

Characteristics:
General Description:

The single and dual channel DIN Rail Repeater Power Supply, D1014S and D1014D is a high integrity analog input interface suitable for applications requiring SIL 2 level (according to IEC61508:2010) in safety related system for high risk industries. Provides a fully floating dc supply for energizing conventional 2 wires 4-20 mA transmitters located in Hazardous Area, and repeats the current in floating circuit to drive a Safe Area load.

The circuit allows bi-directional communication signals, for Hart transmitters.

Function:

1 or 2 totally independent and isolated channels I.S. analog input for 2 wires loop powered Hart transmitters, provides 3 port isolation (input/output/supply) and current (source or sink) or voltage output signal.

Signalling LED:

Power supply indication (green).

Field Configurability:

mA (source or sink) or V output signal.

Hart Communication Frequency Band:

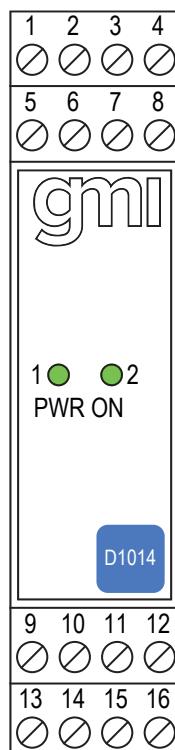
0.5 to 2.5 KHz within 3 dB.

EMC:

Fully compliant with CE marking applicable requirements.

Functional Safety Management Certification:

G.M. International is certified by TUV to conform to IEC61508:2010 part 1 clauses 5-6 for safety related systems up to and included SIL3.


Front Panel and Features:


- SIL 2 according to IEC 61508:2010 Ed. 2 for Tpro = 9 / 10 years ($\leq 10\% / > 10\%$ of total SIF).
- PFDavg (1 year) 1.05 E-04, SFF 87.01%.
- SIL 3 Systematic capability.
- 2 fully independent channels.
- Input from Zone 0 (Zone 20), Division 1, installation in Zone 2, Division 2.
- 4-20 mA Input, Output Signal.
- Hart compatible.
- Input and Output short circuit proof.
- High Accuracy.
- Three port isolation, Input/Output/Supply.
- EMC Compatibility to EN61000-6-2, EN61000-6-4, EN61326-1
- In-field programmability by DIP Switch.
- ATEX, IECEEx, UL & C-UL, FM & FM-C, TÜV Certifications.
- TÜV Functional Safety Certification.
- Type Approval Certificate DNV and KR for maritime applications.
- High Reliability, SMD components.
- High Density, two channels per unit.
- Simplified installation using standard DIN Rail and plug-in terminal blocks.
- 250 Vrms (Um) max. voltage allowed to the instruments associated with the barrier.

Technical Data:
Supply:

12-24 Vdc nom (10 to 30 Vdc) reverse polarity protected, ripple within voltage limits $\leq 5\text{ Vpp}$.

Current consumption @ 24 V: 110 mA for 2 channels D1014D, 55 mA for 1 channel D1014S with 20 mA output typical.

Current consumption @ 12 V: 220 mA for 2 channels D1014D, 110 mA for 1 channel D1014S with 20 mA output typical.

Power dissipation: 1.8 W for 2 channels D1014D, 0.9 W for 1 channel D1014S with 24 V supply voltage and 20 mA output typical.

Max. power consumption: at 30 V supply voltage and short circuit condition, 3.4 W for 2 channels D1014D, 1.7 W for 1 channel D1014S.

Isolation (Test Voltage):

I.S. In/Out 1.5 KV; I.S. In/Supply 1.5 KV; I.S. In/I.S. In 500 V; Out/Supply 500 V; Out/Out 500 V.

Input:

4 to 20 mA (2 wire Tx current limited at $\approx 25\text{ mA}$).

Transmitter line voltage:

$\geq 15.0\text{ V}$ at 20 mA with max. 20 mVrms ripple on 0.5 to 2.5 KHz frequency band.

Output:

4 to 20 mA, on max. 600 Ω load in source mode; V min. 5 V at 0 Ω load V max. 30 V in sink mode, current limited at $\approx 25\text{ mA}$ or 1 to 5 V on internal 250 Ω shunt (or 2 to 10 V on internal 500 Ω shunt on request).

Response time: 20 ms (10 to 90 % step change).

Output ripple: $\leq 20\text{ mVrms}$ on 250 Ω communication load on 0.5 to 2.5 KHz band.

Frequency response: 0.5 to 2.5 KHz bidirectional within 3 dB (Hart protocol).

Performance:

Ref. Conditions 24 V supply, 250 Ω load, $23 \pm 1\text{ }^\circ\text{C}$ ambient temperature.

Calibration accuracy: $\leq \pm 0.1\%$ of full scale.

Linearity error: $\leq \pm 0.1\%$ of full scale.

Supply voltage influence: $\leq \pm 0.05\%$ of full scale for a min to max supply change.

Load influence: $\leq \pm 0.05\%$ of full scale for a 0 to 100 % load resistance change.

Temperature influence: $\leq \pm 0.01\%$ on zero and span for a $1\text{ }^\circ\text{C}$ change.

Compatibility:

CE mark compliant, conforms to Directive: 2014/34/EU ATEX, 2014/30/EU EMC, 2014/35/EU LVD, 2011/65/EU RoHS.

Environmental conditions:

Operating: temperature limits -20 to +60 $^\circ\text{C}$, relative humidity max 95 %.

Storage: temperature limits -45 to +80 $^\circ\text{C}$.

Safety Description:


ATEX: II (1)G [Ex ia Ga] IIC, II (1)D [Ex ia Da] IIIC, I (M1) [Ex ia Ma] I; II 3G Ex ec IIC T4 Gc

IECEEx: [Ex ia Ga] IIC, [Ex ia Da] IIIC, [Ex ia Ma] I; Ex ec IIC T4 Gc

UL: AIS / I, II, III / 1 / ABCDEFG, [AEx ia] IIC

C-UL: AIS / I, II, III / 1 / ABCDEFG, [Ex ia] IIC

FM: NI / 1 / 2 / ABCD / T4, NI / 1 / 2 / IIC / T4, AIS / I, II, III / 1 / ABCDEFG, AEx [ia] IIC

FM-C: NI / 1 / 2 / ABCD / T4, NI / 1 / 2 / IIC / T4, AIS / I, II, III / 1 / ABCDEFG, Ex [ia] IIC associated apparatus and non-sparking electrical equipment.

Uo/Voc = 25.2 V, Io/Isc = 93 mA, Po/Po = 585 mW at terminals 14-15, 10-11.

Um = 250 Vrms, -20 $^\circ\text{C}$ \leq Ta \leq 60 $^\circ\text{C}$.

Approvals:

DMT 01 ATEX E 042 X conforms to EN60079-0, EN60079-11.

IECEEx BVS 07.0027X conforms to IEC60079-0, IEC60079-11.

IMQ 09 ATEX 013 X conforms to EN60079-0, EN60079-7.

IECEEx IMQ 13.0011X conforms to IEC60079-0, IEC60079-7.

UL & C-UL E222308 conforms to UL913, UL 60079-0, UL60079-11, UL60079-15

ANSI/ISA 12.12.01 for UL and CSA-C22.2 No.157-92, CSA-E60079-0, CSA-E60079-11, CSA-C22.2 No. 213 and CSA-E60079-15 for C-UL.

FM & FM-C No. 3024643, 3029921C, conforms to Class 3600, 3610, 3611, 3810,

ANSI/ISA 12.12.02, ANSI/ISA 60079-0, ANSI/ISA 60079-11, C22.2 No.142,

C22.2 No.157, C22.2 No.213, E60079-0, E60079-11, E60079-15,

TÜV Certificate No. TUV IT 25 SIL 0632, SIL 2 conforms to IEC61508:2010 Ed.2.

SIL 3 Functional Safety TÜV Certificate conforms to IEC61508:2010 Ed.2, for Management of Functional Safety.

DNV No. TAA00002BM and KR No.MIL20769-EL001 Cert. for maritime applications .

Mounting:

EN/IEC60715 TH 35 DIN-Rail.

Weight: about 170 g D1014D, 115 g D1014S.

Connection: by polarized plug-in disconnect screw terminal blocks to accomodate terminations up to 2.5 mm².

Location: Safe Area/Non Hazardous Locations or Zone 2, Group IIC T4, Class I, Division 2, Groups A, B, C, D Temperature Code T4 and Class I, Zone 2, Group IIC, IIB, IIA T4 installation.

Protection class: IP 20.

Dimensions: Width 22.5 mm, Depth 99 mm, Height 114.5 mm.

Ordering Information:

Model: D1014

1 channel

S

2 channels

D

Power Bus enclosure

/B

Power Bus and DIN-Rail accessories:

DIN rail anchor MCHP065

DIN rail stopper MOR016

Terminal block male MOR017

Terminal block female MOR022

Parameters Table:

Safety Description		Maximum External Parameters			
	Group Cenelec	Co/Ca (μ F)	Lo/La (mH)	Lo/Ro (μ H/ Ω)	
Terminals 14-15, 10-11					
Uo/Voc = 25.2 V	IIC	0.105	4.1	60.7	
Io/Isc = 93 mA	IIB	0.819	16.4	242.9	
Po/Po = 585 mW	IIA	2.899	32.8	485.8	
	I	4.15	54	797.1	
	IIIC	0.819	16.4	242.9	

NOTE for USA and Canada:

IIC equal to Gas Groups A, B, C, D, E, F and G

IIB equal to Gas Groups C, D, E, F and G

IIA equal to Gas Groups D, E, F and G

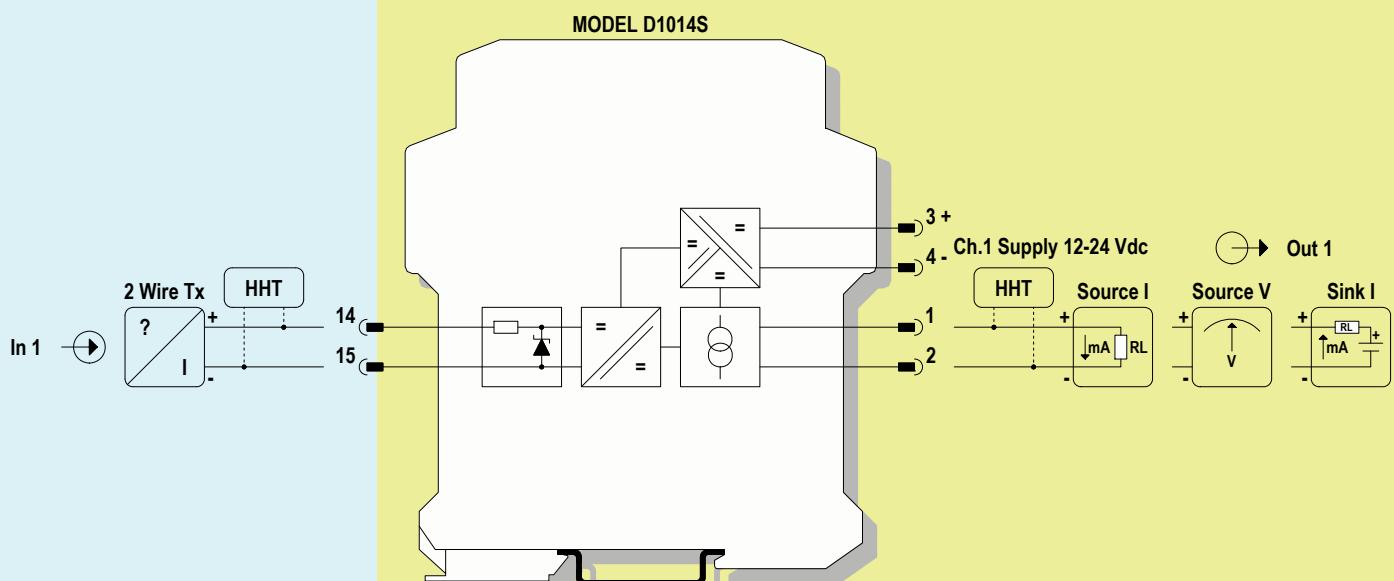
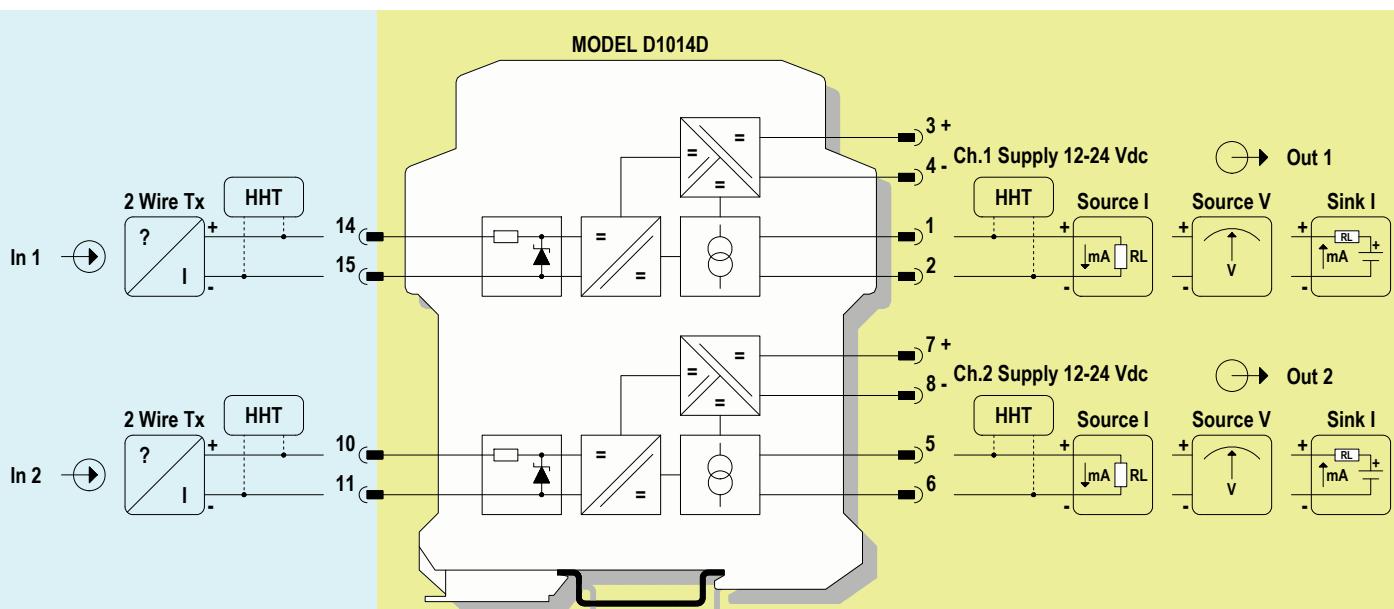
Image:

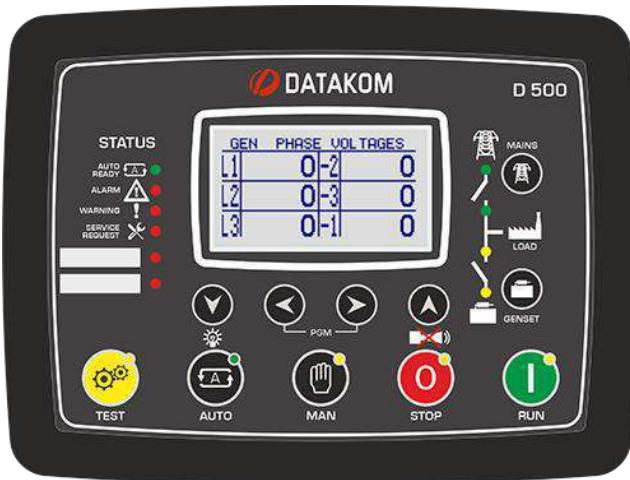


Function Diagram:

HAZARDOUS AREA ZONE 0 (ZONE 20) GROUP IIC,
HAZARDOUS LOCATIONS CLASS I, DIVISION 1, GROUPS A, B, C, D,
CLASS II, DIVISION 1, GROUPS E, F, G, CLASS III, DIVISION 1,
CLASS I, ZONE 0, GROUP IIC

SAFE AREA, ZONE 2 GROUP IIC T4,
NON HAZARDOUS LOCATIONS, CLASS I, DIVISION 2,
GROUPS A, B, C, D T-Code T4, CLASS I, ZONE 2, GROUP IIC T4





D-500 MK2

ADVANCED GENSET CONTROLLER

DESCRIPTION

D-500 MK2 is a next generation genset controller combining multi-functionality and wide communication capabilities together with a reliable and low-cost design.

The same controller provides synchronization, load share, AMF, ATS, Remote Start, Engine Control and Remote Display Panel functionalities.

The module comes ready for remote monitoring over GSM or Ethernet with plug-in communication modules.

Various plug-in modules provide unlimited expansion capabilities allowing to meet any special requirement.

The unit complies and mostly exceeds world's tightest safety, vibration and environmental standards for the industrial category.

Software features are complete with easy firmware upgrade process through USB port.

The Windows based PC software allows monitoring and programming through USB, RS-485, Ethernet and GPRS. The Rainbow Scada web monitoring service allows monitoring and control of an unlimited number of gensets through any web browser.

FUNCTIONALITIES

Multi genset synchronizer and load share *

Multi genset mains synchronizer *

Single genset parallel with mains *

AMF unit with uninterrupted transfer

ATS unit with uninterrupted transfer

Remote start controller

Manual start controller

Engine controller

Remote display & control unit

Waveform display of V & I

Harmonic analysis of V & I

*Optional with plug-in module

COMMUNICATIONS

- Ethernet port (100Mbps) *
- GSM-GPRS *
- Embedded web server *
- Web monitoring *
- Web programming *
- Central Monitoring through internet *
- SMS message sending *
- E-mail sending *
- Central monitoring *
- Modbus RTU through RS-485 *
- Modbus TCP/IP *
- SNMP *
- USB Host *
- CANBUS-2 for inter- module comm. *
- USB Device
- PC software: Rainbow Plus
- J1939-CANBUS for electronic engines

*Optional with plug-in module

TOPOLOGIES

3 phases 4 wires, star

3 phases 4 wires, delta

3 phases 3 wires, delta, 3 CTs

3 phases 3 wires, delta, 2 CTs (L1-L2)

3 phases 3 wires, delta, 2 CTs (L1-L3)

2 phases 3 wires, L1-L2

2 phases 3 wires, L1-L3

1 phase 2 wires



RoHS

EAC

cRJ® us

CE

COPYRIGHT NOTICE

Any unauthorized use or copying of the contents or any part of this document is prohibited. This applies in particular to trademarks, model denominations, part numbers and drawings.

ABOUT THIS DOCUMENT

This document describes minimum requirements and necessary steps for the successful installation of the D-500 family units.

Follow carefully advices given in the document. These are often good practices for the installation of genset control units which reduce future issues.

For all technical queries please contact Datakom at below e-mail address:

technical.support@datakom.com.tr

QUERRIES

If additional information to this manual is required, please contact the manufacturer directly at below e-mail address:

technical.support@datakom.com.tr

Please provide following information in order to get answers to any question:

- Device model name (see the back panel of the unit),
- Complete serial number (see the back panel of the unit),
- Firmware version (read from the display screen),
- Measuring-circuit voltage and power supply voltage,
- Precise description of the query.

RELATED DOCUMENTS

FILENAME	DESCRIPTION
500-Rainbow Installation	Rainbow Plus Installation Guide
500-Rainbow Usage	Rainbow Plus Usage Guide
500-DYNDns account setting	Dynamic DNS Account Setting
500-Ethernet Configuration	Ethernet Configuration Guide
500-GSM Configuration	GSM Configuration Guide
500-Firmware Update	Firmware Update Guide
500-MODBUS	Modbus Application Manual
500-snmp_E_34076	MIB file for SNMP Application
500-Rainbow Scada Installation	Rainbow Scada Installation Guide
500-Rainbow Scada Usage	Rainbow Scada Usage Guide

REVISION HISTORY

REVISION	DATE	AUTHOR	DESCRIPTION
01	24.09.2019	MH	First release, firmware version 6.3

TERMINOLOGY



CAUTION: Potential risk of injury or death.



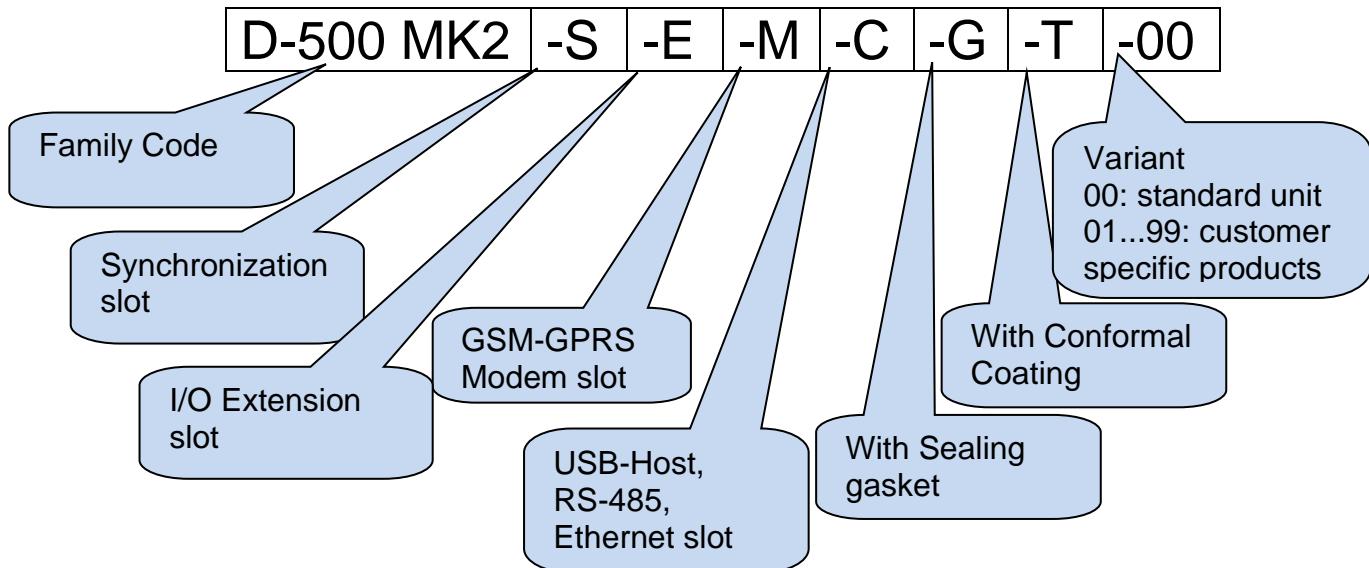
WARNING: Potential risk of malfunction or material damage.



ATTENTION: Useful hints for the understanding of device operation.

ORDERING CODES

The D-500 family units are available in various options and peripheral features. Please use below information for ordering the correct version:



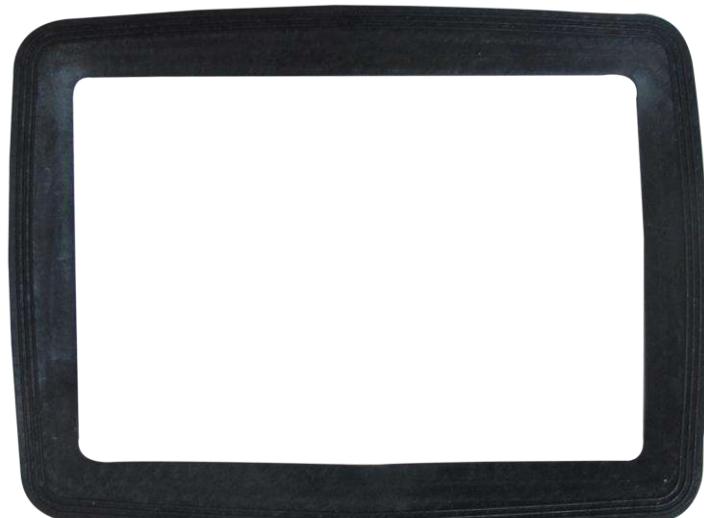
SPARE PARTS



Screw type bracket
Stock Code=J10P01 (per unit)



Self-Retaining type bracket
Stock Code=K16P01 (per unit)



Sealing Gasket, Stock Code= K20P01



SAFETY NOTICE

**Failure to follow below instructions
will result in death or serious injury**



- Electrical equipment should be installed only by qualified specialist. No responsibility is assured by the manufacturer or any of its subsidiaries for any consequences resulting from the non-compliance to these instructions.



- Check the unit for cracks and damages due to transportation. Do not install damaged equipment.



- Do not open the unit. There are no serviceable parts inside.



- Fuses of fast type with a maximum rating of 6A must be connected to supply and AC voltage inputs of the controller.



- Disconnect all power before working on equipment.



- When the unit is connected to the network do not touch terminals.

- Short circuit terminals of unused current transformers.



- Any electrical parameter applied to the device must be in the range specified in the user manual. Although the unit is designed with a wide safety margin, over-range parameters may reduce lifetime, alter operational precision or even damage the unit.



- Do not try to clean the device with solvent or the like. Only clean with a damp cloth.



- Verify correct terminal connections before applying power.

- Only for front panel mounting.



Current Transformers must be used for current measurement.

No direct connection allowed.

TABLE OF CONTENTS

- 1. INSTALLATION INSTRUCTIONS**
- 2. MOUNTING**
 - 2.1 DIMENSIONS
 - 2.2 SEALING, GASKET
 - 2.3 ELECTRICAL INSTALLATION
- 3. TERMINAL DESCRIPTIONS**
 - 3.1. BATTERY VOLTAGE INPUT
 - 3.2. AC VOLTAGE INPUTS
 - 3.3. AC CURRENT INPUTS
 - 3.4. DIGITAL INPUTS
 - 3.5. ANALOG SENDER INPUTS AND SENDER GROUND
 - 3.6. CHARGE INPUT TERMINAL
 - 3.7. MAGNETIC PICKUP INPUT
 - 3.8. DIGITAL OUTPUTS
 - 3.9. MAINS CONTACTOR OUTPUT
 - 3.10. GENERATOR CONTACTOR OUTPUT
 - 3.11. INPUT/OUTPUT EXTENSION
 - 3.12. J1939-CANBUS PORT
 - 3.13. USB DEVICE PORT
- 4. PLUG-IN MODULES**
 - 4.1. MODEM PLUG-IN
 - 4.1.1. GSM MODEM SLOT
 - 4.1.2. Wi-Fi SLOT
 - 4.1.3. ETHERNET SLOT
 - 4.1.4. RS-485 SLOT
 - 4.2. SYNCHRONIZATION PLUG-IN
 - 4.2.1. ANALOG AVR CONTROL OUTPUT
 - 4.2.2. ANALOG GOVERNOR CONTROL OUTPUT
 - 4.2.3. DATALINK-CANBUS PORT
 - 4.2.4. ANALOG LOAD SHARE SIGNAL
 - 4.3. ANALOG PLUG-IN
 - 4.3.1. ANALOG I/O EXTENSION SLOT
 - 4.3.2. 3 X MAINS CT INPUTS SLOT
 - 4.4. COMMUNICATION SLOT
 - 4.4.1. ETHERNET PORT
 - 4.4.2. USB HOST PORT
 - 4.4.3. RS-485 PORT

5. TOPOLOGIES

- 5.1. SELECTING THE TOPOLOGY
- 5.2. 3 PHASE, 4 WIRE, STAR
- 5.3. 3 PHASE, 3 WIRE, DELTA
- 5.4. 3 PHASE, 4 WIRE, DELTA
- 5.5. 3 PHASE, 3 WIRE, DELTA, 2 CT (L1-L2)
- 5.6. 3 PHASE, 3 WIRE, DELTA, 2 CT (L1-L3)
- 5.7. 2 PHASE, 3 WIRE, DELTA, 2 CTs (L1-L2)
- 5.8. 2 PHASE, 3 WIRE, DELTA, 2 CTs (L1-L3)
- 5.9. 1 PHASE, 2 WIRE

6. FUNCTIONALITIES

- 6.1. CT LOCATION SELECTION
- 6.2. SYNCHRONIZATION FUNCTIONALITY
- 6.3. MAINS SYNCHRONIZATION FUNCTIONALITY
- 6.4. SINGLE GENSET PARALLEL WITH MAINS
- 6.5. AMF FUNCTIONALITY
- 6.6. ATS FUNCTIONALITY
- 6.7. REMOTE START FUNCTIONALITY
- 6.8. ENGINE CONTROLLER FUNCTIONALITY
- 6.9. REMOTE DISPLAY UNIT FUNCTIONALITY
- 6.10. 400HZ OPERATION

7. CONNECTION DIAGRAMS

- 7.1. GENSET SYNCHRONIZATION FUNCTIONALITY
- 7.2. MAINS SYNCHRONIZATION FUNCTIONALITY
- 7.3. SINGLE GENSET PARALLEL WITH MAINS FUNCTIONALITY
- 7.4. AMF FUNCTIONALITY
- 7.5. ATS FUNCTIONALITY
- 7.6. REMOTE START FUNCTIONALITY
- 7.7. ENGINE CONTROL FUNCTIONALITY
- 7.8. REMOTE DISPLAY PANEL FUNCTIONALITY

8. TERMINAL DESCRIPTION

9. TECHNICAL SPECIFICATIONS

10. DESCRIPTION OF CONTROLS

- 10.1. FRONT PANEL FUNCTIONALITY
- 10.2. PUSHBUTTON FUNCTIONS
- 10.3. DISPLAY SCREEN ORGANIZATION
- 10.4. AUTOMATIC DISPLAY SCROLL
- 10.5. MEASURED PARAMETERS
- 10.6. LED LAMPS

11. WAVEFORM DISPLAY & HARMONIC ANALYSIS

12. DISPLAYING EVENT LOGS

13. STATISTICAL COUNTERS

- 13.1. FUEL FILLING COUNTER
- 13.2. FUEL CONSUMPTION MONITORING

14. OPERATION OF THE UNIT

- 14.1. QUICK START GUIDE
- 14.2. STOP MODE
- 14.3. AUTO MODE
- 14.4. RUN MODE, MANUAL CONTROL
- 14.5. TEST MODE

15. PROTECTIONS AND ALARMS

- 15.1. DISABLING ALL PROTECTIONS
- 15.2. SERVICE REQUEST ALARM
- 15.3. SHUTDOWN ALARMS
- 15.4. LOADDUMP ALARMS
- 15.5. WARNINGS
- 15.6. NON-VISUAL WARNINGS

16. PROGRAMMING

- 16.1. RESETTING TO FACTORY DEFAULTS
- 16.2. ENTERING THE PROGRAMMING MODE
- 16.3. NAVIGATING BETWEEN MENUS
- 16.4. MODIFYING PARAMETER VALUE
- 16.5. PROGRAMMING MODE EXIT

17. PROGRAM PARAMETER LIST

- 17.1. CONTROLLER CONFIGURATION GROUP
- 17.2. ELECTRICAL PARAMETERS GROUP
- 17.3. ENGINE PARAMETERS GROUP
- 17.4. ADJUST DATE AND TIME
- 17.5. WEEKLY OPERATION SCHEDULE
- 17.6. EXERCISER SCHEDULE
- 17.7. SENDER CONFIGURATION
- 17.8. DIGITAL INPUT CONFIGURATION
- 17.9. OUTPUT CONFIGURATION
- 17.10. SITE ID STRING
- 17.11. ENGINE SERIAL NUMBER
- 17.12. MODEM1-2/SMS1-2-3-4 TELEPHONE NUMBERS
- 17.13. GSM MODEM PARAMETERS
- 17.14. ETHERNET PARAMETERS
- 17.15. SNTP PARAMETERS
- 17.16. Wi-Fi PARAMETERS
- 17.17. SYNCHRONIZATION PARAMETERS

- 18. ETHERNET CONFIGURATION**
- 19. Wi-Fi CONFIGURATION**
- 20. GSM CONFIGURATION**
- 21. CRANK CUTTING**
- 22. OVERCURRENT PROTECTION (IDMT)**
- 23. MOTORIZED CIRCUIT BREAKER CONTROL**
- 24. AUTO LEARNING**
- 25. SPEED & VOLTAGE UP/DOWN RELAY OUTPUTS**
 - 25.1. SPEED UP/DOWN CONTROL**
 - 25.2. VOLTAGE UP/DOWN CONTROL**
- 26. J1939 CANBUS ENGINE SUPPORT**
- 27. GPS SUPPORT**
- 28. SMS COMMANDS**
- 29. LOAD TRANSFER MODES**
 - 29.1. TRANSFER WITH INTERRUPTION**
 - 29.2. UNINTERRUPTED TRANSFER**
 - 29.3. SOFT TRANSFER**
- 30. LOAD SHARING**
 - 30.1. DIGITAL LOAD SHARING (DATALINK)**
 - 30.2. ANALOG LOAD SHARING**
 - 30.3. DROOP MODE OPERATION**
- 31. PARALLELING WITH MAINS OPERATION**
 - 31.1. PEAK LOPPING**
 - 31.2. POWER EXPORT TO MAINS**
 - 31.3. DISTRIBUTED POWER EXPORT TO MAINS**
 - 31.4. PEAK LOPPING WITH GENSET PRIORITY**
- 32. PROTECTION FUNCTIONS PARALLELING WITH MAINS**
 - 32.1. ROCOF FUNCTION (rate of change of frequency)**
 - 32.2. VECTOR SHIFT FUNCTION**
 - 32.3. OVER/UNDER FREQUENCY FUNCTION**
 - 32.4. OVER/UNDER VOLTAGE FUNCTION**
 - 32.5. MAINS REVERSE POWER FUNCTION**
 - 32.6. NO FREQUENCY FUNCTION**
- 33. DATA RECORDING**
 - 33.1. DATA RECORDING MEDIA**
 - 33.2. DIRECTORY STRUCTURE**
 - 33.3. UNDERSTANDING THE CSV FORMAT**
 - 33.4. RECORDED DATA LIST, RECORD PERIOD**

34. SOFTWARE FEATURES

- 34.1. LOAD SHEDDING / DUMMY LOAD
- 34.2. LOAD ADD / SUBSTRACT
- 34.3. FIVE STEP LOAD MANAGEMENT
- 34.4. REMOTE START OPERATION
- 34.5. DISABLE AUTO START, SIMULATE MAINS
- 34.6. BATTERY CHARGING OPERATION, DELAYED SIMULATE MAINS
- 34.7. DUAL GENSET MUTUAL STANDBY OPERATION
- 34.8. MULTIPLE VOLTAGE AND FREQUENCY
- 34.9. SINGLE PHASE OPERATION
- 34.10. EXTERNAL CONTROL OF THE UNIT
- 34.11. AUTOMATIC EXERCISER
- 34.12. WEEKLY OPERATION SCHEDULER
- 34.13. ENGINE HEATING OPERATION
- 34.14. ENGINE IDLE SPEED OPERATION
- 34.15. ENGINE BLOCK HEATER
- 34.16. FUEL PUMP CONTROL
- 34.17. GAS ENGINE FUEL SOLENOID CONTROL
- 34.18. PRE-TRANSFER SIGNAL
- 34.19. CHARGING THE ENGINE BATTERY
- 34.20. EXTERNALLY CONTROLLED DIGITAL OUTPUTS
- 34.21. COMBAT MODE
- 34.22. RESETTING THE CONTROLLER
- 34.23. AUTOMATIC CONNECTION TOPOLOGY DETERMINATION
- 34.24. ZERO POWER AT REST

35. MODBUS COMMUNICATIONS

- 35.1. PARAMETERS REQUIRED FOR RS-485 MODBUS OPERATION
- 35.2. PARAMETERS REQUIRED FOR MODBUS-TCP/IP VIA ETHERNET
- 35.3. DATA FORMATS

36. SNMP COMMUNICATIONS

- 36.1. PARAMETERS REQUIRED FOR SNMP VIA ETHERNET
- 36.2. SNMP TRAP MESSAGES

37. DECLARATION OF CONFORMITY

38. MAINTENANCE

39. DISPOSAL OF THE UNIT

40. ROHS COMPLIANCE

41. TROUBLESHOOTING GUIDE

1. INSTALLATION INSTRUCTIONS

Before installation:

- Read the user manual carefully, determine the correct connection diagram.
- Remove all connectors and mounting brackets from the unit, then pass the unit through the mounting opening.
- Put mounting brackets and tighten. Do not tighten too much, this can break the enclosure.
- Make electrical connections with plugs removed from sockets, then place plugs to their sockets.
- Be sure that adequate cooling is provided.
- Be sure that the temperature of the environment will not exceed the maximum operating temperature in any case.

Below conditions may damage the device:

- Incorrect connections.
- Incorrect power supply voltage.
- Voltage at measuring terminals beyond specified range.
- Voltage applied to digital inputs over specified range.
- Current at measuring terminals beyond specified range.
- Overload or short circuit at relay outputs
- Connecting or removing data terminals when the unit is powered-up.
- High voltage applied to communication ports.
- Ground potential differences at non-isolated communication ports.
- Excessive vibration, direct installation on vibrating parts.



Current Transformers must be used for current measurement.

No direct connection allowed.

Below conditions may cause abnormal operation:

- Power supply voltage below minimum acceptable level.
- Power supply frequency out of specified limits
- Phase order of voltage inputs not correct.
- Current transformers not matching related phases.
- Current transformer polarity incorrect.
- Missing grounding.

2. MOUNTING

2.1. DIMENSIONS

Dimensions: 211x162x42mm

Panel Cutout: 176x121mm minimum

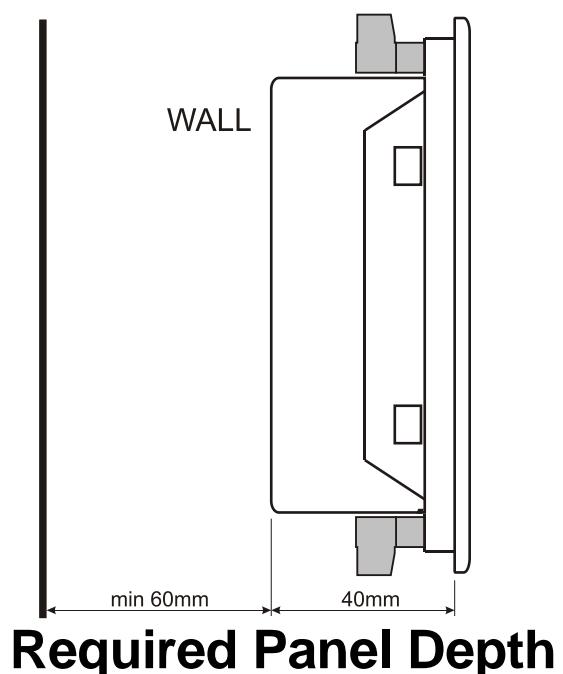
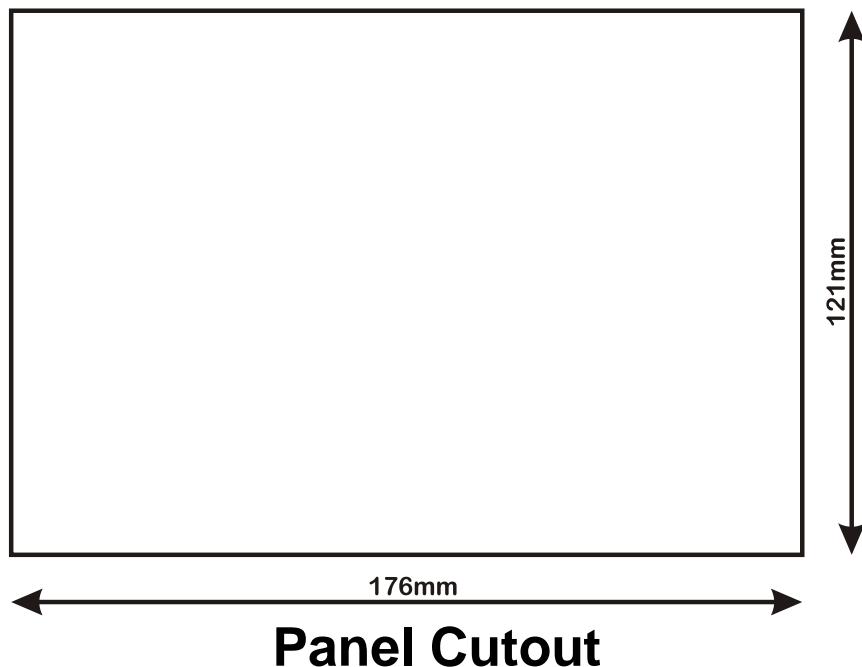
Weight: 500g (approx..)



The unit is designed for panel mounting. The user should not be able to access parts of the unit other than the front panel.

Mount the unit on a flat, vertical surface. Before mounting, remove the mounting brackets and connectors from the unit, then pass the unit through the mounting opening.

Place and tighten mounting brackets.



Two different types of brackets are provided:



Screw type bracket



Self retaining type bracket



Installation of screw type bracket

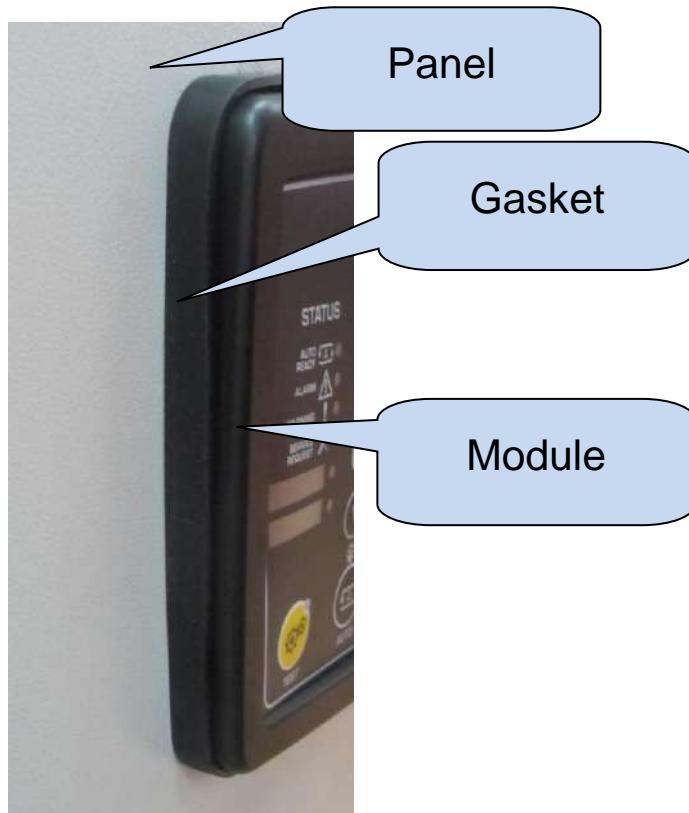


Installation of self-retaining type bracket



Do not tighten too much, this may break the unit.

2.2. SEALING, GASKET



The rubber gasket provides a watertight means of mounting the module to the genset panel. Together with the gasket, IEC 60529-IP65 protection can be reached from the front panel. A short definition of IP protection levels is given below.

1st Digit

- 0 Not protected
- 1 Protected against solid foreign objects of 50 mm diameter and greater
- 2 Protected against solid foreign objects of 12,5 mm diameter and greater
- 3 Protected against solid foreign objects of 2,5 mm diameter and greater
- 4 Protected against solid foreign objects of 1,0 mm diameter and greater
- 5 Protected from the amount of dust that would interfere with normal operation

6 Dust tight

2nd Digit

- 0 Not protected
- 1 Protected against vertically falling water drops
- 2 Protected against vertically falling water drops when enclosure is tilted up to 15 °
- 3 Protected against water sprayed at an angle up to 60 ° on either side of the vertical
- 4 Protected against water splashed against the component from any direction

5 Protected against water projected in jets from any direction

- 6 Protected against water projected in powerful jets from any direction
- 7 Protected against temporary immersion in water
- 8 Protected against continuous immersion in water, or as specified by the user

2.3. ELECTRICAL INSTALLATION



Do not install the unit close to high electromagnetic noise emitting devices like contactors, high current busbars, switchmode power supplies and the like.

Although the unit is protected against electromagnetic disturbance, excessive disturbance can affect the operation, measurement precision and data communication quality.

- **ALWAYS remove plug connectors when inserting wires with a screwdriver.**
- **Fuses must be connected to the power supply and phase voltage inputs, in close proximity of the unit.**
- **Fuses must be of fast type (FF) with a maximum rating of 6A.**
- **Use cables of appropriate temperature range.**
- **Use adequate cable section, at least 0.75mm² (AWG18).**
- **Follow national rules for electrical installation.**
- **Current transformers must have 5A output.**
- **For current transformer inputs, use at least 1.5mm² section (AWG15) cable.**
- **The current transformer cable length should not exceed 1.5 meters. If longer cable is used, increase the cable section proportionally.**



Current Transformers must be used for current measurement.

No direct connection allowed.



The engine body must be grounded. Otherwise faulty voltage and frequency measurements may occur.



For the correct operation of the exerciser and weekly schedule programs, adjust the real time clock of the unit through programming menu.

3. TERMINAL DESCRIPTIONS

3.1. BATTERY VOLTAGE INPUT

Supply voltage:	9 to 36VDC
Cranking dropouts:	Survives 0VDC during 100ms. The voltage before surge should be 9VDC minimum
Overvoltage protection:	Withstands 150VDC continuously.
Reverse voltage:	-36VDC continuous
Maximum operating current:	600mA @ 12VDC. (All options included, digital outputs open.) 300mA @ 24VDC. (All options included, digital outputs open.)
Typical operating current:	300mA @ 12VDC. (all options passive, digital outputs open) 150mA @ 24VDC. (all options passive, digital outputs open)
Measurement range:	0 to 36VDC
Display resolution:	0.1VDC
Accuracy:	0.5% + 1 digit @ 24VDC

3.2. AC VOLTAGE INPUTS

Measurement method:	True RMS
Sampling rate:	8000 Hz
Harmonic analysis:	up to 31th harmonic
Input voltage range:	0 to 300 VAC
Minimum voltage for frequency detection:	15 VAC (Ph-N)
Supported topologies:	3 ph 4 wires star 3 ph 4 wires delta 3 ph 3 wires delta 3 ph 3 wires delta L1-L2 3 ph 3 wires delta L2-L3 2ph 3 wires L1-L2 2ph 3 wires L1-L3 1 ph 2 wires
Measurement range:	0 to 330VAC Ph-N (0 to 570VAC Ph-Ph)
Common mode offset:	max 100V between neutral and BAT-
Input impedance:	4.5M-ohms
Display resolution:	1VDC
Accuracy:	0.5% + 1 digit @ 230VAC Ph-N (± 2 VAC Ph-N) 0.5% + 1 digit @ 400VAC Ph-Ph (± 3 VAC Ph-Ph)

Frequency range:	DC to 500Hz
Frequency display resolution:	0.1 Hz
Frequency accuracy:	0.2% + 1 digit (± 0.1 Hz @ 50Hz)

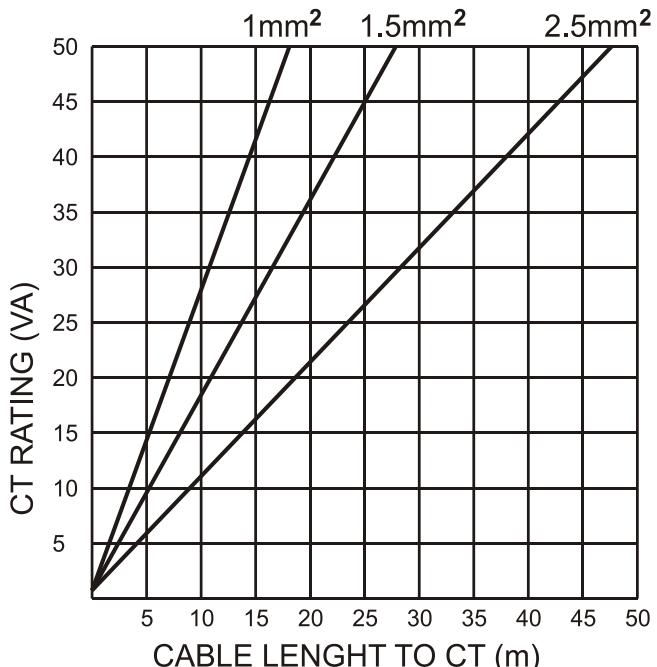
3.3. AC CURRENT INPUTS

Measurement method:	True RMS
Sampling rate:	8000 Hz
Harmonic analysis:	up to 31th harmonic
Supported topologies:	3 ph 4 wires star, 3 ph 4 wires delta, 3 ph 3 wires delta L1-L2 3 ph 3 wires delta L2-L3 2ph 3 wires L1-L2 2ph 3 wires L1-L3 1 ph 2 wires
CT secondary rating:	5A
Measurement range:	5/5 to 5000/5A minimum
Input impedance:	15 milliohm
Burden:	0.375W
Maximum continuous current:	6A
Measurement range:	0.1 to 7.5A
Common mode offset:	Max 5VAC between BAT- and any CT terminal.
Display resolution:	1A
Accuracy:	0.5% + 1 digit @ 5A ($\pm 4.5A$ @ 5/500A full range)

SELECTING THE CT RATING AND CABLE SECTION:

The load on a CT should be kept minimum in order to minimize phase shift effect of the current transformer. Phase shift in a CT will cause erroneous power and power factor readings, although amp readings are correct.

It is advised CT rating to be selected following this table for the best measurement accuracy.



SELECTING THE CT ACCURACY CLASS:

The CT accuracy class should be selected in accordance with the required measurement precision. The accuracy class of controller is 0.5%. Thus 0.5% class CTs are advised for the best result.

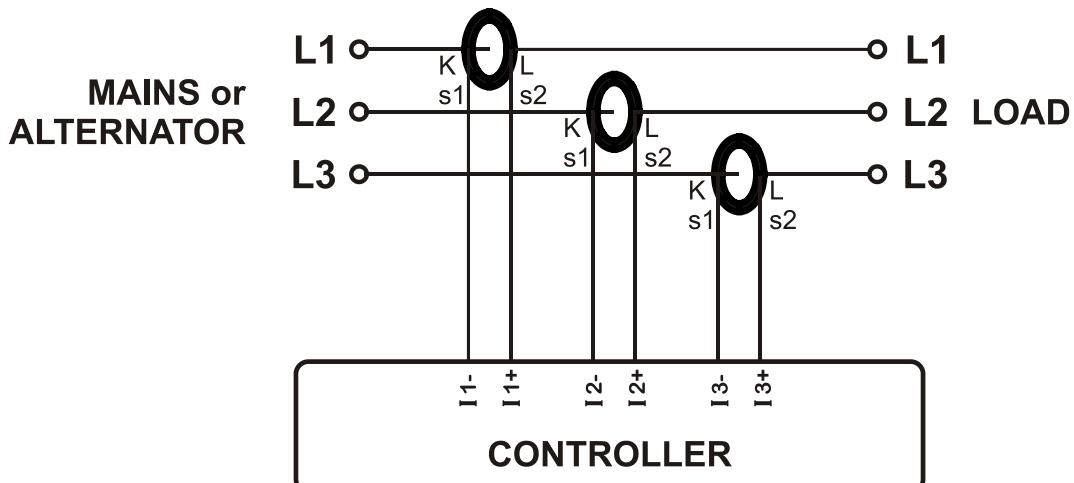


- Current Transformers must be used for current measurement. No direct connection allowed.
- No common terminals or grounding allowed.

CONNECTING CTs:

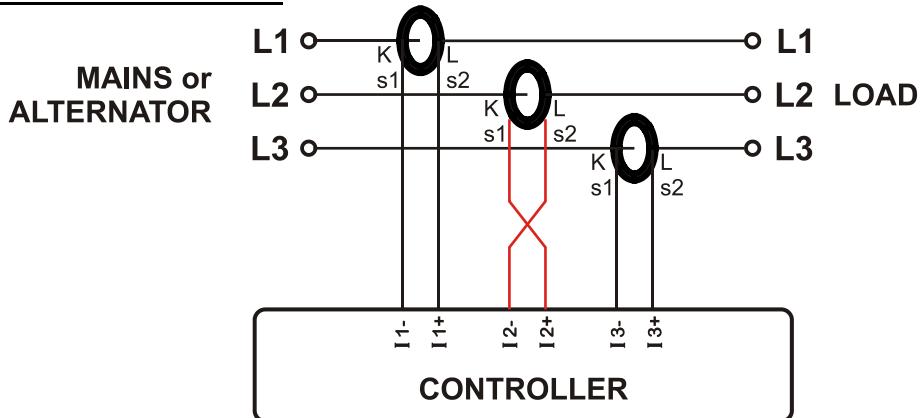
Be sure of connecting each CT to the related phase input with the correct polarity. Mixing CTs between phases will cause faulty power and pf readings.

Many combinations of incorrect CTs connections are possible, so check both order of CTs and their polarity. Reactive power measurement is affected by incorrect CTs connection in similar way as active power measurement.

CORRECT CT CONNECTIONS

Let's suppose that the genset is loaded with 100 kW on each phase. The load Power Factor (PF) is 1. Measured values are as follows:

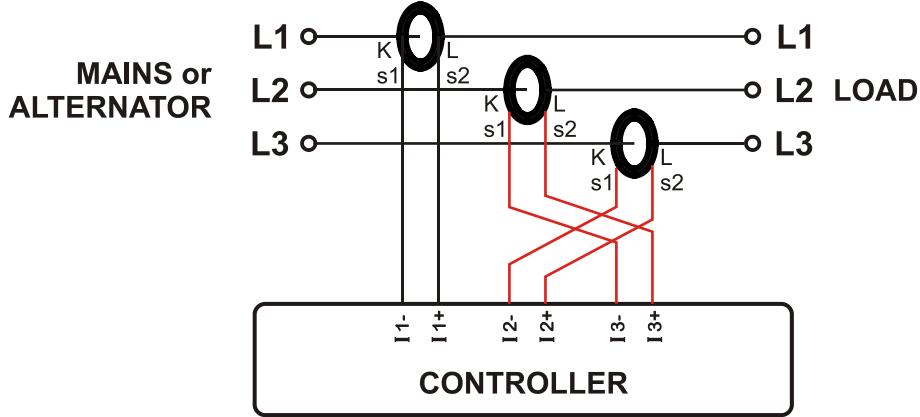
	kW	kVAr	kVA	pf
Phase L1	100.0	0.0	100	1.00
Phase L2	100.0	0.0	100	1.00
Phase L3	100.0	0.0	100	1.00
Total	300.0	0.0	300	1.00

EFFECT OF POLARITY REVERSAL

The generator is still loaded with 100 kW on each phase. The load Power Factor (PF) is 1. PF in phase L2 will show -1.00 due to reverse CT polarity. The result is that total generator power displayed by the controller is 100 kW.

Measured values are as follows:

	kW	kVAr	kVA	pf
Phase L1	100.0	0.0	100	1.00
Phase L2	-100.0	0.0	100	-1.00
Phase L3	100.0	0.0	100	1.00
Total	100.0	0.0	300	0.33

EFFECT OF PHASE SWAPPING

The generator is still loaded with 100 kW on each phase. The load Power Factor (PF) is 1. PF in phases L2 and L3 will show -0.50 due to phase shift between voltages and currents which is caused by CT swapping. The result is that total generator power displayed by controller is 0 kW.

Measured values are as follows:

	kW	kVAr	kVA	pf
Phase L1	100.0	0.0	100	1.00
Phase L2	-50.0	86.6	100	-0.50
Phase L3	-50.0	-86.6	100	-0.50
Total	0.0	0.0	300	0.0

3.4. DIGITAL INPUTS

Number of inputs:	8 inputs, all configurable
Function selection:	from list
Contact type:	Normally open or normally closed (programmable)
Switching:	Battery negative or battery positive (programmable)
Structure:	47 k-ohms resistor to battery positive, 110k-ohms to battery negative.
Measurement:	Analog voltage measurement.
Open circuit voltage:	70% of battery voltage
Low level threshold:	35% of battery voltage
High level threshold:	85% of battery voltage
Maximum input voltage:	+100VDC with respect to battery negative
Minimum input voltage:	-70VDC with respect to battery negative
Noise filtering:	Yes, both analog and digital filtering

3.5. ANALOG SENDER INPUTS & SENDER GROUND

Number of inputs:	4 inputs, all configurable, additional sender ground input
Function selection:	from list
Structure:	667 ohms resistor polarizing to 3.3VDC
Measurement:	Analog resistor measurement.
Open circuit voltage:	+3.3VDC
Short circuit current:	5mA
Measurement range:	0 to 5000 ohms.
Open circuit threshold:	5000 ohms.
Resolution:	1 ohms @ 300 ohms or lower
Accuracy:	2 %+1 ohm (± 7 ohms @300 ohms)
Common mode voltage range:	± 3 VDC
Noise filtering:	Yes, both analog and digital filtering

3.6. CHARGE INPUT TERMINAL

The Charge terminal is both an input and output.

When the engine is ready to run, this terminal supplies the excitation current to the charge alternator. The excitation circuit is equivalent to a 2W lamp.

The threshold voltages for warning and shutdown alarm are adjustable through program parameter.

Structure:	<ul style="list-style-type: none"> • battery voltage output through 20 ohm PTC • voltage measurement input
Output current:	160mA @12VDC 80mA @24VDC
Voltage measurement resolution:	0.1VDC
Voltage measurement accuracy:	2% + 0.1V (0.9V @30VDC)
Charge Fail Warning Threshold:	adjustable
Charge Fail Shutdown Alarm Threshold:	adjustable
Open circuit voltage:	battery positive
Overvoltage protection:	> 500VDC continuous, with respect to battery negative
Reverse voltage protection:	-30VDC with respect to battery negative

3.7. MAGNETIC PICKUP INPUT

Structure:	Differential frequency measurement input
Input impedance:	50 k-ohms
Input voltage:	0.5VAC-RMS to 30VAC-RMS
Max common mode voltage:	± 5VDC
Frequency range:	10Hz to 10 kHz
Resolution:	1 rpm
Accuracy:	0.2% + 1 rpm (±3rpm @1500 rpm)
Flywheel teeth range:	1 to 500



Do not share MPU with other devices.

3.8. DIGITAL OUTPUTS

The unit offers 6 digital outputs with programmable function, selectable from list.

Structure:	Negative pulling protected semiconductor output. One terminal is connected to battery negative.
Max continuous current:	1.0 ADC
Max switching voltage:	33 VDC
Overvoltage protection:	40 VDC
Short circuit protection:	> 1.7 ADC
Reverse voltage protection:	500 VDC

3.9. MAINS CONTACTOR OUTPUT

Structure:	Relay output, normally closed contact. One terminal is internally connected to mains phase L1 input.
Max switching current:	12A @250VAC
Max switching voltage:	440VAC
Max switching power:	3000VA

3.10. GENERATOR CONTACTOR OUTPUT

Structure:	Relay output, normally open contact. One terminal is internally connected to genset phase L1 input.
Max switching current:	16A @250VAC
Max switching voltage:	440VAC
Max switching power:	4000VA

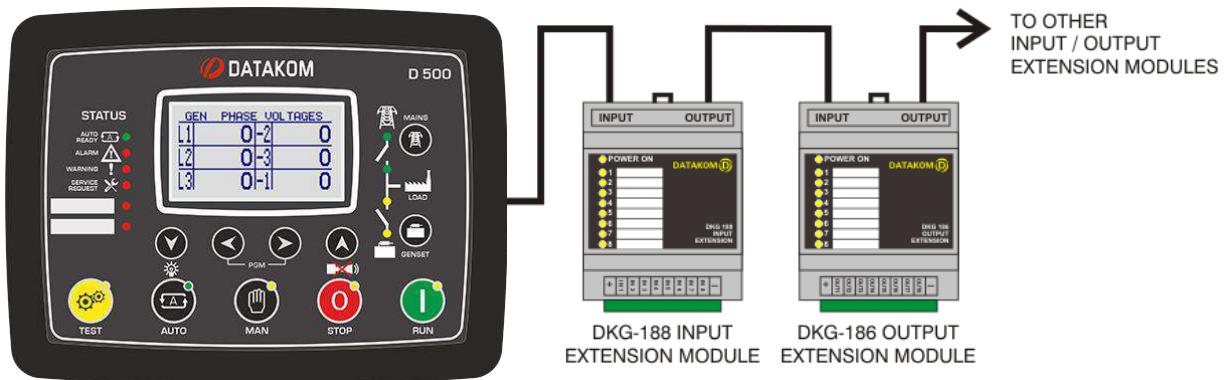
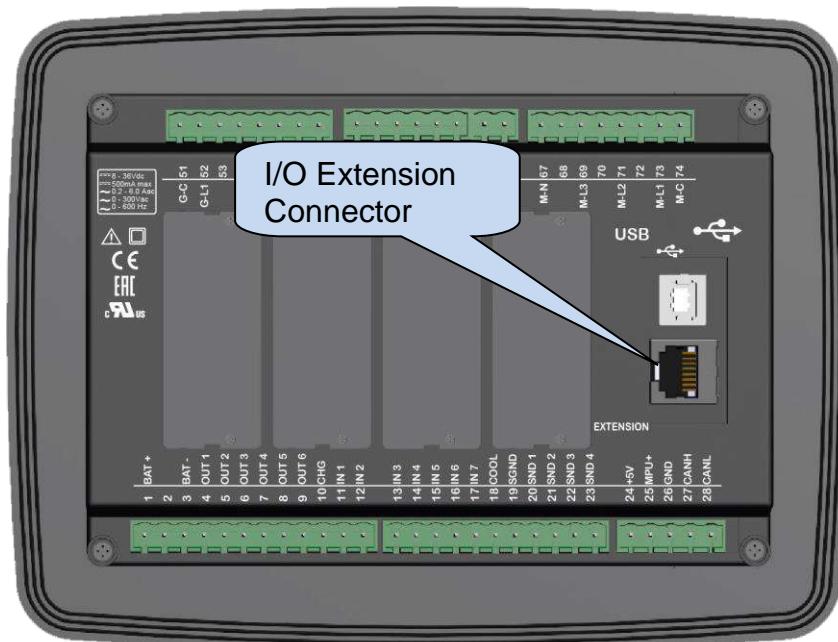
3.11. INPUT/OUTPUT EXTENSION

The module provides resources for 32 additional digital inputs and 32 additional digital outputs.

Digital inputs can be extended using **DKG-188 Digital Input Extension** modules, each one providing 8 inputs. Digital inputs are programmable through the main controller. The switching characteristic is not programmable and must be battery negative. Any function can be assigned to digital inputs.

Digital outputs can be extended using **DKG-186 Fet Extension** modules, each one providing 8 outputs. Digital outputs have the same electrical characteristics as on-board outputs. They have programmable functions through the main controller. Any function can be assigned to any output.

Input and output extension modules are connected to the main controller in a cascade structure, in any order. The connection cable is provided with each extension module.



3.12. J1939-CANBUS PORT

Structure:	CANBUS, non-isolated.
Connection:	3 wires (CANH-CANL-GND).
Data rate:	250 kbps
Termination:	Internal 120 ohms provided
Common mode voltage:	-0.5 VDC to +15 VDC, internally clamped by transient suppressors.
Max distance:	200m with 120 ohm balanced cable

3.13. USB DEVICE PORT



Description:	USB 2.0, not isolated, HID mode
Data rate:	Full Speed 1.5/12 Mbits/s, auto detecting
Connector:	USB-B (printer connector)
Cable length:	Max 6m
Functionality:	Modbus, FAT32 for firmware upgrade (boot loader mode only)

The USB-Device port is designed to connect the module to a PC. Using the RainbowPlus software, programming, control of the genset and monitoring of measured parameters are achieved.

The RainbowPlus software can be downloaded from Datakom website.

The connector on the module is of USB-B type. Thus, A to B type USB cable should be used. This is the same cable used for USB printers.

For more details about programming, control and monitoring please refer to RainbowPlus user manual.



If USB-Device is plugged then USB-Host port will not function.

4. PLUG-IN MODULES



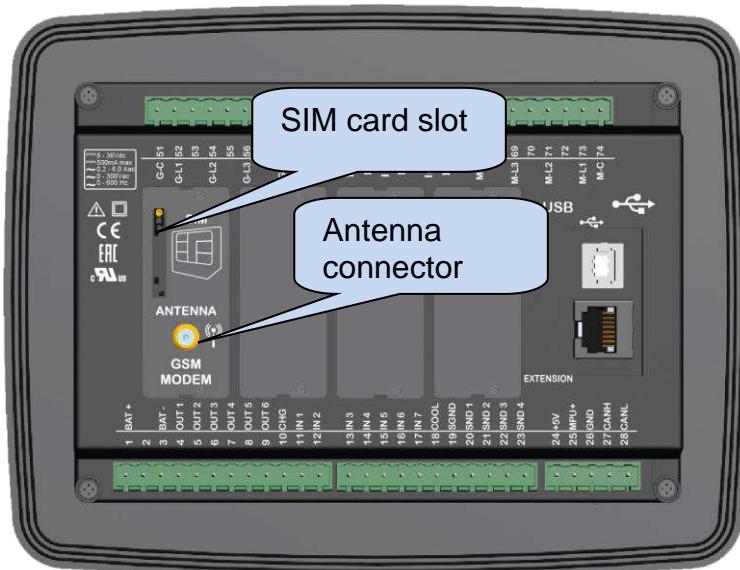
PLUG-IN MODULES	
MODEM PLUG-IN	-2G Modem Slot, -3G Modem Slot, -4G Modem Slot, -Wi-Fi Slot, -Ethernet Slot, -RS-485 Slot
SYNCHRONIZATION PLUG-IN	-Synchronization Slot
ANALOG PLUG-IN	-Analog I/O Extension Slot, -3xMains CT Inputs Slot -DC Voltage and Current Inputs Slot -Tilt Detector Slot
COMMUNICATION PLUG-IN	-Communication Slot

4.1. MODEM PLUG-IN

4.1.1. GSM MODEM SLOT

The optional GSM modem offers the advantage of being internally powered and is fully compatible with the unit. It does not require any special setup.

The 1800/1900 MHz magnetic antenna together with its 2-meter cable is supplied with the internal modem option. The antenna is intended to be placed outside of the genset panel for the best signal reception.



The module requires a GPRS enabled SIM card for full functionality. Voice-only type SIM cards will usually not function properly.

Please refer to **GSM Modem Configuration Guide** for more details.

Description:	Quad-band GSM/GPRS 850/900/1800/1900MHz module. GPRS multi-slot class 12/12 GPRS mobile station class B Compliant to GSM phase 2/2+. – Class 4 (2 W @ 850/ 900 MHz) – Class 1 (1 W @ 1800/1900MHz)
Functionality:	Web Client, SMTP, Modbus TCP/IP (client), SMS, e-mail
Operating temp range:	-40°C to +85 °C
Data speed:	Max. 85.6 kbps (download), 42.8 kbps (upload)
SIM card type:	external SIM 3V/1.8V, GPRS enabled
Antenna:	Quad band, magnetic, with 2m cable
Module certificates:	CE, FCC, ROHS, GCF, REACH

LOCATION DETERMINATION VIA GSM

The unit determines automatically the geographical position through the GSM network. No settings are necessary for this.

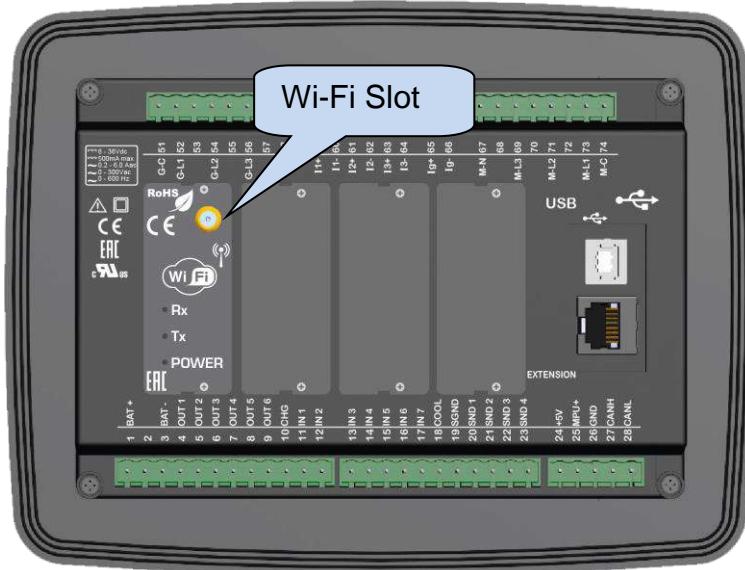
This feature is especially useful for the remote monitoring where the controller will appear automatically at its geo-position or for mobile gensets.

Although the controller supports also GPS location determination for more precise positioning, the GSM based location is free of charge, available everywhere, even where GPS signal is not available.



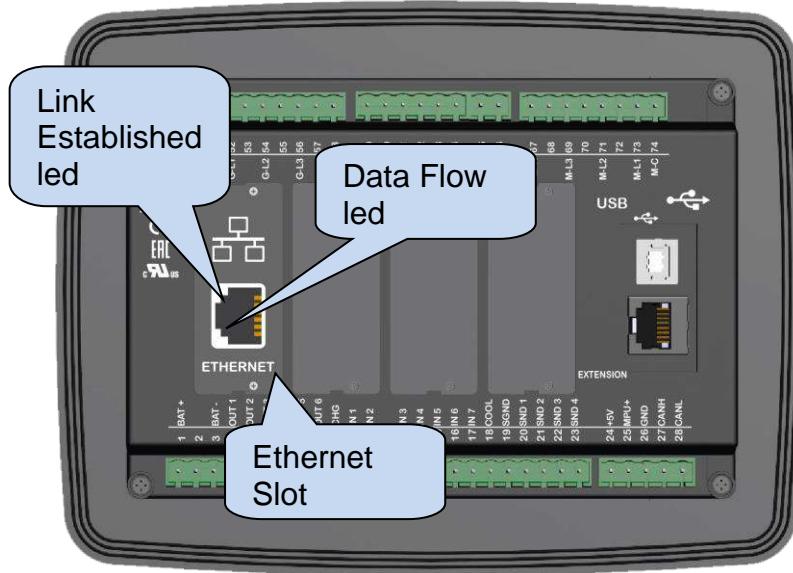
The location precision will depend of the GSM system. In highly populated areas, the precision is good (a few hundred meters), but rural areas may lead to errors of a many kilometers.

4.1.2. Wi-Fi SLOT



Wi-Fi protocols:	802.11 b/g/n
Frequency range:	2.4 GHz ~ 2.5 GHz (2400M ~ 2483.5M)
Network Protocols:	IPv4, TCP/UDP
Security:	WPA/WPA2
Functionality:	Web Client, E-mail, Modbus TCP_IP

4.1.3. ETHERNET SLOT



STANDARD ETHERNET CABLE

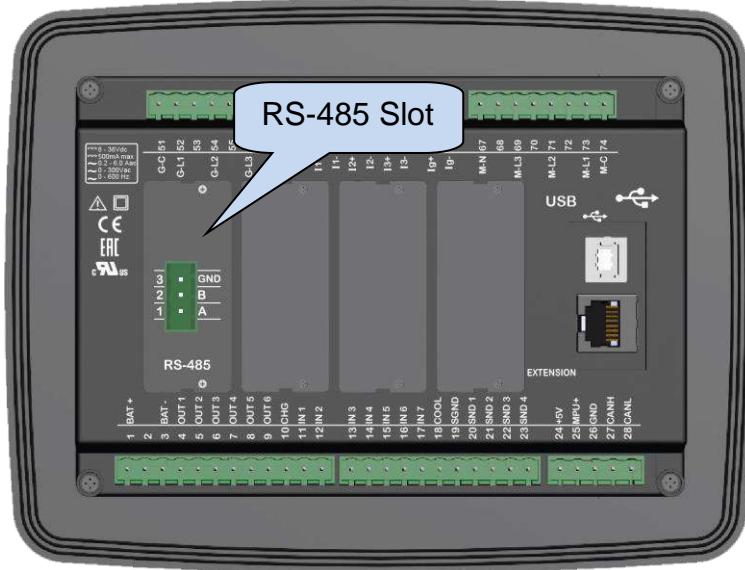
Description:	IEEE802.3 compliant, 100 Base-TX RJ45 ethernet port with indicating leds
Data rate:	100 Mbps, auto detecting
Connector:	RJ45
Cable type:	CAT5 or CAT6
Isolation:	1500 VAC, 1 minute
Max distance:	100m with CAT5 or CAT6 cable
Functionality:	Web Client, E-mail, Modbus TCP_IP

LED FUNCTIONS:

GREEN: This led turns on when the ethernet link is established (connector inserted)

YELLOW: This led blinks when data transfer occurs inwards or outwards. Periodic blinking will witness data flow.

4.1.4. RS-485 SLOT



Structure:	RS-485, isolated.
Connection:	3 wires (A-B-GND). Half duplex.
Baud rate:	2400-115200 bauds, selectable
Data type:	8 bit data, no parity, 1 bit stop
Termination:	External 120 ohms required
Isolation:	250VAC, 1 minute
Common mode voltage:	-0.5 VDC to +7VDC, internally clamped by transient suppressors.
Max distance:	1200m @ 9600 bauds (with 120 ohms balanced cable)

The RS-485 port features MODBUS-RTU protocol. Multiple modules (up to 128) can be paralleled on the same RS-485 bus for data transfer to automation or building management systems.



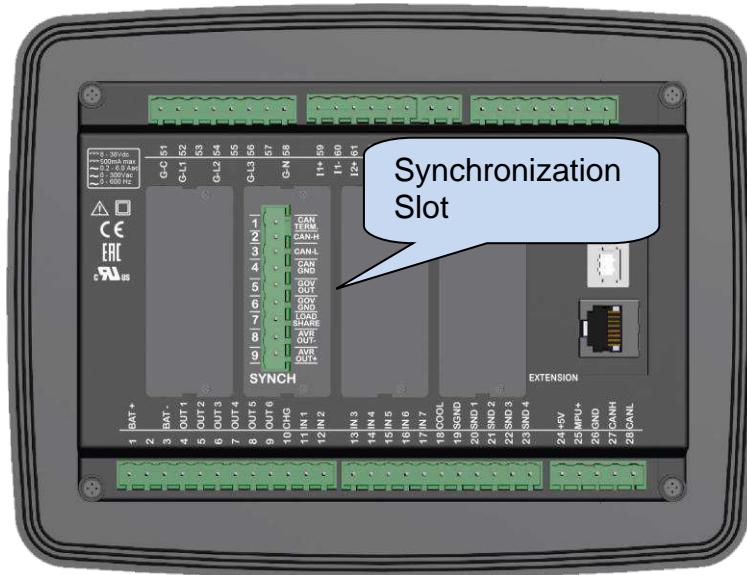
The Modbus register list is available at Datakom technical support.

The RS-485 port provides also a good solution for distant PC connection where RainbowPlus program will enable programming, control and monitoring.



For more details about programming, control and monitoring through RS-485 port please refer to RainbowPlus user manual.

4.2. SYNCHRONIZATION PLUG-IN



4.2.1. ANALOG AVR CONTROL OUTPUT

Structure:	Isolated analog output, ± 3 VDC
Connection:	2 wires
Output Impedance:	270 ohms
Isolation Voltage:	1000 VAC, 1 minute
Precision:	12 bits
Rest point:	Adjustable through program parameter
Sweep Range:	Adjustable through program parameter

4.2.2. ANALOG GOVERNOR CONTROL OUTPUT

Structure:	Isolated analog output, 0-10 VDC
Reference:	Battery negative
Output Impedance:	1000 ohms
Precision:	12 bits
Rest point:	Adjustable through program parameter
Sweep Range:	Adjustable through program parameter

4.2.3. DATALINK-CANBUS PORT

Structure:	CANBUS, isolated.
Connection:	4 wires (DATALINK-H, DATALINK-L, GND, TERMINATION).
Data rate:	250 kbps standard (adjustable between 50 and 500 kbps)
Termination:	120 ohms resistor internally connected to DATALINK-H. The TERMINATION is to be connected to DATALINK-L in order to terminate the Datalink bus.
Isolation voltage:	1000 VAC, 1 minute
Common mode voltage:	-0.5 VDC to +15 VDC, internally clamped by transient suppressors.
Max distance:	200m with 120 ohm balanced cable



The Datalink bus should be terminated from both ends.



The Datalink cable shield should be grounded from one end only.

