selected as “Disable”, The ECU remote control via the J1939 protocol will be disabled.

Speed Control via J1939 (006.Speed control enable)
If this parameter is selected as “Enable”, The speed sensing from J1939 ECU will be used for the speed (Rpm) failures.

Oil Pressure Control via J1939 (007.Oil pressure control enable)
If this parameter is selected as “Enable”, The oil pressure sensing from J1939 ECU will be used for the oil pressure failures and the engine started signal.

Coolant Temperature Control via J1939 (008.Temperature control enable)
If this parameter is selected as “Enable”, The coolant temperature sensing from J1939 ECU will be used for the coolant temperature failures.

Speed Set Point Selection (50/60 Hz) (009.Speed set point)
This parameter used for to select the requested engine speed as 1500Rpm (50Hz) or 1800Rpm (60Hz). **Note:** The scenario; first change the parameter, next wait at least 5 seconds, and then start the engine.

Speed Correction Value (010.Speed correction)
This parameter can be changed between 0 and 100%. The engine should change the speed as follows:

0% = rated speed – speed deviation ECU e.g. 1500 – 120 = 1380rpm
50% = rated speed e.g. = 1500rpm
100% = rated speed + speed deviation ECU e.g. 1500 + 120 = 1620rpm

04.06.CANBUS ERROR SET (*Engine->CanBus error set*)		Min	Max	Default	Unit
001.CAN fault actions	Can Fault Actions: 0- Disable 1- Warning Non-Latching 2- Warning 3- Electrical Trip 4- Shutdown	0(dis)	4	0	
002.CAN fault activation	Can Fault Activation: 0- Active From Starting 1- Active From Safety On 2- Always Active	0	2	0	
003.CAN fault delay	Can Fault Delay	3	250	10	Sec
004.Amber warning actions	J1939 Amber Warning Lamp Actions: 0- Disable 1- Warning Non-Latching 2- Warning 3- Electrical Trip 4- Shutdown	0(dis)	4	0	
005.Amber warning activation	J1939 Amber Warning Lamp Activation: 0- Active From Starting 1- Active From Safety On 2- Always Active	0	2	2	
006.Amber warning delay	J1939 Amber Warning Lamp Delay	0	250	2	Sec
007.Red stop actions	J1939 Red Stop Lamp Actions: 0- Disable 1- Warning Non-Latching 2- Warning 3- Electrical Trip 4- Shutdown	0(dis)	4	0	
008.Red stop activation	J1939 Red Stop Lamp Activation: 0- Active From Starting 1- Active From Safety On 2- Always Active	0	2	2	
009.Red stop delay	J1939 Red Stop Lamp Delay	0	250	2	Sec

Note: dis = disable

04.07.ENGINE MAINTENANCE (*Engine->Maintenance*)		Min	Max	Default	Unit
001.Running hours interval	Running Hours Interval	0(dis)	9999	5000	Hour
002.Maintenance date interval	Maintenance Date Interval	0(dis)	12	6	Month
003.Engine stop when maintenance	Shutdown When Maintenance Is Due	ENABL/DISBL		DISBL	
004.Engine running hour	Engine Running Hour	0	30000	0	
007.Maintenance okay	Maintenance Okay	YES/NO		NO	

Engine Running Hour (004.Engine Running Hour)
The user can change the engine running hours value by using this parameter.

04.08.TEST MODE (*Engine->Test mode*)		Min	Max	Default	Unit
001.Disable/enable select	Test Mode Selection	ENABL/DISBL		ENABL	

Test Mode Selection (001.Disable/enable select)
DISABLE: Test mode disable.
ENABLE: Test mode enable.

04.09.EXERCISE (*Engine->Exercise*)		Min	Max	Default	Unit
001.Disable/enable select	Exercise Disable or Enable	DISBL/ENABL		DISBL	
002.Start time on monday	Exercise Start Time on Monday	0.00	23.59	0.00	H.Min
003.Stop time on monday	Exercise Stop Time on Monday	0.00	23.59	0.00	H.Min
004.Start time on tuesday	Exercise Start Time on Tuesday	0.00	23.59	0.00	H.Min
005.Stop time on tuesday	Exercise Stop Time on Tuesday	0.00	23.59	0.00	H.Min
006.Start time on wednesday	Exercise Start Time on Wednesday	0.00	23.59	0.00	H.Min
007.Stop time on wednesday	Exercise Stop Time on Wednesday	0.00	23.59	0.00	H.Min
008.Start time on thursday	Exercise Start Time on Thursday	0.00	23.59	0.00	H.Min
009.Stop time on thursday	Exercise Stop Time on Thursday	0.00	23.59	0.00	H.Min
010.Start time on friday	Exercise Start Time on Friday	0.00	23.59	0.00	H.Min
011.Stop time on friday	Exercise Stop Time on Friday	0.00	23.59	0.00	H.Min
012.Start time on saturday	Exercise Start Time on Saturday	0.00	23.59	0.00	H.Min
013.Stop time on saturday	Exercise Stop Time on Saturday	0.00	23.59	0.00	H.Min
014.Start time on sunday	Exercise Start Time on Sunday	0.00	23.59	0.00	H.Min
015.Stop time on sunday	Exercise Stop Time on Sunday	0.00	23.59	0.00	H.Min

Exercise Disable or Enable (001.Disable/enable select)
DISABLE: The exercise function is disabled. The unit will not monitor the exercise parameters.

ENABLE: The unit will monitor the exercise parameters.
When the start time of any day is reached, the unit will start the generator.
When the stop time of the same day is reached, the unit will stop the generator.

Note-1: If the “Start and Stop time parameters” of any day are set the same, the exercise function for that day will be passive.

Note-2: If the “Start time parameter” of any day is set larger than the “Stop time parameter”, the exercise function for that day will be passive.

Note: dis = disable

04.10.ENGINE GENERAL (*Engine->General*)		Min	Max	Default	Unit
001.Fuel selection	Engine Fuel Selection	0-GAS 1-DIESEL 2-GASOLINE		1-DIESEL	
002.Stop solenoid time	Stop Solenoid Time	1	99	20	Sec
003.Ignition delay	Ignition Delay	1	99	5	Sec
004.Gas valve delay	Gas Valve Delay	1	99	5	Sec
005.Minimum ignition speed	Minimum Ignition Speed	10	1500	200	RPM
006.Choke time	Choke Time	0.0	30.0	0.8	Sec

Engine Fuel Selection (001.Fuel selection)
Gas, Diesel or Gasoline engines can be selected.

Stop Solenoid Time (002.Stop solenoid time)
This timer is used if the unit is configured to operate an Energise to stop engine. It dictates the duration that the Stop Solenoid output will remain active after the module has detected the engine has come to rest. If the Stop Solenoid output is not configured, this timer will still operate, preventing an immediate restart.

Ignition Delay (003.Ignition delay)
With gas engines often a purging operation is desired before starting. With the engaging of the starter the ignition delay is started. If the 'min ignition speed' is reached after expiry of this time, the configurable relay output 'ignition' is set.

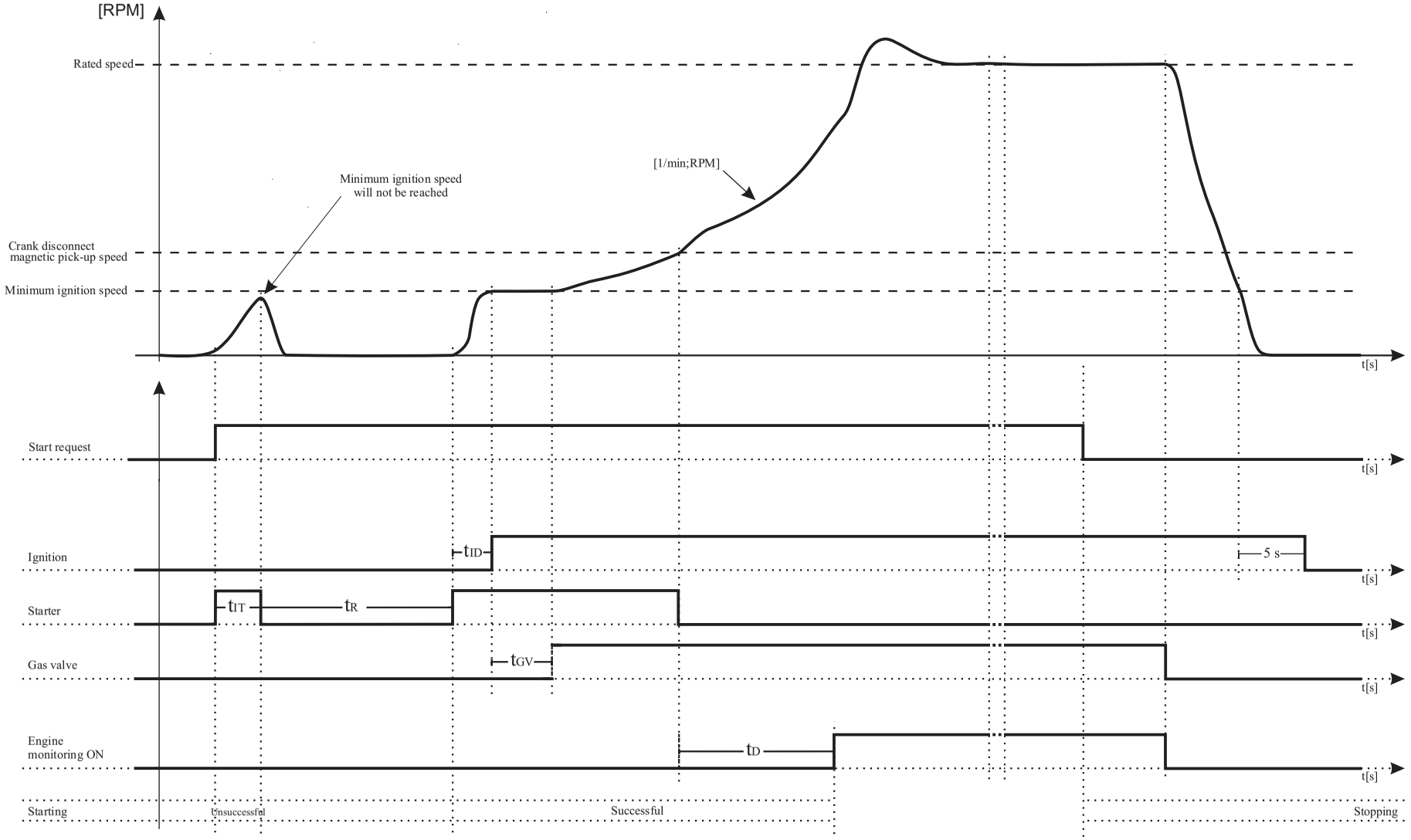
Gas Valve Delay (004.Gas valve delay)
By setting the ignition relay the gas valve delay is started. After the expiry of the set time as long as the number of revolutions is higher than the minimum ignition speed, the gas valve is set. When the necessary engine shutdown process, gas valve is de-energised.

Minimum Ignition Speed (005.Minimum ignition speed)
After expiry of the ignition delay the number of revolutions set must be reached, so that the configurable relay output 'ignition' will be set.

Choke Time (006.Choke time)
This timer dictates that how long choke output will be active in gasoline engines.

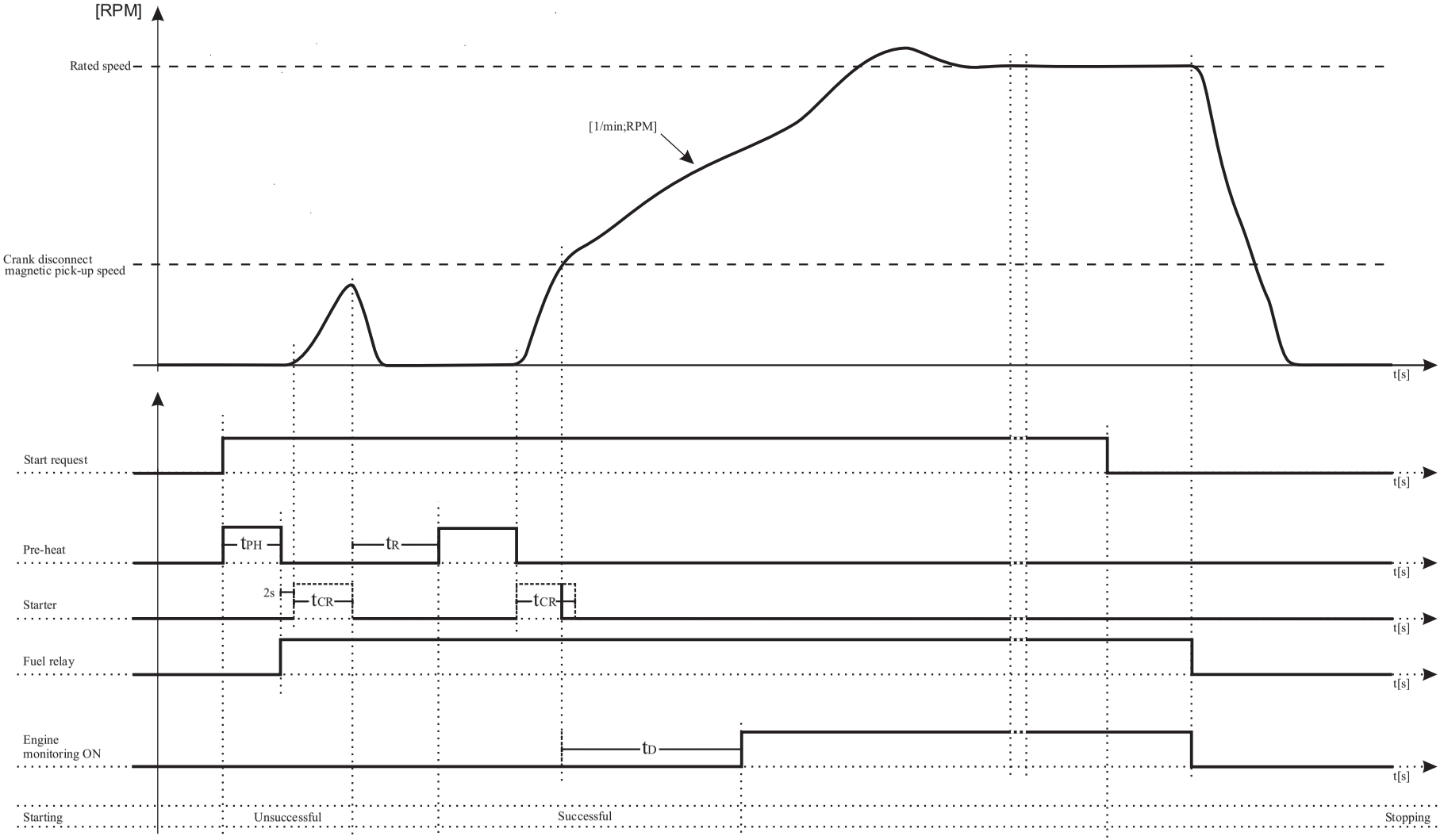
Note: dis = disable

t_R	Interval between 2 start attempts	[s]
t_{ID}	Ignition delay	[s]
t_{GV}	Gas valve delay	[s]
t_D	Engine delayed monitoring	[s]



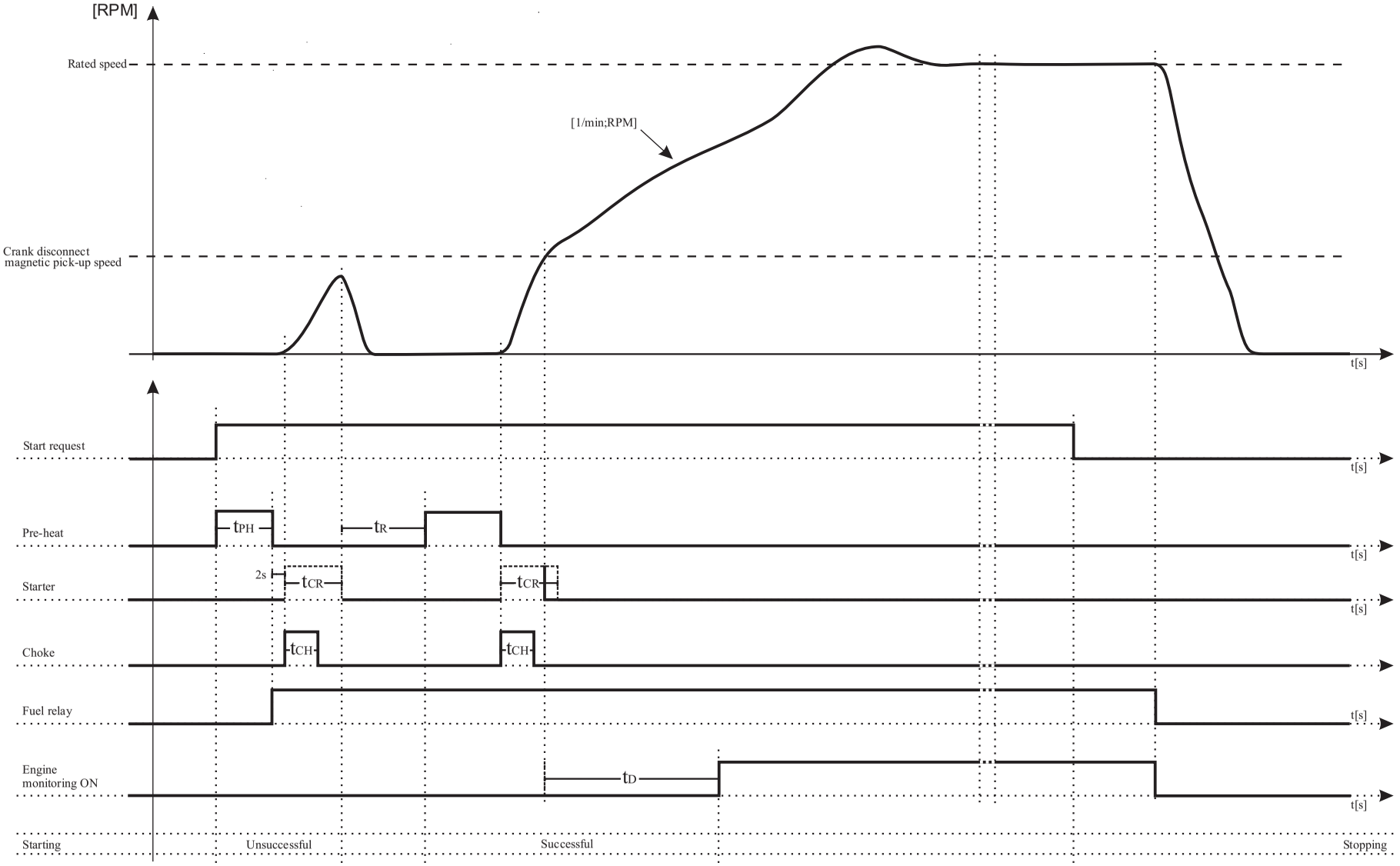
Start/Stop Diagram for GAS ENGINE

t_{PH}	Preheating time	[s]
t_{CR}	Engagement time	[s]
t_R	Interval between 2 start attempts	[s]
t_D	Engine delayed monitoring	[s]



Start/Stop Diagram for DIESEL ENGINE

t_{PH}	Preheating time	[s]
t_{CR}	Engagement time	[s]
t_R	Interval between 2 start attempts	[s]
t_D	Engine delayed monitoring	[s]
t_{CH}	Choke time	[s]



Start/Stop Diagram for GASOLINE ENGINE

5.2.5 Inputs

05.01.SENDER INPUTS (*Inputs->Sender inputs*)		Min	Max	Default	Unit
001.Oil pressure unit	Oil Pressure Unit	BAR/PSI/KPA		BAR	
002.Oil pressure input type	Oil Pressure Input Type	0 - Not Used (Disable) 1 - Digital NC 2 - Digital NO 3 - VDO 5 BAR 4 - VDO 7 BAR 5 - VDO 10 BAR 6 - DATCON 5 BAR 7 - DATCON 7 BAR 8 - MURPHY 7 BAR 9 - User Configured		0 (dis)	
003.Oil pressure prealarm	Oil Pressure Pre-Alarm	0.0 (dis)	30.0	1.2	BAR
004.Oil pressure reset	Oil Pressure Pre-Alarm Reset	0.0	30.0	1.4	BAR
005.Oil pressure shutdown	Oil Pressure Shutdown	0.0	30.0	1.0	BAR
006.Temperature unit	Coolant Temp. Unit	ºC/ºF		ºC	
007.Temperature input type	Coolant Temperature Input Type	0 - Not Used (Disable) 1 - Digital NC 2 - Digital NO 3 - VDO 120 ºC 4 - VDO 150 ºC 5 - DATCON 6 - MURPHY 7 - PT100 8 - User Configured		0 (dis)	
008.Temperature sensor break	Temp. Sensor Break	0 - Disable 1 - Enable From Safety On (3min. delayed) 2 - Always Enable		0 (dis)	
009.High temperature prealarm	High Temp. Pre-Alarm	0 (dis)	300	90	℃
010.High temperature reset	High Temperature Pre-Alarm Reset	0	300	88	℃
011.High temperature shutdown	High Temp. Shutdown	0	300	95	℃
012.Low temperature warning	Low Temp. Warning	0 (dis)	70	0 (dis)	℃
013.Heater control ON	Coolant Heater Control On	0 (dis)	300	0 (dis)	℃
014.Heater control OFF	Coolant Heater Control Off	0	300	45	℃
015.Water pump on time	Water Pump On Time	0	9999	5	Sec
016.Water pump off time	Water Pump Off Time	0	9999	5	Sec
017.Conf. AI1 unit	Conf. Analog Input-1 Unit	BAR/PSI/KPA/ºC/ºF/%/Lt		%	
018.Conf. AI1 type	Configurable Analog Input-1 Type	0 - Not Used (Disable) 1 - Digital NC 2 - Digital NO 3 - VDO OHM (10-180) 4 - VDO TUBE (90-0) 5 - US OHM (240-33) 6 - EMS OHM (0-190) 7 - FORD (73-10) 8 - User Configured		0 (dis)	
019.Conf. AI1 low prealrm	Configurable Analog Input-1 Low Pre-Alarm	0 (dis)	3000	0 (dis)	%