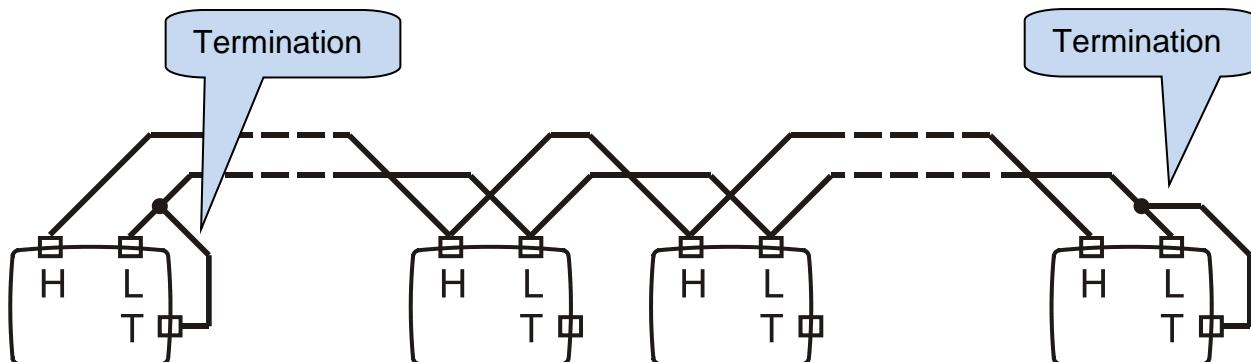


Figure illustrating the Datalink termination from two ends

4.2.4. ANALOG LOAD SHARE SIGNAL

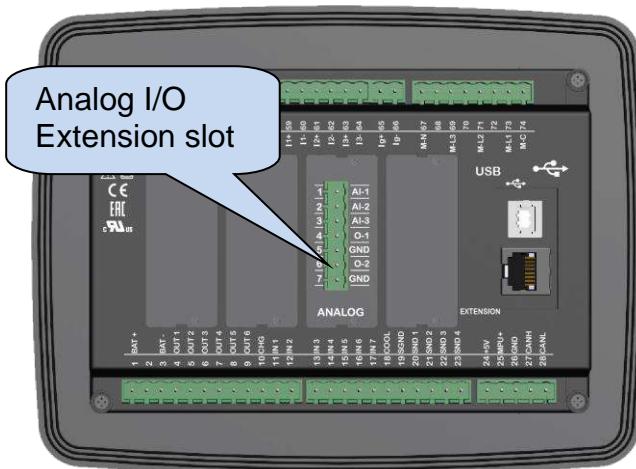
Structure:	Non-isolated analog input & output, 0-10 VDC
Reference:	Battery negative
Output Impedance:	1000 ohms
Precision:	12 bits
Rest point:	Adjustable through program parameter
Sweep Range:	Adjustable through program parameter

4.3. ANALOG PLUG-IN

4.3.1. ANALOG I/O EXTENSION SLOT

Analog I/O extension plug-in module with 3 analog inputs. Each analog input can be switched by DIP switches for:

- Resistive,
- 4 to 20 mA
- 0 to 10 Vdc



4.3.2. 3 X MAINS CT INPUTS SLOT

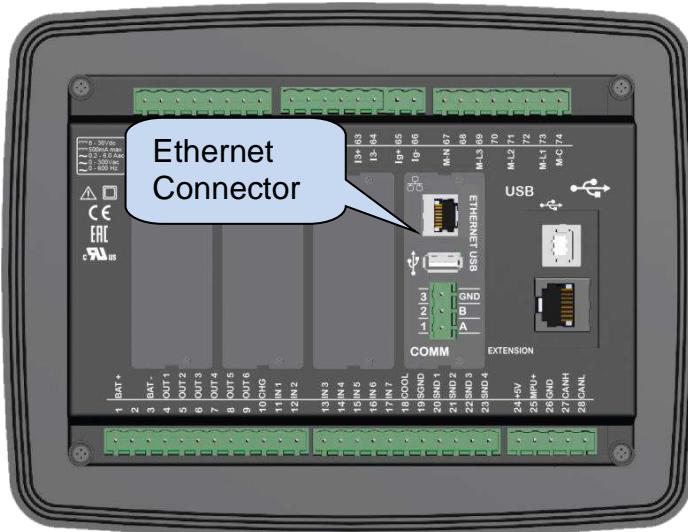


Measurement method:	True RMS
Sampling rate:	8000 Hz
Harmonic analysis:	up to 31th harmonic
Supported topologies:	3 ph 4 wires star, 3 ph 4 wires delta, 3 ph 3 wires delta 3 ph 3 wires delta L1-L2 3 ph 3 wires delta L2-L3 2ph 3 wires L1-L2 2ph 3 wires L1-L3 1 ph 2 wires
CT secondary rating:	5A
Measurement range:	5/5 to 5000/5A minimum
Input impedance:	15 milliohm
Burden:	0.375W
Maximum continuous current:	6A
Measurement range:	0.1 to 7.5A
Common mode offset:	Max 5VAC between BAT- and any CT terminal.
Display resolution:	1A
Accuracy:	0.5% + 1 digit @ 5A ($\pm 4.5A$ @ 5/500A full range)

4.4. COMMUNICATION SLOT

4.4.1. ETHERNET PORT

Description:	IEEE802.3 compliant, 100 Base-TX RJ45 ethernet port with indicating leds
Data rate:	100 Mbits/s, auto detecting
Connector:	RJ45
Cable type:	CAT5 or CAT6
Isolation:	1500 VAC, 1 minute
Max distance:	100m with CAT5 or CAT6 cable
Functionality:	Embedded TCP/IP, Web Server, Web Client, SMTP, e-mail, SNMP, Modbus TCP_IP



STANDARD ETHERNET CABLE

LED FUNCTIONS:

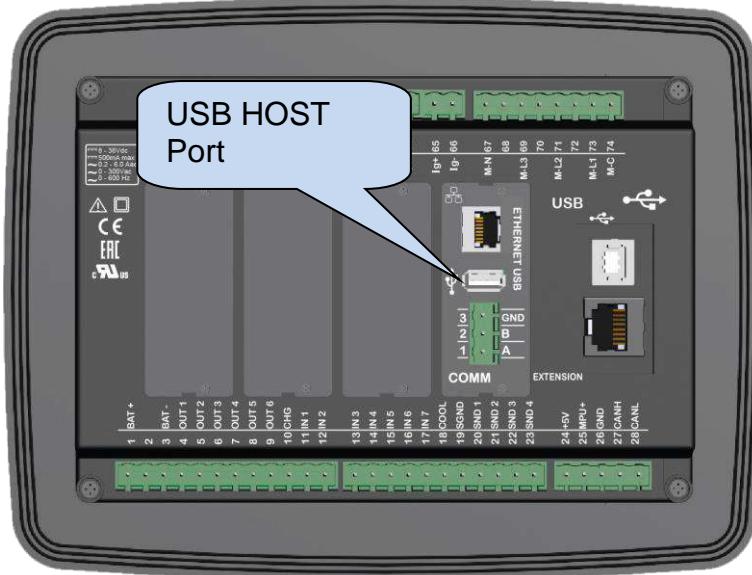
GREEN: This led turns on when the ethernet link is established (connector inserted)

YELLOW: This led blinks when data transfer occurs inwards or outwards. Periodic blinking will witness data flow.

4.4.2. USB HOST PORT



USB FLASH MEMORY



The USB-Host port is available in units with COMM option.

Description:	USB 2.0, not isolated
Power Supply Output:	5V, 300mA max
Data rate:	Full Speed 1.5/12 Mbits/s, auto detecting
Connector:	USB-A (PC type connector)
Cable length:	Max 1.5m
Functionality:	USB memory, FAT32, data recording
Memory capacity:	All USB flash memories.

The USB-Host port is designed for detailed data recording. The period of recording is adjustable through program parameter.

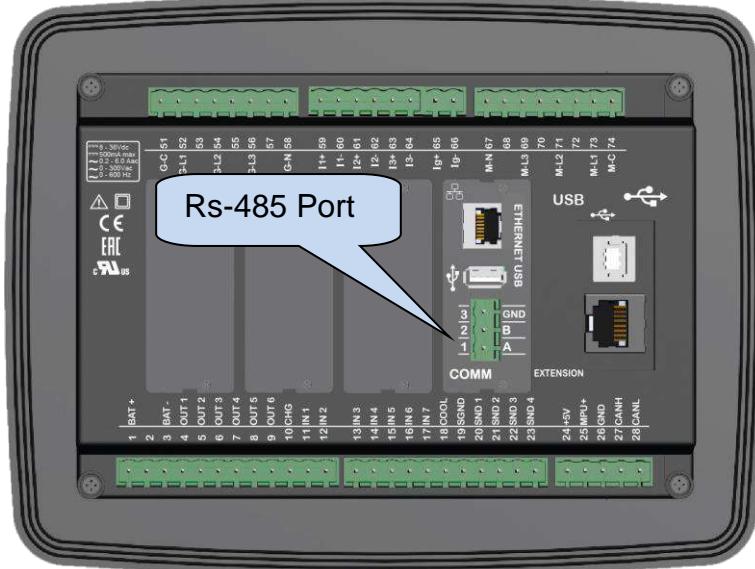
As soon as a USB flash memory is inserted, the unit will start data recording and continue until the memory is removed.

For more details about data recording please review chapter **“Data Recording”**.



If USB-Device is plugged then USB-Host port will not function.

4.4.3. RS-485 PORT



Structure:	RS-485
Connection:	3 wires (A-B-GND). Half duplex.
Baud rate:	2400-115200 bauds, selectable
Data type:	8 bit data, no parity, 1 bit stop
Termination:	External 120 ohms required
Isolation:	250VAC, 1 minute
Common mode voltage:	-0.5 VDC to +7VDC, internally clamped by transient suppressors.
Max distance:	1200m @ 9600 bauds (with 120 ohms balanced cable)

The RS-485 port features MODBUS-RTU protocol. Multiple modules (up to 128) can be paralleled on the same RS-485 bus for data transfer to automation or building management systems.



The Modbus register list is available at Datakom technical support.

The RS-485 port provides also a good solution for distant PC connection where RainbowPlus program will enable programming, control and monitoring.



For more details about programming, control and monitoring through RS-485 port please refer to RainbowPlus user manual.

5. TOPOLOGIES

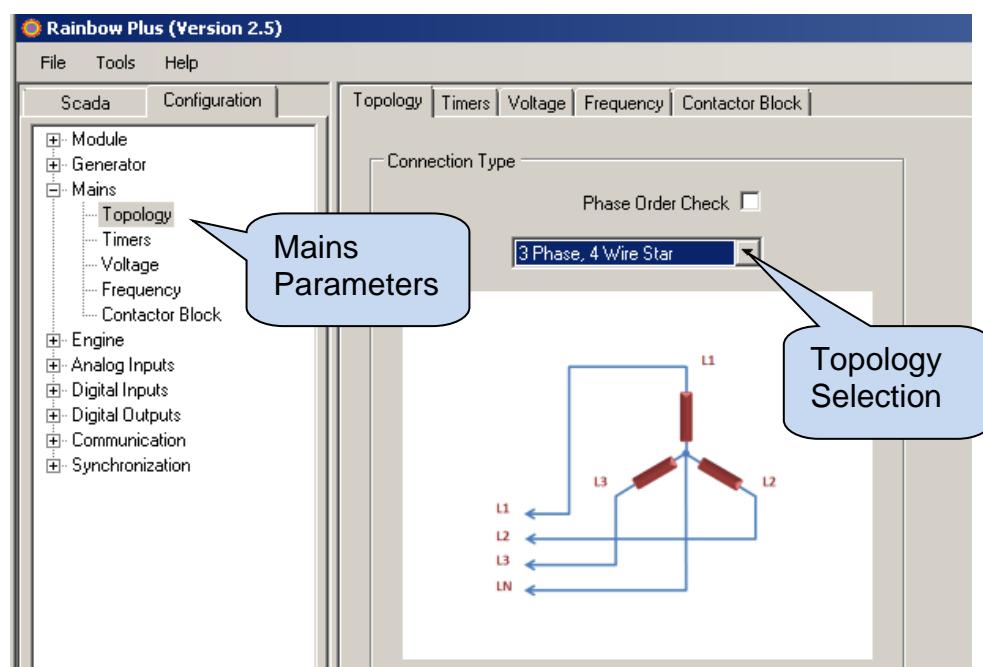
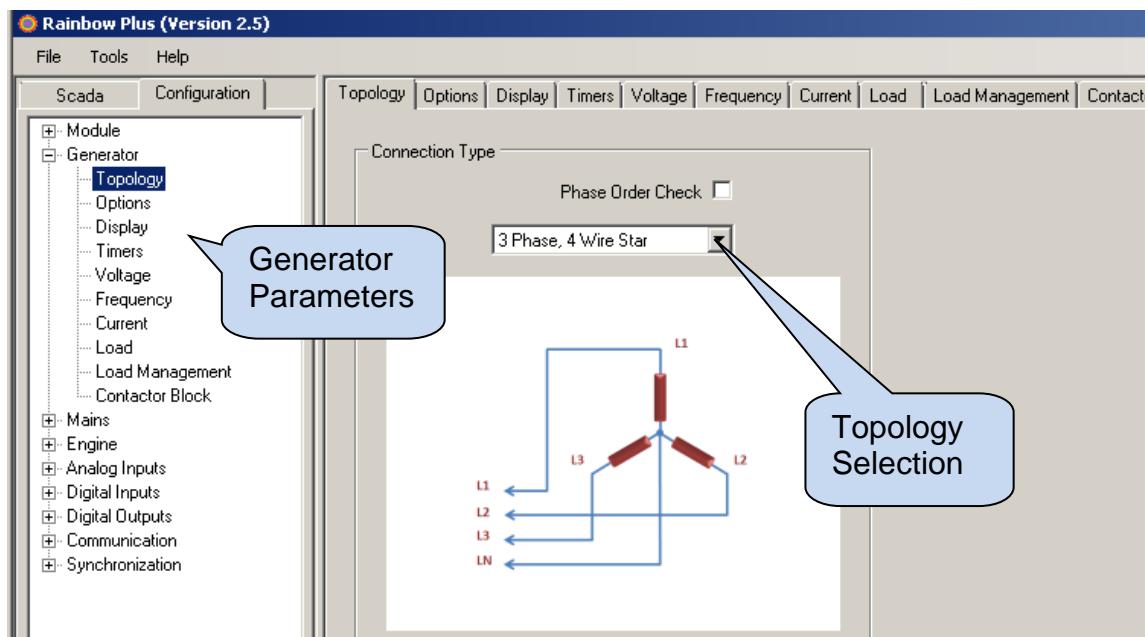
Various topologies are selectable through program parameter.

The topology is independently selectable for both genset and mains sections.

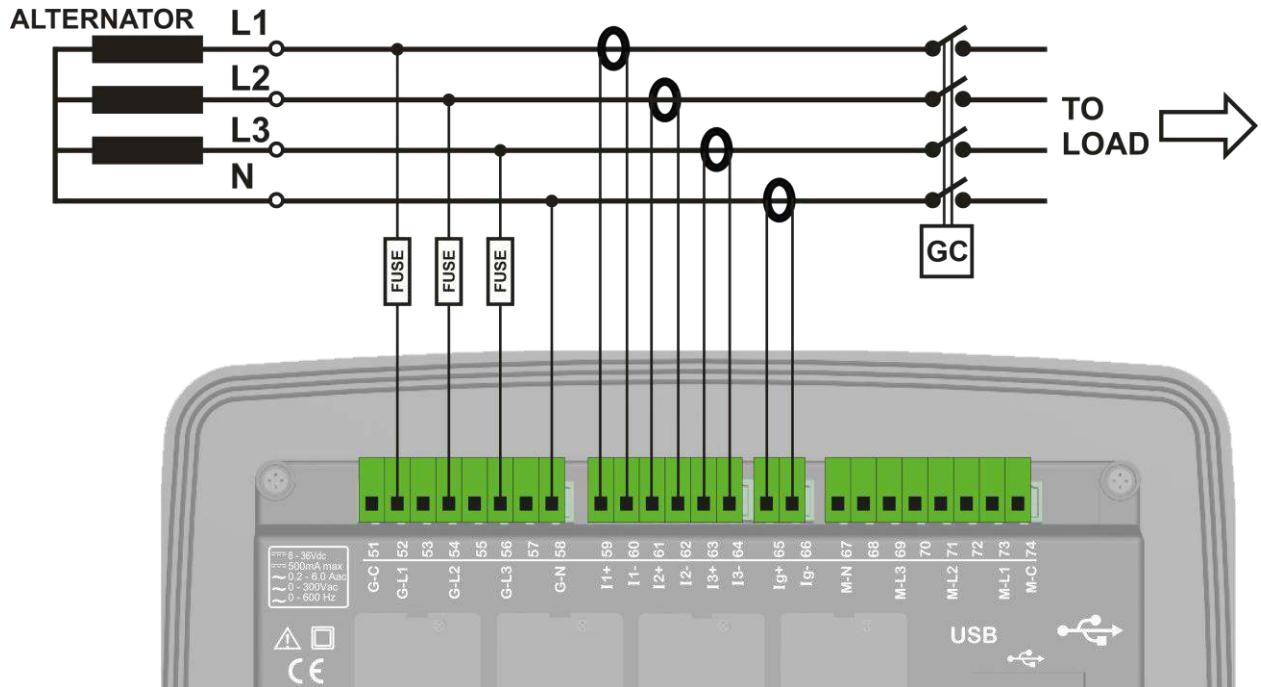
In following drawings, the connections are shown for the alternator. Current transformers are supposed connected to the alternator side.

Similar topologies are available for the mains side as well.

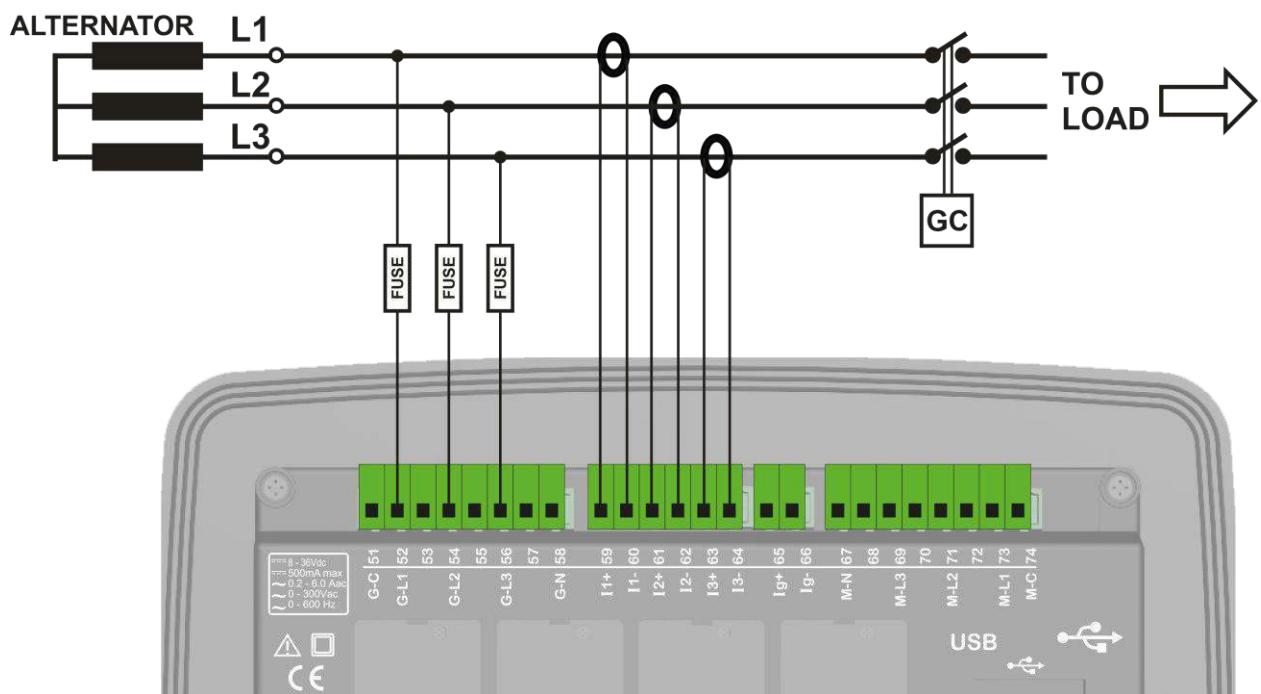
5.1. SELECTING THE TOPOLOGY



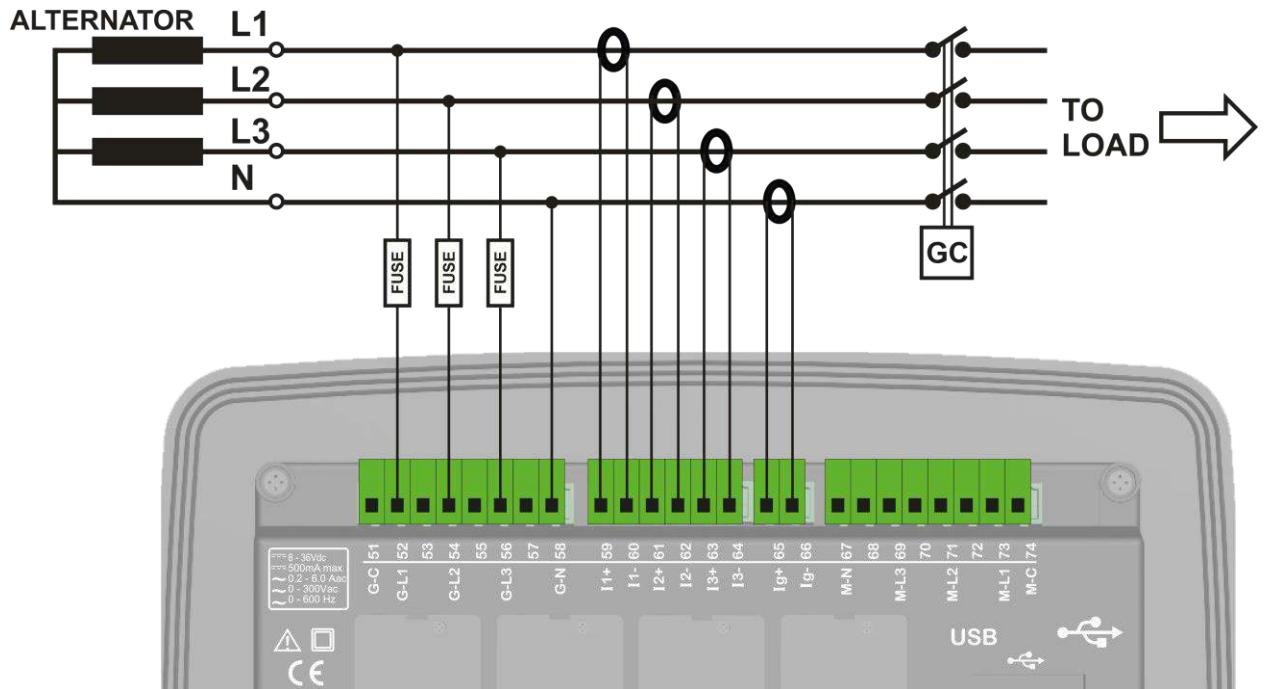
5.2. 3 PHASE, 4 WIRE, STAR



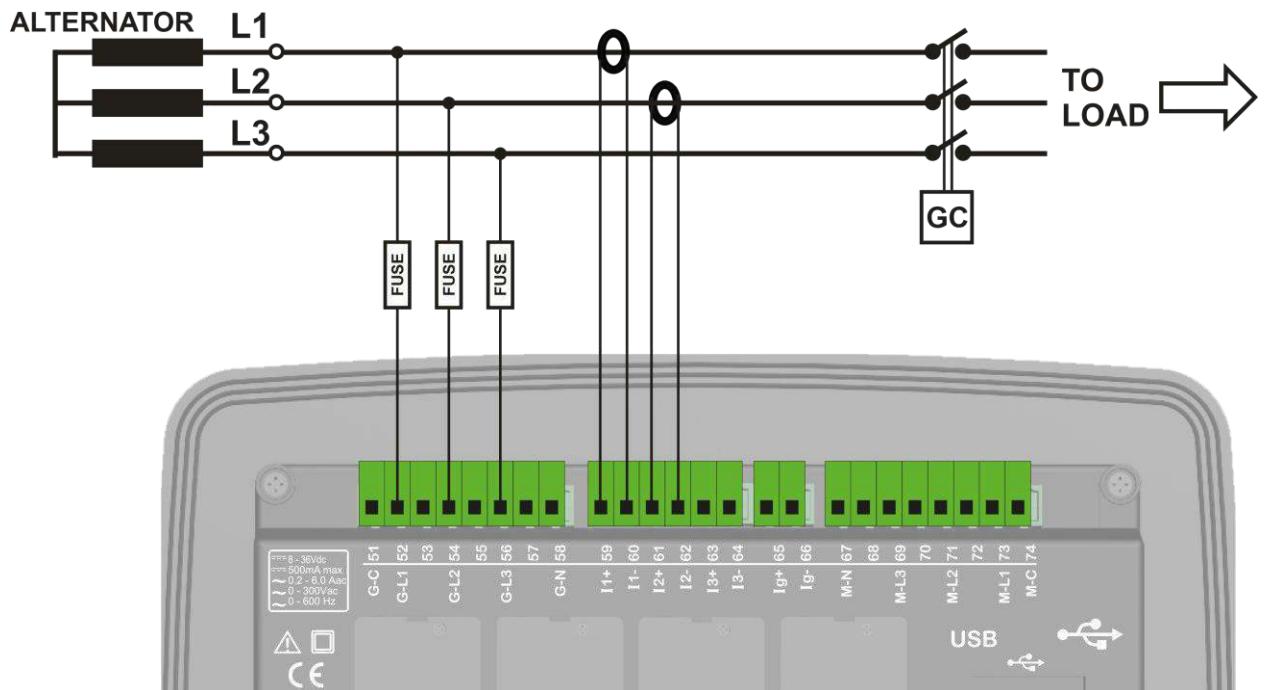
5.3. 3 PHASE, 3 WIRE, DELTA



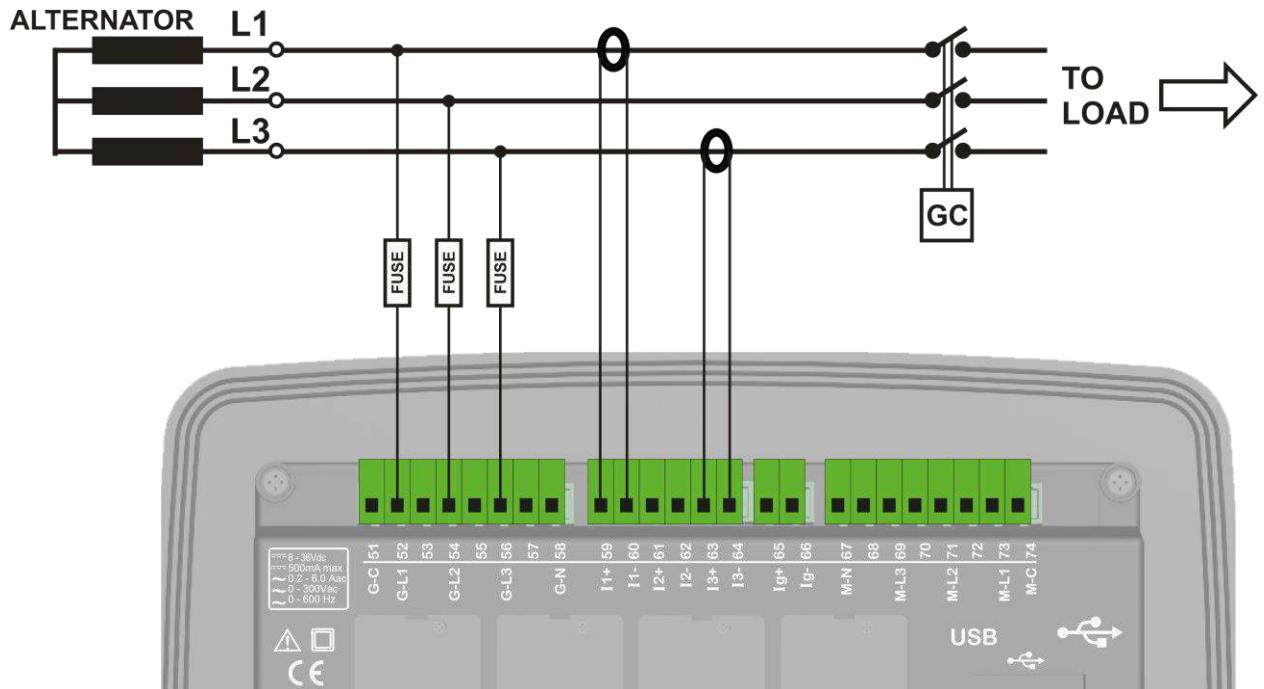
5.4. 3 PHASE, 4 WIRE, DELTA



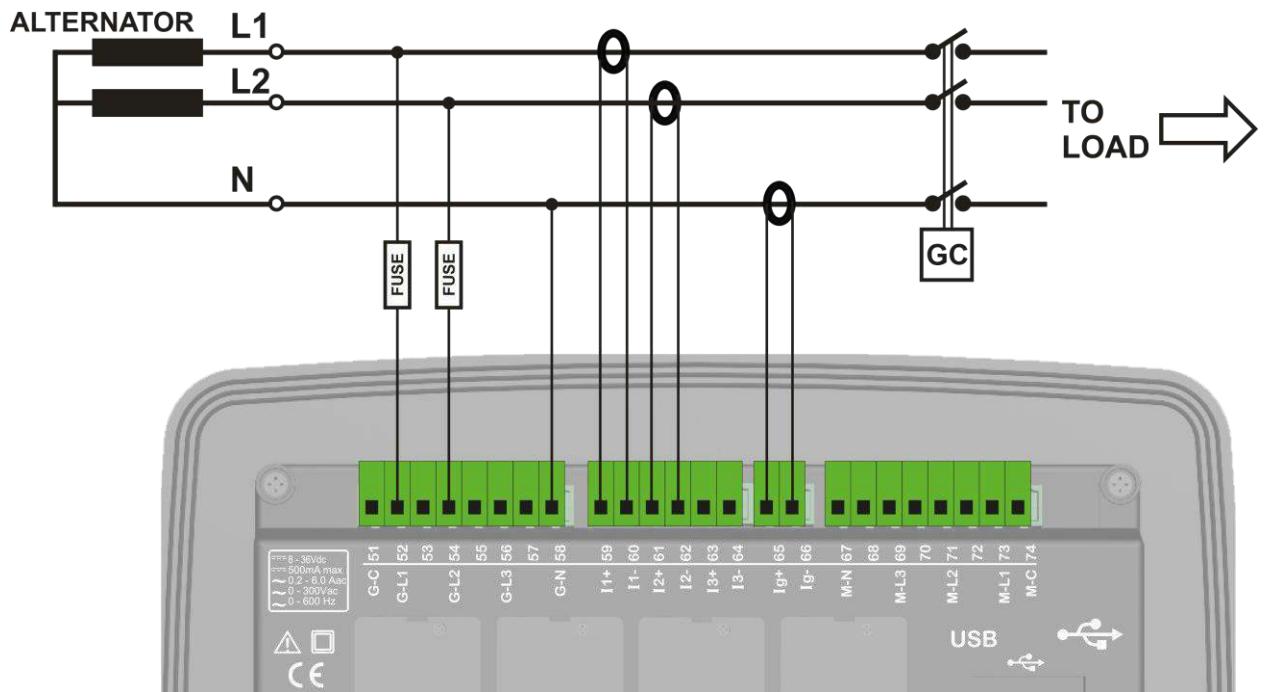
5.5. 3 PHASE, 3 WIRE, DELTA, 2 CT (L1-L2)



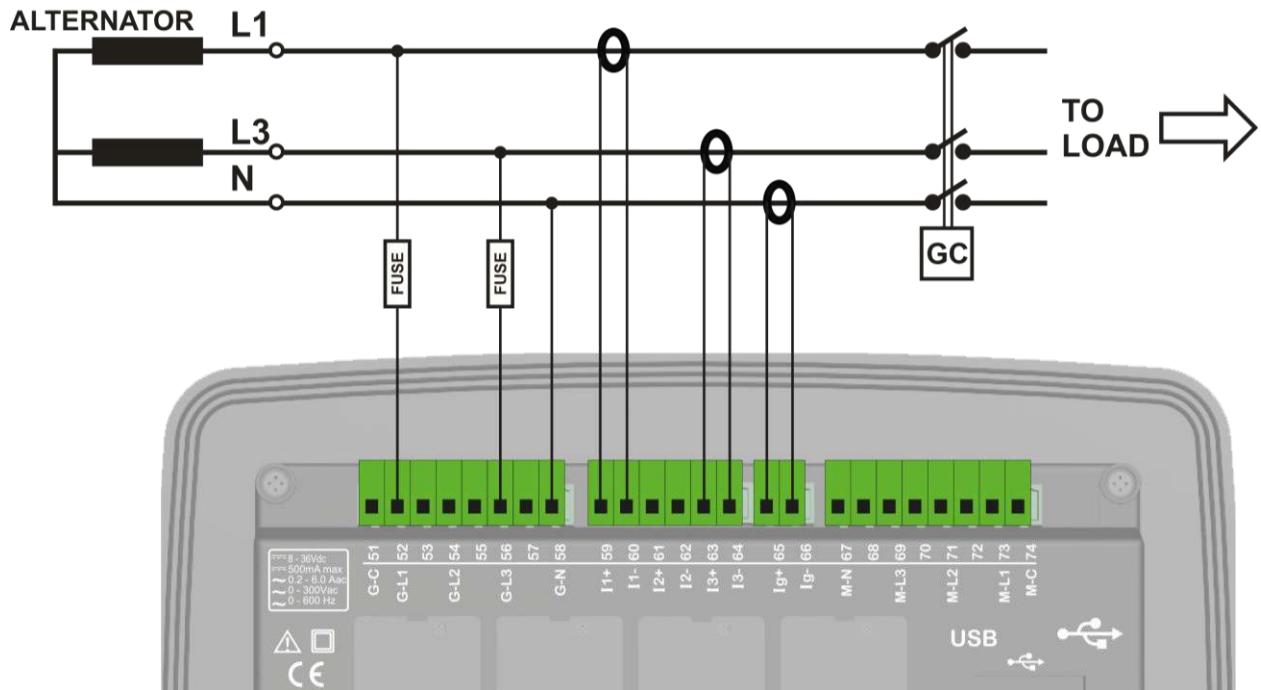
5.6. 3 PHASE, 3 WIRE, DELTA, 2 CT (L1-L3)



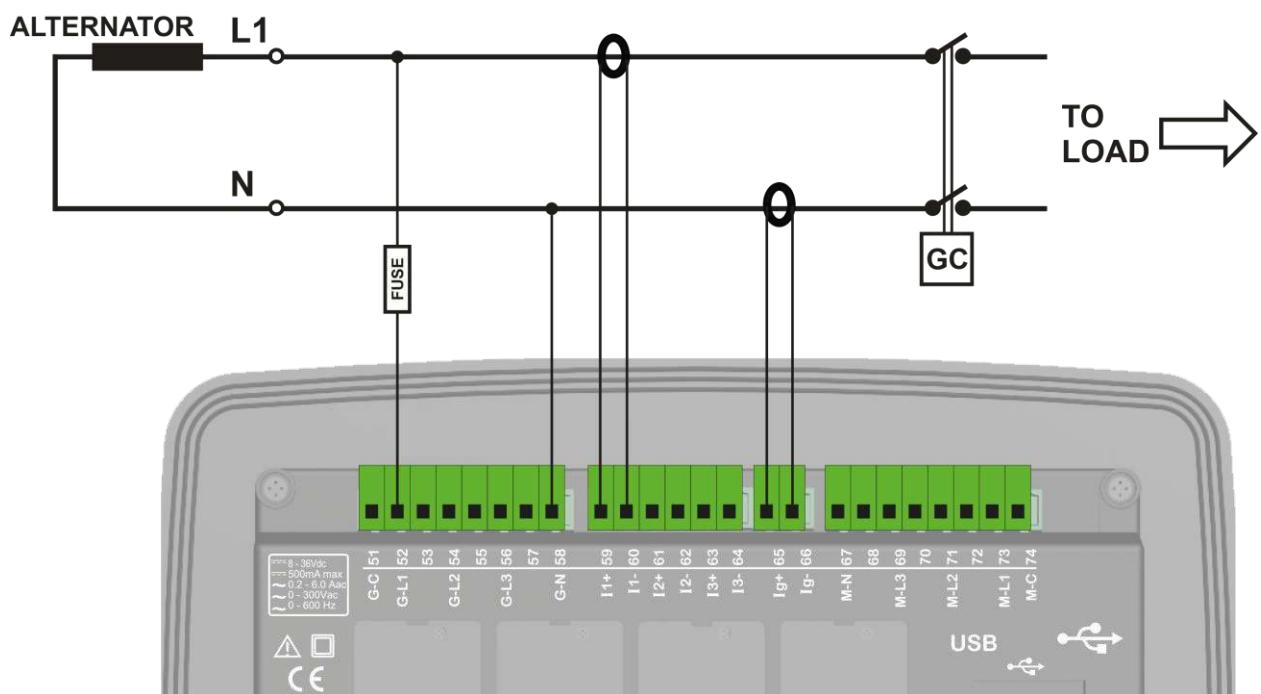
5.7. 2 PHASE, 3 WIRE, DELTA, 2 CTs (L1-L2)



5.8. 2 PHASE, 3 WIRE, DELTA, 2 CTs (L1-L3)



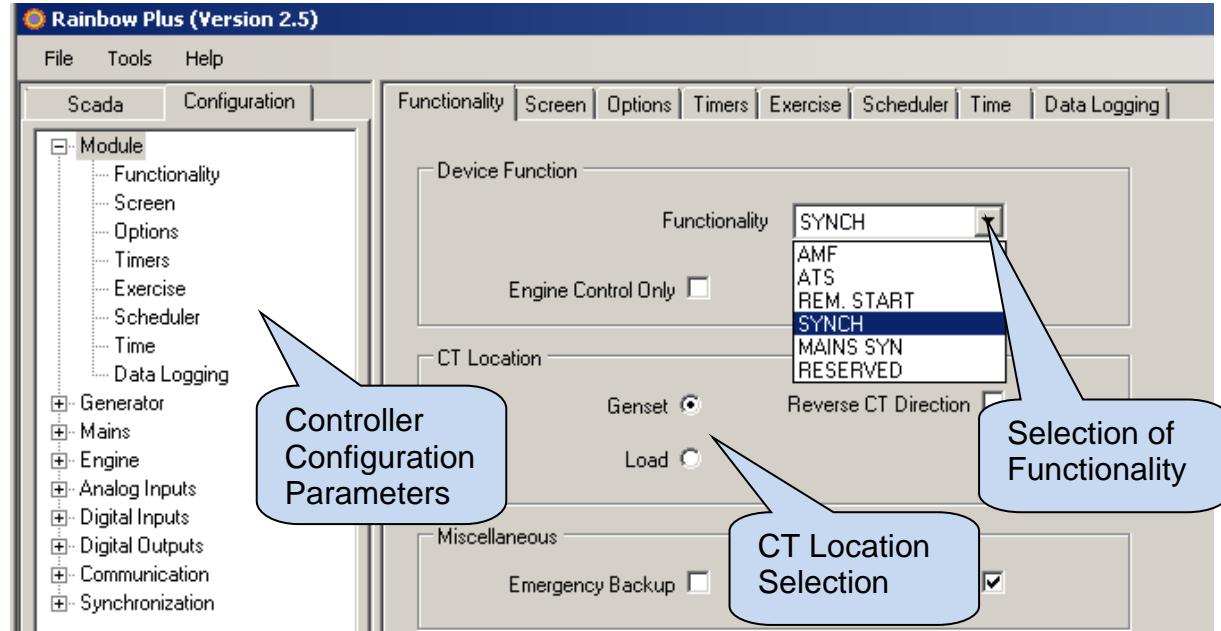
5.9. 1 PHASE, 2 WIRE



6. FUNCTIONALITIES

The same unit provides different functionalities through parameter setting. Thus a single stock item will fulfill various duties, minimizing stock cost.

The selection of the functionality is done through Controller Parameter, as shown in below picture.



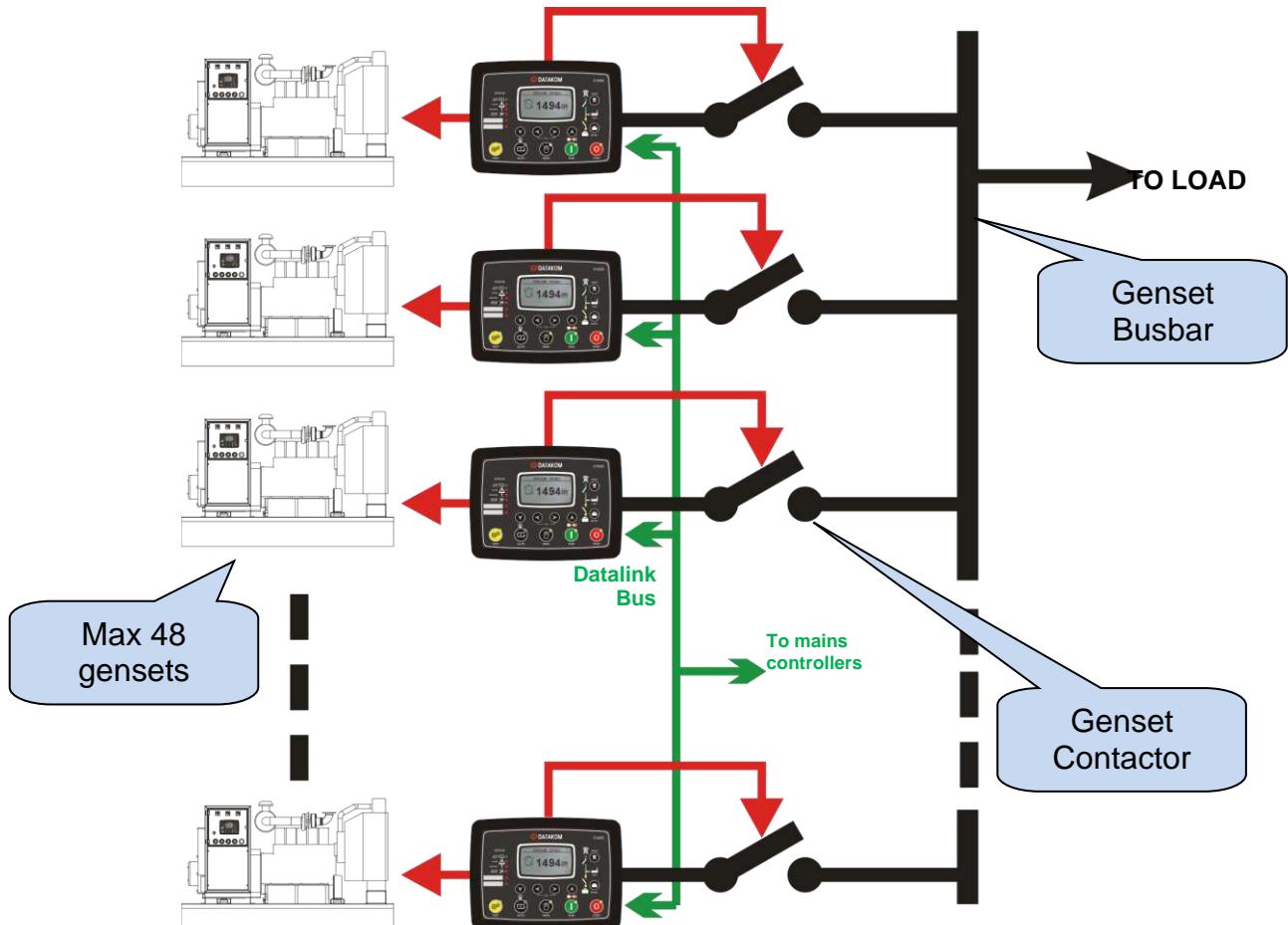
6.1. CT LOCATION SELECTION

CTs may be placed at alternator or load sides. The CT location selection is configured with **Controller Configuration > CT Location** parameter. When CTs are located at the alternator side, then mains current and power parameters will not be displayed. When CTs are located at load side, then both mains and genset currents and power parameters will be displayed, based on contactor positions. Please review AMF functionality connection diagrams for CT connection details.

6.2 SYNCHRONIZATION FUNCTIONALITY

The synchronization functionality is used to parallel 2 or more gensets on the same busbar, in order to increase the total genset power rating or in order to have redundancy/reserve power for a more reliable operation.

A maximum of 48 gensets can be paralleled on the same busbar using D-500 units. Always one of the gensets will become the MASTER one. It will determine the voltage and frequency of the busbar. When more than one genset start together, the master genset will always feed the busbar first. Other gensets will synchronize to the busbar, get in parallel and share the load.



When SYNCH mode is selected, the controller will monitor its REMOTE START input. If the remote start input is active, it will run the genset (depending on settings). The remote start signal is usually provided by a Mains Synchronization unit or an ATS controller. It can be a manually controlled signal as well.

If the Genset busbar is not energized, when the engine runs, the controller will immediately close the genset contactor and feed the busbar. It will also become the MASTER.

If the genset Busbar is already energized, then the controller will synchronize the genset to the Busbar, then close the genset contactor. After this, it will start to share the load.

Ramping for soft loading and unloading is provided as an inherent feature.

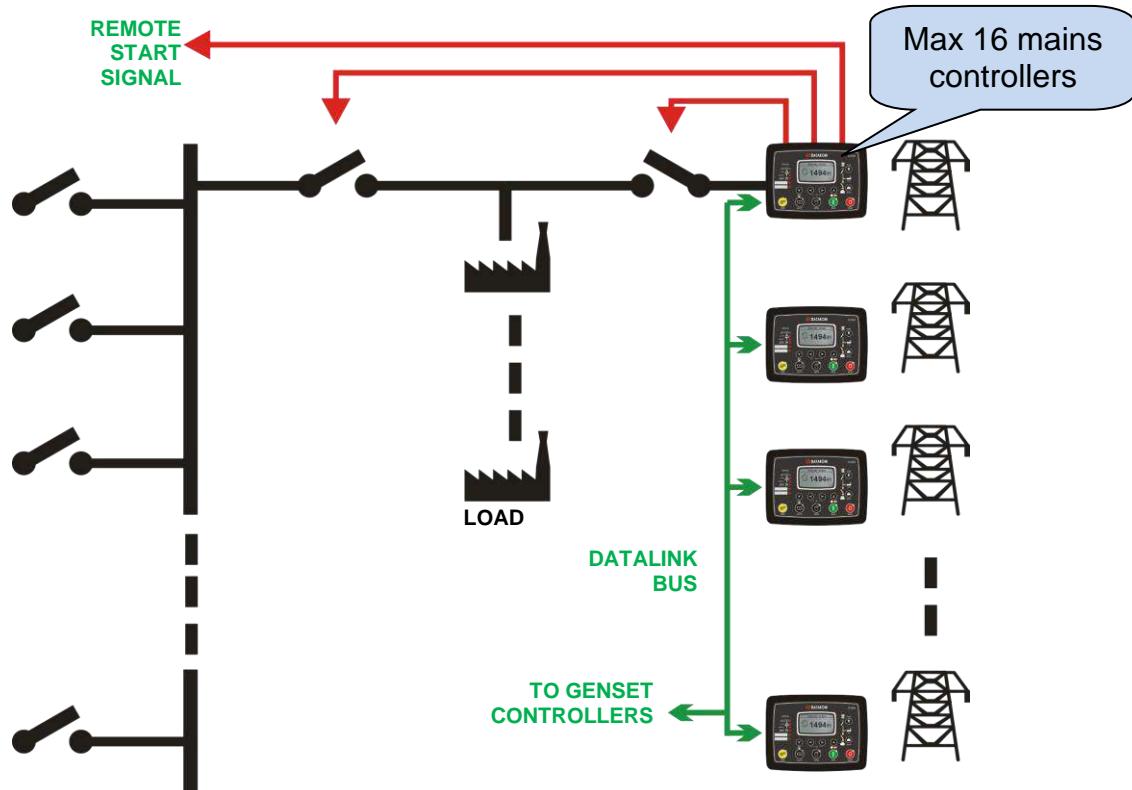
6.3 MAINS SYNCHRONIZATION FUNCTIONALITY

The mains synchronization functionality is used to synchronize a genset group to the power grid. Gensets are put in parallel on the same busbar.

A maximum number of 16 mains synchronizing controllers may coexist on the same Datalink bus.

The mains synchronization may be required for various purposes:

- Soft transfer to/from the grid
- Peak lopping, peak shaving
- Continuous parallel operation with the grid for immediate recovery of power failures
- Power export to the grid



When mains synchronizer functionality is selected, the controller will control the REMOTE START signal for the genset group.

When sufficient number of gensets are available on the busbar, the controller will synchronize the complete busbar to the grid, then put them in parallel.

Different operating modes are available in a grid parallel application. The same controller is able to provide all possible functions.

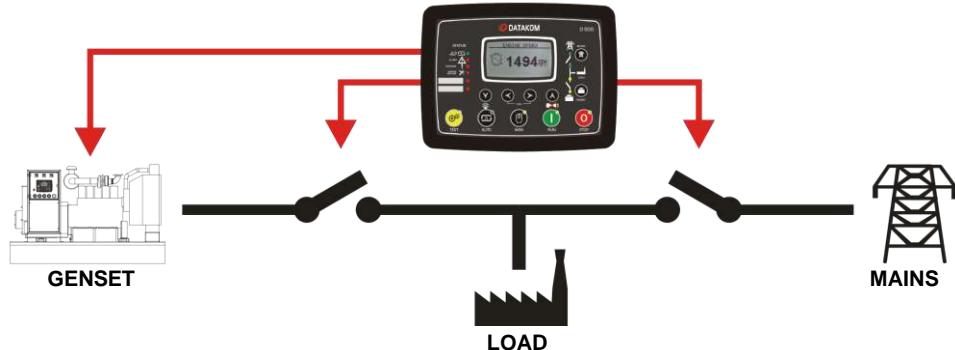
The controller has various built-in "mains failure during parallel" protections. These are necessary to prevent the genset system feeding the grid. Protections are capable of isolating gensets from the grid as fast as 2 to 5 cycles.

6.4 SINGLE GENSET PARALLEL WITH MAINS

A single controller is able to provide all the functionality required in order to control a genset running in parallel with the grid.

Parallel operation with the grid may be required for various purposes:

- Soft transfer to/from the grid
- Peak lopping, peak shaving
- Continuous parallel operation with the grid for immediate recovery of power failures
- Power export to the grid



When AMF functionality is selected, there are a number of adjustable parameters causing parallel operation to the grid:

- Peak lopping enable: the load is supplied by mains and genset at the same time.
- Soft transfer enable: load transfer between mains and genset is performed in parallel mode.
- Power export enable: the genset supplies power to the grid.

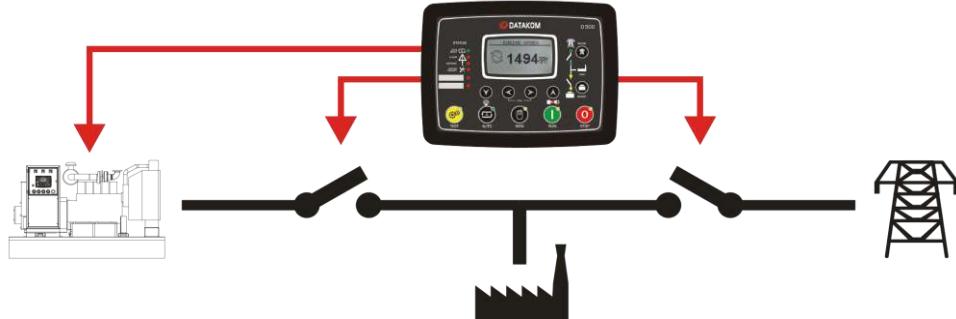
Continuous parallel operation for immediate recovery of mains failures is achieved in peak lopping mode.

Power may be exported to the grid, or load may be shared between grid and genset, or simply soft transfers may be performed. Different operating modes are available in a grid parallel application. The same controller is able to provide all possible functions.

The controller has various built-in protections for "mains failure during parallel operation". These are necessary to prevent the genset system from feeding the grid. Protections are capable of isolating the genset from the grid as fast as 2 to 5 cycles.

6.5. AMF FUNCTIONALITY

When AMF functionality is selected, the unit will monitor mains voltages, provide mains and genset contactor control, run the engine and provide engine and alternator instrumentation and fault monitoring.

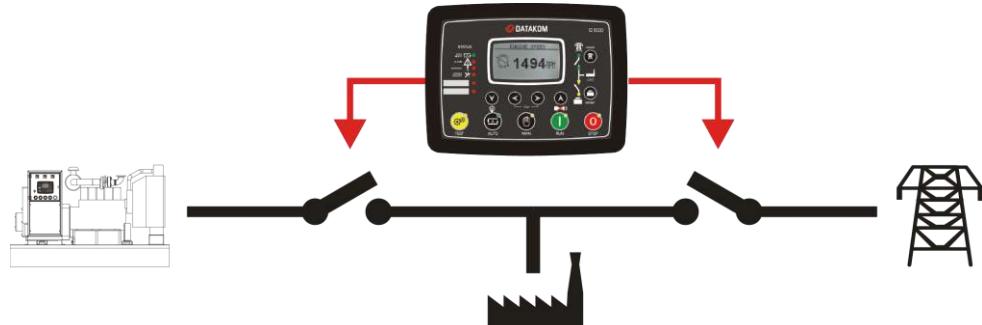


The unit features both MPU and J1939 CANBUS inputs. Thus both mechanical and electronic engines are supported.

The unit provides control outputs for both contactors and motorized circuit breakers.

6.6. ATS FUNCTIONALITY

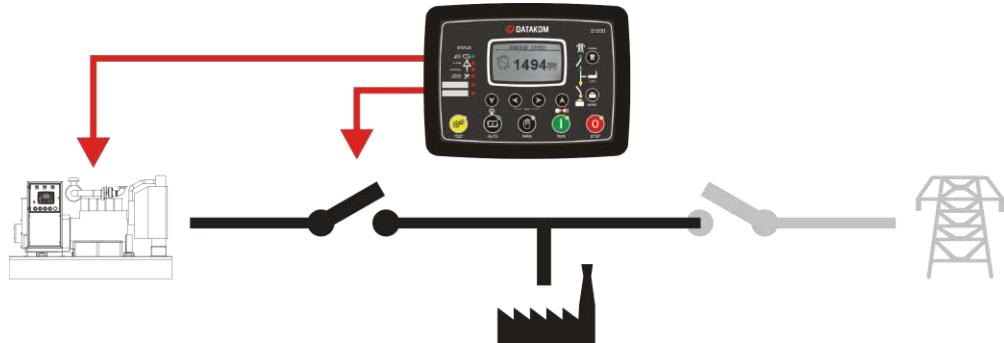
When ATS functionality is selected, the unit will monitor mains voltages, provide mains and genset contactor control and issue a Remote Start signal to the engine controller. It will provide alternator instrumentation and fault monitoring.



Engine instrumentation and protection will be insured by the engine controller.

6.7. REMOTE START FUNCTIONALITY

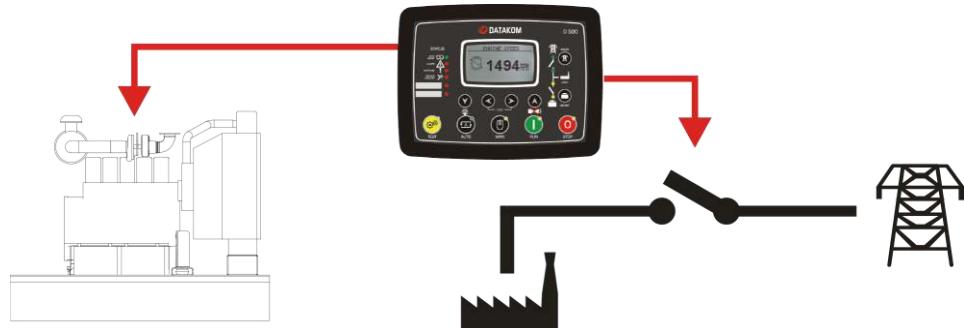
When the Remote Start functionality is selected, the unit will wait for a Remote Start signal from external controller. Upon reception of this signal, it will run the engine, and provide engine and alternator instrumentation and fault monitoring. The genset contactor/MCB control functionality will be available.



The unit features both MPU and J1939 CANBUS inputs. Thus both mechanical and electronic engines are supported.

6.8. ENGINE CONTROLLER FUNCTIONALITY

When the Engine Controller functionality is selected, genset electrical measurements and protections will be disabled. The unit is supposed to control an engine without alternator.



When the **Engine Control Mode** is activated:

- the unit will not display genset AC parameters (volts, amps, kW and pf).
- genset voltage and frequency protections are disabled. However engine rpm protections will be active.

Note that the engine controller functionality is compatible with both AMF and Remote Start modes.

When AMF and Engine controller modes are selected, the unit will monitor the mains and will run the engine upon mains failure. This functionality is useful for the backup electric motor driven systems during mains failures, like fire pump or irrigation systems.

When Remote Start and Engine controller modes are selected, the unit will start and stop the engine with external signal only.

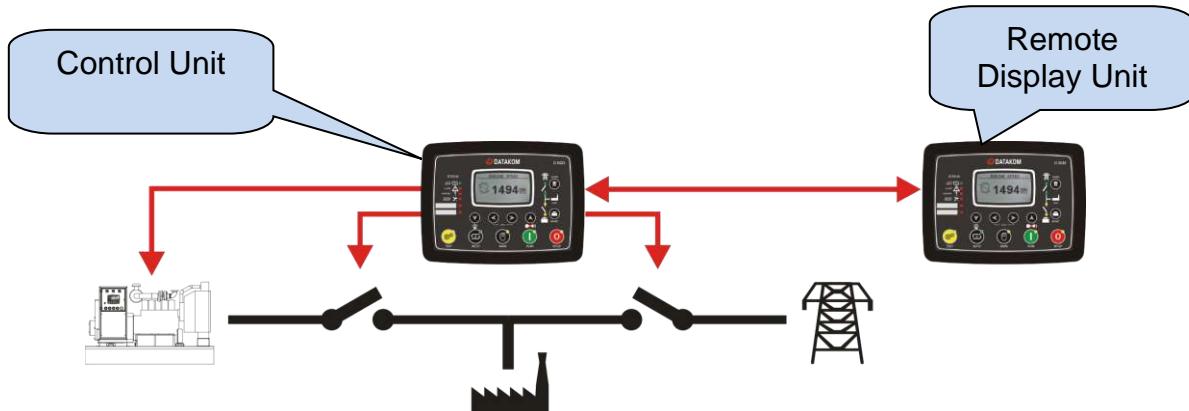
The unit features both MPU and J1939 CANBUS inputs. Thus both mechanical and electronic engines are supported.



It is strongly recommended to wire speed detection through MPU or J1939-CANBUS and enter correct low and high rpm limit values in order to preserve engine speed protection.

6.9. REMOTE DISPLAY UNIT FUNCTIONALITY

The unit is able to become the remote display and control panel of another identical module.



The connection between two modules is done through RS-485 ports. For the best results, a 120 ohms balanced, low capacitance cable should be used.

The data rate between modules is selectable between 2400 and 115200 bauds.

A high data rate offers better synchronization between modules, but the distance will be limited.

Typically at 115200 bauds and with adequate cable, the distance will be 200m maximum.

At 9600 bauds and adequate cable the distance can go up to 1200m.

Below settings are necessary:

PARAMETER	MAIN UNIT	REMOTE DISPLAY UNIT
Annunciator Mode	0	1
RS-485 Enable	1	1
RS-485 Baud Rate	any	same as main unit
Modbus Slave Address	any	same as main unit



The remote display panel should be powered up with an isolated voltage source, like a wall adapter. Otherwise damages due to ground potential differences may occur.

6.10. 400HZ OPERATION

The standard unit is also 400Hz enabled. The nominal frequency setting accepts up to 500Hz. Usual low and high limits will apply without any special setting.

The measurement system of the unit allows frequencies up to 1000Hz to be measured precisely. However the display is limited to 650Hz. Frequencies over 650Hz will be displayed as 650Hz.

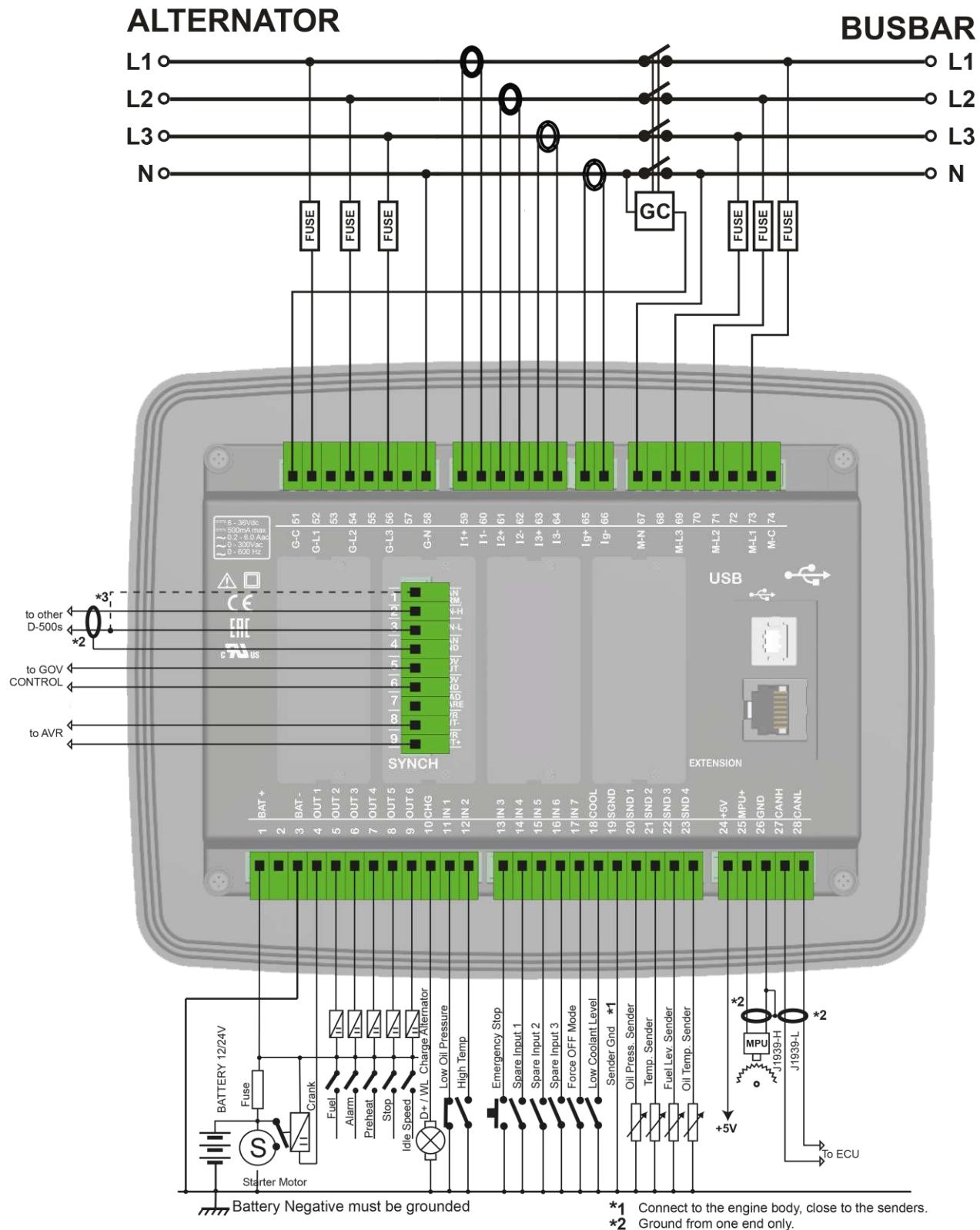
The bandwidth of the harmonic analyzer is limited to 1800Hz. Thus in case of a 400Hz system, only the 3rd harmonic will be displayed.

The waveform display of a 400Hz signal will be represented with 10 points. It will not be as accurate as 50/60Hz signals.

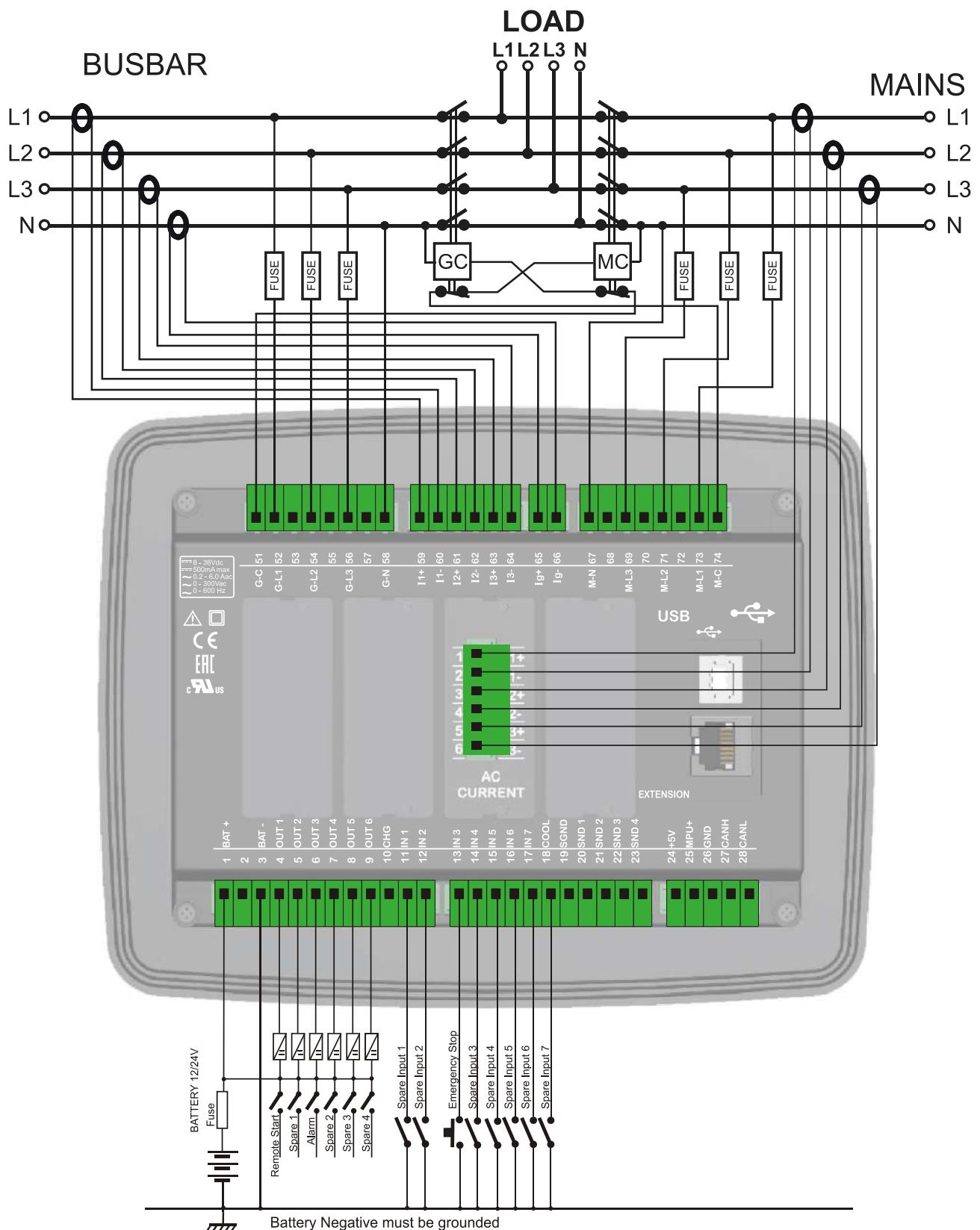
For more details please read chapter: "Waveform Display & Harmonic Analysis".

7. CONNECTION DIAGRAMS

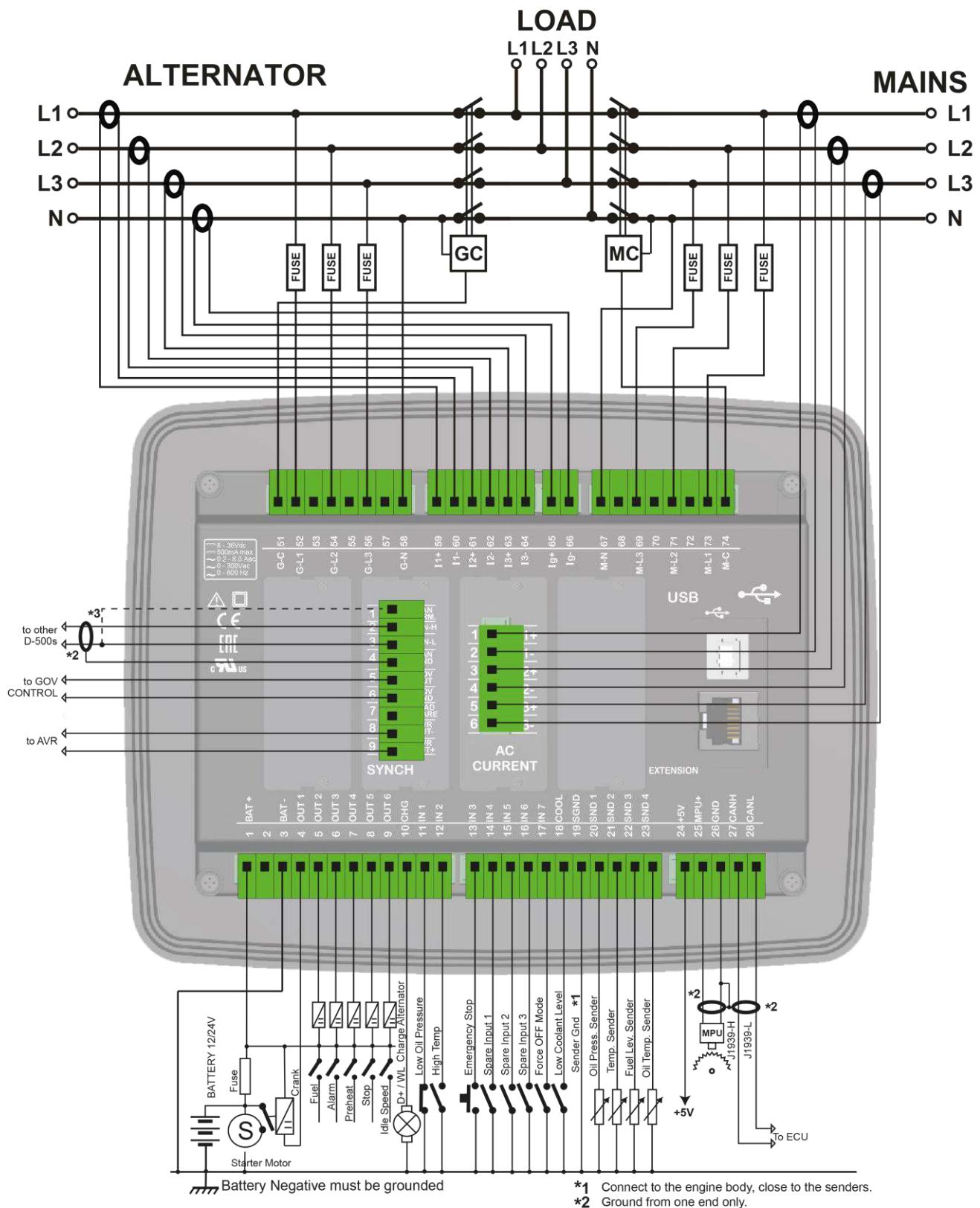
7.1. GENSET SYNCHRONIZATION FUNCTIONALITY



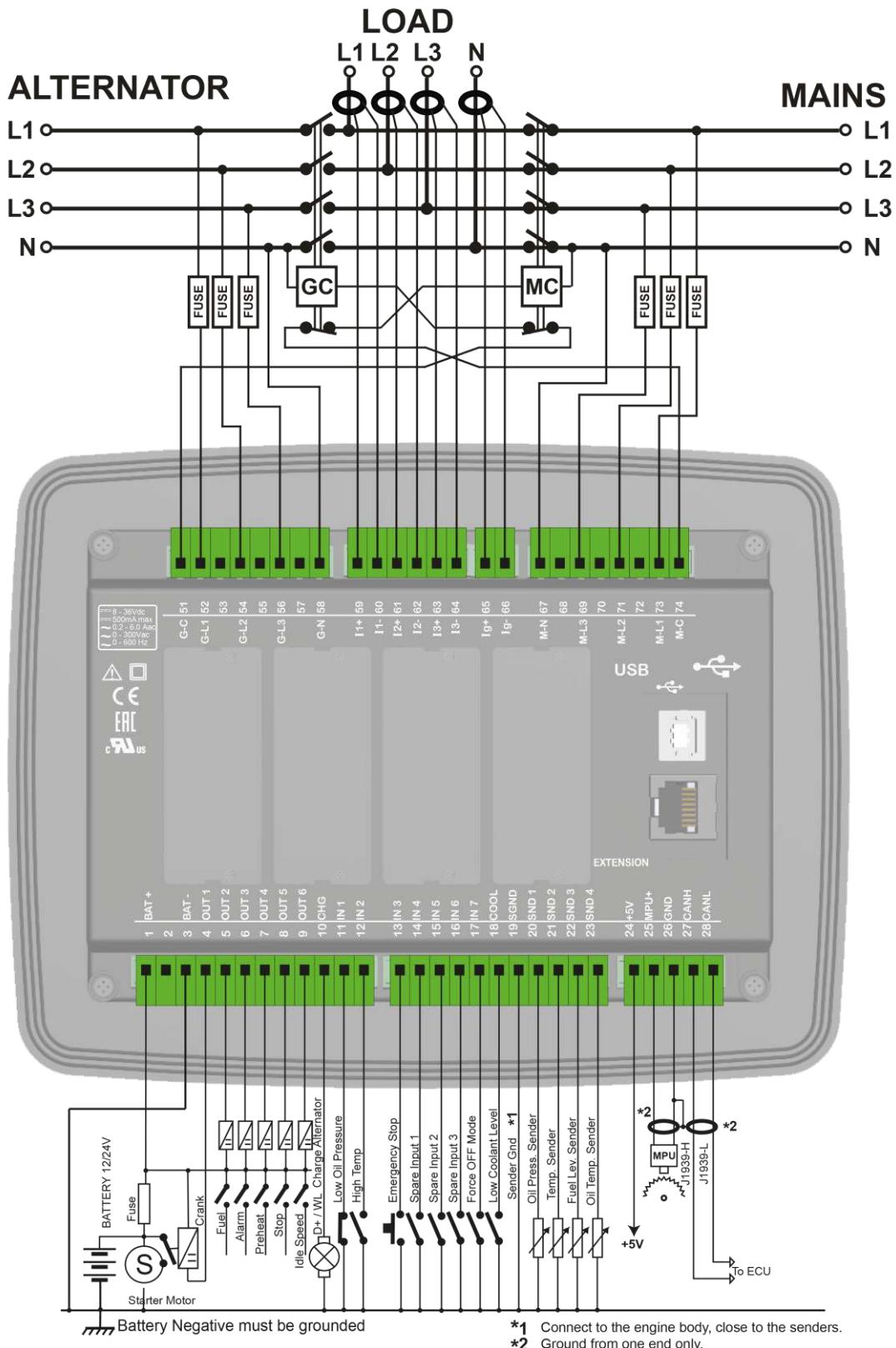
7.2. MAINS SYNCHRONIZATION FUNCTIONALITY



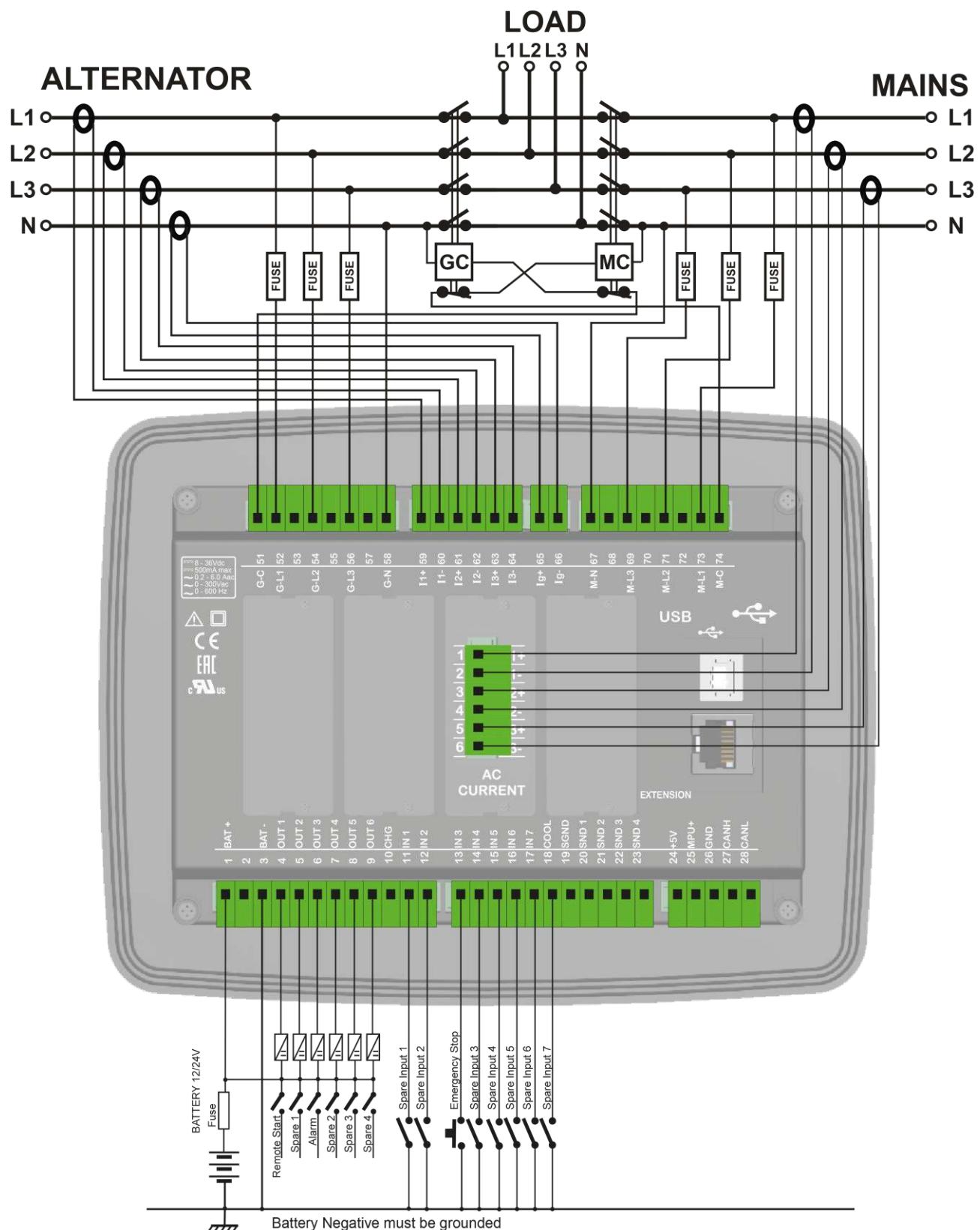
7.3. SINGLE GENSET PARALLEL WITH MAINS FUNCT.



7.4. AMF FUNCTIONALITY

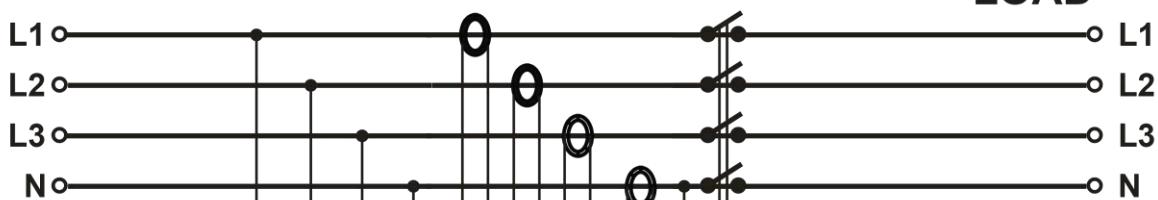


7.5. ATS FUNCTIONALITY

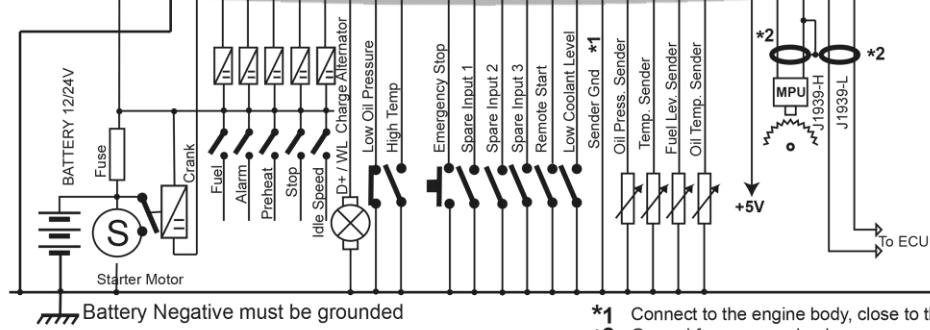
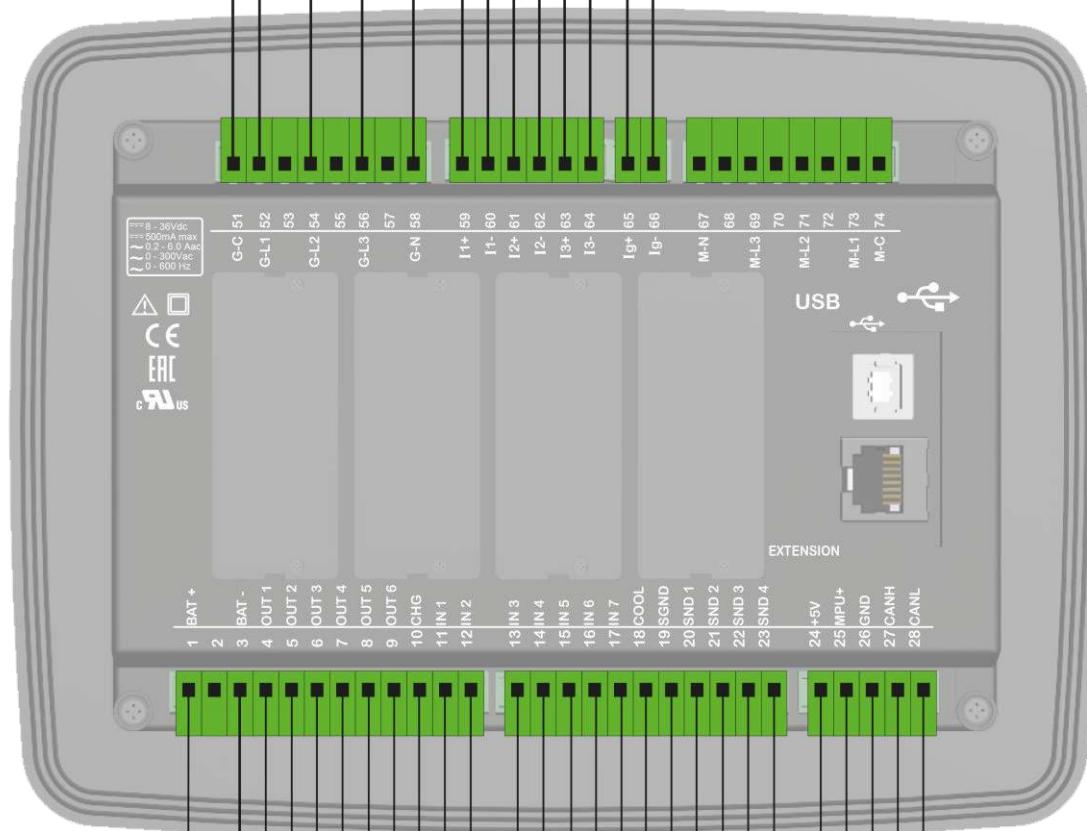


7.6. REMOTE START FUNCTIONALITY

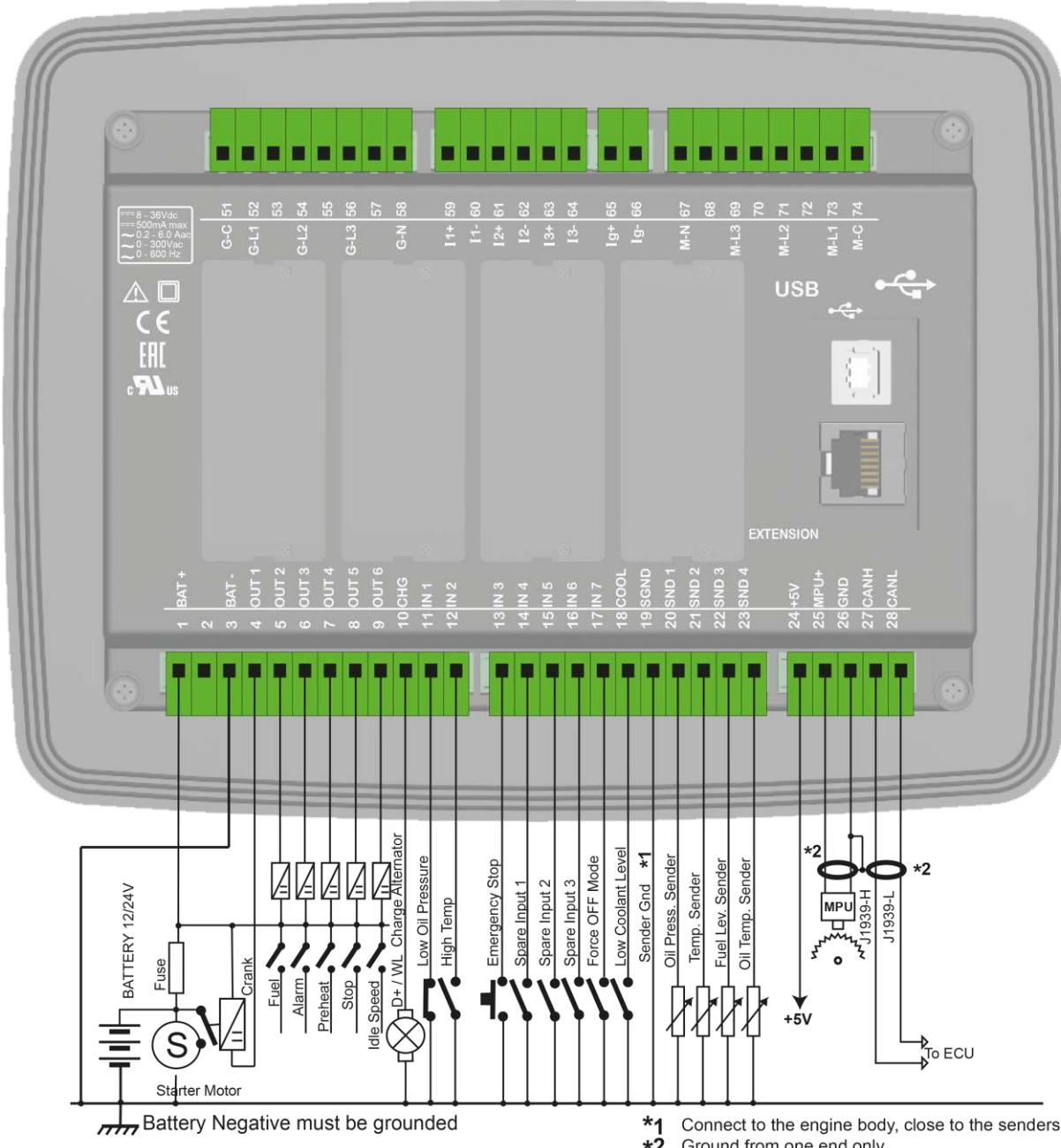
ALTERNATOR



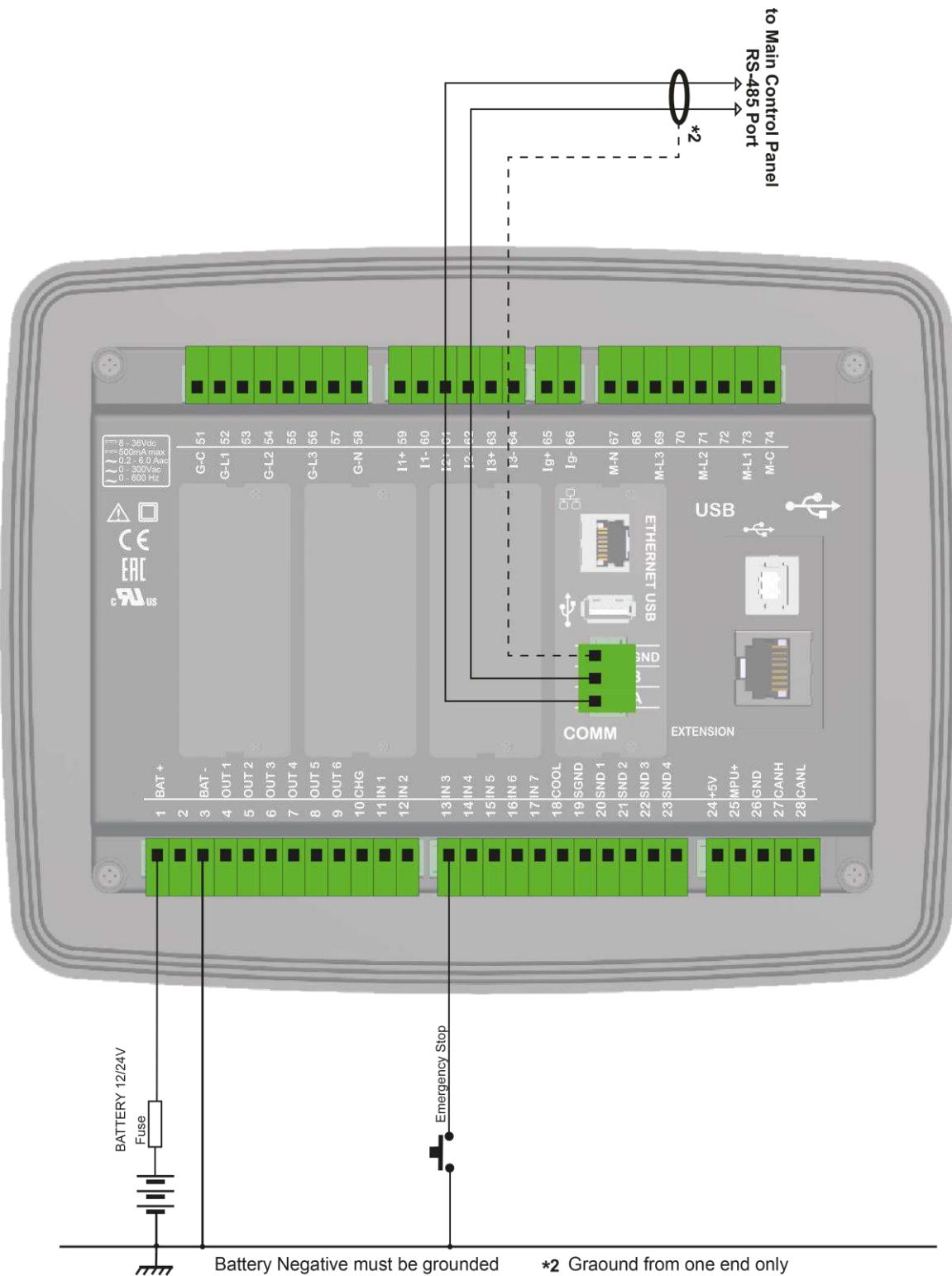
LOAD



7.7. ENGINE CONTROL FUNCTIONALITY



7.8. REMOTE DISPLAY PANEL FUNCTIONALITY



8. TERMINAL DESCRIPTION

Term	Function	Technical data	Description
01	BATTERY POSITIVE	+12 or 24VDC	The positive terminal of the DC Supply.
03	BATTERY NEGATIVE	0 VDC	Power supply negative connection.
04	DIGITAL OUTPUT 1	Protected Semiconductor Outputs, 1A/28VDC	This relay has programmable function, selectable from a list. Factory set as CRANK output.
05	DIGITAL OUTPUT 2		This relay has programmable function, selectable from a list. Factory set as FUEL output.
06	DIGITAL OUTPUT 3		This relay has programmable function, selectable from a list. Factory set as ALARM output.
07	DIGITAL OUTPUT 4		This relay has programmable function, selectable from a list. Factory set as PREHEAT output.
08	DIGITAL OUTPUT 5		This relay has programmable function, selectable from a list. Factory set as STOP output.
09	DIGITAL OUTPUT 6		This relay has programmable function, selectable from a list. Factory set as IDLE SPEED output.
10	CHARGE		Connect the charge alternator's D+/WL terminal to this terminal. This terminal will supply the excitation current and measure the voltage of the charge alternator.

Term	Function	Technical data	Description
11	DIGITAL INPUT 1	Digital Inputs, 0-30Vdc	The input has programmable function. Factory set as LOW OIL PRESSURE SWITCH .
12	DIGITAL INPUT 2		The input has programmable function. Factory set as HIGH TEMP SWITCH .
13	DIGITAL INPUT 3		The input has programmable function. Factory set as EMERGENCY STOP .
14	DIGITAL INPUT 4		The input has programmable function. Factory set as SPARE INPUT-1 .
15	DIGITAL INPUT 5		The input has programmable function. Factory set as SPARE INPUT-2 .
16	DIGITAL INPUT 6		The input has programmable function. Factory set as SPARE INPUT-3 .
17	DIGITAL INPUT 7		The input has programmable function. Factory set as SPARE INPUT-4 .
18	DIGITAL INPUT 8	AC signal driving output and detector input	This input is specially designed for LOW COOLANT LEVEL detection. The terminal is driven with a low amplitude pure sinus waveform. It does not cause wear of the detector electrode.

Term	Function	Technical data	Description
19	SENDER GROUND	Input	Ground potential for analog senders. Connect to the engine body, close to senders. Connect to the oil pressure sender. Do not connect the sender to other devices.
20	ANALOG SENDER 1 (OIL PRESSURE SENDER)	Resistor measuring input, 0-5000 ohms	Connect to the oil pressure sender. Do not connect the sender to other devices.
21	ANALOG SENDER 2 (COOLANT TEMP. SENDER)		Connect to the coolant temperature sender. Do not connect the sender to other devices.
22	ANALOG SENDER 3 (FUEL LEVEL SENDER)		Connect to the fuel level sender. Do not connect the sender to other devices.
23	ANALOG SENDER 4 (OIL TEMP SENDER)		Connect to the oil temperature sender. Do not connect the sender to other devices.
24	SENDER SUPPLY +5V	Output	This terminal provides +5V supply for active type senders. The maximum output current is 50mA. An internal electronic fuse protects the supply against overloads or short circuits.
25	MPU +	Analog input, 0.5 to 30V-AC	Connect the MPU unit to these inputs Use a twisted cable pair or coaxial cable for best results.
26	GND		
27	CANBUS-H	Digital communication port	Connect the J1939 port of an electronic engine to these terminals.
28	CANBUS-L		The 120 ohm terminating resistors are inside the unit. Please do not connect external resistors. Use a twisted cable pair or coaxial cable for best results.

Term	Function	Technical data	Description
51	GENERATOR CONTACTOR	Relay output, 16A-AC	This output provides energy to the generator contactor. If the generator phases do not have acceptable voltage or frequency values, the generator contactor will be de-energized. In order to provide extra security, the normally closed contact of the mains contactor should be serially connected to this output.
52	GEN-L1	Generator phase inputs, 0-300V-AC	Connect the generator phases to these inputs. The generator phase voltages upper and lower limits are programmable.
54	GEN-L2		
56	GEN-L3		
58	GENERATOR NEUTRAL	Input, 0-300V-AC	Neutral terminal for the generator phases.

Term	Function	Technical data	Description
59	GEN I1+	Generator current transformer inputs, 5A-AC	Connect the generator current transformer terminals to these inputs.
60	GEN I1-		Do not connect the same current transformer to other instruments otherwise this may damage the unit.
61	GEN I2+		Connect each terminal of the transformer to the unit's related terminal.
62	GEN I2-		Do not use common terminals. Do not use grounding.
63	GEN I3+		Correct polarity of connection is vital. The rating of the transformers should be identical for each of the 3 phases.
64	GEN I3-		The secondary winding rating shall be 5 Amperes. (ex: 200/5 Amps).
65	GEN I-GND +	Current transformer inputs, 5A-AC	Connect the earth current transformer terminals to these inputs.
66	GEN I-GND-		

Term	Function	Technical data	Description
67	MAINS NEUTRAL	Input, 0-300V-AC	Neutral terminal for the mains phases.
69	MAINS-L3	Mains phase inputs, 0-300V-AC	Connect the mains phases to these inputs.
71	MAINS-L2		The mains voltages upper and lower limits are programmable.
73	MAINS-L1		
74	MAINS CONTACTOR	Relay output, 16A-AC	This output provides energy to the mains contactor. If the mains phases do not have acceptable voltages, the mains contactor will be de-energized. In order to provide extra security, the normally closed contact of the generator contactor should be serially connected to this output.

SYNCH PLUG-IN MODULE:

Term	Function	Technical data	Description
01	DATA LINK TERMINATION RESISTOR	120 ohm resistor	This terminal is used to enable the 120 ohms termination resistor of the Data Link. The Data Link bus should be terminated at 2 ends only. Thus the termination resistor will be enabled in only 2 units. In order to enable the termination resistor, this terminal should be connected to the DATA LINK_L (terminal 03) .
02	DATA LINK-H	Digital communication port, CANBUS, 250kbps	Connect these terminals to the same Data Link terminals of the next unit. All units are connected in parallel on the same Datalink bus.
03	DATA LINK_L		The bus should be terminated at two ends only. Termination resistors are provided inside the unit. Use a balanced 120 ohms low capacitance shielded data cable for the best result.
04	DATA LINK_GROUND	0 VDC	Connect this terminal to the shield of the Datalink from one end only.
05	AVR -	Isolated Output, ± 3 VDC	AVR voltage control outputs. The output has adjustable polarity, restpoint and gain through parameter setting. The isolation is 1000 VAC for 1 minute..
06	AVR +		
07	GOV OUT	Isolated Output, 0 to 10 VDC	Governor control outputs. The output has adjustable polarity, restpoint and gain through parameter setting.
08	GOV GND		
09	LOAD SHARE	Output 0 to 10 VDC	When ANALOG LOAD SHARE terminals of all synchronization units are connected together, they will be able to share the active load through this analog line, even without Datalink communication. This signal is designed as a backup of the Datalink bus for emergency purposes.

ANALOG I/O EXTENSION PLUG-IN MODULE:

Term	Function	Technical data	Description
01	SND 6	Analog inputs, 0-5000 ohms 0 to 10 VDC 4 to 20 mA	These inputs have programmable function.
02	SND 7		
03	SND 8		
04	A1 +	Analog output, 4 to 20 mA	This output will be functional with further firmware version.
05	GND	0 VDC	Ground potential for analog senders.
06	A2 +	Analog output, 4 to 20 mA	This output will be functional with further firmware version.
07	GND	0 VDC	Ground potential for analog senders.



SND 8 cannot be switched to resistive input. The configuration can be 4-20 mA or 0-10 VDC.



Analog outputs will be functional with further firmware version.

AC CURRENT INPUTS PLUG-IN MODULE:

Term	Function	Technical data	Description
01	I1+	Generator current transformer inputs, 5A-AC	Connect the generator current transformer terminals to these inputs.
02	I1-		Do not connect the same current transformer to other instruments otherwise this may damage the unit.
03	I2+		Connect each terminal of the transformer to the unit's related terminal.
04	I2-		Do not use common terminals. Do not use grounding.
05	I3+		Correct polarity of connection is vital. The rating of the transformers should be identical for each of the 3 phases.
06	I3-		The secondary winding rating shall be 5 Amperes. (ex: 200/5 Amps).

9. TECHNICAL SPECIFICATIONS

Alternator voltage: 0 to 300 V-AC (Ph-N)

Alternator frequency: 0-600 Hz.

Mains (Busbar) voltage: 0 to 300 V-AC (Ph-N)

Mains (Busbar) frequency: 0-600 Hz.

Topology: 1-2-3 phases, with or without neutral

DC Supply Range: 8.0 to 36.0 V-DC.

DC power consumption:

300 mA-DC typical @12V-DC

150 mA-DC typical @24V-DC

600 mA-DC max. @12V-DC

300 mA-DC max. @24V-DC

V-A-cos Accuracy: 0.5% + 1 digit

KW-kVA-kVAr Accuracy: 1.0% + 1 digit

CT Range: 5/5A to 5000/5A

VT Range: 0.1/1 to 6500 / 1

kW Range: 0.1kW to 65000 kW

Current Inputs: from current transformers. ../5A.

Digital inputs: input voltage 0 to 36 V-DC.

Analog input range: 0-5000 ohms.

Digital Outputs: Protected mosfet semiconductor outputs, rated 1Amp@28V-DC

Cranking dropouts: survives 0V for 100ms.

Magnetic pickup voltage: 0.5 to 30VAC.

Magnetic pickup frequency: 0 to 10000 Hz.

GOV Control Output: 0-10V-DC

AVR Control Output: ±3V-DC, fully isolated

Charge Alternator Excitation: 2W.

Display Screen: 2.9", 128x64 pixels

Ethernet Port: 100 Mbits

USB Device: USB 2.0 Full speed

USB Host: USB 2.0 Full speed

RS-485 Port: selectable baud rate

Data Link Port: Fully Isolated CANBUS

Operating temperature: -20°C to 70°C (-4 to +158 °F)

Storage temperature: -40°C to 80°C (-40 to +176°F)

Maximum humidity: 95% non-condensing.

IP Protection: IP54 from front panel, IP30 from the rear.

Dimensions: 200 x 148 x 46mm (WxHxD)

Panel Cut-out Dimensions: 176 x 121 mm minimum.

Weight: -----

Case Material: High Temperature, non-flammable ABS/PC

Mounting: Front panel mounted with rear retaining plastic brackets.

EU Directives Conformity

-2014/35/EC (low voltage)

-2014/30/EC (electro-magnetic compatibility)

Norms of reference:

EN 61010 (safety requirements)

EN 61326 (EMC requirements)

UL / CSA Conformity:

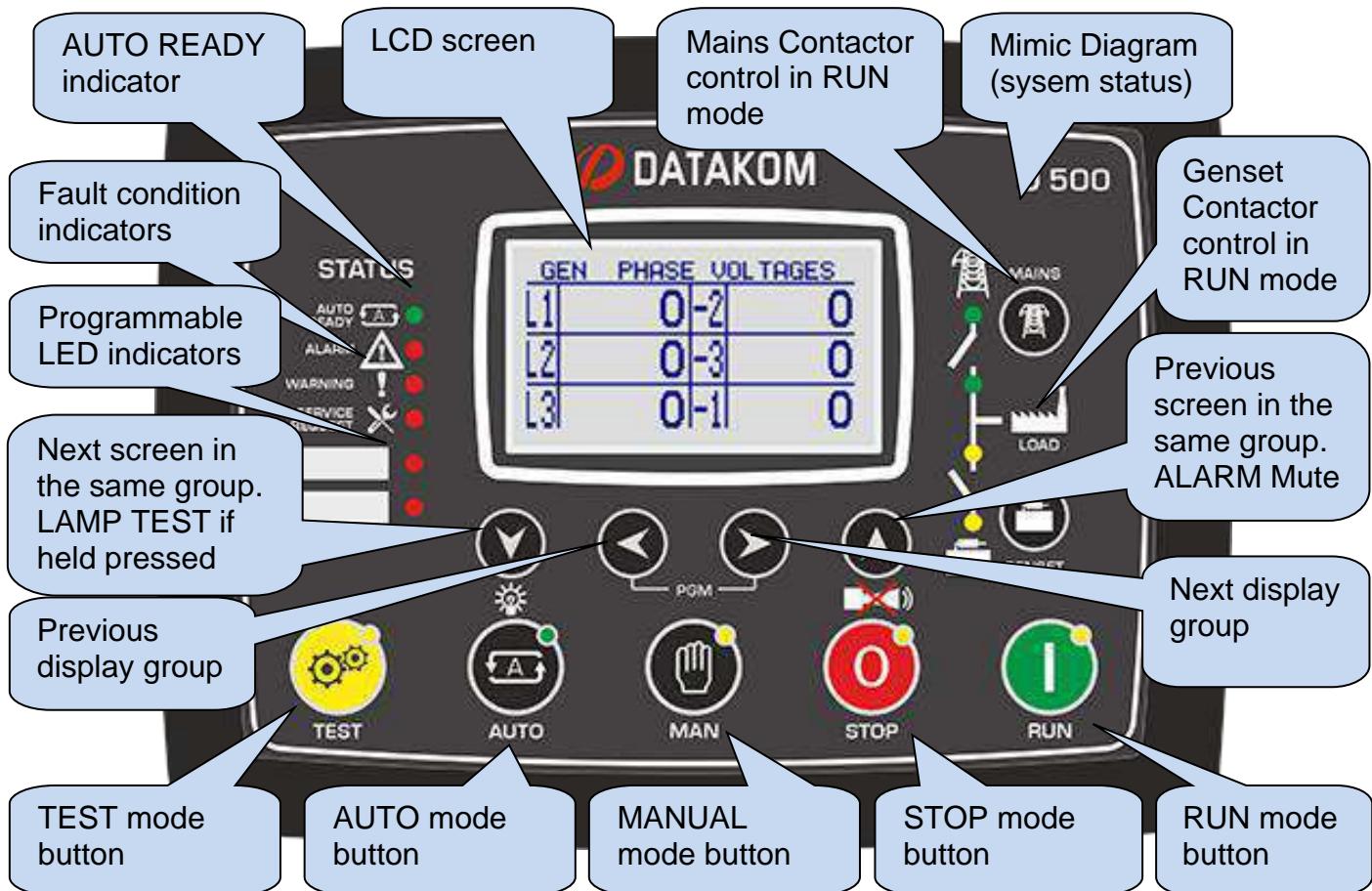
-UL 6200, Controls for Stationary Engine Driven Assemblies (Certificate # - 20140725-E314374)

CSA Compatibility:

-CAN/CSA C22.2 No. 14-13 – Industrial Control Equipment

10. DESCRIPTION OF CONTROLS

10.1. FRONT PANEL FUNCTIONALITY



When the engine hours **OR** the time limit is over, the **SERVICE REQUEST** led (red) will start to flash and the service request output function will be active. The service request can also create a fault condition of any level following parameter setting.

The service request output function may be assigned to any digital output using **Relay Definition** program parameters. Also relays on an extension module may be assigned to this function.



To turn off the SERVICE REQUEST led, and reset the service period, press together the ALARM MUTE and LAMP TEST keys for 5 seconds.

10.2. PUSHBUTTON FUNCTIONS

BUTTON	FUNCTION
	Selects TEST mode. The genset runs and takes the load.
	Selects MANUAL mode. The RUN pushbutton is enabled. The genset will run when RUN mode is selected. It can be stopped anytime by depressing the OFF button.
	Runs the genset off load. Applicable only in MANUAL mode.
	Selects AUTO mode. The genset runs when necessary and takes the load.
	Selects OFF mode. The genset stops after cooldown. If depressed again, the genset will immediately stop.
	Selects next display screen in the same display group. LAMP TEST when held pressed.
	Selects previous display group.
	Selects next display group.
	Selects previous display screen in the same display group. Resets the ALARM RELAY.
	Manual MAINS CONTACTOR (or BUSBAR CONTACTOR) control in RUN mode.
	Manual GENSET CONTACTOR (or BUSBAR CONTACTOR) control in RUN mode.
	When held pressed for 5 seconds, enters PROGRAMMING mode.
	Makes factory reset. Please review chapter RESETTING TO FACTORY DEFAULTS for more details.
	When held pressed for 5 seconds, resets service request counters. Please review chapter SERVICE REQUEST ALARM for more details.

	When held pressed for 5 seconds, switches to MANUAL ADJUST mode
	When held pressed for 1 seconds, switches to next PID ADJUST group in MANUAL ADJUST mode
	When held pressed for 5 seconds, exits the annunciator mode if enabled
	When held pressed for 5 seconds, switch to AUTO LEARN mode (only in Manual mode)

10.3. DISPLAY SCREEN ORGANIZATION

The unit measures a large number of electrical and engine parameters. The display of the parameters is organized as PARAMETER GROUPS and items in a group.

Navigation between different groups are made with  and  buttons.

Each depression of the  button will cause the display to switch to the next group of parameters. After the last group the display will switch to the first group.

Each depression of the  button will cause the display to switch to the previous group of parameters. After the first group the display will switch to the last group.

Navigation inside a group is made with  and  buttons.

Each depression of the  button will cause the display to switch to the next parameter in the same group. After the last parameter the display will switch to the first parameter.

Each depression of the  button will cause the display to switch to the previous parameter in the same group. After the first parameter the display will switch to the last parameter.

Below is a basic list of parameter groups:

Genset (Bus bar) Parameters: Genset voltages, currents, kW, kVA, kVAr, pf etc...

Engine Parameters: Analog sender readings, rpm, battery voltage, engine hours, etc...

J1939 Parameters: Opens only if the J1939 port is enabled. The unit is able to display a long list of parameters, under the condition that the engine sends this information. A complete list of available readings is found at chapter J1939 CANBUS ENGINE SUPPORT.

Mains Parameters: Mains voltages, currents, kW, kVA, kVAr, pf etc...

Synchronization / Load Share Display: A graphical synchroscope updated 10 times a second, target and actual power levels, AVR and governor output positions, bus total power measurements and a mimic diagram about the system is available.

Scopemeter Display: This group display waveforms of voltages and currents as an oscilloscope. All Ph-N and Ph-Ph voltages as well as phase currents are available. This feature is especially useful to investigate waveform distortions and harmonic loads.

Graphical Harmonic Analysis Results: This group displays harmonic composition of voltages and currents. All Ph-N and Ph-Ph voltages as well as phase currents are available. This feature is especially useful to investigate the harmonic caused by complex loads. Only harmonics above 2% are represented in the graphics because of the display resolution. In order to see all harmonic levels please use the Alphanumerical Harmonic Analysis Results.

Alphanumerical Harmonic Analysis Results: This group displays harmonic composition of voltages and currents with 0.1% resolution. All Ph-N and Ph-Ph voltages as well as phase currents are available. This feature is especially useful to investigate the harmonic caused by complex loads.

Alarm Display: This group displays all existing alarms, one screen per alarm. When there is no more alarm to display it will show "END OF ALARM LIST".

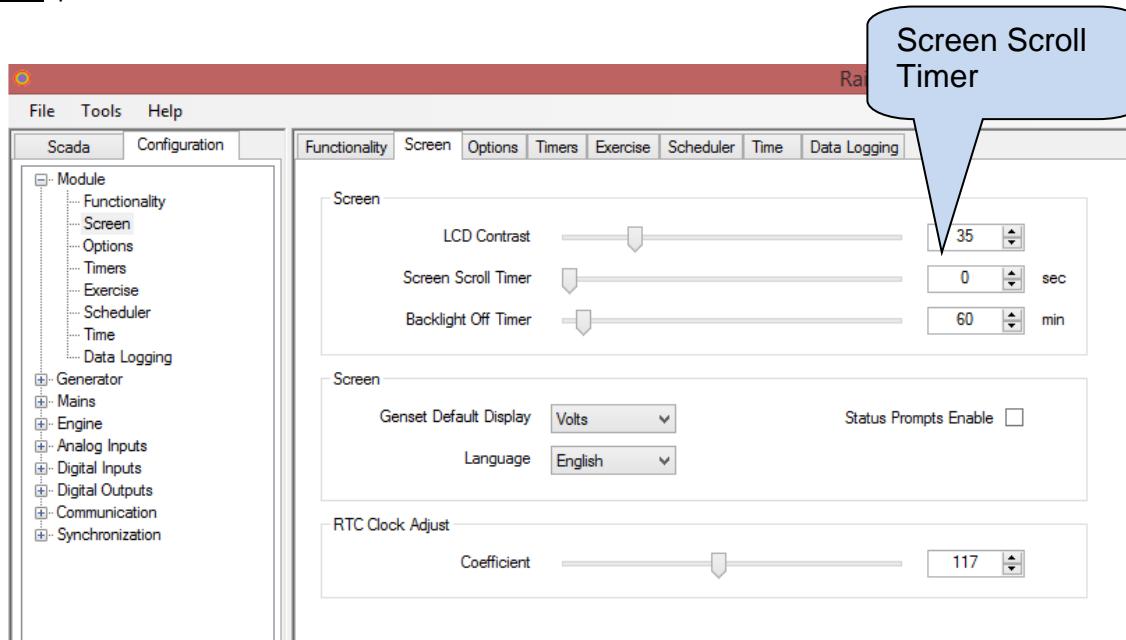
GSM Modem Parameters: Signal strength, counters, communication status, IP addresses etc...

Ethernet Parameters: Ethernet connection status, counters, IP addresses etc...

Status & Counters Groups: This group includes various parameters like genset status, service counters, date-time, firmware version etc...

10.4. AUTOMATIC DISPLAY SCROLL

The unit will automatically scroll all Mains, Genset and Engine measurements with programmable interval. The scroll period setting can be performed using the RainbowPlus program through Module > Screen options.



Eventually the same parameter can be modified through the front panel programming menu. The related parameter is **Controller Configuration > Screen Scroll Timer**.



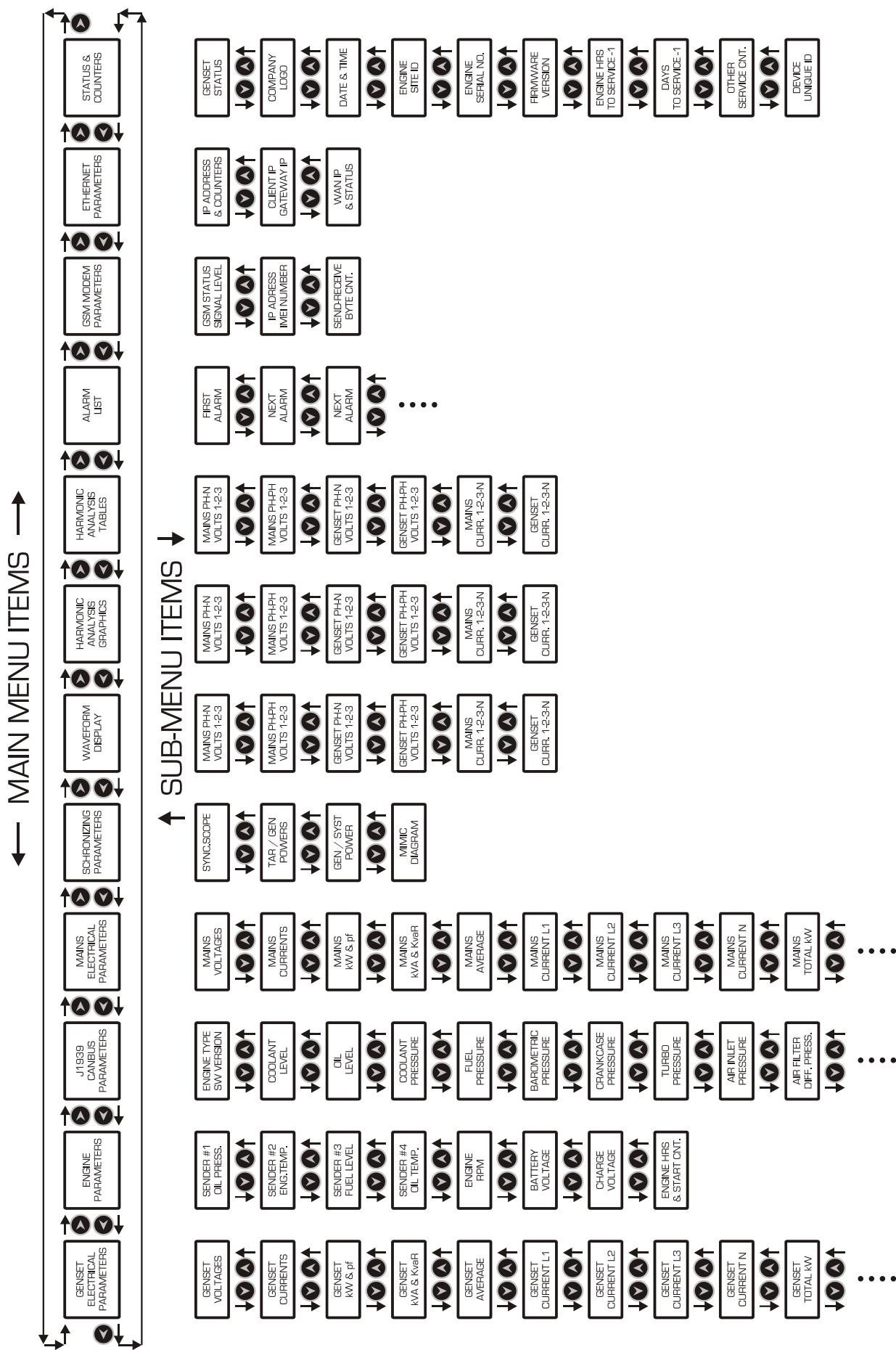
If the Screen Scroll Timer is set to zero, then scrolling will be disabled.



When a front panel button is pressed, the scrolling is suspended during 2 minutes.



If a fault condition occurs, the display will automatically switch to the ALARM LIST page.



10.5. MEASURED PARAMETERS

The unit performs a detailed set of AC measurements.

The list of measured AC parameters is below:

Mains voltage phase L1 to neutral	Gen voltage phase L1 to neutral
Mains voltage phase L2 to neutral	Gen voltage phase L2 to neutral
Mains voltage phase L3 to neutral	Gen voltage phase L3 to neutral
Mains average voltage phase to neutral	Gen average voltage phase to neutral
Mains voltage phase L1-L2	Gen voltage phase L1-L2
Mains voltage phase L2-L3	Gen voltage phase L2-L3
Mains voltage phase L3-L1	Gen voltage phase L3-L1
Mains frequency	Gen frequency
Mains current phase L1	Gen current phase L1
Mains current phase L2	Gen current phase L2
Mains current phase L3	Gen current phase L3
Mains average current	Gen average current
Mains kW phase L1	Gen kW phase L1
Mains kW phase L2	Gen kW phase L2
Mains kW phase L3	Gen kW phase L3
Mains total kW	Gen total kW
Mains kVA phase L1	Gen kVA phase L1
Mains kVA phase L2	Gen kVA phase L2
Mains kVA phase L3	Gen kVA phase L3
Mains kVAr phase L1	Gen kVAr phase L1
Mains kVAr phase L2	Gen kVAr phase L2
Mains kVAr phase L3	Gen kVAr phase L3
Mains pf phase L1	Gen total kVAr
Mains pf phase L2	Gen pf phase L1
Mains pf phase L3	Gen pf phase L2
Mains total pf	Gen pf phase L3
Mains neutral current	Gen total pf
Mains kWh - energy meter	Gen Neutral current
Mains kVAr cap&ind - energy meter	Gen kWh - energy meter
Mains exported power – kWh energy meter	Gen kVArh cap&ind - energy meter

Below engine parameters are always measured:

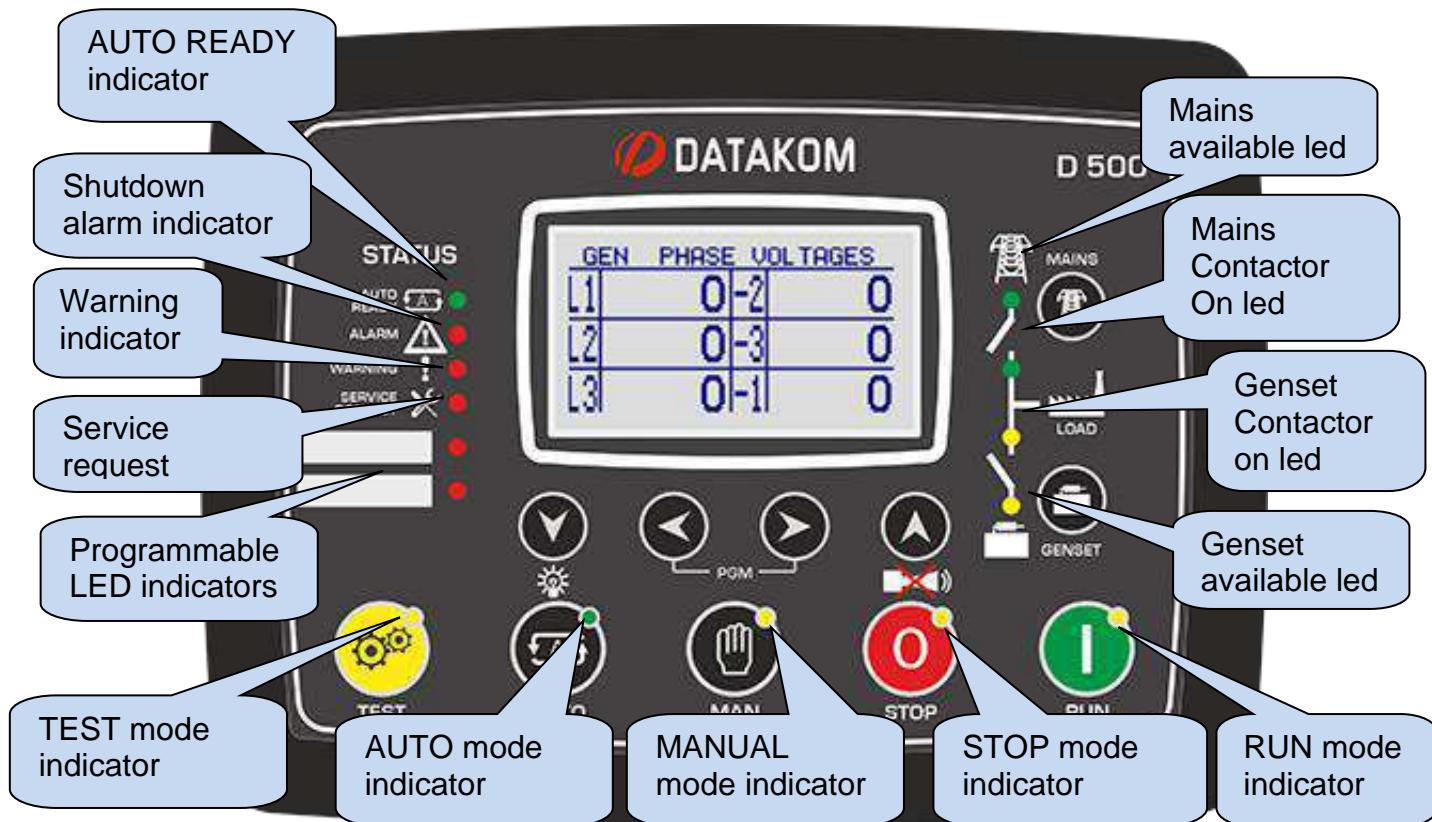
Engine speed (rpm)
Battery voltage,
Charge voltage

The unit features 5 analog senders, fully configurable for the name and function.

Below is a typical list of analog senders, capable of changing following configuration:

Coolant temperature
Oil pressure (bar, Psi)
Fuel level (%, liters)
Oil temperature (°C, °F)
Canopy temperature (°C, °F)

10.6. LED LAMPS



STATUS LEDS:

AUTO READY: Turns on when the AUTO mode is selected and there is no condition preventing engine start.

ALARM: Turns on when a shutdown alarm or load dump condition exists.

WARNING: Turns on when a warning condition exists

SERVICE REQUEST: Turns on when at least one of the service counters has expired.

PROGRAMMABLE LEDS: 2 leds reserved for customer specific use. Any alarm condition or input function can be freely assigned to each led.

MODE LEDS: Each led turns on when the related mode is selected, either locally or remotely.

MIMIC DIAGRAM LEDS:

MAINS AVAILABLE: This led turns on when all mains phase voltages and the mains frequency are within limits. If enabled, the mains phase rotation order must be also right. When any digital input is defined as Remote Start, this led will reflect the status of the input. When a Simulate Mains signal is present, then mains status will become "available". When a Force to Start signal is present, then the mains status will become "not available".

MAINS CONTACTOR ON: Turns on when the mains contactor is activated.

GENSET CONTACTOR ON: Turns on when the genset contactor is activated.

GENSET AVAILABLE: This led turns on when all genset phase voltages and the genset frequency are within limits. If enabled, the genset phase rotation order must be also right.



If a Remote Start input is defined, then the Mains led will reflect the input status.

Simulate Mains and Force to Start signals will also affect this led.

11. WAVEFORM DISPLAY & HARMONIC ANALYSIS

The unit features waveform display together with a precision harmonic analyzer for both mains and genset voltages and currents. Both phase to neutral and phase to phase voltages are available for analysis, thus 18 channels in total are possible.



In order to enable display and analysis of mains currents, current transformers must be placed at load side.

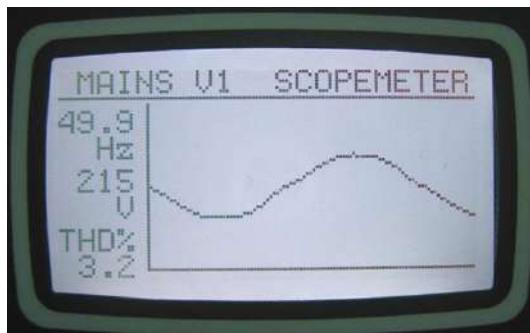
Available channels are:

Mains volts: V1, V2, V3, U12, U23, U31

Mains currents: I1, I2, I3

Genset volts: V1, V2, V3, U12, U23, U31

Genset currents: I1, I2, I3



Scopemeter Display

The waveform display memory is of 100 samples (320 samples in color version) length and 13 bit resolution, with a sampling rate of 4096 s/s. Thus one cycle of a 50Hz signal is represented with 82 points (164 points in color version). The vertical scale is automatically adjusted in order to avoid clipping of the signal.

The waveform is displayed on the device screen, and with more resolution, on PC screen through the RainbowPlus program.

The display memory is also available in the Modbus register area for third party applications. For more details please check chapter "**MODBUS Communications**".

The waveform display is updated twice a second. All channels may be scrolled using buttons.

The harmonic analyzer consists on a Fast Fourier Transform (FFT) algorithm which run twice a second on the selected channel.

The sample memory is of 1024 samples length and 13 bits resolution with a sampling rate of 4096 s/s.

The theory says that a periodic signal may have only odd multiples of the main frequency. Thus in a 50Hz network, harmonics will be found only at 150, 250, 350, 450 Hz etc...

The unit is able to analyze up to 1800Hz and up to 31th harmonic, whichever is smaller. Thus in a 50Hz system all 31 harmonics will be displayed, but in a 60Hz system only 29 harmonics will come to the screen.

In case of a 400Hz system, only the 3rd harmonic will be displayed.



Graphical Harmonic Table

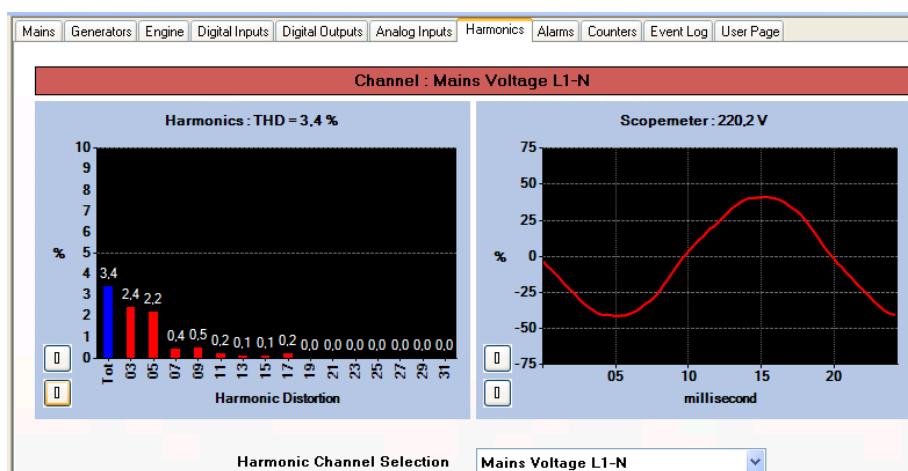


Alphanumeric Harmonics Table

Harmonic are represented by 2 different ways on the device display. The first one is a graphical representation allowing one sight perception of the harmonic structure. Because of the display resolution, only harmonics above 2% are displayed on the B&W display models.

The second display is alphanumeric, thus all harmonics are displayed with 0.1% resolution in order to provide more detailed information.

On RainbowPlus program, harmonics and waveform are displayed on a single screen with more resolution.



RainbowPlus Scada section: Harmonic Analysis and Waveform Display

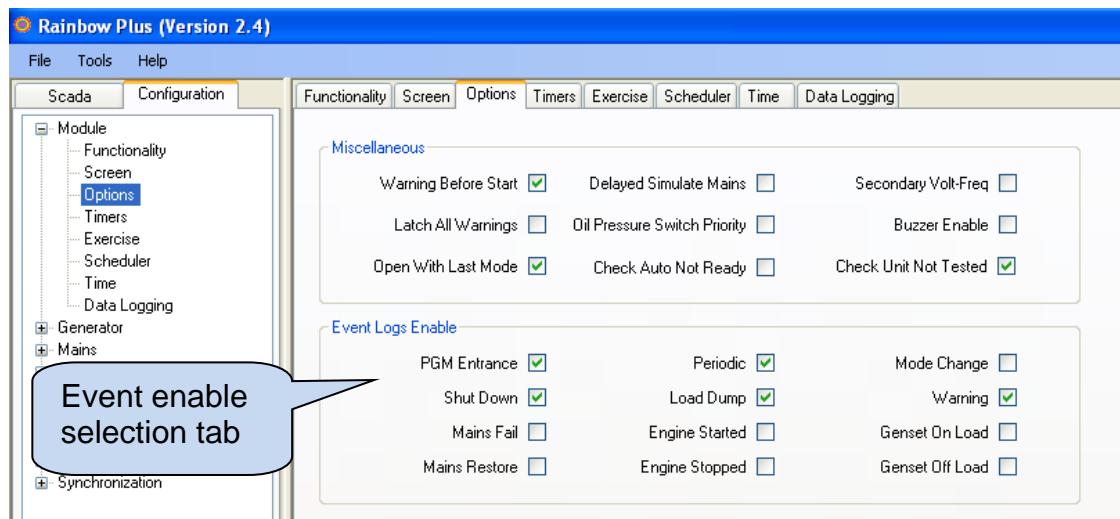
12. DISPLAYING EVENT LOGS

The unit features more than 400 event logs with date-time stamp and full snapshot of measured values at the moment that the event has occurred.

Stored values in an event record are listed below:

- event number
- event type / fault definition (see below for various event sources)
- date and time
- operation mode
- operation status (on-load, on-mains, cranking, etc...)
- engine hours run
- mains phase voltages: L1-L2-L3
- mains frequency
- genset phase voltages: L1-L2-L3
- genset phase currents: L1-L2-L3
- genset frequency
- genset total active power (kW)
- genset total power factor
- oil pressure
- engine temperature
- fuel level
- oil temperature
- canopy temperature
- ambient temperature
- engine rpm
- battery voltage
- charge voltage

Possible event sources are various. Every source can be individually enabled or disabled:



Program mode entrance event: recorded with the password level when program mode is entered.

Periodic event: recorded every 30 minutes when the engine is running, and every 60 minutes anyway.

Mode change event: recorded when the operation mode is changed.

Shutdown/loaddump/warning events: recorded when the related fault condition occurs.

Mains fail/restore events: recorded when mains status is changed

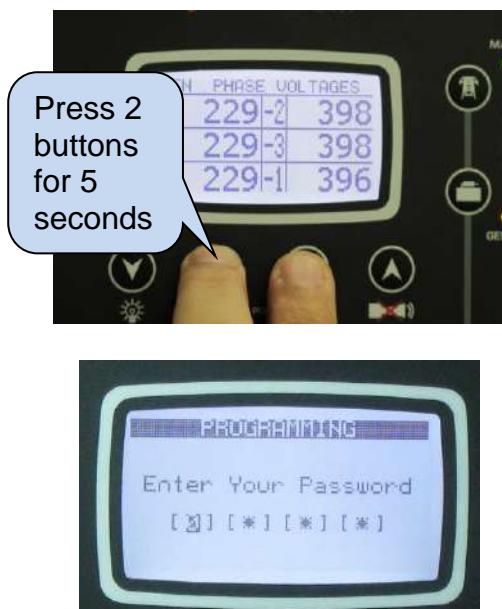
Engine started/stopped events: recorded when engine status is changed

Genset on load/off load events: recorded when the genset loading status is changed

Event logs are displayed within the program mode menu. This is designed in order to reduce the interference of event logs with other measurement screens.

To **enter the event display**, press together  and  buttons for 5 seconds.

When the program mode is entered, below password entry screen will be displayed.



Skip the password entry screen by pressing the  button 4 times. The screen below left will come.

Press again the  button. The last stored event will open, as in the below-right picture.

The first page will display the event number, event type, fault type and date-time information.



When displaying event logs:

-  button will display the next information in the same event
-  button will display the previous information in the same event
-  button will display the same information of the previous event
-  button will display the same information of the next event.

13. STATISTICAL COUNTERS

The unit provides a set of non-resettable incremental counters for statistical purposes.

The counters consist on:

- total genset kWh
- total genset kVArh inductive
- total genset kVArh capacitive
- total genset export kWh
- total mains kWh
- total mains kVArh
- total mains kVAh
- total engine hours
- total engine starts
- total fuel filled in the tank
- engine hours to service-1
- time to service-1
- engine hours to service-2
- time to service-2
- engine hours to service-3
- time to service-3

These counters are kept in a non-volatile memory and are not affected from power failures.

13.1. FUEL FILLING COUNTER

The unit offers a temper-proof incremental counter for fuel filling.

Related parameters are:

Parameter Definition	Unit	Min	Max	Factory Set	Description
Fuel Pulses from MPU input	-	0	1	0	0: MPU input is used for engine speed detection 1: MPU input is used for reading the flowmeter pulses during fuel filling.
Fuel Pulses per Volume	-	0	65000	1000	This is the number of pulses produced by the flowmeter for the unit volume. This parameter is characteristic of the flowmeter used and should be set according to the flowmeter data.
Fuel Counter Unit	Lt/gal	-	-	liters	This is the unit for the fuel counter

The quantity of the fuel filled in the tank is read from pulses generated by a flowmeter installed at the tank filling hose. Flowmeter pulse outputs will be connected to the MPU input of the controller. The controller will count pulses and convert them in liters (or gallons) then increment the fuel filling counter by the calculated amount.

The fuel filling counter is visible through Scada and Central Monitoring. Thus the genset operator can confirm fuel invoices with the real amount of fuel filled in the tank, preventing corruption.

13.2. FUEL CONSUMPTION MONITORING

The unit is capable to display the actual fuel consumption of the engine by two different ways:

- Through J1939 fuel consumption information
- By counting fuel consumption pulses.

If the engine is sending the fuel rate through J1939 messaging, then the unit will directly display the fuel consumption information coming from the ECU.

If a flowmeter is installed at the fuel suction hose of the engine, then the unit is also capable of counting these pulses, calculating and displaying the fuel consumption.

Related parameters are:

Parameter Definition	Unit	Min	Max	Required Value	Description
Fuel Pulses from MPU input	-	0	1	1	0: MPU input is used for engine speed detection 1: MPU input is used for reading the flowmeter pulses during fuel filling.
Fuel Pulses per Volume	-	0	65000	any	This is the number of pulses produced by the flowmeter for the unit volume. This parameter is characteristic of the flowmeter used and should be set according to the flowmeter data.
Fuel Counter Unit	Lt/gal	-	-	any	This is the unit for the fuel counter
Fuel Counter Type	-	0	1	1	This parameter determines the purpose of fuel pulses 0: Fuel filling pulses, increment fuel counter 1: Fuel consumption pulses, display consumption.

14. OPERATION OF THE UNIT

14.1. QUICK START GUIDE

STOPPING THE ENGINE: Press STOP  button

STARTING THE ENGINE: Press MAN  and then RUN  button

MANUAL LOAD TRANSFER: Use MAINS  and GENSET  buttons.

LOAD TEST: Press TEST  button. The genset will run and take the load.

AUTOMATIC OPERATION: Press AUTO  button. Check that **AUTO READY** led is illuminated.



**Mode can be changed anytime without negative effect.
Changing the operation mode while the genset is running will result into a behavior suitable for the new operating mode.**

14.2. STOP MODE

The STOP mode is entered by pressing the  button.

In this mode, the genset will be in a rest state. If it is running, then it will be stopped.

If the engine fails to stop after the expiration of **Stop Timer** then a **Fail to Stop** warning will occur.

If a **Remote Start** or **Force to Start** signal arrives in STOP mode, the genset will not start until AUTO mode is selected.

- **AMF Mode:** If the genset is running under load, then it will ramp out (if applicable) then the genset contactor will open. The engine will continue to run during **Cooldown Timer** and will stop afterwards. If the STOP button is pressed during cooldown, then the engine will immediately stop. The mains contactor will be energized only if mains phase voltages and frequency are within the programmed limits. If enabled, the mains phase order is also checked.
- **Synchronizing & Load Sharing Mode:** If the genset is running under load, then it will ramp out then the genset contactor will open. The engine will continue to run during **Cooldown Timer** and will stop afterwards. If the STOP button is pressed during cooldown, then the engine will immediately stop.
- **ATS Mode:** The controller will clear the REMOTE START signal output and open immediately the genset contactor. The mains contactor will be energized only if mains phase voltages and frequency are within the programmed limits. If enabled, the mains phase order is also checked.

14.3. AUTO MODE

The AUTO mode is entered by pressing the  button.

The AUTO mode is used for the automatic operation of the genset system.

- **AMF Mode:** The controller will constantly monitor the mains availability. It will run the engine and transfer the load when a mains failure occurs.
- **Synchronizing & Load Sharing Mode:** The controller will monitor the **REMOTE START** signal. When the signal arrives, it will run the genset, synchronize to the busbar, get in parallel, ramp up and start sharing the load. Depending on settings, the controller may decide to stop the genset, or restart it anytime in order to achieve the necessary available power on the busbar.
- **ATS Mode:** The controller will constantly monitor the mains availability. When a mains failure occurs, it will activate its **REMOTE START** output, thus the genset group will run and the controller will transfer the load. When the mains is back again, it will open the genset contactor and it will close the mains contactor.



If a panel lock input is defined and signal is applied, then mode change with pushbuttons will not occur. However, display navigation buttons are still enabled and parameters may be visualized.

The mains availability evaluation sequence is below:

- If at least one of the mains phase voltages or the mains frequency is outside limits, the mains will be supposed failing. Otherwise mains is available.
- If a Simulate Mains signal is present, then mains are made available
- If a Force to Start signal is present, then mains are unavailable
- If a Remote Start input is defined, then this signal decides of mains availability.

When mains are evaluated as “unavailable” then an engine start sequence begins:

- The unit waits during **Engine Start Delay** for skipping short mains failures. If the mains is restored before the end of this timer, the genset will not start.
- The unit turns on the fuel and preheat glow plugs (if any) and waits for **preheat timer**.
- The engine will be cranked for programmed times during crank timer. When the engine fires, the crank relay will be immediately deactivated. See section **Crank Cutting** for more details.
- The engine will run at idle speed during Idle Speed Timer.
- The engine will run unloaded during engine heating timer.
- If alternator phase voltages, frequency and phase order are correct, the unit will wait for the generator contactor period and the generator contactor will be energized.

When mains are evaluated as “available” again then an engine stop sequence begins:

- The engine will continue to run for the **mains waiting** period to allow mains voltages to stabilize.
- Then the generator contactor is deactivated and the mains contactor will be energized after mains contactor timer.
- If a cooldown period is given, the generator will continue to run during the cooldown period.
- Before the end of cooldown, the unit will reduce the engine speed to idle speed.
- At the end of cooldown, the fuel solenoid will be de-energized, the stop solenoid will be energized for Stop Solenoid timer and the diesel will stop.
- The unit will be ready for the next mains failure.



If the operation of the genset is disabled by the weekly schedule, then the AUTO led will flash, and the operation of the genset will be as in the STOP mode.

14.4. RUN MODE, MANUAL CONTROL

The RUN mode is entered by pressing the MAN and then the RUN buttons.

When the RUN mode is selected, the engine will be started regardless of the mains availability.

The starting sequence is as described below:

- The unit turns on the fuel and preheat glow plugs (if any) and waits for preheat timer.
- The engine will be cranked for programmed times during crank timer. When the engine fires, the crank relay will be immediately deactivated. See section **Crank Cutting** for more details.
- The engine will run at idle speed during Idle Speed Timer.
- The engine will run unloaded until another mode is selected.

The RUN mode allows also manual contactor control through MC and GC buttons.

When a contactor button is pressed, the related contactor will change position. Thus if it was on, then it will turn off. If it was off then it will turn on.

If the other contactor was on, then it will turn off, the controller will wait for the related contactor timer and the contactor will turn on. This will prevent manual closure of both contactors.



If Emergency Backup mode is enabled and if the mains are off, then the mains contactor will be deactivated and the generator contactor will be activated.

When the mains are on again, a reverse changeover to the mains will be performed, but the engine will be kept running unless another mode is selected.

In order to stop the engine press button or select another mode of operation.

14.5. TEST MODE

The TEST mode is entered by pressing the  button.

The TEST mode is used in order to test the genset under load.

Once this mode is selected, the engine will run as described in the AUTO mode, regardless of the mains availability and the load will be transferred to the genset.

The genset will feed the load indefinitely unless another mode is selected.

- **AMF Mode:** The controller will run the engine and make an interrupted transfer.
- **Synchronizing & Load Sharing Mode:** The controller will run the genset. If the busbar is not energized, it will simply close its genset contactor. If the busbar was energized then it will synchronize to the busbar, get in parallel, ramp up and start sharing the load.
- **ATS Mode:** The controller will activate its REMOTE START output, thus the genset group will run, synchronize and close to the busbar. When sufficient power is ready on the busbar, the controller will transfer the load.

15. PROTECTIONS AND ALARMS

The unit provides 3 different protection levels, being warnings, loaddumps and shutdown alarms.

1- **SHUTDOWN ALARMS:** These are the most important fault conditions and cause:

- The **ALARM** led to turn on steadily,
- The genset contactor to be released immediately,
- The engine to be stopped immediately,
- The **Alarm** digital output to operate.

2- **LOAD_DUMP:** These fault conditions come from electrical trips and cause:

- The **ALARM** led to turn on steadily,
- The genset contactor to be released immediately,
- The engine to be stopped after Cooldown period,
- The **Alarm** digital output to operate.

3- **WARNINGS:** These conditions cause:

- The **WARNING** led to turn on steadily,
- The **Alarm** digital output to operate.



If a fault condition occurs, the display will automatically switch to the ALARM LIST page.

Alarms operate in a first occurring basis:

- If a shutdown alarm is present, following shutdown alarms, loaddumps and warnings will not be accepted,
- If a loaddump is present, following loaddumps and warnings will not be accepted,
- If a warning is present, following warnings will not be accepted.



If the **ALARM MUTE** button is pressed, the **Alarm** output will be deactivated; however the existing alarms will persist and disable the operation of the genset.

Alarms may be of **LATCHING** type following programming.

For latching alarms, even if the alarm condition is removed, the alarms will stay on and disable the operation of the genset.



Existing alarms may be canceled by pressing one of the operating mode buttons:



Most of the alarms have programmable trip levels. See the programming chapter for adjustable alarm limits.

15.1. DISABLING ALL PROTECTIONS

The unit allows any digital input to be configured as “**Disable Protections**”.

This input configuration is used in cases where the engine is required to run until destruction. This may be the case under critical conditions like firefighting or other emergency cases.

This input should be configured as a “**Warning**”. Thus when protections are disabled, a warning message will immediately appear on the screen.

When protections are disabled, all shutdown alarms and loaddumps will become warnings. They will appear on the screen, but will not affect genset operation.

The input may be constantly activated, or preferably it may be activated by an external key activated switch in order to prevent unauthorized activation.



Disabling protections will allow the genset run until destruction. Place written warnings about this situation in the genset room.

15.2. SERVICE REQUEST ALARM

The **SERVICE REQUEST** led is designed to help the periodic maintenance of the genset to be made consistently.

The periodic maintenance is basically carried out after a given engine hours (for example 200 hours), but even if this amount of engine hours is not fulfilled, it is performed after a given time limit (for example 12 months).

The unit offers 3 independent service counter sets in order to enable different service periods with different priorities.

The fault level created upon expiration of service timers may be set as **Warning**, **Loaddump** or **Shutdown**. Thus different levels of fault conditions may be generated at different overrun levels.

Each service counter set has both programmable engine hours and maintenance time limit. If any of the programmed values is zero, this means that the parameter will not be used. For example a maintenance period of 0 months indicates that the unit will request maintenance only based on engine hours, there will be no time limit. If the engine hours is also selected as 0 hours this will mean that this service counter set is not operative.

When the engine hours **OR** the time limit is over, the **SERVICE REQUEST** led (red) will start to flash and the service request output function will be active. The service request can also create a fault condition of any level following parameter setting.

The service request output function may be assigned to any digital output using **Relay Definition** program parameters. Also relays on an extension module may be assigned to this function.



To turn off the SERVICE REQUEST led, and reset the service period, press together the ALARM MUTE and LAMP TEST keys for 5 seconds.

The remaining engine hours and the remaining time limits are kept stored in a non-volatile memory and are not affected from power supply failures.

The time and engine hours to service are displayed in the **GENSET STATUS** menu group.

15.3. SHUTDOWN ALARMS



Digital input and analog sender alarms are fully programmable for the alarm name, sampling and action.

Only internal alarms are explained in this section.

GENSET LOW / HIGH FREQUENCY	Set if the generator frequency is outside programmed limits. These faults will be monitored with Fault Holdoff Timer delay after the engine is running. Low and high limits are separately programmable. The detection delay is also programmable. Another high frequency shutdown limit which is 12% above the high limit is always monitored and stops the engine immediately.
GENSET LOW / HIGH RPM	Set if the generator rpm is outside programmed limits. These faults will be monitored with Fault Holdoff Timer delay after the engine is running. Low and high limits are separately programmable. The detection delay is also programmable. The high rpm overshoot limit is always monitored and stops the engine immediately.
GENSET LOW / HIGH VOLTAGE	Set if any of the generator phase voltages goes outside programmed limits for Voltage Fail Timer . This fault will be monitored with Fault Holdoff Timer delay after the engine is running.
LOW / HIGH BATTERY VOLTAGE	Set if the genset battery voltage is outside programmed limits. Low and high limits are separately programmable. The detection delay is also programmable.
FAIL TO START	Set if the engine is not running after programmed number of start attempts.
FAIL TO STOP	Set if the engine is not stopped before the expiration of the Stop Timer .
LOW CHARGE VOLTAGE	Set if the charge alternator voltage is below the programmed limit. This fault will be monitored with Fault Holdoff Timer delay after the engine is running.
J1939 ECU FAIL	Set if no information has been received during 3 seconds from the ECU of the electronic engine. This fault condition is only controlled when fuel is on.
VOLTAGE UNBALANCE	Set if any of the generator phase voltages differs from the average by more than Voltage Unbalance Limit for Voltage Fail Timer . This fault will be monitored with Fault Holdoff Timer delay after the engine is running.
CURRENT UNBALANCE	Set if any of the generator phase currents differs from the average by more than Voltage Unbalance Limit for Voltage Fail Timer . This fault will be monitored with Fault Holdoff Timer delay after the engine is running. The action taken at fault condition is programmable.
OVERCURRENT	Set if at least one of the genset phase currents goes over the Overcurrent Limit for the period allowed by the IDMT curve setting. The allowed timer is dependent of the overcurrent level. If currents go below the limit before expiration of the timer then no alarm will be set. Please check chapter Overcurrent Protection (IDMT) for more details. The action taken at fault condition is programmable.
PICKUP SIGNAL LOST	Set if the rpm measured from the magnetic pickup input falls below the Crank Cut RPM level during Loss of Speed Signal Timer . The action of signal loss is programmable.
SERVICE REQUEST	Set if at least one of the service counters has expired. In order to reset the service counters please hold pressed both with and buttons during 5 seconds. The screen will display "Completed!"
J1939 ECU Alarm	Set if the communication between the unit and the ECU is lost.

15.4. LOADDUMP ALARMS



Digital input and analog sender alarms are fully programmable for the alarm name, sampling and action.
Only internal alarms are explained in this section.

VOLTAGE UNBALANCE	Set if any of the generator phase voltages differs from the average by more than Voltage Unbalance Limit for Voltage Fail Timer . This fault will be monitored with Fault Holdoff Timer delay after the engine is running.
CURRENT UNBALANCE	Set if any of the generator phase currents differs from the average by more than Voltage Unbalance Limit for Voltage Fail Timer . This fault will be monitored with Fault Holdoff Timer delay after the engine is running. The action taken at fault condition is programmable.
OVERCURRENT	Set if at least one of the genset phase currents goes over the Overcurrent Limit for the period allowed by the IDMT curve setting. The allowed timer is dependent of the overcurrent level. If currents go below the limit before expiration of the timer then no alarm will be set. Please check chapter Overcurrent Protection (IDMT) for more details. The action taken at fault condition is programmable.
OVERLOAD	Set if the genset power (kW) supplied to the load goes over the Overload Load Dump limit for Overload Timer . If the power goes below the limit before expiration of the timer then no alarm will be set.
REVERSE POWER	Set if the genset power (kW) is negative and goes over the Reverse Power limit for Reverse Power Timer . If the power goes below the limit before expiration of the timer then no alarm will be set.
GENSET PHASE ORDER FAIL	Set if the fault is enabled and the genset phase order is reverse.
MAINS CB FAIL TO OPEN	Set if the feedback input is defined and the related contactor block feedback signal is not detected after the expiration of Contactor Open/Close Fail Timer.
GENSET CB FAIL TO CLOSE	Set if the feedback input is defined and the related contactor block feedback signal is not detected after the expiration of Contactor Open/Close Fail Timer.
PICKUP SIGNAL LOST	Set if the rpm measured from the magnetic pickup input falls below the Crank Cut RPM level during Loss of Speed Signal Timer . The action of signal loss is programmable.
SERVICE REQUEST	Set if at least one of the service counters has expired. In order to reset the service counters please hold pressed both with and buttons during 5 seconds. The screen will display "Completed!"
UNIT LOCKED	Set if the controller is remotely locked.
UNKNOWN TOPOLOGY	Set if the automatic topology determination is active, and the topology cannot be determined during "holdoff timer" after the engine runs.
Excitation Lost	Set if the AVR control output has gone to the low or high limit when the genset is on load.

Synchronization Fail	Set if the phase and voltage synchronization is not successful before the expiration of Synchronization Fail Timeout
Busbar Voltage Fail	Set if busbar voltages are not within limits and busbar voltage above Dead Bus Limit during 5 seconds, when the master requests the slave to close the genset contactor to the busbar.
Busbar Freq. Fail	Set if busbar frequency is not within limits and busbar voltage above Dead Bus Limit during 5 seconds, when the master requests the slave to close the genset contactor to the busbar.

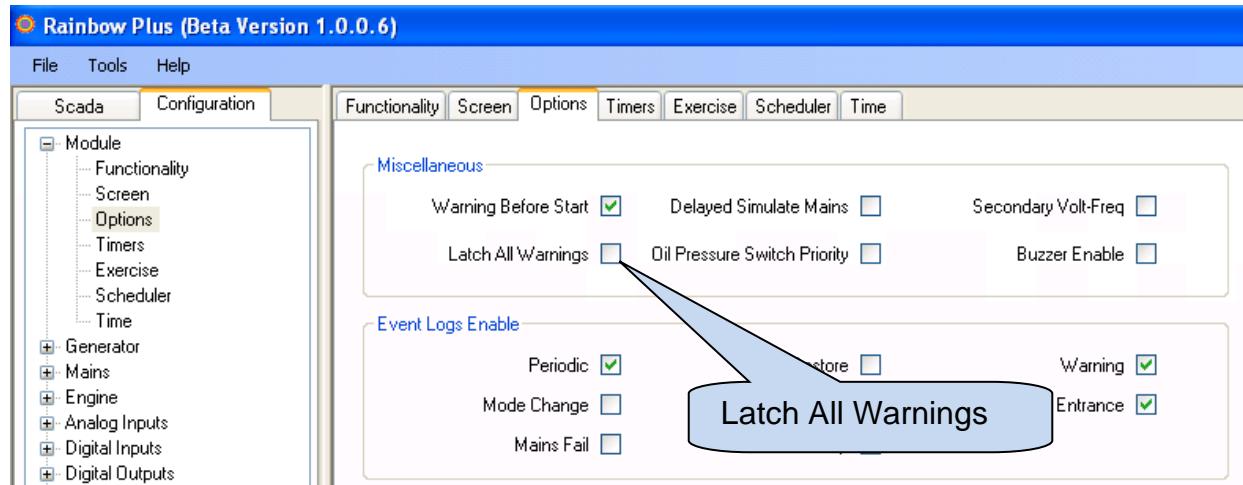
15.5. WARNINGS



Digital input and analog sender alarms are fully programmable for the alarm name, sampling and action.
Only internal alarms are explained in this section.



All warnings can be made latching by enabling a single program parameter: [Controller Configuration >Latch All Warnings](#)



GENSET LOW / HIGH FREQUENCY	Set if the generator frequency is outside programmed limits. These faults will be monitored with Fault Holdoff Timer delay after the engine is running. Low and high limits are separately programmable. The detection delay is also programmable. Another high frequency shutdown limit which is 12% above the high limit is always monitored and stops the engine immediately.
GENSET LOW / HIGH RPM	Set if the generator rpm is outside programmed limits. These faults will be monitored with Fault Holdoff Timer delay after the engine is running. Low and high limits are separately programmable. The detection delay is also programmable. The high rpm overshoot limit is always monitored and stops the engine immediately.
GENSET LOW / HIGH VOLTAGE	Set if any of the generator phase voltages goes outside programmed limits for Voltage Fail Timer . This fault will be monitored with Fault Holdoff Timer delay after the engine is running.
LOW / HIGH BATTERY VOLTAGE	Set if the genset battery voltage is outside programmed limits. Low and high limits are separately programmable. The detection delay is also programmable.
FAIL TO STOP	Set if the engine has not stopped before the expiration of the Stop Timer .
LOW CHARGE VOLTAGE	Set if the charge alternator voltage is below the programmed limit. This fault will be monitored with Fault Holdoff Timer delay after the engine is running.

<u>J1939 ECU FAIL</u>	Set when an engine fault code is received from the ECU of the electronic engine. This fault will not cause an engine stop. If necessary, the engine will be stopped by the ECU.
<u>VOLTAGE UNBALANCE</u>	Set if any of the generator phase voltages differs from the average by more than Voltage Unbalance Limit for Voltage Fail Timer . This fault will be monitored with Fault Holdoff Timer delay after the engine is running.
<u>CURRENT UNBALANCE</u>	Set if any of the generator phase currents differs from the average by more than Voltage Unbalance Limit for Voltage Fail Timer . This fault will be monitored with Fault Holdoff Timer delay after the engine is running. The action taken at fault condition is programmable.
<u>OVERCURRENT</u>	Set if at least one of the genset phase currents goes over the Overcurrent Limit for the period allowed by the IDMT curve setting. The allowed timer is dependent of the overcurrent level. If currents go below the limit before expiration of the timer then no alarm will be set. Please check chapter Overcurrent Protection (IDMT) for more details. The action taken at fault condition is programmable.
<u>OVERCURRENT</u>	Set if at least one of the genset phase currents goes over the Overcurrent Limit .
<u>REVERSE POWER</u>	Set if the genset power (kW) is negative and goes over the Reverse Power limit for Reverse Power Timer . If the power goes below the limit before expiration of the timer then no alarm will be set.
<u>MAINS PHASE ORDER FAIL</u>	Set if the mains phase order checking is enabled, mains phases are present and mains phase order is reversed. This fault prevents the Mains Contactor to close.
<u>GENSET CB FAIL TO CLOSE / OPEN</u>	Set if the feedback input is defined and the related contactor block feedback signal is not detected after the expiration of Contactor Open/Close Fail Timer.
<u>MAINS CB FAIL TO CLOSE</u>	Set if the feedback input is defined and the related contactor block feedback signal is not detected after the expiration of Contactor Open/Close Fail Timer.
<u>SYNCHRONIZATION FAIL</u>	Set if the uninterrupted transfer is enabled and voltage, frequency and phase matching is not found before the expiration of the Synchronization Fail Timer
<u>PICKUP SIGNAL LOST</u>	Set if the rpm measured from the magnetic pickup input falls below the Crank Cut RPM level during Loss of Speed Signal Timer . The action of signal loss is programmable.
<u>SERVICE REQUEST</u>	Set if at least one of the service counters has expired. In order to reset the service counters please hold pressed both with  and  buttons during 5 seconds. The screen will display "Completed!"
<u>EEPROM WRITE FAULT</u>	Set if the internal non-volatile memory cannot be written.
<u>ENGINE RUNNING</u>	Set if the engine is running while the fuel output is not energized.
<u>AUTO NOT READY</u>	Set if the genset is not in AUTO mode or a fault condition or the weekly schedule prevents the automatic starting of the genset.
<u>GPS DISCONNECTED</u>	Set if the serial communication with the GPS is lost.
<u>GPS SIGNAL LOST</u>	Set if the communication with the GPS module is functional, but the GPS signal level is insufficient to determine the geo-location.

15.6. NON-VISUAL WARNINGS



These warnings are not announced at the device front panel, however they appear in event logs, transferred to the Scada and cause SMS and e-mail sending.

Only internal alarms are explained in this section.

<u>FUEL THEFT</u>	<u>Engine is not running:</u> If the fuel level measured from the sender input falls by 20% or more in one hour, then Fuel Theft warning occurs (the detection delay is 10 sec, not adjustable). <u>Engine is running:</u> If the fuel level measured from the sender input falls by 2x " hourly fuel consumption percentage " or more, then Fuel Theft warning occurs.
<u>FUEL FILLING</u>	If the fuel level measured from the sender input is increased by 20% or more in one hour, then Fuel Filling non-visual warning occurs (the detection delay is 10 seconds, not adjustable).
<u>MAINTENANCE DONE</u>	Sent when the periodic maintenance counters are manually reset.

16. PROGRAMMING

16.1. RESETTING TO FACTORY DEFAULTS

In order to resume to the factory set parameter values:

- hold pressed the **OFF**, **LAMP TEST** and **ALARM MUTE** buttons for 5 seconds,
- “**RETURN TO FACTORY SET**” will be displayed
- immediately press and hold pressed the **RIGHT ARROW** button for 5 seconds
- factory set values will be reprogrammed to the parameter memory.



Hold pressed OFF, LAMP TEST and ALARM MUTE



Hold pressed RIGHT ARROW

The program mode is used to adjust timers, operational limits and the configuration of the unit.

Although a free PC program is provided for programming, every parameter may be modified through the front panel, regardless of the operating mode.

When modified, program parameters are automatically recorded into a non-erasable memory and take effect immediately.

The program mode will not affect the operation of the unit. Thus programs may be modified anytime, even while the genset is running.

16.2. ENTERING THE PROGRAMMING MODE

To enter the program mode, press together **◀MENU** and **MENU▶** buttons for 5 seconds.