020.Conf. AI1 low reset	Configurable Analog Input-1 Low Reset	0	3000	60	%
021.Conf. AI1 low shutdown	Configurable Analog Input-1 Low Shutdown	0 (dis)	3000	0 (dis)	%
022.Conf. AI1 high prealarm	Configurable Analog Input-1 High Pre-Alarm	0 (dis)	3000	0 (dis)	%
023.Conf. AI1 high reset	Configurable Analog Input-1 High Reset	0	3000	90	%
024.Conf. AI1 high shutdown	Configurable Analog Input-1 High Shutdown	0 (dis)	3000	0 (dis)	%
025.Conf. AI1 control ON	Configurable Analog Input-1 control ON	0 (dis)	3000	0 (dis)	%
026.Conf. AI1 control OFF	Configurable Analog Input-1 control OFF	0	3000	75	%
027.Conf. AI2 unit	Conf. Analog Input-2 Unit	BAR/PSI/KPA/ºC/ºF/%/Lt		ºC	
028.Conf. AI2 type	Configurable Analog Input-2 Type	0 - Not Used (Disable) 1 - Digital NC 2 - Digital NO 3 - VDO 120 ºC 4 - VDO 150 ºC 5 - DATCON 6 - MURPHY 7 - PT100 8 - User Configured		0 (dis)	
029.Conf. AI2 low prealarm	Configurable Analog Input-2 Low Pre-Alarm	0 (dis)	300	0 (dis)	ºC
030.Conf. AI2 low reset	Configurable Analog Input-2 Low Reset	0	300	60	ºC
031.Conf. AI2 low shutdown	Configurable Analog Input-2 Low Shutdown	0 (dis)	300	0 (dis)	ºC
032.Conf. AI2 high prealarm	Configurable Analog Input-2 High Pre-Alarm	0 (dis)	300	0 (dis)	ºC
033.Conf. AI2 high reset	Configurable Analog Input-2 High Reset	0	300	90	ºC
034.Conf. AI2 high shutdown	Configurable Analog Input-2 High Shutdown	0 (dis)	300	0 (dis)	ºC
035.Conf. AI2 control ON	Configurable Analog Input-2 control ON	0 (dis)	300	0 (dis)	ºC
036.Conf. AI2 control OFF	Configurable Analog Input-2 control OFF	0	300	75	ºC

Note: dis = disable

Oil Pressure Input Type (002.Oil pressure input type)
This section is used to configure the Oil Pressure sender input.
0-NOT USED: The Oil Pressure input will not be monitored.
1-DIGITAL NC: The Oil pressure input is fed from an engine mounted digital pressure switch. This switch returns a closed signal during low oil pressure conditions (and engine at rest), once oil pressure is established the switch will open.
2-DIGITAL NO: The Oil pressure input is fed from an engine mounted digital pressure switch. This switch returns an open signal during low oil pressure conditions (and engine at rest), once oil pressure is established the switch will close.
3, 4, 5, 6, 7, 8 and 9: Oil pressure input is connected to a resistive type engine mounted oil pressure transducer. If this parameter selected as "**9-USER CONFIGURED"**, the user can input the data manually according to the sensor curve.

Temperature Input Type (007.Temperature input type)
This section is used to configure the Coolant Temperature sender input.
0-NOT USED: The Coolant Temperature input will not be monitored.
1-DIGITAL NC: The Coolant Temperature input is fed from an engine mounted digital temperature switch. This switch returns a closed signal during low temperature, should the temperature rise above the switch manifacturers trip point the switch contact will open.
2-DIGITAL NO: The Coolant Temperature input is fed from an engine mounted digital temperature switch. This switch returns an open signal during low temperature, should the temperature rise above the switch manifacturers trip point the switch contact will close.
3, 4, 5, 6, 7 and 8: The Coolant Temperature input is connected to a resistive type engine mounted temperature transducer. If this parameter selected as "**8-USER CONFIGURED"**, the user can input the data manually according to the sensor curve.

Temperature Sensor Break (008.Temperature sensor break)
DISABLE: The Coolant Temperature sensor break will not be monitored.
ENABLE FROM SAFETY ON (3min. delayed): The Coolant Temperature sensor break will be monitored if the engine runs at least 3 minutes.
AIWAYS ENABLE: The Coolant Temperature sensor break always will be monitored.

Configurable Analog Input-1 Type (018.Conf. AI1 type)
This section is used to configure the Configurable Analog Input-1 sender input.
0-NOT USED: The Configurable Analog Input-1 will not be monitored.
1-DIGITAL NC: open for low Configurable Analog Input-1.
2-DIGITAL NO: close for low Configurable Analog Input-1.
3, 4, 5, 6, 7 and 8: The Configurable Analog Input-1 input is connected to a resistive type engine mounted level/temperature/pressure transducer. If this parameter selected as "**8-USER CONFIGURED"**, the user can input the data manually according to the sensor curve.

Configurable Analog Input-2 Type (028.Conf. AI2 type)
This section is used to configure the Configurable Analog Input-2 sender input.
0-NOT USED: The Configurable Analog Input-2 will not be monitored.
1-DIGITAL NC: open for low Configurable Analog Input-2.
2-DIGITAL NO: close for low Configurable Analog Input-2.
3, 4, 5, 6, 7 and 8: The Configurable Analog Input-2 input is connected to a resistive type engine mounted level/temperature/pressure transducer. If this parameter selected as "**8-USER CONFIGURED"**, the user can input the data manually according to the sensor curve.

05.02.SENDER LINEARISATION (*Inputs->Sender linearisation*)		Min	Max	Default	Unit
001.Oil pressure sender 1	Oil Pressure Sender Point-1	0	1300	15	R
002.Oil pressure 1	Oil Pressure Point-1	0.0	30.0	0.0	BAR
003.Oil pressure sender 2	Oil Pressure Sender Point-2	0	1300	31	R
004.Oil pressure 2	Oil Pressure Point-2	0.0	30.0	1.0	BAR
005.Oil pressure sender 3	Oil Pressure Sender Point-3	0	1300	49	R
006.Oil pressure 3	Oil Pressure Point-3	0.0	30.0	2.0	BAR
007.Oil pressure sender 4	Oil Pressure Sender Point-4	0	1300	66	R
008.Oil pressure 4	Oil Pressure Point-4	0.0	30.0	3.0	BAR
009.Oil pressure sender 5	Oil Pressure Sender Point-5	0	1300	85	R
010.Oil pressure 5	Oil Pressure Point-5	0.0	30.0	4.0	BAR
011.Oil pressure sender 6	Oil Pressure Sender Point-6	0	1300	101	R
012.Oil pressure 6	Oil Pressure Point-6	0.0	30.0	5.0	BAR
013.Oil pressure sender 7	Oil Pressure Sender Point-7	0	1300	117	R
014.Oil pressure 7	Oil Pressure Point-7	0.0	30.0	6.0	BAR
015.Oil pressure sender 8	Oil Pressure Sender Point-8	0	1300	132	R
016.Oil pressure 8	Oil Pressure Point-8	0.0	30.0	7.0	BAR
017.Oil pressure sender 9	Oil Pressure Sender Point-9	0	1300	149	R
018.Oil pressure 9	Oil Pressure Point-9	0.0	30.0	8.0	BAR
019.Oil pressure sender 10	Oil Pressure Sender Point-10	0	1300	178	R
020.Oil pressure 10	Oil Pressure Point-10	0.0	30.0	10.0	BAR
021.Temperature sender 1	Temperature Sender Point-1	0	1300	579	R
022.Temperature 1	Temperature Point-1	0	300	28	ºC
023.Temperature sender 2	Temperature Sender Point-2	0	1300	404	R
024.Temperature 2	Temperature Point-2	0	300	35	ºC
025.Temperature sender 3	Temperature Sender Point-3	0	1300	342	R
026.Temperature 3	Temperature Point-3	0	300	40	ºC
027.Temperature sender 4	Temperature Sender Point-4	0	1300	250	R
028.Temperature 4	Temperature Point-4	0	300	50	ºC
029.Temperature sender 5	Temperature Sender Point-5	0	1300	179	R
030.Temperature 5	Temperature Point-5	0	300	60	ºC
031.Temperature sender 6	Temperature Sender Point-6	0	1300	136	R
032.Temperature 6	Temperature Point-6	0	300	70	ºC
033.Temperature sender 7	Temperature Sender Point-7	0	1300	103	R
034.Temperature 7	Temperature Point-7	0	300	80	ºC
035.Temperature sender 8	Temperature Sender Point-8	0	1300	77	R
036.Temperature 8	Temperature Point-8	0	300	90	ºC
037.Temperature sender 9	Temperature Sender Point-9	0	1300	67	R
038.Temperature 9	Temperature Point-9	0	300	95	ºC
039.Temperature sender 10	Temperature Sender Point-10	0	1300	63	R
040.Temperature 10	Temperature Point-10	0	300	98	ºC
041.Conf. AI1 sender 1	Conf. Analog Input-1 Sender Point-1	0	1300	10	R
042.Conf. AI1 value 1	Conf. Analog Input-1 Point-1	0	3000	0	%
043.Conf. AI1 sender 2	Conf. Analog Input-1 Sender Point-2	0	1300	30	R
044.Conf. AI1 value 2	Conf. Analog Input-1 Point-2	0	3000	11	%
045.Conf. AI1 sender 3	Conf. Analog Input-1 Sender Point-3	0	1300	50	R
046.Conf. AI1 value 3	Conf. Analog Input-1 Point-3	0	3000	22	%
047.Conf. AI1 sender 4	Conf. Analog Input-1 Sender Point-4	0	1300	70	R
048.Conf. AI1 value 4	Conf. Analog Input-1 Point-4	0	3000	33	%
049.Conf. AI1 sender 5	Conf. Analog Input-1 Sender Point-5	0	1300	90	R
050.Conf. AI1 value 5	Conf. Analog Input-1 Point-5	0	3000	44	%

051.Conf. AI1 sender 6	Conf. Analog Input-1 Sender Point-6	0	1300	110	R
052.Conf. AI1 value 6	Conf. Analog Input-1 Point-6	0	3000	55	%
053.Conf. AI1 sender 7	Conf. Analog Input-1 Sender Point-7	0	1300	130	R
054.Conf. AI1 value 7	Conf. Analog Input-1 Point-7	0	3000	66	%
055.Conf. AI1 sender 8	Conf. Analog Input-1 Sender Point-8	0	1300	150	R
056.Conf. AI1 value 8	Conf. Analog Input-1 Point-8	0	3000	77	%
057.Conf. AI1 sender 9	Conf. Analog Input-1 Sender Point-9	0	1300	170	R
058.Conf. AI1 value 9	Conf. Analog Input-1 Point-9	0	3000	88	%
059.Conf. AI1 sender 10	Conf. Analog Input-1 Sender Point-10	0	1300	190	R
060.Conf. AI1 value 10	Conf. Analog Input-1 Point-10	0	3000	100	%
061.Conf. AI2 sender 1	Conf. Analog Input-2 Sender Point-1	0	1300	579	R
062.Conf. AI2 value 1	Conf. Analog Input-2 Point-1	0	300	28	ºC
063.Conf. AI2 sender 2	Conf. Analog Input-2 Sender Point-2	0	1300	404	R
064.Conf. AI2 value 2	Conf. Analog Input-2 Point-2	0	300	35	ºC
065.Conf. AI2 sender 3	Conf. Analog Input-2 Sender Point-3	0	1300	342	R
066.Conf. AI2 value 3	Conf. Analog Input-2 Point-3	0	300	40	ºC
067.Conf. AI2 sender 4	Conf. Analog Input-2 Sender Point-4	0	1300	250	R
068.Conf. AI2 value 4	Conf. Analog Input-2 Point-4	0	300	50	ºC
069.Conf. AI2 sender 5	Conf. Analog Input-2 Sender Point-5	0	1300	179	R
070.Conf. AI2 value 5	Conf. Analog Input-2 Point-5	0	300	60	ºC
071.Conf. AI2 sender 6	Conf. Analog Input-2 Sender Point-6	0	1300	136	R
072.Conf. AI2 value 6	Conf. Analog Input-2 Point-6	0	300	70	ºC
073.Conf. AI2 sender 7	Conf. Analog Input-2 Sender Point-7	0	1300	103	R
074.Conf. AI2 value 7	Conf. Analog Input-2 Point-7	0	300	80	ºC
075.Conf. AI2 sender 8	Conf. Analog Input-2 Sender Point-8	0	1300	77	R
076.Conf. AI2 value 8	Conf. Analog Input-2 Point-8	0	300	90	ºC
077.Conf. AI2 sender 9	Conf. Analog Input-2 Sender Point-9	0	1300	67	R
078.Conf. AI2 value 9	Conf. Analog Input-2 Point-9	0	300	95	ºC
079.Conf. AI2 sender 10	Conf. Analog Input-2 Sender Point-10	0	1300	63	R
080.Conf. AI2 value 10	Conf. Analog Input-2 Point-10	0	300	98	ºC

05.03.CONF. INPUT-X (*Inputs->Conf. input-x*)		**Min**	**Max**	**Default**	**Unit**
001.Dis,user conf.or list	0- Disable 1- User Configured 2- Select From List	0(dis)	2	In1,2,3=2 In4,5=2 Others=1	
002.Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	In1=1 Others=0	
003.Indication	If User Configured 0- Status 1- Warning Non-Latching 2- Warning Latching 3- Electrical Trip 4- Shutdown	0	4	0	
004.Activation	If User Configured 0- Active From Starting 1- Active From Safety On 2- Always Active	0	2	2	
005.Select from list	If Select From List 0-Remote Start On Load 1-Remote Start Off Load 2-Auxiliary Mains Fail 3-Generator Breaker Open/Close 4-Simulate Horn Reset Button 5-Simulate Alarm Reset Button 6-Simulate Auto Button 7-Simulate Test Button 8-Simulate Manual Button 9-Simulate Start Button 10-Simulate Stop Button 11-Generator Closed Auxiliary 12-Generator Load Inhibit 13-Mains Closed Auxiliary 14-Mains Load Inhibit 15-Auto Restore Inhibit 16-Auto Start Inhibit 17-Panel Lock 18-Scheduled Runs(Exercise) Inhibited 19-Remote Inhibit 20-Force Break Transfer 21-Force No-break Transfer 22-Force Soft Transfer 23-Force Parallel Operation 24-Mains Breaker Open/Close 25-Emergency Stop (for only input-1) 25-Low Oil Pressure (for only input-4) 25-High Temperature (for only input-5) 26-Low Oil Level (for only input-4) 26-Emergency Stop No-Latching (for only input-1)	0	In1,4=26 In5=25 Others=24	In1=25 In2=13 In3=11 In4=25 In5=25	
006.Active delay	Input active delay	0	250	0	Sec

Note-1 : x = 1(input-1), 2(input-2), 3(input-3), 4(input-4), 5(input-5), 6(input-6), 7(input-7), 8(input-8), 9(input-9), 10(input-10), 11(input-11), or 12(input-12)

Note-2 : dis = disable

05.15.CONF. INPUT-13 (*Inputs->Conf. input-13*)		Min	Max	Default	Unit
001.Input type	0- Disable 1- User Configured (Digital) 2- Select From List (Digital) 3- Cabin Temperature (Anolog)	0(dis)	3	1	
002.Polarity	If Input Type is Digital 0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
003.Indication	If Input Type is User Configured 0- Status 1- Warning Non-Latching 2- Warning Latching 3- Electrical Trip 4- Shutdown	0	4	0	
004.Activation	If Input Type is User Configured 0- Active From Starting 1- Active From Safety On 2- Always Active	0	2	2	
005.Select from list	If Select From List 0-Remote Start On Load 1-Remote Start Off Load 2-Auxiliary Mains Fail 3-Generator Breaker Open/Close 4-Simulate Horn Reset Button 5-Simulate Alarm Reset Button 6-Simulate Auto Button 7-Simulate Test Button 8-Simulate Manual Button 9-Simulate Start Button 10-Simulate Stop Button 11-Generator Closed Auxiliary 12-Generator Load Inhibit 13-Mains Closed Auxiliary 14-Mains Load Inhibit 15-Auto Restore Inhibit 16-Auto Start Inhibit 17-Panel Lock 18-Scheduled Runs(Exercise) Inhibited 19-Remote Inhibit 20-Force Break Transfer 21-Force No-break Transfer 22-Force Soft Transfer 23-Force Parallel Operation 24-Mains Breaker Open/Close	0	24	14	
006.Active delay	Input active delay (If Input Type is Digital)	0	250	5	Sec
007.Cabin temp.low prealarm	Cabin temperature low prealarm	-50(dis)	100	dis	ºC
008.Cabin temp.low reset	Cabin temperature low prealarm reset	-50	100	0	ºC
009.Cabin temp.low shutdown	Cabin temperature low shutdown	-50(dis)	100	dis	ºC
010.Cabin temp.high prealarm	Cabin temperature high prealarm	-50(dis)	100	dis	ºC
011.Cabin temp.high reset	Cabin temperature high prealarm reset	-50	100	0	ºC
012.Cabin temp.high shutdown	Cabin temperature high shutdown	-50(dis)	100	dis	ºC

Note: dis = disable

05.16.CONF. EXP. INPUT-X (*Inputs->Conf. exp. input-x*)		**Min**	**Max**	**Default**	**Unit**
001.Dis,user conf.or list	0- Disable 1- User Configured 2- Select From List	0(dis)	2	1	
002.Hardware type	0-> -Ve (Switched To Battery -) 1-> +Ve (Switched To Battery +)	0	1	0	
003.Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
004.Indication	If User Configured 0- Status 1- Warning Non-Latching 2- Warning Latching 3- Electrical Trip 4- Shutdown	0	4	0	
005.Activation	If User Configured 0- Active From Starting 1- Active From Safety On 2- Always Active	0	2	2	
006.Select from list	If Select From List 2-Auxiliary Mains Fail 3-Generator Breaker Open/Close 4-Simulate Horn Reset Button 5-Simulate Alarm Reset Button 6-Simulate Auto Button 7-Simulate Test Button 8-Simulate Manual Button 9-Simulate Start Button 10-Simulate Stop Button 11-Generator Closed Auxiliary 12-Generator Load Inhibit 13-Mains Closed Auxiliary 14-Mains Load Inhibit 15-Auto Restore Inhibit 16-Auto Start Inhibit 17-Panel Lock 18-Scheduled Runs(Exercise) Inhibited 19-Remote Inhibit 20-Force Break Transfer 21-Force No-break Transfer	2	21	2	
007.Active delay	Input active delay	0	250	5	Sec

Note-1 : x = 1(exp. input-1), 2(exp. input-2), 3(exp. input-3), 4(exp. input-4), 5(exp. input-5), 6(exp. input-6), 7(exp. input-7) or 8(exp. input-8)

Note-2 : dis = disable

CONFIGURABLE INPUTS SELECTIONS

0 REMOTE START ON LOAD
In AUTO mode, if one of the configurable inputs are selected as 0 (Remote Start On Load), the unit doesn't perform the mains failure control in order to start the generator. In AUTO mode, if one of the configurable inputs are selected as 0 (Remote Start On Load) and this input is active, then the unit will perform the start sequence and transfer load to the generator. If the input is passive, the unit will perform the stop sequence.

1 REMOTE START OFF LOAD
If this input is active, operation will be similar to the 'Remote Start On Load' function except that the generator will not be instructed to take the load. This function can be used where an engine only run is required e.g. for exercise.

2 AUXILIARY MAINS FAIL
The unit will monitor the incoming single or three phase supply for Over Voltage, Under Voltage, Over Frequency or Under Frequency. It may be required to monitor a different mains supply or some aspect of the incoming mains not monitored by the unit. If the devices providing this additional monitoring are connected to operate this input, the unit will operate as if the incoming mains supply has fallen outside of limits, the genset will be instructed to start and take load. Removal of the input signal will cause the unit to act if the mains has returned to within limits.

3 GENERATOR BREAKER OPEN/CLOSE
If this input is activated in manual mode, the load will be supply from the genset.
If this input is passived in manual mode, the load will be disconnected from the genset.

4 SIMULATE HORN RESET BUTTON
This input mimic's the operation of the 'Horn Reset' button and is used to provide a remotely located Horn Reset push button.

5 SIMULATE ALARM RESET BUTTON
This input mimic's the operation of the 'Alarm Reset' button and is used to provide a remotely located Alarm Reset push button.

6 SIMULATE AUTO BUTTON
This input mimic's the operation of the 'Auto' button and is used to provide a remotely located Auto mode push button.

7 SIMULATE TEST BUTTON
This input mimic's the operation of the 'Test' button and is used to provide a remotely located Test mode push button.

8 SIMULATE MANUAL BUTTON
This input mimic's the operation of the 'Manual' button and is used to provide a remotely located Manual mode push button.

9 SIMULATE START BUTTON
This input mimic's the operation of the 'Start' button and is used to provide a remotely located start push button.

10 SIMULATE STOP BUTTON
This input mimic's the operation of the 'Stop' button and is used to provide a remotely located Stop push button.

11 GENERATOR CLOSED AUXILIARY
This input is used to provide feedback to allow the unit to give true indication of the contactor or circuit breaker switching status. It should be connected to the generator load switching device auxiliary contact.

12 GENERATOR LOAD INHIBIT
This input is used to prevent the unit from loading the generator. If the generator is already on load, activating this input will cause the unit to unload the generator. Removing the input will allow the generator to be loaded again. **Note:** This input only operates to control the generator-switching device if the unit load switching logic is attempting load the generator. It will not control the generator-switching device when the mains is on load.