When the program mode is entered, below password entry screen will be displayed.



A 4 digit password must be entered using **▼**, **▲**, **MENU▶** and **◀MENU** buttons.

The **▼**, **▲** buttons modify the value of the current digit. The **MENU▶**, **◀MENU** buttons navigate between digits.

The unit supports 3 password levels. The level_1 is designed for field adjustable parameters. The level_2 is designed for factory adjustable parameters. The level_3 is reserved. It allows recalibration of the unit.

The password level-1 is factory set to '1234' and the password level-2 is factory set to '9876'.



Passwords are not front panel adjustable.

If a wrong password is entered, the unit will still allow access to the program parameters, but in read-only mode.

If password "0000" is entered, only EVENT LOG file will be available.

16.3. NAVIGATING BETWEEN MENUS

The program mode is driven with a two level menu system. The top menu consists on program groups and each group consists on various program parameters.

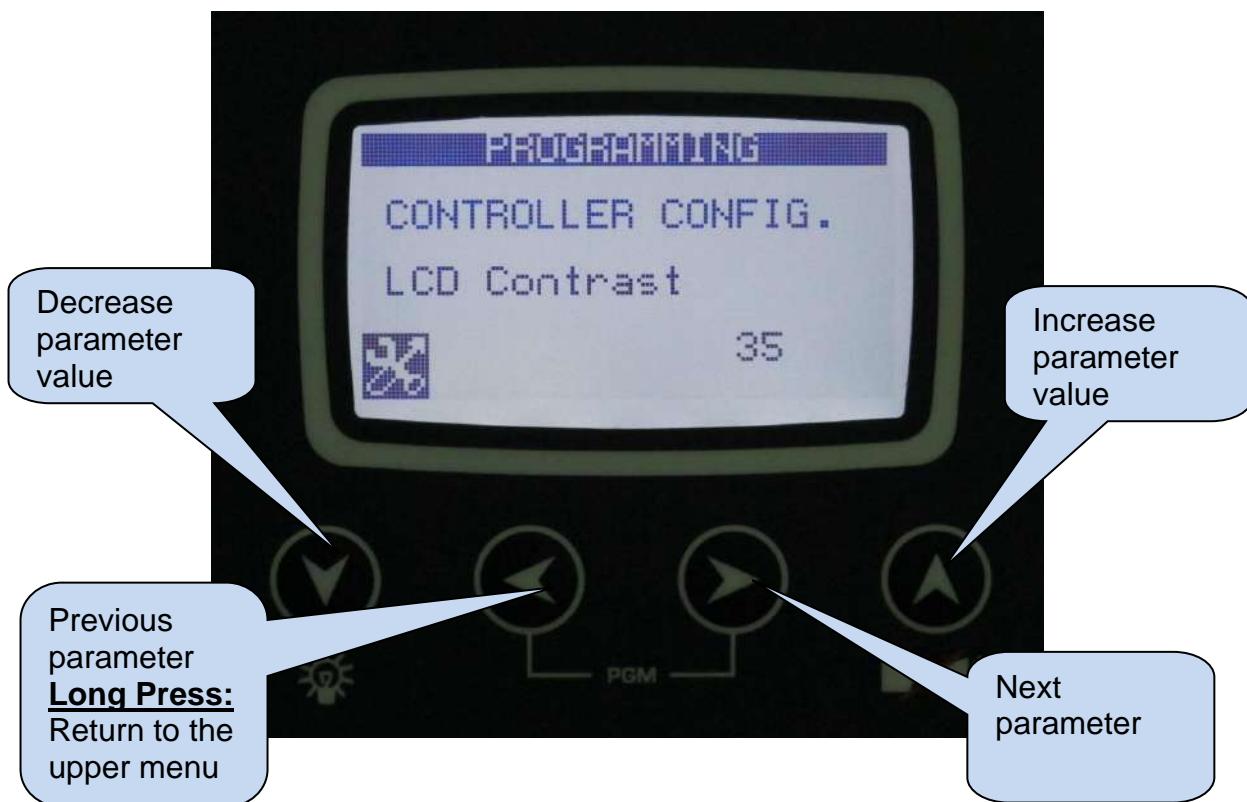
When program mode is entered, a list of available groups will be displayed. Navigation between different groups are made with **▼** and **▲** buttons. Selected group is shown in reverse video (blue on white). In order to enter inside a group, please press **MENU▶** button. In order to exit from the group to the main list please press **◀MENU** button.



Navigation inside a group is made also with **▼** and **▲** buttons. A list of available parameters will be displayed. Selected parameter is shown in reverse video (blue on white). In order display/change the value of this parameter, please press **MENU▶** button. Parameter value may be increased and decreased with **▼** and **▲** buttons. If these keys are hold pressed, the program value will be increased/decreased by steps of 10. When a program parameter is modified, it is automatically saved in memory. If **MENU▶** button is pressed, next parameter will be displayed. If **◀MENU** button is pressed, then the list of parameters in this group will be displayed.

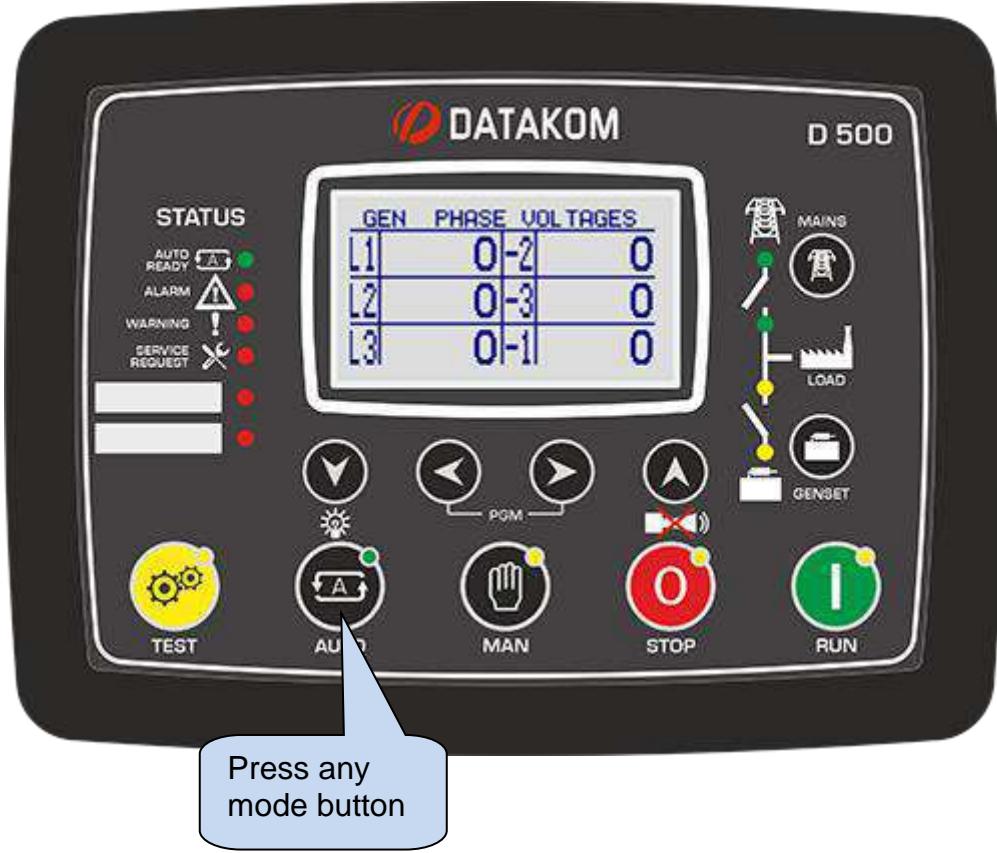


16.4. MODIFYING PARAMETER VALUE



16.5. PROGRAMMING MODE EXIT

To exit the **program mode** press one of the mode selection keys. If no button is pressed during 2 minutes the program mode will be cancelled automatically.



17. PROGRAM PARAMETER LIST

17.1. CONTROLLER CONFIGURATION GROUP

Parameter Definition	Unit	Min	Max	Factory Set	Description
LCD Contrast	-	30	50	31	This parameter is used to set LCD contrast. Adjust for the best viewing angle.
Screen Scroll Timer	sec	0	250	0	The screen will scroll between different measurements with this interval. If set to zero, the screen scroll will be disabled.
Language	-	0	1	0	0: English language selected. 1: Local language selected. This language may depend on the country where the unit is intended to be used.
Genset Default Display	-	0	4	0	This parameter selects the screen which is displayed during genset on load operation. 0: genset voltages table 1: genset currents and freq. table 2: genset kW and pf table 3: genset kVA and kVAr table 4: genset average measurements
Status Prompt Window Enable	-	0	1	0	0: Status prompts disabled 1: Status prompts enabled
Fault Holdoff Timer	sec	0	120	12	This parameter defines the delay after the engine runs and before the fault monitoring is enabled.
Alarm Relay Timer	sec	0	120	60	This is the period during which the ALARM relay is active. If the period is set to 0, this will mean that the period is unlimited.
Intermittent Alarm Relay	-	0	1	0	0: continuous 1: intermittent (turns on and off every second)
Emergency Backup Operation	-	0	1	0	0: In RUN mode, the load will not be transferred to the genset even if the mains fails. 1: In RUN mode, the load will be transferred to the genset if the mains fails.
Exerciser Enable	-	0	1	0	0: automatic exerciser disabled 1: automatic exerciser enabled
Exercise Period	-	Weekly	Monthly	Weekly	Weekly: exercise once per week Monthly: exercise once per month The exact exerciser day and time is adjusted within the EXERCISE SCHEDULE section.
Exercise Off/On Load	-	0	1	1	0: Exercise at RUN mode 1: Exercise at TEST mode
Delayed Simulate Mains	-	0	1	0	0: delayed simulate mains disabled 1: delayed simulate mains enabled

17.1. CONTROLLER CONFIGURATION GROUP (continued)

Parameter Definition	Unit	Min	Max	Factory Set	Description
Modem / GPS Selection	-	0	5	0	0: no MODEM / no GPS 1: Internal MODEM, no GPS 2: External MODEM, no GPS 3: External generic MODEM, no GPS 4: no MODEM, RS-232 GPS 5: Internal MODEM, RS-232 GPS
External Modem / GPS Baud Rate	bps	2400	115200	115200	This is the data rate of the RS-232 port for the external modem / GPS.
GSM Sim Card Pin	-	0	9999	0	If the GSM SIM card uses pin number, enter the pin number here. If incorrect pin number is entered, then the SIM card will not operate.
SMS Enable	-	0	1	0	0: SMS messages disabled 1: SMS messages enabled
GPRS Connection Enable	-	0	1	0	0: GPRS disabled 1: GPRS enabled
Web Programming Enable	-	0	1	0	0: Web programming disabled 1: Web programming enabled
Web Control Enable	-	0	1	0	0: Web control disabled 1: Web control enabled
Web Refresh Rate	sec	0	240	10	The unit will refresh the web page with this interval.
Ping Period	sec	30	900	120	The unit will check the availability of the internet connection with this interval.
Rainbow Scada Refresh Rate	sec	0	65535	60	The unit will update the distant monitoring terminal with this rate.
Rainbow Scada Address-1 Port	-	0	65535	90	This is the port number of the first monitoring terminal address.
Rainbow Scada Address-2 Port	-	0	65535	90	This is the port number of the second monitoring terminal address.
Web Server Port	-	0	65535	80	This is the port number of the internal web server. The unit will answer queries to this port only.
Modbus TCP/IP Port	-	0	65535	502	Internal Modbus TCP/IP server's port number. The unit answers Modbus requests to this port only.
SMTP Port	-	0	65535	587	This is the port number used for e-mail sending.
Ethernet to RS-485 Modbus Gateway Enable	-	0	1	0	0: ethernet-modbus gateway function disabled. 1: ethernet-modbus gateway function enabled. The unit will redirect Modbus requests from ethernet to the RS-485 port.
GPRS to RS-485 Modbus Gateway Enable	-	0	1	0	0: gprs-modbus gateway function disabled. 1: gprs-modbus gateway function enabled. The unit will redirect Modbus requests from GPRS to the RS-485 port.
RS-485 Enable	-	0	1	1	0: RS-485 port disabled 1: RS-485 port enabled
Modbus Address	-	0	240	1	This is the modbus controller identity used in Modbus communication.

17.1. CONTROLLER CONFIGURATION GROUP (continued)

Parameter Definition	Unit	Min	Max	Factory Set	Description
RS-485 Baud Rate	bps	2400	115200	9600	This is the data rate of the RS-485 Modbus port.
Ethernet Enable	-	0	1	1	0: ethernet port disabled 1: ethernet port enabled
Oil Pressure Switch Priority	-	0	1	0	0: crank cut is performed through oil pressure switch and oil pressure sender reading 1: crank cut is performed only through oil pressure switch
Flashing Relay ON Timer	min	0	1200	0	Delayed Simulate Mains Operation: max genset running time after Simulate Mains signal disappears. Dual Genset Systems: flashing relay ON state duration timer.
Flashing Relay OFF Timer	min	0	1200	0	Dual Genset Systems: flashing relay OFF state duration.
Real Time Clock Adjust	-	0	255	117	This parameter trims precisely the real time clock circuit. Values from 0 to 63 speed up the clock with 0.25sec/day steps. Values from 127 to 64 slow down the clock with 0.25sec/day steps.
Hysteresis Voltage	V-AC	0	30	8	This parameter provides the mains and genset voltage limits with a hysteresis feature in order to prevent faulty decisions. For example, when the mains are present, the mains voltage low limit will be used as the programmed low limit. When the mains fail, the low limit will be incremented by this value. It is advised to set this value to 8 volts.
Engine Control Only	-	0	1	0	0: Genset control 1: Engine control (no alternator)
Alternator Pole Pairs	-	1	8	2	This parameter is used for frequency to rpm conversion. For a 1500/1800 rpm engine select 2. For a 3000/3600 rpm engine select 1.
RPM from genset frequency	-	0	1	1	0: read rpm from the MPU input 1: convert frequency to rpm (using Alternator Pole Pairs)
Crank Teeth Count	-	1	244	30	This is the number of pulses generated by the magnetic pickup sensing unit in one turn of the flywheel.
SMS on Mains Change	-	0	1	0	This parameter controls SMS sending when mains voltages status is changed. No warnings generated. 0: no SMS on mains failed or restored 1: SMS sent on mains failed or restored
SMS on IP Change	-	0	1	0	This parameter controls SMS sending when IP address of GPRS connection is changed. No warnings generated. 0: no SMS on IP change 1: SMS sent on IP change

17.1. CONTROLLER CONFIGURATION GROUP (continued)

Parameter Definition	Unit	Min	Max	Factory Set	Description
E-mail on IP Change	-	0	1	0	<p>This parameter controls e-mail sending when IP address of GPRS or ethernet connection is changed. No warnings generated.</p> <p>0: no e-mail on IP change 1: e-mail sent on IP change</p>
Fuel Pump Low Limit	%	0	100	20	If the fuel level measured from the sender input falls below this level, then the FUEL PUMP function will become active.
Fuel Pump High Limit	%	0	100	80	If the fuel level measured from the sender input goes above this level, then the FUEL PUMP function will become passive.
Warning Before Start	-	0	1	1	<p>This parameter controls the activation of the ALARM output during "Engine Start Delay" timer before engine run.</p> <p>0: no warning before start 1: warning before start</p>
Latch all Warnings	-	0	1	0	<p>0: warnings are latching/non-latching on parameter control 1: all warnings are latched. Even if the fault source is removed, warnings will persist until manually reset.</p>
Remote Control Enable	-	0	1	1	<p>This parameter controls remote control of the unit through Rainbow, Modbus and Modbus TCP/IP.</p> <p>0: remote control disabled 1: remote control enabled</p>
Annunciator Mode	-	0	1	0	<p>0: normal operation 1: the unit becomes an annunciator of the remote unit. Engine/genset control functions are disabled.</p>
CT Location	-	Genset	Load	Genset	<p>0: CTs are at the genset side. Mains currents are not measured. 1: CTs are at load side. Both mains and genset currents are monitored following contactor status.</p>
Reverse CT Direction	-	0	1	0	<p>This parameter is useful to invert all CT polarities at the same time.</p> <p>0: normal CT polarity assumed. 1: reverse CT polarity assumed.</p>
Buzzer Enable	-	0	1	0	<p>Internal buzzer control</p> <p>0: buzzer disabled 1: buzzer enabled</p>
Log Record Period	sec	5	3600	5	<p>This parameter adjusts the data logging frequency to micro-SD or USB Flash memories. Frequent recording will require more memory capacity.</p> <p>With a period of 2 seconds, 4GB per year of memory is necessary.</p> <p>With a period of 1 minute, 133MB is consumed per year.</p>

17.1. CONTROLLER CONFIGURATION GROUP (continued)

Parameter Definition	Unit	Min	Max	Factory Set	Description
Unit Functionality	-	0	3	AMF	<p>0: AMF functionality. The unit controls both engine and load transfer. The genset starts based on mains status.</p> <p>1: ATS functionality. The unit controls the load transfer and issues REMOTE START signal based on mains status.</p> <p>2: REMOTE START functionality. The unit controls engine and alternator. The genset starts with external signal.</p> <p>3: SYNCH functionality. The unit controls the synchronization and load sharing. The genset starts with remote start signal coming from a mains synchronizer or ATS module</p> <p>4: MAINS SYN functionality: The unit controls the soft load transfer and issues REMOTE START signal based on mains status.</p> <p>5:RESERVED: Not used</p>
LCD Backlight Timer	min	0	1440	60	If no button is pressed during this period, then the unit will reduce the LCD screen backlight intensity in for economy.
Fuel Filling Timer	sec	0	36000	0	<p>After activation of the fuel pump function, if the Fuel Pump High Limit level is not reached, then the fuel pump will stop for safety.</p> <p>If this parameter is set to zero, then the timer is unlimited.</p>
SMS Commands Enabled	-	0	1	0	<p>0: SMS commands not accepted</p> <p>1: SMS commands are accepted but from listed telephone numbers only.</p>
Open with Last Mode	-	0	1	0	<p>0: The unit powers up in STOP mode</p> <p>1: The unit powers up in the same operating mode before power down.</p>
Pre-Transfer Delay	sec	0	60	0	<p>If this parameter is not zero, the unit will activate the Wait Before Transfer output function during this timer, before initiating a load transfer.</p> <p>This function is designed for elevator systems, in order to bring the cabin to a floor and <u>open doors</u> before transfer.</p>
E-mail on mains change	-	0	1	0	<p>0: No e-mail at mains status changes</p> <p>1: E-mails sent at mains status change</p>
Enable Auto not Ready Warning	-	0	1	0	<p>0: Auto not Ready Warning disabled</p> <p>1: Auto not Ready Warning enabled</p>
Fuel Pulses from MPU input	-	0	1	0	<p>0: MPU input is used for engine speed detection</p> <p>1: MPU input is used for reading the flowmeter pulses during fuel filling.</p>

17.1. CONTROLLER CONFIGURATION GROUP (continued)

Parameter Definition	Unit	Min	Max	Factory Set	Description
Fuel Pulses per Volume	-	0	65000	1000	This is the number of pulses produced by the flowmeter for the unit volume. This parameter is characteristic of the flowmeter used and should be set according to the flowmeter data.
Fuel Counter Unit	-	Liter	Gallon	Liter	This is the unit for the fuel counter
SMS on Engine Run/Stop	-	0	1	0	This parameter controls SMS sending when the engine runs or stops. No warnings generated. 0: no SMS on engine run/stop 1: SMS sent on engine run/stop
E-mail on Engine Run/Stop	-	0	1	0	This parameter controls e-mail sending when the engine runs or stops. No warnings generated. 0: no e-mail on engine run/stop 1: e-mail sent on engine run/stop
Fuel Counter Type	-	0	1	0	This parameter determines the purpose of fuel pulses 0: Fuel filling pulses, increment fuel counter 1: Fuel consumption pulses, display consumption.
Dual Genset Equal Aging Enabled	-	0	1	0	0: Equal aging not enabled 1: Equal aging enabled
CT Secondary Rating	-	0	1	0	0: xxx/5A 1: xxx/1A
Automatic Topology Detection	-	0	1	0	If this parameter is enabled, when the engine runs, the controller will detect the connection topology automatically and will select alarm levels accordingly. 0: auto detect not enabled 1: auto detect enabled
Maintenance Done Warning Enable	-	0	1	0	If enabled, the unit will generate a non-visual warning when maintenance counters are reset. In consequence, SMS and e-mails will be sent, the warning will be visible on the central monitoring system. 0: maintenance warning disabled 1: maintenance warning enabled
Stop Status Screens	-	0	1	0	0: Enable status screens 1: Disable status screens
Time Zone	min	-720	+720	0	This parameter adjusts the time zone of the controller, in order to allow internal real time clock to be synchronized to the UTC time.
GSM Location Information	-	0	1	0	0: no location information from GSM 1: location information read from GSM system.
Disable STOP at Loaddump	-	0	1	0	0: When Loaddump alarm occurs, genset contactor opens and genset runs until the end of the cooldown 1: When Loaddump alarm occurs, genset contactor opens but the genset continues running without timeout.

17.2. ELECTRICAL PARAMETERS GROUP

Parameter Definition	Unit	Min	Max	Factory Set	Description
Genset Current Transformer Primary	Amp	1	5000	500	This is the rated value of current transformers at the genset CT inputs. All transformers must have the same rating. The secondary of the transformer will be 5 Amps.
Mains Current Transformer Primary	Amp	1	5000	500	This is the rated value of current transformers at the mains CT inputs. All transformers must have the same rating. The secondary of the transformer will be 5 Amps.
Voltage Transformer Ratio	-	0	5000	1.0	This is the voltage transformer ratio. This value will multiply all voltage and power readings. If transformers are not used, the ratio should be set to 1.0
Nominal Voltage	V-AC	0	300	230	The nominal value of genset and mains voltages. Voltage limits are defined by reference to this value.
Nominal Frequency	Hz	0	500	50	The nominal value of genset and mains frequency. Frequency limits are defined by reference to this value.
Nominal Voltage-2	V-AC	0	300	120	When secondary voltage is selected, this is the nominal value of genset and mains voltages. Voltage limits are defined by reference to this value.
Nominal Frequency-2	Hz	0	500	60	When secondary frequency is selected, this is nominal value of genset and mains frequency. Frequency limits are defined by reference to this value.
Nominal Voltage-3	V-AC	0	300	120	When tertiary voltage is selected, this is the nominal value of genset and mains voltages. Voltage limits are defined by reference to this value.
Nominal Frequency-3	Hz	0	500	60	When tertiary frequency is selected, this is nominal value of genset and mains frequency. Frequency limits are defined by reference to this value.
Mains Voltage Low Limit	%	V-100	V+100	V-20%	If one of the mains phases goes under this limit, it means that the mains are off and starts the transfer to the genset in AUTO mode. The value is defined with reference to Nominal Voltage.
Mains Voltage High Limit	%	V-100	V+100	V+20%	If one of the mains phases goes over this limit, it means that the mains are off and starts the transfer to the genset in AUTO mode. The value is defined with reference to Nominal Voltage.
Mains Voltage Fail Timer	sec	0	10	1	If at least one of the mains phase voltages goes outside of the limits during this timer, it means that the mains are off and it starts the transfer to the genset in AUTO mode.

17.2. ELECTRICAL PARAMETERS GROUP (continued)

Parameter Definition	Unit	Min	Max	Factory Set	Description
Instant Mains Dropout	%	0	50	0	<p>If the mains phase voltages are outside limits, but not more than this parameter (with reference to nominal voltage), then the genset will run without releasing the mains contactor. When the genset is ready to take the load, the load will be transferred.</p> <p>If this parameter is set to zero then the mains contactor is immediately released at mains failure.</p>
Mains Frequency Low Limit	%	F-100	F+100	F-10%	If the mains frequency goes under this limit, it means that the mains are off and starts the transfer to the genset in AUTO mode. The value is defined with reference to Nominal Frequency.
Mains Frequency High Limit	%	F-100	F+100	F+10%	If the mains frequency goes over this limit, it means that the mains are off and starts the transfer to the genset in AUTO mode. The value is defined with reference to Nominal Frequency.
Mains Frequency Fail Timer	sec	0	10	1	If the mains frequency goes outside of the limits during this timer, it means that the mains are off and starts the transfer to the genset in AUTO mode.
Genset Low Voltage Warning Limit	%	V-100	V+100	V-15%	If one of the genset phase voltages goes under this limit when feeding the load, this will generate a GENSET LOW VOLTAGE warning.
Genset Low Voltage Shutdown Limit	%	V-100	V+100	V-20%	If one of the genset phase voltages goes under this limit when feeding the load, this will generate a GENSET LOW VOLTAGE shutdown alarm and the engine will stop.
Genset High Voltage Warning Limit	%	V-100	V+100	V+15%	If one of the genset phase voltages goes over this limit when feeding the load, this will generate a GENSET HIGH VOLTAGE warning.
Genset High Voltage Shutdown Limit	%	V-100	V+100	V+20%	If one of the genset phase voltages goes over this limit when feeding the load, this will generate a GENSET HIGH VOLTAGE shutdown alarm and the engine will stop.
Genset Voltage Fail Timer	sec	0	10	1	If at least one of the genset phase voltages goes outside of the limits during this timer, a genset voltage fault will occur.

17.2. ELECTRICAL PARAMETERS GROUP (continued)

Parameter Definition	Unit	Min	Max	Factory Set	Description
Genset Low Frequency Warning Limit	%	F-100	F+100	V-15%	If the genset frequency goes under this limit when feeding the load, this will generate a GENSET LOW FREQUENCY warning.
Genset Low Frequency Shutdown Limit	%	F-100	F+100	F-20%	If the genset frequency goes under this limit when feeding the load, this will generate a GENSET LOW FREQUENCY shutdown alarm and the engine will stop.
Genset High Frequency Warning Limit	%	F-100	F+100	F+15%	If the genset frequency goes over this limit when feeding the load, this will generate a GENSET HIGH FREQUENCY warning.
Genset High Frequency Shutdown Limit	%	F-100	F+100	F+20%	If the genset frequency goes over this limit when feeding the load, this will generate a GENSET HIGH FREQUENCY shutdown alarm and the engine will stop.
Genset Frequency Fail Timer	sec	0	10	1	If the genset frequency goes outside of the limits during this timer, a genset frequency fault will occur.
Low Battery Voltage Warning Limit	V-DC	5.0	35.0	12.0	If the battery voltage falls below this limit, this will generate a LOW BATTERY warning.
Low Battery Voltage Shutdown Limit	V-DC	5.0	35.0	9.0	If the battery voltage falls below this limit, this will generate a LOW BATTERY shutdown alarm and the engine will stop.
High Battery Voltage Warning Limit	V-DC	5.0	35.0	29.0	If the battery voltage goes over this limit, this will generate a HIGH BATTERY warning.
High Battery Voltage Shutdown Limit	V-DC	5.0	35.0	30.0	If the battery voltage goes over this limit, this will generate a HIGH BATTERY shutdown alarm and the engine will stop.
Battery Voltage Fail Timer	sec	0	10	3	If the battery voltage goes outside of the limits during this timer, a battery voltage fault will occur.
Genset Voltage Unbalance Limit	%	0	100	0.0	If any genset phase voltage differs from the average more than this limit, it will generate a Voltage Unbalance fault condition. The action taken upon fault condition is programmable. If this parameter is set to 0.0 then voltage unbalance is not monitored
Genset Voltage Unbalance Action	-	0	3	0	0: no action 1: shutdown alarm 2: load dump alarm 3: warning

17.2. ELECTRICAL PARAMETERS GROUP (continued)

Parameter Definition	Unit	Min	Max	Factory Set	Description
Genset Current Unbalance Limit	%	0	100	0.0	If any genset phase current differs from the average more than this limit, it will generate a Current Unbalance fault condition. The action taken upon fault condition is programmable. If this parameter is set to 0.0 then voltage unbalance is not monitored
Genset Current Unbalance Action	-	0	3	0	0: no action 1: shutdown alarm 2: loaddump alarm 3: warning
Genset Reverse Power Warning Limit	kW	0	50000	0	If the genset power is negative and goes above this limit then a REVERSE POWER warning will be generated. If this parameter is set to 0 then reverse power fault is not monitored.
Genset Reverse Power Loaddump Limit	kW	0	50000	0	If the genset power is negative and goes above this limit then a REVERSE POWER loaddump will be generated.
Genset Reverse Power Fail Timer	sec	0	120	5	If the genset power is negative and over limits during this timer, a reverse power fault will occur.
Genset Overcurrent Limit	Amp	0	50000	0	If one of the genset phase currents goes over this limit when feeding the load, this will generate a genset overcurrent fault condition. The action taken upon fault condition is programmable. If this parameter is set to 0 then overcurrent fault is not monitored.
Genset Overcurrent Limit-2	Amp	0	50000	0	When secondary voltage is selected, if one of the genset phase currents goes over this limit when feeding the load, this will generate a genset overcurrent fault condition. The action taken upon fault condition is programmable. If this parameter is set to 0 then overcurrent fault is not monitored.
Genset Overcurrent Limit-3	Amp	0	50000	0	When tertiary voltage is selected, if one of the genset phase currents goes over this limit when feeding the load, this will generate a genset overcurrent fault condition. The action taken upon fault condition is programmable. If this parameter is set to 0 then overcurrent fault is not monitored.
Genset Overcurrent Action	-	0	3	0	0: shutdown alarm 1: loaddump alarm
Overcurrent Time Multiplier	0	1	64	16	This parameter defines the reaction speed of the overcurrent detector. A higher number means higher sensitivity. Detailed explanation is given at chapter: "Overcurrent Protection"

17.2. ELECTRICAL PARAMETERS GROUP (continued)

Parameter Definition	Unit	Min	Max	Factory Set	Description
Genset Overload Limit	kW	0	50000	0	If the total genset active power goes over this limit when feeding the load, this will generate a genset overload loaddump alarm. If this parameter is set to 0 then overload fault is not monitored.
Genset Overload Fail Timer	sec	0	120	3	If the genset active power is over the limit during this timer, an overload fault will occur.
Load Shedding Low Limit	kW	0	50000	0	If the genset power goes below this limit then the load shedding relay will be deactivated. Review chapter "Load Shedding" for more details.
Load Shedding High Limit	kW	0	50000	0	If the genset power goes above this limit then the load shedding relay will be activated. Review chapter "Load Shedding" for more details.
Load Add Delay	sec	0	240	0	This is the minimum delay between 2 load_add pulses. Review chapter "Load Shedding" for more details.
Load Subtract-Add Delay	min	0	120	0	This is the minimum delay required for a load_add pulse after a load_subtract pulse. Review chapter "Load Shedding" for more details.
Mains Waiting Timer	sec	0	50000	30	This is the time between the mains voltages and frequency entered within the limits and the generator contactor is deactivated.
Mains Connection Topology	-	0	7	5	<p>This is the connection topology of mains voltages and CTs. Detailed explanations are given in the chapter: "TOPOLOGIES".</p> <p>0: 2 phase, 3 wire L1-L2 1: 2 phase, 3 wire L1-L3 2: 3 phase, 3 wire 3: 3 phase, 3 wire, 2CTs L1-L2 4: 3 phase, 3 wire, 2CTs L1-L3 5: 3 phase, 4 wire star 6: 3 phase, 4 wire delta 7: single phase, 2 wire</p>
Genset Connection Topology	-	0	7	5	<p>This is the connection topology of genset voltages and CTs. Detailed explanations are given in the chapter: TOPOLOGIES.</p> <p>0: 2 phase, 3 wire L1-L2 1: 2 phase, 3 wire L1-L3 2: 3 phase, 3 wire 3: 3 phase, 3 wire, 2CTs L1-L2 4: 3 phase, 3 wire, 2CTs L1-L3 5: 3 phase, 4 wire star 6: 3 phase, 4 wire delta 7: single phase, 2 wire</p>

17.2. ELECTRICAL PARAMETERS GROUP (continued)

Parameter Definition	Unit	Min	Max	Factory Set	Description
Mains Contactor Timer	sec	0	600	0.5	This is the period after the generator contactor has been deactivated and before the mains contactor has been activated.
Mains MCB Close Pulse	sec	0	10	0.5	After the mains MCB_undervoltage coil is energized and mains MCB_undervoltage coil timer is elapsed, the mains MCB_close relay will be activated during this period. Review chapter " Motorized Circuit Breaker Control " for more details.
Mains MCB Open Pulse	sec	0	10	0.5	The mains MCB_open relay will be activated during this period. Review chapter " Motorized Circuit Breaker Control " for more details.
Mains MCB Undervoltage Coil Timer	sec	0	10	0.5	The mains MCB_undervoltage coil is energized during this period before the mains MCB_close relay is activated. Review chapter " Motorized Circuit Breaker Control " for more details.
MCB Alarm Level	-	0	1	0	0: shutdown alarm 1: loaddump alarm
Mains MCB Fail Timer	sec	0	600	2.0	If a mains MCB feedback input is defined and if the mains MCB fails to change position before the expiration of this timer, then a fault condition occurs.
Mains Phase Order Check Enable	-	0	1	0	0: mains phase order checking disabled 1: if mains phase order is faulty, then a warning is given and mains contactor deenergized.
Genset Contactor Timer	sec	0	600	0.5	This is the period after the mains contactor has been deactivated and before the genset contactor has been activated.
Genset MCB Close Pulse	sec	0	10	0.5	After the genset MCB_undervoltage coil is energized and genset MCB_undervoltage coil timer is elapsed, the genset MCB_close relay will be activated during this period. Review chapter " Motorized Circuit Breaker Control " for more details.
Genset MCB Open Pulse	sec	0	10	0.5	The genset MCB_open relay will be activated during this period. Review chapter " Motorized Circuit Breaker Control " for more details.
Genset MCB Undervoltage Coil Timer	sec	0	10	0.5	The genset MCB_undervoltage coil is energized during this period before the genset MCB_close relay is activated. Review chapter " Motorized Circuit Breaker Control " for more details.

17.2. ELECTRICAL PARAMETERS GROUP (continued)

Parameter Definition	Unit	Min	Max	Factory Set	Description
GCB Alarm Level	-	0	1	0	0: shutdown alarm 1: loaddump alarm
Genset MCB Fail Timer	sec	0	600	2.0	If a genset MCB feedback input is defined and if the genset MCB fails to change position before the expiration of this timer, then a fault condition occurs.
Genset Phase Order Check Enable	-	0	1	0	0: genset phase order checking disabled 1: if genset phase order is faulty, then a genset phase order fail loaddump alarm is given.
Busbar Fail Timer	sec	0	30	2.0	When a genset closes to the Busbar, if the master genset controller does not detect the Busbar voltage at the expiration of this period, a “BUSBAR FAIL” fault condition will occur.
Busbar Ready Timer	sec	0	30	2.0	This is the delay after all generators close to the busbar and before the master genset controller acknowledges “Busbar ready” signal.
Multi Load Subtract Power Level	kW	0	65000	0	When the genset active power goes over this limit, the controller will start subtracting load as described in chapter Five Step Load Management .
Multi Load Add Power Level	kW	0	65000	0	When the genset active power goes below this limit, the controller will start adding load as described in chapter Five Step Load Management .
Multi Load Subtract Start Delay	sec	0	36000	0	If the load stays over the Multi Load Subtract Power Level parameter during this timer, then 1 step of load is subtracted.
Multi Load Subtract Wait Delay	sec	0	36000	0	This is the minimum period between two load subtract operations.
Multi Load Add Start Delay	sec	0	36000	0	If the load stays below the Multi Load Add Power Level parameter during this timer, then 1 step of load is added.
Multi Load Add Wait Delay	sec	0	36000	0	This is the minimum period between two load add operations.
Excess power Warning Limit	kW	0	50000	0	If the genset active power goes above this limit then the controller will give an Excess Power Warning.

17.3. ENGINE PARAMETERS GROUP

Parameter Definition	Unit	Min	Max	Factory Set	Description
Nominal RPM	rpm	0	50000	1500	The nominal value of engine rpm. Low-high rpm limits are defined by reference to this value.
Nominal RPM-2	rpm	0	50000	1800	When secondary frequency is selected, this is the nominal value of engine rpm. Low-high rpm limits are defined by reference to this value.
Nominal RPM-3	rpm	0	50000	1800	When tertiary frequency is selected, this is the nominal value of engine rpm. Low-high rpm limits are defined by reference to this value.
Low RPM Warning Limit	%	R-100	R+100	R-10%	If the engine rpm goes under this limit when feeding the load, this will generate a GENSET LOW RPM warning.
Low RPM Shutdown Limit	%	R-100	R+100	R-15%	If the engine rpm goes under this limit when feeding the load, this will generate a GENSET LOW RPM shutdown alarm and the engine will stop.
High RPM Warning Limit	%	R-100	R+100	R+10%	If the engine rpm goes over this limit when feeding the load, this will generate a GENSET HIGH RPM warning.
High RPM Shutdown Limit	%	R-100	R+100	R+15%	If the engine rpm goes over this limit when feeding the load, this will generate a GENSET HIGH RPM shutdown alarm and the engine will stop.
RPM Fail Timer	sec	0	10	3	If the engine rpm goes outside of the limits during this timer, an engine speed fault will occur.
Overspeed Overshoot Limit	%	HRSL-100	HRSL +100	HRSL +10%	If the engine rpm goes over the "High RPM Shutdown Limit" by this quantity, this will generate immediately a GENSET HIGH RPM shutdown alarm and the engine will stop.
Loss of Signal Check	-	0	1	0	0: speed signal existency not checked 1: If the speed signal is lost, it will generate a Speed Signal Lost fault condition. The action taken upon fault condition is programmable.
Loss of Speed Signal Action	-	0	2	0	0: shutdown alarm 1: load dump alarm 2: warning
Loss of Speed Signal Timer	sec	0	240	0	If the speed signal is lost during this timer, a Speed Signal Lost fault will occur.
Low Charge Voltage Warning Limit	V-DC	0	40	6.0	If the charge alternator voltage goes under this limit, a charge alternator voltage warning will occur.
Low Charge Voltage Shutdown Limit	V-DC	0	40	4.0	If the charge alternator voltage goes under this limit, a charge alternator voltage shutdown will occur and the engine will stop.

17.3. ENGINE PARAMETERS GROUP (continued)

Parameter Definition	Unit	Min	Max	Factory Set	Description
Charge Voltage Fail Timer	sec	0	120	1	If the charge alternator voltage goes under limits during this timer, a charge alternator voltage fault will occur.
Engine Heating Temperature	°C	0	80	0	If it is requested that the engine runs without load until reaching a certain temperature, this parameter defines the temperature.
Engine Start Delay	min	0	720	1	This is the time between the mains fails and the fuel solenoid turns on before starting the genset. It prevents unwanted genset operation in battery backed-up loads.
Preheat Timer	sec	0	30	0	This is the time after the fuel solenoid is energized and before the genset is started. During this period the PREHEAT relay output is energized (if assigned by Relay Definitions)
Crank Timer	sec	1	15	6	This is the maximum start period. Starting will be automatically cancelled if the genset fires before the timer.
Wait Between Starts	sec	1	240	10	This is the waiting period between two start attempts.
Engine Heating Timer	sec	0	240	4	This is the period used for engine heating before load transfer.
Engine Heating Method	-	0	1	0	The genset will not take the load before engine heating is completed. 0: engine is heated during Engine Heating Timer . 1: engine is heated until the coolant temperature reaches the Engine Heating Temperature and at least during the Engine Heating Timer .
Cooldown Timer	sec	0	600	120	This is the period that the generator runs for cooling purpose after the load is transferred to mains.
Stop Solenoid Timer	sec	0	90	10	This is the maximum time duration for the engine to stop. During this period the STOP relay output is energized (if assigned by Relay Definitions). If the genset has not stopped after this period, a FAIL TO STOP warning occurs.
Number of Starts	-	1	6	3	Number of Starts
Choke Timer	sec	0	240	5	This is the control delay of CHOKE output. The choke output is activated together with the crank output. It is released after this delay or when engine runs (whichever occurs first).

17.3. ENGINE PARAMETERS GROUP (continued)

Parameter Definition	Unit	Min	Max	Factory Set	Description
Idle Speed (Run) Timer	sec	0	240	0	When the engine runs, the Idle output relay function will be active during this timer. While the IDLE output is active, low voltage, low frequency and low rpm checks are disabled.
Idle Speed (Stop) Timer	sec	0	240	0	Before the engine stops, the Idle output relay function will be active during this timer. While the IDLE output is active, low voltage, low frequency and low rpm checks are disabled.
Idle Holdoff Timer	sec	0	30	10	While the IDLE period is over, low voltage, low frequency and low speed checks are enabled after the expiration of this timer.
Gas Solenoid Delay	sec	0	240	5	The gas solenoid of the gas engine (if assigned by Relay Definitions) will be opened after this delay during cranking.
Crank Cut Voltage	V-AC	0	65000	100	The crank relay output is deenergized when the genset phase L1 voltage reaches this limit.
Crank Cut Frequency	Hz	0	100	10	The crank relay output is deenergized when the genset frequency reaches this limit.
Crank Cut RPM	rpm	0	65000	500	The crank relay output is deenergized when the engine rpm reaches this limit.
Crank Cut Charge Voltage	V-DC	0	40	6	The crank relay output is deenergized when the charge alternator voltage reaches this limit.
Crank Cut with Oil Pressure	-	0	1	0	0: no crank cut with oil pressure 1: cranking is cut when oil pressure switch is open or the oil pressure measured is above shutdown limit.
Crank Cut with Oil Pressure Delay	sec	0	30	2	If crank cutting with oil pressure is enabled, cranking is cut after this delay when oil pressure switch is open or the oil pressure measured is above shutdown limit.
Charge Input Connected	-	0	1	0	0: Crank cutting with charge input disabled 1: Crank cutting with charge input enabled
Fuel Tank Capacity	Lt	0	65000	0	The full capacity of the fuel tank. If this parameter is zero, the fuel quantity in the tank is not displayed.
Fuel Consumption per Hour	%	0	100	0.0	This parameter is the threshold for sending FUEL THEFT and FUELLING sms messages. If this parameter is set to 0, then no Fuel Theft and Fuelling sms messages will be sent. If SMS is required, set this parameter to a value above the hourly fuel consumption of the genset.

17.3. ENGINE PARAMETERS GROUP (continued)

Parameter Definition	Unit	Min	Max	Factory Set	Description
Coolant Cooler On	°C	0	250	90	If the coolant temp is above this limit then the cooler relay function will become active.
Coolant Cooler Off	°C	0	250	80	If the coolant temp is below this limit then the cooler relay function will become inactive.
Coolant Heater On	°C	0	250	50	If the coolant temp is below this limit then the heater relay function will become active.
Coolant Heater Off	°C	0	250	60	If the coolant temp is above this limit then the heater relay function will become inactive.
Fan Overrun Timer	sec	0	240	0	The cooler relay will stay active during this timer after the coolant temp is below "Coolant Cooler Off" limit.
Canopy Fan Turn-On	°C	0	250	90	If the canopy temp is above this limit then the canopy fan relay function will become active.
Canopy Fan Turn-Off	°C	0	250	80	If the canopy temp is below this limit then the canopy fan relay function will become inactive.
Ambient Fan Turn-On	°C	0	250	90	If the ambient temp is above this limit then the ambient fan relay function will become active.
Ambient Fan Turn-Off	°C	0	250	80	If the ambient temp is below this limit then the ambient fan relay function will become inactive.
Service-1 Engine Hours	hours	0	5000	250	The SERVICE REQUEST led indicator will turn on after this quantity of engine hours from the last service. If the period is set to '0' no SERVICE REQUEST will be generated depending on service-1 engine hours.
Service-1 Period	month	0	24	6	The SERVICE REQUEST led indicator will turn on after this amount of time from the last service. If the period is set to '0' no SERVICE REQUEST will be indicated depending on Service-1 Period.
Service-1 Alarm Level	-	0	3	3	0: no action 1: shutdown alarm 2: loaddump alarm 3: warning

17.3. ENGINE PARAMETERS GROUP (continued)

Parameter Definition	Unit	Min	Max	Factory Set	Description
Service-2 Engine Hours	hours	0	5000	250	The SERVICE REQUEST led indicator will turn on after this quantity of engine hours from the last service. If the period is set to '0' no SERVICE REQUEST will be generated depending on service-2 engine hours.
Service-2 Period	month	0	24	6	The SERVICE REQUEST led indicator will turn on after this amount of time from the last service. If the period is set to '0' no SERVICE REQUEST will be indicated depending on Service-2 Period.
Service-2 Alarm Level	-	0	3	0	0: no action 1: shutdown alarm 2: loaddump alarm 3: warning
Service-3 Engine Hours	hours	0	5000	250	The SERVICE REQUEST led indicator will turn on after this quantity of engine hours from the last service. If the period is set to '0' no SERVICE REQUEST will be generated depending on service-3 engine hours.
Service-3 Period	month	0	24	6	The SERVICE REQUEST led indicator will turn on after this amount of time from the last service. If the period is set to '0' no SERVICE REQUEST will be indicated depending on Service-3 Period.
Service-3 Alarm Level	-	0	3	0	0: no action 1: shutdown alarm 2: loaddump alarm 3: warning
J1939 Enable	-	0	1	0	0: The J1939 port is inoperative. 1: The analog measurements (oil, temp, and rpm) are picked up from the ECU. If the ECU communication is lost, then the engine will be stopped.

17.3. ENGINE PARAMETERS GROUP (continued)

Parameter Definition	Unit	Min	Max	Factory Set	Description
J1939 Engine Brand	-	0	15	0	0: GENERIC 1: CUMMINS 2: DETROIT DIESEL 3: DEUTZ 4: JOHN DEERE 5: PERKINS 6: VOLVO 7: CATERPILLAR 8: SCANIA 9: IVECO 10: MTU-MDEC 11: BOSCH 12: BAUDOUIN Other values: Reserved. Do not use.

17.3. ENGINE PARAMETERS GROUP (continued)

J1939 ECU Type	-	0	7	0	GENERIC ENGINE BRAND 0: Generic CUMMINS ENGINE 0: CM850 1: CM570 DETROIT DIESEL ENGINE 0: Generic DEUTZ ENGINE 0: Generic 1: EMR2 2: EMR3 JOHN DEERE ENGINE 0: Generic PERKINS ENGINE 0: Generic 1: ADEM3 2: ADEM 1.3 VOLVO ENGINE 0: Generic 1: without CIU unit 2: EDC4 CATERPILLAR ENGINE 0: Generic SCANIA ENGINE 0: Generic 1: S6 (Single Speed) 2: S8 (All Speed) IVECO ENGINE 0: Generic 1: Vector 2: NEF/CURSOR MTU-MDEC ENGINE 0: MDEC 302 1: MDEC 201 2: MDEC 303 3: MDEC 304 4: MDEC 506 BOSCH INJECTION SYSTEM 0: Generic 1: EDC 731 2: EDC 9.3 BAUDOUIN 0: Generic 1: WISE10 2: WISE15
----------------	---	---	---	---	--

17.3. ENGINE PARAMETERS GROUP (continued)

Parameter Definition	Unit	Min	Max	Factory Set	Description
J1939 Speed Adjust	%	-100	+100	0.0	This parameter adjusts the speed of an ECU controlled engine by +/- 8%.
High Air Inlet Temperature Warning Limit	°C	0	200	0	If the air inlet temperature measured through ECU is over this limit, then a high air inlet temperature warning will occur.
High Air Inlet Temperature Alarm Limit	°C	0	200	0	If the air inlet temperature measured through ECU is over this limit, then a high air inlet temperature shutdown/loaddump alarm will occur.
High Air Inlet Temperature Alarm Action	-	0	1		0: shutdown alarm 1: loaddump alarm
Low Coolant Level Warning Limit	%	0	100	0	If the coolant level measured through ECU is below this limit, then a low coolant level warning will occur.
Low Coolant Level Alarm Limit	%	0	100	0	If the coolant level measured through ECU is below this limit, then a low coolant level shutdown/loaddump alarm will occur.
Low Coolant Level Alarm Action	-	0	1	0	0: shutdown alarm 1: loaddump alarm
Battery Charge Run Voltage	V-DC	0	35.0	0	If the battery voltage goes below this limit the engine will be automatically started in order to charge the battery using the charge alternator.
Battery Charge Run Timer	min	0	1200	0	If the battery voltage goes below the Battery Charge Run Voltage limit, the engine will be automatically run during this period in order to charge the battery using the charge alternator.
Oil Pump Stop Pressure	bars	0	20	0	The oil pump is activated prior to the crank cycle and stopped when this pressure level is reached. If this value is set to zero, then the oil pump is not activated.
Service Reset-1	-	0	1	0	0: no action 1: reset service-1 counters
Service Reset-2	-	0	1	0	0: no action 1: reset service-3 counters
Service Reset-3	-	0	1	0	0: no action 1: reset service-3 counters
Disable ECU speed control	-	0	1	0	0: Engine speed checking is performed with the RPM information coming from the engine ECU unit. 1: the RPM information coming from the engine ECU unit is not used for engine speed checking.
J1939 SPN Mask	-	0	65535	0	The SPN number written to this parameter is excluded from engine ECU alarm list.
J1939 FMI Mask	-	0	65535	0	The FMI number written to this parameter is excluded from engine ECU alarm list

17.4. ADJUST DATE AND TIME



These parameters allow adjusting the battery backup real time clock of the module. Once set, the clock will continue to run even if DC power is removed from the unit.

Parameter Definition	Unit	Min	Max	Description
Date	-	01	31	Current day of the month.
Month	-	01	12	Current month.
Year	-	00	99	Last two digits of the current year.
Hours	-	00	23	Current hour of the day.
Minutes	-	00	59	Current minute of the hour.
Seconds	-	00	59	Current second of the minute.

17.5. WEEKLY OPERATION SCHEDULE



In AUTO mode, it is possible to define the periods where automatic operation is desired. It may be required that the genset does not start at night or weekends.

Weekly schedule programs allow an hourly setting of automatic operation of the unit during one week.

There are 7days x 24hours =144 parameters. Each hour of the week can be independently defined as AUTO or OFF period.



If automatic operation is disabled by the weekly exerciser, the AUTO led will flash.

17.6. EXERCISER SCHEDULE



The unit provides 7 independent automatic exerciser programs. Automatic exercise may be done in weekly or monthly basis.

If monthly exercise is selected, the week, day and hour is adjustable for each exercise item.

If weekly exercise is selected, the day and hour is adjustable for each exercise item.

Exercise can be done with or without load.

Thus the genset can be instructed to run automatically in given days and times of a week and take the load.

17.7. SENDER CONFIGURATION

The unit has 4 analog sender inputs. Only parameters of one sender are explained below. Other senders have identical parameter set.

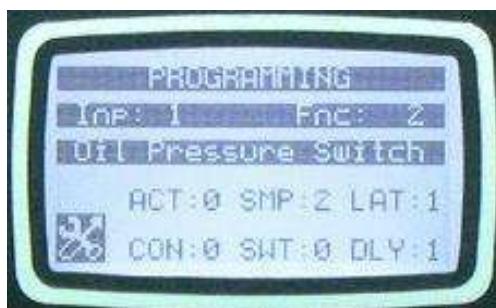
Each sender has 16 step programmable curves. The sender name and reading unit is freely programmable, thus the sender can be adapted to any type through programming.

Each sender has below programmable parameters:

Parameter Definition	Unit	Min	Max	Factory Set	Description
Sender Type	-	0	15		Selects between predefined sender functions. If this parameter is set to 13-14-15 then the sender name string can be freely entered.
Alarm Level	-	0	1		0: shutdown alarm 1: loaddump alarm
Alarm Handling	-	0	3		0: always 1: on engine running 2: after hold-off timer 3: reserved
Sender Open Alarm	-	0	3		If sender resistor is above 5000 ohms, a fault case is generated. This parameter defines the action taken upon fault case. 0: no alarm 1: shutdown alarm 2: loaddump alarm 3: warning
Low Alarm Check Enable	0	0	1		The low alarm may be selected as shutdown or loaddump with "alarm level" parameter. 0: low value alarm disabled 1: low value alarm enabled
Low Warning Check Enable	0	0	1		0: low value warning disabled 1: low value warning enabled
High Alarm Check Enable	0	0	1		The high alarm may be selected as shutdown or loaddump with "alarm level" parameter. 0: high value alarm disabled 1: high value alarm enabled
High Warning Check Enable	0	0	1		0: high value warning disabled 1: high value warning enabled
Low Alarm Level	x	0	10000		If enabled, defines the low alarm limit. The low alarm may be selected as shutdown or loaddump with "alarm level" parameter.
Low Warning Level	x	0	10000		If defined, defines the low warning.
High Alarm Level	x	0	10000		If enabled, defines the high alarm limit. The high alarm may be selected as shutdown or loaddump with "alarm level" parameter.
High Warning Level	x	0	10000		If defined, defines the high warning.

Parameter Definition	Unit	Min	Max	Factory Set	Description
Sender Curve-1 ohm	ohms	0	5000		Point-1 ohm value
Sender Curve-1 value	x	0	10000		Point-1 reading
Sender Curve-2 ohm	ohms	0	5000		Point-2 ohm value
Sender Curve-2 value	x	0	10000		Point-2 reading
Sender Curve-3 ohm	ohms	0	5000		Point-3 ohm value
Sender Curve-3 value	x	0	10000		Point-3 reading
Sender Curve-4 ohm	ohms	0	5000		Point-4 ohm value
Sender Curve-4 value	x	0	10000		Point-4 reading
Sender Curve-5 ohm	ohms	0	5000		Point-5 ohm value
Sender Curve-5 value	x	0	10000		Point-5 reading
Sender Curve-6 ohm	ohms	0	5000		Point-6 ohm value
Sender Curve-6 value	x	0	10000		Point-6 reading
Sender Curve-7 ohm	ohms	0	5000		Point-7 ohm value
Sender Curve-7 value	x	0	10000		Point-7 reading
Sender Curve-8 ohm	ohms	0	5000		Point-8 ohm value
Sender Curve-8 value	x	0	10000		Point-8 reading
Sender Curve-9 ohm	ohms	0	5000		Point-9 ohm value
Sender Curve-9 value	x	0	10000		Point-9 reading
Sender Curve-10 ohm	ohms	0	5000		Point-10 ohm value
Sender Curve-10 value	x	0	10000		Point-10 reading
Sender Curve-11 ohm	ohms	0	5000		Point-11 ohm value
Sender Curve-11 value	x	0	10000		Point-11 reading
Sender Curve-12 ohm	ohms	0	5000		Point-12 ohm value
Sender Curve-12 value	x	0	10000		Point-12 reading
Sender Curve-13 ohm	ohms	0	5000		Point-13 ohm value
Sender Curve-13 value	x	0	10000		Point-13 reading
Sender Curve-14 ohm	ohms	0	5000		Point-14 ohm value
Sender Curve-14 value	x	0	10000		Point-14 reading
Sender Curve-15 ohm	ohms	0	5000		Point-15 ohm value
Sender Curve-15 value	x	0	10000		Point-15 reading
Sender Curve-16 ohm	ohms	0	5000		Point-16 ohm value
Sender Curve-16 value	x	0	10000		Point-16 reading
Sender Name	-	-	-		If the sender type parameter is set to zero (not used), this string is used as sender name while displaying the sender reading.
Sender Low Fault String	-	-	-		If the sender type parameter is set to zero (not used), this string is used as sender low value fault in the alarm display.
Sender High Fault String	-	-	-		If the sender type parameter is set to zero (not used), this string is used as sender high value fault in the alarm display.

17.8. DIGITAL INPUT CONFIGURATION



The unit has 8 digital inputs. By using external input extension modules, up to 40 inputs in total are available.

Only parameters of one input are explained below. Other inputs have identical parameter set.

The input name is freely programmable, thus the input can be adapted to any functionality through programming.



The input name entry is made through RainbowPlus program only.

Each sender has below programmable parameters:

Parameter Definition	Unit	Min	Max	Factory Set	Description
Input Function	-	0	99		Selects between predefined input functions. Selected input name is displayed in the line below. If this parameter is set to 0 then the input name string can be freely entered.
Action	-	0	3		0: shutdown alarm 1: loaddump alarm 2: warning 3: no fault condition from this input.
Sampling	-	0	3		0: always 1: on engine running 2: after hold-off timer 3: reserved
Latching	-	0	1		0: non-latching. The fault disappears when cause is removed. 1: latching. The fault persists even if the cause is removed. Requires manual reset.
Contact type	-	0	1		0: Normally open 1: Normally closed
Switching	-	0	1		0: Battery negative 1: Battery positive
Response delay	-	0	3		0: No delay 1: Delayed (1sec) 2: Delayed (10sec) 3: Delayed (1800sec)

INPUT FUNCTION LIST

No	Description
1	User Defined Function
2	Low Oil Press. Switch
3	High Temp. Switch
4	Coolant Level Switch
5	Rectifier Fail Switch
6	Emergency Stop
7	Alternator High Temp
8	Excitation Loss Sw.
9	Low Fuel Switch
10	Earthquake Detector
11	Gen Cont Auxiliary
12	Mains Cont Auxiliary
13	Force AUTO Mode
14	Force OFF Mode
15	Force TEST Mode
16	Over Load Switch
17	Manual Fuel Fill!
18	Priority
19	Remote Start
20	Disable Auto Start
21	Force to Start
22	Fault Reset
23	Alarm Mute
24	Panel Lock
25	Fuel Pump Switch
26	Secondary Volt&Freq
27	Disable Protections
28	Auto Restore Inhibit
29	GensetLoadingInhibit
30	Air Flap Fault
31	Canopy Door Open
32	Station Door Open
33	Station Over-Heat Sw.
34	Weather Cloudy
35	Weather Rainy
36	Lightning
37	Cooler Fan Fault
38	Heater Fan Fault
39	Canopy Fan Fault
40	Station Fan Fault

No	Description
41	Over Resonance
42	Short-Circuit Alarm
43	Reset Service 1 Alm
44	Reset Service 2 Alm
45	Reset Service 3 Alm
46	Heavy Duty
47	Synchro Genset Run
48	Synch Genset on Load
49	Program Lock
50	Fire Circuit Press.Sw.
51	Lamp Test
52	Combat Mode
53	Tertiary Volt Freq.
54	Remote priority+1
55	Remote priority+2
56	Remote priority+4
57	Remote priority+8
58	Mains restore inhibit
59	Speed UP
60	Speed DOWN
61	Force parallel op.
62	-
63	-
64	-
65	-
66	-
67	-
68	-
69	-
70	-
71	-
72	-
73	-
74	-
75	-
76	-
77	-
78	-
79	-
80	-

No	Description
81	-
82	-
83	-
84	-
85	-
86	-
87	-
88	-
89	-
90	-
91	-
92	-
93	-
94	-
95	-
96	-
97	-
98	-
99	-
100	Input not in Use

17.9. OUTPUT CONFIGURATION

The parameters below define the functions of relay outputs. The unit has 6 relay outputs. All relays have programmable functions, selected from a list.

Relays may be extended up to 40 using **Relay Extension Modules**. Other relays are in the optional Extension Modules.

Parameter Definition	Factory set	Terminal number	Description
Relay-01	3	4	Factory set as Crank Relay output
Relay-02	1	5	Factory set as Fuel Relay output
Relay-03	2	6	Factory set as Horn Relay output
Relay-04	8	7	Factory set as Preheat Relay output
Relay-05	4	8	Factory set as Stop Relay output
Relay-06	7	9	Factory set as Idle Speed Relay output

Relay-09	1	-	Relay extension module – 1
Relay-10	1	-	Relay extension module – 1
Relay-11	1	-	Relay extension module – 1
Relay-12	1	-	Relay extension module – 1
Relay-13	1	-	Relay extension module – 1
Relay-14	1	-	Relay extension module – 1
Relay-15	1	-	Relay extension module – 1
Relay-16	1	-	Relay extension module – 1
Relay-17	1	-	Relay extension module – 2
Relay-18	1	-	Relay extension module – 2
Relay-19	1	-	Relay extension module – 2
Relay-20	1	-	Relay extension module - 2
Relay-21	1	-	Relay extension module - 2
Relay-22	1	-	Relay extension module - 2
Relay-23	1	-	Relay extension module - 2
Relay-24	1	-	Relay extension module - 2
Relay-25	1	-	Relay extension module - 3
Relay-26	1	-	Relay extension module - 3
Relay-27	1	-	Relay extension module - 3
Relay-28	1	-	Relay extension module - 3
Relay-29	1	-	Relay extension module - 3
Relay-30	1	-	Relay extension module - 3
Relay-31	1	-	Relay extension module - 3
Relay-32	1	-	Relay extension module - 3
Relay-33	1	-	Relay extension module - 4
Relay-34	1	-	Relay extension module - 4
Relay-35	1	-	Relay extension module - 4
Relay-36	1	-	Relay extension module - 4
Relay-37	1	-	Relay extension module - 4
Relay-38	1	-	Relay extension module - 4
Relay-39	1	-	Relay extension module - 4
Relay-40	1	-	Relay extension module - 4



Below is a short list for reference purposes. Please use the RainbowPlus program for complete selection list.

OUTPUT FUNCTION LIST

No	Description
1	Fuel
2	Horn
3	Crank
4	Stop Solenoid
5	Genset Contactor
6	Mains Contactor
7	Idle Speed
8	Preheat
9	Alternate Crank
10	Fuel Main Winding
11	Genset Close Pulse
12	Genset Open Pulse
13	Genset UV Coil
14	Mains Close Pulse
15	Mains Open Pulse
16	Mains UV Coil
17	Flashing Relay
18	Gas Solenoid
19	Fuel Pump Control
20	Choke
21	Block Heater
22	Coolant Cooler
23	Coolant Heater
24	Fan Control
25	Air Flap Control
26	Canopy Fan Control
27	Ambient Fan Control
28	Remote Start Output
29	Genset Ready
30	Bus Bar Contactor
31	Bus Bar Close Pulse
32	Bus Bar Open Pulse
33	Bus Bar UV Coil
34	Load Shedding
35	Load Add
36	Load Substract
37	Service 1 Request
38	Service 2 Request
39	Service 3 Request
40	Mains Ph.Order Fail
41	Genset Ph.Order Fail
42	Auto Ready
43	Weekly Schedule On
44	Exerciser On
45	Mains Fail

No	Description
46	Pgm Mode Active
47	Engine Running
48	Genset Voltage Ok
49	Alarm Check Enable
50	Oil Pressure Ok!
51	Shutdown Alarm
52	Loaddump Alarm
53	Warning Alarm
54	Shutdown or Loaddump
55	Shut. or LDD or Warn
56	Test Mode
57	Auto Mode
58	Manual Mode
59	Off Mode
60	Not In Auto
61	Genset At Rest
62	Waiting Before Fuel
63	Preheating
64	Waiting Oil Flash Off
65	Engine Heating
66	Synchronizing
67	Cooling Down
68	Stopping
69	Protections Disabled
70	Remote Start Input
71	Disable Auto Start
72	Force to Start
73	Auto Restore Inhibited
74	Gen.Loading Inhibited
75	Inp.Expansion1Mounted
76	Inp.Expansion2Mounted
77	Out.Expansion1Mounted
78	Out.Expansion2Mounted
79	Master Unit
80	Multi Gen. Remote Start
81	Remote Control Out 1
82	Remote Control Out 2
83	Remote Control Out 3
84	Remote Control Out 4
85	Remote Control Out 5
86	Remote Control Out 6
87	Remote Control Out 7
88	Remote Control Out 8
89	Remote Control Out 9
90	Remote Control Out 10

No	Description
91	Remote Control Out 11
92	Remote Control Out 12
93	Remote Control Out 13
94	Remote Control Out 14
95	Remote Control Out 15
96	Remote Control Out 16
97	Multi Load Add Out 1
98	Multi Load Subst. Out 1
99	Multi Load Add Out 2
100	Multi Load Subst. Out 2
101	Multi Load Add Out 3
102	Multi Load Subst. Out 3
103	Multi Load Add Out 4
104	Multi Load Subst. Out 4
105	Multi Load Add Out 5
106	Multi Load Subst. Out 5
107	Heavy Duty Active
108	ECU Power On
109	Battery Charge Run
110	Fire Circuit PS Active
111	Pre-transfer Delay
112	Secondary Volt Freq.
113	Lamp Test Active
114	Alarm Mute Active
115	Combat mode
116	Busbar Ready
117	Droop Mode Active
118	Tertiary Volt Freq
119	Smart Load Management
120	Follower mode active
121	Oil pump output
122	Speed Up pulse output
123	Speed down pulse output
124	Volt up pulse output
125	Volt down pulse output
126	Synch OK output
127	Zero Power Relay output
128	Fuel Pull-in Coil
129	Crank-1/2
130	Crank-2/2
131	
132	
133	
134	
135	

17.10. SITE ID STRING

The site identity string is designed to identify the current controller.

This is the site Id string sent at the beginning of SMS messages, e-mails and web page headers for the identification of the genset sending the message. Any 20 character long string may be entered.

17.11. ENGINE SERIAL NUMBER

The engine serial number string is designed to identify the current controller.

This string is added to GSM-SMS messages, e-mails, web page headers etc.

17.12. MODEM1-2/SMS1-2-3-4 TELEPHONE NUMBERS

These telephone number buffers accept up to 16 digits, including the wait character (",") in order to enable dialing through a pabx.

If Modem Selection= External PSTN Modem: First 2 numbers are used for modem calls.

Other selections: all numbers are used for SMS sending.



Enter numbers starting from first character. Do not leave blank characters at the beginning.

17.13. GSM MODEM PARAMETERS

Parameter Definition	Description
APN User Name	The APN (access point name) username may be required by the GSM operator. However some GSM operators may allow access without username. The exact information should be obtained from the GSM operator. Please search the GSM operator's website with "APN" string.
APN Password	If the APN (access point name) username is required by the GSM operator, most probably the APN password will also be required. However some GSM operators may allow access without password. The exact information should be obtained from the GSM operator. Please search the GSM operator's website with "APN" string.
APN Name	The APN (access point name) is always required by the GSM operator. The exact information should be obtained from the GSM operator. Please search the GSM operator's website with "APN" string.
SMS Service Center Number	The SMS service center number may be required by the GSM operator. However some GSM operators may allow SMS sending without SMS service center number. The exact information should be obtained from the GSM operator. Please search the GSM operator's website with "sms service center" string.



Below GSM modem related parameters are found in the Controller Configuration group.

Parameter Definition	Unit	Min	Max	Factory Set	Description
GSM Sim Card Pin	-	0000	9999	0	If the GSM SIM card uses pin number, enter the pin number here. If incorrect pin number is entered, then the SIM card will not operate.
SMS Enable	-	0	1	0	0: SMS messages disabled 1: SMS messages enabled
GPRS Connection Enable	-	0	1	0	0: GPRS disabled 1: GPRS enabled
SMS on Mains Change	-	0	1	0	This parameter controls SMS sending when mains voltages status is changed. No warnings generated. 0: no SMS on mains failed or restored 1: SMS sent on mains failed or restored
SMS on IP Change	-	0	1	0	This parameter controls SMS sending when IP address of GPRS connection is changed. No warnings generated. 0: no SMS on IP change 1: SMS sent on IP change

17.14. TCP/IP PARAMETERS

Parameter Definition	Factory Set	Description
Network IP Address	0.0.0.0	<p>This is the IPv4 (internet protocol version 4) address that the unit will require from the DHCP (dynamic host control protocol) server.</p> <p>If this parameter is set to 0.0.0.0 then the unit will require any IPv4 address from the DHCP server.</p> <p>If you are not an IP professional please leave this address as "0.0.0.0".</p>
Gateway IP Address	0.0.0.0	<p>This is the router IPv4 address, If the Network IP address and Gateway IP Address are set to "0.0.0.0" then the unit will get the gateway address automatically.</p> <p>If you are not an IP professional please leave this address as "0.0.0.0".</p>
Subnet Mask	255.255.255.0	<p>Reserved for IP professionals.</p> <p>If you are not an IP professional please leave this address as "255.255.255.0".</p>
User IP Mask 1 (2) (3)	255.255.255.255 0.0.0.0 0.0.0.0	<p>These 3 registers control the IPv4 access to the unit. The remote IPv4 address is logical AND'ed with these IP addresses. If the result gives the remote IP address, then access is enabled.</p> <p>Thus access may be limited to the same LAN members (x.x.x.255) or strictly to predefined IPv4 addresses.</p>
Domain Name	d500.dyndns-ip.com	<p>This string is used in “Dynamic DNS” feature. The unit will register itself to the dynamic DNS server under this name.</p> <p>For more detailed information please review chapter on “Dynamic DNS Feature” and the document “Dynamic DNS Account Setting”.</p>
Domain Name Extension	-	Rest of domain name if it is longer than 20 characters.
Membership Address	members.dyndns.org	<p>This string is used in “Dynamic DNS” feature. This is the address used in registering to the dynamic DNS server.</p> <p>For more detailed information please review chapter on “Dynamic DNS Feature” and the document “Dynamic DNS Account Setting”.</p>
Username/Password		<p>These strings are used in “Dynamic DNS” feature while registering to the dynamic DNS server.</p> <p>For more detailed information please review chapter on “Dynamic DNS Feature” and the document “Dynamic DNS Account Setting”.</p>
Ping Address	www.google.com	<p>This internet address is regularly accessed in order to check the availability of internet access.</p> <p>The access period is defined in parameter Controller Configuration>Ping Period.</p>
IP Confirmation Address	checkip.dyndns.org	This internet address is regularly accessed in order to read the IPv4 address of the unit.
Rainbow Address-1 Rainbow Address-2	31.207.87.179	<p>These parameters accept both internet addresses and IPv4 addresses. Information for remote monitoring is sent to these addresses.</p> <p>The port information of these addresses are found in Controller Configuration group.</p>

17.14. ETHERNET PARAMETERS (continued)

Parameter Definition	Factory Set	Description
Mail Account Name	d500_a	This is the account name appearing in the "from" tab of the e-mail recipient. (ex: D500@gmail.com)
Mail Account Password	d500_1234	This is the e-mail password of above e-mail account.
Mail Server Address	smtp.mail.yahoo.com	This is the Outgoing Mail Server Address of the above e-mail account (ex: smtp.gmail.com)
E-mail Address-1	-	These are e-mail recipient addresses where the unit is intended to send e-mail messages. Up to 3 e-mails can be sent at once.
E-mail Address-2	-	
E-mail Address-3	-	



Below ETHERNET related parameters are found in the Controller Configuration group.

Parameter Definition	Unit	Min	Max	Factory Set	Description
Web Programming Enable	-	0	1	0	0: Web programming disabled 1: Web programming enabled
Web Control Enable	-	0	1	0	0: Web control disabled 1: Web control enabled
Web Refresh Rate	sec	0	240	5	The unit will refresh the web page with this interval.
Ping Period	min	0	240	0	The unit will check the availability of the internet connection with this interval.
Rainbow Refresh Rate	sec	0	65535	5	The unit will update the distant monitoring terminal with this rate.
Rainbow Address-1 Port	-	0	65535	0	This is the port number of the first monitoring terminal address.
Rainbow Address-2 Port	-	0	65535	0	This is the port number of the second monitoring terminal address.
Web Server Port	-	0	65535	80	This is the port number of the internal web server. The unit will answer queries to this port only.
Modbus TCP/ Port	-	0	65535	502	This is the port number of the internal Modbus TCP/IP terminal. The unit will answer Modbus requests to this port only.
SMTP Port	-	0	65535	587	This is the port number used for e-mail sending.
Ethernet Enable	-	0	1	1	0: ethernet port disabled 1: ethernet port enabled
E-mail on IP Change	-	0	1	0	This parameter controls e-mail sending when IP address of GPRS or ethernet connection is changed. No warnings generated. 0: no e-mail on IP change 1: e-mail sent on IP change

17.15. SNTP PARAMETERS

SNTP (simple network time protocol) communication allows the controller to query high precision, atomic clock based date/time servers through the internet and to adjust its internal real time clock to these servers.

Thanks to the SNTP communication, the internal RTC will reach an atomic clock precision.

Parameter Definition	Factory Set	Description
SNTP Refresh Period	30 sec	This is the wait period between two SNTP requests of the unit in order to update its internal real time time clock from the servers.
SNTP Address 1 Port	123	This is the port number of the first SNTP server.
SNTP Address 2 Port	123	This is the port number of the second SNTP server.
SNTP Address 1	0.tr.pool.ntp.org	This is the IP address of the first SNTP server.
SNTP Address 2	1.tr.pool.ntp.org	This is the IP address of the second SNTP server.

17.16. Wi-Fi PARAMETERS

Wi-Fi parameter can be configured only from PC software.

Parameter Definition	Factory Set	Description
SSID	This is the name of wireless network that you want to connect.
Wi-Fi Password	This is the password of wireless network that you want to connect.

17.17. SYNCHRONIZATION PARAMETERS

Parameter Definition	Unit	Min	Max	Factory Set	Description
Genset Active Power Rate	kW	1	65000	100	It defines genset active power rating.
Genset Reactive Power Rate	kVAr	1	65000	75	It defines genset reactive power rating.
Mains Active Power Rate	kW	0	65000	100	It defines mains transformer active power rating.
Mains Reactive Power Rate	kVAr	0	65000	75	It defines mains transformer reactive power rating.
Unit Datalink Address	-	1	64	1	This parameter is used in order to force data link addresses for fault free operation with broken communication wires.
Device Run/Stop Priority	-	1	64	1	This parameter defines the priority level of D500 on the same data link.
Datalink Baud Rate	Kbps	0	4	3	0: 50 Kbps 1: 100 Kbps 2: 125 Kbps 3: 250 Kbps 4: 500 Kbps
Genset Number in Multi Genset Systems	-	1	48	1	This is the number of synchronizing gensets to the busbar.
Minimum Genset Fault Action	-	0	4	0	This is action to be taken if the number of available gensets is less than Genset Number in Multi Genset Systems 0: not used 1: engine shutdown 2: load-dump alarm 3: warning
Mains Synch Unit Number	-	0	16	0	This is the number of Mains Synchronizing units in the system.
Master Change Delay	hour	0	255	0	This parameter defines the minimum time period difference between two master change operations in equal aging.
Multi Genset Start-Up Options	-	0	2	0	This parameter determines the number of gensets to start, when there is a REMOTE START signal. 0: Run With Start Power when Remote Start signal arrives 1: Run With Mains Power when Remote Start signal arrives 2: Run all available gensets when remote start signal arrives
Multi Genset Start-Up Power	kW	0	65000	100	This parameter decides the number of gensets to start. If the total power of starting gensets is less than this limit, then a TOO FEW GENSETS warning will occur.
Insufficient Multi Genset Start-Up Power Alarm Level	-	0	3	3	0: not used 1: engine shutdown 2: load-dump alarm 3: warning

Parameter Definition	Unit	Min	Max	Factory Set	Description
System Reserve Power	kW	0	65000	20	The master keeps this amount of extra power available during whole operation under load as a safety against a sudden load surge.
Load Management Method	-	0	1	0	0: Equal Aging 1: Smart
Dead Busbar Limit for Multi Genset System	VAC	0	300	50	This parameter defines the minimum voltage for the detection of a live busbar.
Governor Control Enable	-	0	1	1	0: Governor control disabled. 1: Governor control enabled.
Governor Output Reverse Polarity	-	0	1	0	0: Governor control normal polarity (speed increases with voltage increase). 1: Governor control reverse polarity (speed decreases with voltage increase).
Governor Output Low Lim	%	0	100.0	0.0	This parameter defines governor control output low limit. Limits from 0V to 10V can be set by this parameter
Governor Output Gain Lim	%	0	100.0	100.0	This parameter defines governor control output gain.
Governor Output Rest Point	%	0	100.0	50.0	This is the rest value of the governor control output at no load.
Governor Droop Enable	-	0	1	0	0: Governor droop mode disabled. 1: Governor droop mode enabled.
Governor Output Droop	%	0	100.0	0	The controller will inject this quantity of droop at the genset rpm at 100% active power load.
AVR Control Enable	-	0	1	1	0: AVR control disabled. 1: AVR control enabled.
AVR Reverse Polarity	-	0	1	1	0: AVR control normal polarity (voltage increases with value increase). 1: AVR control reverse polarity (voltage decreases with value increase).
AVR Output Low Limit	%	0	100.0	0.0	This parameter defines AVR output low limit. Limits from -3.0V to +3.0V can be set by this parameter
AVR Output High Limit	%	0	100.0	100.0	This parameter defines AVR output high limit. Limits from -3.0V to +3.0V can be set by this parameter
AVR Output Rest Point	%	0	100.0	50.0	This is the rest value of the AVR control output at no load.
AVR Droop Enable	-	0	1	0	0: AVR droop mode disabled. 1: AVR droop mode enabled.
AVR Output Droop	%	0	100.0	0.0	The controller will inject this quantity of droop at the genset voltage at 100% reactive power load.
Excitation Loss Alarm Level	-	0	3	2	0: not used 1: engine shutdown 2: load-dump alarm 3: warning
No Break Transfer Enable	-	0	1	0	0: only interrupted transfer enabled 1: no break transfer enabled
Synchronization Fail Timeout	sec	0	600	30	If the phase and voltage synchronization is not successful before the expiration of this timer, then a Synchronization Fail warning is given and the transfer will be performed with interruption.

Parameter Definition	Unit	Min	Max	Factory Set	Description
Synchronization Contactor Timeout	sec	0	25.5	0.5	When synchronization is detected, both contactors will stay closed during this timer.
Max Frequency Difference	Hz	0.1	2.0	0.5	This is the maximum difference between mains and genset frequencies to close both contactors.
Phase to Phase Voltage Check	-	0	1	0	0: Phase to neutral voltage check 1: Phase to phase voltage check
Max Volt Difference	VAC	0	20	5	This is the maximum difference between the mains phase-L1 and the genset phase-L1 voltages to close both contactors. If voltage transformer is used, this quantity is multiplied with voltage transformer ratio.
Max Phase Difference	deg.	0	20	10	This is the maximum phase angle between the mains phase-L1 and the genset phase-L1 voltages to close both contactors.
Phase Angle Offset	deg.	-60	+60	0	This parameter is used to compensate the phase angle introduced by voltage transformers in case of MV synchronization. This angle value is added to the phase differential during phase matching process.
Dwell Timeout	Sec	0.01	0.50	0.10	The synchronization conditions must remain satisfied during this timeout for the controller to decide to close its contactor.
Phase Synchronization G Gain	%	0	200	20	This parameter governs the phase synchronization speed. If this parameter is increased, the synchronization will be faster but unstable. If it is decreased, the synchronization will be slower but more stable. The best setting is the fastest stable synchronization.
Frequency Synchronization G Gain	%	0	200	20	This parameter governs the frequency synchronization speed. If this parameter is increased, the synchronization will be faster but unstable. If it is decreased, the synchronization will be slower but more stable. The best setting is the fastest stable synchronization.
Voltage Synchronization G Gain	%	0	200	30	This parameter governs the voltage synchronization speed. If this parameter is increased, the synchronization will be faster but unstable. If it is decreased, the synchronization will be slower but more stable. The best setting is the fastest stable synchronization.
Soft Transfer Enable	-	0	1	0	0: Soft Transfer disabled 1: Soft Transfer enabled.
Soft Transfer Timer	sec	0	240	30	This is the time duration of the Soft Transfer. At the end of this timer one of the contactors will release to terminate the parallel operation

Parameter Definition	Unit	Min	Max	Factory Set	Description
Active Power Ramp (kW/sec)	%	0	100.0	1.0	In case of a soft transfer, the load's active power (kW) will be transferred to the mains with this rate vice versa.
Reactive Power Ramp (kVAr/sec)	%	0	100.0	1.0	In case of a soft transfer, the load's reactive power (kVAr) will be transferred to the mains with this rate vice versa.
Ramp On High Limit	%	0	100.0	80.0	If multi genset system total active power goes over this limit while soft transferring to mains load contactor will be de-energized.
Ramp Off Low Limit	%	0	100.0	10.0	If multi genset system total active power goes under this limit while soft transferring to mains load contactor will be de-energized.
Active Power Share G Gain	%	0	200	20	This parameter defines the reaction speed of the kW control during soft loading. The standard value for this parameter is %20. But it must be readjusted for the genset during manufacturing. If this parameter is too high, a kW oscillation may occur. If it is too low, the kW transfer will be slower.
Reactive Power Share G Gain	%	0	200	20	This parameter defines the reaction speed of the kVAr control during soft loading. The standard value for this parameter is %20. But it must be readjusted for the genset during manufacturing. If this parameter is too high, a kVAr oscillation may occur. If it is too low, the kVAr transfer will be slower.
Nominal Frequency G Gain	%	0	200	8	This parameter governs the nominal frequency catching of the master unit. If this parameter is increased, the operation will be faster but unstable. If it is decreased, the operation will be slower but more stable. The best setting is the fastest stable operation.
Nominal Voltage G Gain	%	0	200	8	This parameter governs the nominal voltage catching of the master unit. If this parameter is increased, the operation will be faster but unstable. If it is decreased, the operation will be slower but more stable. The best setting is the fastest stable operation.
Multi Genset Delayed Start	%	0	120	80	If the total active load is above this level for the period defined in Multi Genset Run/Stop Delay , the slave genset will start, synchronize and share the load. This parameter is defined as a percentage of the Genset Power Rating parameter.
Multi Genset Quick Start	%	0	120	90	If the total active load is above this level, the slave genset will start, synchronize and share the load without delay. This parameter is defined as a percentage of the Genset Power Rating parameter.

Parameter Definition	Unit	Min	Max	Factory Set	Description
Multi Genset Delayed Stop	%	0	120	30	If the total active load is below this level during the period defined in Genset Start Power parameter, the slave genset will stop.
Multi Genset Run/Stop Delay	sec	0	240	10	This is the time delay used for starting and stopping of the slave genset. Related starting and stopping power levels are defined in parameters Multi Genset Delayed Start and Multi Genset Delayed Stop .
Load Management Inhibit Delay	sec	0	43200	30	This is the period after all gensets closed to busbar and before the load management function is put in service.
Parallel Check Delay	sec	0	25.0	0.2	This is the delay after the mains contactor is energized (for parallel to mains) and before the protections for mains failure are enabled.
ROCOF df/dt (Hz/Sec)	Hz	0.5	15.0	5.0	This parameter defines the sensitivity of the ROCOF (rate of change of frequency) protection while operating in parallel with mains. When the parallel protections are enabled, if the mains frequency change exceeds this limit for 4 consecutive periods, the mains contactor will be de-energized and a warning will be generated.
Vector Shift Limit	Deg.	1	30	10	This parameter defines the sensitivity of the vector shift protection while operating in parallel with mains. When the parallel protections are enabled, if the phase of the mains measured on last 2 cycles jumps over this limit on the phase measured on last 4 th and 5 th period, the mains contactor will be de-energized and a warning will be generated. It is advised to set this parameter to 10 degrees.
Peak Lopping Enable	-	0	1	0	0: Peak lopping disabled. In AUTO mode the unit will start multi genset system only if a mains failure occurs. 1: Peak lopping enabled. In AUTO mode, the multi genset system will start and share the load if the mains power exceeds Peak Lopping Start Power parameter.
Peak Lopping Maximum Mains Power	kW	0	65000	100	In peak lopping mode, the unit will not allow the mains to deliver to the load a power higher than this limit in order to protect the mains.
Peak Lopping Stop Power	kW	0	65000	60	In peak lopping mode the multi genset system will stop only when the total load power falls below this limit. This parameter should be set lower than Peak Lopping Start Power parameter.
Peak Lopping Start /Stop Delay	sec	0	240	10	In peak lopping mode the multi genset system will start/stop when load power exceeds the limits during this period.

Parameter Definition	Unit	Min	Max	Factory Set	Description
Peak Lopping Start Power	kW	0	65000	80	In peak lopping mode the multi genset system will start and enter in parallel with the mains only if the mains power exceeds this limit. However it will supply power to the load only if the load power exceeds Peak Lopping Maximum Mains Power parameter. This parameter should be set lower than Peak Lopping Maximum Mains Power parameter.
Power Export Enable	-	0	1	0	0: Normal operation. 1: Power Export to Mains operation.
Exported Power	kW	0	65000	100	This is the active power to be exported to the mains in Power Export to Mains operation mode
Exported Power Factor	-	0.600	-0.600	1.000	This is the power factor of the power exported to the mains in Power Export to Mains operation mode.
Command Active Power G Gain	%	0	200	10	This parameter governs the active power catching speed of the synchronization unit. If this parameter is increased, the operation will be faster but unstable. If it is decreased, the operation will be slower but more stable. The best setting is the fastest stable operation.
Command Reactive Power G Gain	%	0	200	20	This parameter governs the reactive power catching speed of the synchronization unit. If this parameter is increased, the operation will be faster but unstable. If it is decreased, the operation will be slower but more stable. The best setting is the fastest stable operation.
Minimum Exported Power	kW	0	65000	100	In the Distributed Power Export to Mains mode, the exported power will not fall below this limit.
Export Power Ramp (kW/sec)	%	0	100.0	1.0	In the Distributed Power Export to Mains mode, the genset active export power (KW) will be increased/decreased with this rate.
Frequency Barrier	Hz	0.1	2.0	0.5	In the Distributed Power Export to Mains mode, this is the minimum variation from the nominal frequency causing an active power ramp-up or ramp-down.
Speed Up/Down Pulse Minimum	msec	10	200	10	This parameter defines the minimum pulse width in speed pulse control mode.
Speed Up/Down Pulse Maximum Duration	msec	0	2000	0	This parameter defines the maximum pulse width in speed pulse control mode. If this parameter is set to zero then no maximum pulse width is used.
Speed Up/Down Pulse Delay	msec	20	1000	20	This parameter defines the minimum pulse delay between two speed up/down control pulses.
Voltage Up/Down Pulse Minimum	msec	10	200	10	This parameter defines the minimum pulse width in voltage pulse control mode.

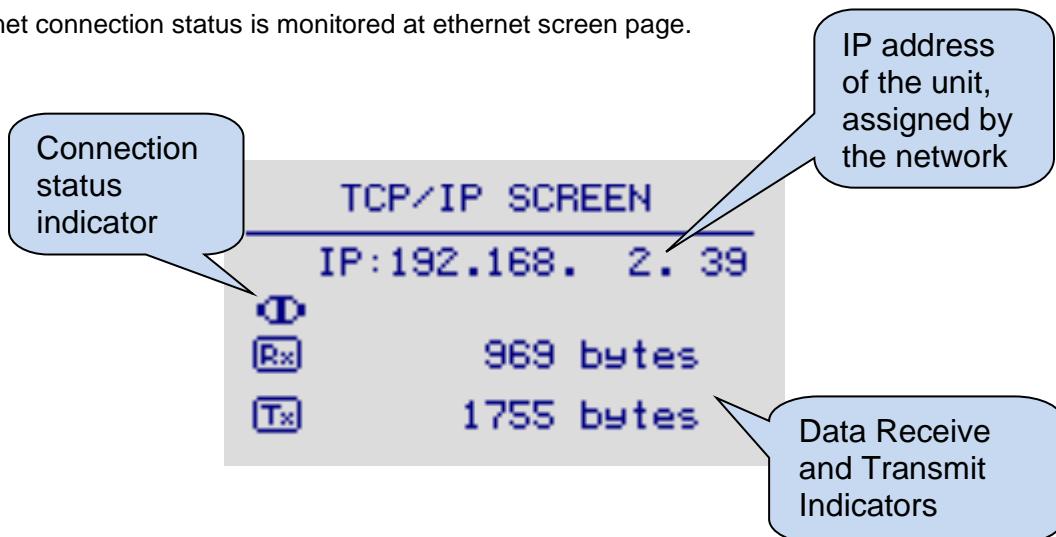
Parameter Definition	Unit	Min	Max	Factory Set	Description
Voltage Up/Down Pulse Maximum Duration	msec	0	2000	0	This parameter defines the maximum pulse width in voltage pulse control mode. If this parameter is set to zero then no maximum pulse width is used.
Voltage Up/Down Pulse Delay	msec	20	1000	20	This parameter defines the minimum pulse delay between two of voltage up/down control pulses.
Return to Mid-Point	-	0	1	0	This parameter controls the "Return to Mid-point" output relay function. 0: no return to mid-point output 1: return to mid-point output active during stop timer.
Reactive Load Sharing Pulse Period	msec	0	5000	10	In reactive load sharing, this is the period between two voltage up/down pulses.
Reactive Load Sharing Start Limit	%	0	100	0.0	This is the minimum reactive power percentage in order to activate voltage up/down pulses.

18. ETHERNET CONFIGURATION

Related parameters are:

Parameter Definition	Factory Set	Description
Network IP Address	0.0.0.0	This is the IPv4 (internet protocol version 4) address that the unit will require from the DHCP (dynamic host control protocol) server. If this parameter is set to 0.0.0.0 then the unit will require any IPv4 address from the DHCP server. If you are not an IP professional please leave this address as "0.0.0.0".
Gateway IP Address	0.0.0.0	This is the router IPv4 address, If the Network IP address and Gateway IP Address are set to "0.0.0.0" then the unit will get the gateway address automatically. If you are not an IP professional please leave this address as "0.0.0.0".
Subnet Mask	255.255.255.0	Reserved for IP professionals. If you are not an IP professional please leave this address as "255.255.255.0".
Modbus TCP/IP Port	502	Internal Modbus TCP/IP server's port number. The unit answers Modbus requests to this port only.
Modbus Address	1	This is the modbus controller identity used in Modbus communication.

The ethernet connection status is monitored at ethernet screen page.

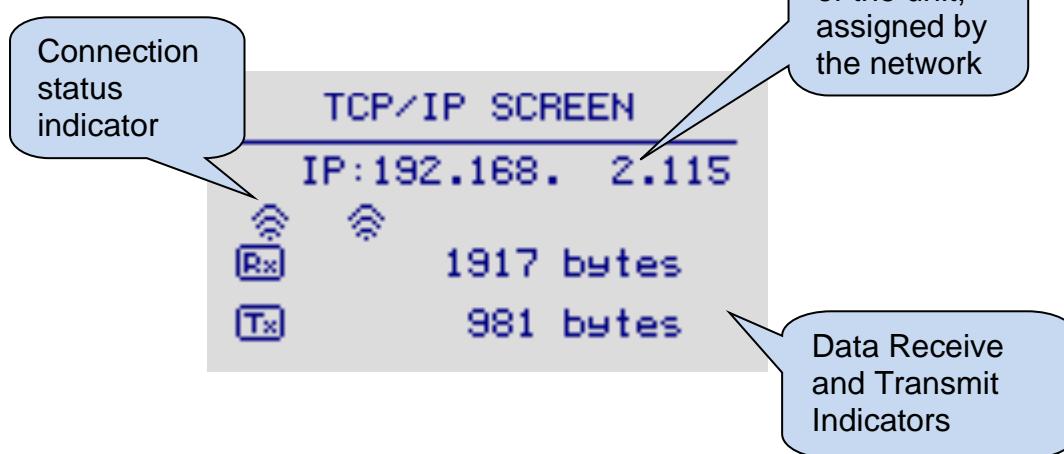


19. Wi-Fi CONFIGURATION

Related parameters are:

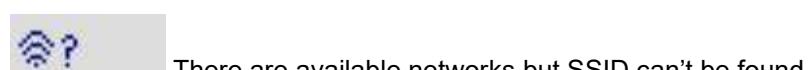
Parameter Definition	Factory Set	Description
SSID	This is the name of wireless network that you want to connect.
Wi-Fi Password	This is the password of wireless network that you want to connect.
Network IP Address	0.0.0.0	This is the IPv4 (internet protocol version 4) address that the unit will require from the DHCP (dynamic host control protocol) server. If this parameter is set to 0.0.0.0 then the unit will require any IPv4 address from the DHCP server. If you are not an IP professional please leave this address as "0.0.0.0".
Gateway IP Address	0.0.0.0	This is the router IPv4 address, If the Network IP address and Gateway IP Address are set to "0.0.0.0" then the unit will get the gateway address automatically. If you are not an IP professional please leave this address as "0.0.0.0".
Subnet Mask	255.255.255.0	Reserved for IP professionals. If you are not an IP professional please leave this address as "255.255.255.0".

The ethernet connection status is monitored at ethernet screen page.



Connection Status Indicators:

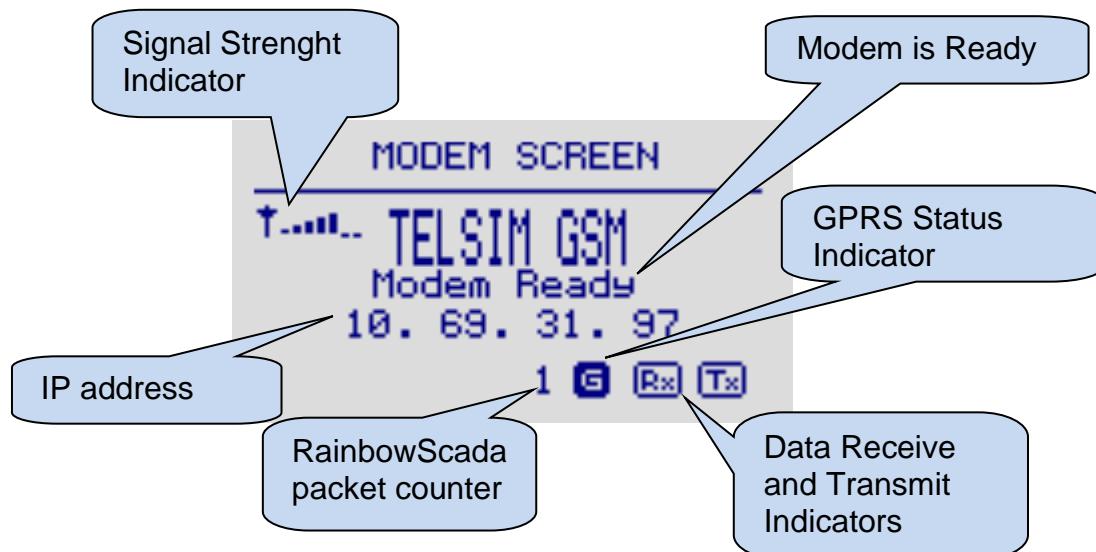
If there is no any wireless indicator on connection screen, it shows that device can't find available networks.



20. GSM CONFIGURATION

Related parameters are:

Parameter Definition	Factory Set	Description
SMS Enable	0	0: SMS messages disabled 1: SMS messages enabled
GPRS Connection Enable	0	0: GPRS disabled 1: GPRS enabled
SMS on Mains Change	0	This parameter controls SMS sending when mains voltages status is changed. No warnings generated. 0: no SMS on mains failed or restored 1: SMS sent on mains failed or restored
SMS on Engine Run/Stop	0	This parameter controls SMS sending when the engine runs or stops. No warnings generated. 0: no SMS on engine run/stop 1: SMS sent on engine run/stop
SMS Commands Enabled	0	0: SMS commands not accepted 1: SMS commands are accepted but from listed telephone numbers only.
GSM Location Active	0	0: no location information from GSM 1: location information read from GSM system.
APN User Name		The APN (access point name) username may be required by the GSM operator. However some GSM operators may allow access without username. The exact information should be obtained from the GSM operator. Please search the GSM operator's website with "APN" string.
APN Password		If the APN (access point name) username is required by the GSM operator, most probably the APN password will also be required. However some GSM operators may allow access without password. The exact information should be obtained from the GSM operator. Please search the GSM operator's website with "APN" string.
APN Name		The APN (access point name) is always required by the GSM operator. The exact information should be obtained from the GSM operator. Please search the GSM operator's website with "APN" string.



21. CRANK CUTTING

In order to insure fast and reliable crank cutting, the unit uses various resources for engine running condition detection.

Cranking is stopped when at least one of below conditions is met:

- Crank timer expired:

The crank timer is adjusted through **Engine Parameters > Crank Timer**. The maximum allowed timer is 15 seconds.

- Genset AC voltage over threshold:

If the genset phase L1 AC voltage reaches **Engine Parameters > Crank Cut Voltage**, then cranking is immediately stopped.

- Genset frequency over threshold:

If the genset phase L1 frequency reaches **Engine Parameters > Crank Cut Frequency**, then cranking is immediately stopped.

- Genset rpm over threshold:

If the genset rpm reaches **Engine Parameters > Crank Cut RPM**, then cranking is immediately stopped.

- Charge alternator voltage over threshold

Following setting is necessary: **Engine Parameters > Charge Input Connected = 1**

If the charge alternator voltage reaches **Engine Parameters > Crank Cut Charge Voltage**, then cranking is immediately stopped.

- Oil pressure above threshold

Following setting is necessary: **Engine Parameters > Crank Cut with Oil Pressure = 1**

The crank cutting with oil pressure offers a programmable delay through **Engine Parameters > Crank Cut with Oil Pressure Delay**. The parameter is factory set to 2 seconds.

Both low oil pressure switch and oil pressure sender readings may be used for crank cutting. The oil pressure switch is always used. The sender may be disabled through **Controller Configuration > Oil Pressure Switch Priority** parameter.

If enabled, when oil pressure is detected, cranking is stopped after adjustable timer delay.

22. OVERCURRENT PROTECTION (IDMT)

The unit offers a programmable IDMT protection function in order to protect the alternator against excessive currents.

The IDMT (Inverse Definite Minimum Time) protection function has such tripping characteristics that the tripping time varies inversely with the value of current. Beyond a certain current limit the tripping time becomes constant (definite) and causes tripping in minimum time.

The tripping formula is defined as below:

$$t = \frac{TMS}{\left(\frac{I}{I_{set}} - 1\right)^2}$$

Where:

TMS is the IDMT time multiplier setting. This is also the tripping time at 100% overload.

I is the current of the most loaded phase

I_{set} is the programmed overcurrent limit

t is the tripping time in seconds

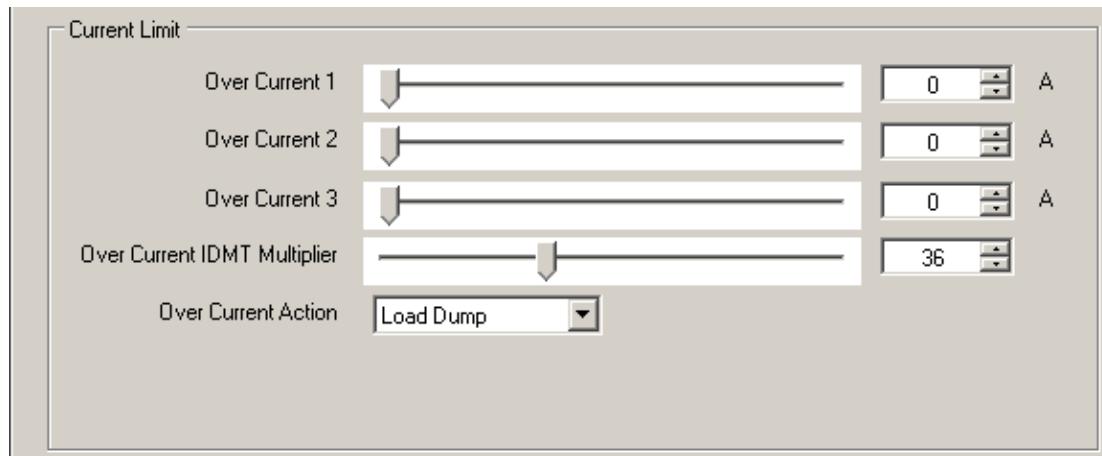
Currents below the overcurrent limit are allowed to flow for unlimited time. Currents above the limit will cause the IDMT protection to trigger with a delay depending on the strength of the overcurrent. Higher the current, faster the protection will trip.

When a non-tripping overcurrent condition occurs, the unit will keep trace of it. In case of a consecutive overcurrent, the controller will take into account the residual heat caused by the previous overcurrent and will trip faster than usual.

The IDMT multiplier adjusts the sensitivity of the IDMT detector. When the multiplier is low, then tripping will be faster for the same current.

The unit provides separate Overcurrent limits for primary, secondary and tertiary volt/speed/amp settings. Switching from primary volt/freq/amps to secondary or tertiary values will also switch the IDMT detector to the secondary/tertiary setting.

The action of the tripping may be selected as a Loaddump (stop after cooldown) or shutdown alarm (immediate stop).

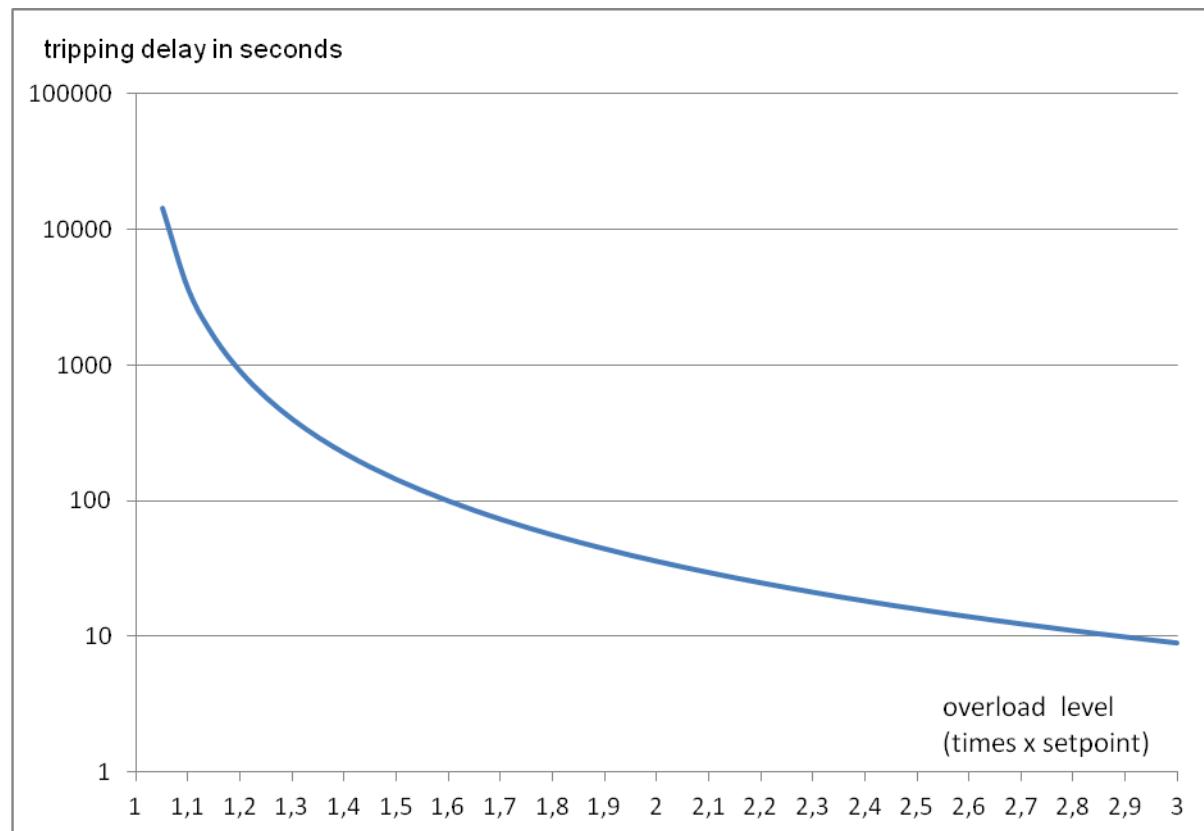


Screenshot from RainbowPlus configuration program, Generator>Current section

Below is a table showing the tripping delay in function of the percent load level (with TMS=36):

100%	unlimited	170%	73s	240%	18s
110%	3600s	180%	56s	250%	16s
120%	900s	190%	44s	260%	14s
130%	400s	200%	36s	270%	12s
140%	225s	210%	30s	280%	11s
150%	144s	220%	25s	290%	10s
160%	100s	230%	21s	300%	9s

Below is the tripping delay curve in function of the load level (with TMS=36):

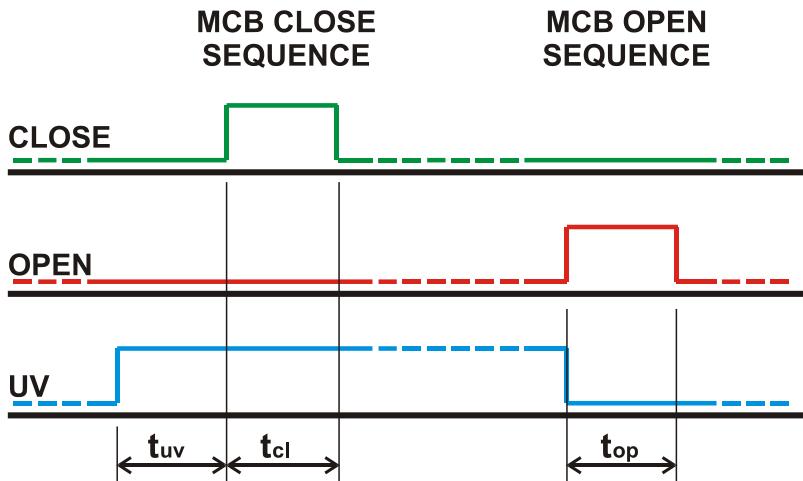


23. MOTORIZED CIRCUIT BREAKER CONTROL

The unit offers full control for any brand and model of motorized circuit breakers (MCB).

The MCB control is performed through 3 digital output functions, namely Open, Close and Undervoltage coil controls. Only 2 of these outputs are used in a single application.

Any digital output can be assigned to MCB control signals through programming menu.



The MCB CLOSE sequence is below:

Activate UV output, wait for undervoltage coil timer (t_{uv})

Activate CLOSE output, wait for close pulse timer (t_{cl})

Deactivate CLOSE output

The MCB OPEN sequence is below:

Deactivate UV output

Activate OPEN output, wait for open pulse timer (t_{op})

Deactivate OPEN output



Open Pulse, Close Pulse and Undervoltage Coil timers are adjusted through programming menu.



If MCB feedback input is defined and the MCB fails to change position after the expiration of MCB Fail timer, then a fault condition will occur.

MCB modules can be operated by 2 different ways. The unit supports both configurations.

Below is the terminology used:

M: gear motor

PF: ready to close contact

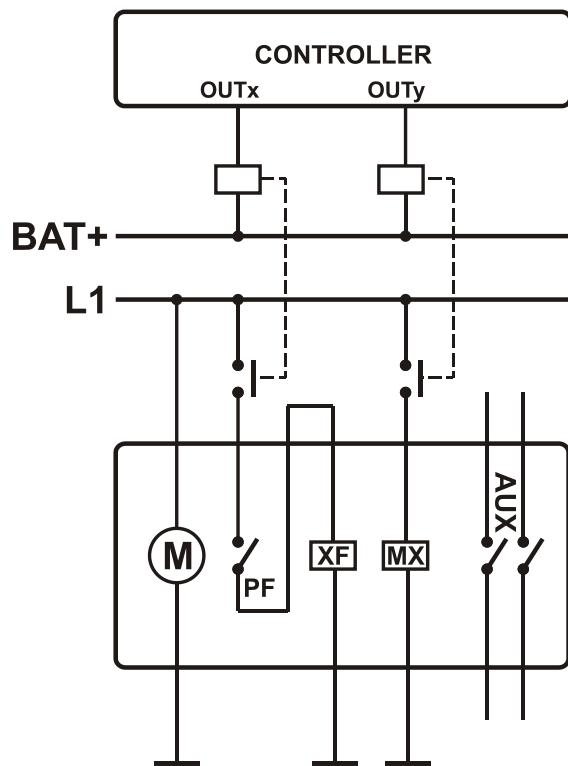
XF: close coil

MX: open coil

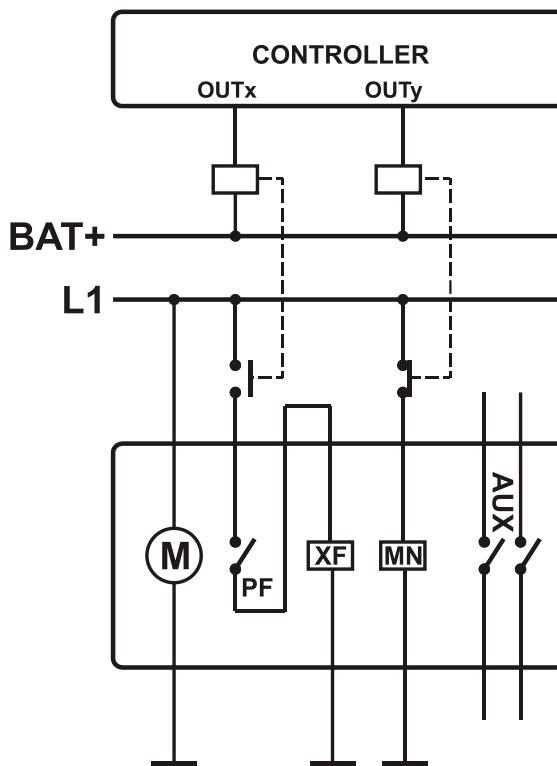
MN: undervoltage trip (release)

AUX: auxiliary contacts

MCB WITH OPEN-CLOSE COILS



MCB WITH CLOSE-UV COILS



In the diagram at left, relay function assignments should be as below:

OUTx: Mains (or Genset) Close Pulse

OUTy: Mains (or Genset) Open Pulse

In the diagram at right, relay function assignments should be as below:

OUTx: Mains (or Genset) Close Pulse

OUTy: Mains (or Genset) Undervoltage Coil

24. AUTO LEARNING

The controller offers the automatic learning feature for adjusting synchronization & load sharing set-points and PID coefficients.

The AUTO LEARNING makes the synchronization commissioning and fine adjusting a simple straightforward operation.

In order to activate the AUTO LEARNING:

Please enter programming > synchronization parameters.

- Disable GOV control enable parameter.
- Gov Low Limit will be 0, Gov Gain will be 100 and Gov rest point will be 50.
- Disable AVR control enable parameter.
- AVR Low Limit will be 0, AVR Gain will be 100 and AVR rest point will be 50.

Governor		
Governor Out Low Limit	0.0	%
Governor Out Gain	100.0	%
Governor Out Rest Point	50.0	%
Governor Out Droop	0.0	%
<input type="checkbox"/> Governor Droop Enable	<input type="checkbox"/> Governor Control Enable	<input type="checkbox"/> Governor Reverse Polarity

AVR		
AVR Out Low Limit	0.0	%
AVR Out High Limit	100.0	%
AVR Out Rest Point	50.0	%
AVR Out Droop	0.0	%
<input type="checkbox"/> AVR Droop Enable	<input type="checkbox"/> AVR Control Enable	<input type="checkbox"/> AVR Reverse Polarity

Start the generator manually.

- Adjust the required nominal frequency on the speed control unit using the speed pot.
- Adjust the required nominal voltage on the AVR unit using the voltage pot.

Stop the generator and enter programming > synchronization parameters.

- Enable Gov control enable parameter.
- Enable AVR control enable parameter.

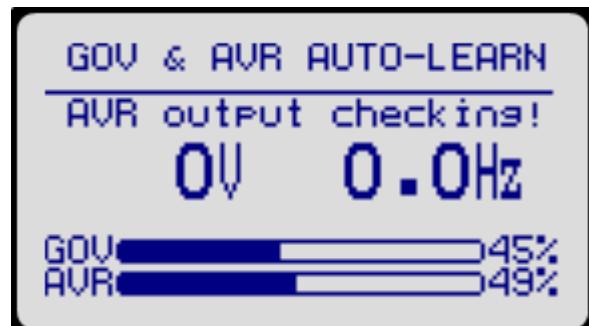
Governor		
Governor Out Low Limit	0.0	%
Governor Out Gain	100.0	%
Governor Out Rest Point	50.0	%
Governor Out Droop	0.0	%
<input type="checkbox"/> Governor Droop Enable	<input checked="" type="checkbox"/> Governor Control Enable	<input type="checkbox"/> Governor Reverse Polarity

AVR		
AVR Out Low Limit	0.0	%
AVR Out High Limit	100.0	%
AVR Out Rest Point	50.0	%
AVR Out Droop	0.0	%
<input type="checkbox"/> AVR Droop Enable	<input checked="" type="checkbox"/> AVR Control Enable	<input type="checkbox"/> AVR Reverse Polarity

Next step will be auto learning.

To activate Auto Learning, push MAN button  and then hold pressed Up Arrow button .

The unit will ask for confirmation. Push  button to start Auto Learning operation.



Auto learning is completed successfully. The controller will force the genset to its nominal speed and voltage.

There will be no need to adjust any governor or AVR limits, neither PID coefficients. All is adjusted to guarantee smooth synchronization and load share.

25. SPEED & VOLTAGE UP/DOWN RELAY OUTPUTS



These outputs will be available in firmware version 5.7

The unit is able to control motorized potentiometers through up/down output functions.

In order to use up/down functions, corresponding digital output function parameter should be set properly.

External potentiometers should be set to mid-point position at initial conditions.

25.1. SPEED UP/DOWN CONTROL

If speed up/down outputs are enabled, the master unit will operate in order to adjust itself to the nominal speed defined in program parameter **Nominal Frequency**.

If speed-up or speed-down functions are assigned to digital outputs, then the unit will start to generate speed up/down pulses in order to control the external speed potentiometer. The analog GOV control output will be still valid and functional.

The minimum speed pulse width is set through program parameter **Speed Up/Down Pulse Minimum**.

The minimum delay between two successive pulses is set through program parameter **Speed Up/Down Pulse Delay** and the maximum speed pulse width is set through program parameter **Speed Up/Down Pulse Maximum Duration**.

Parameter Definition	Description
Speed Up/Down Pulse Minimum	Minimum pulse width in speed pulse control mode.
Speed Up/Down Pulse Maximum Duration	Maximum pulse width in speed pulse control mode. If this parameter is set to zero then no maximum pulse width is used.
Speed Up/Down Pulse Delay	Minimum pulse delay between two speed up/down control pulses.

25.2. VOLTAGE UP/DOWN CONTROL

If voltage up/down outputs are enabled, the master unit will operate in order to adjust itself to the nominal voltage defined in program parameter **Nominal Voltage**.

If voltage-up or voltage-down functions are assigned to digital outputs, then the unit will start to generate voltage up/down pulses to control the external voltage potentiometer. The analog AVR control output will be still valid and functional.

The minimum voltage pulse width is set through program parameter **Voltage Up/Down Pulse Minimum**. The minimum delay between two successive pulses is set through program parameter **Voltage Up/Down Pulse Delay** and the maximum voltage pulse width is set through program parameter **Voltage Up/Down Pulse Maximum Duration**.

Parameter Definition	Description
Voltage Up/Down Pulse Minimum	Minimum pulse width in voltage pulse control mode.
Voltage Up/Down Pulse Maximum Duration	Maximum pulse width in voltage pulse control mode. If this parameter is set to zero then no maximum pulse width is used.
Voltage Up/Down Pulse Delay	Minimum pulse delay between two of voltage up/down control pulses.

26. J1939 CANBUS ENGINE SUPPORT

The unit offers a special J1939 port in order to communicate with electronic engines controlled by an **ECU** (electronic control unit). The J1939 port consists of 2 terminals which are **J1939+** and **J1939-**.

The connection between the unit and the engine should be made with an appropriate balanced 120 ohms low capacitance coaxial cable. The external conductor should be grounded at one end only.

A **120 ohms** termination resistor is installed inside the unit. Please do not connect external resistor.

The J1939 port is activated by setting the program parameter **J1939 Enable** to 1. The **J1939 Engine Type** parameter should be set accordingly. The list of available engines is given at the programming section. Please contact Datakom for the most current list of engines.

If the J1939 port is enabled then the **oil pressure**, **coolant temperature** and the **engine rpm** information are picked up from the **ECU** unit. If connected, the MPU unit and related analog senders are discarded.

The controller is able to read and display all below parameters, under condition that the engine sends these information. Most engines send only some of them. If the engine does not send a parameter, the unit will simply skip it. Thus only available information are displayed.

The complete list of J1939 display parameters is below:

PGN 65253 / SPN 247 Engine Total Hours of Operation
PGN 65257 / SPN 250 Engine Total Fuel Used
PGN 65262 / SPN 110 Engine Coolant Temperature
/ SPN 174 Engine Fuel Temperature 1
/ SPN 175 Engine Oil Temperature 1
PGN 65263 / SPN 100 Engine Oil Pressure
/ SPN 94 Engine Fuel Delivery Pressure
/ SPN 98 Engine Oil Level
/ SPN 101 Engine Crankcase Pressure
/ SPN 109 Engine Coolant Pressure
/ SPN 111 Engine Coolant Level
PGN 65266 / SPN 183 Engine Fuel Rate
/ SPN 184 Engine Instantaneous Fuel Economy
/ SPN 185 Engine Average Fuel Economy
PGN 65269 / SPN 108 Barometric Pressure
/ SPN 171 Ambient Air Temperature
/ SPN 172 Engine Air Inlet Temperature
PGN 65270 / SPN 102 Engine Turbocharger Boost Pressure
/ SPN 105 Engine Intake Manifold 1 Temperature
/ SPN 106 Engine Air Inlet Pressure
/ SPN 107 Engine Air Filter 1 Differential Pressure
/ SPN 173 Engine Exhaust Gas Temperature
PGN 65271 / SPN 158
PGN 61443 / SPN 92 Engine Percent Load At Current Speed
/ SPN 91 Accelerator Pedal Position 1
PGN 61444 / SPN 190 Engine Speed
/ SPN 513 Actual Engine - Percent Torque
/ SPN 512 Driver's Demand Engine - Percent Torque

The J1939 measurements are also available for Modbus operation. Please check chapter **Modbus Communications** for more details.

When the fuel output is active, if no information is received from the ECU during last 3 seconds, then the unit will give a **ECU FAIL** alarm and stop the engine. This feature prevents uncontrolled engine operation.

The **fault conditions of an electronic engine** are considered by the unit as **warnings** and do not cause engine stop. The engine is supposed protected by the ECU which will stop it when necessary.

The electronic engine **fault codes** are displayed **in text** within the alarm list table, together with their **SPN-FMI** codes. The complete list of fault codes is given in the engine manufacturer's user manual.

Below is a basic list of fault conditions (x denotes any FMI)

SPN	FMI	DESCRIPTION
56	x	Overspeed shutdown
57	x	Low oil pressure shutdown
58	x	High engine temp. shutdown
71	x	Gain adjust potentiometer fault
75	x	Generator speed circuit fault
79	x	Frequency adjust potentiometer fault
80	x	Droop adjust potentiometer fault
81	x	Low oil pressure warning
82	x	High engine temp. warning
91	x	Accelerator pedal circuit fault
94	x	Fuel filter restriction Fuel pressure sensor fail
97	x	Water in Fuel
99	x	Oil filter differential pressure fault
98	x	Low oil level, High oil level, Oil level sensor fail
100	x	Low oil pressure, Oil pressure sensor fail
101	x	Crankcase pressure fault
102	x	Intake manifold 1 pressure fault
103	x	Turbocharger 1 speed fault
105	x	Intake manifold temp high, Intake manifold temp sensor fail
106	x	High boost pressure, Turbo outlet pressure sensor fail
107	x	Air filter restriction, Air filter sensor fail
108	x	Atmospheric pressure sensor fail
109	x	Coolant pressure fault
110	x	High coolant temperature, Coolant temperature sensor fail
111	x	Low coolant level, Coolant level sensor fail
153	x	Crankcase ventilation fault
158	x	Battery voltage failure
164	x	High injector activation pressure, Injector activation pressure sensor fail
168	x	Battery 1 voltage fault
172	x	High inlet air temperature, High inlet manifold air temperature, Inlet manifold air temperature sensor fail
173	x	Exhaust gas temp. fault
174	x	High fuel temperature, Fuel temperature sensor fail
175	x	High oil temperature, Oil temperature sensor fail
190	x	Overspeed, Speed sensor loss of signal, Speed sensor mechanical failure

SPN	FMI	DESCRIPTION
234	x	Incorrect ECM software
612	x	Engine magnetic speed sensor fault
620	x	ECU internal +5V fail
626	x	Preheating relay fault
627	x	Injector power supply fault
629	x	ECU hardware fail
630	x	ECU memory fail
633	x	Fuel injector valve fault
636	x	Camshaft sensor
637	x	Flywheel sensor
639	x	ECU memory fail
644	x	External speed comm. Input fault
647	x	Fan control circuit fault
651	x	Injector cylinder #1 fault
652	x	Injector cylinder #2 fault
653	x	Injector cylinder #3 fault
654	x	Injector cylinder #4 fault
655	x	Injector cylinder #5 fault
656	x	Injector cylinder #6 fault
657	x	Injector cylinder #7 fault
657	x	Injector cylinder #8 fault
677	x	Start motor relay fail
723	x	Secondary engine speed sensor fail
1075	x	Electric lift pump circulation fault
1079	x	ECU internal +5V fail
1111	x	Check configuration parameters
1265	x	Engine oil burn valve fault
1377	x	Multiple unit synch. Switch fault
1378	x	Engine oil change interval
1384	x	Engine commanded shutdown
2000	x	ECU failure
2433	x	Exhaust gas temp. right manifold
2434	x	Exhaust gas temp. left manifold
2791	x	Internal EGR fail

Below is a basic list of FMI codes.

Please be aware that these codes may differ slightly depending on the engine brand and model.

FMI	DESCRIPTION
0	Value too high" Valid data, but above the normal working range
1	"Value too low" Valid data, but below the normal working range
2	"Faulty data" Intermittent or faulty data or Short circuit to battery voltage, injector high voltage side
3	"Electrical fault" Abnormally high voltage or short circuit to battery voltage, injector low voltage side
4	"Electrical fault" Abnormally low voltage or short circuit to battery negative, injector low voltage or high voltage side
5	"Electrical fault" Abnormally low current or open circuit
6	"Electrical fault" Abnormally high current or short circuit to battery negative
7	"Mechanical fault" Faulty response from mechanical system
8	"Mechanical or electrical fault" Abnormal frequency
9	"Communication fault" Abnormal updating rate or Open circuit in injector circuit
10	"Mechanical or electrical fault" Abnormally large variations
11	"Unknown fault" Unidentified fault
12	"Component fault" Faulty unit or component
13	"Faulty calibration" Calibration values outside the limits
14	"Unknown fault" Special instructions
15	Data valid but above normal operating range - least severe level
16	Data valid but above normal operating range - moderately severe level
17	Data valid but below normal operating range - least severe level
18	Data valid but below normal operating range - moderately severe level
19	Received network data in error
20	not used (reserved)
21	not used (reserved)
22	not used (reserved)
23	not used (reserved)
24	not used (reserved)
25	not used (reserved)
26	not used (reserved)
27	not used (reserved)
28	not used (reserved)
29	not used (reserved)
30	not used (reserved)
31	Condition exist

27. GPS SUPPORT

The unit supports external GPS module from USB-Host port.

USB GPS modules can be procured from the free market.

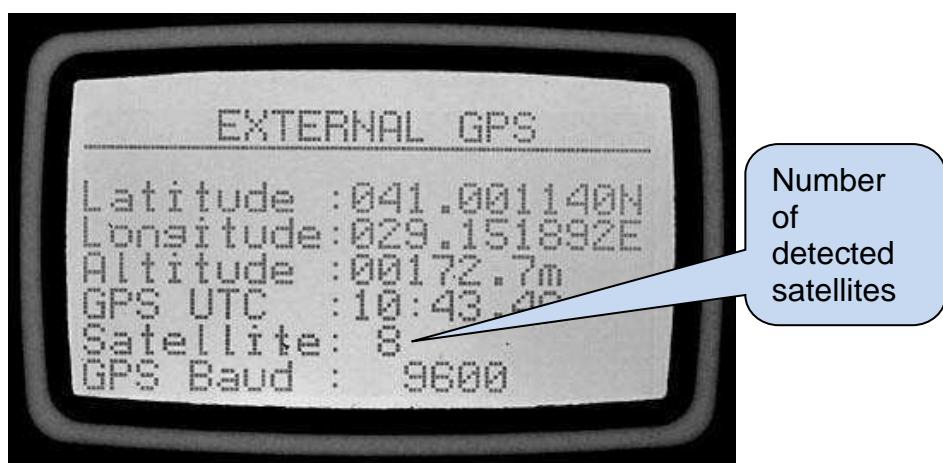


USB GPS MODULE

Related parameters are:

Parameter Definition	Unit	Min	Max	Factory Set	Description
Modem / GPS Selection	-	0	5	0	0: no modem 1: Internal GSM modem 2: external modem 3: external generic modem 4: no modem, GPS on RS-232 5: Internal modem, GPS on RS-232
External Modem / GPS Baud Rate	bps	2400	115200	115200	This is the data rate of the RS-232 port for the external modem / GPS.

The GPS screen is found under GSM Modem screen group.



GPS SCREEN

The GPS location determination is based on signals transmitted by GPS satellites circulating in earth's orbit. 24 satellites are available in total, but the number of satellites in sight will depend on the physical location and time.

A minimum of 3 satellites are necessary to determine the location. A fourth satellite is used for verification. More satellites will mean more precision. The unit displays the number of effective satellites on its GPS screen.

GPS satellites transmit a precision date and time information as well. This information is displayed on the GPS Screen, but not used elsewhere.

The location determination quality of the GPS module will depend on the physical location. The GPS should be installed in a location where it is capable of seeing a large portion of open sky. It can also work on reflections from ground or other buildings without seeing the sky, but location precision will be affected by this.



GPS based location has priority over GSM based location. If both type of locations are available, then GPS location will be used.

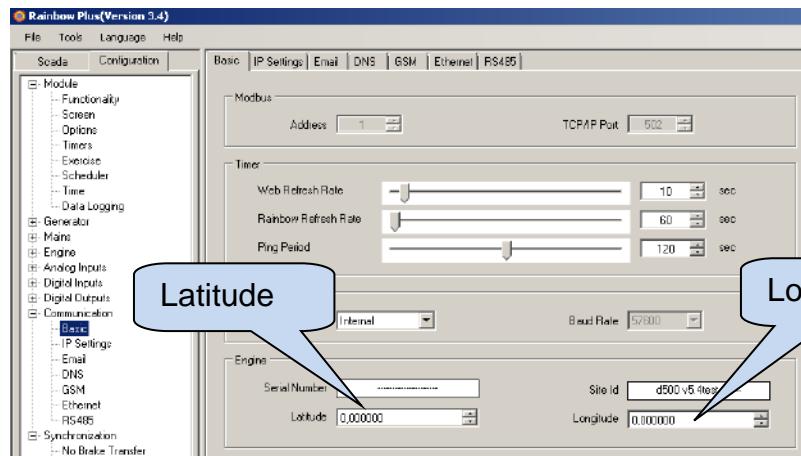


Detection of a USB-GPS is automatic. The unit will detect and use it without any programming.

Geographical location is stored in a non-volatile memory once an hour. Thus if the GPS signal is lost, the unit continues to appear at the same location of the remote monitoring system. However a GPS warning will be generated on loss of signal or communication with the module.

It is possible to program the geographical location inside the controller, forcing it to appear at the desired location of the remote monitoring system. The location setting is done through Rainbow Plus only.

Location parameters are found under: **Communication>Basic** tab



28. SMS COMMANDS



SMS messages are accepted only from phone numbers recorded in the **Communication>GSM>Message Numbers** tab.

Answers to SMS messages will be sent to all phone numbers in the list.



SMS messages must be written exactly as below, without any preceding blanks.
Only **UPPERCASE** characters are permitted.

COMMAND	DESCRIPTION	ANSWER
GET IP	If GPRS connection is active, the controller will reply by an SMS message indicating the IP address of the GSM modem.	IP: 188.41.10.244
GPRS 1	Activates the GPRS connection	GPRS enabled!
GPRS 0	Stops the GPRS connection	GPRS disabled!
RESET ALARMS	Clears alarms of the controller. The operating mode is not modified.	Alarms cleared!
REBOOT	Performs a hard reset on the controller	no answer
MODEM RESET	Performs a hard reset on the modem	no answer
GET INFO	Returns the alarm list and actual measured values	ALARMS (if exists) GEN: Vavg/IAVG/kWtot/pf/Freq MAINS: Vavg/IAVG/kWtot OIL_PR/TEMP/FUEL%

COMMAND	DESCRIPTION	ANSWER
MODE STOP	Puts the controller into STOP mode. Alarms are also cleared.	Unit forced to STOP!
MODE AUTO	Puts the controller into AUTO mode. Alarms are also cleared.	Unit forced to AUTO!
MODE MANUAL	Puts the controller into MANUAL (RUN) mode. Alarms are also cleared.	Unit forced to RUN!
MODE TEST	Puts the controller into TEST mode. Alarms are also cleared.	Unit forced to TEST!
OUT1 ON	Sets remote controlled output #1 to active state	OUT 1 = ON
OUT1 OFF	Sets remote controlled output #1 to passive state	OUT 1 = OFF
OUTxx ON	Sets remote controlled output #xx to active state (xx denotes any number between 1 and 16).	OUT xx = ON
OUTxx OFF	Sets remote controlled output #xx to passive state (xx denotes any number between 1 and 16).	OUT xx = OFF

29. LOAD TRANSFER MODES

The unit offers 3 ways of transferring the load from genset to mains and vice versa:

- transfer with interruption,
- no break transfer, (from genset to mains)
- soft transfer

29.1. TRANSFER WITH INTERRUPTION

This is the most conventional way of transferring the load between the genset and mains. There will be a power interruption period during the transfer. Note that the program parameters **Mains Contactor Timer** and **Genset Contactor Timer** define the power interruption period.



If this transfer method is used, it is advised to make an electrical interlock between the two contactors to prevent an accidental phase to phase short circuit.

Transfer from genset (or busbar) to mains:

- The generator (or busbar) contactor releases,
- The unit waits for Mains Contactor Timer
- The mains contactor is energized.

Transfer from mains to genset (or busbar):

- The mains contactor releases,
- The unit waits for Generator Contactor Timer
- The generator (or busbar) contactor is energized.

29.2. UNINTERRUPTED TRANSFER

In this mode, the transfer will be made **without power interruption from genset to mains**. This implies that both of the mains and generator contactors will be active during transfer.

The maximum duration that both contactors will be active is programmable. However this process may be quicker with the use of one auxiliary feedback contact from each contactor. Thus the changeover will be quite instantaneous, preventing any excess or reverse power condition.

To prevent a phase to phase short circuit below criteria must be met:

- The mains and generator voltages must be equal,
- The mains and generator voltages must have the same phase,
- The mains and generator voltages must have the same phase sequence.

The unit will allow an **Uninterrupted Transfer** only if **all** of the below conditions are fulfilled:

- Mains phase voltages within the programmed limits,
- Mains frequency within the programmed limits,
- Genset phase voltages within the programmed limits,
- Genset frequency within the programmed limits,
- Mains phase order correct (or phase order check must be disabled),
- Genset phase order correct (or phase order check must be disabled),
- The difference between mains and genset frequencies not more than programmed limit,
- The voltage difference mains-L1 and genset-L1 not more than programmed limit,
- The phase angle between mains-L1 and genset-L1 not more than programmed limit,

When an uninterrupted transfer cycle is started, the unit will wait until the expiration of the **Synchronization Fail Timer**, to find a matching frequency, phase and voltage.

Usually, with frequencies matching at +/- 2Hz and voltages matching at +/-10 volts an **Uninterrupted Transfer** is expected to successful.

If matching is found before the expiration of the **Synchronization Fail Timer**, then both contactors will be activated. If contactor auxiliary contacts are used, the other contactor will release immediately. If contactor auxiliary contacts are not used, the other contactor will release after **contactor timeout**.

The unit offers below parameters for the setup of the Uninterrupted transfer feature.

Parameter Definition	Description
No Break Transfer Enable	0: only interrupted transfer enabled 1: no break transfer enabled
Synchronization Fail Timeout	If the phase and voltage synchronization is not successful before the expiration of this timer, then a Synchronization Fail warning is given and the transfer will be performed with interruption.
Synchronization Contactor Timeout	When synchronization is detected, both contactors will stay closed during this timer.
Max Freq Difference	This is the maximum difference between mains and genset frequencies to close both contactors.
Max Volt Difference	This is the maximum difference between the mains phase-L1 and the genset phase-L1 voltages to close both contactors. If voltage transformer is used, this quantity is multiplied with voltage transformer ratio.
Max Phase Difference	This is the maximum phase angle between the mains phase-L1 and the genset phase-L1 voltages to close both contactors.
Phase Offset	This parameter is used to compensate the phase angle introduced by voltage transformers in case of MV synchronization. This angle value is added to the phase differential during phase matching process.

29.3. SOFT TRANSFER

In this mode, the transfer will be made without interruption like the **Uninterrupted Transfer** mode. But the load will be gradually transferred under **active and reactive power** control.

The Soft Transfer sequence starts like an Uninterrupted transfer. But when both contactors are activated, the unit starts transferring the kW and kVAr load to the mains with a predefined ramp (**Active Power Ramp, Reactive Power Ramp**). The duration of the load transfer sequence is controlled by the **Soft Transfer Timer**.

The unit offers a comprehensive set of protection functions to detect quickly a mains failure during parallel operation with mains. The protections are enabled after the timeout defined by the parameter **Parallel Check Delay**. These protections will be explained with more detail in the following chapter.

If a **mains failure** occurs during parallel with mains operation, the mains contactor will immediately de-energize, a general **Parallel Mains Fail** warning and a specific protection function warning will be generated.

At the end of the **Soft Transfer Timer**, the load contactor will be released. If any alarm is encountered during the **Soft Transfer** sequence, the controller will revert to the Interrupted transfer.

The controller has a set of programmable parameters to define the Soft Transfer operation. All parameters used in Uninterrupted Transfer are also used in Soft Transfer. Additional parameters are:

Parameter Definition	Description
Soft Transfer Enable	This parameter enables/disables the Soft Transfer feature.
Soft Transfer Timer	This is the time duration of the Soft Transfer. At the end of this timer one of the contactors will release to terminate the parallel operation
Active Power Ramp	The load's active power (kW) will be transferred to the mains with this rate.
Reactive Power Ramp	The load's reactive power (kVAr) will be transferred to the mains with this rate.
Ramp On High Limit	This parameter defines high limit of soft transferring from busbar to mains.
Ramp Off Low Limit	This parameter defines low limit of soft transferring from busbar to mains.
Parallel Check Delay	This is the delay after the mains contactor is energized (for parallel to mains) and before the protections for mains failure are enabled.

30. LOAD SHARING



This chapter is only applicable to units operated in multi-genset SYNCHRONIZATION & LOAD SHARE mode.

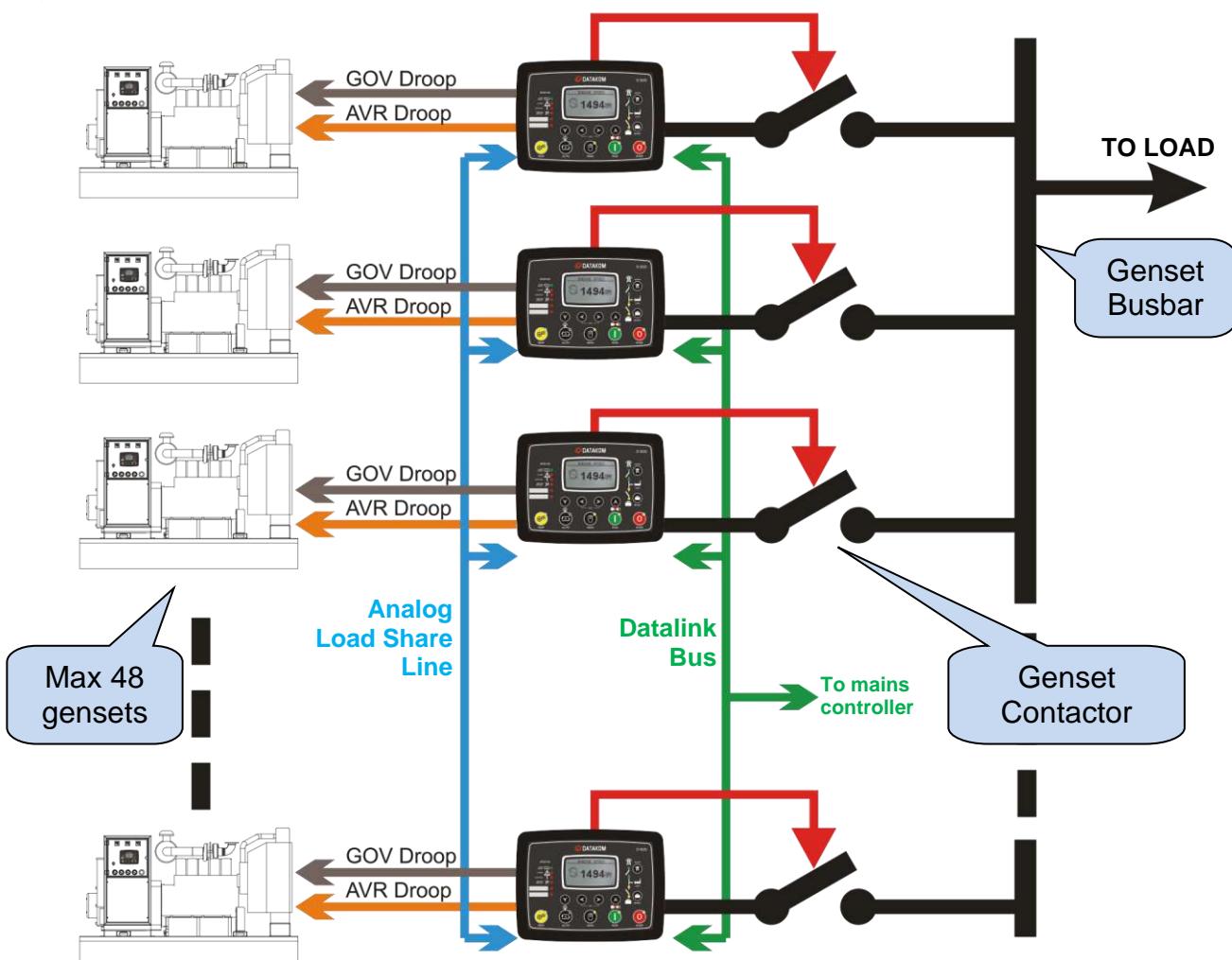
The load sharing functionality brings flexibility and economy to the genset system, where only the necessary number of gensets to supply the load run.

The reliability is also improved, where the user may have redundancy for failure cases or reserve power for accidental increase in power demand. The redundancy allows also stopping one genset for maintenance without interrupting the load power supply.

A maximum of 48 gensets can be paralleled on the same busbar using D-500 units. Always one of the gensets will become the **MASTER** one.

The master genset will determine the voltage and frequency of the busbar. It should be noted that, when the number of gensets in parallel increases, the stability of the system will be deteriorated, thus smaller kW and kVAr gains should be used.

When more than one genset start together, the master genset will always feed the busbar first. Other gensets will synchronize to the busbar, get in parallel and share the load.



Load sharing may be performed in 3 different ways:

- Digital load share, based on **Datalink** communication
- Active power sharing based on the **Analog Load Share Line**
- Uncontrolled load share, based on **droop operation**

30.1. DIGITAL LOAD SHARING (DATALINK)

The Datalink is an isolated Canbus line where all controllers communicate between them. The default Datalink bit speed is factory set to 250kbps. However speeds from 50kbps to 500kbps may be manually selected.



All units on the same Datalink bus must operate with the same bit speed.

The Datalink is the best performing way of load sharing. All controllers will broadcast all their power parameters and **both active and reactive powers** will be shared.

The load sharing display of each unit will show precisely the total system power loading and the individual genset power loading.

Based on the total power demand and own parameter setting, each genset will decide when to run.

When a genset decides to run, it will synchronize to the busbar, close its genset contactor and ramp-up until reaching the necessary power rate.

When a genset decides to stop, it will ramp-down, then open its genset contactor, then cooldown and stop.

The load sharing takes into account the genset nominal power settings. Gensets of various power ratings may be used in parallel. Each genset will be loaded with the same percentage of its nominal power.

Parameters used in the load sharing: (detailed descriptions are in the programming section)

Genset Active Power Rate	Dwell Timeout
Genset Reactive Power Rate	Active Power Ramp (kW/sec)
Genset Number in Multi Genset Systems	Reactive Power Ramp (kVAr/sec)
Minimum Genset Fault Action	Ramp On High Limit
Multi Genset Start-Up Options	Ramp Off Low Limit
Multi Genset Start-Up Power	Active Power Share G Gain
Insufficient Multi Genset Start-Up Power Alarm Level	Reactive Power Share G Gain
System Reserve Power	Nominal Frequency G Gain
Load Management Method	Nominal Voltage G Gain
Governor Droop Enable	Multi Genset Delayed Start
Governor Output Droop	Multi Genset Quick Start
AVR Droop Enable	Multi Genset Delayed Stop
AVR Output Droop	Multi Genset Run/Stop Delay
	Load Management Inhibit Delay

30.2. ANALOG LOAD SHARING

Load sharing can be performed as well using the Analog Load Share line.

The Analog Load Share facility is designed as an **emergency backup** to the digital load share for increased reliability.



When the Datalink line is active, the Analog Load Share Line is not used.

The analog load share is a wire where all load sharing controllers are in parallel.



Mains controllers do not use the analog load share line.

Only the **active power** is shared using the analog line. Thus it provides no control over the reactive power sharing. However reactive power sharing may be still performed using the droop function. Please see next chapter for the droop function.

As there is no communication between controllers in the absence of the Datalink, no smart load management is performed. When the REMOTE START signal comes, the genset runs, synchronizes to the busbar and supplies the active power requested by the load share line. It will stop only when the REMOTE START signal is removed.



Analog load sharing is less stable than digital load sharing.

Parameters used in the analog load sharing: (details are in the programming section)

Governor Droop Enable	Reactive Power Ramp (kVAr/sec)
Governor Output Droop	Ramp On High Limit
AVR Droop Enable	Ramp Off Low Limit
AVR Output Droop	Active Power Share G Gain
Dwell Timeout	Reactive Power Share G Gain
Active Power Ramp (kW/sec)	

30.3. DROOP MODE OPERATION

Droop mode allows an uncontrolled load share for emergency cases where the Datalink and Analog Load Share are not available.

This is the most primitive load sharing method, often used in old times.

The speed droop consists of a slight decrease in the genset speed with increasing active power demand.

The voltage droop is a slight decrease in the alternator voltage with increasing reactive power demand.



In order to achieve an acceptable load sharing, each genset must have the same nominal voltage and frequency settings.

As there is no communication between controllers in the absence of the Datalink, no smart load management is performed. When the REMOTE START signal comes, the genset runs, synchronizes to the busbar and closes its genset contactor.

The amount of active and reactive powers supplied to the load is controlled by the droop function. The genset will stop only when the REMOTE START signal is removed.



Droop mode load sharing is less accurate than digital load sharing. Differences between genset loads should be considered as normal.

Parameters used in the droop mode load sharing: (details are in the programming section)

Governor Droop Enable

Governor Output Droop

AVR Droop Enable

AVR Output Droop

31. PARALLEL OPERATION WITH MAINS

31.1. PEAK LOPPING

The Peak Lopping feature consists on the use of the genset system as a backup to the mains, in cases where the mains power rating is insufficient to supply the load.



The peak lopping application is only possible with slowly varying loads.

When peak lopping is enabled and the unit is in **AUTO** mode, if mains power exceeds the parameter **Peak Lopping Start Power** during **Peak Lopping Start /Stop Delay**, then the genset system will start and enter in parallel with the mains. As the mains power limit is not exceeded it will not supply power to the load.

When the total load power exceeds the parameter **Peak Lopping Maximum Mains Power** the unit will allow the mains to deliver only **Peak Lopping Maximum Mains Power** to the load. The exceeding quantity will be supplied by the genset system.

When the total load power falls below the parameter **Peak Lopping Stop Power** during peak lopping start/stop delay **Peak Lopping Start /Stop Delay** the load contactor will release and the unit will start the stop sequence.

The parameter **Peak Lopping Stop Power** should be less than the parameter **Peak Lopping Start Power** in order to prevent unstable operation (genset starts and stops repeatedly).

The unit offers a comprehensive set of protection functions to detect quickly a mains failure during parallel operation with mains. The protections are enabled after the timeout defined by the parameter **Parallel Check Delay**. These protections will be explained with more detail in the chapter **G59 PROTECTIONS**.

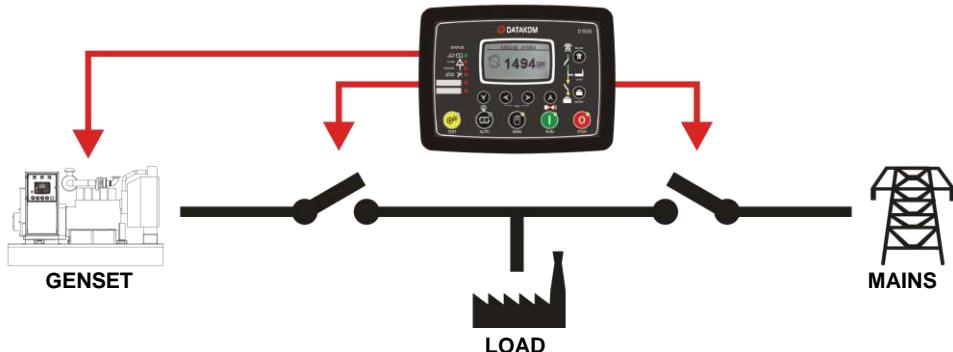
If a **mains failure** occurs during parallel operation with mains, the mains contactor will immediately de-energize, a general **Parallel Mains Fail** warning and a specific protection function warning will be generated. The load will be supplied by the multi genset system without interruption. When mains is restored again, the D700 will synchronize the genset system with the mains and resume to parallel operation.

The D700 has a set of programmable parameters to define the Peak Lopping operation. All parameters used in Uninterrupted Transfer and Soft transfer are also used in Peak Lopping. Additional parameters are:

Parameter Definition	Description
Peak Lopping Enable	This parameter enables/disables the Peak Lopping operation.
Peak Lopping Maximum Mains Power	This is maximum active power that the mains may deliver.
Peak Lopping Start Power	This is the mains active power limit for the start of the multi genset system.
Peak Lopping Stop Power	This is the total load active power for the stop of the multi genset system.
Peak Lopping Start /Stop Delay	This is the delay time for starting/stopping of the multi genset system.

The peak lopping may be disabled momentarily with an external signal. In order to achieve this, a digital input should be programmed as **Disable Peak Lopping** function input. More information about input programming is found in the **PROGRAMMING** chapter.

31.2. POWER EXPORT TO MAINS



The **Export to Mains** mode allows the multi genset system to supply the mains power grid under constant power factor. Thus the multi genset system will be part of the mains power supply system.

The Export to Mains mode is activated by setting the program parameter **Power Export Enable**. This operating mode is not compatible with Peak Lopping. Thus **Peak Lopping Enable** parameter must be 0.

When **Export to Mains** is enabled, the mains voltages and frequency are within limits and the D700 in **AUTO** mode, the unit will run the genset system, synchronize with mains and close the Load Contactor.

Then the output active power of the genset system will ramp-up at the rate defined in program parameter **Active Power Ramp**. The reactive power is continuously adjusted in order to hold the power factor constant (defined in **Exported Power Factor**).

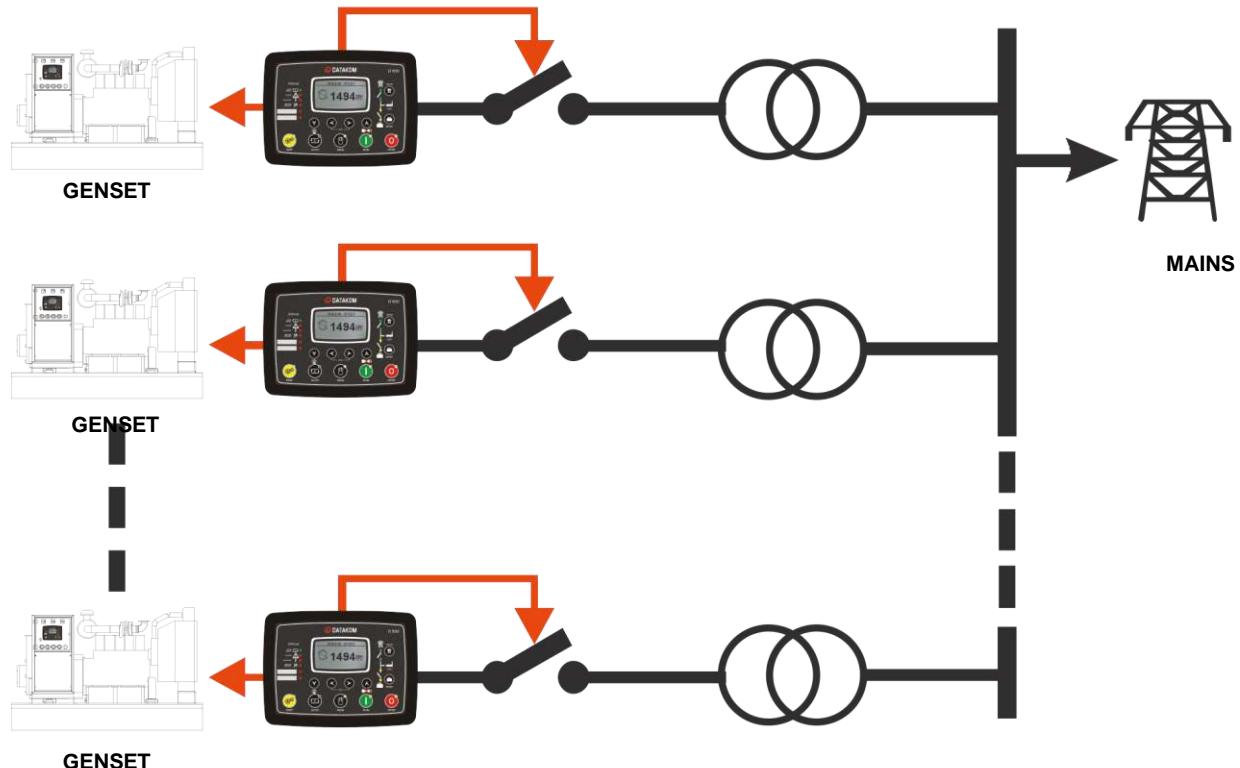
When the requested output power is reached, the ramping will be terminated. The requested power is defined by **Exported Power** program parameter.

The G59 protections for mains failure in parallel are active during the Export to Mains operation, with the exception of **Mains Reverse Power** protection. If a mains failure is detected during paralleling, then the mains contactor will open, and the D700 will continue to feed the local load. When the mains is restored, then the genset system will resume **Export to Mains** operation.

The Export to Mains operation is compatible with the **Weekly Operating Schedule**. Thus the genset can be programmed for supplying the mains only during given time intervals.

The power export mode may be disabled momentarily with an external signal. In order to achieve this, a digital input should be programmed as **Disable Power Export** function input. More information about input programming is found in the **PROGRAMMING** chapter.

31.3. DISTRIBUTED POWER EXPORT TO MAINS



The **Distributed Power Export to Mains** mode allows an unlimited number of gensets to export power to the mains and share active and reactive loads without any communication between controllers.

The application of this feature is large independent areas, relying only on generators for power generation. Gensets are distributed to the area, making any communication between controllers impossible. Thus each controller has to determine the required power to export independently from other controllers.

OPERATING PRINCIPLE:

When required to run, each generator is synchronized and closed to the mains independently. Usually generators are run and stopped manually by staff charged of power generation. The energy request will depend of the time of the day, thus the required number of gensets will vary.

The operating principle is based on the precise measurement of the mains frequency by the controllers.

When the frequency is below the nominal value, this means a need for extra power, and each controller will slowly ramp-up the exported power. When the frequency is above the nominal value, this shows an excess of power export, thus each controller will ramp-down its export power. For stability reasons a frequency band of no-action is also defined.

The reactive power export is controlled by the grid voltage. The controller tends to maintain the mains voltage at its nominal value, resulting in the production of the exact amount of reactive power requested by the load.

PARAMETERS TO ADJUST:

The Distributed Power Export functionality is enabled by a digital input set to the “**Distributed Power Export**” function (function_56). When signal arrives to this input, then the Distributed Power Export operating mode is enabled.

Parameter Definition	Description
Minimum Exported Power	The exported power will not fall below this limit.
Export Power Ramp (kW/sec)	The genset active export power (kW) will be increased/decreased with this rate.
Frequency Barrier	This is the minimum variation from the nominal frequency causing a power rump-up or ramp-down operation.

Other than above parameters, all parameters related to **Power Export to Mains** should be adequately programmed and the Power Export mode should be enabled.

31.4. PEAK LOPPING WITH GENSET PRIORITY

The purpose of this operating mode is to supply the with genset power wherever this is possible. This occurs generally in gas producing plants. The mains is used in order to back gensets up when the genset power or the gas production is insufficient

All gensets in the system synchronize and share the load. When genset power reaches the set limit, then gensets synchronize with the mains and start parallel operation. The extra load demand is supplied by the mains.

In order to activate Peak Lopping with Genset Priority, the Peak Lopping Enable parameter must be activated and the Peak Lopping Priority parameter must be set as Genset Priority.

If the total genset power available reaches **Multi Genset Quick Start** value, then the genset system will synchronize to the busbar and the excess load will be supplied by the mains. Gensets continue their operation at the power rating defined in **Multi Genset Quick Start** parameter. If the load falls below the **Multi Genset Quick Start** parameter then the mains contactor opens and the load will be supplied by the genset system only.

If one of the digital inputs of the Mains Synchronizing unit is adjusted as **Force Parallel Operation** and a signal is applied to this input, the genset system will immediately synchronize to the mains regardless of the load value. However the load will be supplied by the genset system only. This operation mode allows synchronizing to the mains to be ready before heavy loads enter into service.

PARAMETERS TO BE ADJUSTED:

Parameter Definition	Description
Peak Lopping Enable	This parameter allows the genset system to share the load with mains.
Peak Lopping Priority	If this parameter is adjusted as Genset has priority over mains, then the mains supplies the load only if the genset power is insufficient.
Multi Genset Quick Start	If the genset total active load is above this level, the genset system will synchronize to the mains and the excess load will be supplied by the mains.

32. PROTECTION FUNCTIONS PARALLELING WITH MAINS

The D-500 includes a comprehensive set of protection functions to detect quickly a **mains failure** during **parallel with mains** operation.

The protections are enabled after the timeout defined by the parameter **Parallel Check Delay** in order not to detect a mains failure during transients caused by the closing of the contactors.



Do not forget that the protections are disabled during Parallel Check Delay. Set this timeout as short as possible.

If any of the protection functions detects a mains failure during parallel with mains:

- the mains contactor is immediately de-energized,
- a Parallel Mains Fail warning is generated,
- a specific warning to the related protection function is generated.



Immediate disconnection of the generator from the mains in case of a mains failure, is required in most countries for paralleling of synchronous generators to the mains.

32.1. ROCOF FUNCTION (rate of change of frequency)

The ROCOF measures the frequency of the mains for each period. If the frequency change exceeds the predefined limit for 4 successive periods, then the ROCOF function detects a mains failure. Thus the response time of the ROCOF is approximately 4 cycles.

However the ROCOF will not detect relatively slow changes in mains frequency.

Related parameter: **ROCOF df/dt**

If the parameter is set to zero, then the protection function will be disabled.

32.2. VECTOR SHIFT FUNCTION

The Vector Shift measures and stores the period of last 5 cycles. At the end of each cycle it compares the average period of last 2 cycles with the average period of 4th and 5th cycles. If the difference exceeds the predefined limit, then the vector shift detects a mains failure. Thus the response time of the vector shift is 5 cycles.

However the vector shift will not detect relatively slow changes in mains frequency.

Related parameter: **Vector Shift Limit**

If the parameter is set to zero, then the protection function will be disabled.

32.3. OVER/UNDER FREQUENCY FUNCTION

This protection function measures the frequency of the mains for each period. If the frequency is outside limits for 4 successive periods, it detects a mains failure. The response time of the mains frequency is approximately 4 cycles.

Related parameters:

Mains Frequency Low Limit
Mains Frequency High Limit

32.4. OVER/UNDER VOLTAGE FUNCTION

The mains phase voltages are measured twice a second and compared with predefined high and low limits. If at least one of the phase voltages is outside limits, this will mean a mains failure. The response time is approximately 500ms.

Related parameters:

Mains Voltage Low Limit
Mains Voltage High Limit

32.5. MAINS REVERSE POWER FUNCTION

The mains active power is measured for each period. If the genset system supplies power to mains and this power exceeds the predefined limit, this will mean a mains failure.

The mains reverse power detector has a variable response time. For a power not exceeding 2 times the predefined limit the response time is 8 cycles. The response time is reduced with larger reverse powers. It is approximately 1 cycle with a reverse power of 8 times the predefined limit.

Related parameter:

Mains Reverse Power Limit

If the parameter is set to zero, then the protection function will be disabled.

32.6. NO FREQUENCY FUNCTION

The unit counts the time after the last detection of the mains frequency pulses. If no mains pulses is detected for a period corresponding to 2,5 times the **Mains Frequency Low Limit**, a mains failure alarm is generated.

Related parameter: **Mains Frequency Low Limit**

If the parameter is set to zero, then the protection function will be disabled.