13 MAINS CLOSED AUXILIARY
This input is used to provide feedback to allow the unit to give true indication of the contactor or circuit breaker switching status. It should be connected to the generator load switching device auxiliary contact.

14 MAINS LOAD INHIBIT
This input is used to prevent the unit from loading the mains supply. If the manis supply is already on load, activating this input will cause the unit to unload the mains supply. Removing the input will allow the mains to be loaded again.

15 AUTO RESTORE INHIBIT
When module in the AUTO mode. In the event of a remote start or mains failure, the generator will be instructed to start and take load. On removal of the remote start signal or mains return, the module will continue to run the generator on load until this AUTO RESTORE INHIBIT input is removed. Once the input is removed the unit will transfer the load back to the mains supply and follow a normal generator stop sequence. This input allows the module to be fitted as part of a system where the manual restoration to mains is controlled remotely or by an automated system.

16 AUTO START INHIBIT
This input is used to provide an over-ride function to prevent the unit from starting the generator in the event of a remote start or mains out of limits condition occurring. If this input is active and a remote start signal or mains failure occurs the unit will not give a start command to the generator. If this input signal is then removed, the unit will operate as if a remote start or mains failure has occurred, starting and loading the generator. This function can be used to give an 'AND' function so that a generator will only be called to start if the mains fails and another condition exists whish requires the generator to run. If the 'Auto Start Inhibit' signal become active once more it will be ignored until the unit has returned the mains supply on load and shutdown.

17 PANEL LOCK
This input is used to provide security to the installation. If the panel lock input is active, the unit will not respond to operation of the mode select or start buttons. This allows the unit to be placed into a spesific mode (such as Auto) and than secured. The operation of the unit is not affected and the operator will still be able to view the various instrumentation pages etc. **Note:** External control sources (i.e. Simulate Start Button) are not affected by the panel lock input and will continue to operate normally.

18 SCHEDULED RUNS(EXERCISE) INHIBITED
This input is used to prevent the generator for starting in the event of a programmed scheduled (exercise) run occurring. While the input is active no scheduled runs will occur. If the input is active when a schedule run is called for, and is removed during the running period the gen-set will start and complete any remaining scheduled running time.

19 REMOTE INHIBIT
In AUTO mode, if one of the configurable inputs are selected as 22 (Remote Inhibit) and this input is active, the module will inhibit the generator for starting. In the other hand, if this input is active while the generator was starting, the module will stop the generator.

20 FORCE BREAK TRANSFER
This input is used to enable break transfer. When this input is activated, the load is transferred after a short interruption according to the content of “01.02.014.Transfer time” parameter.

21 FORCE NO-BREAK TRANSFER
This input is used to enable no-break transfer. When this input is activated, the load is transferred uninterruptedly. The load is supplied from both the mains and the genset until the time in “09.10.002.No break transition time” parameter expires.

22 FORCE SOFT TRANSFER
This input is used to enable soft transfer. When this input is activated, the load is transferred with ramp according to the content of “09.10.008.Load control ramp” parameter.

23 FORCE PARALLEL OPERATION
This input is used to enable parallel operation. When this input is activated, the load is shared between the mains and the genset according to the content of “09.10.003.Load control mode” parameter.

24 MAINS BREAKER OPEN/CLOSE
If this input is activated in manual mode, the load will be supply from the mains.
If this input is passived in manual mode, the load will be disconnected from the mains.

25 EMERGENCY STOP (FOR CONFIGURABLE INPUT-1)
This input is used as the emergency stop input.

25 LOW OIL PRESSURE (FOR CONFIGURABLE INPUT-4)
This input is used as the oil pressure failure input. It will be checked while starting or stopping attempts.

25 HIGH TEMPERATURE (FOR CONFIGURABLE INPUT-5)
This input is used as the temperature failure input.

26-LOW OIL LEVEL (FOR CONFIGURABLE INPUT-4)
This input is used as the oil pressure failure input. It won’t be checked while starting or stopping attemps.

26 EMERGENCY STOP NO-LATCHING (FOR CONFIGURABLE INPUT-1)
This input is used as the non-latching emergency stop input.

5.2.6 Outputs

06.01.CONF. OUTPUT-1 (*Outputs->Conf. output-1*)		Min	Max	Default	Unit
001.Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
002.Function	0-NOT USED 1-AIR FLAP CONTROL 2-ALARM RESET 3-AUDIBLE ALARM 4-AUTO START INHIBIT 5-AUXILIARY MAINS FAILURE 6-BATTERY HIGH VOLTAGE 7-BATTERY LOW VOLTAGE 8-CALLING FOR SCHEDULED RUN(EXERCISE) 9-CAN ECU POWER 10-CAN ECU STOP 11-CHARGE ALTERNATOR FAILURE 12-COMMON ALARM 13-COMMON ELECTRICAL TRIP ALARM 14-COMMON SHUTDOWN ALARM 15-COMMON WARNING ALARM 16-COOLING FAN AFTER START 17-COOLING FAN AFTER STOP 18-COOLANT TEMPERATURE HIGH PRE-ALARM 19-COOLANT TEMPERATURE HIGH SHUTDOWN 20-COOLING DOWN TIMER IN PROGRESS 21-CRANK RELAY ENERGISED 22-DELAYED ALARMS ACTIVE 23-DIGITAL INPUT-1 ALARM 24-DIGITAL INPUT-2 ALARM 25-DIGITAL INPUT-3 ALARM 26-DIGITAL INPUT-4 ALARM 27-DIGITAL INPUT-5 ALARM 28-DIGITAL INPUT-6 ALARM 29-DIGITAL INPUT-7 ALARM 30-DIGITAL INPUT-8 ALARM 31-DIGITAL INPUT-9 ALARM 32-DIGITAL INPUT-10 ALARM 33-DIGITAL INPUT-11 ALARM 34-DIGITAL INPUT-12 ALARM 35-DIGITAL INPUT-13 ALARM 36-EXPANSION INPUT-1 ALARM 37-EXPANSION INPUT-2 ALARM 38-EXPANSION INPUT-3 ALARM 39-EXPANSION INPUT-4 ALARM 40-EXPANSION INPUT-5 ALARM 41-EXPANSION INPUT-6 ALARM 42-EXPANSION INPUT-7 ALARM 43-EXPANSION INPUT-8 ALARM 44-EARTH FAULT 45-EMERGENCY STOP 46-FAIL TO START ALARM 47-FAIL TO STOP ALARM 48-CONF. AI1 CONTROL 49-FUEL RELAY ENERGISED 50-GAS ENGINE IGNITION OUTPUT 51-GENERATOR AT REST 52-GENERATOR AVAILABLE 53-GENERATOR CLOSED AUXILIARY 54-GENERATOR FAILED TO CLOSE 55-GENERATOR FAILED TO OPEN 56-GENERATOR HIGH FREQUENCY PRE-ALARM 57-GENERATOR HIGH FREQUENCY SHUTDOWN 58-GENERATOR HIGH VOLTAGE PRE-ALARM 59-GENERATOR HIGH VOLTAGE SHUTDOWN 60-GENERATOR LOAD INHIBIT 61-GENERATOR LOW FREQUENCY PRE-ALARM 62-GENERATOR LOW FREQUENCY SHUTDOWN 63-GENERATOR LOW VOLTAGE PRE-ALARM 64-GENERATOR LOW VOLTAGE SHUTDOWN 65-GENERATOR STOPPING 66-GENERATOR OPEN BREAKER 67-HORN OUTPUT LATCHED 68-HORN OUTPUT PULSED 69-LAMP TEST 70-CONF. AI2 CONTROL 71-LOSS OF MAGNETIC PICK-UP SPEED SIGNAL 72-LOW TEMPERATURE 73-MAINTENANCE DUE ALARM 74-MAINS CLOSED AUXILIARY 75-MAINS FAILED TO CLOSE 76-MAINS FAILED TO OPEN 77-MAINS FAILURE 78-MAINS HIGH FREQUENCY 79-MAINS HIGH VOLTAGE 80-MAINS LOAD INHIBIT 81-MAINS LOW FREQUENCY 82-MAINS LOW VOLTAGE 83-MAINS OPEN BREAKER 84-NO LOADING COMMAND 85-OIL PRESSURE LOW PRE-ALARM 86-OIL PRESSURE LOW SHUTDOWN 87-CONF.AI1.HIGH PRE-ALARM 88-CONF.AI1.HIGH SHUTDOWN 89-OVER CURRENT PRE-ALARM 90-OVER CURRENT 91-OVER POWER PRE-ALARM 92-OVER POWER SHUTDOWN 93-OVERSPEED PRE-ALARM 94-OVERSPEED SHUTDOWN 95-PANEL LOCK 96-PRE-HEAT(during preheat timer) 97-PRE-HEAT(until end of cranking) 98-PRE-HEAT(until end of warming) 99-PRE-HEAT(until end safety on) 100-REMOTE START PRESENT 101-REMOTE STOP DELAY IN PROGRESS 102-SHORT CIRCUIT 103-SMOKE LIMITING 104-STARTING ALARM 105-STARTING ALARMS ARMED 106-STOP RELAY ENERGIZED 107-SYSTEM IN AUTO MODE 108-SYSTEM IN MANUAL MODE 109-SYSTEM IN STOP MODE 110-SYSTEM IN TEST MODE 111-UNDER CURRENT PRE-ALARM 112-UNDER CURRENT 113-UNDER POWER PRE-ALARM 114-UNDER POWER SHUTDOWN 115-UNDERSPEED PRE-ALARM 116-UNDERSPEED SHUTDOWN 117-WAITING FOR GENERATOR 118-RESERVED 119-LOAD SUPPLY FROM GENERATOR 120-LOAD SUPPLY FROM MAINS 121-CONFIGURABLE ANALOG INPUT 1 LOW PRE-ALARM 122-CONFIGURABLE ANALOG INPUT 1 LOW SHUTDOWN 123-CONFIGURABLE ANALOG INPUT 2 LOW PRE-ALARM 124-CONFIGURABLE ANALOG INPUT 2 LOW SHUTDOWN 125-CONFIGURABLE ANALOG INPUT 2 HIGH PRE-ALARM 126-CONFIGURABLE ANALOG INPUT 2 HIGH SHUTDOWN 127-CHOKE ACTIVE 128-REMOTE CONTROL ACTIVE 129-REVERSE POWER 130-CABIN TEMPERATURE LOW PRE-ALARM 131-CABIN TEMPERATURE LOW SHUTDOWN 132-CABIN TEMPERATURE HIGH PRE-ALARM 133-CABIN TEMPERATURE HIGH SHUTDOWN 134-HEATER CONTROL 135-REMOTE OUTPUT 136-UNBALANCE LOAD 137-WATER PUMP 138-RESERVED 139-SYNCHRONIZATION FAIL 140-LOAD SHEDDING CONTROL-1 141-LOAD SHEDDING CONTROL-2 142-LOAD SHEDDING CONTROL-3 143-LOAD SHEDDING CONTROL-4 144-LOAD SHEDDING CONTROL-5 145-GOVERNOR MAXIMUM LIMIT ALARM 146-AVR MAXIMUM LIMIT ALARM 147-MAINS ROCOF ALARM 148-MAINS VECTOR SHIFT ALARM 149-MAINS UNDER VOLTAGE COIL 150-GENERATOR UNDER VOLTAGE COIL 151-SPEED DOWN PULSE OUTPUT 152-SPEED UP PULSE OUTPUT 153-VOLTAGE DOWN PULSE OUTPUT 154-VOLTAGE UP PULSE OUTPUT	0	154	49	

06.02.CONF. OUTPUT-2 (*Outputs->Conf. output-2*)		Min	Max	Default	Unit
001.Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
002.Function	The same as Configurable Output-1 options	0	154	21	

06.03.CONF. OUTPUT-3 (*Outputs->Conf. output-3*)		Min	Max	Default	Unit
001.Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
002.Function	The same as Configurable Output-1 options	0	154	68	

06.04.CONF. OUTPUT-4 (*Outputs->Conf. output-4*)		Min	Max	Default	Unit
001.Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
002.Function	The same as Configurable Output-1 options	0	154	9	

06.05.CONF. OUTPUT-5 (*Outputs->Conf. output-5*)		Min	Max	Default	Unit
001.Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
002.Function	The same as Configurable Output-1 options	0	154	12	

06.06.CONF. OUTPUT-6 (*Outputs->Conf. output-6*)		Min	Max	Default	Unit
001.Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
002.Function	The same as Configurable Output-1 options	0	154	75	

06.07.CONF. OUTPUT-7 (*Outputs->Conf. output-7*)		Min	Max	Default	Unit
001.Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
002.Function	The same as Configurable Output-1 options	0	154	54	

06.08.CONF. OUTPUT-8 (*Outputs->Conf. output-8*)		Min	Max	Default	Unit
001.Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
002.Function	The same as Configurable Output-1 options	0	154	83	

06.09.CONF. OUTPUT-9 (*Outputs->Conf. output-9*)		Min	Max	Default	Unit
001.Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
002.Function	The same as Configurable Output-1 options	0	154	66	

06.11.CONF. EXP. OUTPUT-1 (*Outputs->Conf. exp. Output-1*)		Min	Max	Default	Unit
001.Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
002.Function	The same as Configurable Output-1 options	0	154	12	

06.12.CONF. EXP. OUTPUT-2 (*Outputs->Conf. exp. output-2*)		Min	Max	Default	Unit
001.Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
002.Function	The same as Configurable Output-1 options	0	154	12	

06.13.CONF. EXP. OUTPUT-3 (*Outputs->Conf. exp. Output-3*)		Min	Max	Default	Unit
001.Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
002.Function	The same as Configurable Output-1 options	0	154	12	

06.14.CONF. EXP. OUTPUT-4 (*Outputs->Conf. exp. Output-4*)		Min	Max	Default	Unit
001.Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
002.Function	The same as Configurable Output-1 options	0	154	12	

06.15.CONF. EXP. OUTPUT-5 (*Outputs->Conf. exp. Output-5*)		Min	Max	Default	Unit
001.Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
002.Function	The same as Configurable Output-1 options	0	154	12	

06.16.CONF. EXP. OUTPUT-6 (*Outputs->Conf. exp. Output-6*)		Min	Max	Default	Unit
001.Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
002.Function	The same as Configurable Output-1 options	0	154	12	

06.17.CONF. EXP. OUTPUT-7 (*Outputs->Conf. exp. Output-7*)		Min	Max	Default	Unit
001.Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
002.Function	The same as Configurable Output-1 options	0	154	12	

06.18.CONF. EXP. OUTPUT-8 (*Outputs->Conf. exp. output-8*)		Min	Max	Default	Unit
001.Polarity	0- Normally Open (Close To Activate) 1- Normally Close (Open To Activate)	0	1	0	
002.Function	The same as Configurable Output-1 options	0	154	12	

CONFIGURABLE OUTPUTS SELECTIONS

0 NOT USED
Output is not used

1 AIR FLAP CONTROL
Normally used to control an air flap, this output becomes active upon an Engine shutdown failure situation. Inactive when the set has come to rest.

2 ALARM RESET
The output indicates that an alarm reset being performed. Once the alarm reset has been completed, the output become inactive again. The output could be used to give an external reset signal to external systems.

3 AUDIBLE ALARM
The output indicates that the internal sounder is operating. It may be use for external sounder.

4 AUTO START INHIBIT
This output indicates that a digital input that has been configured as 'auto start inhibit' is active.

5 AUXILIARY MAINS FAILURE
This output indicates that a digital input that has been configured as 'auxiliary mains failure' is active.

6 BATTERY HIGH VOLTAGE
This output indicates that a battery high voltage alarm has occurred.

7 BATTERY LOW VOLTAGE
This output indicates that a battery low voltage alarm has occurred.

8 CALLING FOR SCHEDULED RUN(EXERCISE)
This output indicates that a scheduled run(exercise) has been called for. If the unit is in the 'auto' and mains okay, the unit will change mode to 'test' and the generator will run if no shutdown alarms are present.

9 CAN ECU POWER
This output normally used to turn on the ECU (sometimes via an external slave relay). Some engine ECUs are permanently powered in which case the ECU Power output is used to give input to a Run (or similarly named) input on the ECU.

10 CAN ECU STOP
This output used to give input to a Stop (or similarly named) input on the ECU. This is used as a backup stop system should the ECU Data link fail. In this instance, it is not possible to stop the engine using a data command as the link is not operative. As a backup, the STOP signal is given to the engine via a separate hardwired connection.

11 CHARGE ALTERNATOR FAILURE
This output indicates that a charging alternator failure has occurred.

12 COMMON ALARM
This output indicates that a warning, electrical trip or shutdown alarm has been activated.

13 COMMON ELECTRICAL TRIP ALARM
This output indicates that an electrical trip alarm has been activated. This output can only be reset by removal of the fault and by then pressing the RESET button.

14 COMMON SHUTDOWN ALARM
This output indicates that a shutdown alarm has been activated. This output can only be reset by removal of the fault and by then pressing the RESET button or by using an external 'alarm reset' input.

15 COMMON WARNING ALARM
This output indicates that a warning alarm has been activated. This output is normally self-resetting on removal of the fault.

16 COOLING FAN AFTER START
This output should energise as soon as engine has started so the fan should be running when the engine is running. This output should continue to operate for Cooling Fan Time parameter after engine has stopped.

17 COOLING FAN AFTER STOP
This output indicates that can be made to energise for Cooling Fan Time parameter after the engine shuts down (to run an electric cooling fan on the radiator).

18 COOLANT TEMPERATURE HIGH PRE-ALARM
This output indicates that a high engine coolant temperature warning (pre-alarm) has occurred.

19 COOLANT TEMPERATURE HIGH SHUTDOWN
This output indicates that a high engine coolant temperature shutdown has occurred.

20 COOLING DOWN TIMER IN PROGRESS
This output source will be active when the cooling off-load timer is running.

21 CRANK RELAY ENERGISED
The output mimics the operation of the crank relay. Can be used to control external logic circuitry.

22 DELAYED ALARMS ACTIVE
The output indicates that the delayed alarms now enabled. Can be used to control external logic circuitry.

23 DIGITAL INPUT-1 ALARM
This output indicates that digital input 1 alarm has occurred.

24 DIGITAL INPUT-2 ALARM
This output indicates that digital input 2 alarm has occurred.

25 DIGITAL INPUT-3 ALARM
This output indicates that digital input 3 alarm has occurred.

26 DIGITAL INPUT-4 ALARM
This output indicates that digital input 4 alarm has occurred.

27 DIGITAL INPUT-5 ALARM
This output indicates that digital input 5 alarm has occurred.

28 DIGITAL INPUT-6 ALARM
This output indicates that digital input 6 alarm has occurred.

29 DIGITAL INPUT-7 ALARM
This output indicates that digital input 7 alarm has occurred.

30 DIGITAL INPUT-8 ALARM
This output indicates that digital input 8 alarm has occurred.

31 DIGITAL INPUT-9 ALARM
This output indicates that digital input 9 alarm has occurred.

32 DIGITAL INPUT-10 ALARM
This output indicates that digital input 10 alarm has occurred.

33 DIGITAL INPUT-11 ALARM
This output indicates that digital input 11 alarm has occurred.

34 DIGITAL INPUT-12 ALARM
This output indicates that digital input 12 alarm has occurred.

35 DIGITAL INPUT-13 ALARM
This output indicates that digital input 13 alarm has occurred.

36 EXPANSION CONFIGURABLE INPUT-1 ALARM
This output indicates that expansion configurable input 1 alarm has occurred.

37 EXPANSION CONFIGURABLE INPUT-2 ALARM
This output indicates that expansion configurable input 2 alarm has occurred.

38 EXPANSION CONFIGURABLE INPUT-3 ALARM
This output indicates that expansion configurable input 3 alarm has occurred.

39 EXPANSION CONFIGURABLE INPUT-4 ALARM
This output indicates that expansion configurable input 4 alarm has occurred.

40 EXPANSION CONFIGURABLE INPUT-5 ALARM
This output indicates that expansion configurable input 5 alarm has occurred.

41 EXPANSION CONFIGURABLE INPUT-6 ALARM
This output indicates that expansion configurable input 6 alarm has occurred.

42 EXPANSION CONFIGURABLE INPUT-7 ALARM
This output indicates that expansion configurable input 7 alarm has occurred.

43 EXPANSION CONFIGURABLE INPUT-8 ALARM
This output indicates that expansion configurable input 8 alarm has occurred.

44 EARTH FAULT
This output indicates that the unit has detected that an earth fault exists on the generator output.

45 EMERGENCY STOP
This output indicates that an emergency stop alarm has occurred.

46 FAIL TO START ALARM
This output indicates that the engine has not started after the specified number of attempts.

47 FAIL TO STOP ALARM
This output indicates that the generator has failed to stop within the selected time.

48 CONFIGURABLE ANALOG INPUT-1 CONTROL
Becomes active when the Analog Input-1 falls below the "ANALOG INPUT-1 ON" setting. If the output is already active it will become inactive when the Analog Input-1 is above the “ANALOG INPUT-1 OFF" setting.

49 FUEL RELAY ENERGISED
The output mimics the operation of the fuel relay. It can be used to control external logic circuitry.

50 GAS ENGINE IGNITION OUTPUT
With the engaging of the starter the ignition delay is started. If the ‘minimum ignition speed’ is reached after expiry of this time, the configurable relay output ‘ignition’ is set. When the necessary engine shutdown process, firstly gas valve is de-energised. Then ignition output is de-energised that after 5 seconds when the engine speed become lower than ‘minimum ignition speed’

51 GENERATOR AT REST
The output indicates that the generator is not running.

52 GENERATOR AVAILABLE
This output indicates when the generator is ready to accept load, i.e. after safety on and warm up timers have timed out.