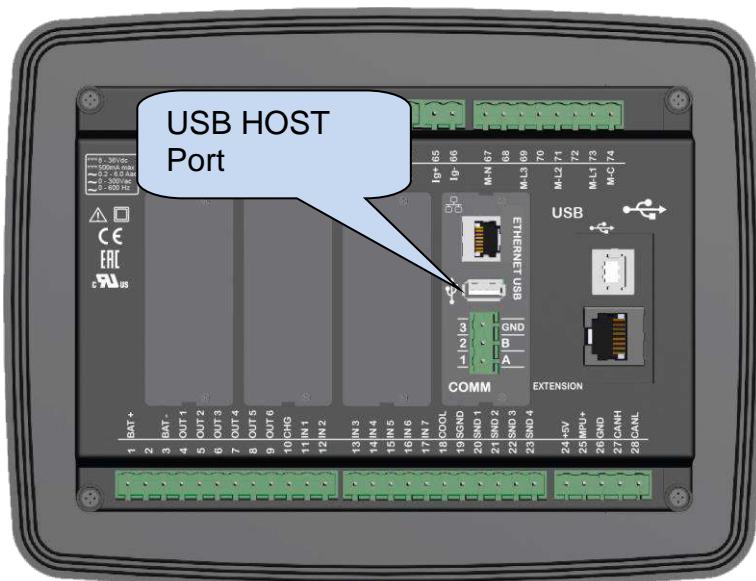
33. DATA RECORDING

33.1. DATA RECORDING MEDIA

Data can be recorded in USB flash memory. As soon as a USB flash memory is inserted, the unit will start data recording and continue until the memory is removed.



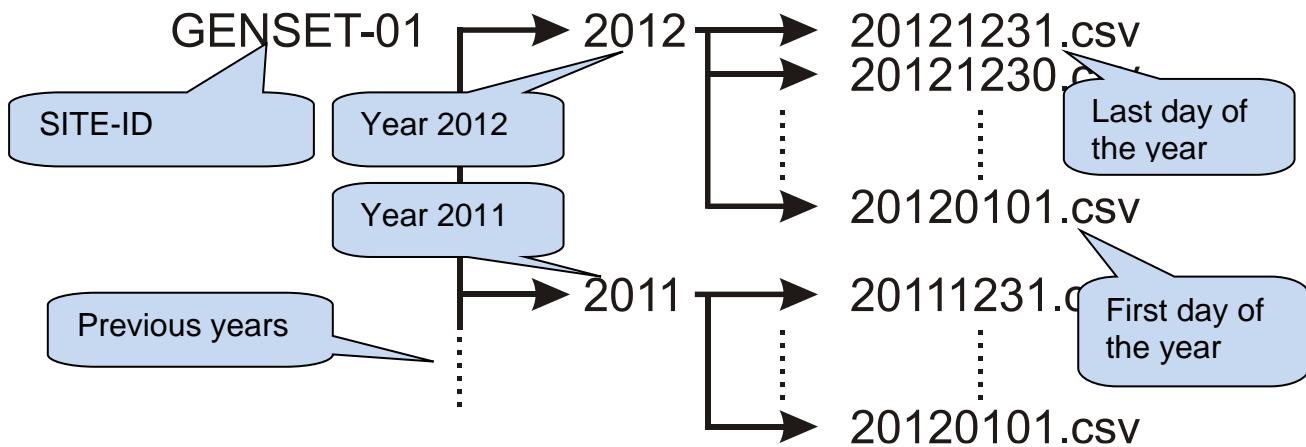
USB FLASH MEMORY



If USB-Device is plugged then USB-Host port will not function.

33.2. DIRECTORY STRUCTURE

The unit will record data in either an USB-Flash memory or a micro-SD flash memory card. The record structure is the same in both cases.



The unit will record data in a directory named with the first 11 characters of its site-id parameter. In order to avoid confusion between records, it is highly recommended to configure the site-id parameter accordingly to the genset installation place. Thus the same memory module may be used for recording in different controllers,

Inside the <SITE-ID> directory, the unit will open a separate directory for each year of recording. The directory will be simply named by the year, like 2012, 2013 etc...

Inside the year directory, the controller will record data in a different file for each day of recording. The record file will be named YYYYMMDD like "20120331" representing March '31, 2012. Thus alphabetical listing will produce a sorted list by date of recording.

The recorded file is of CSV (comma separated values) type. This is a text file which can be directly opened with Microsoft Excel program without any loss of information. It can be also opened with any text editor (like Notepad program).

Inside the file, each record consists of a line including a large set of measured parameters. The recorded parameters list is not adjustable. The controller records all practically necessary parameters.

33.3. UNDERSTANDING THE CSV FORMAT

The ".csv" file is basically a text file format. Thanks to this, it can be opened by any text editor in any operating system.

When opened with the Microsoft Excel program, the values will appear in tabulated form, enabling application of formulas, graphs and other features of Excel program.

33.4. RECORDED DATA LIST, RECORD PERIOD

The recording period is adjustable between 2 seconds and 18 hours by program parameter.

A short period will give better resolution, but it will generate more data in the memory card.

One data record is typically 250 bytes long, thus with a minimum period of 2 seconds, the unit will store 10.8 MB of data per day (250x30x60x24). A typical memory of 4GB will store data during 370 days, more than 1 year.

With a recording period of 1 minute, 4GB memory card will store data during 30 years.

Below parameters are recorded:

Date and time of recording	Gen voltage phase L1 to neutral
Operating mode	Gen voltage phase L2 to neutral
Mains voltage phase L1 to neutral	Gen voltage phase L3 to neutral
Mains voltage phase L2 to neutral	Gen average voltage phase to neutral
Mains voltage phase L3 to neutral	Gen voltage phase L1-L2
Mains voltage phase L1-L2	Gen voltage phase L2-L3
Mains voltage phase L2-L3	Gen voltage phase L3-L1
Mains voltage phase L3-L1	Gen current phase L1
Mains frequency	Gen current phase L2
Mains current phase L1	Gen current phase L3
Mains current phase L2	Gen average current
Mains current phase L3	Gen frequency
Mains average current	Gen kW phase L1
Mains frequency	Gen kW phase L2
Mains kW phase L1	Gen kW phase L3
Mains kW phase L2	Gen total kW
Mains kW phase L3	Gen kVA phase L1
Mains total kW	Gen kVA phase L2
Mains kVA phase L1	Gen kVA phase L3
Mains kVA phase L2	Gen kVAr phase L1
Mains kVA phase L3	Gen kVAr phase L2
Mains kVAr phase L1	Gen kVAr phase L3
Mains kVAr phase L2	Gen pf phase L1
Mains kVAr phase L3	Gen pf phase L2
Mains pf phase L1	Gen pf phase L3
Mains pf phase L2	Gen total pf
Mains pf phase L3	Neutral current
Mains total pf	Oil pressure (bar & psi)
Mains neutral current	Coolant temperature (°C & °F)
	Fuel level (%)
	Oil temperature (°C & °F)
	Canopy temperature (°C & °F)
	Engine speed (rpm)
	Battery voltage
	Charge input voltage
	Engine hours

34. SOFTWARE FEATURES

34.1. LOAD SHEDDING / DUMMY LOAD

The load shedding feature consists on the disconnection of the least crucial loads when the genset power approaches to its limits. These loads will be supplied again when the genset power falls below the programmed limit. The internal Load Shedding function is always active. Any digital output may be used as the load shedding output.

The dummy load function consists on the connection of a dummy load if the total genset load is below a limit and to disconnection of the dummy load when the total power exceeds another limit. The dummy load function is the inverse of the load shedding function, thus the same output may be used for both purposes.

It is also possible to control more complex external systems with multiple steps, using LOAD_ADD and LOAD_SUBSTRACT output functions. Any digital output may be assigned to these signals.

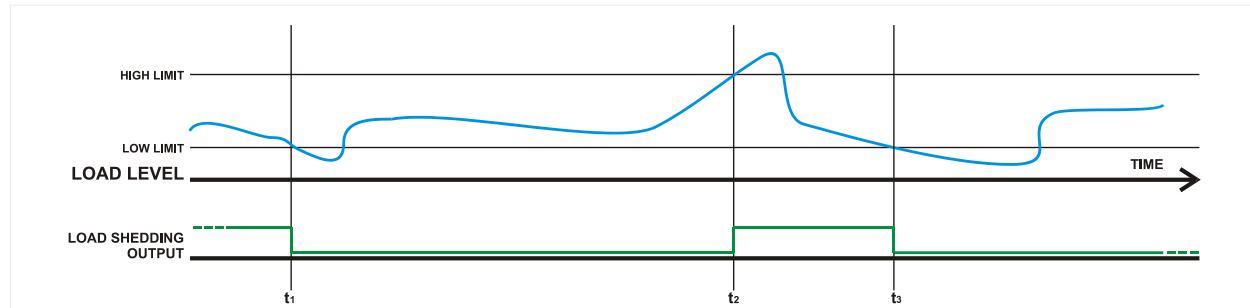
When the load is above the Load Shedding High Limit, the controller will activate the Load Shedding output.

When the load is below the Load Shedding Low Limit, the controller will release the Load Shedding output.

The parameters used in Load Shedding feature are in the Electrical Parameters Group:

Load Shedding Low Limit: If the genset power goes below this limit then the load shedding relay will be deactivated.

Load Shedding High Limit: If the genset power goes above this limit then the load shedding relay will be activated.



t₁: the load goes below the Load Shedding Low Limit, thus the Load Shedding output becomes inactive.

t₂: the load goes above the Load Shedding High Limit, thus the Load Shedding output becomes active.

t₃: the load goes below the Load Shedding Low Limit, thus the Load Shedding output becomes inactive.

34.2. LOAD ADD / SUBTRACT

The load add/subtract output functions are designed to provide control signals for an external, multi-step load adding/subtracting system.

This external system will add either linearly or by small steps a dummy load that will prevent the genset from running below the minimum required load level.

The same function may be used in order to supply loads of different priority levels following the available genset capacity.

When the load is below the Load Shedding Low Limit, the controller will activate the Load Add output. The external system will increase the load until it goes over the low limit, where the Load Add output will become inactive.

When the load is above the Load Shedding High Limit, the controller will activate the Load Subtract output. The external system will decrease the load until it goes below the high limit, where the Load Subtract output will become inactive.

There are protection delays between two pulses. These timers help to stabilizing the decision algorithm and preventing unwanted multiple operations.

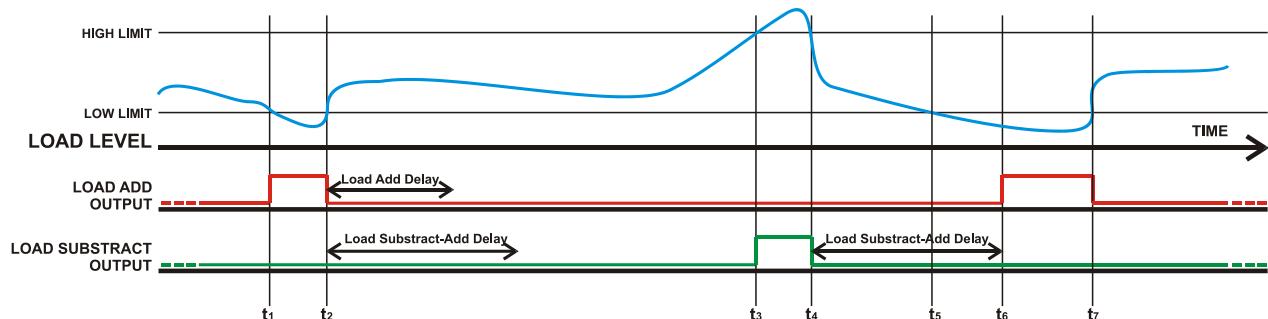
The parameters used in Load Shedding feature are in the Electrical Parameters Group:

Load Shedding Low Limit: If the genset power goes below this limit then the load_add relay will be active.

Load Shedding High Limit: If the genset power goes above this limit then the load_subtract relay will be active.

Load Add Delay: This is the minimum delay between 2 load_add pulses. This is also the minimum delay between 2 load_subtract pulses.

Load Subtract-Add Delay: This is the minimum delay between load_add and load_subtract pulses.



t₁: the load goes below the Load Shedding Low Limit, thus the Load Add output becomes active.

t₂: the load goes above the Load Shedding Low Limit, thus the Load Add output becomes inactive.

t₃: the load goes above the Load Shedding High Limit, thus the Load Subtract output becomes active.

t₄: the load goes below the Load Shedding High Limit, thus the Load Subtract output becomes inactive.

t₅: the load goes below the Load Shedding Low Limit, but the Load Subtract-Add delay is not expired. The controller waits until expiration of the timer.

t₆: the timer is expired and the load is still below the Load Shedding Low Limit, the Load Add output becomes active.

t₇: the load goes above the Load Shedding Low Limit, thus the Load Add output becomes inactive.

34.3. FIVE STEP LOAD MANAGEMENT

The controller is able to manage the supply of up to 5 prioritized loads. The loads are supplied starting from the number #1 (highest priority) and unloaded from the highest number (lowest priority) available.

Protection timers help to stabilizing the decision algorithm and preventing unwanted multiple operations.

When the load is below the **Multi Load Add Power Level** during **Multi Load Add Start Delay**, then 1 step of load is added. The minimum wait period between two load_adds is **Multi Load Add Wait Delay**.

When the load is above the **Multi Load Subtract Power Level** during **Multi Load Subtract Start Delay**, then 1 step of load is unloaded. The minimum wait period between two load_subtracts is **Multi Load Subtract Wait Delay**.

Add and subtract outputs send pulses of 0.25s duration.

The parameters used in Load Shedding feature are in the Electrical Parameters Group:

Multi Load Subtract Power Level: When the genset active power goes over this limit, the controller will start subtracting load.

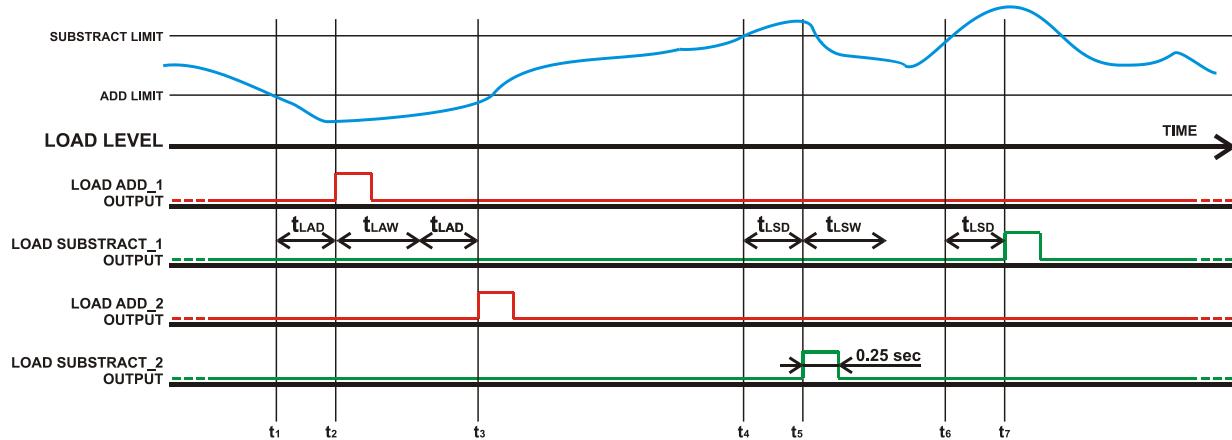
Multi Load Add Power Level: When the genset active power goes below this limit, the controller will start adding load.

Multi Load Subtract Start Delay (tLSD): If the load stays over the **Multi Load Subtract Power Level** parameter during this timer, then 1 step of load is subtracted.

Multi Load Subtract Wait Delay (tLSW): This is the minimum period between two load subtract pulses.

Multi Load Add Start Delay (tLAD): If the load stays below the **Multi Load Add Power Level** parameter during this timer, then 1 step of load is added.

Multi Load Add Wait Delay (tLAW): This is the minimum period between two load add pulses.



t1: the load goes below the Multi Load Add Power Level.

t2: after Multi Load Add Start Delay the load is still below Multi Load Add Power Level, the Load_Add_1 sends a pulse.

t3: after Multi Load Add Start Delay and Multi Load Add Wait Delay, the load is still below Multi Load Add Power Level, thus Load_Add_2 output sends a pulse.

t4: the load goes above the Multi Load Subtract Power Level.

t5: after Multi Load Subtract Start Delay, the load is still above Multi Load Subtract Power Level, thus the Load_Subtract_2 sends a pulse.

t6: the load goes above the Multi Load Subtract Power Level.

t7: Multi Load Subtract Wait Delay is already expired. After Multi Load Subtract Start Delay, the load is still above Multi Load Subtract Power Level, thus the Load_Subtract_1 output sends a pulse.

34.4. REMOTE START OPERATION

The unit offers the possibility of **Remote Start** mode of operation. Any digital input may be assigned as **Remote Start Input** using **Input Function Select** program parameters.

The **Remote Start** signal may be a NO or NC contact, switching to either battery positive or battery negative. These selections are made using programming menu.

It is also necessary to set the **ACTION** program parameter of the related input to **3** in order to prevent any alarm from this input.

When a **Remote Start** input is defined, the mains phases are not monitored. When the **Remote Start** signal is present then the mains will be supposed to fail, inversely when the **Remote Start** signal is absent then mains voltages will be supposed to be present.

The front panels mimic diagram's mains LEDs will always reflect the status of the **Remote Start** input.

34.5. DISABLE AUTO START, SIMULATE MAINS

The unit offers an optional **Disable Auto Start** signal input. Any digital input may be assigned as **Disable Auto Start** using **Input Function Select** program parameters.

It is also necessary to set the **ACTION** program parameter of the related input to **3** in order to prevent any alarms generated from this input.

The **Disable Auto Start** signal may be a NO or NC contact, switching to either battery positive or battery negative. These selections are made using the programming menu.

If the **Disable Auto Start** input is defined and the input signal is active, the mains phases are not monitored and supposed to be inside limits. This will prevent the genset from starting even in case of a mains failure. If the genset is running when the signal is applied, then usual Mains Waiting and Countdown cycles will be performed before engine stop. When the **Disable Auto Start** signal is present, the front panels mimic diagram's mains LEDs will reflect the mains voltages as present.

When the signal is passive, the unit will revert to normal operation and monitor the mains voltage status.



The REMOTE START operation overrides DISABLE AUTO START and FORCE TO START operations.

34.6. BATTERY CHARGING OPERATION, DELAYED SIMULATE MAINS

The Delayed Mains Simulation feature is used in battery backed up telecom systems where batteries are able to supply the load during a certain period. The genset is requested to run only when battery voltage drops below the critical level. Once the engine runs, the rectifier system starts charging the batteries and the battery voltage goes up immediately. Thus the engine should continue to run a programmed period for effective charging. The critical battery voltage level will be detected by an external unit which provides the digital **Disable Auto Start** signal for the genset control unit.

The unit offers an optional **Disable Auto Start** signal input. Any digital input may be assigned as **Simulate Mains** using **Input Function Select** program parameters.

It is also necessary to set the **ACTION** program parameter of the related input to **3** in order to prevent any alarms generated from this input.

The **Disable Auto Start** signal may be a NO or NC contact, switching to either battery positive or battery negative. These selections are made using the programming menu.

If the **Delayed Simulate Mains** program parameter is set to **1** and the input signal is active when the genset is not feeding the load, the mains phases are not monitored and supposed to be inside limits. This will prevent the genset from starting when the simulate mains signal is present (batteries charged). The genset will start when mains voltages are out of limits and the simulate mains signal not present.

If the genset is running when the signal is applied, then **MAINS SIMULATION** will be prevented during **Flashing Relay On Timer** program parameter. After this, usual Mains Waiting and Cooldown cycles will be performed before engine stop. When the **SIMULATE MAINS** signal is present, the front panels mimic diagram's mains LEDs will reflect the mains voltages as present.

When the signal is passive, the unit will revert to normal operation and monitor the mains voltage status.



The REMOTE START operation overrides Disable Auto Start operation. When both “Remote Start Operation” and “Delayed Simulate Mains” are enabled then REMOTE START operation mode is performed.

34.7. DUAL GENSET MUTUAL STANDBY OPERATION

Dual genset intermittent operation consists of regular switching of the load between 2 gensets. The use of 2 gensets instead of one is due either to safety purposes in case of a genset failure or to a continuous operation requesting service stops.

The running period for each genset is adjustable using **Flashing Relay On Timer** and **Flashing Relay Off Timer** program parameters. If the time is adjusted as 0 hours, it will be actually set to 2 minutes for faster testing purposes.

A flashing relay output function is provided, based on the parameter **Flashing Relay On/Off Timers**. Each time the period programmed using **Flashing Relay Timer** elapses, the relay output will change position.

The flashing relay function may be assigned to any digital output using **Output Configuration** program parameters.

The dual genset intermittent operation uses also the **Disable Auto Start** feature. Please review related chapter for a detailed explanation of this feature.

Priority In Dual Genset Mutual Standby Operation:

It may be required that the dual genset system starts the same genset at every mains failure. This is achieved using the **PRIORITY** input.

Any digital input may be assigned as **Priority** using **Input Function Select** program parameters.

It is also necessary to set the **ACTION** program parameter of the related input to **3** in order to prevent any alarms generated from this input.

The **Priority** signal may be a NO or NC contact, switching to either battery positive or battery negative. These selections are made using the programming menu.

If a **Priority** input is defined, then the system will work in priority mode. If the priority signal is applied, the unit will become master after each mains failure. If the priority signal is not applied, then the unit will become the slave one and the other genset will start.



Please contact DATAKOM for a complete application manual.

34.8. MULTIPLE VOLTAGE AND FREQUENCY

The unit offers 3 sets of voltage and frequency protection limit values. The user is allowed to switch between these 3 sets anytime.

This feature is especially useful in multiple voltage or frequency gensets for easy switching between different operating conditions.

The switching to the second or third set of limit values can be done via digital input signal.

If switching is done with digital input signal, one of digital inputs has to be defined as “**2nd Volt-Freq Select**” using “**INPUT FUNCTION SELECT**” program group.

If third set is used, the one of digital inputs has to be defined as “**3rd Volt-Freq Select**” using “**INPUT FUNCTION SELECT**” program group.

Below parameters are available for second voltage-frequency selection:

Nominal Voltage

Nominal Frequency

Nominal RPM

Genset Overcurrent Limit

34.9. SINGLE PHASE OPERATION

If the unit is used in a single phase electrical network, it is advised to select the topology as **Single Phase 2 Wires**.

When the topology is set to **Single Phase 2 Wires**, then the unit will measure electrical parameters only on phases **L1** of genset and mains.

Voltage and overcurrent checks will be performed on phases **L1** only.

Phases **L2** and **L3** parameters, as well as phase-to-phase voltages are removed from display screens.

34.10. EXTERNAL CONTROL OF THE UNIT

The unit offers total external control through programmable digital inputs. Any digital input may be programmed for below functions:

- Force STOP mode
- Force AUTO mode
- Force TEST mode
- Disable Auto Start
- Force to Start
- Fault Reset
- Alarm Mute
- Panel Lock

External mode select signals have priority on mode buttons of the unit. If the mode is selected by external signal, it is impossible to change this mode with front panel pushbuttons. However if the external mode select signal is removed, the unit will revert to the last selected mode via pushbuttons.

It is also possible to lock the front panel completely for remote command.

34.11. AUTOMATIC EXERCISER

The unit offers 7 independent automatic exercisers. The exercise operation may be done on a weekly or monthly basis.

The start day and time of the exercise is programmable as well as its duration. The exercise may be done with or without load following programming.

Program parameters related to the exerciser are:

Exercise start day and hour

Exercise duration

Exercise off_load/on_load

Please refer to the programming section for a more detailed description of the above parameters.

When the start day and hour of exercise has come, the unit will automatically switch to either **RUN** or **TEST** mode. The engine will run. If the on_load exercise is selected then the load will be transferred to the genset.

If a mains failure occurs during the off-load exercise, the load will not be transferred to the genset unless the **Emergency Backup Operation** is allowed by setting the related program parameter to 1. Thus it is highly recommended that the Emergency Backup mode enabled with off-load exerciser.

At the end of the exercise duration, the unit will switch back to the initial mode of operation.

If any of the mode selection keys are pressed during exercise, then the exercise will be immediately terminated.

Using the weekly exercise mode and with suitable parameter setting, the unit may feed the load from the genset during predefined hours of each day. This operation may be used in high tariff periods of the day.

34.12. WEEKLY OPERATION SCHEDULER

In most applications, the genset is requested to operate only in working hours. Thanks to the weekly program feature, unwanted operation of the genset may be prohibited.

The scheduler is active only in **AUTO** mode. When the scheduler prevents genset operation in **AUTO** mode, the **AUTO** led will flash.



When the scheduler prevents genset operation in AUTO mode, the AUTO led will flash.

The scheduler consists of 144 programmable parameters, one for each hour in a week. Thus every hour of the week may be independently selected as ON or OFF times.

These programmable parameters allow the genset to operate automatically only in allowed time limits.

The unit has a battery backed-up precision real time clock circuit. The real time clock circuit will continue its operation even in power failures. The real time clock is precisely trimmed using the **Real Time Clock Adjust** program parameter. For more details check the programming section.

34.13. ENGINE HEATING OPERATION

Especially on engines without a body heater, or with a failing one, it may be desired that the genset should not take the load before reaching a suitable temperature. The unit offers 2 different ways of engine heating.

1. Timer controlled heating:

This operation mode is selected when the **Engine Heating Method** parameter is set to **0**. In this mode, the engine will run during parameter **Engine Heating Timer**, and then the genset will take the load.

2. Timer and temperature controlled heating:

This operation mode is selected when the **Engine Heating Method** parameter is set to **1**. In this mode, at first the engine will run during parameter **Engine Heating Timer**, then it will continue to run until the measured coolant temperature reaches the limit defined in parameter **Engine Heating Temperature**. When the requested temperature is reached, the load will be transferred to the genset. This operation mode may be used as a backup to the engine body heater. If the engine body is warm the heating will be skipped.

34.14. ENGINE IDLE SPEED OPERATION

It may be required that the engine runs at the idle speed for a programmed duration for engine heating. The idle operation duration is adjusted with the parameter **Idle Speed Timer**. The idle speed will be set by the governor control unit of the engine.

Any digital output may be assigned as **IDLE output** using **Relay Definition** program parameters.

The Idle speed operation is performed both in engine start-up and cool-down sequences. Low speed and low voltage protections are disabled during idle speed operation.

34.15. ENGINE BLOCK HEATER

The unit is able to provide a digital output in order to drive the block heater resistor. The temperature reference is the coolant temperature measured from the analog sender input.

The block heater output function may be assigned to any digital output using **Relay Definition** program parameters.

The engine body temperature limit is adjusted using the parameter **Engine Heating Temperature**. The same parameter is used for engine heating operation.

The relay will become active if the body temperature falls to 4 degrees below the limit set by **Engine Heating Temperature**. It turns off when the body temperature exceeds **Engine Heating Temperature**.

34.16. FUEL PUMP CONTROL

The unit is able to provide a digital output function in order to drive the fuel pump motor.

The fuel pump is used to transfer fuel from the large capacity main tank (if exists), to the genset daily tank which is generally integrated in the chassis and has a limited capacity.

The fuel level reference is measured through the analog fuel level sender. When the measured fuel level falls below **Fuel Pump Low Limit** parameter, the fuel pump output function will become active. When the fuel level reaches **Fuel Pump High Limit** parameter, the output function will become passive. Thus the chassis fuel tank level will be always kept between **Fuel Pump Low Limit** and **Fuel Pump High Limit** parameters.

If the **Fuel Pump High Limit** is not reached within **Fuel Filling Timer** duration, then the fuel pump will stop for safety.

The fuel pump relay function may be assigned to any digital output using **Relay Definition** program parameters.

34.17. GAS ENGINE FUEL SOLENOID CONTROL

The unit provides a special function for the fuel solenoid control of a gas engine.

The fuel solenoid of a gas engine is different from a diesel engine. It should be opened after the cranking has been started and should be closed between crank cycles. The delay between the crank start and solenoid opening is adjusted using the **Gas Solenoid Delay** program parameter.

The gas engine fuel solenoid relay function may be assigned to any digital output using **Relay Definition** program parameters.

34.18. PRE-TRANSFER SIGNAL

The controller is able to provide a pre-transfer digital output function.

This function is designed for elevator systems, in order to bring the cabin to a floor and open cabin doors before transfer.

The duration where this output is active is adjusted with the **Pre-Transfer Delay** parameter.



If the **Pre-transfer Delay** parameter is not zero, this will delay transfers by the same amount.

34.19. CHARGING THE ENGINE BATTERY

The controller offers an automatic charge cycle for the engine battery.

When the engine battery weakens, the genset will run automatically during programmed period in an unloaded state in order to charge the engine battery, protecting it from total discharge when the genset has not run for a long time.

Related parameters:

Battery Charge Run Voltage: If this parameter is different from zero and the engine battery voltage falls below this limit then the controller will run the engine unloaded, in order to charge engine battery. The running duration is determined by the **Battery Charge Run Timer** parameter.

Battery Charge Run Timer: This parameter determines the engine battery charge running duration. The minimum run time is 2 minutes.

Emergency Backup: If this parameter is activated and the mains fails during engine battery charging run, then the genset will take the load.

34.20. EXTERNALLY CONTROLLED DIGITAL OUTPUTS

The controller offers 16 externally controllable digital output functions.

These output functions have no effect in the operation of the unit; however they can be redirected to any digital output, allowing remote control of functions or external devices.

The remote control of these outputs are enabled through Modbus, Modbus TCP/IP and Rainbow Scada remote control functions.

The outputs are in 16 bits of the same Modbus register, placed at address 11559d.



Output statuses are kept in a non-volatile memory and are not affected by power failures.



Please review the Modbus manual for more details.

34.21. COMBAT MODE

The controller offers a combat mode input function.

When a digital input is defined as Combat Mode and signal applied to this input, the controller will turn off all led lamps and the backlight illumination 10 seconds after any key is pressed.

When a button is pressed, the illumination will be enabled for 10 seconds.

34.22. RESETTING THE CONTROLLER

When necessary, the controller may be manually reset by holding the STOP button pressed for 30 seconds.

The manual reset will cause the hardware to be configured following new settings.

It is advised to proceed to a manual reset or power off/on cycle after every hardware configuration modification.

34.23. AUTOMATIC CONNECTION TOPOLOGY DETERMINATION

The controller offers the capability of automatically determining the connection topology and setting the voltage checks in accordance.

Related parameters are:

Automatic Topology Detection	-	0	1	0	If this parameter is enabled, when the engine runs, the controller will detect the connection topology automatically and will select alarm levels accordingly. 0: auto detect not enabled 1: auto detect enabled
------------------------------	---	---	---	---	--

If the automatic topology determination is activated by program parameter, when the engine runs, the connection topology is tested to be one of below ones during “holdoff timer” period.

If below voltage conditions are met continuously during 3 seconds, then the topology is considered to be determined.

If the topology cannot be determined during holdoff timer duration, then an “**Unknown Topology**” loaddump is generated, and the engine stops after cooldown.



During topology determination phase, if the RUN button is held pressed, the holdoff timer will not expire and the controller will try to determine the topology as long as the RUN button is held pressed.

This feature is especially useful for manual voltage adjustment after a new topology selection.

Available topologies to be determined are:

TOPOLOGY	Voltage	Overcurrent Limit	Overload Limit
High Wye	314V > L1&L2&L3 > 182V	Overcurrent limit x1	Overload limit x 1
Low Wye	157 V > L1&L2&L3 > 92 V	Overcurrent limit x2	Overload limit x 1
High Zigzag	276 V > L1&L2 > 204 V	Overcurrent limit x1	Overload limit x 2/3
Low Zigzag	136 V > L1&L2 > 84 V	Overcurrent limit x2	Overload limit x 2/3

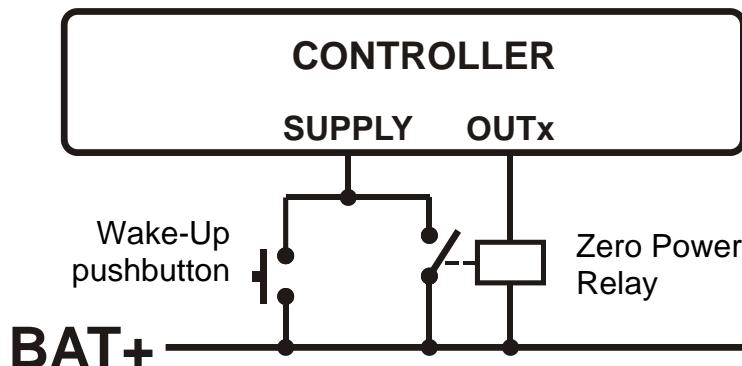
34.24. ZERO POWER AT REST

In a manual genset, it is possible to reduce the current consumption of the unit down to true zero Amperes, in order to prevent the battery from discharging.

For “zero power at rest operation”, an external relay and “wake-up” pushbutton is necessary.

A digital output should be set to ZERO POWER RELAY function. An external relay should be driven with this digital output. The relay contact will feed the controller power supply.

Any digital output may be assigned as zero-power-relay output. Please refer to the relay function list for the setup.



The controller wakes-up on applying the power through the “wake-up” pushbutton. Then it will immediately activate the zero power output which will cause the zero power relay to feed the controller.

If the engine is not run, or if the engine stops, a timer of 5 minutes will be counted. At the expiration of the counter, the controller will deenergize the zero power relay which will cut the power supply. The controller will wait in a zero-power state until the wake-up pushbutton is depressed again.

35. MODBUS COMMUNICATIONS



This chapter is a brief description of the Modbus properties of the controller. For a complete documentation please use “500 Modbus Application Manual”

The unit offers the possibility of MODBUS communication through below carriers:

- RS485 serial port, with adjustable baud rate between 2400 and 115200 bauds
- MODBUS-TCP/IP through Ethernet port (100Mb)
- MODBUS-TCP/IP through GPRS (85/42kb), client mode through Rainbow Scada only

The MODBUS properties of the unit are:

- Data transfer mode: RTU
- Serial data: selectable baud rate, 8 bit data, no parity, 1 bit stop
- Modbus-TCP/IP: Ethernet 100Mb or GPRS Class 10.
- Supported functions:
 - Function 3 (Read multiple registers)
 - Function 6 (Write single register)
 - Function 16 (Write multiple registers)

Each register consists of 2 bytes (16 bits). A larger data structure will contain multiple registers.

The Modbus communications requires a slave address to be assigned to each device in the Modbus network. This address ranges between 1 and 240 and allows the addressing of different slave devices in the same network.



Each device in the same RS-485 serial network must be assigned a different slave address. Otherwise the Modbus communications will not be performed.



Devices using Modbus-TCP/IP with different IP or port addresses may use any slave address. It is advised to set these slave addresses to the default setting which is 1.

35.1. PARAMETERS REQUIRED FOR RS-485 MODBUS OPERATION

Modbus Slave Address: may be set between 1 and 240

RS-485 Enable: must be set to 1 (or checkbox enabled)

RS-485 Baud Rate: selectable between 2400 and 115200 bauds. All devices in the same network must use the same Baud Rate.

Selecting a higher baud rate will allow faster communication, but will reduce the communication distance. Selecting a lower baud rate will increase the communication distance, but will cause slower response times.

Typically 9600 bauds will allow 1200m distance with special balanced 120 ohms cable.

35.2. PARAMETERS REQUIRED FOR MODBUS-TCP/IP VIA ETHERNET

Modbus Slave Address: may be set between 1 and 240. If only one unit is available in the same IP address, it is advised to keep the default address (1).

Ethernet Enable: This parameter should be set to 1 (or checked) in order to enable the ethernet port.

Modbus TCP/IP Port: The usual setting is 502. However the unit is able to work on any port address.

User IP Mask: There are 3 mask registers available. The use of the registers are emphasized in the D500 User Manual. Please set the first mask as 255.255.255.0 for the proper operation.

Ethernet Network IP: May be left as 0.0.0.0 for automatic address claim or set to a value in order to claim a defined address.

Ethernet Gateway IP: Should be set in accordance with your local switch configuration.

Ethernet Subnet Mask: Should be set in accordance with your local switch configuration.

35.3. DATA FORMATS

16bit variables: These variables are stored in a single register. Bit_0 denotes the LSB and bit 15 denotes the MSB.

32 bit variables: These variables are stored in 2 consecutive registers. The high order 16 bits are in the first register and the low order 16 bits are in the second register

Bit arrays: Arrays larger than 16 bits are stored in multiple registers. The LSB of the first register is bit_0. The MSB of the first register is bit_15. The LSB of the second register is bit_16. The MSB of the second register is bit_31, and so on.

Below is a shortlist of available Modbus registers. For complete register map please refer to 500 Modbus Application Manual.

ADDRESS (decimal)	R / W	DATA SIZE	COEFF.	DESCRIPTION
8193	W	16bit	x10	Pushbutton simulation BIT 0.Simulate Stop button BIT 1.Simulate Manual button BIT 2.Simulate Auto button BIT 3.Simulate Test button BIT 4.Simulate Run button BIT 5.Simulate GCB button BIT 7.Simulate Menu+ button BIT 8.Simulate Menu- button BIT 9.Simulate Up button BIT10.Simulate Down button BIT14.Button Long pressed BIT15.Button Very Long Pressed
10240	R	32bit	x10	Mains phase L1 voltage
10242	R	32bit	x10	Mains phase L2 voltage
10244	R	32bit	x10	Mains phase L3voltage
10246	R	32bit	x10	Genset phase L1 voltage
10248	R	32bit	x10	Genset phase L2 voltage
10250	R	32bit	x10	Genset phase L3 voltage
10252	R	32bit	x10	Mains phase L1-L2 voltage
10254	R	32bit	x10	Mains phase L2-L3 voltage
10256	R	32bit	x10	Mains phase L3-L1voltage
10258	R	32bit	x10	Genset phase L1-L2 voltage
10260	R	32bit	x10	Genset phase L2-L3 voltage
10262	R	32bit	x10	Genset phase L3-L1 voltage
10264	R	32bit	x10	Mains phase L1 current
10266	R	32bit	x10	Mains phase L2 current
10268	R	32bit	x10	Mains phase L3 current
10270	R	32bit	x10	Genset phase L1 current
10272	R	32bit	x10	Genset phase L2 current
10274	R	32bit	x10	Genset phase L3 current
10276	R	32bit	x10	Mains neutral current
10278	R	32bit	x10	Genset neutral current
10292	R	32bit	x10	Mains total active power
10294	R	32bit	x10	Genset total active power
10308	R	32bit	x10	Mains total reactive power
10310	R	32bit	x10	Genset total reactive power
10324	R	32bit	x10	Mains total apparent power
10326	R	32bit	x10	Genset total apparent power
10334	R	16bit	x10	Mains total power factor
10335	R	16bit	x10	Genset total power factor
10338	R	16bit	x100	Mains frequency
10339	R	16bit	x100	Genset frequency
10341	R	16bit	x100	Battery voltage
10361	R	16bit	x10	Oil pressure in bars (multiply by 14.50 to for psi)
10362	R	16bit	x10	Engine temp in °C (multiply by 1.8 then add 32 for °F)
10363	R	16bit	x10	Fuel level in %
10364	R	16bit	x10	Oil temp in °C (multiply by 1.8 then add 32 for °F)
10365	R	16bit	x10	Canopy temp in °C (multiply by 1.8 then add 32 for °F)
10366	R	16bit	x10	Ambient temp in °C (multiply by 1.8 then add 32 for °F)
10376	R	16bit	x1	Engine rpm

ADDRESS (decimal)	R / W	DATA SIZE	COEFF.	DESCRIPTION
10504- 10519	R	256bit	-	Shutdown alarm bits. Bit definitions are given at the end of the document.
10520- 10535	R	256bit	-	Loaddump alarm bits. Bit definitions are given at the end of the document.
10536- 10551	R	256bit	-	Warning alarm bits. Bit definitions are given at the end of the document.
10604	R	16bit	-	Unit operation status 0= genset at rest 1= wait before fuel 2= engine preheat 3= wait oil flash off 4=crank rest 5=cranking 6= engine run idle speed 7= engine heating 8= running off load 9= synchronizing to mains 10= load transfer to genset 11= gen cb activation 12= genset cb timer 13= master genset on load, 14= peak lopping 15= power exporting 16= slave genset on load 17= synchronizing back to mains 18= load transfer to mains 19= mains cb activation 20= mains cb timer 21= stop with cooldown 22= cooling down 23= engine stop idle speed 24= immediate stop 25= engine stopping
10605	R	16bit	-	Unit mode 0= STOP mode 1= AUTO mode 2= MANUAL mode 3= TEST mode
10606	R	16bit	x1	Genset operation timer. In various wait statuses, the genset operation status will change at the expiration of this timer.
10610	R	16bit	-	Device hardware version information
10611	R	16bit	-	Device software version information
10616	R	32bit	x1	Counter: number of genset runs
10618	R	32bit	x1	Counter: number of genset cranks
10620	R	32bit	x1	Counter: number of genset on load
10622	R	32bit	x100	Counter: engine hours run
10624	R	32bit	x100	Counter: engine hours since last service
10626	R	32bit	x100	Counter: engine days since last service
10628	R	32bit	x10	Counter: genset total active energy (kWh)
10630	R	32bit	x10	Counter: genset total inductive reactive energy (kVArh-ind)
10632	R	32bit	x10	Counter: genset total capacitive reactive energy (kVArh-cap)
10634	R	32bit	x100	Counter: remaining engine hours to service-1
10636	R	32bit	x100	Counter: remaining engine days to service-1
10638	R	32bit	x100	Counter: remaining engine hours to service-2
10640	R	32bit	x100	Counter: remaining engine days to service-2
10642	R	32bit	x100	Counter: remaining engine hours to service-3
10644	R	32bit	x100	Counter: remaining engine days to service-3

36. SNMP COMMUNICATIONS

The unit offers the possibility of SNMP communication through its Ethernet port (100Mb)



The supported version of the SNMP is V1.0 and V1.1

Below parameters may be set to the controller:

Control Buttons
Remote Controlled Digital Outputs

Below parameters may be read from the controller:

Mains voltages (L1, L2, L3, L12, L23, L31)
Mains Currents (I1, I2, I3, IN)
Mains Active Power (L1, L2, L3, Total)
Mains Reactive Power (L1, L2, L3, Total)
Mains Apparent Power (L1, L2, L3, Total)
Mains Power Factor (L1, L2, L3, Total)
Mains Phase Angle
Mains Frequency
Genset voltages (L1, L2, L3, L12, L23, L31)
Genset Currents (I1, I2, I3, IN)
Genset Active Power (L1, L2, L3, Total)
Genset Reactive Power (L1, L2, L3, Total)
Genset Apparent Power (L1, L2, L3, Total)
Genset Power Factor (L1, L2, L3, Total)
Genset Phase Angle
Genset Frequency
Genset Operation Mode

Genset Operation Status
Charge Input Voltage
Battery Voltage
Oil Pressure
Coolant Temperature
Fuel Level
Oil Temperature
Canopy Temperature
Ambient Temperature
Engine RPM
Total Genset Cranks Counter
Total Genset Runs Counter
Engine Run Hours Counter
Total kW-h counter
Total kVAR-h (inductive) Counter
Total kVAR-h (capacitive) Counter
Engine Hours to Service-1 Counter
Days to Service-1 Counter
Engine Hours to Service-2 Counter
Days to Service-2 Counter
Engine Hours to Service-3 Counter
Days to Service-3 Counter
Shutdown Alarm List
Loaddump Alarm List
Warning Alarm List
Remote Controlled Digital Outputs



The SNMP MIB file is available at DATAKOM technical support.

36.1. PARAMETERS REQUIRED FOR SNMP VIA ETHERNET

Modbus Slave Address: may be set between 1 and 240. If only one unit is available in the same IP address, it is advised to keep the default address (1).

Ethernet Enable: This parameter should be set to 1 (or checked) in order to enable the ethernet port.

Modbus TCP/IP Port: The usual setting is 502. However the unit is able to work on any port address.

User IP Mask: There are 3 mask registers available. The use of the registers are emphasized in the D500 User Manual. Please set the first mask as 255.255.255.0 for the proper operation.

Ethernet Network IP: May be left as 0.0.0.0 for automatic address claim or set to a value in order to claim a defined address.

Ethernet Gateway IP: Should be set in accordance with your local switch configuration.

Ethernet Subnet Mask: Should be set in accordance with your local switch configuration.

36.2. SNMP TRAP MESSAGES

When a fault case occurs or the genset runs or the genset takes the load or the genset unloads or the genset stops, an automatic SNMP TRAP message is send to the SNMP Client.

In order to enable SNMP TRAP messages, the Client has to send at least one SNMP request message to the controller in order to inform it about its IP address. The controller records the address of the **last** SNMP Client and sends trap messages to this address.

The SNMP TRAP message message contains the controller operating mode, engine status and the alarm list.

37. DECLARATION OF CONFORMITY

The unit conforms to the EU directives
-2014/35/EC (low voltage)
-2014/30/EC (electro-magnetic compatibility)

Norms of reference:

- EN 61010 (safety requirements)
- EN 61326 (EMC requirements)

The CE mark indicates that this product complies with the European requirements for safety, health environmental and customer protection.

UL / CSA Conformity:

- UL 6200, Controls for Stationary Engine Driven Assemblies (Certificate # - 20140725-E314374)
- CAN/CSA C22.2 No. 14-13 – Industrial Control Equipment

38. MAINTENANCE



DO NOT OPEN THE UNIT !

There are NO serviceable parts inside the unit.

Wipe the unit, if necessary with a soft damp cloth. Do not use chemical agents

39. DISPOSAL OF THE UNIT

Following **DIRECTIVE 2002/96/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 January 2003 on waste electrical and electronic equipment (WEEE)**, this unit should be stored and disposed separately from the usual waste.

40. ROHS COMPLIANCE

The european ROHS directive restricts and prohibits the use of some chemical materials in electronic devices.

Following the "**DIRECTIVE 2011/65/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment**", this product is listed in annex-I under category: "**Monitoring and control instruments including industrial monitoring and control instruments**" and exempted from ROHS directive.

However we are not using any ROHS uncompliant electronic components in the production. Only the solder contains lead. The switching to unleaded solderin is in progress.

41. TROUBLESHOOTING GUIDE



Below is a basic list of most often encountered troubles. More detailed investigation may be required in some cases.

The genset operates while AC mains are OK or continues to operate after AC mains are OK:

- Check engine body grounding.
- AC mains voltages may be outside programmed limits, measure the phase voltages.
- Check the AC voltage readings on the screen.
- Upper and lower limits of the mains voltages may be too tight. Check the parameters **Mains Voltage Low Limit** and **Mains Voltage High Limit**. Standard values are 170/270 volts.
- The hysteresis voltage may be given to excessive. The standard value is 8 volts.

AC voltages or frequency displayed on the unit are not correct:

- Check engine body grounding, it is necessary.
- The error margin of the unit is +/- 2 volts.
- If there are faulty measurements only when the engine is running, there may be a faulty charging alternator or voltage regulator on the engine. Disconnect the charging alternator connection of the engine and check if the error is removed.
- If there are faulty measurements only when mains are present, then the battery charger may be failed. Turn off the rectifier fuse and check again.

KW and cosΦ readings are faulty although the Amp readings are correct:

- Current transformers are not connected to the correct inputs or some of the CTs are connected with reverse polarity. Determine the correct connections of each individual CT in order to obtain correct KW and cosΦ for the related phase, and then connect all CTs. Please review chapter "**AC CURRENT INPUTS**"



Short circuit outputs of unused Current Transformers.

When the AC mains fails the unit energizes the fuel solenoid, but does not start and OIL PRESSURE EXISTS ! message is displayed:

- The unit is not supplied with battery (-) voltage at the oil pressure input.
- Oil pressure switch not connected.
- Oil pressure switch connection wire cut.
- Oil pressure switch faulty.
- Oil pressure switch closes too lately. If oil pressure switch closes, the unit will start. Optionally oil pressure switch may be replaced.

The engine does not run after the first start attempt, then the unit does not start again and OIL PRESSURE EXISTS ! message is displayed:

-The oil pressure switch closes very lately. As the unit senses an oil pressure, it does not start. When oil pressure switch closes the unit will start. Optionally the oil pressure switch may be replaced.

When the AC mains fails, the engine starts to run but the unit gives START FAIL alarm and then the engine stops:

-The generator phase voltages are not connected to the unit. Measure the AC voltage between terminals **GEN L1-L2-L3** and **Generator Neutral** at the rear of the unit while the engine is running. A fuse protecting the generator phases may be failed. A misconnection may be occurred. If everything is OK, turn all the fuses off, and then turn all the fuses on, starting from the DC supply fuse. Then test the unit again.

The unit is late to remove engine cranking:

-The generator voltage rises lately. Also the generator remnant voltage is below 15 volts. The unit removes starting with the generator frequency, and needs at least 15 volts to measure the frequency.
-The unit is also able to cut cranking from charge alternator voltage and oil pressure input. Please read chapter "**CRANK CUTTING**"

The unit is inoperative:

Measure the DC-supply voltage between terminals BAT+ and BAT- at the rear of the unit. If OK, turn all fuses off, then turn all the fuses on, starting from the DC supply fuse. Then test the unit again.

Programming mode can not be entered:

The program lock input disables programming mode entry. Disconnect the program lock input from battery negative before modification. Do not forget to make this connection again to prevent unauthorized program modifications.

Some program parameters are skipped:

These parameters are reserved for factory setting and cannot be modified.

AUTO led flashes and the genset does not run when mains fail:

The unit is in Weekly Schedule **OFF** time. Please check date and time setting of the unit. Please check also Weekly Schedule program parameters.

The genset runs but does not take the load:

Check that the genset Yellow led is on steadily. Adjust genset voltage and frequency limits if necessary.
Check that the digital output-8 is configured as "**Genset Contactor**"
Check "**Genset Contactor Timer**" program parameter.
Check that a Genset Loading Inhibit input signal is not active. Check input functions. If an input is configured as "**Genset Loading Inhibit**" then check the signal is not present at this input.

THE NEW D-300 MK2



The D-300 MK2 is a cost effective modular genset controller ready for internet monitoring through plug-in modules.

FEATURES

- Diesel and gas genset support
- 400Hz operation support
- 400 event logs, full snapshot
- All parameters front panel editable
- 3 level configuration password
- 128x64 graphical LCD display
- Downloadable languages
- Waveform display of V & I
- Harmonic analysis of V & I
- 16Amp MCB & GCB outputs
- 8 configurable digital inputs
- 6 configurable digital outputs
- 3 configurable analog inputs
- Both CANBUS-J1939 & MPU
- 3 configurable service alarms
- Multiple automatic exerciser
- Weekly operation schedule
- Dual mutual standby with equal aging of gensets
- Manual "speed fine adjust" on selected ECUs
- Automatic fuel pump control
- Disable protections feature
- Excess power protection
- Reverse power protection
- Overload IDMT protection
- Load shedding, dummy load
- Multiple load management
- Current unbalance protection
- Voltage unbalance protection
- Fuel filling & fuel theft alarm
- Battery back-up real time clock
- Idle speed control
- Battery charge run enabled
- Combat mode support
- Multiple nominal conditions
- Contactor & MCB drive
- 4 quadrant genset power counters
- Mains power counters
- Fuel filling counter
- Fuel consumption counter
- Modem diagnostics display
- Configurable through USB, RS-485, Ethernet and GPRS
- Free configuration program
- Allows SMS controls
- Ready for central monitoring
- Mobile genset support
- Automatic GSM geo-location
- Easy USB firmware upgrade
- -40°C operation with optional display heater
- IP65 rating with optional gasket

MEASUREMENTS

- Mains & genset PN/PP voltages
- Mains & genset frequency
- Mains & genset phase currents
- Mains & genset neutral currents
- Mains & genset, phase & total, kW, kVA, kVAr, pf
- Engine speed
- Battery voltage

PLUG-IN MODULES

- *GSM Modem (2G-3G-4G)*
- *Ethernet 100Mbps*
- *Wi-Fi (802.11 b/g/n)*
- *RS-485 (2400-57600baud)*
- *RS-232 (2400-57600baud)*

FUNCTIONALITIES

- *AMF unit*
- *ATS unit*
- *Remote start controller*
- *Manual start controller*
- *Engine controller*

TOPOLOGIES

- *3 ph 4 w, star & delta*
- *3 ph 3 w, 2 CTs*
- *2 ph 3 w*
- *1 phase 2 wires*

COMMUNICATION

- *USB Device*
- *J1939-CANBUS*
- *Geo-locating through GSM*
- *Internet Central Monitoring*
- *SMS message sending*
- *E-mail sending*
- *Free PC software: Rainbow Plus*
- *Modbus RTU (2400-57600baud)*
- *Modbus TCP/IP*



RoHS

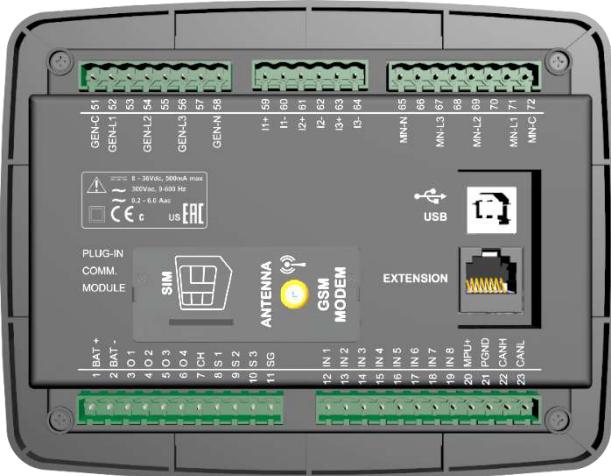
EAC

cRJ® US

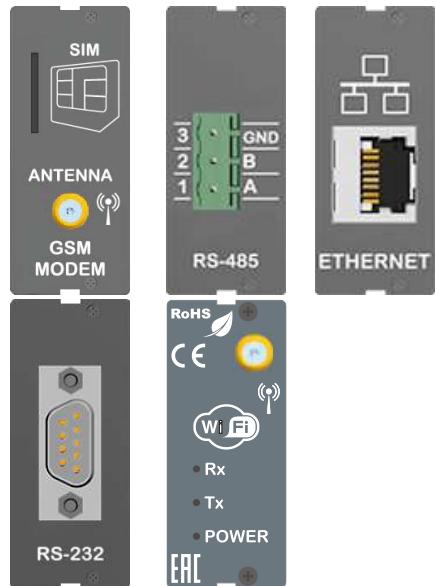
CE

DATAKOM

PLUG-IN MODULES

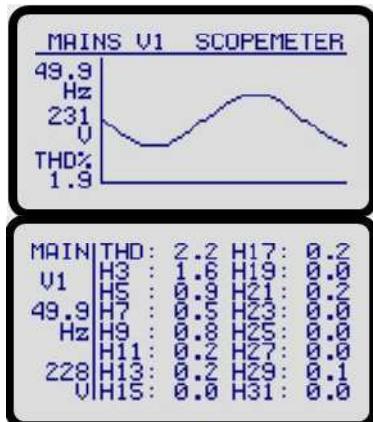


Backpanel view

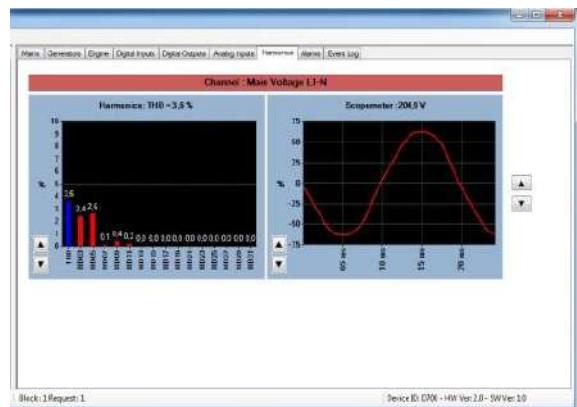


Plug-in modules

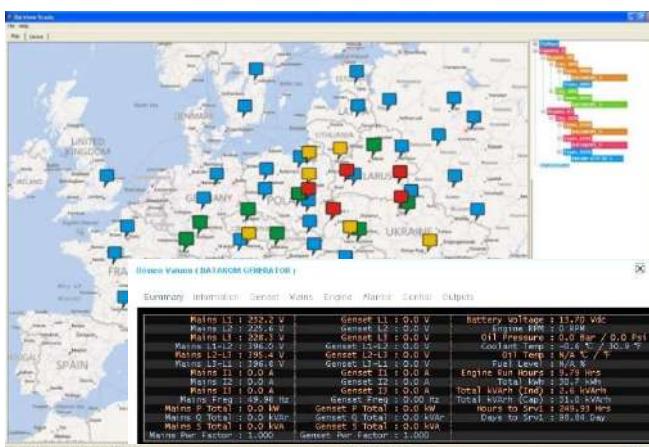
SCOPEMETER & HARMONICS



RAINBOW PLUS PROGRAM



RAINBOW SCADA CENTRAL MONITORING

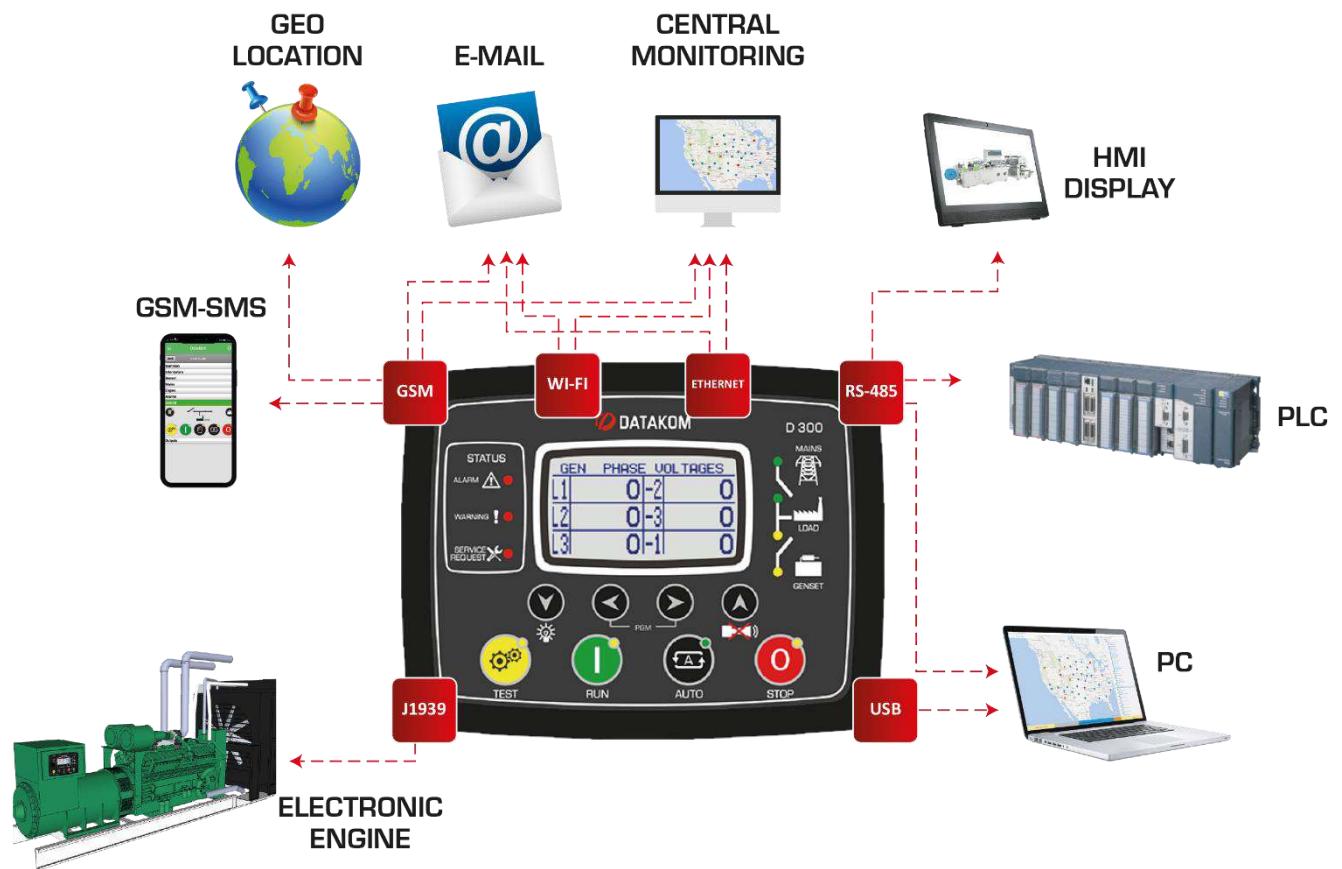


Display on Map, online monitoring



Smartphone Support

COMMUNICATIONS



TECHNICAL SPECIFICATIONS

Alternator voltage: 0 to 300 V-AC (Ph-N)
Alternator frequency: 0-600 Hz.
Mains voltage: 0 to 300 V-AC (Ph-N)
Mains frequency: 0-600 Hz.
Topology: 1-2-3 phases, with or without neutral
DC Supply Range: 8.0 to 36.0 V-DC.
V-A-cos Accuracy: 0.5% + 1 digit
kW-kVA-kVar Accuracy: 1.0% + 1 digit
Current consumption: 180 mA-DC max @ 12V-DC
Current Inputs: current transformers. .../5A or .../1A.
Digital inputs: input voltage 0 to 36 V-DC.
Analog input range: 0-5000 ohms.
Mains and genset contactor outputs: 16Amps@250V
DC Outputs: Protected mosfet semiconductor outputs, rated 1Amp@28V-DC
Cranking dropouts: survives 0V for 100ms.
Magnetic pickup voltage: 0.5 to 50VAC.
Magnetic pickup frequency: 0 to 10000 Hz.
Charge Alternator Excitation: 2W.
Display Screen: 2.9", 128x64 pixels
USB Device: USB 2.0 Full speed
Operating temperature: -20°C to 70°C (-4 to +158 °F)
 With optional display heater: -40°C to 70°C (-40 to +158 °F)
Storage temperature: -40°C to 80°C (-40 to +176°F)

Maximum humidity: 95% non-condensing.
IP Protection: IP65 from front panel, IP30 from the rear (with gasket)
Dimensions: 180 x 140 x 46mm (WxHxD)
Panel Cut-out Dimensions: 151 x 111 mm minimum.
Weight: 300 g (approx.)
Case Material: High Temperature, non-flammable ABS/PC
Installation: Flat surface mounting on a Type 1 enclosure. Rear retaining plastic brackets.

CONFORMITY

EU Directives Conformity
 -2014/35/EC (low voltage)
 -2014/30/EC (electro-magnetic compatibility)

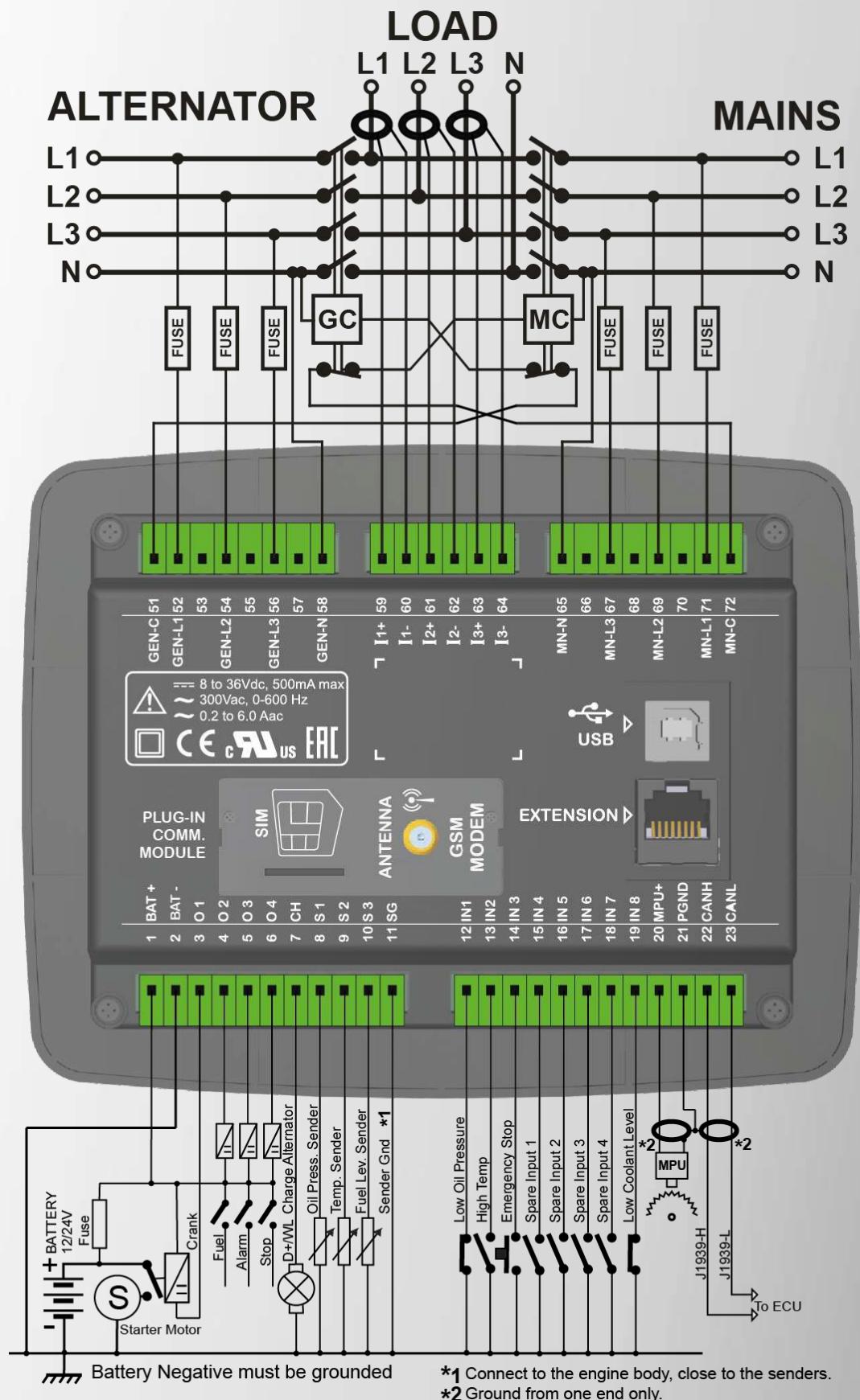
Norms of reference:

EN 61010 (safety requirements)
 EN 61326 (EMC requirements)

UL & CSA Compatibility:

-UL 6200, Controls for Stationary Engine Driven Assemblies (Certificate # - 20140725-E314374)
 -CAN/CSA C22.2 No. 14-13 – Industrial Control Equipment

TYPICAL CONNECTIONS



Fișă tehnică produs

Specificații



Easy9 RCBO 1P+N 4500 AC 30mA C 16A

EZ9D32616

Principale

Gama	Easy9
Tip produs sau componentă	Residual current breaker with overcurrent protection (RCBO)
Poli	1P + N
pozitie neutralului	Stanga
numarul polilor protejati	1
[In] curent nominal	16 A
Tip retea electrică	C.a.
tehnologie unitate de declansare	Termo-magnetic
cod pentru curba	C
sensibilitatea legaturii la pamant	30 mA
temporizare protectie pentru surgeri la pamant	Instantaneu
clasa de protectie pentru surgeri la pamant	Type AC
capacitate de rupere	4500 A

Suplimentare

aplicatie a dispozitivului	Protectie
locatia dispozitivului in sistem	lesire
frecventa retea electrică	50 Hz
[Ue] tensiunea de functionare	230 V c.a. 50 Hz
limita de declansare magnetica	5...10 x In
capacitate nominala de rupere si realizare	4500 A
[Uimp] tensiune nominala de tinere la impuls	4 kV
indicator de pozitie contact	Da
tip de control	Comutare
suport de montare	Sina DIN
mod de montare	Clipsabil
Numar de pasi de 9mm pe rand	4
inaltime	82 mm
latime	36 mm
adancime	70,5 mm
durabilitate mecanica	10000 cic

durabilitate electrica	4000 cic
conexiuni - borne	Terminal tip tunel (sus sau jos) 1...16 mm ² rigid Terminal tip tunel (sus sau jos) 1...10 mm ² flexibil
cuplu de strangere	2 N.m sus sau jos
protectie de seurgere la pamant	Inglobat

Mediu

standarde	SR EN 61009-1
grad de protectie IP	IP20 IP40 (carcasa modulara)
tropicalizare	2 conformitate cu IEC 60068-2-30
umiditate relativa	95 % la 55 °C
temperatura ambientala de functionare	-5...60 °C
temperatura ambientala pentru depozitare	-40...85 °C

Unitati de ambalare

Unitate de masura pentru prima forma de impachetare	PCE
Număr de produse în pachet	1
Inaltime prima forma de impachetare	4,000 cm
Latime prima forma de impachetare	8,300 cm
Lungime prima forma de impachetare	9,000 cm
Greutate colet(Lbs)	201,000 g
Unitate de masura pentru a doua forma de impachetare	S03
Numar unitati in a doua forma de impachetare	60
Inaltime a doua forma de impachetare	30,000 cm
Latime a doua forma de impachetare	30,000 cm
Lungime a doua forma de impachetare	40,000 cm
Greutate a doua forma de impachetare	12,547 kg
Unitate de masura pentru a treia forma de impachetare	P12
Numar unitati in a treia forma de impachetare	480
Inaltime a treia forma de impachetare	45,000 cm
Latime a treia forma de impachetare	80,000 cm
Lungime a treia forma de impachetare	120,000 cm
Greutate a treia forma de impachetare	111,592 kg

Garantie contractuală

Garantie (in luni)	18
---------------------------	----

Schneider Electric isi propune sa atinga nivelul Net Zero pana in 2050 prin parteneriate la nivelul lantului de aprovizionare, materiale cu impact mai redus si circularitate, prin campania „Use Better, Use Longer, Use Again” pentru a extinde durata de viata a produselor si reciclabilitatea.

[Environmental Data explicate >](#)

[Cum evaluam sustenabilitatea produselor >](#)

Amprenta de mediu

Amprenta de carbon totala pe durata de viata	6
Raport de mediu	Profilul ambiental al produsului

Use Better

Materiale si ambalare

Pachet cu carton reciclabil	Nu
Ambalaj fara plastic	Nu
Directiva RoHS UE	Conform
Numar SCIP	678d3ecc-6f24-42c7-bb11-218205429e33
Regulamentul REACH	Declaratia REACH
Statut de indemn de halogen	Product contains halogen above thresholds
Nu contine PVC	Da

Use Longer

Prelungire durata de viata

Reparare	Nu
----------	----

Use Again

Reambalare si refabricare

Profil circularitate	Nu sunt necesare operatii de reciclare speciale
Preluare la sfarsitul durantei de viata	Da
Eticheta WEEE	<p> În Uniunea Europeană, produsele trebuie reciclate respectand sistemul specific de colectare a deșeurilor și nu trebuie să ajunga în pubelele de colectare a deșeurilor menajere.</p>

Fișă tehnică produs

Specificații



Acti9, iCV40N 3P+N C 25A 6kA 30mA AC RCBO

A9DE3725

Principale

Gama	Acti 9
nume produs	Acti9 iCV40
Tip produs sau componenta	Residual current breaker with overcurrent protection (RCBO)
nume scurt al dispozitivului	iCV40N
aplicatie a dispozitivului	Distribuție
descriere poli	3P + N
numarul polilor protejati	3
pozitie neutralului	Stanga
[In] calibră	25 A
Tip retea electrică	C.a.
frecvența retea electrică	50/60 Hz
tehnologie unitate de declansare	Termo-magnetic
cod pentru curba	C
sensibilitate legătura de punere la pamant	30 mA
adecvare pentru izolatie	Da conformitate cu SR EN 60947-2
etichete privind calitatea	EAC IMQ

Suplimentare

locatia dispozitivului in sistem	lesire
[Ue] tensiune nominala de functionare	400 V c.a. 50/60 Hz
limita de declansare magnetica	5...10 x In
releu de declansare pentru curent rezidual	Independent de tensiune
temporizare protectie pentru surgeri la pamant	Instantaneu
clasa de protectie pentru surgeri la pamant	Type AC
capacitate de rupere	6000 A Icn la 400 V c.a. 50/60 Hz conformitate cu EN/IEC 61009-2-1
[Ics] capacitatea nominala de rupere in serviciu	6000 A 100 % x Icn at 400 V c.a. 50/60 Hz conforming to EN/IEC 61009-2-1
capacitatea de cuplare si capacitatea de rupere nominale	Idm 3000 A la 400 V c.a. 50/60 Hz conformitate cu EN 61009-2-1 Idm 500 A la 400 V c.a. 50/60 Hz conformitate cu IEC 61009-2-1
clasa de limitare	3 conformitate cu EN/IEC 61009-2-1
[Ui] tensiune nominala de izolatie	440 V c.a. 50/60 Hz

[Uimp] tensiune nominala de tinere la impuls	4 kV
indicator de pozitie contact	Da
tip de control	Comutare
semnalizare locala	Fault indication Indicatie ON/OFF
mod de montare	Clipsabil
suport de montare	Sina DIN
pieptene bare de distributie pe categorii de compatibilitate	Sus sau jos tooth
pasul de conectare	18 mm between phases 9 mm intre faza si neutru
Numar de pasi de 9mm pe rand	10
inaltime	93 mm
latime	90 mm
adancime	73 mm
greutate neta	500 g
culoare	Alb
durabilitate mecanica	20000 cic
durabilitate electrica	20000 cic
descriere optiuni de blocare	Sigilabil Dispozitiv de blocare
conexiuni - borne	Borne tip tunel sus sau jos 1...16 mm ² rigid Borne tip tunel sus sau jos 1...10 mm ² flexibil
lungimea de dezisolare a cablului	14 mm for sus sau jos connection
cuplu de strangere	2 N.m sus sau jos
protectie de securitate la pamant	Inglobat

Mediu

Standarde	EN/IEC 61009-2-1
certificari produs	UE
grad de protectie IP	IP20 conforming to SR EN 60529 IP40 (carcasa modulara) conforming to SR EN 60529
grad de poluare	3
categorie de supratensiune	III conforming to IEC 60364
compatibilitate electromagnetică	8/20 µs ținere la impuls, 250 A conformitate cu EN/IEC 61009-1
umiditate relativa	95 % la 55 °C
altitudine de functionare	2000 m
temperatura ambientala de utilizare	-5...60 °C
temperatura ambietala pentru depozitare	-40...85 °C

Unitati de ambalare

Unitate de masura pentru prima forma de impachetare	PCE
Număr de produse în pachet	1
Inaltime prima forma de impachetare	8,700 cm

Latime prima forma de impachetare	11,400 cm
Lungime prima forma de impachetare	13,000 cm
Greutate colet(Lbs)	569,000 g
Unitate de masura pentru a doua forma de impachetare	S03
Numar unitati in a doua forma de impachetare	16
Inaltime a doua forma de impachetare	30,000 cm
Latime a doua forma de impachetare	30,000 cm
Lungime a doua forma de impachetare	40,000 cm
Greutate a doua forma de impachetare	9,700 kg

Garanție contractuală

Garantie (in luni)	18
---------------------------	----

Schneider Electric isi propune sa atinga nivelul Net Zero pana in 2050 prin parteneriate la nivelul lantului de aprovizionare, materiale cu impact mai redus si circularitate, prin campania „Use Better, Use Longer, Use Again” pentru a extinde durata de viata a produselor si reciclabilitatea.

[Environmental Data explicate >](#)

[Cum evaluam sustenabilitatea produselor >](#)

Amprenta de mediu

Amprenta de carbon totala pe durata de viata

7

Use Better

Materiale si ambalare

Pachet cu carton reciclabil

Da

Ambalaj fara plastic

Da

[Directiva RoHS UE](#)

Conform cu anumite exceptii

Numar SCIP

B078722f-7853-4e1e-a05b-29638f57b0ab

Regulamentul REACH

[Declaratia REACH](#)

Use Longer

Prelungire durata de viata

Reparare

Nu

Use Again

Reambalare si refabricare

Profil circularitate

[Informatii privind sfarsitul duratei de viata](#)

Preluare la sfarsitul duratei de viata

Da

Eticheta WEEE

 În Uniunea Europeană, produsele trebuie reciclate respectând sistemul specific de colectare a deșeurilor și nu trebuie să ajungă în pubelele de colectare a deșeurilor menajere.