53 GENERATOR CLOSED AUXILIARY
This output indicates that a digital input that has been configured as 'generator closed auxiliary' is active.

54 GENERATOR FAILED TO CLOSE
This output source has intended to be used to indicate a failure of the generator contactor or breaker. It can only be used if the unit is configured to use 'generator closed auxiliary' feedback.

55 GENERATOR FAILED TO OPEN
This output source has intended to be used to indicate a failure of the generator contactor or breaker. It can only be used if the unit is configured to use 'generator closed auxiliary' feedback.

56 GENERATOR HIGH FREQUENCY PRE-ALARM
This output indicates that a generator high frequency warning (pre-alarm) has occurred.

57 GENERATOR HIGH FREQUENCY SHUTDOWN
This output indicates that a generator high frequency shutdown has occurred.

58 GENERATOR HIGH VOLTAGE PRE-ALARM
This output indicates that a generator high voltage warning (pre-alarm) has occurred.

59 GENERATOR HIGH VOLTAGE SHUTDOWN
This output indicates that a generator high voltage shutdown has occurred.

60 GENERATOR LOAD INHIBIT
This output indicates that a digital input has been configured as 'generator load inhibit' is active.

61 GENERATOR LOW FREQUENCY PRE-ALARM
This output indicates that a generator low frequency warning (pre-alarm) has occurred.

62 GENERATOR LOW FREQUENCY SHUTDOWN
This output indicates that a generator low frequency shutdown has occurred.

63 GENERATOR LOW VOLTAGE PRE-ALARM
This output indicates that a generator low voltage warning (pre-alarm) has occurred.

64 GENERATOR LOW VOLTAGE SHUTDOWN
This output indicates that a generator low voltage shutdown has occurred.

65 GENERATOR STOPPING
This output indicates that the engine has been instructed to stop but has not come to rest.

66 GENERATOR OPEN BREAKER
This output used to control the load switching device. For Details see: "BREAKERS Page" section.

67 HORN OUTPUT LATCHED
This output indicates that the latched horn alarm has occurred.

68 HORN OUTPUT PULSED
This output indicates that the pulsed horn alarm has occurred.

69 LAMP TEST
This output indicates that the module is performing a lamp test. Once the lamp test completed, the output will become inactive again. The output can be used to feed a lamp test on external modules or panel lamps.

70 CONFIGURABLE ANALOG INPUT-2 CONTROL
Becomes active when the Analog Input-2 falls below the "ANALOG INPUT-2 ON" setting. If the output is already active it will become inactive when the Analog Input-2 is above the “ANALOG INPUT-2 OFF" setting.

71 LOSS OF MAGNETIC PICK-UP SPEED SIGNAL
This output indicates that the magnetic pick up signal is not sufficient to be used by the unit for speed monitoring. The alarm can only operate if the speed signal fails to appearduring cranking. It is disabled if ‘multiple attempts to engage’ is selected. If the MPU fails during engine running this would result in an under speed alarm.

72 LOW TEMPERATURE
This output indicates that a low temperature warning has occurred.

73 MAINTENANCE DUE ALARM
This output indicates that the generator is now due for maintenance either because it has used all the available running hours or the periodic maintenance time has expired. To clear the output a maintenance reset must be performed.

74 MAINS CLOSED AUXILIARY
This output indicates that a digital input that has been configured as 'mains closed auxiliary' is active.

75 MAINS FAILED TO CLOSE
This output source has intended to be used to indicate a failure of the mains contactor or breaker. It can only be used if the unit is configured to use 'mains closed auxiliary' feedback.

76 MAINS FAILED TO OPEN
This output source has intended to be used to indicate a failure of the mains contactor or breaker. It can only be used if the unit is configured to use 'mains closed auxiliary' feedback.

77 MAINS FAILURE
This output indicates that the unit has sensed that a failure of the incoming AC mains supply. This output will become active whenever the mains voltage or frequency goes out of limits, or if the auxiliary mains failure input active (if used) and the mains transient timer has expired.

78 MAINS HIGH FREQUENCY
This output indicates that the unit has sensed that the incoming AC mains supply frequency has exceeded the frequency limit setting.

79 MAINS HIGH VOLTAGE
This output indicates that the unit has sensed that the incoming AC mains supply voltage has exceeded the voltage limit setting.

80 MAINS LOAD INHIBIT
This output indicates that a digital input has been configured as 'mains load inhibit' is active.

81 MAINS LOW FREQUENCY
This output indicates that the unit has sensed that the incoming AC mains supply frequency has fallen below the frequency setting.

82 MAINS LOW VOLTAGE
This output indicates that the unit has sensed that the incoming AC mains supply voltage has fallen below the voltage limit setting.

83 MAINS OPEN BREAKER
This output used to control the load switching device. For Details see: "BREAKERS Page" section.

84 NO LOADING COMMAND
This output indicates that the unit is not calling of the generator contactor or breaker to be closed. Should the unit close the generator contactor this output will become inactive.

85 OIL PRESSURE LOW PRE-ALARM
This output indicates that a low oil pressure warning (pre-alarm) has occurred.

86 OIL PRESSURE LOW SHUTDOWN
This output indicates that a low oil pressure shutdown has occurred.

87 CONFIGURABLE ANALOG INPUT-1 HIGH PRE-ALARM
This output indicates that a high analog input-1 warning (pre-alarm) has occurred.

88 CONFIGURABLE ANALOG INPUT-1 HIGH SHUTDOWN
This output indicates that a high analog input-1 shutdown has occurred.

89 OVER CURRENT PRE-ALARM
This output indicates that the over current pre-alarm has been reached.

90 OVER CURRENT ALARM
This output indicates that the over current trip level has been reached.

91 OVER POWER PRE-ALARM
This output indicates that the over power pre-alarm has been reached.

92 OVER POWER SHUTDOWN
This output indicates that the over power shutdown has been reached.

93 OVER SPEED PRE-ALARM
This output indicates that the over speed warning (pre-alarm) has occurred.

94 OVER SPEED SHUTDOWN
This output indicates that the over speed shutdown has occurred.

95 PANEL LOCK
This output indicates that the unit ‘panel lock’ is active. If the panel lock input is active, the unit will not respond to operation of the Mode select or start buttons. This allows the unit to be placed into a specific mode (such as auto) and then secured.

96 PRE-HEAT(during preheat timer)
The output controls the pre-heater. Pre-heat output is available for the duration of pre-heat timer, which terminates prior to cranking.

97 PRE-HEAT(until end of cranking)
The output controls the pre-heater. As 'Pre-heat (during pre-heat timer)' mode but pre-heat is also available during cranking.

98 PRE-HEAT(until end of warming)
The output controls the pre-heater. As 'Pre-heat (until safety on)' but pre-heat continues to be available until the warm-up timer has elapsed.

99 PRE-HEAT(until end safety on)
The output controls the pre-heater. As 'Pre-heat (until end of cranking)' but pre-heat is also available while waiting for the delayed alarms to become active.

100 REMOTE START PRESENT
This output indicates that a digital input that has been configured as 'remote start' is active. This output could be used to pass the remote start signal on to else where in the control system.

101 REMOTE STOP DELAY IN PROGRESS
This output source will be active to indicate that the return timer is running.

102 SHORT CIRCUIT
This output indicates that the module has detected a short circuit on the generator output.

103 SMOKE LIMITING
This output is used to supply a smoke-limiting signal to an Electronic Governor to limit smoke emissions on start-up. It is used in conjunction with the Smoke limit timer (Idle mode timer) settings. Once the timer has expired, the Smoke limit output will cease to operate allowing the engine to accelerate to normal running speed.

104 STARTING ALARM
This output is used to supply an external sounder with a signal that the engine is about to start. The output will be active during the start delay and pre-heat timer (if used).

105 STARTING ALARMS ARMED
The output indicates that the starting alarms are now enabled. It can be used to control external logic circuitry. Starting alarms are armed as soon as the unit commences starting of the engine and remain armed until the engine at rest.

106 STOP RELAY ENERGISED
The output mimics the operation of the stop relay. Can be used to control external logic circuitry.

107 SYSTEM IN AUTO MODE
The output indicates that the unit is in the Auto mode.

108 SYSTEM IN MANUAL MODE
The output indicates that the unit is in the Manual mode.

109 SYSTEM IN STOP MODE
The output indicates that the unit is in the Stop mode.

110 SYSTEM IN TEST MODE
The output indicates that the unit is in the Test mode.

111 UNDER CURRENT PRE-ALARM
This output indicates that the under current pre-alarm has been reached.

112 UNDER CURRENT ALARM
This output indicates that the under current trip level has been reached.

113 UNDER POWER PRE-ALARM
This output indicates that the under power pre-alarm has been reached.

114 UNDER POWER SHUTDOWN
This output indicates that the under power shutdown has been reached.

115 UNDER SPEED PRE-ALARM
This output indicates that an under speed warning (pre-alarm) has occurred.

116 UNDER SPEED SHUTDOWN
This output indicates that an under speed shutdown has occurred.

117 WAITING FOR GENERATOR
This output indicates that the engine has been instructed to start but has not yet become available. Once the generator becomes available this output will be in-active.

118 RESERVED

119 LOAD SUPPLY FROM GENERATOR
This output indicates that the load is supplying from generator.

120 LOAD SUPPLY FROM MAINS
This output indicates that the load is supplying from mains.

121 CONFIGURABLE ANALOG INPUT-1 LOW PRE-ALARM
This output indicates that a low configurable analog input-1 warning (pre-alarm) has occurred.

122 CONFIGURABLE ANALOG INPUT-1 LOW SHUTDOWN
This output indicates that a low analog input-1 shutdown has occurred.

123 CONFIGURABLE ANALOG INPUT-2 LOW PRE-ALARM
This output indicates that a low configurable analog input-1 warning (pre-alarm) has occurred.

124 CONFIGURABLE ANALOG INPUT-2 LOW SHUTDOWN
This output indicates that a low analog input-2 shutdown has occurred.

125 CONFIGURABLE ANALOG INPUT-2 HIGH PRE-ALARM
This output indicates that a high analog input-2 warning (pre-alarm) has occurred.

126 CONFIGURABLE ANALOG INPUT-2 HIGH SHUTDOWN
This output indicates that a high analog input-2 shutdown has occurred.

127 CHOKE ACTIVE
This ouput becomes active everytime generator cranks and stays active until the choke time expires.

128 REMOTE CONTROL ACTIVE
This output indicates that the engine is being controlled remotely.

129 REVERSE POWER
This ouput becomes active when generator's active power drops below the Reverse Power Set value.

130 CABIN TEMPERATURE LOW PRE-ALARM
This output indicates that a low cabin temperature warning (pre-alarm) has occurred.

131 CABIN TEMPERATURE LOW SHUTDOWN
This output indicates that a low cabin temperature shutdown has occurred.

132 CABIN TEMPERATURE HIGH PRE-ALARM
This output indicates that a high cabin temperature warning (pre-alarm) has occurred.

133 CABIN TEMPERATURE HIGH SHUTDOWN
This output indicates that a high cabin temperature shutdown has occurred.

134 HEATER CONTROL
Becomes active when the Coolant Temperature falls below the "Heater control ON" setting. If the output is already active it will become inactive when the Coolant Temperature is above the “Heater control OFF" setting.

135 REMOTE OUTPUT
This output indicates that the output can be energised or de-energised remotely.

136 UNBALANCE LOAD
This output indicates “out of balance” current loading of the generator.
Sometimes also called Negative Sequence Current or Symmetry Fault.

137 WATER PUMP
This output becomes active for the “Water pump on time” parameter and passive for the “Water pump off time” parameter while the "Heater control output" was active.

138 RESERVED

139 SYNCHRONIZATION FAIL
Becomes active if the module fails to synchronise after the “Maximum synchronization time”.

140 LOAD SHEDDING CONTROL-1
This output becomes active if the engine kW exceeds the “Load Shedding Control Trip” level.
This output becomes pasive if the engine kW returns to below the “Load Shedding Control Return” level.

141 LOAD SHEDDING CONTROL-2
This output becomes active if the engine kW exceeds the “Load Shedding Control Trip” level.
This output becomes pasive if the engine kW returns to below the “Load Shedding Control Return” level.

142 LOAD SHEDDING CONTROL-3
This output becomes active if the engine kW exceeds the “Load Shedding Control Trip” level.
This output becomes pasive if the engine kW returns to below the “Load Shedding Control Return” level.

143 LOAD SHEDDING CONTROL-4
This output becomes active if the engine kW exceeds the “Load Shedding Control Trip” level.
This output becomes pasive if the engine kW returns to below the “Load Shedding Control Return” level.

144 LOAD SHEDDING CONTROL-5
This output becomes active if the engine kW exceeds the “Load Shedding Control Trip” level.
This output becomes pasive if the engine kW returns to below the “Load Shedding Control Return” level.

145 GOVERNOR MAXIMUM LIMIT ALARM
This output indicates that the analogue Governor output has been reached to its maximum level.

146 AVR MAXIMUM LIMIT ALARM
This output indicates that the analogue AVR output has been reached to its maximum level.

147 MAINS ROCOF ALARM
This output indicates that the R.O.C.O.F. (Rate Of Change Of Frequency) protection has triggered during parallel operation with the mains.

148 MAINS VECTOR SHIFT ALARM
This output indicates that the Vector Shift protection has triggered during parallel operation with the mains.

149 MAINS UNDER VOLTAGE COIL
This output is used to control the load switching device. This output will be active whenever the mains is required to be on load. When want to the mains to be off load, this output will be passive.

150 GENERATOR UNDER VOLTAGE COIL
This output is used to control the load switching device. This output will be active whenever the generator is required to be on load. When want to the generator to be off load, this output will be passive.

151 SPEED DOWN PULSE OUTPUT
This output is used to give a speed lower signal to the external governor or motorised potentiometers.

152 SPEED UP PULSE OUTPUT
This output is used to give a speed raise signal to the external governor or motorised potentiometers.

153 VOLTAGE DOWN PULSE OUTPUT
This output is used to give a voltage lower signal to the external AVR or motorised potentiometers.

154 VOLTAGE UP PULSE OUTPUT
This output is used to give a voltage raise signal to the external AVR or motorised potentiometers.

5.2.7 Timers

07.01.START TIMERS (*Timers->Start timers*)		Min	Max	Default	Unit
001.Mains transient delay	Mains Transient Delay	0.0	20.0	2.0	Sec
002.Mains fail start delay	Mains Fail Start Delay	0	9999	0	Sec
003.Remote start delay	Remote Start Delay	0	3600	4	Sec
004.Pre-heat	Pre-Heat	0	250	3	Sec
005.Pre-heat bypass	Pre-Heat Bypass	0	250	0	Min
006.Safety on delay	Safety On Delay	0	99	5	Sec
007.Warming up time	Warmup Time	0	250	3	Sec
008.Horn duration	Horn Duration	0 (dis)	999	60	Sec
009.Charge excitation time	Charge Excitation Time	0	99(cont)	15	Sec
010.Cooling fan time	Cooling Fan Time	0	250	180	Sec
011.Idle mode time	Idle Mode Time (Smoke Limiting)	0 (dis)	3600	dis	Sec
012.Idle mode time off	Idle Mode Time Off (Smoke Limiting Off)	0	250	5	Sec

Mains Transient Delay (001.Mains transient delay)
The unit uses this parameter to decide the mains failure.

Mains Fail Start Delay (002.Mains fail start delay)
This timer dictates how long the unit will wait after it has received a mains failure signal before it will attempt to genset start. This prevent un-necessary starting on a fluctuating mains supply etc.

Remote Start Delay (003.Remote start delay)
This timer dictates how long the unit will wait after it has received a remote start signal before it will attempt to start. This prevent un-necessary starting on a fluctuating mains supply etc.

Pre-Heat (004.Pre-heat)
This timer dictates the duration that the pre-heat output will be active before an attempt is made to start the engine. Once this timer is expired cranking will commence.

Pre-Heat Bypass (005.Pre-heat bypass)
This feature allows the unit to start a hot engine without performing an un-necessary pre-heat delay. The bypass timer is triggered by the generator starting and actually being loaded. If the generator started but does not achieve loading then the timer will not be triggered. The bypass timer is initiated once the engine has come to rest. If any attempts to start are requested within the duration of the bypass timer the start sequence will bypass the pre-heat timer.

Safety On Delay (006.Safety on delay)
This timer dictates how long the unit will ignore the Low Oil Pressure, High Engine Temperature, Underspeed, Undervolts and any other inputs configured as active from safety on. It allows the values such as oil pressure to rise to their operating values on starting without triggering an alarm. Once the timer has expired all alarm conditions are monitored again. If configured to use 'fast loading', should all the monitored conditions, such as oil pressure, come to expected state prior to the end of the safety on timer, the timer will be terminated prematurely ensuring maximum protection as soon as possible.

Warmup Time (007.Warming up time)
This timer is initiated once the engine is up and running. It delays loading the generator until it has stabilised. Once this timer is expired the 'Close generator' signal will be given and the generator is available to be loaded.

Horn Duration (008.Horn duration)
This timer dictates how long the external horn and the internal sounder will work after the last error detected. Once after this timer ended unit will do the external horn and the internal sounder reset.

Charge Excitation Time (009.Charge excitation time)
Charge excitation was selectable as momentary / continuous operation.This timer dictates how long the Charge excitation will active.

Note: dis = disable cont = continuous

Cooling Fan Time (010.Cooling fan time)
This timer dictates how long the Cooling Fan will continue to operate.

Idle Mode Time (011.Idle mode time)
This is the amount of time that the smoke limiting output will remain active for once the engine has started. While the smoke limiting output is active the engine will be held at a reduced speed to minimise smoke emissions on start-up. (Only if fitted with an appropriate Electronic Control Module). Once the timer has expired the engine will be allowed to accelerate up to its normal operating speed.

Idle Mode Time Off (012.Idle mode time off)
This timer is started after the Idle mode timer (smoke limit timer) was expired. This is to allow the engine to accelerate to its normal running speed without triggering an underspeed alarm, etc.

07.02.STOPPING TIMERS (***Timers->Stopping timers***)		**Min**	**Max**	**Default**	**Unit**
001.Mains return delay	Mains Return Delay	0	3600	5	Sec
002.Remote stop delay	Remote Stop Delay	0	250	4	Sec
003.Cooling time	Cooling Time	0 (dis)	3600	60	Sec
004.Fail to stop delay	Fail To Stop Time	15	99	30	Sec

Mains Return Delay (001.Mains return delay)
This timer dictates how long the unit will wait before it will un-load the generator (back to the mains supply) and initialise it's stop cycle. This is ensure that the mains supply has stabilised before transferring the load back to mains.

Remote Stop Delay (002.Remote stop delay)
This timer dictates how long the unit will wait after it has received a remote stop signal before it will attempt to stop. This prevent un-necessary stopping on a fluctuating mains supply etc.

Cooling Timer (003.Cooling time)
This is the time the generator is to run off-load once the load transfer signal has ceased. This gives the engine time to cool down before shutdown.

Fail To Stop Time (004.Fail to stop delay)
Once the unit has given a shutdown signal to the engine it expects the engine to come to rest. It monitors the Oil pressure and speed sensing sources and if they still indicate engine movement when this timer expires a 'Fail To Stop' alarm signal is generated.

5.2.8 Expansion Modules

08.01.IO (1-8) MODULE (***Expansion modules->IO (1-8)***)		**Min**	**Max**	**Default**	**Unit**
001.Disable/enable select	Exp. I/O Module Selection	ENABL/DISBL		DISBL	

08.02.DIAL-UP(***Expansion modules->Dial-up***)		**Min**	**Max**	**Default**	**Unit**
001.Disable/enable select	Exp. Dial-up Module Selection	ENABL/DISBL		ENABL	
002.Call back selection	Call Back Selection	ENABL/DISBL		DISBL	

08.04.GPRS MODULE (***Expansion modules->GPRS***)		**Min**	**Max**	**Default**	**Unit**
001.Disable/enable select	Expansion GPRS Module Selection	0-DISABLE 1-GPRS SERVER 2-GPRS CLIENT 3-SMS		1-GPRS SERVER	
002.Call back selection	Call Back Selection	ENABL/DISBL		DISBL	
003.Cell info refresh rate	Cell info refresh rate	0(dis)	999	15	Min
004.Location data	Location data	ENABL/DISBL		DISBL	
005.Location warning	Location warning	1(dis)	999	1(dis)	Km

08.05.GPRS WEB MODULE (***Expansion modules->GPRS Web)***		**Min**	**Max**	**Default**	**Unit**
001.Disable/enable select	GPRS-Web Module Selection	ENABL/DISBL		ENABL	

5.2.9 Synchronization

09.01.GOVERNOR CONTROL (Synchronization->*Governor control*)		Min	Max	Default	Unit
001.Frequency control	Frequency Control Selection: 0- Disable 1- Analogue 2- Digital (Up/Down)	0	2	1	
002.Manual frequency set	Manual Frequency Set	30.0	75.0	50.0	Hz
003.Minimum output value*1	Minimum Output Value	0.0	100.0	55.0	%
004.Maximum output value*1	Maximum Output Value	0.0	100.0	70.0	%
005.Initial value*1	Initial Output Value	0.0	100.0	50.0	%
006.Output direction*1	0- Positive 1- Negative	0	1	0	
007.Proportional	Proportional	0.00	99.99	5.58	
008.Integral	Integral	0.00	99.99	0.30	
009.Derivative	Derivative	0.00	99.99	0.01	
010.Frequency control start	Frequency Control Start Value	10.0	80.0	43.0	Hz
011.Frequency control delay	Frequency Control Start Delay	0	999	3	Sec
012.Frequency control ramp	Frequency Control Ramp Value	0.10	60.00	2.50	Hz/s
013.Frequency set value offset	Frequency Set Value Offset	0.00	0.50	0.12	Hz
014.Maximum output limit actions	Maximum Output Limit Actions: 0- Disable, 1- Warning, 2- Electrical Trip, 3- Shutdown.	0(dis)	3	0(dis)	
015.Max.output limit act.dely time	Max. Output Limit Act. Delay Time	0	99	2	Sec
017.Up/Down pulse period*2	Speed Up/Down Pulse Period	0.1	10.0	1.0	Sec
018.Up/Down pulse time*2	Speed Up/Down Pulse Time	0.01	5.00	0.50	Sec
019.Up/Down frequency deadband*2	Up/Down Frequency Deadband	0.02	9.99	0.08	Hz

Notes: *1 = These parameters can be adjusted automatically by using the “Auto Adjust Feature For Governor And AVR”.
If the speed control is via the CanJ1939 (if there is no requirement to connect the analogue governor output), the “**006.Output direction**” parameter must be set to “**0-Positive**”.