Product data sheet

HDB3WN1B10

Characteristics

Miniature circuit breaker HDB3W - 18 mm AC - B - 1P - 6 kA - 10 A



Main

Range of product	HDB3w
Product or component type	Miniature circuit-breaker
Device application	Isolation Control
Poles description	1P
[In] rated current	10 A

Complementary

[Ue] rated operational voltage	240 V AC 50/60 Hz
Breaking capacity	6.0 kA
Dielectric test voltage	2.0 kV 50/60 Hz 1 min
[Uimp] rated impulse withstand voltage	4.0 kV
Magnetic tripping limit	3...5 x In
Curve code	B
[Ui] rated insulation voltage	250.0 V between phase and ground
Suitability for isolation	Yes
Mounting support	35 mm DIN rail
Protection type	Overload protection Short-circuit protection
Cable entry	Top Bottom
Mechanical durability	25000 cycles
Electrical durability	6000 cycles
IP degree of protection	IP20
Overvoltage category	II
Provision for padlocking	Handle padlockable in on and off position
Connections - terminals	Forked type tag connectors
Clamping connection capacity	= 25 mm ²
Tightening torque	3 N.m
Height	80 mm
Width	17.7 mm
Depth	78.5 mm
Embedding depth	61 mm
E-commerce address	Hdb3w-mcb-without-indicator-6ka-breaking-capacity

Environment

Shock resistance	30 gn (duration = 11.0 ms) for 3 shocks
Ambient air temperature for operation	-20...60 °C
Trip unit technology	Thermal-magnetic
Ambient air temperature for storage	-40...70 °C
Operating altitude	0...2000 m
Product certifications	CE CB TÜV
Pollution degree	2
Standards	EN/IEC 60898-1

Offer Sustainability

Sustainable packaging	No
-----------------------	----

Product data sheet

HDB3WL3C50

Characteristics

Miniature circuit breaker HDB3W - 18 mm AC - C - 3P - 4.5 kA - 50 A



Main

Range of product	HDB3w
Product or component type	Miniature circuit-breaker
Device application	Isolation Control
Poles description	3P
[In] rated current	50 A

Complementary

[Ue] rated operational voltage	415 V AC 50/60 Hz
Breaking capacity	4.5 kA
Dielectric test voltage	2.0 kV 50/60 Hz 1 min
[Uimp] rated impulse withstand voltage	4.0 kV
Magnetic tripping limit	5...10 x In
Curve code	C
[Ui] rated insulation voltage	250.0 V between phase and ground 500.0 V between phases
Suitability for isolation	Yes
Mounting support	35 mm DIN rail
Protection type	Overload protection Short-circuit protection
Cable entry	Top Bottom
Mechanical durability	25000 cycles
Electrical durability	6000 cycles
IP degree of protection	IP20
Overvoltage category	II
Provision for padlocking	Handle padlockable in on and off position
Connections - terminals	Forked type tag connectors
Clamping connection capacity	= 25 mm ²
Tightening torque	3 N.m
Height	80 mm
Width	53.09999999999994 mm
Depth	78.5 mm
Embedding depth	61 mm
Net weight	0.272 kg

Environment

Shock resistance	30 gn (duration = 11.0 ms) for 3 shocks
Ambient air temperature for operation	-20...60 °C
Trip unit technology	Thermal-magnetic
Ambient air temperature for storage	-40...70 °C
Operating altitude	0...2000 m
Product certifications	CE CB TÜV
Pollution degree	2
Standards	EN/IEC 60898-1

Packing Units

Unit Type of Package 1	PCE
Number of Units in Package 1	1
Package 1 Height	5.310 cm
Package 1 Width	8.000 cm
Package 1 Length	7.850 cm
Package 1 Weight	0.272 kg

Offer Sustainability

Sustainable packaging	No
-----------------------	----

Product datasheet

Specifications



Miniature circuit breaker (MCB), Easy9, 1P, 6A, C curve, 4500A (IEC/EN 60898-1)

EZ9F34106

Discontinued on: 20 Aug 2020

Discontinued

Main

Range	Easy9
Device application	Distribution
Product or component type	Miniature circuit-breaker
Device short name	Easy9 MCB
Poles	1P
Number of protected poles	1
[In] rated current	6 A
Network type	AC
Trip unit technology	Thermal-magnetic
Curve code	C
Breaking capacity	4500 A Icn at 230 V AC 50/60 Hz conforming to IEC 60898-1 4500 A Icn at 400 V AC 50/60 Hz conforming to IEC 60898-1
Suitability for isolation	Yes conforming to IEC 60898-1

Complementary

Network frequency	50 Hz
[Ue] rated operational voltage	230 V AC 50 Hz
Magnetic tripping limit	5...10 x In
[Ics] rated service breaking capacity	4.5 kA 100 % x Icn at 230 V AC 50/60 Hz conforming to IEC 60898-1
[Ui] rated insulation voltage	500 V AC 50/60 Hz conforming to IEC 60898-1
[Uiimp] rated impulse withstand voltage	4 kV conforming to IEC 60898-1
Contact position indicator	Yes
control type	Toggle
Local signalling	Without
Mounting mode	Clip-on
Mounting support	DIN rail
9 mm pitches	2
Height	81 mm
Width	18 mm
Depth	66.5 mm
Colour	Grey (RAL 7035)

Mechanical durability	10000 cycles
Electrical durability	4000 cycles
Connections - terminals	Tunnel type terminal (top or bottom) 1...25 mm ² rigid Tunnel type terminal (top or bottom) 1...16 mm ² flexible
Tightening torque	2 N.m top or bottom

Environment

Standards	IEC 60898-1
Product certifications	GOST-R
IP degree of protection	IP20 conforming to IEC 60529
Pollution degree	2
Tropicalisation	2
Relative humidity	95 % at -25...60 °C
Ambient air temperature for operation	-25...60 °C
Ambient air temperature for storage	-40...85 °C

Packing Units

Unit Type of Package 1	PCE
Number of Units in Package 1	1
Package 1 Height	7.500 cm
Package 1 Width	1.800 cm
Package 1 Length	8.500 cm
Package 1 Weight	97.000 g
Unit Type of Package 2	S03
Number of Units in Package 2	144
Package 2 Height	30.000 cm
Package 2 Width	30.000 cm
Package 2 Length	40.000 cm
Package 2 Weight	14.970 kg

Contractual warranty

Warranty (in months)	18
-----------------------------	----

 Environmental Data

Schneider Electric aims to achieve Net Zero status by 2050 through supply chain partnerships, lower impact materials, and circularity via our ongoing "Use Better, Use Longer, Use Again" campaign to extend product lifetimes and recyclability.

[Environmental Data explained >](#)

[How we assess product sustainability >](#)

Environmental footprint

Total lifecycle Carbon footprint	18
----------------------------------	----

Use Better

Materials and Packaging

Packaging made with recycled cardboard	No
Packaging without single use plastic	No
EU RoHS Directive	Compliant with Exemptions
SCIP Number	0dbcf8b1-4732-4e36-88bc-462a078c2d4c
REACH Regulation	REACH Declaration
Halogen-free status	Product contains halogen above thresholds
PVC free	No

Use Longer

Lifetime extension

Repair	No
--------	----

Use Again

Repack and remanufacture

End of life manual availability	No need of specific recycling operations
Take-back	No
WEEE Label	 The product must be disposed on European Union markets following specific waste collection and never end up in rubbish bins

Fișă tehnică produs

Specificații

Buton incastrat complet, rosu Ø22 cu revenire cu arc 1NC "nemarcat"



XB4BA42

Principale

gama de produse	Harmony XB4
nume scurt al dispozitivului	XB4
Tip produs sau componentă	Intrerupător cu revenire
material rama	Metal cromat
material inel de fixare	Zamak
diametrul de montaj	22,5 mm
cantitate indivizibila de vânzare	1
forma a capului unității de semnalizare	Rotund
tip de operator	revenire cu arc
profil utilizator	Rosu Incastrat, nemarcat
tip cap	Standard
tip și componitie contacte	1 NC
operare contacte	Decuplare lenta
conexiuni - borne	Borne cu surub, $\leq 2 \times 1.5 \text{ mm}^2$ cu pini conformitate cu IEC 60947-1 Borne cu surub, $1 \times 0.22 \dots 2 \times 2.5 \text{ mm}^2$ fără terminale de cablu conformitate cu IEC 60947-1

Suplimentare

înălțime	47 mm
latime	30 mm
adâncime	52 mm
descriere borne ISO nr. 1	(21-22)NC
greutate netă	0,08 kg
rezistență la spalare cu presiune înaltă	7000000 Pa la 55 °C, distanță : 0.1 m
utilizare contacte	Contacte standard
deschidere pozitiva	Cu conformitate cu IEC 60947-5-1 anexa K
cursa de operare	1,5 mm (schimbare stare electrică NC) 4,3 mm (cursă totală)
forță de acționare	3,5 N schimbare stare electrică NC
durabilitate mecanică	10000000 cic
cuplu de strangere	0,8...1,2 N.m conformitate cu IEC 60947-1

forma a capului surubului	Cruce compatibil cu Philips nr. 1 surubelnita Cruce compatibil cu pozidriv No 1 surubelnita Perforat compatibil cu plat Ø 4 mm surubelnita Perforat compatibil cu plat Ø 5.5 mm surubelnita
Material contacte	Aliaj de argint (Ag/Ni)
protectie la scurtcircuit	10 A cartuș fuzibil tip gG conformitate cu SR EN 60947-5-1
[Ith] curent termic conventional in aer liber	10 A conformitate cu SR EN 60947-5-1
[Ui] tensiune nominala de izolatie	600 V (grad de poluare 3) conformitate cu IEC 60947-1
[Uiimp] tensiune de tinere la impuls	6 kV conformitate cu IEC 60947-1
[Ie] curent nominal de utilizare	3 A la 240 V, AC-15, A600 conformitate cu SR EN 60947-5-1 6 A la 120 V, AC-15, A600 conformitate cu SR EN 60947-5-1 0,1 A la 600 V, DC-13, Q600 conformitate cu SR EN 60947-5-1 0,27 A la 250 V, DC-13, Q600 conformitate cu SR EN 60947-5-1 0,55 A la 125 V, DC-13, Q600 conformitate cu SR EN 60947-5-1 1,2 A la 600 V, AC-15, A600 conformitate cu SR EN 60947-5-1
durabilitate electrica	1000000 cic, AC-15, 2 A la 230 V, rata de functionare <3600 cic/h, factor de sarcina: 0,5 conformitate cu IEC 60947-5-1 anexa C 1000000 cic, AC-15, 3 A la 120 V, rata de functionare <3600 cic/h, factor de sarcina: 0,5 conformitate cu IEC 60947-5-1 anexa C 1000000 cic, AC-15, 4 A la 24 V, rata de functionare <3600 cic/h, factor de sarcina: 0,5 conformitate cu IEC 60947-5-1 anexa C 1000000 cic, DC-13, 0,2 A la 110 V, rata de functionare <3600 cic/h, factor de sarcina: 0,5 conformitate cu IEC 60947-5-1 anexa C 1000000 cic, DC-13, 0,5 A la 24 V, rata de functionare <3600 cic/h, factor de sarcina: 0,5 conformitate cu IEC 60947-5-1 anexa C
securitatea electrica IEC 60947-5-4	$\Delta < 10\exp(-6)$ la 5 V si 1 mA in mediu curat conformitate cu SR EN 60947-5-4 $\Delta < 10\exp(-8)$ la 17 V si 5 mA in mediu curat conformitate cu SR EN 60947-5-4
prezentare dispozitiv	Produs complet

Mediu

tratament protector	TH
temperatura ambientala pentru depozitare	-40...70 °C
temperatura ambientala de functionare	-40...70 °C
categorie de supratensiune	Class I conforming to IEC 60536
grad de protectie IP	IP66 conformitate cu SR EN 60529 IP67 IP69 IP69K
grad de protectie NEMA	NEMA 13 NEMA 4X
grad de protectie IK	IK06 conforming to IEC 50102
standarde	IEC 60947-5-5 UL 60947-1 CSA C22.2 No 15 SR EN 60947-5-4 IEC 60947-1 JIS C8201-5-1 SR EN 60947-5-1 JIS C8201-1
certificari produs	CSA LROS (Lloyds register of shipping) BV listat de UL DNV
rezistenta la vibratii	5 gn (f= 2...500 Hz) conforming to IEC 60068-2-6

rezistența la socuri	30 gn (durată = 18 ms) pentru half sine wave acceleration conformitate cu IEC 60068-2-27 50 gn (durată = 11 ms) pentru half sine wave acceleration conformitate cu IEC 60068-2-27
----------------------	--

Unități de ambalare

Unitate de măsură pentru prima formă de impachetare	PCE
Număr de produse în pachet	1
Inaltime prima formă de impachetare	3,500 cm
Latime prima formă de impachetare	5,500 cm
Lungime prima formă de impachetare	8,500 cm
Greutate colet(Lbs)	78,900 g
Unitate de măsură pentru a doua formă de impachetare	S03
Număr unități în a doua formă de impachetare	150
Inaltime a doua formă de impachetare	30,000 cm
Latime a doua formă de impachetare	30,000 cm
Lungime a doua formă de impachetare	40,000 cm
Greutate a doua formă de impachetare	12,268 kg
Unitate de măsură pentru a treia formă de impachetare	P06
Număr unități în a treia formă de impachetare	1200
Inaltime a treia formă de impachetare	75,000 cm
Latime a treia formă de impachetare	80,000 cm
Lungime a treia formă de impachetare	60,000 cm
Greutate a treia formă de impachetare	106,144 kg

Garanție contractuală

Garanție (în luni)	18
--------------------	----

Schneider Electric isi propune sa atinga nivelul Net Zero pana in 2050 prin parteneriate la nivelul lantului de aprovizionare, materiale cu impact mai redus si circularitate, prin campania „Use Better, Use Longer, Use Again” pentru a extinde durata de viata a produselor si reciclabilitatea.

[Environmental Data explicate >](#)

[Cum evaluam sustenabilitatea produselor >](#)

Amprenta de mediu

Amprenta de carbon totala pe durata de viata	1
Raport de mediu	Profilul ambiental al produsului

Use Better

Materiale si ambalare

Pachet cu carton reciclabil	Da
Ambalaj fara plastic	Da
Directiva RoHS UE	Conformitate proactivă (Produs în afara domeniului de aplicare a EU RoHS)
Regulamentul REACH	Declarația REACH

Use Longer

Prelungire durata de viata

Reparare	Nu
Index reparare produs	A

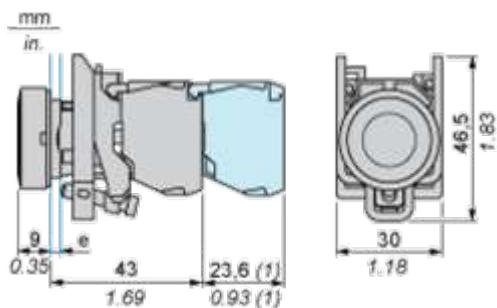
Use Again

Reambalare si refabricare

Profil circularitate	Informatii privind sfarsitul duratei de viata
Preluare la sfarsitul duratei de viata	Da
Eticheta WEEE	 În Uniunea Europeană, produsele trebuie reciclate respectând sistemul specific de colectare a deșeurilor și nu trebuie să ajungă în pubelele de colectare a deșeurilor menajere.

Dimensions Drawings

Dimensions

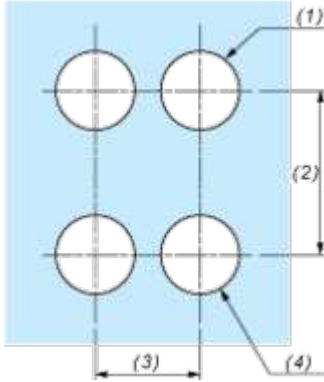
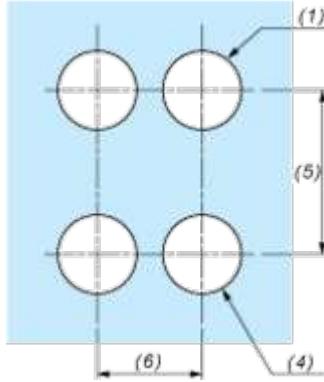


e : clamping thickness: 1 to 6 mm / 0.04 to 0.24 in.

(1) Additional row of contacts or double contact.

Mounting and Clearance

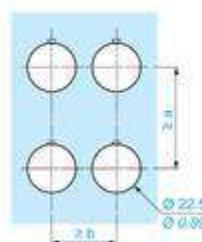
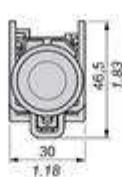
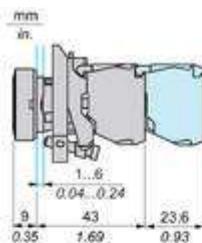
Panel Cut-out for Pushbuttons, Switches and Pilot Lights (Finished Holes, Ready for Installation)

Connection by Screw Clamp Terminals or Plug-in Connectors or on Printed Circuit Board	Connection by Faston Connectors
	

(1) Diameter on finished panel or support
(2) 40 mm min. / 1.57 in. min.
(3) 30 mm min. / 1.18 in. min.
(4) Ø 22.5 mm / 0.89 in. recommended (Ø 22.3 mm $^{+0.4}_0$ / 0.88 in. $^{+0.016}_0$)
(5) 45 mm min. / 1.78 in. min.
(6) 32 mm min. / 1.26 in. min.

Technical Illustration

Dimensions



	a (mm)	a (in.)	b (mm)	b (in.)
ZBE*****	40	1.57	30	1.18
ZBE*****3	45	1.77	32	1.26
ZBE*****4	40	1.57	30	1.18
ZBE*****5	50	1.97	30	1.18
ZBE*****9	40	1.57	30	1.18
ZBRT*	40	1.57	30	1.18
ZBRV1				

Offer Marketing Illustration

Product benefits / Features



Offer Marketing Illustration

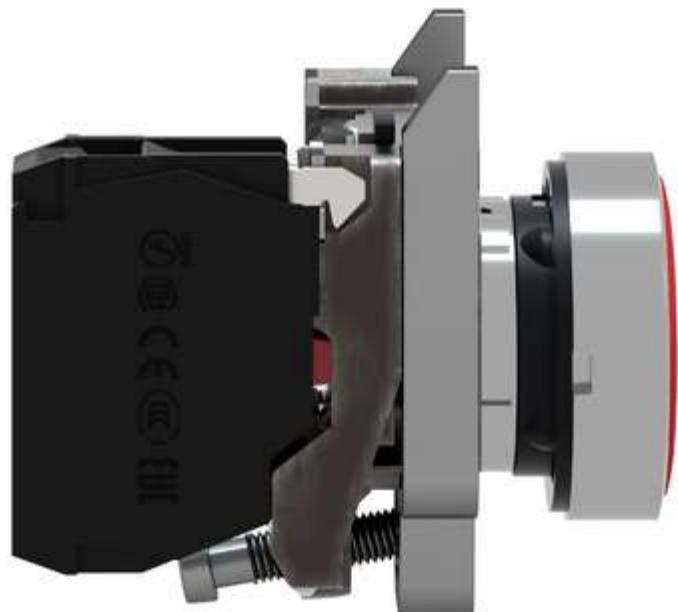
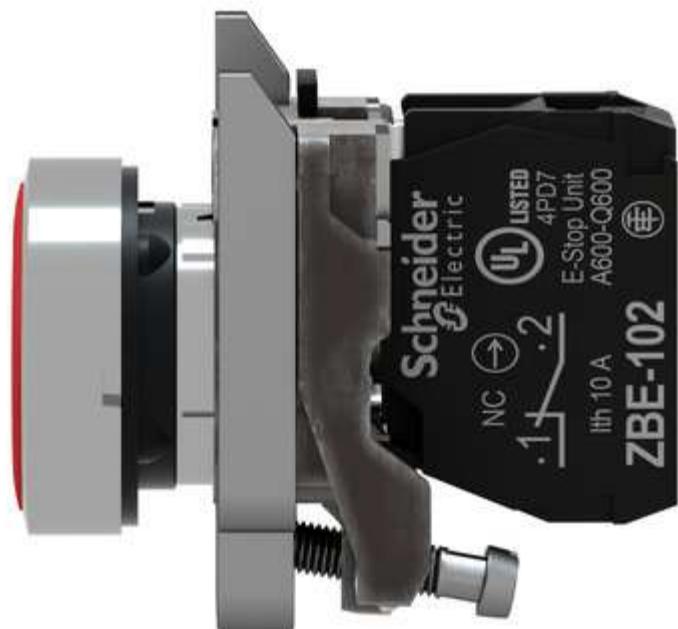
Product benefits / Features



Image of product / Alternate images

Alternative





Fișă tehnică produs

Specificații

Fisa Mobila Mureva, Dreapta, 16 A, 3P + N + E, 380, 415 V Ac, Ip44



PKE16M435

Principale

Gama	Mureva
Tip produs sau componentă	Wander plug
nume scurt al dispozitivului	Mureva plug
Plug, socket category	Low voltage
descriere poli	3P + N + E
Tip retea electrică	C.a.
standard priza	Industrial

Suplimentare

forma fisa, priza, carcasa	Drept
[In] curent nominal	16 A
[Ue] tensiune nominală	380...415 V
frecvența rețea electrică	50/60 Hz
Ground lug clockwise position	6 h
Plug, socket material	Carcasa self-extinguishing engineering polymer
materialul contactelor	Sleeves brass
conexiuni - borne	Captive screws
secțiune cablu	1...4 mm ²
diametru exterior cablu	8...15 mm
intrare cablu	Fair lead Presetupa
tip filet	Pg 21
greutate netă	0,19 kg
înaltime	142 mm
latime	74 mm
adâncime	74 mm
culoare	Gri (RAL 7035)
Voltage colour	Red

Mediu

standarde	IEC 60309-1 IEC 60309-2
grad de protecție IP	IP44 conforming to SR EN 60529

grad de protectie IK	IK08 conforming to EN 62262
rezistenta la foc	850 °C conformitate cu IEC 60695-2-11
umiditate relativa	50 % la 40 °C 70 % la 30 °C 90 % la 20 °C
alitudine de functionare	2000 m
temperatura ambientala de utilizare	35 °C 86400 s) -25...40 °C

Unitati de ambalare

Unitate de masura pentru prima forma de impachetare	PCE
Număr de produse în pachet	1
Inaltime prima forma de impachetare	6,500 cm
Latime prima forma de impachetare	6,500 cm
Lungime prima forma de impachetare	15,500 cm
Greutate colet(Lbs)	191,600 g
Unitate de masura pentru a doua forma de impachetare	BB1
Numar unitati in a doua forma de impachetare	10
Inaltime a doua forma de impachetare	12,500 cm
Latime a doua forma de impachetare	27,000 cm
Lungime a doua forma de impachetare	27,000 cm
Greutate a doua forma de impachetare	2,055 kg
Unitate de masura pentru a treia forma de impachetare	S03
Numar unitati in a treia forma de impachetare	30
Inaltime a treia forma de impachetare	30,000 cm
Latime a treia forma de impachetare	30,000 cm
Lungime a treia forma de impachetare	40,000 cm
Greutate a treia forma de impachetare	6,626 kg

Garantie contractuală

Garantie (in luni)	18
--------------------	----

Schneider Electric isi propune sa atinga nivelul Net Zero pana in 2050 prin parteneriate la nivelul lantului de aprovizionare, materiale cu impact mai redus si circularitate, prin campania „Use Better, Use Longer, Use Again” pentru a extinde durata de viata a produselor si reciclabilitatea.

[Environmental Data explicate >](#)

[Cum evaluam sustenabilitatea produselor >](#)

Amprenta de mediu

Amprenta de carbon totala pe durata de viata	5
Raport de mediu	Profilul ambiental al produsului

Use Better

Materiale si ambalare

Pachet cu carton reciclabil	Da
Ambalaj fara plastic	Da
Directiva RoHS UE	Conform cu anumite exceptii
Numar SCIP	661ec80b-b956-4b0a-92bb-53046f4cfb4c
Regulamentul REACH	Declaratia REACH

Use Longer

Prelungire durata de viata

Reparare	Nu
----------	----

Use Again

Reambalare si refabricare

Profil circularitate	Nu sunt necesare operatii de reciclare speciale
Preluare la sfarsitul durantei de viata	No
Eticheta WEEE	 În Uniunea Europeană, produsele trebuie reciclate respectand sistemul specific de colectare a deșeurilor și nu trebuie să ajunga în pubelele de colectare a deșeurilor menajere.

Technical Illustration

Exploded view



Technical Illustration

Exploded view



Technical Illustration

Exploded view



Technical Illustration

Exploded view



Technical Illustration

Exploded view



КОНТАКТОРЫ КМИ В ОБОЛОЧКЕ С КНОПКАМИ УПРАВЛЕНИЯ

Руководство по эксплуатации

1 Назначение и область применения

1.1 Контакторы серии КМИ в сборе с электротепловым реле в оболочке с кнопками управления товарного знака IEK (далее – контакторы) предназначены для дистанционного пуска и остановки трехфазных асинхронных электродвигателей с короткозамкнутым ротором на напряжение переменного тока до 400 В частоты 50 Гц, а также для защиты электродвигателей от перегрузок недопустимой продолжительности и сверхтоков, возникающих при обрыве одной из фаз.

1.2 По требованиям безопасности соответствуют техническому регламенту Таможенного союза ТР ТС 004/2011 и ГОСТ Р 50030.4.1 (МЭК 60947-4-1).

1.3 Условия эксплуатации:

- диапазон рабочих температур – от минус 25 до плюс 50 °C;
- высота над уровнем моря – не более 2000 м;
- относительная влажность воздуха до 50 % при плюс 40 °C, допускается эксплуатация контакторов при относительной влажности воздуха до 90 % и температуре плюс 20 °C;
- воздействия вибрационной нагрузки с частотой до 100 Гц при ускорении 1g;

– климатическое исполнение и категория размещения контакторов УХЛ4 по ГОСТ 15150.

1.4 Степень защиты, обеспечиваемая оболочкой контакторов, IP54 по ГОСТ 14254 (IEC 60529).

2 Технические данные

2.1 Номинальные и предельные значения параметров главной цепи контакторов в категории применения АС-3 и АС-1(I_{th}) приведены в таблице 1.

2.2 Механическая износостойкость и коммутационная износостойкость контактов главной цепи при номинальных рабочих токах, указанных в таблице 1 в категории основного применения АС-3, а также допустимая частота включений в час указаны в таблице 2.

Таблица 1

Параметры		КМИ 10960	КМИ 11260	КМИ 11860	КМИ 22560	КМИ 23260	КМИ 34062	КМИ 35062	КМИ 46562	КМИ 48062	КМИ 49562
Номинальное рабочее напряжение переменного тока U_e , В	400										
Номинальное напряжение изоляции U_i , В	660										
Номинальное импульсное напряжение U_{imp} , кВ	6										
Номинальный рабочий ток I_e , категория применения АС-3 ($U_n \leq 400$ В), А	9	12	18	25	32	40	50	65	80	95	
Условный тепловой ток I_{th} ($t^o \leq 40^o$), категория применения АС-1, А	25	25	32	40	50	60	80	80	125	125	
Номинальная мощность по АС-3, кВт	230 В	2,2	3	4	5,5	7,5	11	15	18,5	22	25
	400 В	4	5,5	7,5	11	15	18,5	22	30	37	45
Макс. кратковременная нагрузка ($t < 1$ с), А	162	216	324	450	576	720	900	1170	1440	1710	
Условный ток короткого замыкания I_{nc} , А	1000		3000						5000		
Защита от сверхтоков предохранитель gG , А	10	20	25	40	50	50	63	80	100	100	
Мощность рассеяния при I_e , Вт	AC-3	0,2	0,36	0,8	1,25	2	2,4	3,7	4,2	5,1	7,2
	AC-1	1,56	1,56	2,5	3,2	5	5,4	9,6	6,4	12,5	12,5
Типоисполнение теплового реле	РТИ-1314	РТИ-1316	РТИ-1321	РТИ-1322	РТИ-1353	РТИ-3355	РТИ-3357	РТИ-3359	РТИ-3363	РТИ-3365	

Таблица 2

Механическая износостойкость		Коммутационная износостойкость	
Общий ресурс по износостойкости, млн циклов	Частота включений в час	Общий ресурс по износостойкости, млн циклов	Частота включений в час
10	3600	1,0	1200

2.3 Сечения подключаемых проводников к главным цепям указаны в таблице 3.

2.4 Номинальные и предельные значения параметров цепей управления (включающих катушек) контакторов приведены в таблице 4.

2.5 Технические характеристики вспомогательной цепи (встроенного дополнительного контакта) (только для типоисполнений КМИ 34062, КМИ 35062, КМИ 46562, КМИ 48062, КМИ 49562) приведены в таблице 5.

Таблица 3

Параметры	КМИ 10960	КМИ 11260	КМИ 11860	КМИ 22560	КМИ 23260	КМИ 34062	КМИ 35062	КМИ 46562	КМИ 48062	КМИ 49562
Гибкий кабель без наконечника, мм^2	1,0–2,5	1,0–2,5	1,5–4	1,5–4	2,5–6	6–16	10–25	10–25	16–35	16–35
Жесткий кабель без наконечника, мм^2	1,5–4	1,5–4	2,5–6	2,5–6	4–10	10–25	16–35	16–35	25–50	25–50
Крутящий момент при затягивании, Н·м	1,2	1,2	1,2	1,2	2,5	2,5	2,5	2,5	4,0	4,0

Таблица 4

Параметры	КМИ 10960	КМИ 11260	КМИ 11860	КМИ 22560	КМИ 23260	КМИ 34062	КМИ 35062	КМИ 46562	КМИ 48062	КМИ 49562
Номинальное напряжение катушки управления U_c , В	230; 400									
Диапазоны напряжения управления	Срабатывание $(0,85 \div 1,1)U_c$ Отпускание $(0,2 \div 0,75)U_c$									
Мощность потребления катушки при U_c , ВА	Срабатывание $\cos \varphi = 0,75$	60	60	60	90	90	200	200	200	200
	Удержание $\cos \varphi = 0,3$	7	7	7	7,5	7,5	20	20	20	20
Время срабатывания, мс	Замыкание	12–22	12–22	12–22	15–24	15–24	20–26	20–26	20–26	20–35
	Размыкание	4–19	4–19	4–19	5–19	5–19	8–12	8–12	8–12	6–20
Мощность рассеяния, Вт		3	3	3	3,5	3,5	10	10	10	10
Эл. износоуст., млн. ком. циклов	AC-3	1,7	1,7	1,4	1,4	1,6	1,5	1,4	1,4	0,9
	AC-1	0,55	0,7	1,0	1,3	1,3	1,3	1,3	1,4	0,7
Мех. износоустойчивость., млн. ком. циклов		2	2	2	2	2	2	1,5	1,5	1,5

Таблица 5

Параметры	КМИ 34062	КМИ 35062	КМИ 46562	КМИ 48062	КМИ 49562
Номинальное напряжение U_n , В	переменного тока до 660				
	постоянного тока до 440				
Номинальное напряжение изоляции U_i , В	660				
Ток термической стойкости ($t^{\circ} \leq 40^{\circ}$) I_{th} , А	10				
Минимальная включающая способность	Umin, В	17			
	Imin, мА	15			
Защита от сверхтоков – предохранитель gG, А	10				
Максимальная кратковременная нагрузка ($t \leq 1c$), А	100				
Сопротивление изоляции, МОм	>10				

2.6 Технические параметры встроенных электротепловых реле главной цепи приведены в таблице 6.

2.7 Технические параметры встроенного дополнительного контакта электротепловых реле приведены в таблице 7.

Таблица 6

Параметры		Тип электротеплового реле									
		РТИ-1314	РТИ-1316	РТИ-1321	РТИ-1322	РТИ-2355	РТИ-3355	РТИ-3357	РТИ-3359	РТИ-3363	РТИ-3365
Диапазон уставок реле, А		7–10	9–13	12–18	17–25	28–36	30–40	37–50	48–65	63–80	80–93
Номинальное напряжение изоляции, В		660									
Номинальное импульсное напряжение, кВ		6									
Диапазон рабочей частоты, Гц		0–400									
Сечение присоединяемых проводников, мм^2	Гибкий кабель без наконечника	1,5–10				4–35					
	Гибкий кабель с наконечником	1–4				4–35					
	Жесткий кабель	1–6				4–35					
Момент затяжки, Н·м		2				9					

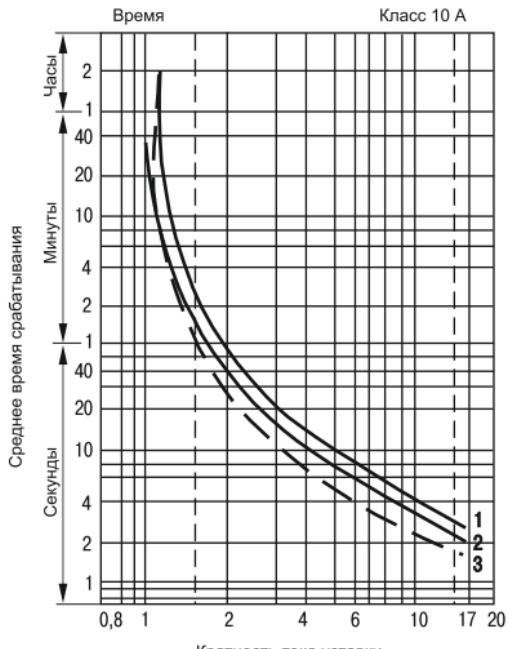
Таблица 7

Параметры	Значение
Тип дополнительного контакта	13
Ток термической стойкости, А	5
Максимальная мощность катушки контактора в зависимости от напряжения, ВА	380 В
Задержка от сверхтоков – предохранитель gG, А	5
Сечение присоединяемых проводников, мм^2	1–2,5
Момент затяжки, Н·м	1,2

2.8 Времяточковые характеристики срабатывания электротепловых реле приведены на рисунке 1.

2.9 Габаритные размеры контакторов приведены на рисунках 2, 3, 4.

2.10 Схемы электрические принципиальные контакторов приведены на рисунках 5, 6.



- 1 – симметричный трехфазный режим из холодного состояния
- 2 – симметричный двухфазный режим из холодного состояния
- 3 – симметричный трехфазный режим после длительного протекания номинального тока (горячее состояние)

Рисунок 1

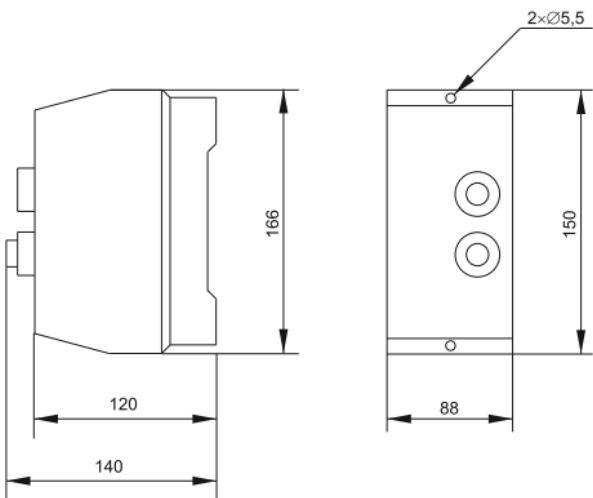


Рисунок 2 – КМИ 10960, КМИ 11260, КМИ 11860

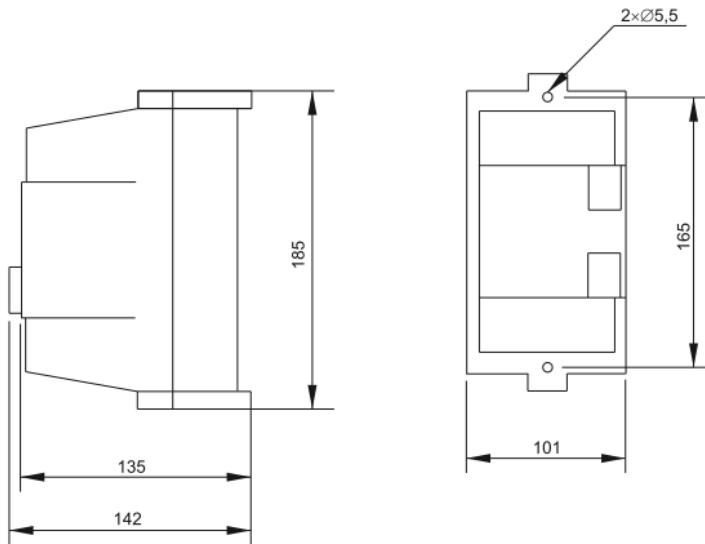


Рисунок 3 – КМИ 22560, КМИ 23260

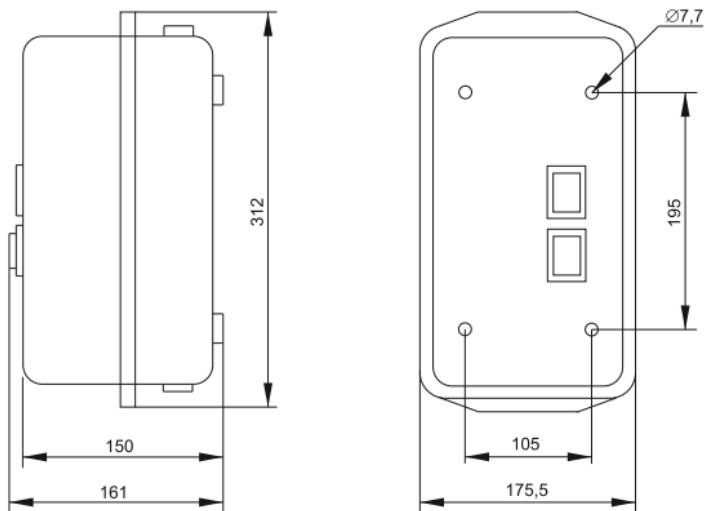


Рисунок 4 – КМИ 34062, КМИ 35062, КМИ 46562, КМИ 48062, КМИ 49562

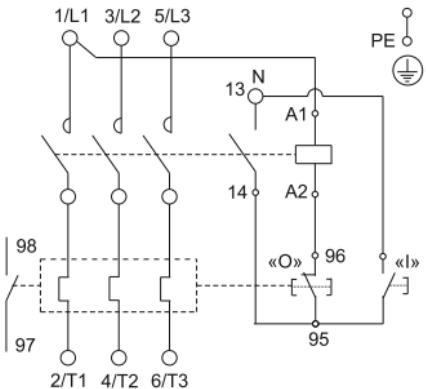


Рисунок 5 – Схема электрическая контакторов с катушкой управления 230 В~

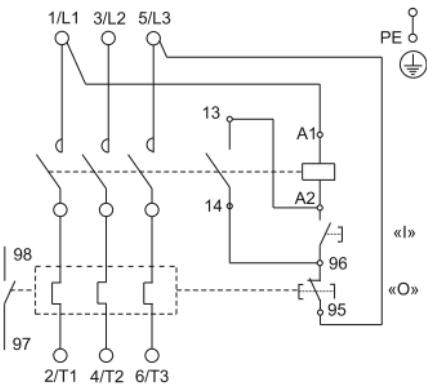


Рисунок 6 – Схема электрическая контакторов с катушкой управления 400 В~

3 Комплектность

3.1 В комплект поставки входит:

- контактор – 1 шт.;
- руководство по эксплуатации. Паспорт – 1 шт.

4 Требования безопасности

4.1 Эксплуатация контакторов должна осуществляться в соответствии с «Правилами техники безопасности при эксплуатации электроустановок потребителей».

4.2 Мерой предосторожности для основной защиты от поражения электрическим током является основная изоляция, а защита при повреждении не предусмотрена.

4.3 По истечении срока службы контактор утилизировать.

5 Условия транспортирования, хранения и утилизации

5.1 Транспортирование контакторов в части воздействия механических факторов – по группе С и Ж ГОСТ 23216, климатических факторов – по группе 4(Ж2) по ГОСТ 15150.

5.2 Транспортирование контакторов допускается любым видом крытого транспорта, обеспечивающим предохранение упакованных контакторов от механических повреждений, загрязнения и попадания влаги, при температуре от минус 45 до 50 °С.

5.3 Хранение контакторов осуществляется в упаковке изготовителя в помещениях с естественной вентиляцией при температуре окружающего воздуха от минус 45 до плюс 50 °С и относительной влажности до 98 % при 50 °С.

5.4 Утилизация изделия производится путем его разборки и передачи организациям, занимающимся переработкой пластмасс, цветных и черных металлов.

6 Гарантийные обязательства

6.1 Гарантийный срок эксплуатации контакторов – 5 лет со дня продажи при условии соблюдения потребителем правил эксплуатации, транспортирования и хранения.

6.2 В период гарантийных обязательств и при возникновении претензий обращаться к продавцу или в организации:

Российская Федерация

ООО «ИЭК ХОЛДИНГ»

142100, Московская область,
г. Подольск, проспект Ленина,
дом 107/49, офис 457
Тел./факс: +7 (495) 542-22-27
info@iek.ru
www.iek.ru

Russian Federation

«IEK HOLDING» LLC

107/49 Prospect Lenina, office 457,
Podolsk, Moscow region, 142100
Tel./fax: +7 (495) 542-22-27
info@iek.ru
www.iek.ru

МОНГОЛИЯ

«ИЭК Монголия» КОО

Улан-Батор, 20-й участок
Баянголского района, Западная
зона промышленного района 16100,
Московская улица, 9
Тел.: +976 7015-28-28
Факс: +976 7016-28-28
info@iek.mn
www.iek.mn

Mongolia

«IEK Mongolia» LLC

ul. Moskovskaya, 9, Zapadnaya zona
promyshlennogo rayona 16100,
20 uchastok Bayangolyskogo rayona,
Ulan Bator
Tel.: +976 7015-28-28
Fax: +976 7016-28-28
info@iek.mn
www.iek.mn

Республика Молдова

«ИЭК ТРЭЙД» О.О.О.

MD-2044, город Кишинев
ул. Мария Дрэган, 21
Тел.: +373 (22) 479-065, 479-066
Факс: +373 (22) 479-067
info@iek.md; infomd@md.iek.ru
www.iek.md

Republic of Moldova

«IEK TRADE» L.L.C.

21 Maria Dragan str., Chisinau,
MD-2044
Tel.: +373 (22) 479-065, 479-066
Fax: +373 (22) 479-067
info@iek.md; infomd@md.iek.ru
www.iek.md

Страны Азии**Республика Казахстан****ТОО «ТД ИЭК. КАЗ»**

040916, Алматинская область,
Карасайский район, с. Иргели,
мкр. Акжол 71А

Тел.: +7 (727) 237-92-49, 237-92-50

infokz@iek.ru

www.iek.kz

УКРАИНА**ООО «ТОРГОВЫЙ ДОМ****УКРЕЛЕКТРОКОМПЛЕКТ»**

08132, Киевская область,
Киево-Святошинский район,
г. Вишневое, ул. Киевская, 6В
Тел.: +38 (044) 536-99-00
info@iek.com.ua
www.iek.ua

Страны Евросоюза**Латвийская Республика****ООО «ИЭК Балтия»**

LV-1005, г. Рига, ул. Ранкас, 11
Тел.: +371 2934-60-30
iek-baltija@inbox.lv
www.iek.ru

Республика Беларусь**ООО «ИЭК ХОЛДИНГ»**

(Представительство
в Республике Беларусь)
220025, г. Минск,
ул. Шафарнянская, д. 11, пом. 62
Тел.: +375 (17) 286-36-29
iek.by@iek.ru
www.iek.ru

Asian countries**Republic of Kazakhstan**

«ТД IEK.KAZ» LLP

71A mkr. Akzhol, s. Irgeli,
Karasaiskiy district, Almaty region,
040916

Tel.: +7 (727) 237-92-49, 237-92-50

infokz@iek.ru

www.iek.kz

Ukraine**«TRADE HOUSE****UKRELEKTROKOMPLEKT» LLC**

ul. Kievskaya, 6 V, Vishnyovoe, Kyivo-
Svyatoshinskiy rayon, Kyiv oblast,
08132
Tel.: +38 (044) 536-99-00
info@iek.com.ua
www.iek.ua

EU countries**Republic of Latvia****LLC «IEK Baltia»**

11, Rankas str., Riga, LV-1005
Tel.: +371 2934-60-30
iek-baltija@inbox.lv
www.iek.ru

Republic of Belarus**LLC «IEK HOLDING»**

(Representative office
in the Republic of Belarus)
220025, Minsk, ul. Shafarnyanskaya,
d. 11, room 62
Tel.: +375 (17) 286-36-29
iek.by@iek.ru
www.iek.ru

Ka

Defne

Switch & Socket Outlet Series



Defne Switch & Socket Outlet Series

Colourful Products



Every detail is important in your life your choices add value to your environment. Defne switch and socket series, with its modern and elegant design, color options and quality, it makes your choices unique.

Functions



One Way Switch



Two-Circuit Switch



One Way Switch Illuminated



3 Circuit Switch



Double USB Charge Socket



Socket Outlet with Earthing Pin and Child Protection



Audio Switch 10 W



Dimmer



Data Socket Outlet



Loudspeaker - connection,
1 gang

Innovational aspect to your environments

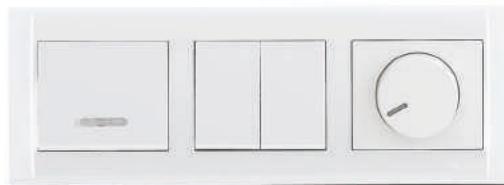
With functionality, product quality, environmental sensitivity criterias, Defne series are developed for elegant and original designs for eye catching aesthetics in your environments.



Multi Frames



Double Horizontal Frame



Triple Horizontal Frame



Double Vertical Frame



Quartet Horizontal Frame



Fiftet Horizontal Frame



Sextet Horizontal Frame



Triple Vertical Frame

Defne Switch & Socket Outlet Series

Colourful Products



001 White



010 Beige



065 Metallic Silver



057 Dore



052 Green



050 Fume



100 Pearl



105 Natural Pine



101 Natural Oak



103 Natural Cherry



102 Natural Walnut



096 Brown



009 Brown - Light Brown



060 Gold

Pastel Colour Frames



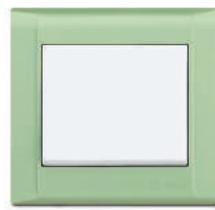
085 Magenta



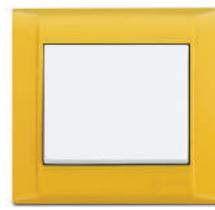
092 Blue



078 Lilac



091 Green



074 Yellow



095 Light Lilac



094 Orange



093 Rose

The secret of soft and relaxing environment is hidden in the combining of delicate details with inspiring colors.

Defne Switch & Socket Outlet Series



One Way Switch *

42001001

10 AX, 250 V~

EN 60669-1

Piece in Box / Package - 12 / 120



One Way Switch Illuminated *

42001021

10 AX, 250 V~

EN 60669-1

Piece in Box / Package - 12 / 120



Two-Circuit Switch *

42001003

10 AX, 250 V~

EN 60669-1

Piece in Box / Package - 12 / 120



Two-Circuit Switch Illuminated *

42001023

10 AX, 250 V~

EN 60669-1

Piece in Box / Package - 12 / 120



Light Switch *

42001004

10 A, 250 V~

EN 60669-1

Piece in Box / Package - 12 / 120



Light Switch Illuminated *

42001024

10 A, 250 V~

EN 60669-1

Piece in Box / Package - 12 / 120



Two-Way Switch *

42001005

10 AX, 250 V~

EN 60669-1

Piece in Box / Package - 12 / 120



Two-Way Switch Illuminated *

42001025

10 AX, 250 V~

EN 60669-1

Piece in Box / Package - 12 / 120



Door Switch *

42001096

10 A, 250 V~

EN 60669-1

Piece in Box / Package - 12 / 120



Door Switch Illuminated *

4200107

10 A, 250 V~

EN 60669-1

Piece in Box / Package - 12 / 120



Intermediate Switch *

42001020

10 AX, 250 V~

EN 60669-1

Piece in Box / Package - 12 / 120



Intermediate Switch Illuminated *

42001040

10 AX, 250 V~

EN 60669-1

Piece in Box / Package - 12 / 120

* Marked products are available with screwless terminal option.



Bell Switch*
42001050
10 A, 250 V~
EN 60669-1
Piece in Box / Package - 12 / 120



Bell Switch Illuminated 12V*
42001085
10 A, 12 V~
EN 60669-1
Piece in Box / Package - 12 / 120



Bell Switch With Label*
42001010
10 A, 250 V~
EN 60669-1
Piece in Box / Package - 12 / 120



Bell Switch Illuminated *
42001070
10 A, 250 V~
EN 60669-1
Piece in Box / Package - 12 / 120



**Bell Switch Illuminated *
With Label 12V**
42001030
10 A, 12 V~
EN 60669-1
Piece in Box / Package- 12 / 120



Control Switch 2-Pole *
42001071
16 A, 250 V~
EN 60669-1
Piece in Box / Package - 12 / 120



Double Two-Way Switch
42001026
10 AX, 250 V~
EN 60669-1
Piece in Box / Package- 12 / 120



Shutter Push-Button *
42001041
10 A, 250 V~
EN 60669-1
Piece in Box / Package - 12 / 120



3 Circuit Switch
42001091
10 AX, 250 V~
EN 60669-1
Piece in Box / Package - 12 / 120



3 Gang 3 Pole Switch
42001092
10 AX, 250 V~
EN 60669-1
Piece in Box / Package - 12 / 120



1 Gang 3 Circuit Switch
42001094
10 AX, 250 V~
EN 60669-1
Piece in Box / Package - 12 / 120



1 Gang 3 Pole Switch
42001095
10 AX, 250 V~
EN 60669-1
Piece in Box / Package - 12 / 120

Defne Switch & Socket Outlet Series



Socket Outlet
42001022
16 A, 250 V~
IEC 60884-1
Piece in Box / Package - 12 / 120



Schuko Socket Outlet *
42001028
16 A, 250 V~
IEC 60884-1
Piece in Box / Package - 12 / 120



Schuko Socket Outlet with Lid *
42001029
16 A, 250 V~
IEC 60884-1
Piece in Box / Package - 12 / 120



Schuko Socket Outlet with
Child Protection and Lid *
42001254
16 A, 250 V~
IEC 60884-1
Piece in Box / Package - 12 / 120



Socket Outlet with Earthing Pin *
42001019
16 A, 250 V~
IEC 60884-1
Piece in Box / Package - 12 / 120



Socket Outlet with Child Protection
42001052
16 A, 250 V~
IEC 60884-1
Piece in Box / Package - 12 / 120



Socket Outlet with Earthing Pin
and Child Protection *
42001053
16 A, 250 V~
IEC 60884-1
Piece in Box / Package - 12 / 120



Schuko Socket Outlet with
Child Protection *
42001058
16 A, 250 V~
IEC 60884-1
Piece in Box / Package - 12 / 120



Double Socket Outlet with
Earthing Pin
42001018
16 A, 250 V~
IEC 60884-1
Piece in Box / Package - 12 / 120



Double Socket Outlet
42001017
16 A, 250 V~
IEC 60884-1
Piece in Box / Package - 12 / 120



Double Schuko Socket Outlet High
42001082
16 A, 250 V~
IEC 60884-1
Piece in Box / Package - 12 / 120

* Marked products are available with screwless terminal option.



Antenna Socket Through
6 dB Female
42001007
TSE K 72
Piece in Box / Package - 12 / 120



Antenna Socket End
4 dB Female
42001027
TSE K 72
Piece in Box / Package - 12 / 120



Antenna Socket Through
Male 6 dB
42001043
TSE K 72
Piece in Box / Package - 12 / 120



Antenna Socket End
Male 4 dB
42001044
TSE K 72
Piece in Box / Package - 12 / 120



TV-RF Antenna Socket Through 7 dB
42001060
TSE K 72
Piece in Box / Package - 12 / 120



TV-RF Antenna Socket End 1.5 dB
42001065
TSE K 72
Piece in Box / Package - 12 / 120



TV-SAT Antenna Socket Through
4 dB
42001083
TSE K 72
Piece in Box / Package - 12 / 120



TV-SAT Antenna Socket End
1 dB
42001098
TSE K 72
Piece in Box / Package - 12 / 120



TV-RF-SAT Antenna Socket
Through 4 dB
42001067
TSE K 72
Piece in Box / Package - 12 / 120



TV-RF-SAT Antenna Socket End
1.5 dB
42001066
TSE K 72
Piece in Box / Package - 12 / 120



Telephone Socket
42001014
TSE K 71
Piece in Box / Package - 12 / 120



Double Telephone Socket
42001034
TSE K 71
Piece in Box / Package - 12 / 120

Defne Switch & Socket Outlet Series



Double Data Socket Outlet (1xCat5)
42001035
TSE K 71
Piece in Box / Package - 12 / 120



Double Data Socket Outlet (2xCat5)
42001036
TSE K 71
Piece in Box / Package - 12 / 120



Data Socket Outlet (2xCat3)
42001076
TSE K 71
Piece in Box / Package - 12 / 120



Data Socket Outlet
(Cat5+Telephone Socket)
42001037
TSE K 71
Piece in Box / Package - 12 / 120



Data Socket Outlet (empty)
42001038
TSE K 71
Piece in Box / Package - 12 / 120



Loudspeaker - connection, 1 gang
42001080
TSE K 71
Piece in Box / Package - 12 / 120



Dimmer
42001011
60-600 W, 250 V~
EN 60669-2-2
Piece in Box / Package - 10 / 100



Dimmer Coil Filtered
42001031
60-600 W, 250 V~
EN 60669-2-2
Piece in Box / Package - 10 / 100



Dimmer
42001093
60-1000 W, 250 V~
EN 60669-2-2
Piece in Box / Package - 10 / 100



1-10V Led Dimmer
42001459
50Hz, 230 V~
IEC 60669-2-1
Piece in Box / Package - 10 / 100



Remote Controlled Dimmer(IR)
Coil Filtered
42001045
60-300 W, 250 V~
EN 60669-2-2
Piece in Box / Package - 10 / 100



Audio Switch 10 W
42001086
10 W
Piece in Box / Package - 6 / 60



Emergency-Light

42001055

250 V~

Piece in Box / Package - 6 / 60



Delayed Energy Saver (Without Relay) *

42001046

10 A, 220 V~

Piece in Box / Package - 10 / 100

Energy Saver (Without Relay)

42001183

10 A, 220 V~

Piece in Box / Package - 12 / 120



Electro-Magnetic Energy Saver *

42001301

12 V~

Piece in Box / Package - 12 / 120

Radio Frequency Energy saver

42001302

12 V~

Piece in Box / Package - 12 / 120



Warning Bell

42001056

250 V~

Piece in Box / Package - 6 / 60



Cooling Switch

42001084

16 A, 250 V~

Piece in Box / Package - 12 / 120



Surge-Protective Socket Outlet with Child Protection

42001139K

16 A, 250 V~

Piece in Box / Package - 5 / 30



Universal Grounding Sockets With Child Protection (British-German)

42001306

13 A, 250 V~

Piece in Box / Package - 12 / 120



Universal Socket with Switch and Child Protection

42001305

13 A, 250 V~

Piece in Box / Package - 12 / 120



Hotel Room Bell Switch

42001253

10 A, 250 V~

Piece in Box / Package - 12 / 120



Hotel Room Signalling Switch

42001252

10 A, 250 V~

Piece in Box / Package - 12 / 120

* Energy saver product visuals are given as representations, the card must be ordered separately.

Defne Switch & Socket Outlet Series



HDMI Socket (with jack)
42001494
Piece in Box / Package - 12 / 120



USB Socket (with jack)
42001495
Piece in Box / Package - 12 / 120



USB Charging Socket
42001465
Input: 250V AC, Output: 5V DC, 2A
Piece in Box / Package - 12 / 120



Double USB Charge Socket
42001A80
Piece in Box / Package - 12 / 120

Sales Options

1st Sales Option - Complete Product



Complete Product

2nd Sales Option - Module (With Rocker / Cover Plate) and Frame



Module
(With Rocker / Cover Plate)



Frame



Complete Product



Frame
42001701



Double Vertical Frame
42001707



Double Horizontal Frame
42001702



Triple Horizontal Frame
42001703



Triple Vertical Frame
42001708



Quartet Horizontal Frame
42001704



Fiftet Horizontal Frame
42001705

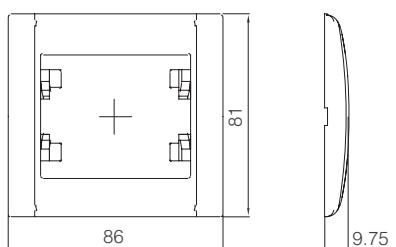


Sixtet Horizontal Frame
42001706

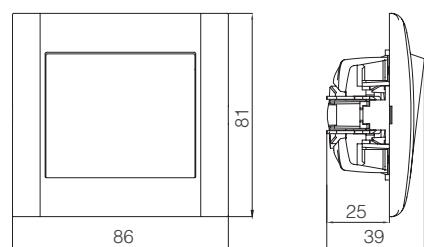
Defne Switch & Socket Outlet Series

Technical Drawings

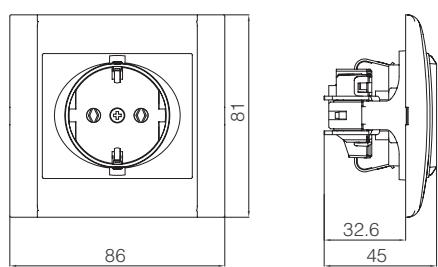
Frame



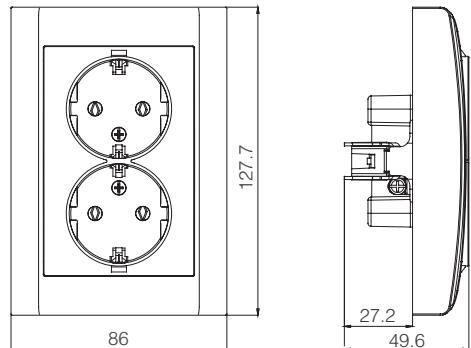
One Way Switch



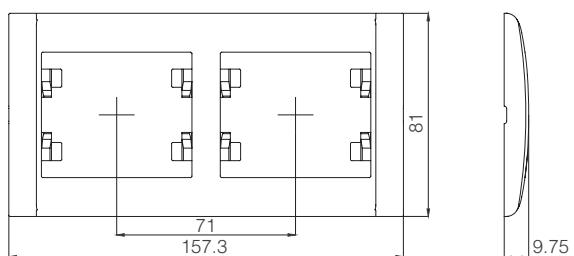
Schuko Socket Outlet



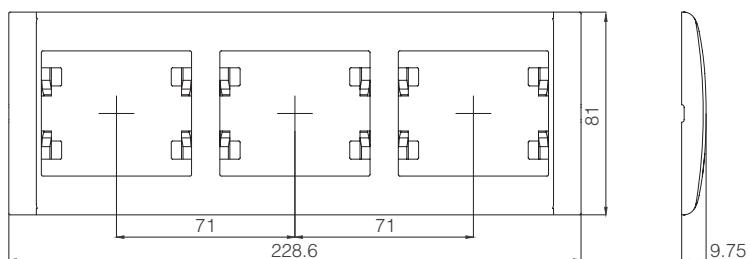
Double Schuko Socket Outlet



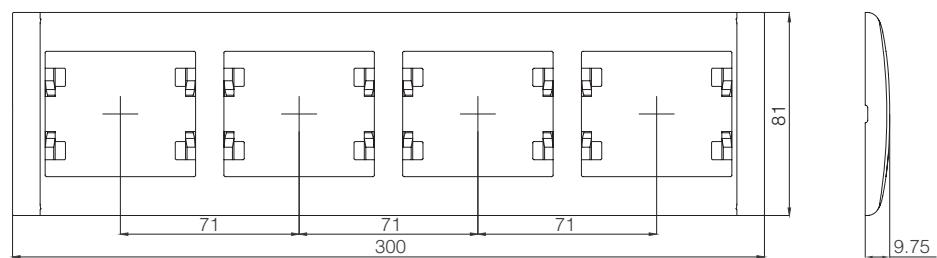
Double Horizontal Frame



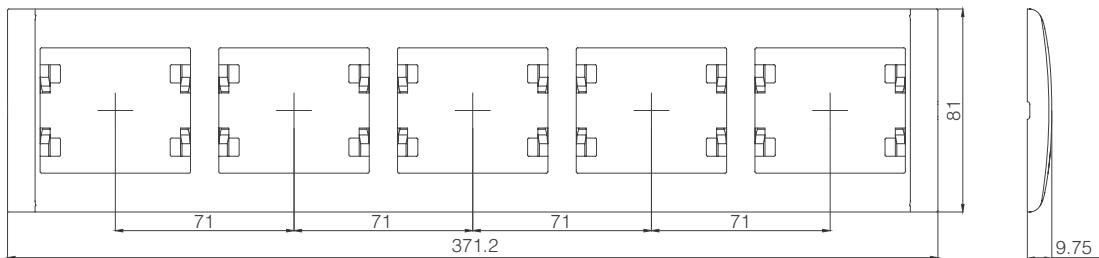
Triple Horizontal Frame



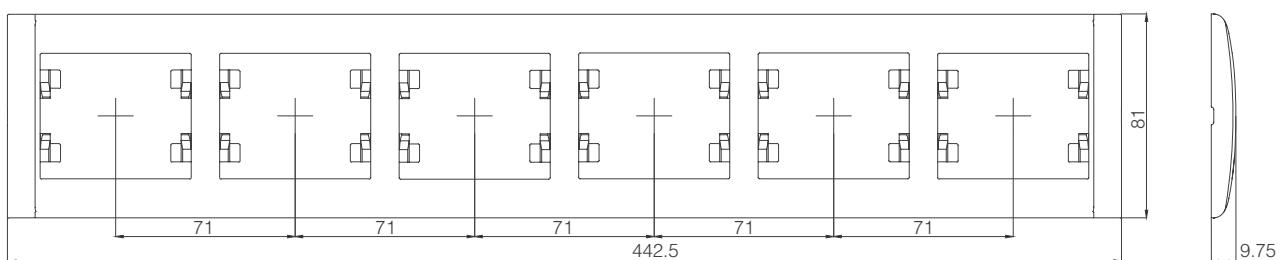
Quartet Horizontal Frame



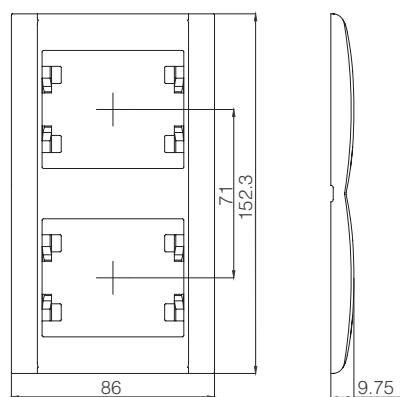
Fif tet Horizontal Frame



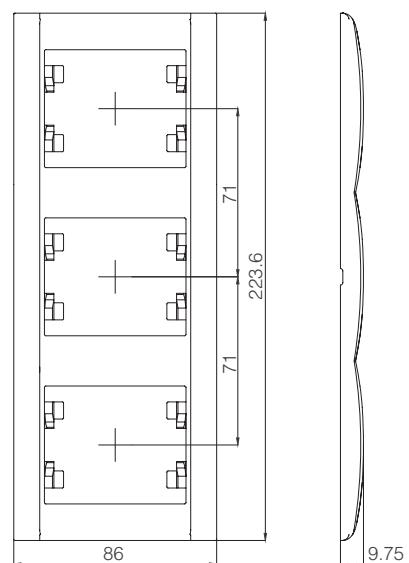
Sixtet Horizontal Frame



Double Vertical Frame



Triple Vertical Frame



Defne Switch & Socket Outlet Series

1st Sales Option - Complete Product

Product Name	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
Switch Group					
• One Way Switch	42 xxx 001	12	120	10,20	285 x 505 x 280
• One Way Switch Illuminated	42 xxx 021	12	120	10,39	285 x 505 x 280
• Two-Circuit Switch	42 xxx 003	12	120	10,59	285 x 505 x 280
• Two-Circuit Switch Illuminated	42 xxx 023	12	120	10,85	285 x 505 x 280
• Light Switch	42 xxx 004	12	120	10,15	285 x 505 x 280
• Light Switch Illuminated	42 xxx 024	12	120	10,37	285 x 505 x 280
• Double Light	42 xxx 441	12	120	10,83	285 x 505 x 280
• Two-Way Switch	42 xxx 005	12	120	10,40	285 x 505 x 280
• Two-Way Switch Illuminated	42 xxx 025	12	120	10,64	285 x 505 x 280
• Door Switch	42 xxx 096	12	120	10,15	285 x 505 x 280
• Door Switch Illuminated	42 xxx 097	12	120	10,08	285 x 505 x 280
• Intermediate Switch	42 xxx 020	12	120	10,28	285 x 505 x 280
• Intermediate Switch Illuminated	42 xxx 040	12	120	10,86	285 x 505 x 280
• Bell Switch	42 xxx 050	12	120	10,15	285 x 505 x 280
• Bell Switch Illuminated 12V	42 xxx 085	12	120	10,08	285 x 505 x 280
• Bell Switch Illuminated	42 xxx 070	12	120	10,35	285 x 505 x 280
• Bell Switch With Label	42 xxx 010	12	120	10,10	285 x 505 x 280
• Bell Switch Illuminated With Label 12V	42 xxx 030	12	120	10,10	285 x 505 x 280
3 Circuit Switch	42 xxx 091	12	120	10,85	285 x 505 x 280
3 Gang 3 Pole Switch	42 xxx 092	12	120	11,18	285 x 505 x 280
1 Gang 3 Circuit Switch	42 xxx 094	12	120	10,69	285 x 505 x 280
1 Gang 3 Pole Switch	42 xxx 095	12	120	11,03	285 x 505 x 280
Cooling Switch	42 xxx 084	12	120	10,97	285 x 505 x 280
Double Two-Way Switch	42 xxx 026	12	120	11,73	285 x 505 x 280
• Shutter Push-Button	42 xxx 041	12	120	10,79	285 x 505 x 280
One Gang Shutter Push-Button	42 xxx 279	12	120	10,63	285 x 505 x 280
• Control Switch 2-Pole	42 xxx 071	12	120	10,32	285 x 505 x 280
Hotel Room Signalling Switch	42 xxx 252	12	120	10,77	285 x 505 x 280
Hotel Room Bell Switch	42 xxx 253	12	120	10,74	285 x 505 x 280
British Type Two Phase Illuminated Switches Emergency	42 xxx 304	12	120	11,61	285 x 505 x 280
Emergency Switch with Cord	42 xxx 128	12	120	10,11	285 x 505 x 280
Socket Outlet Group					
Socket Outlet	42 xxx 022	12	120	8,96	285 x 505 x 280
Schuko Socket Outlet	42 xxx 028	12	120	10,28	285 x 505 x 280
Schuko Socket Outlet Screwless	42 xxx 172	12	120	10,39	285 x 505 x 280
Schuko Socket Outlet with Lid	42 xxx 029	12	120	13,17	335 x 475 x 300
Schuko Socket Outlet Screwless with Lid	42 xxx 099	12	120	10,02	285 x 475 x 275
Schuko Socket Outlet with Child Protection and Lid	42 xxx 254	12	120	11,35	335 x 475 x 300
Schuko Socket Outlet Screwless with Child Protection and Lid	42 xxx 255	12	120	10,02	285 x 475 x 275
Socket Outlet with Earthing Pin	42 xxx 019	12	120	10,58	285 x 505 x 280
Socket Outlet Screwless with Earthing Pin	42 xxx 173	12	120	10,65	285 x 475 x 275
Socket Outlet with Earthing Pin and Lid	42 xxx 016	12	120	11,06	335 x 475 x 300
Socket Outlet with Child Protection	42 xxx 052	12	120	9,20	285 x 505 x 280
Socket Outlet with Earthing Pin and Child Protection	42 xxx 053	12	120	10,82	285 x 505 x 280
Socket Outlet Screwless with Earthing Pin and Child Protection	42 xxx 198	12	120	10,47	285 x 475 x 275
Socket Outlet with Child Protection	42 xxx 300	12	120	11,30	335 x 475 x 300
Schuko Socket Outlet with Child Protection	42 xxx 058	12	120	10,56	285 x 505 x 280
Schuko Socket Outlet Screwless with Child Protection	42 xxx 174	12	120	10,67	285 x 505 x 280
Double Socket Outlet with Earthing Pin	42 xxx 018	12	120	15,75	410 x 485 x 310
Double Socket Outlet	42 xxx 017	12	120	11,80	335 x 475 x 300
Double Schuko Socket Outlet High	42 xxx 082	12	120	14,85	380 x 505 x 390
Universal Socket with Switch and Child Protection	42 xxx 305	12	120	11,22	285 x 505 x 280
Universal Grounding Sockets With Child Protection (British-German)	42 xxx 306	12	120	3,32	505 x 280 x 185
"H" Type Grounded Socket	42 xxx 048	12	120	10,19	285 x 475 x 275

1st Sales Option - Complete Product



Complete Product

Product Name	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
Tv Socket Outlet Group					
Antenna Socket Through 6 dB Female	42 xxx 007	12	120	9,26	285 x 505 x 280
Antenna Socket End 4 dB Female	42 xxx 027	12	120	9,25	285 x 505 x 280
Antenna Socket End 0.5 dB Metal Case	42 xxx 087	12	120	10,89	285 x 505 x 280
Antenna Socket Through 11 dB Metal Case *	42 xxx 088	12	120	10,49	285 x 505 x 280
TV Antenna Socket Non-Resistance	42 xxx 142	12	120	9,37	285 x 505 x 280
Antenna Socket Through Male	42 xxx 043	12	120	9,50	285 x 505 x 280
Antenna Socket End Male	42 xxx 044	12	120	8,69	285 x 505 x 280
TV-RF Antenna Socket Through 7 dB **	42 xxx 060	12	120	14,42	285 x 505 x 280
TV-RF Antenna Socket End 1.5 dB	42 xxx 065	12	120	13,65	285 x 505 x 280
TV-SAT Antenna Socket End 1 dB	42 xxx 098	12	120	14,36	285 x 505 x 280
TV-SAT Antenna Socket Through 4 dB	42 xxx 083	12	120	14,23	285 x 505 x 280
TV-RF-SAT Antenna Socket End 1.5 dB	42 xxx 066	12	120	14,05	285 x 505 x 280
TV-RF-SAT Antenna Socket Through 4 dB	42 xxx 067	12	120	13,95	285 x 505 x 280
SAT Antenna Socket Through	42 xxx 133	12	120	10,74	285 x 505 x 280
SAT Antenna Socket End	42 xxx 134	12	120	10,76	285 x 505 x 280
Data Transmission Group					
Telephone Socket	42 xxx 014	12	120	8,93	280 x 500 x 290
Double Telephone Socket	42 xxx 034	12	120	9,20	285 x 505 x 280
Double Telephone Socket (1xCat3) with Data Connector	42 xxx 042	12	120	8,99	285 x 505 x 280
Double Data Socket Outlet (1xCat5)	42 xxx 035	12	120	9,33	285 x 505 x 280
Double Data Socket Outlet (2xCat5)	42 xxx 036	12	120	10,10	285 x 505 x 280
Data Socket Outlet (Cat5+Telephone Socket)	42 xxx 037	12	120	8,72	285 x 505 x 280
Data Socket Outlet (empty)	42 xxx 038	12	120	8,57	285 x 505 x 280
Double Data Socket Outlet (1xCat6)	42 xxx 135	12	120	9,27	285 x 505 x 280
Double Data Socket Outlet (2xCat6)	42 xxx 136	12	120	9,98	285 x 505 x 280
Data Socket Outlet (Cat3+Cat6)	42 xxx 137	12	120	9,73	285 x 505 x 280
Double Data Socket-Outlet (1xCat 3)	42 xxx 075	12	120	9,52	285 x 505 x 280
Data Socket Outlet (2xCat3)	42 xxx 076	12	120	8,67	285 x 505 x 280
Loudspeaker - connection, 1 gang	42 xxx 080	12	120	9,32	285 x 505 x 280
HDMI Socket (with jack)	42 xxx 494	12	120	9,04	285 x 480 x 280
USB Socket (with jack)	42 xxx 495	12	120	9,04	285 x 480 x 280
Electronic Group					
Dimmer 60-600W	42 xxx 011	10	100	12,47	370 x 485 x 260
Dimmer Coil Filtered 60-600W	42 xxx 031	10	100	17,92	410 x 545 x 315
Dimmer 60-1000W	42 xxx 093	10	100	10,78	370 x 485 x 260
1-10V Led Dimmer	42 xxx 459	10	100	14,72	380 x 495 x 310
Remote Controlled Dimmer(IR) Coil Filtered 60-300W	42 xxx 045	10	100	14,77	410 x 545 x 315
Audio Switch 10 W	42 xxx 086	6	60	6,36	385 x 500 x 190
Emergency-Light	42 xxx 055	6	60	8,49	370 x 500 x 165
Warning Bell	42 xxx 056	6	60	6,01	370 x 500 x 165
Delayed Energy Saver (Without Relay)	42 xxx 046	12	120	11,53	410 x 545 x 315
Energy Saver (Without Relay)	42 xxx 183	12	120	10,37	285 x 475 x 275
Electro-Magnetic Energy Saver	42 xxx 301	12	120	8,07	365 x 472 x 215
Radio Frequency Energy saver	42 xxx 302	12	120	8,22	365 x 472 x 215
Surge-Protective Socket Outlet with Child Protection	42 xxx 139K	5	30	3,81	265 x 425 x 175
USB Charging Socket	42 xxx 465	12	120	11,79	285 x 480 x 280
Double USB Charge Socket	42 xxx A80	12	120	11,67	285 x 480 x 280

(*) Marked products are available with screwless terminal option. (*) 14 dB and 18 dB versions are available. (**) 10 - 12 - 15 - 20 dB versions are available.

(■) See page 231 for relay options for marked products.

SAMPLE

	Product Name	Code No
White	Screw Switch	42 001 0 01
	Screwless Terminal Switch	42 001 1 01

When you order screwless terminals must use '1' instead of '0' at the third digit of the item code.

Within the product codes showing 'xxx', enter the color from the table below..

Colors	Code No	Code No	Code No				
	xxx	Colors	xxx	Colors	xxx		
White	001	Metallic Silver	065	Natural Oak	101		
Beige	010	Dore	057	Natural Walnut	102		
Brown	096	Green	052	Natural Cherry	103		
Light Brown	097	Fume	050	Natural Pine	105		
Brown / Light Brown	009	Gold	060				
Black	111	Pearl	100				

Defne Switch & Socket Outlet Series

2nd Sales Option - Module (With Rocker / Cover Plate) and Frame

a) Module (With Rocker / Cover Plate)

Product Name	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
--------------	----------	--------------	------------------	-------------------	----------------------

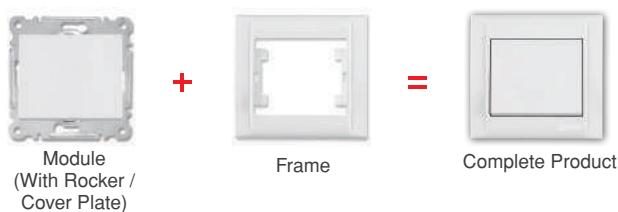
Switch Group

One Way Switch, Module with Rocker	43 xxx 001	12	120	8,35	365 x 472 x 215
One Way Switch Illuminated, Module with Rocker	43 xxx 021	12	120	8,57	365 x 472 x 215
Two-Circuit Switch, Module with Rocker	43 xxx 003	12	120	8,85	365 x 472 x 215
Two-Circuit Switch Illuminated, Module with Rocker	43 xxx 023	12	120	9,06	365 x 472 x 215
Light Switch, Module with Rocker	43 xxx 004	12	120	8,33	365 x 472 x 215
Light Switch Illuminated, Module with Rocker	43 xxx 024	12	120	8,62	365 x 472 x 215
Double Light Module and Rocker	43 xxx 441	12	120	10,37	365 x 472 x 215
Two-Way Switch, Module with Rocker	43 xxx 005	12	120	8,64	365 x 472 x 215
Two-Way Switch Illuminated, Module with Rocker	43 xxx 025	12	120	8,92	365 x 472 x 215
Door Switch, Module with Rocker	43 xxx 096	12	120	8,33	365 x 472 x 215
Door Switch Illuminated, Module with Rocker	43 xxx 097	12	120	8,62	365 x 472 x 215
Intermediate Switch, Module with Rocker	43 xxx 020	12	120	9,00	365 x 472 x 215
Intermediate Switch Illuminated, Module with Rocker	43 xxx 040	12	120	9,24	355 x 435 x 210
3 Circuit Switch, Module with Rocker	43 xxx 091	12	120	8,31	365 x 472 x 215
3 Gang 3 Pole Switch, Module with Rocker	43 xxx 092	12	120	8,31	365 x 472 x 215
1 Gang 3 Circuit Switch, Module with Rocker	43 xxx 094	12	120	8,31	365 x 472 x 215
1 Gang 3 Pole Switch, Module with Rocker	43 xxx 095	12	120	8,31	365 x 472 x 215
Cooling Switch, Module with Rocker	43 xxx 084	12	120	9,31	365 x 472 x 215
Double Two-Way Switch, Module with Rocker	43 xxx 026	12	120	10,01	285 x 475 x 275
Shutter Push-Button, Module with Rocker	43 xxx 041	12	120	9,12	365 x 472 x 215
One Gang Shutter Push-Button, Module with Rocker	43 xxx 279	12	120	8,64	365 x 472 x 215
Bell Switch, Module with Rocker	43 xxx 050	12	120	8,56	365 x 472 x 215
Bell Switch With Label, Module with Rocker	43 xxx 010	12	120	8,48	365 x 472 x 215
Bell Switch Illuminated 12V, Module with Rocker	43 xxx 085	12	120	8,78	365 x 472 x 215
Bell Switch Illuminated, Module with Rocker	43 xxx 070	12	120	8,78	365 x 472 x 215
Bell Switch Illuminated With Label 12V, Module with Rocker	43 xxx 030	12	120	8,78	365 x 472 x 215
Control Switch 2-Pole, Module with Rocker	43 xxx 071	12	120	8,38	365 x 472 x 215
Hotel Room Signalling Switch, Module with Rocker	43 xxx 252	12	120	8,85	365 x 472 x 215
Hotel Room Bell Switch, Module with Rocker	43 xxx 253	12	120	9,01	365 x 472 x 215
Emergency Switch with Cord, Module with Rocker	43 xxx 128	12	120	8,33	365 x 472 x 215

Socket Outlet Group

Socket Outlet, Module with Cover Plate	43 xxx 022	12	120	7,24	365 x 472 x 215
Schuko Socket Outlet, Module with Cover Plate	43 xxx 028	12	120	10,01	365 x 472 x 215
Schuko Socket Outlet Screwless, Module with Cover Plate	43 xxx 172	12	120	8,75	365 x 472 x 215
Schuko Socket Outlet with Lid, Module with Cover Plate	43 xxx 029	12	120	11,75	285 x 475 x 275
Schuko Socket Outlet Screwless with Lid, Module with Cover Plate	43 xxx 099	12	120	8,60	285 x 475 x 275
Socket Outlet with Earthing Pin, Module with Cover Plate	43 xxx 019	12	120	8,48	365 x 472 x 215
Socket Outlet Screwless with Earthing Pin, Module with Cover Plate	43 xxx 173	12	120	8,49	365 x 472 x 215
Socket Outlet with Earthing Pin and Lid, Module with Cover Plate	43 xxx 016	12	120	9,64	285 x 475 x 275
Socket Outlet with Child Protection, Module with Cover Plate	43 xxx 052	12	120	8,56	365 x 472 x 215
Socket Outlet with Earthing Pin and Child Protection, Module with Cover Plate	43 xxx 053	12	120	8,48	365 x 472 x 215
Socket Outlet Screwless with Earthing Pin and Child Protection, Module with Cover Plate	43 xxx 198	12	120	8,48	365 x 472 x 215
Socket Outlet with Child Protection, Module with Cover Plate	43 xxx 300	12	120	9,88	285 x 475 x 275
Schuko Socket Outlet with Child Protection, Module with Cover Plate	43 xxx 058	12	120	8,48	365 x 472 x 215
Schuko Socket Outlet Screwless with Child Protection, Module with Cover Plate	43 xxx 174	12	120	8,42	365 x 472 x 215
Schuko Socket Outlet with Child Protection and Lid, Module with Cover Plate	43 xxx 254	12	120	9,90	365 x 472 x 215
Schuko Socket Outlet Screwless with Child Protection and Lid, Module with Cover Plate	43 xxx 255	12	120	8,60	285 x 475 x 275
Double Socket Outlet, Module with Cover Plate	43 xxx 017	12	120	9,44	285 x 475 x 275
Double Socket Outlet with Earthing Pin, Module with Cover Plate	43 xxx 018	12	120	11,30	335 x 475 x 300
Double Schuko Socket Outlet High, Module with Cover Plate	43 xxx 082	12	120	11,01	335 x 475 x 300
Universal Grounding Sockets With Child Protection (British-German), Module with Cover Plate	43 xxx 306	12	120	8,22	365 x 472 x 215

2nd Sales Option - Module (With Rocker / Cover Plate) and Frame



(*) Marked products are available with screwless terminal option.