*2 = These parameters are only applicable if the “09.01.001.Frequency control” parameter is configured to “*2-Digital (Up/Down)*”.

Frequency Control Selection (001.Frequency control)
0-Disable: Normally, this parameter should be “Enable” for frequency control. But the user need to make “0-Disable” it during first Governor settings or system adaptation.
When the user try to adjust the Governor module to make stable engine speed for nominal frequency if the unit give another control output to the Governor module, frequency setting is not possible.

1-Analogue: The frequency is controlled using an analogue PID controller via the governor output terminals (Terminal-42 (G+) and Terminal-43 (G-)).

2-Digital (Up/Down): The frequency is controlled using an speed up/down output functions (”*151-Speed down pulse output”* and “*152-Speed up pulse output”*) via the configurable digital outputs.

Manual Frequency Set (002.Manual frequency set)
The value of this parameter is the reference for manual frequency control.

Minimum Output Value (003.Minimum output value)
The value of this parameter must be set to the minimum voltage scale of the Governor module.

Maximum Output Value (004.Maximum output value)
The value of this parameter must be set to the maximum voltage scale of the Governor module.

Initial Output Value (005.Initial value)
The value entered for this parameter is hold the governor frequency in nominal value until the monitored frequency reaches to the value of parameter of frequency control start.

Output Direction (006.Output direction)
0-Positive: If Trans-Amf.Syncro Governor output voltage increases, the generator frequency will increase. If Trans-Amf.Syncro Governor output voltage decreases, the generator frequency will decrease.

1-Negative: If Trans-Amf.Syncro Governor output voltage increases, the generator frequency will decrease. If Trans-Amf.Syncro Governor output voltage decreases, the generator frequency will increase.

Proportional (007.Proportional)
The proportional term produces an output value that is proportional to the current error value. If the proportional gain is too high, the system can become unstable. If the proportional gain is too low, the control action may be too small when responding to system disturbances.

Integral (008.Integral)
The integral response will continually increase over time unless the error is zero. This parameter permits the user to adjust how quickly the integral attempts to correct for any offset. If the integral gain constant is too large, the engine will not stabilize. If the integral gain constant is too small, the engine will take too long to settle at a steady state.

Derivative (009.Derivative)
The derivative action predicts system behavior and thus improves settling time and stability of the system. If this parameter is increased, the stability of the system will increase. Essentially this is the brake for the process.

Frequency Control Start Value (010.Frequency control start)
If the monitored generator frequency has exceed the value of this parameter, the frequency controller is activated. This prevents to control the frequency before the engine is completing its stabilization.

Frequency Control Start Delay (011.Frequency control delay)
After the delay time expires the frequency controller is activated.

Frequency Control Ramp Value (012.Frequency control ramp)
The ramp value is supplies the controller with the different setpoint values. This value is used to modify of the rate of the controller's setpoint value. For the faster change in the setpoint, the greater value must entered here.

Frequency Set Value Offset (013.Frequency set value offset)
This parameter is used for while the genset synchronize to the mains. With this offset, the unit synchronizes with a positive slip.

014.Maximum output limit actions and 015.Max.output limit act.dely time
If the analogue Governor output is being driven to its maximum level for the duration of the "015.Max.output limit act.dely time" parameter, the Governor maximum trim alarm is activated.

Speed Up/Down Pulse Period (017.Up/Down pulse period)
This parameter determines the period of the digital output that configured as "Speed Up/Down Pulse Output".

Speed Up/Down Pulse Time (018.Up/Down pulse time)
This parameter determines the pulse width of the digital output that configured as "Speed Up/Down Pulse Output".

Up/Down Frequency Deadband (019.Up/Down frequency deadband)
If the measured genset frequency deviates from the frequency setpoint by more than the value configured in this parameter, the unit gives a speed up/down signal. This parameter prevents unnecessary wear at the speed up/down relay contacts.

For example:
The frequency setpoint is configured as 50.0 Hz and this deadband parameter configured as 0.2 Hz.
If the measured frequency falls below 49.8 Hz (50.0 - 0.2), the unit gives a speed up pulse signal.
If the measured frequency rises above 50.2 Hz (50.0 + 0.2), the unit gives a speed down pulse signal.

09.02.AVR CONTROL (Synchronization->*AVR control*)		Min	Max	Default	Unit
001.Voltage control	Voltage Control Selection: 0- Disable 1- Analogue 2- Digital (Up/Down)	0	2	1	
002.Manual voltage set	Manual Voltage Set	60	440	400	V~
003.Minimum output value*1	Minimum Output Value	0.0	100.0	37.5	%
004.Maximum output value*1	Maximum Output Value	0.0	100.0	62.5	%
005.Initial value*1	Initial Output Value	0.0	100.0	50.0	%
006.Output direction*1	0- Positive 1- Negative	0	1	0	
007.Proportional	Proportional	0.00	99.99	3.24	
008.Integral	Integral	0.00	99.99	0.30	
009.Derivative	Derivative	0.00	99.99	0.01	
010.Voltage control start	Voltage Control Start Value	60	440	300	V~
011.Voltage control delay	Voltage Control Start Delay	0	999	5	
012.Voltage control ramp	Voltage Control Ramp Value	1.00	99.99	5.00	%/s
013.Maximum output limit actions	Maximum Output Limit Actions: 0- Disable, 1- Warning, 2- Electrical Trip, 3- Shutdown.	0(dis)	3	0(dis)	
014.Max.output limit act.dely time	Max. Output Limit Act. Delay Time	0	99	2	Sec
016.Up/Down pulse period*2	Voltage Up/Down Pulse Period	0.1	10.0	1.0	Sec
017.Up/Down pulse time*2	Voltage Up/Down Pulse Time	0.01	5.00	0.50	Sec
018.Up/Down voltage deadband*2	Up/Down Voltage Deadband	0.10	9.99	1.00	%

Notes: *1 = These parameters can be adjusted automatically by using the “Auto Adjust Feature For Governor And AVR”.

*2 = These parameters are only applicable if the “09.02.001.Voltage control” parameter is configured to “*2-Digital (Up/Down)*”.

Voltage Control Selection (001.Voltage control)
0-Disable: Normally, this parameter should be “Enable” for alternator voltage control. But the user need to make “0-Disable” it during first AVR settings or system adaptation.
When the user try to adjust the AVR module to make stable alternator voltage for nominal voltage if the unit give another control output to the AVR module, alternator voltage setting is not possible.

1-Analogue: The voltage is controlled using an analogue PID controller via the AVR output terminals (Terminal-44 (A+) and Terminal-45 (A-)).

2-Digital (Up/Down): The voltage is controlled using an voltage up/down output functions (”*153-Voltage down pulse output”* and “*154-Voltage up pulse output”*) via the configurable digital outputs.

Manual Voltage Set (002.Manual voltage set)
The value of this parameter is the reference for manual alternator voltage control.

Minimum Output Value (003.Minimum output value)
The value of this parameter must be set to the minimum voltage scale of the AVR module.

Maximum Output Value (004.Maximum output value)
The value of this parameter must be set to the maximum voltage scale of the AVR module.

Initial Output Value (005.Initial value)
The value entered for this parameter is hold the alternator voltage in nominal value until the monitored alternator voltage reaches to the value of parameter of voltage control start.

Output Direction (006.Output direction)
0-Positive: If Trans-Amf.Syncro AVR output voltage increases, the alternator voltage will increase. if Trans-Amf.Syncro AVR output voltage decreases, the alternator voltage will decrease.

1-Negative: If Trans-Amf.Syncro AVR output voltage increases, the alternator voltage will decrease. if Trans-Amf.Syncro AVR output voltage decreases, the alternator voltage will increase.

Proportional (007.Proportional)
The proportional term produces an output value that is proportional to the current error value. If the proportional gain is too high, the system can become unstable. If the proportional gain is too low, the control action may be too small when responding to system disturbances.

Integral (008.Integral)
The integral response will continually increase over time unless the error is zero. This parameter permits the user to adjust how quickly the integral attempts to correct for any offset. If the integral gain constant is too large, the engine will not stabilize. If the integral gain constant is too small, the engine will take too long to settle at a steady state.

Derivative (009.Derivative)
The derivative action predicts system behavior and thus improves settling time and stability of the system. If this parameter is increased, the stability of the system will increase. Essentially this is the brake for the process.

Voltage Control Start Value (010.Voltage control start)
If the monitored generator voltage has exceed the value of this parameter, the voltage controller is activated. This prevents to control the voltage before the engine is completing its stabilization.

Voltage Control Start Delay (011.Voltage control delay)
After the delay time expires the voltage controller is activated.

Voltage Control Ramp Value (012.Voltage control ramp)
The ramp value is supplies the controller with the different setpoint values. This value is used to modify of the rate of the controller's setpoint value. For the faster change in the setpoint, the greater value must entered here.

013.Maximum output limit actions and 014.Max.output limit act.dely time
If the analogue AVR output is being driven to its maximum level for the duration of the "014.Max.output limit act.dely time" parameter, the AVR maximum trim alarm is activated.

Voltage Up/Down Pulse Period (016.Up/Down pulse period)
This parameter determines the period of the digital output that configured as "Voltage Up/Down Pulse Output".

Voltage Up/Down Pulse Time (017.Up/Down pulse time)
This parameter determines the pulse width of the digital output that configured as "Voltage Up/Down Pulse Output".

Up/Down Voltage Deadband (018.Up/Down voltage deadband)
If the measured alternator voltage deviates from the voltage setpoint by more than the value configured in this parameter, the unit gives a voltage up/down signal. This parameter prevents unnecessary wear at the voltage up/down relay contacts.

For example:
The voltage setpoint is configured as 400 Vac and this deadband parameter configured as 1.00 %.
If the measured alternator voltage falls below 396 Vac (400 - 4), the unit gives a voltage up pulse signal.
If the measured alternator voltage rises above 404 Vac (400 + 4), the unit gives a voltage down pulse signal.

09.03.PF CONTROL (Synchronization->*PF control*)		Min	Max	Default	Unit
001.PF control	Power Factor Control	ENABL/DISBL		DISBL	
002.Proportional	Proportional	0.00	99.99	3.24	
003.Integral	Integral	0.00	99.99	0.30	
004.Derivative	Derivative	0.00	99.99	0.01	
005.PF control ramp	PF Control Ramp Value	0.01	99.99	3.00	%/s
006.PF control set	Power Factor Control Set Value	-1.00	1.00	1.00	

Power Factor Control (001.PF control)
ENABLE: The power factor is controlled using a PID controller. In mains parallel operation, the reactive load sharing is not performed. So the reactive power of the genset is regulated by the “Power factor control set” parameter.

DISABLE: The power factor is not controlled.

Proportional (002.Proportional)
The proportional term produces an output value that is proportional to the current error value. If the proportional gain is too high, the system can become unstable. If the proportional gain is too low, the control action may be too small when responding to system disturbances.

Integral (003.Integral)
The integral response will continually increase over time unless the error is zero. This parameter permits the user to adjust how quickly the integral attempts to correct for any offset. If the integral gain constant is too large, the engine will not stabilize. If the integral gain constant is too small, the engine will take too long to settle at a steady state.

Derivative (004.Derivative)
The derivative action predicts system behavior and thus improves settling time and stability of the system. If this parameter is increased, the stability of the system will increase. Essentially this is the brake for the process.

Power Factor Control Ramp Value (005.PF control ramp)
The ramp value is supplies the controller with the different setpoint values. This value is used to modify of the rate of the controller’s setpoint value. For the faster change in the setpoint, the greater value must entered here.

Power Factor Control Set Value (006.PF control set)
The power factor is controlled using a PID controller on the unit.
In mains parallel operation, the reactive load sharing is not performed. So the reactive power of the genset is regulated by the “006.Power factor control set” parameter.

09.05.LOAD SHARE CONTROL (Synchronization->*Load share control*)		Min	Max	Default	Unit
001.Generator kW rating	Generator kW Rating	1	9999	120	kW
002.Generator kVAr rating	Generator kVAr Rating	1	9999	90	kVAr
007.Active power control ramp	Active Power Control Ramp	0.10	99.99	3.00	%/s

Generator kW rating (001.Generator kW rating)
This parameter defines generator active power rating. It is used for kW sharing.

Generator kVAr rating (002.Generator kVAr rating)
This parameter defines generator reactive power rating. It is used for kVAr control.

Active Power Control Ramp (007.Active power control ramp)
This parameter defines the rate of the ramp onto and off the load. Initially, the unit will take active power by load minimum and then will increase its load share.
If the genset is unloaded the unit will ramp down at the value of this parameter from the current active power level to the level set by generator unload limit before being removed from the bus.

09.06.SYNCHRON CONTROL (*Synchronization->Synchron control*)		Min	Max	Default	Unit
002.Maximum voltage difference	Maximum Voltage Difference	0	50	5	V~
003.Positive frequency difference	Positive Frequency Difference	0.02	0.49	0.20	Hz
004.Negative frequency difference	Negative Frequency Difference	-0.49	0.00	-.18	Hz
005.Maximum positive phase angle	Maximum Positive Phase Angle	0.0	60.0	2.0	°
006.Maximum negative phase angle	Maximum Negative Phase Angle	-60.0	0.0	-5.0	°
007.Relay closing time	Contactor Closing Time	40	300	60	msec
008.Maximum synchronization time	Maximum Synchronization Time	0	999	80	Sec
009.Synchron dwell time	Synchronization Dwell Time	0.0	25.0	0.0	Sec

The above parameters are used for the mains and/or generator synchronization.

Maximum Voltage Difference (002.Maximum voltage difference)
If the difference between mains and genset voltage is less than this parameter's value, the close command will be issued for the mains circuit breaker (MCB) or generator circuit breaker (GCB).

Positive Frequency Difference (003.Positive frequency difference)
If the difference between mains and genset frequency is less than this parameter's value, the close command will be issued for the mains circuit breaker (MCB) or generator circuit breaker (GCB).

Negative Frequency Difference (004.Negative frequency difference)
If the difference between mains and genset frequency is greather than this parameter's value, the close command will be issued for the mains circuit breaker (MCB) or generator circuit breaker (GCB).

Maximum Positive Phase Angle (005.Maximum positive phase angle)
If the leading phase angle between mains and genset is less than this parameter's value, the close command will be issued for the mains circuit breaker (MCB) or generator circuit breaker (GCB).

Maximum Negative Phase Angle (006.Maximum negative phase angle)
If the lagging phase angle between mains and genset is less than this parameter's value, the close command will be issued for the mains circuit breaker (MCB) or generator circuit breaker (GCB).

Contactor Closing Time (007.Relay closing time)
The specific time of the mains circuit breaker (MCB) or generator circuit breaker (GCB) defines to the lead time of the close command.

Maximum Synchronization Time (008.Maximum synchronization time)
If the synchronization is not successful within a time period adjusted by this parameter, the synchronization alarm will be issued and the genset will be stopped.

Synchronization dwell time (009.Synchron dwell time)
If the synchronization conditions occurs and persists until this time, the close command will be issued for the mains circuit breaker (MCB) or generator circuit breaker (GCB).

09.08.LOAD SHEDDING CONTROL (Synchronization->*Load shed.cont*)		Min	Max	Default	Unit
001.Number of outputs in control	Number of outputs in control	0(dis)	5	0(dis)	
002.Number of outputs at start	Number of outputs at start	0	5	0	
003.Trip level	Trip level	0	100	80	%
004.Return level	Return level	0	100	40	%
005.Trip Delay	Trip Delay	0	3600	5	Sec
006.Return delay	Return delay	0	3600	5	Sec

Number of outputs in control (001.Number of outputs in control)
The number of outputs (maximum 5) that will be used in the Load Shedding Control. If the parameter is selected as “Disable”, the Load Shedding Control is disabled.

Number of outputs at start (002.Number of outputs at start)
The number of outputs configured to Load Shedding Control 1-5 that will be energised when the genset is required to take load.

Trip level (003.Trip level) and Trip delay (005.Trip delay)
If the kW level is above the “Trip level” parameter for the duration of the “Trip delay” parameter, then the next output configured to Load Shedding Control is activated.

Return level (004.Return level) and Return delay (006.Return delay)
If the kW level is below the “Return level” parameter for the duration of the “Return delay” parameter, then the highest numbered output configured to Load Shedding Control is de-activated.

09.10.BREAKER&LOAD CONT. (*Synchronization->Breaker&load cont*)		Min	Max	Default	Unit
001.Breaker transition mode	Breaker Transition Mode Selection: 0- Break 1- No break 2- Soft 3- Parallel	0	3	0	
002.No break transition time	No break transition time	0.0	25.0	0.5	Sec
003.Load control mode	Load Control Mode Selection: 0- Import Power 1- Export Power 2- Constant Power	0	2	0	
004.Load control set	Load Control Set	1	9999	100	kW
005.Load control hysteresis	Load Control Hysteresis	0	9999	20	kW
006.Import power start delay	Import Power Start Delay	0	999	5	Sec
007.Import power stop delay	Import Power Stop Delay	0	999	5	Sec
012.Soft transition high limit	Soft Transition High Limit	0	100	90	%
013.Soft transition low limit	Soft Transition Low Limit	0	100	10	%
014.Soft transition timeout	Soft Transition Timeout	0	999	30	Sec

Breaker Transition Mode Selection (001.Breaker transition mode)
0-BREAK: This mode is used to enable break transfer. When this mode is activated, the load is transferred after a short interruption according to the content of “01.02.014.Transfer time” parameter.

1-NO BREAK: This mode is used to enable no-break transfer. When this mode is activated, the load is transferred uninterruptedly. The load is supplied from both the mains and the genset until the time in “09.10.002.No break transition time” parameter expires.

2-SOFT: This mode is used to enable soft transfer. When this mode is activated, the load is transferred with ramp according to the content of “09.10.008.Load control ramp” parameter.

3-PARALLEL: This mode is used to enable parallel operation. When this mode is activated, the load is shared between the mains and the genset according to the content of “09.10.003.Load control mode” parameter.

No Break Transition Time (002.No break transition time)
If the “09.10.001.Breaker transition mode” parameter is configured as “1-NO BREAK”, the load is supplied from both the mains and the genset until the time in this parameter expires.

Load Control Mode Selection (003.Load control mode)
If the “09.10.001.Breaker transition mode” parameter is configured as “3-PARALLEL”, the Load control mode must be selected from this parameter. Options are as follows;

0-IMPORT POWER: Peak lopping or peak shaving. The mains shall always supply for the limit value set by parameter “09.10.004.Load control set”. When the customer demand load exceeds the limit value set by parameter “09.10.004.Load control set”, the load above the limit value is supplied by the genset. It is especially used at times when the power requirement increases, that is, when the mains tariff will endure.

1-EXPORT POWER: Power export to mains. The genset power export to the mains as much as the value in parameter “09.10.004.Load control set” with constant power factor.
The genset operates as part of the mains line in this mode.

2-CONSTANT POWER: Base load. The genset shall always supply for the limit value set by parameter “09.10.004.Load control set”. When the customer demand load exceeds the limit value set by parameter “09.10.004.Load control set”, the load above the limit value is supplied by the mains.
If the load falls below the the limit value set by parameter “09.10.004.Load control set”, the excess power of the genset is export to the mains.

Load Control Set (004.Load control set)
This value is the reference for the load controller mode (import, export, constant) or the soft transition mode when performing parallel operation.

Load Control Hysteresis (005.Load control hysteresis)
In parallel operation with the mains (0-Import power mode), this hysteresis value is used to issue stop command to the genset.

Import Power Start Delay (006.Import power start delay)
In parallel operation with the mains (0-Import power mode), when the customer demand load exceeds the limit value set by parameter “09.10.004.Load control set”, the start command will be issued to the genset after the delay time of this parameter has expired.

Import Power Stop Delay (007.Import power stop delay)
In parallel operation with the mains (0-Import power mode), when the customer demand load falls below the “09.10.004.Load control set” parameter minus the “09.10.005.Load control hysteresis” parameter, the stop command will be issued to the genset after the delay time of this parameter has expired.

Soft Transition High Limit (012.Soft transition high limit)
If the mains active power exceeds this limit while soft transferring from the genset to the mains, the soft transition will be terminated and the generator circuit breaker (GCB) will be de-energized.

Soft Transition Low Limit (013.Soft transition low limit)
If the mains active power falls below this limit while soft transferring from the mains to the genset, the soft transition will be terminated and the mains circuit breaker (MCB) will be de-energized.

Soft Transition Timeout (014.Soft transition timeout)
If this timer was expired while soft transferring from the genset to the mains, the soft transition will be terminated and the generator circuit breaker (GCB) will be de-energized.

If this timer was expired while soft transferring from the mains to the genset, the soft transition will be terminated and the mains circuit breaker (MCB) will be de-energized.

09.11.MAINS DECOUPLING (*Synchronization->Mains decoupling*)		Min	Max	Default	Unit
001.Vector shift set	Vector Shift Set Value	0(dis)	30	8	°
002.Rocof (df/dt) set	Rocof (df/dt) Set Value	0.4(dis)	9.9	5.0	Hz/s
003.Rocof (df/dt) delay	Rocof (df/dt) Delay	0.0	9.9	0.8	Sec
004.Mains decoupling actions	Mains Decoupling Actions: 0- Warning 1- Electrical Trip 2- Auxiliary Mains Failure	0	2	1	
005.Mains decoupling control delay	Mains Decoupling Control Delay	0.0	999.9	1.0	Sec

Vector Shift Set Value (001.Vector shift set)
Vector shift protection is enabled when the genset is in parallel with the mains supply.
This parameter specifies the level of vector shift protection.
The unit measures the last 4 periods for any phase of the mains. At the end of each period, the average duration of the last 2 periods and the average duration of the 3th and 4th periods are compared. If the difference is greater than the value defined in this parameter, the unit will detect mains failure and display the “Mains vector shift alarm!” message on the screen.

Rocof (df/dt) Set Value (002.Rocof (df/dt) set)
Rocof means “rate of change of frequency”.
Rocof protection is enabled when the genset is in parallel with the mains supply.
This parameter specifies the level of Rocof protection.
The unit measures the frequency of the mains every period. If the change in the mains frequency value exceeds the value defined in this parameter in the last 4 periods measured and this condition continues for the time specified in the "09.11.003.Rocof (df/dt) delay" parameter, the unit will detect mains failure and display the “Mains rocof alarm!” message on the screen.

Rocof (df/dt) Delay (003.Rocof (df/dt) delay)
If the measured Rocof (df/dt) exceeds the value in the “09.11.002.Rocof (df/dt) set" parameter for the delay time configured here, the unit will detect mains failure and display the “Mains rocof alarm!” message on the screen.

Mains Decoupling Actions (004.Mains decoupling actions)
The mains decoupling protections are “Rocof” and “Vector shift”.
When any of these protections (“Rocof” and “Vector shift”) is active, the unit decides how to behave according to the selection on this parameter;

0-Warning: The related alarm message is displayed to warn the user. But the generator load switch (GCB), the mains load switch (MCB) or the genset are not affected by this situation.

1-Electrical Trip: The generator load switch (GCB) is opened and the genset is stopped after running for as long as the cooling period.

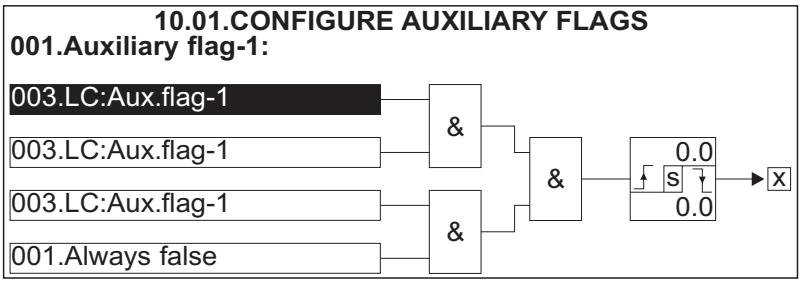
2-Auxiliary Mains Failure: The mains load switch (MCB) is opened and the genset is allowed to continue providing power to the load.

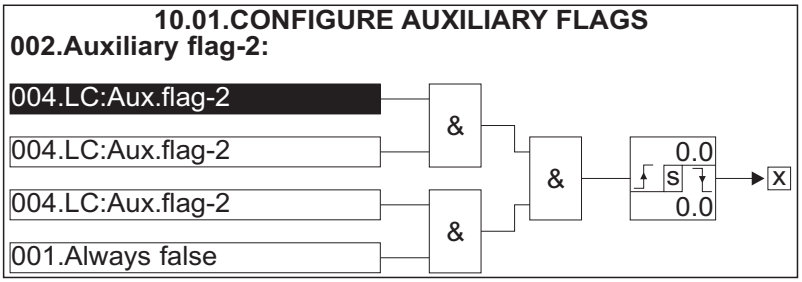
Mains Decoupling Control Delay (005.Mains decoupling control delay)
In parallel operation with the mains, when the mains contactor is switched on, the mains decoupling protections (Rocof and Vector shift) are activated after this time.

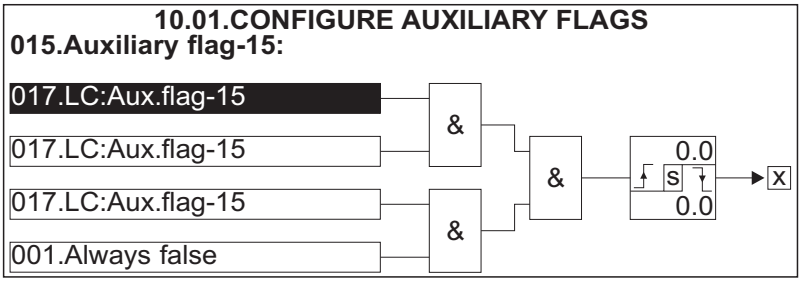
5.2.10 Logic Controller

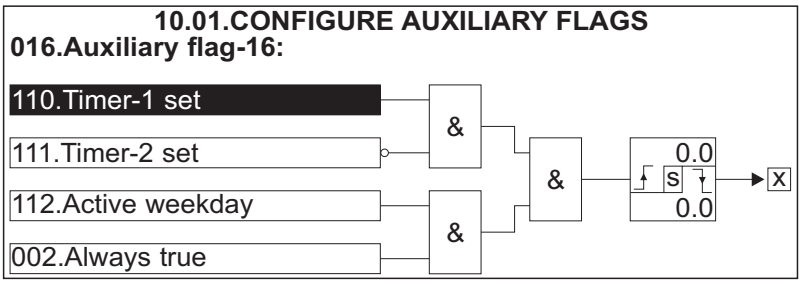
10.01.CONF. AUXILIARY FLAGS *(Logic controller->Conf. auxiliary flags)*		Min	Max	Default	Unit
001.Auxiliary flag-1:	Auxiliary Flag-1 Configuration	*Logic Controller*		0	
002.Auxiliary flag-2:	Auxiliary Flag-2 Configuration	*Logic Controller*		0	
003.Auxiliary flag-3:	Auxiliary Flag-3 Configuration	*Logic Controller*		0	
004.Auxiliary flag-4:	Auxiliary Flag-4 Configuration	*Logic Controller*		0	
005.Auxiliary flag-5:	Auxiliary Flag-5 Configuration	*Logic Controller*		0	
006.Auxiliary flag-6:	Auxiliary Flag-6 Configuration	*Logic Controller*		0	
007.Auxiliary flag-7:	Auxiliary Flag-7 Configuration	*Logic Controller*		0	
008.Auxiliary flag-8:	Auxiliary Flag-8 Configuration	*Logic Controller*		0	
009.Auxiliary flag-9:	Auxiliary Flag-9 Configuration	*Logic Controller*		0	
010.Auxiliary flag-10:	Auxiliary Flag-10 Configuration	*Logic Controller*		0	
011.Auxiliary flag-11:	Auxiliary Flag-11 Configuration	*Logic Controller*		0	
012.Auxiliary flag-12:	Auxiliary Flag-12 Configuration	*Logic Controller*		0	
013.Auxiliary flag-13:	Auxiliary Flag-13 Configuration	*Logic Controller*		0	
014.Auxiliary flag-14:	Auxiliary Flag-14 Configuration	*Logic Controller*		0	
015.Auxiliary flag-15:	Auxiliary Flag-15 Configuration	*Logic Controller*		0	
016.Auxiliary flag-16:	Auxiliary Flag-16 Configuration	*Logic Controller*		0	

Factory setting of the above LC parameters:



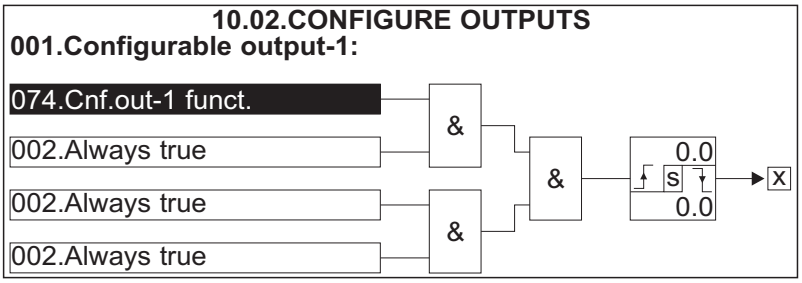


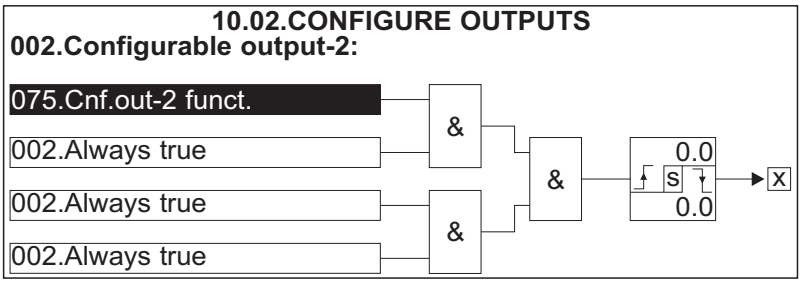


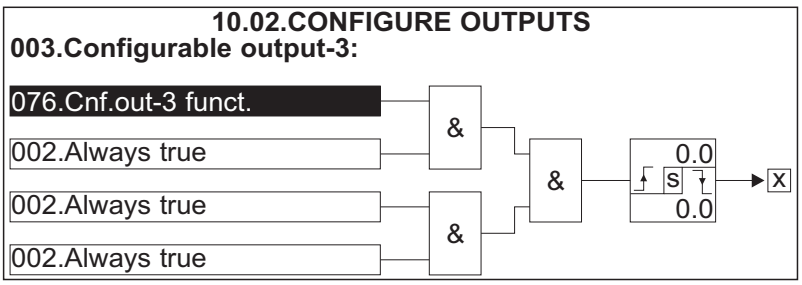


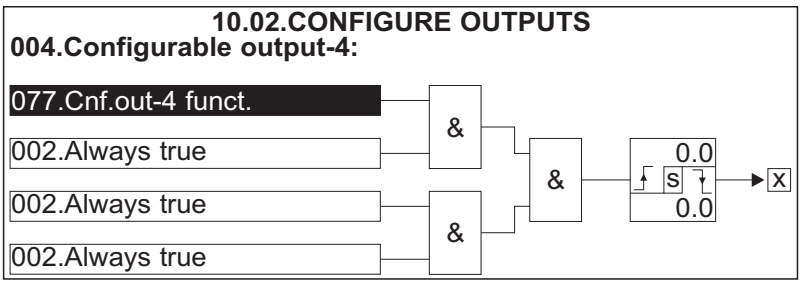
10.02.CONFIGURE OUTPUTS *(Logic controller->Configure outputs)*		Min	Max	Default	Unit
001.Configurable output-1:	Configurable Output-1 Configuration	*Logic Controller*		0	
002.Configurable output-2:	Configurable Output-2 Configuration	*Logic Controller*		0	
003.Configurable output-3:	Configurable Output-3 Configuration	*Logic Controller*		0	
004.Configurable output-4:	Configurable Output-4 Configuration	*Logic Controller*		0	
005.Configurable output-5:	Configurable Output-5 Configuration	*Logic Controller*		0	
006.Configurable output-6:	Configurable Output-6 Configuration	*Logic Controller*		0	
007.Configurable output-7:	Configurable Output-7 Configuration	*Logic Controller*		0	
008.Configurable output-8:	Configurable Output-8 Configuration	*Logic Controller*		0	
009.Configurable output-9:	Configurable Output-9 Configuration	*Logic Controller*		0	

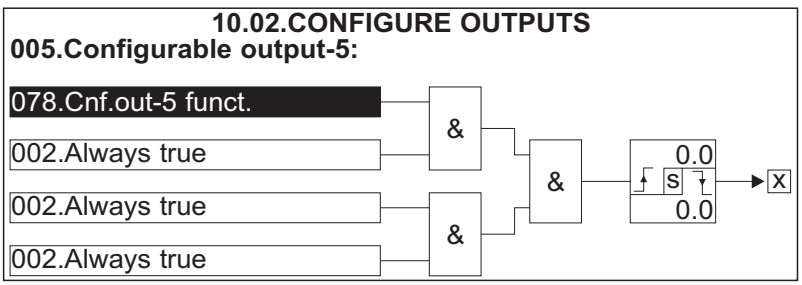
Factory setting of the above LC parameters:



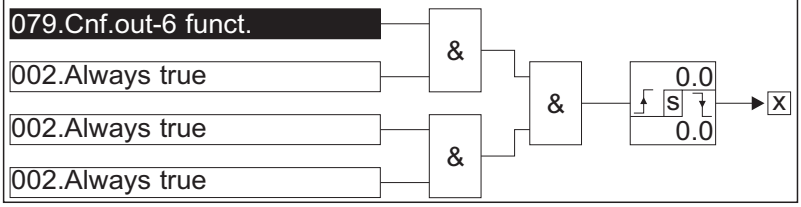




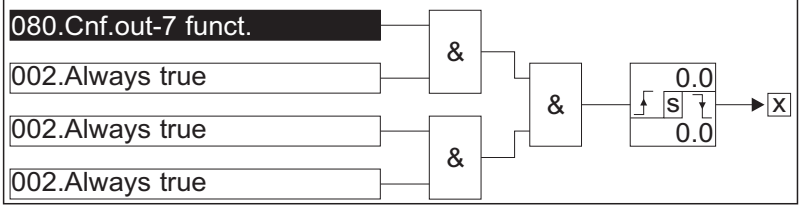




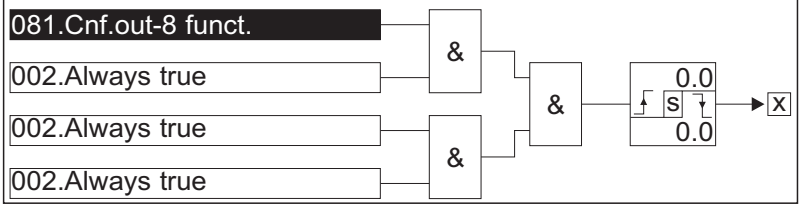
10.02.CONFIGURE OUTPUTS
006.Configurable output-6:



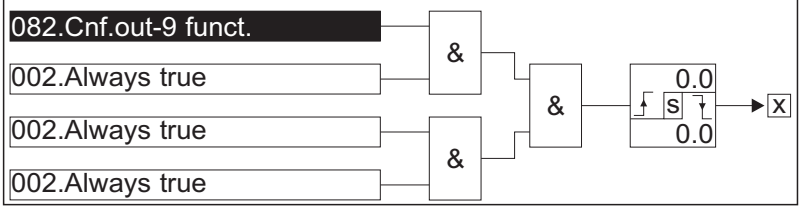
10.02.CONFIGURE OUTPUTS
007.Configurable output-7:



10.02.CONFIGURE OUTPUTS
008.Configurable output-8:

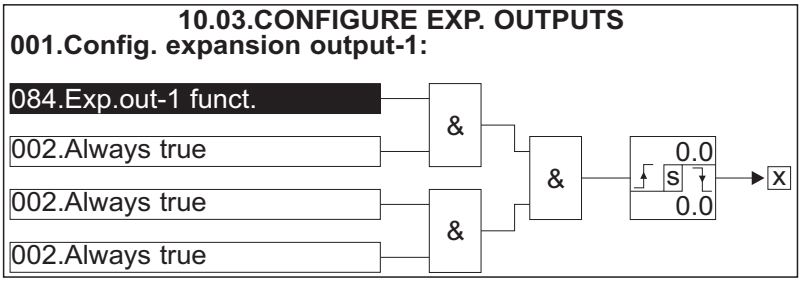


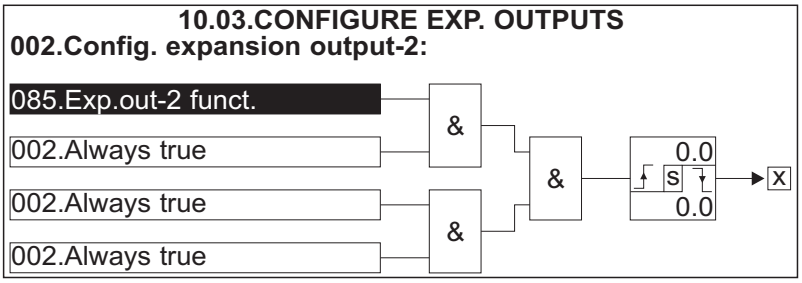
10.02.CONFIGURE OUTPUTS
009.Configurable output-9:

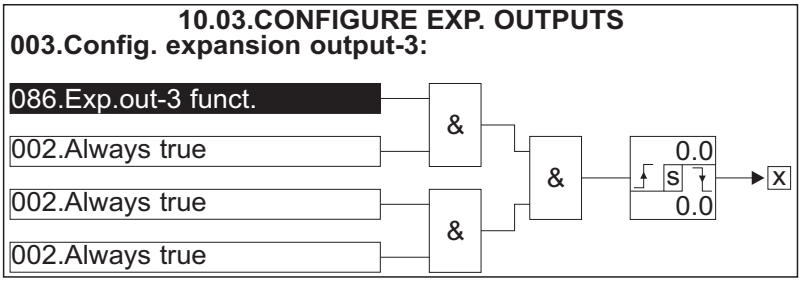


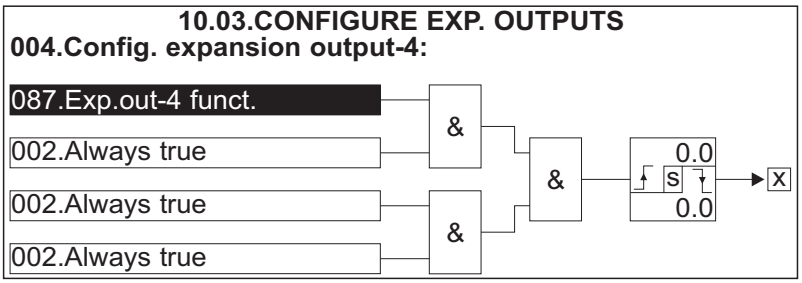
10.03.CONFIG. EXP. OUTPUTS *(Logic controller->Config. exp. outputs)*		Min	Max	Default	Unit
001.Config. expansion output-1:	Config. Exp. Output-1 Configuration	*Logic Controller*		0	
002.Config. expansion output-2:	Config. Exp. Output-2 Configuration	*Logic Controller*		0	
003.Config. expansion output-3:	Config. Exp. Output-3 Configuration	*Logic Controller*		0	
004.Config. expansion output-4:	Config. Exp. Output-4 Configuration	*Logic Controller*		0	
005.Config. expansion output-5:	Config. Exp. Output-5 Configuration	*Logic Controller*		0	
006.Config. expansion output-6:	Config. Exp. Output-6 Configuration	*Logic Controller*		0	
007.Config. expansion output-7:	Config. Exp. Output-7 Configuration	*Logic Controller*		0	
008.Config. expansion output-8:	Config. Exp. Output-8 Configuration	*Logic Controller*		0	

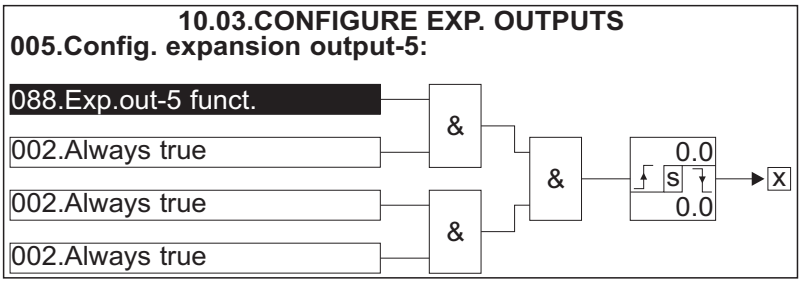
Factory setting of the above LC parameters:

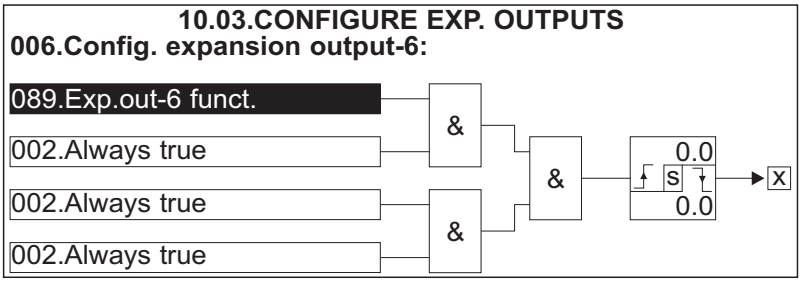


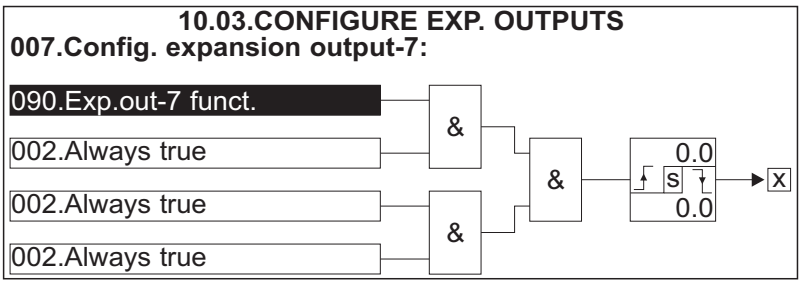


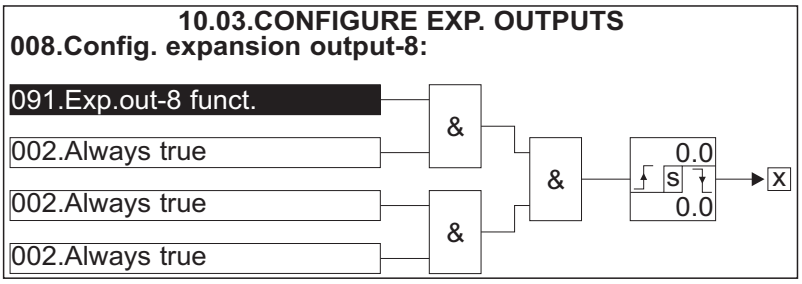






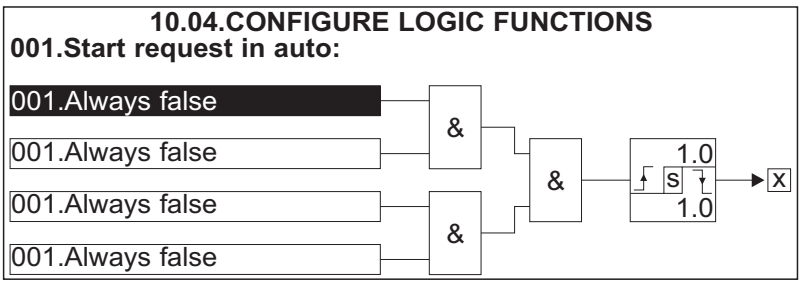


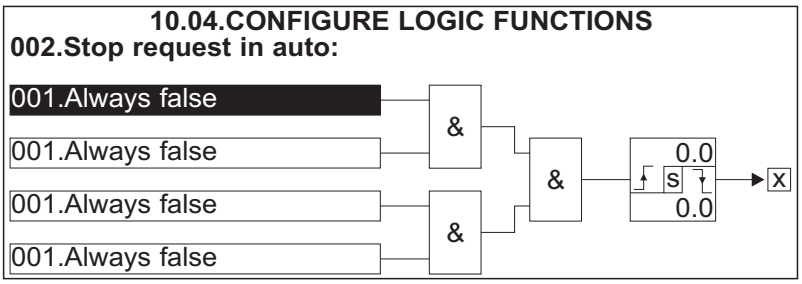




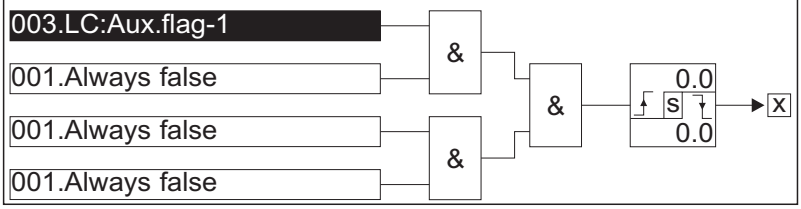
10.04.CONF. LOGIC FUNCTIONS *(Logic controller->Conf. logic functions)*		Min	Max	Default	Unit
001.Start request in auto:	Start Request In Auto Configuration	*Logic Controller*		0	
002.Stop request in auto:	Stop Request In Auto Configuration	*Logic Controller*		0	
004.Changed mode to auto:	Changed Mode To Auto Configuration	*Logic Controller*		0	
005.Changed mode to test:	Changed Mode To Test Configuration	*Logic Controller*		0	
006.Changed mode to manual:	Changed Mode To Man Configuration	*Logic Controller*		0	
007.Changed mode to stop:	Changed Mode To Stop Configuration	*Logic Controller*		0	
008.Informed mains interruption:	Informed Mains Interrupt Configuration	*Logic Controller*		0	

Factory setting of the above LC parameters:

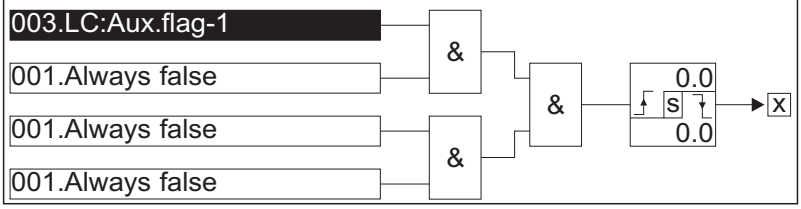




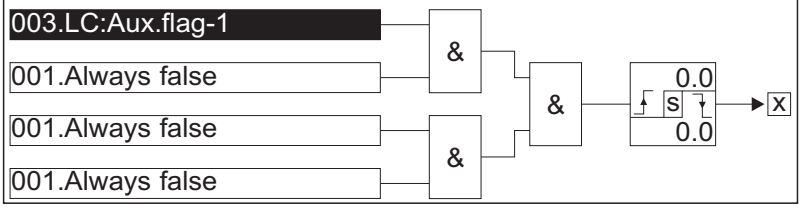
10.04.CONFIGURE LOGIC FUNCTIONS
004.Changed mode to auto:



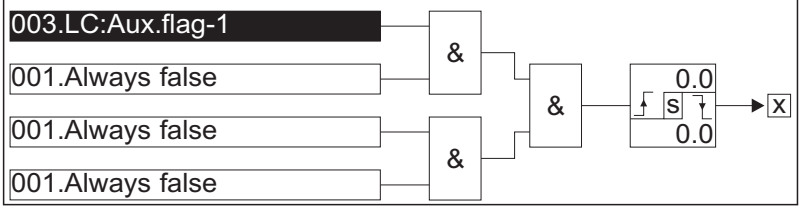
10.04.CONFIGURE LOGIC FUNCTIONS
005.Changed mode to test:



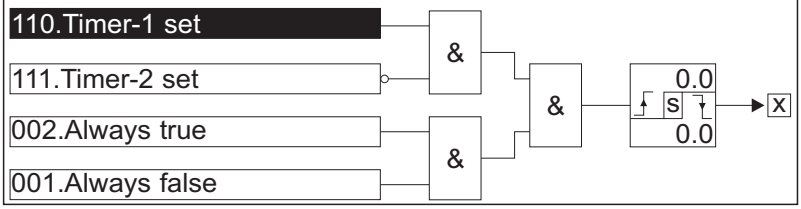
10.04.CONFIGURE LOGIC FUNCTIONS
006.Changed mode to manual:



10.04.CONFIGURE LOGIC FUNCTIONS
007.Changed mode to stop:



10.04.CONFIGURE LOGIC FUNCTIONS
008.Informed mains interruption:



10.05.CONFIGURE TIMERS *(Logic controller->Configure timers)*		Min	Max	Default	Unit
001.Timer-1 hour	Timer-1 Hour	0	23	8	Hour
002.Timer-1 minute	Timer-1 Minute	0	59	0	Min
003.Timer-1 second	Timer-1 Second	0	59	0	Sec
004.Timer-2 hour	Timer-2 Hour	0	23	17	Hour
005.Timer-2 minute	Timer-2 Minute	0	59	0	Min
006.Timer-2 second	Timer-2 Second	0	59	0	Sec
007.Active day	Active Day	1	31	1	
008.Active hour	Active Hour	0	23	12	Hour
009.Active minute	Active Minute	0	59	0	Min
010.Active second	Active Second	0	59	0	Sec
011.Monday disable/enable	Monday Disable/Enable	ENABL/DISBL		ENABL	
012.Tuesday disable/enable	Tuesday Disable/Enable	ENABL/DISBL		ENABL	
013.Wednesday disable/enable	Wednesday Disable/Enable	ENABL/DISBL		ENABL	
014.Thursday disable/enable	Thursday Disable/Enable	ENABL/DISBL		ENABL	
015.Friday disable/enable	Friday Disable/Enable	ENABL/DISBL		ENABL	
016.Saturday disable/enable	Saturday Disable/Enable	ENABL/DISBL		DISBL	
017.Sunday disable/enable	Sunday Disable/Enable	ENABL/DISBL		DISBL	

The LC parameters in this page are used for establish specific times within various Logic Controller functions.

10.06.LOGIC CONTROLLER GENERAL *(Logic controller->General)*		Min	Max	Default	Unit
001.Register set-1	Register Set-1 Value	-9999	9999	100	
002.Register set-2	Register Set-2 Value	-9999	9999	100	
003.Register set-3	Register Set-3 Value	-9999	9999	100	
004.Register set-4	Register Set-4 Value	-9999	9999	100	
005.Register set-5	Register Set-5 Value	-9999	9999	100	
006.Register set-6	Register Set-6 Value	-9999	9999	100	
007.Register set-7	Register Set-7 Value	-9999	9999	100	
008.Register set-8	Register Set-8 Value	-9999	9999	100	

The LC parameters in this page are used for control specific register value within various Logic Controller functions.

5.2.11 User Adjustment

11.04.BATTERY&CHRG GEN.VOL (*User adjustment->Battery&chrg gen.vol*)		Min	Max	Default	Unit
001.Battery volt offset	Battery Voltage Offset	-5.0	5.0	0	V⎓
002.Generator charge volt offset	Charge Generator Voltage Offset	-5.0	5.0	0	V⎓

11.05.SENDER INPUTS OFFSET (*User adjustment->Sender inputs offset*)		Min	Max	Default	Unit
001.Oil Pressure offset	Oil Pressure Offset	-2.0	2.0	0.0	BAR
002.Temperature offset	Coolant Temperature Offset	-20	20	0	ºC
003.Conf. AI1 offset	Configurable Analog Input-1 Offset	-200	200	0	%
004.Conf. AI2 offset	Configurable Analog Input-2 Offset	-20	20	0	ºC

6. Auto Adjust Feature For Governor And AVR

The unit provides the auto adjust feature for adjusting Governor & AVR parameters.

Auto Adjust mode activate steps:

1-) Enter “Program->Technician setting->09.Synchronization->01.Governor control” parameter page and adjust related parameters as follows;

Set “001.Frequency control” parameter as “Disable”.
Set “003.Minimum output value” parameter as “50.0%”.
Set “004.Maximum output value” parameter as “100.0%”.
Set “005.Initial value” parameter as “50.0%”.

2-) Enter “Program->Technician setting->09.Synchronization->02.AVR control” parameter page and adjust related parameters as follows;

Set “001.Voltage control” parameter as “Disable”.
Set “003.Minimum output value” parameter as “35.0%”.
Set “004.Maximum output value” parameter as “65.0%”.
Set “005.Initial value” parameter as “50.0%”.

3-) Start the generator manually.

Adjust the nominal frequency using the speed potantiometer on the Governor.
Adjust the nominal voltage using the voltage potantiometer on the AVR.

4-) Stop the generator.

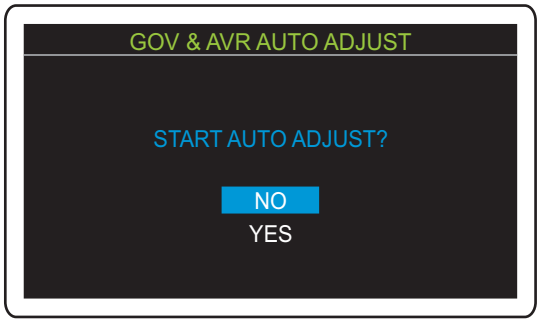
5-) Enter “Program->Technician setting->09.Synchronization->01.Governor control” parameter page and adjust related parameter as follows;

Set “001.Frequency control” parameter as “Enable”.

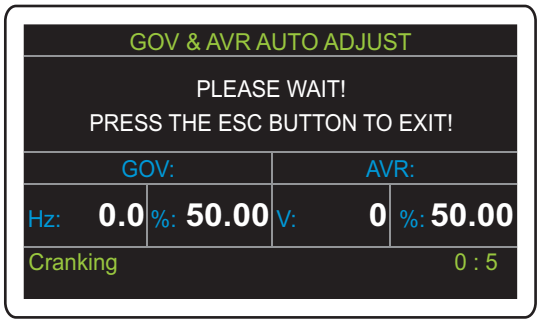
6-) Enter “Program->Technician setting->09.Synchronization->02.AVR control” parameter page and adjust related parameter as follows;

Set “001.Voltage control” parameter as “Enable”.

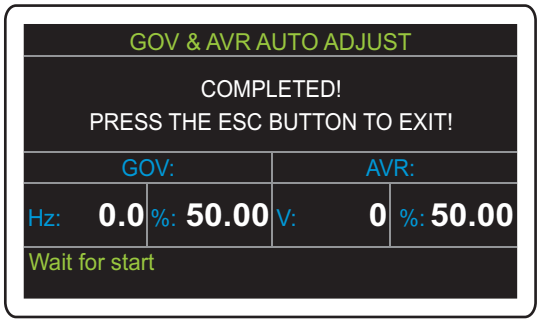
7-) In Manual mode when the horn silence button held pressed for 5 seconds, the unit will ask confirm as follows;



8-) Select “YES” option using the Decrement button and press the Enter button to start Auto Adjust. Then the generator will be run automatically and the below screen will be showed;



9-) The Auto Adjust process will be completed after approximately two minutes and the below screen will be showed;

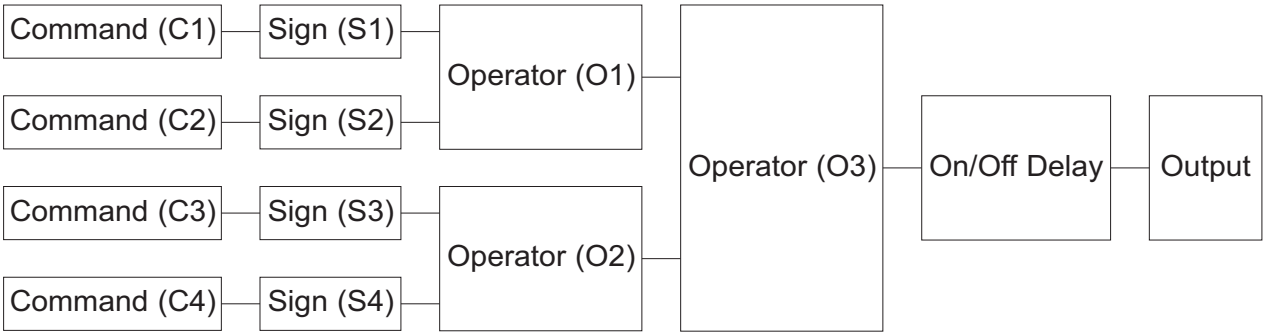


10-) Now the related Governor and AVR parameters are automatically set.

7. Logic Controller

The Logic Controller is used for configure the unit outputs or the engine start/stop or the unit operation mode. For instance, the engine start can be programmed depending on whether the configurable input is active or a specific time of related day.

Structure of the Logic Controller:



Command (Cx):

Up to 330 functions is provided for the command inputs. These command variables are used for control the output function or relay.

Complete list of all command variables as follows;

001.Always false: The command and sign value are ignored and this logic path is always “false”
002.Always true: The command and sign value are ignored and this logic path is always “true”
003.LC:Aux.flag-1: Auxiliary flag-1
004.LC:Aux.flag-2: Auxiliary flag-2
005.LC:Aux.flag-3: Auxiliary flag-3
006.LC:Aux.flag-4: Auxiliary flag-4
007.LC:Aux.flag-5: Auxiliary flag-5
008.LC:Aux.flag-6: Auxiliary flag-6
009.LC:Aux.flag-7: Auxiliary flag-7
010.LC:Aux.flag-8: Auxiliary flag-8
011.LC:Aux.flag-9: Auxiliary flag-9
012.LC:Aux.flag-10: Auxiliary flag-10
013.LC:Aux.flag-11: Auxiliary flag-11
014.LC:Aux.flag-12: Auxiliary flag-12
015.LC:Aux.flag-13: Auxiliary flag-13
016.LC:Aux.flag-14: Auxiliary flag-14
017.LC:Aux.flag-15: Auxiliary flag-15
018.LC:Aux.flag-16: Auxiliary flag-16
019.LC:Conf.out-1: Configurable output-1
020.LC:Conf.out-2: Configurable output-2
021.LC:Conf.out-3: Configurable output-3
022.LC:Conf.out-4: Configurable output-4
023.LC:Conf.out-5: Configurable output-5
024.LC:Conf.out-6: Configurable output-6
025.LC:Conf.out-7: Configurable output-7
026.LC:Conf.out-8: Configurable output-8
027.LC:Conf.out-9: Configurable output-9
028.LC:Reserved
029.LC:Cnf.exp.out-1: Configurable expansion output-1
030.LC:Cnf.exp.out-2: Configurable expansion output-2
031.LC:Cnf.exp.out-3: Configurable expansion output-3
032.LC:Cnf.exp.out-4: Configurable expansion output-4
033.LC:Cnf.exp.out-5: Configurable expansion output-5
034.LC:Cnf.exp.out-6: Configurable expansion output-6
035.LC:Cnf.exp.out-7: Configurable expansion output-7
036.LC:Cnf.exp.out-8: Configurable expansion output-8

037.LC:Strt req.auto: Start request in auto mode
038.LC:Stop req.auto: Stop request in auto mode
039.LC:Reserved
040.LC:Oper.mod.auto: Changed operation mode to auto
041.LC:Oper.mod.test: Changed operation mode to test
042.LC:Oper.mod.man.: Changed operation mode to manual
043.LC:Oper.mod.stop: Changed operation mode to stop
044.LC:Inf.mains.int: Informed mains interruption
045.LC:Reserved
046.LC:Reserved
047.LC:Reserved
048.LC:Reserved
049.LC:Reserved
050.LC:Reserved
051.LC:Reserved
052.LC:Reserved
053.Cnf.in-1 active: Configurable input-1 active
054.Cnf.in-2 active: Configurable input-2 active
055.Cnf.in-3 active: Configurable input-3 active
056.Cnf.in-4 active: Configurable input-4 active
057.Cnf.in-5 active: Configurable input-5 active
058.Cnf.in-6 active: Configurable input-6 active
059.Cnf.in-7 active: Configurable input-7 active
060.Cnf.in-8 active: Configurable input-8 active
061.Cnf.in-9 active: Configurable input-9 active
062.Cnf.in-10 active: Configurable input-10 active
063.Cnf.in-11 active: Configurable input-11 active
064.Cnf.in-12 active: Configurable input-12 active
065.Cnf.in-13 active: Configurable input-13 active
066.Exp.in-1 active: Configurable expansion input-1 active
067.Exp.in-2 active: Configurable expansion input-2 active
068.Exp.in-3 active: Configurable expansion input-3 active
069.Exp.in-4 active: Configurable expansion input-4 active
070.Exp.in-5 active: Configurable expansion input-5 active
071.Exp.in-6 active: Configurable expansion input-6 active
072.Exp.in-7 active: Configurable expansion input-7 active
073.Exp.in-8 active: Configurable expansion input-8 active
074.Cnf.out-1 funct.: Configurable output-1 function
075.Cnf.out-2 funct.: Configurable output-2 function
076.Cnf.out-3 funct.: Configurable output-3 function
077.Cnf.out-4 funct.: Configurable output-4 function
078.Cnf.out-5 funct.: Configurable output-5 function
079.Cnf.out-6 funct.: Configurable output-6 function
080.Cnf.out-7 funct.: Configurable output-7 function
081.Cnf.out-8 funct.: Configurable output-8 function
082.Cnf.out-9 funct.: Configurable output-9 function
083.Reserved
084.Exp.out-1 funct.: Configurable expansion output-1 function
085.Exp.out-2 funct.: Configurable expansion output-2 function
086.Exp.out-3 funct.: Configurable expansion output-3 function
087.Exp.out-4 funct.: Configurable expansion output-4 function
088.Exp.out-5 funct.: Configurable expansion output-5 function
089.Exp.out-6 funct.: Configurable expansion output-6 function
090.Exp.out-7 funct.: Configurable expansion output-7 function
091.Exp.out-8 funct.: Configurable expansion output-8 function
092.GCB close active: Generator circuit breaker (GCB) close output active
093.MCB close active: Mains circuit breaker (MCB) close output active
094.Auto mode active: Auto mode active
095.Test mode active: Test mode active
096.Man. mode active: Manual mode active

097.Stop mode active: Stop mode active
098.Generator start: Generator start
099.Generat.running: Generator running
100.Generator okay: Generator okay
101.Load supply gen.: Load supply from generator
102.Load suppl.Mains: Load supply from mains
103.Mains okay: Mains okay
104.Chrg alt.out act: Charge alternator output active
105.Reserved
106.Reserved
107.Reserved
108.Reserved
109.Reserved
110.Timer-1 set: Timer-1 set point exceeded
111.Timer-2 set: Timer-2 set point exceeded
112.Active weekday: Active weekday equal to setting
113.Active day: Active day equal to setting
114.Active hour: Active hour equal to setting
115.Active minute: Active minute equal to setting
116.Active second: Active second equal to setting
117.Reserved
118.Reserved
119.Reserved
120.Red alarm led-1: Red alarm led-1 active
121.Red alarm led-2: Red alarm led-2 active
122.Red alarm led-3: Red alarm led-3 active
123.Red alarm led-4: Red alarm led-4 active
124.Red alarm led-5: Red alarm led-5 active
125.Red alarm led-6: Red alarm led-6 active
126.Yellow alr led-1: Yellow alarm led-1 active
127.Yellow alr led-2: Yellow alarm led-2 active
128.Yellow alr led-3: Yellow alarm led-3 active
129.Servic.alr led-1: Service alarm led-1 active
130.Servic.alr led-2: Service alarm led-2 active
131.Servic.alr led-3: Service alarm led-3 active
132.Servic.alr led-4: Service alarm led-4 active
133.Servic.alr led-5: Service alarm led-5 active
134.Servic.alr led-6: Service alarm led-6 active
135.Input-1 alarm!: Spare 1 error
136.Input-2 alarm!: Spare 2 error
137.Input-3 alarm!: Spare 3 error
138.Input-4 alarm!: Spare 4 error
139.Input-5 alarm!: Spare 5 error
140.Input-6 alarm!: Spare 6 error
141.Input-7 alarm!: Spare 7 error
142.Input-8 alarm!: Spare 8 error
143.Input-9 alarm!: Spare 9 error
144.Input-10 alarm!: Spare 10 error
145.Input-11 alarm!: Spare 11 error
146.Input-12 alarm!: Spare 12 error
147.Input-13 alarm!: Spare 13 error
148.Exp.input-1 alr!: Expansion I/O module spare 1 error
149.Exp.input-2 alr!: Expansion I/O module spare 2 error
150.Exp.input-3 alr!: Expansion I/O module spare 3 error
151.Exp.input-4 alr!: Expansion I/O module spare 4 error
152.Exp.input-5 alr!: Expansion I/O module spare 5 error
153.Exp.input-6 alr!: Expansion I/O module spare 6 error
154.Exp.input-7 alr!: Expansion I/O module spare 7 error
155.Exp.input-8 alr!: Expansion I/O module spare 8 error

156.Emergency stop!: Emergency stop error
157.Over speed alrm!: Over speed error
158.Undr speed trip!: Under speed error
159.Ovr speed preal!: Over speed prealarm
160.Und.speed preal!: Under speed prealarm
161.Gen ph.seq.wrng!: Generator phase sequence wrong
162.Speed loss alrm!: Speed loss error
163.Gen. stop fail!: Generator stop error
164.Cnf.AI1 low err!: Configurable analogue input-1 low error
165.Batt. low warn!: Battery low error
166.Batt. high warn!: Battery high error
167.High temp.preal!: Coolant temperature high prealarm
168.Co.AI1 low prea!: Configurable analogue input-1 low prealarm
169.Oil press.preal!: Oil pressure prealarm
170.Gen.un.vol.prea!: Generator Under Voltage prealarm
171.Gen.ov.vol.prea!: Generator Over Voltage prealarm
172.Gen.un.frq.prea!: Generator Under Frequency prealarm
173.Gen.ov.frq.prea!: Generator Over Frequency prealarm
174.Maintenance alr!: Maintenance error
175.Gen.br.not clos!: Generator Breaker Not Closed alarm
176.Gen.br.not open!: Generator Breaker Not Opened alarm
177.Mains br.not cl!: Mains Breaker Not Closed alarm
178.Mains br.not op!: Mains Breaker Not Opened alarm
179.Over curr.trip!: Over Current Error
180.Short circ.trip!: Short Circuit Error
181.Earth curr.trip!: Earth Fault Error
182.J1939 ECU warn!: Amber warning lamp error
183.Over curr.warn!: Over Current Warning
184.Cnf.AI1 hi.prea!: Configurable analogue input-1 high prealarm
185.Earth curr.warn!: Earth Fault Warning
186.J1939 Red stop!: Red stop lamp error
187.Ov.cur.trip col!: Over Current Electrical Trip
188.Co.AI1 high err!: Configurable analogue input-1 high error
189.Ea.cur.trip col!: Earth Fault Electrical Trip
190.Low temperature!: Low temperature
191.Cnf.AI2 hi.prea!: Configurable analogue input-2 high prealarm
192.Co.AI2 high err!: Configurable analogue input-2 high error
193.Can bus warning!: Can Bus error
194.Charge alt.fail!: Charge alternator fail
195.Gen.un.frq.shut!: Generator Under Frequency shutdown
196.High temp.shut!: High Temp. shutdown
197.Gen.un.vol.shut!: Generator Under Voltage shutdown
198.Oil press.shut!: Pressure shutdown
199.Start fail!: Fail to start alarm
200.Gen.ov.frq.shut!: Generator over frequency shutdown
201.Gen.ov.vol.shut!: Generator over voltage shutdown
202.Mains.ph.seq.wr!: Mains phase sequence wrong
203.Under cur.preal!: Under Current prealarm
204.Under cur.warn!: Under Current Warning
205.Un.cur.trip col!: Under Current Electrical Trip
206.Under cur.trip!: Under Current Error
207.Over cur.preal!: Over Current prealarm
208.Under pow.preal!: Under power prealarm
209.Under pow.trip!: Under power Error
210.Over pow. preal!: Over power prealarm
211.Over power alrm!: Over power Error
212.Co.AI2 low prea!: Configurable analogue input-2 low prealarm
213.Cnf.AI2 low err!: Configurable analogue input-2 low error
214.Oil Pres.sns.br!: Oil pressure sensor break
215.Cln temp.sns.br!: Temperature sensor break

216.Cnf.AI1 sens.br!: Configurable analogue input-1 sensor break
217.Cnf.AI2 sens.br!: Configurable analogue input-2 sensor break
218.Revers.pow.warn!: Reverse power Warning
219.Rv.pow.trip col!: Reverse power Electrical Trip
220.Revers.pow.trip!: Reverse power Error
221.Cab.tmp.lo.prea!: Cabin temperature low prealarm
222.Cab.temp.lo.err!: Cabin temperature low error
223.Cab.tmp.hi.prea!: Cabin temperature high prealarm
224.Cab.temp.hi.err!: Cabin temperature high error
225.Undr power warn!: Under power warning
226.Un.pow.trip col!: Under power electrical trip
227.Over power warn!: Over power warning
228.Ov.pow.trip col!": Over power electrical trip
229.Unbal.load warn!: Unbalance load (negative phase sequence) warning
230.Un.load trip co!: Unbalance load (negative phase sequence) electrical trip
231.Unbal.load trip!: Unbalance load (negative phase sequence) error
232.Reserved!
233.Synchroniz. err!: Synchronization error
234.Unbal.volt warn!: Unbalance volt warning
235.Un.vol trip col!: Unbalance volt electrical trip
236.Unbal.volt trip!: Unbalance volt error
237.Excit.loss warn!: Excitation loss Warning
238.Ex.loss trip co!: Excitation loss Electrical Trip
239.Excit.loss trip!: Excitation loss Error
240.Reserved!
241.Gov.max.lim.wrn!: Governor maximum limit Warning
242.Gov.mx.lm.tr co!: Governor maximum limit Electrical Trip
243.Gov.max.lm.trip!: Governor maximum limit Error
244.AVR max.lim.wrn!: AVR maximum limit Warning
245.AVR mx.lm.tr.co!: AVR maximum limit Electrical Trip
246.AVR max.lm.trip!: AVR maximum limit Error
247.Reserved!
248.Mains rocof alr!: Mains rocof alarm
249.Mains vec.shift!: Mains vector shift alarm
250.Reserved!
251.Reserved!
252.Reserved!
253.Reserved!
254.Reserved!
255.Reserved!
256.Reserved!
257.Reserved!
258.Reserved!
259.Reserved!
260.Reserved!
261.Reserved!
262.Reserved!
263.Reserved!
264.Reserved!
265.Reserved!
266.Reserved!
267.Reserved!
268.Reserved!
269.Reserved!
270.Reserved!
271.Reserved!
272.Reserved!
273.Sl.Contr.com.er!

274.RC:Register set1: Register set1 parameter value
275.RC:Register set2: Register set2 parameter value
276.RC:Register set3: Register set3 parameter value
277.RC:Register set4: Register set4 parameter value
278.RC:Register set5: Register set5 parameter value
279.RC:Register set6: Register set6 parameter value
280.RC:Register set7: Register set7 parameter value
281.RC:Register set8: Register set8 parameter value
282.RC:Mains V1: Mains V1 active value
283.RC:Mains V2: Mains V2 active value
284.RC:Mains V3: Mains V3 active value
285.RC:Mains V12: Mains V12 active value
286.RC:Mains V23: Mains V23 active value
287.RC:Mains V31: Mains V31 active value
288.RC:Mains freque.: Mains frequency active value
289.RC:Gen V1: Gen V1 active value
290.RC:Gen V2: Gen V2 active value
291.RC:Gen V3: Gen V3 active value
292.RC:Gen V12: Gen V12 active value
293.RC:Gen V23: Gen V23 active value
294.RC:Gen V31: Gen V31 active value
295.RC:Gen frequency: Gen frequency active value
296.RC:Gen I1: Gen I1 active value
297.RC:Gen I2: Gen I2 active value
298.RC:Gen I3: Gen I3 active value
299.RC:Earth Current: Earth Current active value
300.RC:Mains P total: Mains P total active value
301.RC:Mains Q total: Mains Q total active value
302.RC:Mains S total: Mainsn S total active value
303.RC:Gen P1: Gen P1 active value
304.RC:Gen P2: Gen P2 active value
305.RC:Gen P3: Gen P3 active value
306.RC:Gen P total: Gen P total active value
307.RC:Gen Q1: Gen Q1 active value
308.RC:Gen Q2: Gen Q2 active value
309.RC:Gen Q3: Gen Q3 active value
310.RC:Gen Q total: Gen Q total active value
311.RC:Gen S1: Gen S1 active value
312.RC:Gen S2: Gen S2 active value
313.RC:Gen S3: Gen S3 active value
314.RC:Gen S total: Gen S total active value
315.RC:Gen kWh: Gen kWh active value
316.RC:Gen kVArh: Gen kVArh active value
317.RC:Engine RPM: Engine RPM active value
318.RC:Oil pressure: Oil pressure active value
319.RC:Coolant temp: Coolant temperature active value
320.RC:Config. AI1: Configurable analog input-1 active value
321.RC:Config. AI2: Configurable analog input-2 active value
322.RC:Cabin temper.: Cabin temperature active value
323.RC:Battery volt: Battery voltage active value
324.RC:Gen chrg volt: Generator charge voltage active value
325.RC:Run times: Run times active value
326.RC:Crank times: Crank times active value
327.RC:Working hours: Working hours active value
328.RC:Mainten.hours: Next maintenance hours active value
329.RC:Mainten. days: Next maintenance days active value
330.RC:Mains I1: Mains I1 active value

Sign (Sx):

The sign field can be used for invert the status of the input command. If the sign field is configured to the “Not” state value, the output of the input command variable changes from true to false or vice versa. Complete list of all sign values as follows;

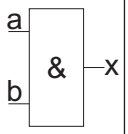
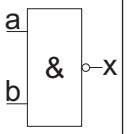
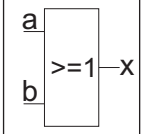
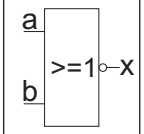
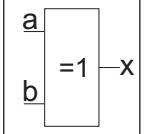
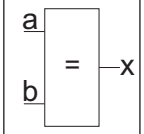
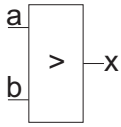
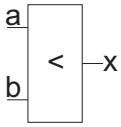
Direct command value:
—— The input command value is passed directly to the operator.

Not command value:
o— The input command value is inverted passed to the operator.

Operator (Ox):

The operator field can be used for logic symbols such as AND, NAND, OR, NOR, XOR, NXOR. Additionally the operator field can be used for comparison symbols such as >, <.
Complete list of all operator field symbols as follows;

Logic and comparison symbols:

	AND	NAND	OR	NOR	XOR	NXOR	>	<
Symbols								
Truth table	a b x 0 0 0 0 1 0 1 0 0 1 1 1	a b x 0 0 1 0 1 1 1 0 1 1 1 0	a b x 0 0 0 0 1 1 1 0 1 1 1 1	a b x 0 0 1 0 1 0 1 0 0 1 1 0	a b x 0 0 0 0 1 1 1 0 1 1 1 0	a b x 0 0 1 0 1 0 1 0 0 1 1 1	if a>b, x=1	if a<b, x=1

On/Off Delay:

The On Delay is the amount of time that the logical output status is delayed before changing to true.
The Off Delay is the amount of time that the logical output status is delayed before changing to false.

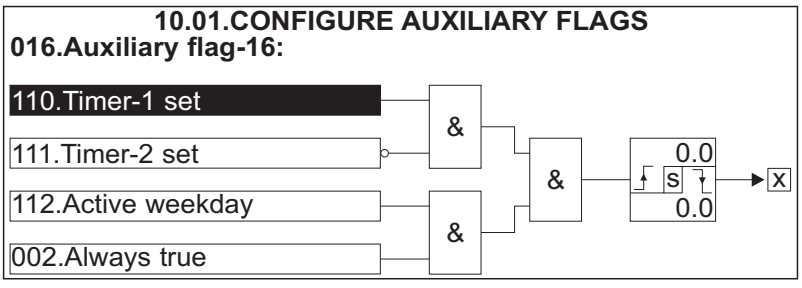
Output:

The Logic Controller outputs can be grouped into three types as “*Configurable auxiliary flags*”, “*Unit configurable outputs*” and “*Configurable logic functions*”.

1-) Configurable auxiliary flags:

These 16 auxiliary logical flags can be programmed to activate or deactivate logical functions. These flags can be used whenever for input commands are not enough or time delayed signals are required.

The “10.01.016.Auxiliary flag-16” logical output can be used like "Timer function” as follows;



2-) Unit configurable outputs:

There are 10 internal configurable outputs and 8 expansion I/O module configurable outputs.

If the “10.02.001.Configurable output-1” logical output becomes true, the unit configurable output-1 will be activated.

If the “10.02.002.Configurable output-2” logical output becomes true, the unit configurable output-2 will be activated.

If the “10.02.003.Configurable output-3” logical output becomes true, the unit configurable output-3 will be activated.

If the “10.02.004.Configurable output-4” logical output becomes true, the unit configurable output-4 will be activated.

If the “10.02.005.Configurable output-5” logical output becomes true, the unit configurable output-5 will be activated.

If the “10.02.006.Configurable output-6” logical output becomes true, the unit configurable output-6 will be activated.

If the “10.02.007.Configurable output-7” logical output becomes true, the unit configurable output-7 will be activated.

If the “10.02.008.Configurable output-8” logical output becomes true, the unit configurable output-8 will be activated.

If the “10.02.009.Configurable output-9” logical output becomes true, the unit configurable output-9 will be activated.

If the “10.03.001.Config. expansion output-1” logical output becomes true, the unit configurable expansion output-1 will be activated.

If the “10.03.002.Config. expansion output-2” logical output becomes true, the unit configurable expansion output-2 will be activated.

If the “10.03.003.Config. expansion output-3” logical output becomes true, the unit configurable expansion output-3 will be activated.

If the “10.03.004.Config. expansion output-4” logical output becomes true, the unit configurable expansion output-4 will be activated.

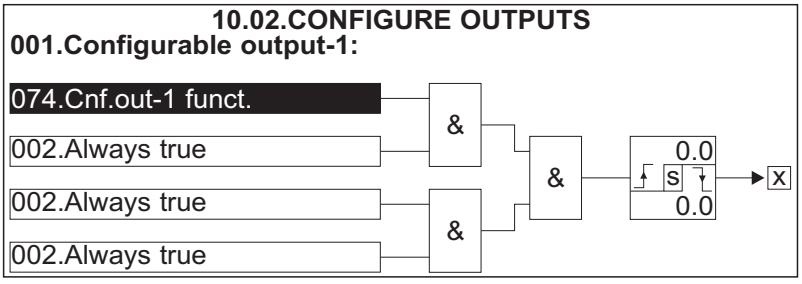
If the “10.03.005.Config. expansion output-5” logical output becomes true, the unit configurable expansion output-5 will be activated.

If the “10.03.006.Config. expansion output-6” logical output becomes true, the unit configurable expansion output-6 will be activated.

If the “10.03.007.Config. expansion output-7” logical output becomes true, the unit configurable expansion output-7 will be activated.

If the “10.03.008.Config. expansion output-8” logical output becomes true, the unit configurable expansion output-8 will be activated.

As factory default, the “10.02.001.Configurable output-1” logical output is programmed as configurable output-1 function (Fuel relay energised) as follows;



3-) Configurable logic functions:

Internal conditions such as “Start request in auto”, “Stop request in auto”, “Load dependent start/stop”, “Changed mode to auto”, “Changed mode to test”, “Changed mode to manual”, “Changed mode to stop”.

If the “10.04.001.Start request in auto” logical output becomes true, the engine will be started in auto mode.

If the “10.04.002.Stop request in auto” logical output becomes true, the engine will be stopped in auto mode.

If the “10.04.004.Changed mode to auto” logical output becomes true, the unit operation mode will be changed to auto mode.

If the “10.04.005.Changed mode to test” logical output becomes true, the unit operation mode will be changed to test mode.

If the “10.04.006.Changed mode to manual” logical output becomes true, the unit operation mode will be changed to manual mode.

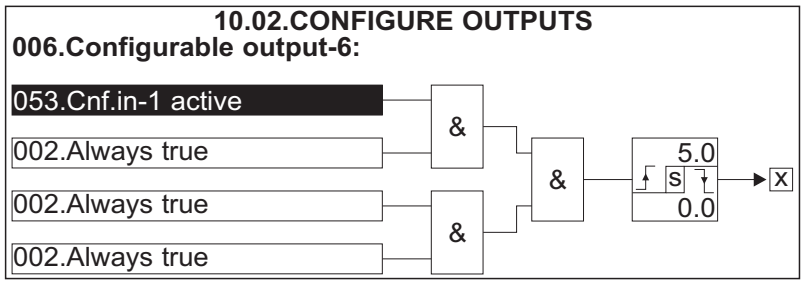
If the “10.04.007.Changed mode to stop” logical output becomes true, the unit operation mode will be changed to stop mode.

If the “10.04.008.Informed mains interruption” logical function becomes true, the genset is started, synchronised with the mains supply and the load is transferred from the mains to the genset with soft transferring.

Programming examples:

Example-1: If the configurable input-1 is active and if this situation continues for 5 seconds, the unit configurable output-6 will be active.

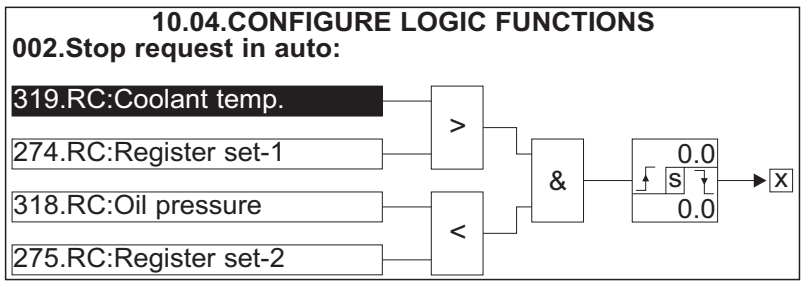
For this, the “10.02.006.Configurable output-6” logical output must be programmed as follows;



Example-2: In auto mode, if the coolant temperature active value rises above 90ºC and if the oil pressure active value falls below 0.8Bar, the engine will be stop.

For this;

- Set the “Program->Technician setting->10.Logic controller->06.General->001.Register set-1” parameter as “90”
- Set the “Program->Technician setting->10.Logic controller->06.General->002.Register set-2” parameter as “8”
- The “10.04.002.Stop request in auto” logical output must be programmed as follows;



8. Specifications

Equipment use	: Electrical control equipment for generating sets.
Housing & Mounting	: 276 mm x 189 mm x 45 mm. (including connectors). Plastic housing for panel mounting.
Panel Cut-Out	: 223mm x 162mm.
Protection	: IP65 at front panel.
Weight	: Approximately 0,82 Kg.
Environmental rating	: Standard, indoor at an altitude of less then 2000 meters with non-condensing humidity.
Operating/Storage Temperature	: -20°C to +70°C / -30°C to +80°C
Operating/Storage Humidity	: 95 % max. (non-condensing)
Installation Over Volt. Category	: II Appliances, portable equipment
Pollution Degree	: II, Normal office or workplace, non conductive pollution
Mode of Operation	: Continuous.
DC Battery Supply Voltage	: 8 to 32 V⎓ (Peak: 36 V⎓). Max. operating current is 860 mA.
Cranking Dropouts	: Battery voltage can be “0” VDC for max. 50 ms during cranking (battery voltage should be at least nominal voltage before cranking).
Battery Voltage Measurement	: 8 to 32 V⎓, Accuracy: 1 % FS, Resolution: 0,1 V
Mains Voltage Measurement	: 5 to 300 VAC Ph-N, 5 to 99.9 Hz. Accuracy: 1 % FS, Resolution: 1 V.
Mains Frequency	: 5 to 99.9Hz (min. 20 VAC Ph-N) Accuracy: 0,25 % FS, Resolution: 0,1 Hz.
Generator Voltage Measurement	: 5 to 300 VAC Ph-N, 5 to 99.9 Hz. Accuracy: 1 % FS, Resolution: 1 V.
Generator Frequency	: 5 to 99.9Hz (min. 20 VAC Ph-N) Accuracy: 0,25 % FS, Resolution: 0,1 Hz.
Magnetic Pickup Input	: 35 to 10000 Hz (1 to 35 volts peak continuously). Accuracy: 0,25 % FS.
CT secondary	: 5A.
Governor Output	:+/-10V⎓, Accuracy: 0.1%, Resolution: 12bit, Isolation:1000V⎓
AVR Output	:+/-10V⎓, Accuracy: 0.1%, Resolution: 12bit, Isolation:1000V⎓
Charge Generator Excitation	: 210mA @12V, 105mA @24V. Nominal 2.5W.
Charge Gen. Vol. Measurement	: 8 to 32 V ⎓, Accuracy: 1 % FS, Resolution: 0,1 V.
Sender Measurement	: 0 to 1300 ohm, Accuracy: 1 % FS, Resolution: 1 ohm.
Cabin Temp. Measurement	: -50 to +100 ºC, Accuracy: 1 % FS, Resolution: 1 ºC.
Communication interface	: USB programming and communication port, CanBus communication with 1939 ECU, Ethernet, RS485.
Optional Expansion I/O Module	: Expansion I/O module including 8 inputs and 8 outputs.
Optional Comm. Modules	: GSM/GPRS and Web Server modules.
Relay Outputs	: Generator contactor output 8A at DC supply voltage Mains contactor output 8A at DC supply voltage
Transistor Outputs	: Fuel or Configurable output-1 15A at DC supply voltage Crank or Configurable output-2 15A at DC supply voltage Configurable output-3,4,5,6,7,8,9 1A at DC supply voltage
Approvals	: EAC , CE

9. Other Informations

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