SAMPLE

Product Name	Code No
White	43 001 0 01
Screwless Terminal Switch	43 001 1 01

When you order screwless terminals must use '1' instead of '0' at the third digit of the item code.

Product Name	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
Tv Socket Outlet Group					
Antenna Socket End 4 dB Female, Module with Cover Plate	43 xxx 027	12	120	7,71	365 x 472 x 215
Antenna Socket Through 6 dB Female, Module with Cover Plate	43 xxx 007	12	120	7,71	365 x 472 x 215
Antenna Socket End 0.5 dB Metal Case, Module with Cover Plate	43 xxx 087	12	120	8,40	365 x 472 x 215
Antenna Socket Through 11 dB Metal Case, Module with Cover Plate *	43 xxx 088	12	120	8,40	365 x 472 x 215
TV Antenna Socket Non-Resistance, Module with Cover Plate	43 xxx 142	12	120	8,18	365 x 472 x 215
SAT Antenna Socket Through, Module with Cover Plate	43 xxx 133	12	120	9,07	365 x 472 x 215
SAT Antenna Socket End, Module with Cover Plate	43 xxx 134	12	120	9,17	365 x 472 x 215
TV-RF Antenna Socket End 1.5 dB, Module with Cover Plate	43 xxx 065	12	120	12,14	365 x 472 x 215
TV-RF Antenna Socket Through 7 dB, Module with Cover Plate **	43 xxx 060	12	120	12,14	365 x 472 x 215
TV-RF-SAT Antenna Socket End 1.5 dB, Module with Cover Plate	43 xxx 066	12	120	12,08	365 x 472 x 215
TV-RF-SAT Antenna Socket Through 4 dB, Module with Cover Plate	43 xxx 067	12	120	12,20	365 x 472 x 215
TV-SAT Antenna Socket End 1 dB, Module with Cover Plate	43 xxx 098	12	120	12,44	365 x 472 x 215
TV-SAT Antenna Socket Through 4 dB, Module with Cover Plate	43 xxx 083	12	120	12,44	365 x 472 x 215
Data Transmission Group					
Telephone Socket, Module with Cover Plate	43 xxx 014	12	120	7,40	365 x 472 x 215
Double Telephone Socket, Module with Cover Plate	43 xxx 034	12	120	7,42	365 x 472 x 215
Double Telephone Socket (1xCat3) Data Connector, Module with Cover Plate	43 xxx 042	12	120	7,65	285 x 475 x 275
Double Data Socket Outlet (1xCat5), Module with Cover Plate	43 xxx 035	12	120	6,75	285 x 475 x 275
Double Data Socket Outlet (2xCat5), Module with Cover Plate	43 xxx 036	12	120	7,86	285 x 475 x 275
Data Socket Outlet (Cat5+Telephone Socket), Module with Cover Plate	43 xxx 037	12	120	7,90	285 x 475 x 275
Data Socket Outlet (empty), Module with Cover Plate	43 xxx 038	12	120	6,75	285 x 475 x 275
Double Data Socket-Outlet (1xCat6) Module with Cover Plate	43 xxx 135	12	120	7,85	365 x 477 x 220
Double Data Socket-Outlet (2xCat6) Module with Cover Plate	43 xxx 136	12	120	8,22	365 x 477 x 220
Double Data Socket-Outlet (Cat3xCat6) Module with Cover Plate	43 xxx 137	12	120	8,31	365 x 477 x 220
Double Data Socket-Outlet (1xCat3) Module with Cover Plate	43 xxx 075	12	120	7,71	285 x 475 x 275
Loudspeaker - connection, 1 gang, Module with Cover Plate	43 xxx 080	12	120	7,19	365 x 472 x 215
HDMI Socket (with jack), Module with Cover Plate	43 xxx 494	12	120	7,59	365 x 472 x 215
USB Socket (with jack), Module with Cover Plate	43 xxx 495	12	120	7,59	365 x 472 x 215
Electronic Group					
Dimmer 60-600W, Module with Cover Plate	43 xxx 011	12	120	10,30	335 x 475 x 300
Dimmer Coil Filtered 60-600W, Module with Cover Plate	43 xxx 031	12	120	15,75	335 x 475 x 300
Dimmer 60-1000W, Module with Cover Plate	43 xxx 093	12	120	10,27	335 x 475 x 300
1-10V Led Dimmer, Module with Cover Plate	43 xxx 459	10	100	9,91	335 x 480 x 305
Remote Controlled Dimmer(IR) Coil Filtered 60-300W, Module with Cover Plate	43 xxx 045	12	120	15,07	335 x 475 x 300
Audio Switch 10 W, Module with Cover Plate	43 xxx 086	6	60	4,92	315 x 420 x 195
Emergency-Light, Module with Cover Plate	43 xxx 055	6	60	5,82	315 x 420 x 195
Warning Bell, Module with Cover Plate	43 xxx 056	6	60	4,55	315 x 420 x 195
Delayed Energy Saver (Without Relay), Module with Cover Plate	43 xxx 046	12	120	8,60	365 x 472 x 215
Energy Saver (Without Relay), Module with Cover Plate	43 xxx 183	12	120	8,07	365 x 472 x 215
Electro-Magnetic Energy Saver, Module with Cover Plate	43 xxx 301	12	120	6,63	365 x 472 x 215
Radio Frequency Energy saver, Module with Cover Plate	43 xxx 302	12	120	6,77	365 x 472 x 215
Surge-Protective Socket Outlet with Child Protection, Module with Cover Plate	43 xxx 139K	5	30	3,40	190 x 290 x 272
USB Charging Socket, Module with Cover Plate	43 xxx 465	12	120	10,35	365 x 472 x 215
Double USB Charge Socket, Module with Cover Plate	43 xxx A80	12	120	10,22	365 x 472 x 215

(*) 14 dB and 18 dB versions are available. (**) 10 - 12 - 15 - 20 dB versions are available. (■) See page 231 for relay options for marked products.

b) Frames

Product Name	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
Frame	42 xxx 701	12	120	2,39	185 x 365 x 205
Double Horizontal Frame	42 xxx 702	25	250	6,16	385 x 450 x 290
Triple Horizontal Frame	42 xxx 703	20	200	7,98	417 x 455 x 290
Quartet Horizontal Frame	42 xxx 704	25	250	10,90	400 x 600 x 345
Fiftet Horizontal Frame	42 xxx 705	5	60	3,69	210 x 370 x 345
Sixtet Horizontal Frame	42 xxx 706	5	60	3,90	350 x 440 x 210
Double Vertical Frame	42 xxx 707	25	250	6,76	385 x 450 x 290
Triple Vertical Frame	42 xxx 708	20	200	8,48	417 x 455 x 290
Double Socket Outlet Frame	42 xxx 710	12	120	3,21	180 x 450 x 270
Double Outlet Frame (high)	42 xxx 759	12	120	3,86	285 x 475 x 275

Please specify your choice of pastel colors by applying below color codes into the 'xxx' marked space.

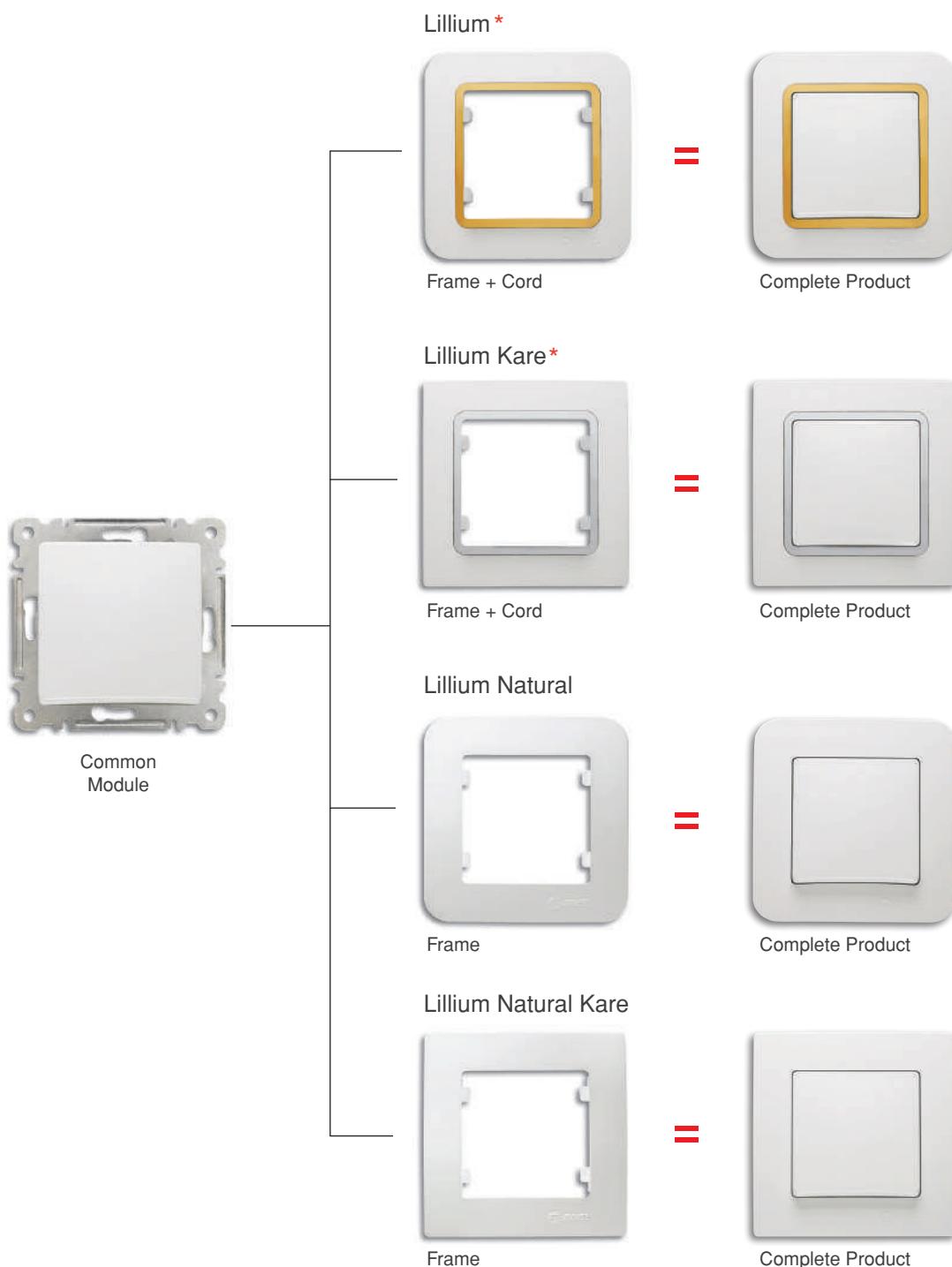
Colors	Code No xxx	Colors	Code No xxx
Yellow	074	Blue	092
Lilac	078	Rose	093
Magenta	085	Orange	094
Green	091	Light Lilac	095

Within frame codes showing 'xxx', enter the color codes from the table below.

Colors	Code No	Code No	Code No				
	xxx	Colors	xxx	Colors	xxx	Colors	xxx
White	001	Metallic Silver	065	Natural Oak	101		
Beige	010	Dore	057	Natural Walnut	102		
Brown	096	Green	052	Natural Cherry	103		
Light Brown	097	Fume	050	Natural Pine	105		
Brown / Light Brown	009	Gold	060				
Black	111	Pearl	100				

Module - Frame Changing Table

- Lillium Family Switch and Socket Series can be ordered in modular form; Modul (white and cream button/cover mounted) and frameworks and cords are packed separately.
- Common module (white and cream button/cover mounted) can be supplied with 4 different frame and 4 different Lillium switch and socket series can be created; Lillium Kare, Lillium Natural Kare, Lillium and Lillium Natural.
- Keeping only the common module (white and cream button/cover mounted) in your stock, your stock can be held minimum and you may procure necessary frames and cords for your own choice depending on the order you receive.



* Cords of Lillium and Lillium Kare products are ordered separately.

Module (With Rocker / Cover Plate)

Product Name	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
Switch Group					
One Way Switch, Module with Rocker	30 xxx 001	12	120	8,35	365 x 472 x 215
One Way Switch Illuminated, Module with Rocker	30 xxx 021	12	120	8,74	365 x 472 x 215
Two-Circuit Switch, Module with Rocker	30 xxx 003	12	120	8,87	365 x 472 x 215
Two-Circuit Switch Illuminated, Module with Rocker	30 xxx 023	12	120	9,13	365 x 472 x 215
Light Switch, Module with Rocker	30 xxx 004	12	120	8,44	365 x 472 x 215
Light Switch Illuminated, Module with Rocker	30 xxx 024	12	120	9,59	365 x 472 x 215
Double Light Module	30 xxx 441	12	120	9,48	365 x 472 x 215
Two-Way Switch, Module with Rocker	30 xxx 005	12	120	7,21	365 x 472 x 215
Two-Way Switch Illuminated, Module with Rocker	30 xxx 025	12	120	8,92	365 x 472 x 215
Door Switch, Module with Rocker	30 xxx 096	12	120	8,36	365 x 472 x 215
Door Switch Illuminated, Module with Rocker	30 xxx 097	12	120	8,56	365 x 472 x 215
Intermediate Switch, Module with Rocker	30 xxx 020	12	120	8,93	365 x 472 x 215
Intermediate Switch Illuminated, Module with Rocker	30 xxx 040	12	120	9,28	365 x 472 x 215
Bell Switch, Module with Rocker	30 xxx 050	12	120	8,65	365 x 472 x 215
Bell Switch Illuminated 12V, Module with Rocker	30 xxx 085	12	120	8,87	365 x 472 x 215
Bell Switch Illuminated, Module with Rocker	30 xxx 070	12	120	8,91	365 x 472 x 215
Bell Switch with Label, Module with Rocker	30 xxx 010	12	120	8,63	365 x 472 x 215
Bell Switch Illuminated 12V with Label, Module with Rocker	30 xxx 030	12	120	8,85	365 x 472 x 215
3 Circuit Switch, Module with Rocker	30 xxx 091	12	120	9,46	365 x 472 x 215
Double Two-Way Switch, Module with Rocker	30 xxx 026	12	120	11,18	285 x 475 x 275
Shutter Push-Button, Module with Rocker	30 xxx 041	12	120	9,07	365 x 472 x 215
Control Switch 2-Pole, Module with Rocker	30 xxx 071	12	120	9,22	365 x 472 x 215
Socket Outlet Group					
Socket Outlet, Module with Cover Plate	30 xxx 022	12	120	8,69	365 x 472 x 215
Schuko Socket Outlet, Module with Cover Plate	30 xxx 028	12	120	8,94	365 x 472 x 215
Schuko Socket Outlet Screwless, Module with Cover Plate	30 xxx 172	12	120	9,04	365 x 472 x 215
Schuko Socket Outlet with Lid, Module with Cover Plate	30 xxx 029	12	120	10,66	285 x 475 x 275
Schuko Socket Outlet Screwless with Lid, Module with Cover Plate	30 xxx 099	12	120	10,10	285 x 475 x 275
Schuko Socket Outlet with Child Protection and Lid, Module with Cover Plate	30 xxx 254	12	120	10,66	285 x 475 x 275
Schuko Socket Outlet Screwless with Child Protection and Lid, Module with Cover Plate	30 xxx 255	12	120	10,10	285 x 475 x 275
Socket Outlet with Earthing Pin, Module with Cover Plate	30 xxx 019	12	120	10,24	365 x 472 x 215
Socket Outlet Screwless with Earthing Pin, Module with Cover Plate	30 xxx 173	12	120	10,13	365 x 472 x 215
Socket Outlet with Child Protection, Module with Cover Plate	30 xxx 052	12	120	8,86	365 x 472 x 215
Socket Outlet Screwless with Earthing Pin and Child Protection, Module with Cover Plate	30 xxx 053	12	120	9,83	365 x 472 x 215
Socket Outlet Screwless with Earthing Pin and Child Protection, Module with Cover Plate	30 xxx 198	12	120	10,09	365 x 472 x 215
Socket Outlet with Child Protection, Module with Cover Plate	30 xxx 300	12	120	11,62	285 x 475 x 275
Schuko Socket Outlet with Child Protection, Module with Cover Plate	30 xxx 058	12	120	9,71	365 x 472 x 215
Schuko Socket Outlet Screwless with Child Protection, Module with Cover Plate	30 xxx 174	12	120	9,25	365 x 472 x 215
Double Socket Outlet with Earthing Pin, Module with Cover Plate	30 xxx 018	12	120	10,75	285 x 475 x 275
Double Socket Outlet, Module with Cover Plate	30 xxx 017	12	120	9,18	285 x 475 x 275
Double Schuko Socket Outlet, Module with Cover Plate	30 xxx 082	12	120	10,55	335 x 475 x 300
Double Schuko Socket Outlet High, Module with Cover Plate	30 xxx 057	12	120	11,50	335 x 475 x 300
Tv Socket Outlet Group					
Antenna Socket Through 6 dB Female, Module with Cover Plate	30 xxx 007	12	120	8,64	365 x 472 x 215
Antenna Socket End 4 dB Female, Module with Cover Plate	30 xxx 027	12	120	8,40	365 x 472 x 215
Antenna Socket End 0.5dB Metal Case, Module with Cover Plate	30 xxx 087	12	120	8,49	365 x 472 x 215
Antenna Socket Through 11dB Metal Case, Module with Cover Plate *	30 xxx 088	12	120	9,29	365 x 472 x 215
Tv Antenna Socket Non-resistance, Module With Cover Plate	30 xxx 142	12	120	8,37	365 x 472 x 215
TV-RF Antenna Socket Through 7 dB, Module with Cover Plate **	30 xxx 060	12	120	12,42	365 x 472 x 215
TV-RF Antenna Socket End 1.5 dB, Module with Cover Plate	30 xxx 065	12	120	12,60	365 x 472 x 215
TV-SAT Antenna Socket Through 4 dB, Module with Cover Plate	30 xxx 083	12	120	12,11	365 x 472 x 215
TV-SAT Antenna Socket End 1dB, Module with Cover Plate	30 xxx 098	12	120	12,10	365 x 472 x 215
TV-RF-SAT Antenna Socket End 1.5 dB, Module with Cover Plate	30 xxx 066	12	120	13,28	365 x 472 x 215
TV-RF-SAT Antenna Socket Through 4 dB, Module with Cover Plate	30 xxx 067	12	120	13,52	365 x 472 x 215
SAT Antenna Socket Through, Module with Cover Plate	30 xxx 133	12	120	9,09	365 x 472 x 215
SAT Antenna Socket End, Module with Cover Plate	30 xxx 134	12	120	9,69	365 x 472 x 215

Variation Table for Lillium Series

Product Name	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
Data Transmission Group					
Telephone Socket Module with Cover Plate	30 xxx 014	12	120	8,04	365 x 472 x 215
Double Telephone Socket, Module with Cover Plate	30 xxx 034	12	120	7,86	365 x 472 x 215
Double Data Socket Outlet (1xCat5), Module with Cover Plate	30 xxx 035	12	120	7,80	285 x 475 x 275
Double Data Socket Outlet (2xCat5), Module with Cover Plate	30 xxx 036	12	120	8,34	285 x 475 x 275
Data Socket Outlet (Cat5+Telephone Socket), Module with Cover Plate	30 xxx 037	12	120	8,22	365 x 472 x 215
Data Socket Outlet (empty), Module with Cover Plate	30 xxx 038	12	120	6,48	365 x 472 x 215
Double Data Socket-Outlet (1xCat6) Module with Cover Plate	30 xxx 135	12	120	8,05	365 x 477 x 220
Double Data Socket-Outlet (2xCat6) Module with Cover Plate	30 xxx 136	12	120	8,76	365 x 477 x 220
Double Data Socket-Outlet (Cat3xCat6) Module with Cover Plate	30 xxx 137	12	120	8,50	365 x 477 x 220
Double Data Socket-Outlet (1xCat3) Module with Cover Plate	30 xxx 075	12	120	8,05	365 x 477 x 220
Loudspeaker - connection, 1 gang, Module with Cover Plate	30 xxx 080	12	120	7,98	365 x 472 x 215
Electronic Group					
Dimmer, Module with Cover Plate	30 xxx 011	12	120	12,32	335 x 475 x 300
Dimmer Coil Filtered, Module with Cover Plate	30 xxx 031	12	120	18,16	335 x 475 x 300
Dimmer, Module with Cover Plate	30 xxx 093	12	120	10,25	335 x 475 x 300
1-10V Led Dimmer, Module with Cover Plate	30 xxx 459	10	100	9,91	335 x 480 x 305
Remote Controlled Dimmer(IR) Coil Filtered, Module with Cover Plate	30 xxx 045	12	120	16,32	335 x 475 x 300
Audio Switch 10 W, Module with Cover Plate	30 xxx 086	6	60	5,53	315 x 420 x 195
Emergency-Light, Module with Cover Plate	30 xxx 055	6	60	5,90	180 x 450 x 270
Warning Bell, Module With Cover Plate	30 xxx 056 **	6	60	5,20	180 x 450 x 270
Delayed Energy Saver (Without Relay), Module with Cover Plate	30 xxx 046 **	12	120	9,76	365 x 472 x 215
Energy Saver (Without Relay), Module with Cover Plate	30 xxx 183	12	120	8,85	365 x 472 x 215
Electro-Magnetic Energy Saver, Module with Cover Plate	30 xxx 301	12	120	8,23	365 x 472 x 215
Radio Frequency Energy saver, Module with Cover Plate	30 xxx 302	12	120	8,38	365 x 472 x 215
Surge-Protective Socket Outlet with Child Protection, Module with Cover Plate	30 xxx 139K	5	30	3,30	265 x 425 x 175

Product Name	Without Thin Frame (White-Beige) Code No.	With Thin Frame (White-Beige) Code No.	Colored Corded Code No.	Piece in Box	Piece in Package	Without Thin Frame	Size of Package (mm)
	Gross Weight (kg)***						
Frame	18 xxx 701	18 xxx 701	18 xxx 701	12	120	2,47	185 x 365 x 205
Double Horizontal Frame	71 x 12	70 x 12	72 x 12	25	250	7,45	335 x 475 x 300
Triple Horizontal Frame	71 x 13	70 x 13	72 x 13	20	200	9,08	417 x 455 x 290
Quartet Horizontal Frame	71 x 39	70 x 39	72 x 39	25	250	13,70	410 x 545 x 315
Fiftet Horizontal Frame	71 x 59	70 x 59	72 x 59	5	60	3,55	210 x 370 x 345
Sixtet Horizontal Frame	71 x 69	70 x 69	72 x 69	5	60	4,00	440 x 450 x 140
Double Vertical Frame	71 x 32	70 x 32	72 x 32	25	250	7,92	335 x 475 x 300
Triple Vertical Frame	71 x 33	70 x 33	72 x 33	20	200	8,38	417 x 455 x 290
Double Socket Outlet Frame ***	18 xxx 710	18 xxx 710	18 xxx 710	12	120	4,02	180 x 450 x 270
Double Socket Outlet Frame High ***	18 xxx 759	18 xxx 759	18 xxx 759	12	120	4,36	285 x 475 x 275

Product Name	Code No.	Piece in Box	Piece in Package	Without Thin Frame	Size of Package (mm)
				Gross Weight (kg)***	
Frame	31 xxx 701	12	120	2,35	185 x 365 x 205
Double Horizontal Frame	31 xxx 702	25	250	6,90	335 x 475 x 300
Triple Horizontal Frame	31 xxx 703	20	200	8,22	417 x 455 x 290
Quartet Horizontal Frame	31 xxx 704	25	250	12,07	400 x 600 x 345
Fiftet Horizontal Frame	31 xxx 705	5	60	3,90	350 x 370 x 210
Sixtet Horizontal Frame	31 xxx 706	5	60	4,60	350 x 440 x 210
Double Vertical Frame	31 xxx 707	25	250	6,91	335 x 475 x 300
Triple Vertical Frame	31 xxx 708	20	200	8,37	417 x 455 x 290
Double Socket Outlet Frame ***	31 xxx 710	12	120	3,22	180 x 450 x 270
Double Socket Outlet Frame High ***	31 xxx 759	12	120	4,35	285 x 475 x 275

(*) Marked products are available with screwless terminal option.

(**) The available products shall be only used within Lillium Square series.

(***) Marked products can be ordered only in white and beige colors.

(■) See page 231 for relay options for marked products.

(*) 14 dB and 18 dB versions are available.

(**) 10 - 12 - 15 - 20 dB versions are available.

(***) Must add 0,34 / 0,40 kg to gross weight for orders with thin frame.

SAMPLE

White	Product Name	Code No
	Screw Switch	30 001 0 01
	Screwless Terminal Switch	30 001 1 01

When you order screwless terminals must use '1' instead of '0' at the third digit of the item code.

Within the product codes showing 'xxx', and 'x' enter the color codes from the table below

Colors	Code No	
	xxx	x
White	001	0
Beige	010	2

Lillium Natural Frames

Product Name	(White-Beige) Code No.	Colour Code No.	Brown Code No.	Root Oak Code No.	Root Walnut Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
Frame	19 xxx 701	19 xxx 701	19 xxx 701	19 xxx 701	19 xxx 701	12	120	2,36	185 x 365 x 205
Double Horizontal Frame	55 x 12	57 x 12	55 x 12	56 x 12	56 x 12	25	250	6,56	335 x 475 x 300
Triple Horizontal Frame	55 x 13	57 x 13	55 x 13	56 x 13	56 x 13	20	200	7,74	417 x 455 x 290
Quartet Horizontal Frame	55 x 39	57 x 39	55 x 39	56 x 39	56 x 39	25	250	11,54	400 x 600 x 345
Fifet Horizontal Frame	55 x 59	57 x 59	55 x 59	56 x 59	56 x 59	5	60	3,66	210 x 370 x 345
Sixtet Horizontal Frame	55 x 69	57 x 69	55 x 69	56 x 69	56 x 69	5	60	4,40	440 x 450 x 140
Double Vertical Frame	55 x 32	57 x 32	55 x 32	56 x 32	56 x 32	25	250	6,64	335 x 475 x 300
Triple Vertical Frame	55 x 33	57 x 33	55 x 33	56 x 33	56 x 33	20	200	8,25	417 x 455 x 290
Double Socket Outlet Frame ***	19 xxx 710	19 xxx 710	19 xxx 710	19 xxx 710	19 xxx 710	12	120	3,19	180 x 450 x 270
Double Socket Outlet Frame High ***	19 xxx 759	19 xxx 759	19 xxx 759	19 xxx 759	19 xxx 759	12	120	4,34	285 x 475 x 275

Lillium Natural Kare Frames

Product Name	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
Frame	32 xxx 701	12	120	2,31	185 x 365 x 205
Double Horizontal Frame	32 xxx 702	25	250	6,55	335 x 475 x 300
Triple Horizontal Frame	32 xxx 703	20	200	8,34	417 x 455 x 290
Quartet Horizontal Frame	32 xxx 704	25	250	11,74	400 x 600 x 345
Fifet Horizontal Frame	32 xxx 705	5	60	3,45	350 x 370 x 210
Sixtet Horizontal Frame	32 xxx 706	5	60	4,25	350 x 440 x 210
Double Vertical Frame	32 xxx 707	25	250	6,72	335 x 475 x 300
Triple Vertical Frame	32 xxx 708	20	200	8,36	417 x 455 x 290
Double Socket Outlet Frame ***	32 xxx 710	12	120	4,12	180 x 450 x 270
Double Socket Outlet Frame High ***	32 xxx 759	12	120	5,24	285 x 475 x 275

(***) Marked products can be ordered only in white and beige colors.

Within the product codes showing 'xxx', and 'x'
enter the color codes from the table below.

Colors	Code No	
	xxx	x
White	001	0
Beige	010	2

Please specify your choice of pastel colors by applying
below color codes into the 'xxx' marked space.

Colors	Code No	Code No
	xxx	xxx
Yellow	074	Blue
Lilac	078	Rose
Magenta	085	Orange
Green	091	Light Lilac

Note: Pastel colored frame option is valid for only Lillium Natural Square.

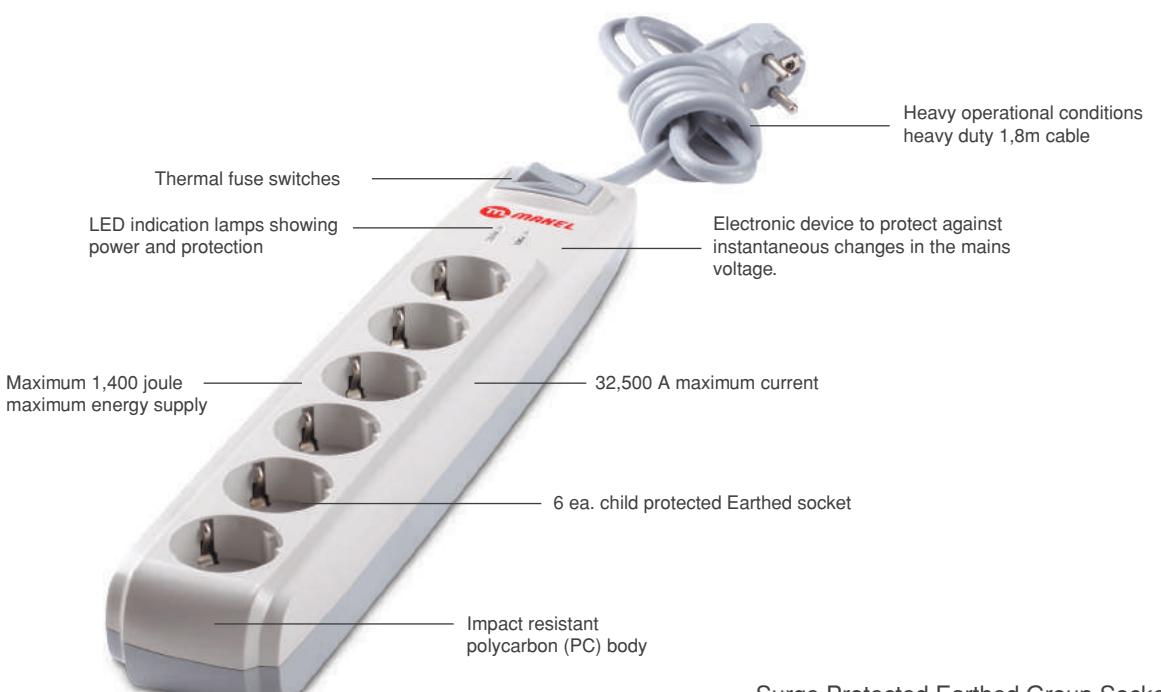
Group Sockets



Surge Protected Earthed Group Socket

Secure protection against instant impacts from mains voltage in your house and office...

The electric-electronic devices can be damaged from instantaneous shocks in the mains voltage (for lightning strike, short term increases in the mains voltage, etc.). Makel shock protected outlets protects electric/electronic devices such as refrigerators, washing machines, ovens, LCD plasma TV, computers, music systems, movie players and similar devices.



Surge Protected Earthed Group Socket

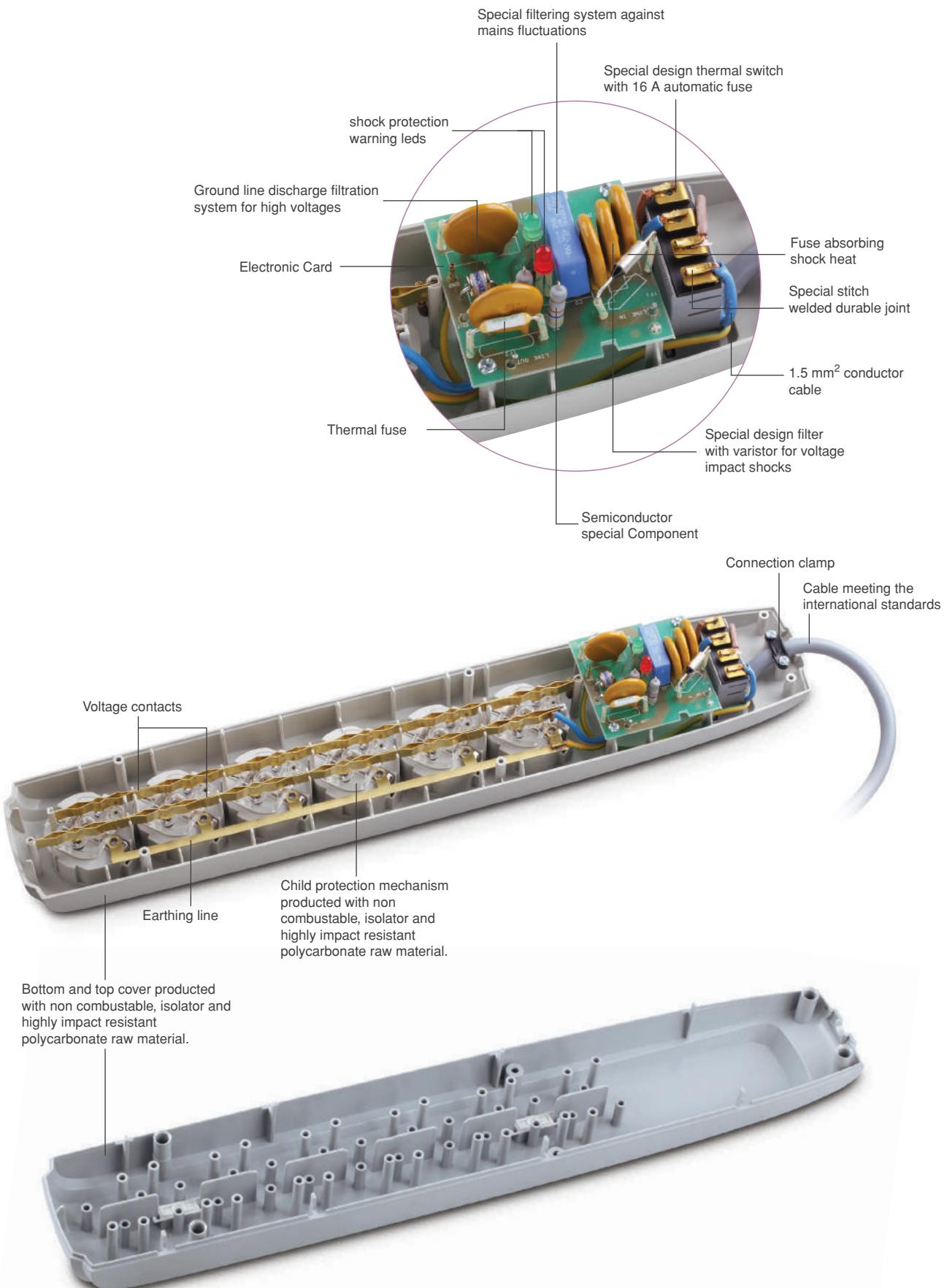
25064200

16 A, 250 V~

TS EN 61643 - 11

Piece in Box / Package - 1 / 6

Dismantled Product



Whether you wish to fix it to a surface or hang it, guide energy freely however you wish

With the special hanger apparatus designed for use in any setting you wish, you can use this apparatus as fixed on surfaces or in hanging form. You can use the Makel New Generation Sockets, which provide solutions for your needs with practical uses and options to use freely, in any area you wish.



- A secure electrical terminal cap that can be easily opened and closed for cable installation,
- A specially designed body compatible with Rohs,
- Nonflammability guarantee,
- Antistaticdust-free material,
- Production in compliance with International standards,
- 3 paneled security screws that cannot be removed thanks to its special structure,

- UV protection material,
- Capable of being fixed to all surfaces,
- Use in hanging form when fixing to surface is not necessary,
- Standard child protection feature in all products,
- Option of product with or without switch,
- Secure and practical use with blue led light visible in the dark and push-release buttons

Product Options



2 Gang Multiple Earthed Socket without Cable



3 Gang Multiple Earthed Socket with Switch & Cable



3 Gang Multiple Earthed Socket with Switch, without Cable

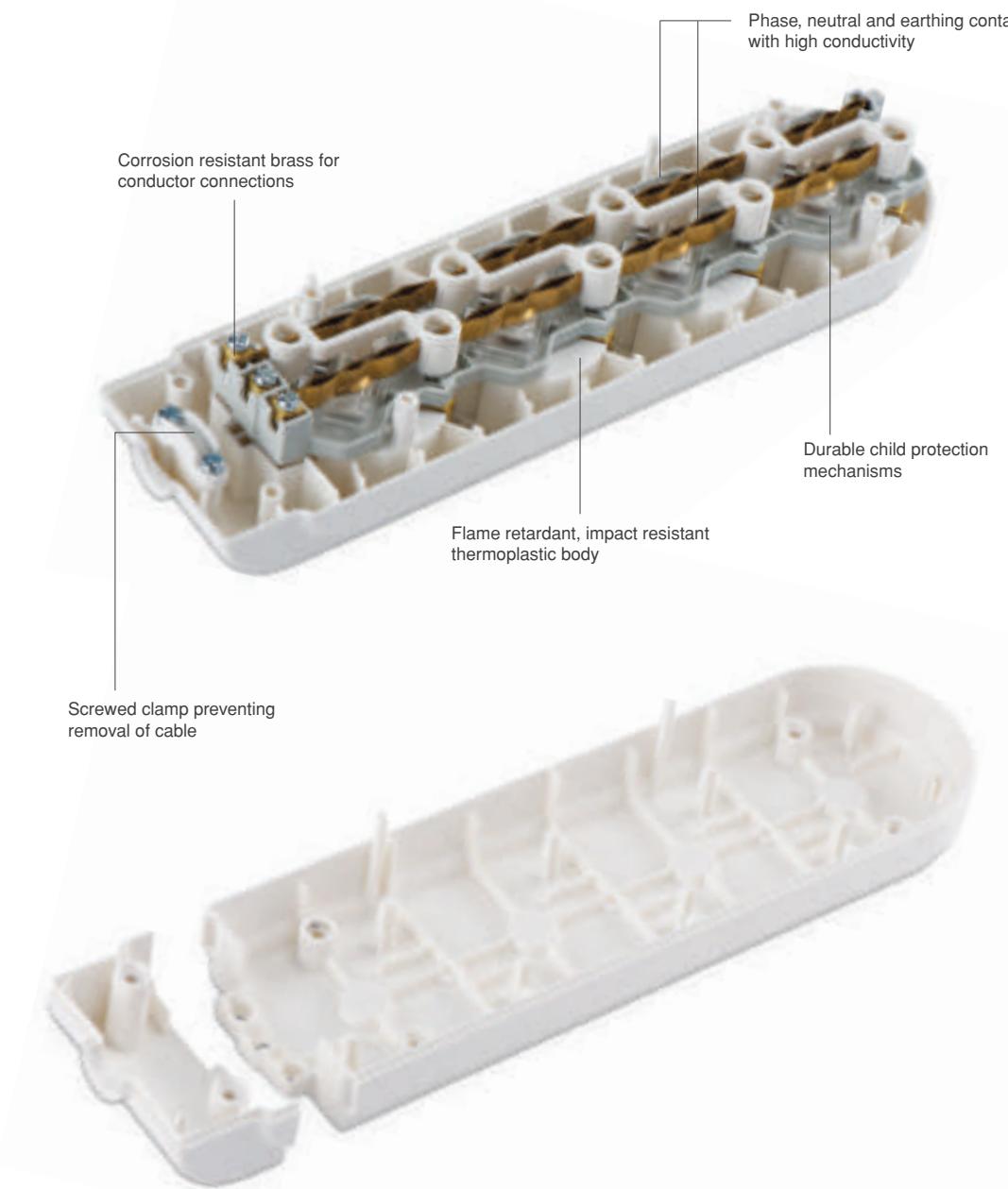


4 Gang Multiple Earthed Socket with Switch



5 Gang Multiple Earthed Socket without Cable

Dismantled Product



Group sockets provide, high quality and easy solutions for use of your electrical and electronic products at the same time.

In group outlets, quality, safety, functionality and hardware abundance are merged. Schuko, not Schuko and eco models as well as switched, ups, corded and clamped options will ease your life. In corded models, cord options of 2, 3, 5, 7, 10, 15 meters are available.



- Wide range of products with cord and cordless
- The internal contact case made of flame retardant thermoplastic material
- Nonflammable plastic contact safe
- Impact resistant reinforced body
- Halogen free feature

Product Options



3 Gang Multiple Earthed
Socket with Switch & Cable



3 Gang Multiple Earthed
Socket with Cable



3 Gang Multiple Pin Earthed
Socket with Switch & Cable

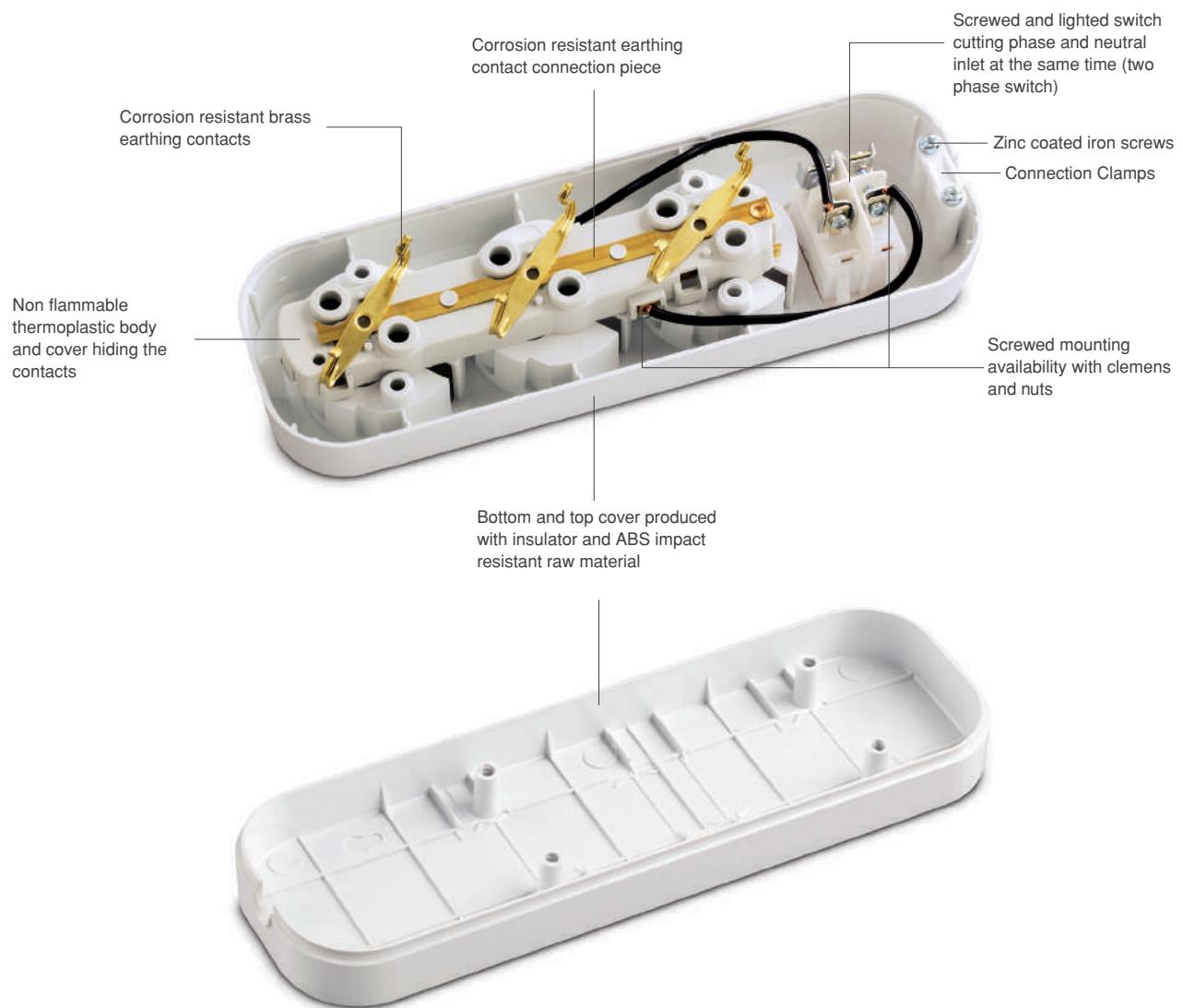


4 Gang Multiple Earthed
Socket with Cable



4 Gang Multiple Earthed
Socket without Cable

Dismantled Product



New Generation Group Socket



2 Gang Multiple Earthed Socket without Cable

N2201000 / N2211000 *

16 A, 250 V~

IEC 60884-1

Piece in Box / Package - 20 / 80



2 Gang Multiple Earthed Socket with Switch, without Cable

N2301000 / N2311000 *

16 A, 250 V~

IEC 60884-1

Piece in Box / Package - 15 / 60



2 Gang Multiple Earthed Socket with Cable

N2201033 / N2211033 * - 2m - Piece in Box / Package - 12 / 48

N2201043 / N2211043 * - 3m - Piece in Box / Package - 12 / 48

N2201063 / N2211063 * - 5m - Piece in Box / Package - 12 / 24

16 A, 250 V~

IEC 60884-1



2 Gang Multiple Earthed Socket with Switch & Cable

N2301033 / N2311033 * - 2m - Piece in Box / Package - 12 / 48

N2301043 / N2311043 * - 3m - Piece in Box / Package - 12 / 48

N2301063 / N2311063 * - 5m - Piece in Box / Package - 12 / 24

16 A, 250 V~

IEC 60884-1



3 Gang Multiple Earthed Socket without Cable

N3201000 / N3211000 *

16 A, 250 V~

IEC 60884-1

Piece in Box / Package - 15 / 60

* Childproof



3 Gang Multiple Earthed Socket with Switch, without Cable

N3301000 / N3311000*

16 A, 250 V~

IEC 60884-1

Piece in Box / Package - 20 / 80



3 Gang Multiple Earthed Socket with Cable

N3201033 / N3211033* - 2m - Piece in Box / Package - 12 / 48

N3201043 / N3211043* - 3m - Piece in Box / Package - 12 / 48

N3201063 / N3211063* - 5m - Piece in Box / Package - 12 / 24

16 A, 250 V~

IEC 60884-1



3 Gang Multiple Earthed Socket with Switch & Cable

N3301033 / N3311033* - 2m - Piece in Box / Package - 12 / 48

N3301043 / N3311043* - 3m - Piece in Box / Package - 12 / 48

N3301063 / N3311063* - 5m - Piece in Box / Package - 12 / 24

16 A, 250 V~

IEC 60884-1



4 Gang Multiple Earthed Socket without Cable

N4200000 / N4211000*

16 A, 250 V~

IEC 60884-1

Piece in Box / Package - 20 / 80



4 Gang Multiple Earthed Socket with Switch, without Cable

N4301000 / N4311000*

16 A, 250 V~

IEC 60884-1

Piece in Box / Package - 30 / 60

New Generation Group Socket



4 Gang Multiple Earthed Socket with Cable

N4200033 / N4211043* - 2m - Piece in Box / Package - 12 / 48

N4200043 / N4211053* - 3m - Piece in Box / Package - 12 / 48

N4200063 / N4211063* - 5m - Piece in Box / Package - 12 / 24

16 A, 250 V~

IEC 60884-1



4 Gang Multiple Earthed Socket with Switch & Cable

N4301033 / N4311043* - 2m - Piece in Box / Package - 12 / 24

N4301043 / N4311053* - 3m - Piece in Box / Package - 10 / 20

N4301063 / N4311063* - 5m - Piece in Box / Package - 12 / 24

16 A, 250 V~

IEC 60884-1



5 Gang Multiple Earthed Socket without Cable

N5201000 / N5211000*

16 A, 250 V~

IEC 60884-1

Piece in Box / Package - 30 / 60



5 Gang Multiple Earthed Socket with Switch, without Cable

N5301000 / N5311000*

16 A, 250 V~

IEC 60884-1

Piece in Box / Package - 12 / 48

* Childproof



5 Gang Multiple Earthed Socket with Cable

N5201033 / N5211043* - 2m - Piece in Box / Package - 12 / 24

N5201043 / N5211053* - 3m - Piece in Box / Package - 12 / 24

N5201063 / N5211063* - 5m - Piece in Box / Package - 12 / 24

16 A, 250 V~

IEC 60884-1



5 Gang Multiple Earthed Socket with Switch & Cable

N5301033 / N5311043* - 2m - Piece in Box / Package - 12 / 24

N5301043 / N5311053* - 3m - Piece in Box / Package - 12 / 24

N5301063 / N5311063* - 5m - Piece in Box / Package - 12 / 24

16 A, 250 V~

IEC 60884-1



6 Gang Multiple Earthed Socket without Cable

N6201000 / N6211000*

16 A, 250 V~

IEC 60884-1

Piece in Box / Package - 9 / 36



6 Gang Multiple Earthed Socket with Switch, without Cable

N6301000 / N6311000*

16 A, 250 V~

IEC 60884-1

Piece in Box / Package - 9 / 36

New Generation Group Socket



6 Gang Multiple Earthed Socket with Cable

N6201033 / N6211043* - 2m - Piece in Box / Package - 12 / 24

N6201043 / N6211053* - 3m - Piece in Box / Package - 12 / 24

N6201063 / N6211063* - 5m - Piece in Box / Package - 12 / 24

16 A, 250 V~

IEC 60884-1



6 Gang Multiple Earthed Socket with Switch & Cable

N6301033 / N6311043* - 2m - Piece in Box / Package - 12 / 24

N6301043 / N6311053* - 3m - Piece in Box / Package - 12 / 24

N6301063 / N6311063* - 5m - Piece in Box / Package - 12 / 24

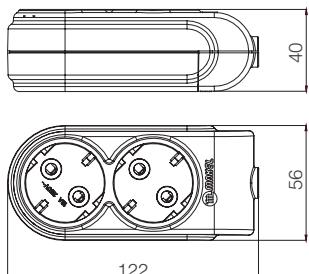
16 A, 250 V~

IEC 60884-1

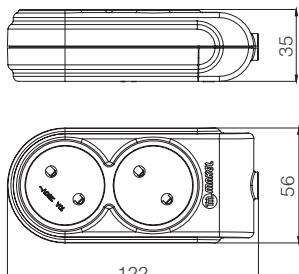
* Childproof

New Generation Group Socket

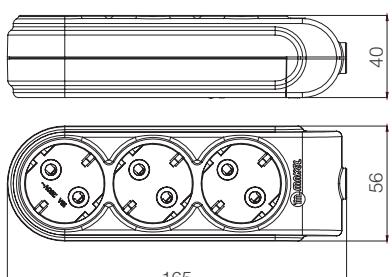
Technical Drawings



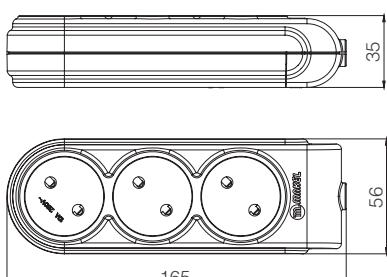
2 Gang Earthed Socket



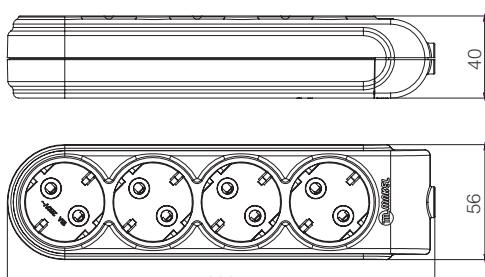
2 Gang Socket without Earthed



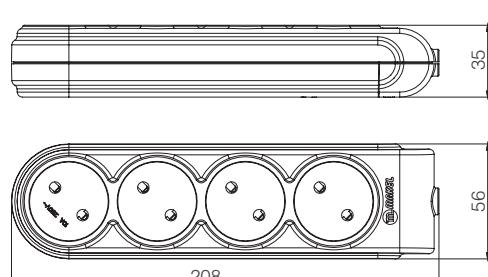
3 Gang Earthed Socket



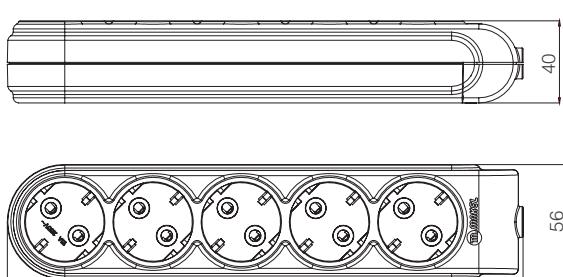
3 Gang Socket without Earthed



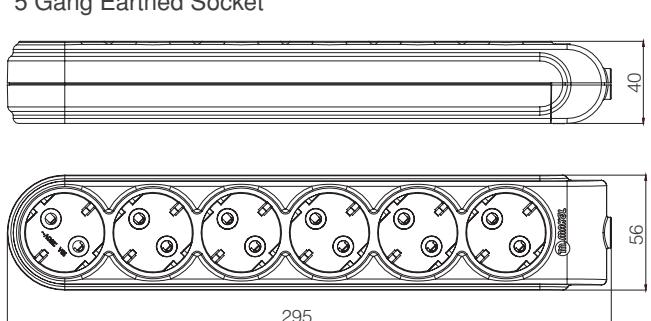
4 Gang Earthed Socket



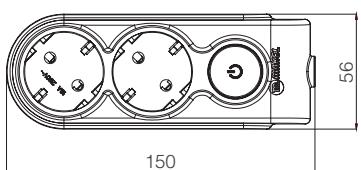
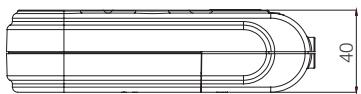
4 Gang Socket without Earthed



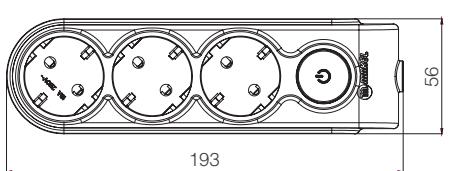
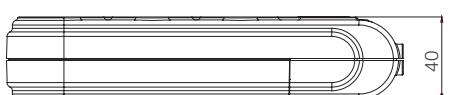
5 Gang Earthed Socket



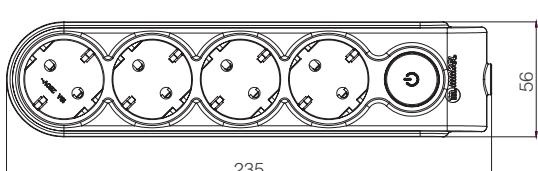
6 Gang Earthed Socket



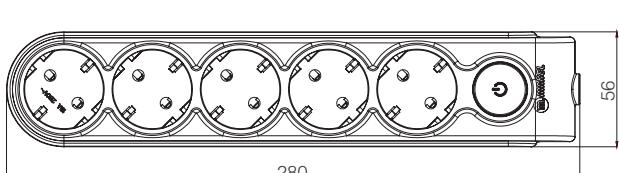
2 Gang Earthing Socket with Switch



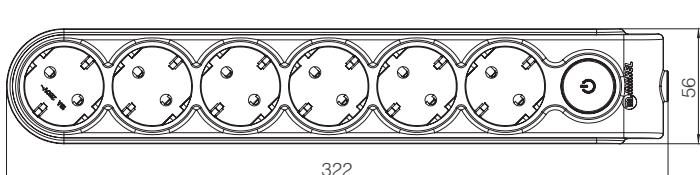
3 Gang Earthing Socket with Switch



4 Gang Earthing Socket with Switch



5 Gang Earthing Socket with Switch



6 Gang Earthing Socket with Switch

Earthed Group Sockets



2 Gang Multiple Earthed Socket
without Cable

MGP111

16 A, 250 V~

IEC 60884-1

Piece in Box / Package - 20 / 80



2 Gang Multiple Earthed Socket with Cable

MGP112 - 2m - Piece in Box / Package - 12 / 48

MGP512 - 2m 3*1.5 - Piece in Box / Package - 12 / 48

MGP113 - 3m - Piece in Box / Package - 12 / 48

MGP513 - 3m 3*1.5 - Piece in Box / Package - 12 / 48

MGP114 - 5m - Piece in Box / Package - 12 / 24

MGP514 - 5m 3*1.5 - Piece in Box / Package - 12 / 24

MGP117 - 7m - Piece in Box / Package - 12 / 24

MGP118 - 10m - Piece in Box / Package - 12 / 24

MGP119 - 15m - Piece in Box / Package - 10 / 20

16 A, 250 V~

IEC 60884-1



3 Gang Multiple Earthed Socket without Cable

MGP131

16 A, 250 V~

IEC 60884-1

Piece in Box / Package - 15 / 60



3 Gang Multiple Pin Earthed Socket
without Cable

MGP135

16 A, 250 V~

Piece in Box / Package - 15 / 60



3 Gang Multiple Earthed Socket with Cable

MGP132 - 2m - Piece in Box / Package - 12 / 48
MGP532 - 2m 3*1.5 - Piece in Box / Package - 12 / 48
MGP133 - 3m - Piece in Box / Package - 12 / 48
MGP533 - 3m 3*1.5 - Piece in Box / Package - 12 / 36
MGP134 - 5m - Piece in Box / Package - 12 / 24
MGP534 - 5m 3*1.5 - Piece in Box / Package - 12 / 24
MGP137 - 7m - Piece in Box / Package - 12 / 24
MGP138 - 10m - Piece in Box / Package - 12 / 24
MGP538 - 10m 3*1.5 - Piece in Box / Package - 12 / 24
MGP139 - 15m - Piece in Box / Package - 10 / 20
16 A, 250 V~
IEC 60884-1



3 Gang Multiple Pin Earthed Socket with Cable

MGP136 - 2m
16 A, 250 V~
Piece in Box / Package - 12 / 48



4 Gang Multiple Earthed Socket without Cable

MGP151
16 A, 250 V~
IEC 60884-1
Piece in Box / Package - 20 / 80



4 Gang Multiple Pin Earthed Socket without Cable

MGP155
16 A, 250 V~
Piece in Box / Package - 20 / 80

Group Sockets



4 Gang Multiple Earthed Socket with Cable

MGP152 - 2m - Piece in Box / Package - 12 / 48
MGP552 - 2m 3*1.5 - Piece in Box / Package - 12 / 24
MGP153 - 3m - Piece in Box / Package - 12 / 48
MGP553 - 3m 3*1.5 - Piece in Box / Package - 18 / 36
MGP154 - 5m - Piece in Box / Package - 12 / 24
MGP554 - 5m 3*1.5 - Piece in Box / Package - 12 / 24
MGP157 - 7m - Piece in Box / Package - 12 / 24
MGP158 - 10m - Piece in Box / Package - 12 / 24
MGP558 - 10m 31.5 - Piece in Box / Package - 12 / 24
MGP159 - 15m - Piece in Box / Package - 10 / 20
16 A, 250 V~
IEC 60884-1



4 Gang Multiple Pin Earthed Socket with Cable

MGP156 - 2m
16 A, 250 V~
Piece in Box / Package - 12 / 48



6 Gang Multiple Earthed Socket without Cable

MGP181
16 A, 250 V~
IEC 60884-1
Piece in Box / Package - 15 / 60



6 Gang Multiple Pin Earthed Socket without Cable

MGP185
16 A, 250 V~
Piece in Box / Package - 15 / 60



6 Gang Multiple Earthed Socket with Cable

MGP182 - 2m - Piece in Box / Package - 12 / 24
MGP582 - 2m 3*1.5 - Piece in Box / Package - 12 / 24
MGP183 - 3m - Piece in Box / Package - 12 / 24
MGP583 - 3m 3*1.5 - Piece in Box / Package - 12 / 24
MGP184 - 5m - Piece in Box / Package - 12 / 24
MGP584 - 5m 3*1.5 - Piece in Box / Package - 12 / 24
MGP187 - 7m - Piece in Box / Package - 12 / 24
MGP188 - 10m - Piece in Box / Package - 10 / 20
MGP588 - 10m 3*1.5 - Piece in Box / Package - 10 / 20
MGP189 - 15m - Piece in Box / Package - 10 / 20
16 A, 250 V~
IEC 60884-1



6 Gang Multiple Pin Earthed Socket with Cable

MGP186 - 2m
16 A, 250 V~
Piece in Box / Package - 12 / 24



3 Gang Multiple Earthed Socket with Switch, without Cable

MGP211
16 A, 250 V~
IEC 60884-1
Piece in Box / Package - 20 / 80



3 Gang Multiple Pin Earthed Socket with Switch, without Cable

MGP215
16 A, 250 V~
Piece in Box / Package - 20 / 80

Group Sockets



3 Gang Multiple Earthing Socket with Switch & Cable

MGP212 - 2m - Piece in Box / Package - 12 / 48
MGP612 - 2m 3*1.5 - Piece in Box / Package - 12 / 48
MGP213 - 3m - Piece in Box / Package - 12 / 48
MGP613 - 3m 3*1.5 - Piece in Box / Package - 18 / 36
MGP214 - 5m - Piece in Box / Package - 12 / 24
MGP614 - 5m 3*1.5 - Piece in Box / Package - 12 / 24
MGP217 - 7m - Piece in Box / Package - 12 / 24
MGP218 - 10m - Piece in Box / Package - 12 / 24
MGP219 - 15m - Piece in Box / Package - 10 / 20
16 A, 250 V~
IEC 60884-1



3 Gang Multiple Pin Earthing Socket with Switch & Cable

MGP216 - 2m
16 A, 250 V~
Piece in Box / Package - 12 / 48



6 Gang Multiple Earthing Socket with Switch, without Cable

MGP231
16 A, 250 V~
IEC 60884-1
Piece in Box / Package - 12 / 48



6 Gang Multiple Pin Earthing Socket with Switch, without Cable

MGP235
16 A, 250 V~
Piece in Box / Package - 12 / 48



6 Gang Multiple Earthed Socket with Switch & Cable

MGP232 - 2m - Piece in Box / Package - 12 / 24
MGP632 - 2m 3*1.5 - Piece in Box / Package - 12 / 24
MGP233 - 3m - Piece in Box / Package - 12 / 24
MGP633 - 3m 3*1.5 - Piece in Box / Package - 12 / 24
MGP234 - 5m - Piece in Box / Package - 12 / 24
MGP634 - 5m 3*1.5 - Piece in Box / Package - 12 / 24
MGP237 - 7m - Piece in Box / Package - 12 / 24
MGP238 - 10m - Piece in Box / Package - 10 / 20
MGP239 - 15m - Piece in Box / Package - 10 / 20
16 A, 250 V~
IEC 60884-1



6 Gang Multiple Pin Earthed Socket with Switch & Cable

MGP236 - 2m
16 A, 250 V~
Piece in Box / Package - 12 / 24

Group Sockets



2 Gang Multiple Socket without Cable

MGP101
10 A, 250 V~
IEC 60884-1
Piece in Box / Package - 25 / 100



2 Gang Multiple Socket with Cable

MGP102 - 2m - Piece in Box / Package - 12 / 48
MGP103 - 3m - Piece in Box / Package - 12 / 48
MGP104 - 5m - Piece in Box / Package - 12 / 48
MGP107 - 7m - Piece in Box / Package - 12 / 24
MGP108 - 10m - Piece in Box / Package - 12 / 24
MGP109 - 15m - Piece in Box / Package - 10 / 20
10 A, 250 V~
IEC 60884-1

Group Sockets



3 Gang Multiple Socket without Cable

MGP121

10 A, 250 V~

IEC 60884-1

Piece in Box / Package - 20 / 80



3 Gang Multiple Socket with Cable

MGP122 - 2m - Piece in Box / Package - 12 / 48

MGP123 - 3m - Piece in Box / Package - 12 / 48

MGP124 - 5m - Piece in Box / Package - 12 / 48

MGP127 - 7m - Piece in Box / Package - 12 / 24

MGP128 - 10m - Piece in Box / Package - 12 / 24

MGP129 - 15m - Piece in Box / Package - 10 / 20

10 A, 250 V~

IEC 60884-1



4 Gang Multiple Socket without Cable

MGP141

10 A, 250 V~

IEC 60884-1

Piece in Box / Package - 20 / 120



4 Gang Multiple Socket with Cable

MGP142 - 2m - Piece in Box / Package - 12 / 48

MGP143 - 3m - Piece in Box / Package - 12 / 48

MGP144 - 5m - Piece in Box / Package - 12 / 48

MGP147 - 7m - Piece in Box / Package - 12 / 24

MGP148 - 10m - Piece in Box / Package - 12 / 24

MGP149 - 15m - Piece in Box / Package - 10 / 20

10 A, 250 V~

IEC 60884-1

Eco Earthed Group Sockets



Eco 2 Gang Multiple Earthed Socket
without Cable

MGP311

16 A, 250 V~

IEC 60884-1

Piece in Box / Package - 20 / 80



Eco 2 Gang Multiple Earthed Socket with Cable

MGP312 - 2m - Piece in Box / Package - 12 / 48

MGP313 - 3m - Piece in Box / Package - 12 / 48

MGP314 - 5m - Piece in Box / Package - 12 / 24

MGP317 - 7m - Piece in Box / Package - 12 / 24

MGP318 - 10m - Piece in Box / Package - 12 / 24

16 A, 250 V~

IEC 60884-1



Eco 3 Gang Multiple Earthed Socket
without Cable

MGP331

16 A, 250 V~

IEC 60884-1

Piece in Box / Package - 15 / 60



Eco 3 Gang Multiple Earthed Socket with Cable

MGP332 - 2m - Piece in Box / Package - 12 / 48

MGP333 - 3m - Piece in Box / Package - 12 / 48

MGP334 - 5m - Piece in Box / Package - 12 / 24

MGP338 - 10m - Piece in Box / Package - 12 / 24

16 A, 250 V~

IEC 60884-1



Eco 4 Gang Multiple Earthed Socket
without Cable

MGP351

16 A, 250 V~

IEC 60884-1

Piece in Box / Package - 20 / 80

Group Sockets



Eco 4 Gang Multiple Earthed Socket with Cable

MGP352 - 2m Piece in Box / Package - 12 / 48

MGP353 - 3m Piece in Box / Package - 12 / 48

MGP354 - 5m Piece in Box / Package - 12 / 24

16 A, 250 V~

IEC 60884-1



Eco 6 Gang Multiple Earthed Socket without Cable

MGP381

16 A, 250 V~

IEC 60884-1

Piece in Box / Package - 15 / 60



Eco 6 Gang Multiple Earthed Socket with Cable

MGP382 - 2m - Piece in Box / Package - 12 / 24

MGP383 - 3m - Piece in Box / Package - 12 / 24

MGP384 - 5m - Piece in Box / Package - 12 / 24

16 A, 250 V~

IEC 60884-1

Eco Group Sockets



Eco 2 Gang Multiple Socket without Cable

MGP301

10 A, 250 V~

IEC 60884-1

Piece in Box / Package - 25 / 100



Eco 2 Gang Multiple Socket with Cable

MGP302 - 2m - Piece in Box / Package - 12 / 48
MGP303 - 3m - Piece in Box / Package - 12 / 48
MGP304 - 5m - Piece in Box / Package - 12 / 48
MGP307 - 7m - Piece in Box / Package - 12 / 24
MGP308 - 10m - Piece in Box / Package - 12 / 24
10 A, 250 V~
IEC 60884-1



Eco 3 Gang Multiple Socket without Cable

MGP321
10 A, 250 V~
IEC 60884-1
Piece in Box / Package - 20 / 80



Eco 3 Gang Multiple Socket with Cable

MGP322 - 2m - Piece in Box / Package - 12 / 48
MGP323 - 3m - Piece in Box / Package - 12 / 48
MGP324 - 5m - Piece in Box / Package - 12 / 48
MGP327 - 7m - Piece in Box / Package - 12 / 24
MGP328 - 10m - Piece in Box / Package - 12 / 24
10 A, 250 V~
IEC 60884-1



Eco 4 Gang Multiple Socket without Cable

MGP341
10 A, 250 V~
IEC 60884-1
Piece in Box / Package - 20 / 120

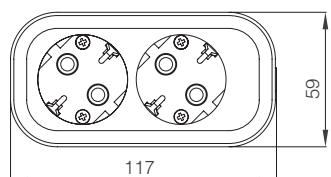
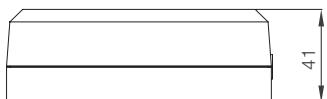


Eco 4 Gang Multiple Socket with Cable

MGP342 - 2m - Piece in Box / Package - 12 / 48
MGP343 - 3m - Piece in Box / Package - 12 / 48
MGP344 - 5m - Piece in Box / Package - 12 / 48
10 A, 250 V~
IEC 60884-1

Group Sockets

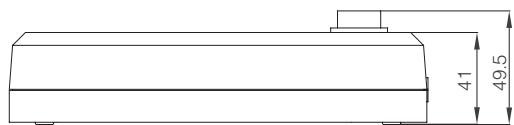
Technical Drawings



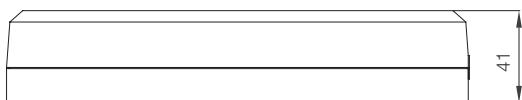
2 Gang Earthed Socket



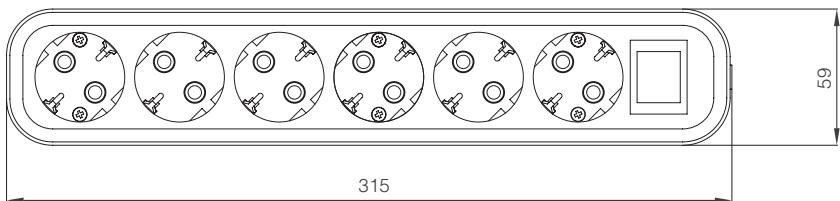
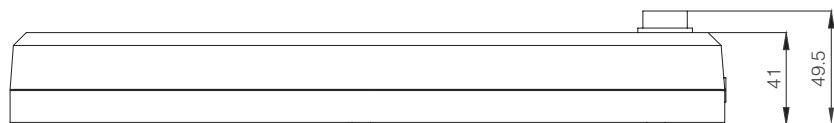
3 Gang Earthed Socket



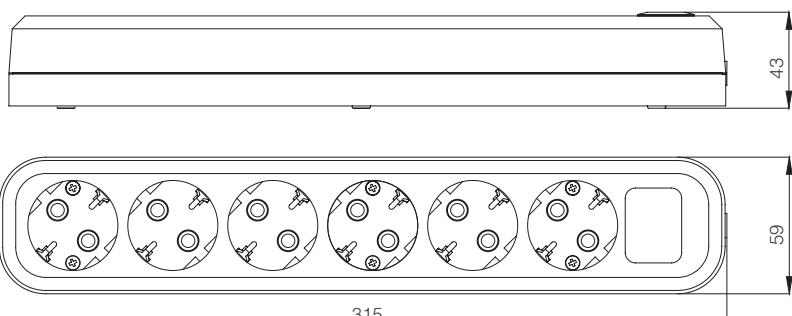
3 Gang Earthed Socket with Switch



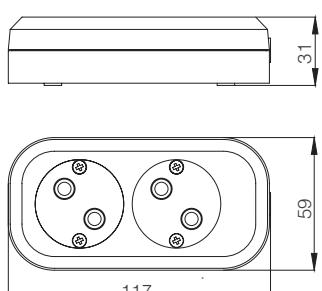
4 Gang Earthed Socket



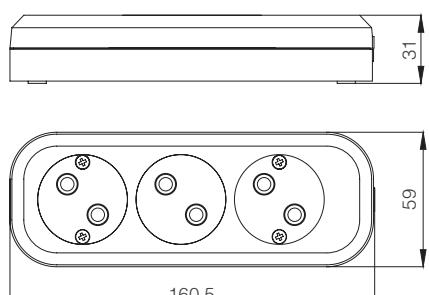
6 Gang Earthed Socket with Switch



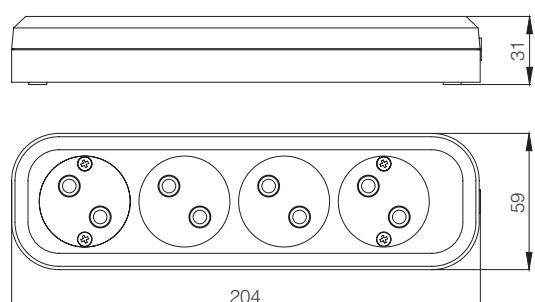
6 Gang Earthing Socket



2 Gang Socket without Earthing



3 Gang Socket without Earthing



4 Gang Socket without Earthing

New Generation Group Socket

New Generation Earthed Group Socket

Product Name	Code No.	Childproof Code No	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
2 Gang without Cable	N2201000	N2211000	20	80	8,95	330 x 380 x 300
2 Gang with Cable 2 metres	N2201033	N2211033	12	48	15,74	360 x 445 x 405
2 Gang with Cable 3 metres	N2201043	N2211043	12	48	20,06	360 x 445 x 405
2 Gang with Cable 5 metres	N2201063	N2211063	12	24	14,16	365 x 490 x 220
2 Gang switch switch, without Cable	N2301000	N2311000	15	60	8,31	330 x 380 x 300
2 Gang with switch & cable 2 metres	N2301033	N2311033	12	48	16,83	360 x 445 x 405
2 Gang with switch & cable 3 metres	N2301043	N2311043	12	48	16,83	360 x 445 x 405
2 Gang with switch & cable 5 metres	N2301063	N2311063	12	24	14,70	365 x 490 x 220
3 Gang without Cable	N3201000	N3211000	15	60	8,71	330 x 380 x 300
3 Gang with Cable 2 metres	N3201033	N3211033	12	48	17,15	360 x 445 x 405
3 Gang with Cable 3 metres	N3201043	N3211043	12	48	21,47	360 x 445 x 405
3 Gang with Cable 5 metres	N3201063	N3211063	12	24	14,86	365 x 490 x 220
3 Gang switch switch, without cable	N3301000	N3311000	20	80	13,23	325 x 440 x 380
3 Gang with switch & cable 2 metres	N3301033	N3311033	12	48	18,16	360 x 445 x 405
3 Gang with switch & cable 3 metres	N3301043	N3311043	12	48	22,48	360 x 445 x 405
3 Gang with switch & cable 5 metres	N3301063	N3311063	12	24	15,37	365 x 490 x 220
USB Switch Triple Corded 2 meters	N3701033	N3911043	12	24	10,49	290 x 505 x 260
4 Gang without Cable	N4200000	N4211000	20	80	13,69	325 x 440 x 380
4 Gang with Cable 2 metres	N4200033	N4211043	12	48	18,44	360 x 445 x 405
4 Gang with Cable 3 metres	N4200043	N4211053	12	48	22,89	364 x 495 x 385
4 Gang with Cable 5 metres	N4200063	N4211063	12	24	15,51	365 x 490 x 220
4 Gang switch switch, without cable	N4301000	N4311000	30	60	11,61	290 x 500 x 255
4 Gang with switch & cable 2 metres	N4301033	N4311043	12	24	9,96	365 x 490 x 220
4 Gang with switch & cable 3 metres	N4301043	N4311053	10	20	23,91	364 x 495 x 385
4 Gang with switch & cable 5 metres	N4301063	N4311063	12	24	16,01	365 x 490 x 220
5 Gang without Cable	N5201000	N5211000	30	60	11,70	290 x 500 x 255
5 Gang with Cable 2 metres	N5201033	N5211043	12	24	10,00	365 x 490 x 220
5 Gang with Cable 3 metres	N5201043	N5211053	12	24	12,49	360 x 500 x 325
5 Gang with Cable 5 metres	N5201063	N5211063	12	24	16,37	360 x 500 x 325
5 Gang switch switch, without cable	N5301000	N5311000	12	48	11,34	360 x 445 x 405
5 Gang with switch & cable 2 metres	N5301033	N5311043	12	24	9,13	355 x 515 x 295
5 Gang with switch & cable 3 metres	N5301043	N5311053	12	24	13,20	360 x 500 x 325
5 Gang with switch & cable 5 metres	N5301063	N5311063	12	24	17,08	360 x 500 x 325
6 Gang without Cable	N6201000	N6211000	9	36	11,76	360 x 445 x 405
6 Gang with Cable 2 metres	N6201033	N6211043	12	24	9,40	355 x 515 x 295
6 Gang with Cable 3 metres	N6201043	N6211053	12	24	13,40	360 x 500 x 325
6 Gang with Cable 5 metres	N6201063	N6211063	12	24	17,29	360 x 500 x 325
6 Gang switch switch, without cable	N6301000	N6311000	9	36	12,82	360 x 445 x 405
6 Gang with switch & cable 2 metres	N6301033	N6311043	12	24	11,60	355 x 515 x 295
6 Gang with switch & cable 3 metres	N6301043	N6311053	12	24	13,93	360 x 500 x 325
6 Gang with switch & cable 5 metres	N6301063	N6311063	12	24	17,82	360 x 500 x 325

Product Name	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
Hanger Bracket	10000A69	25	100	2,13	330 x 380 x 300
Grond Socket Hanger Bracket	10000A70	25	100	2,13	330 x 380 x 300

Group Sockets

Earthed Group Sockets

Product Name	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
2 Gang without Cable	MGP111	20	80	8,05	330 x 380 x 300
2 Gang with Cable 2 metres	MGP112	12	48	15,90	360 x 445 x 410
2 Gang with Cable 2 metres 3*1.5	MGP512	12	48	17,16	360 x 445 x 410
2 Gang with Cable 3 metres	MGP113	12	48	19,80	360 x 445 x 410
2 Gang with Cable 3 metres 3*1.5	MGP513	12	48	21,38	360 x 445 x 410
2 Gang with Cable 5 metres	MGP114	12	24	14,55	365 x 490 x 220
2 Gang with Cable 5 metres 3*1.5	MGP514	12	24	15,38	365 x 490 x 220
2 Gang with Cable 7 metres	MGP117	12	24	17,62	305 x 505 x 320
2 Gang with Cable 10 metres	MGP118	12	24	24,85	360 x 500 x 325
2 Gang with Cable 15 metres	MGP119	10	20	26,52	360 x 500 x 325
3 Gang without Cable	MGP131	15	60	8,30	330 x 380 x 300
3 Gang Pin Earthing, without Cable	MGP135	15	60	8,36	330 x 380 x 300
3 Gang with Cable 2 metres	MGP132	12	48	17,25	360 x 445 x 410
3 Gang with Cable 2 metres 3*1.5	MGP532	12	48	18,55	360 x 445 x 410
3 Gang Pin Earthing, with Cable 2 metres	MGP136	12	48	17,55	360 x 445 x 410
3 Gang with Cable 3 metres	MGP133	12	48	21,65	360 x 445 x 410
3 Gang with Cable 3 metres 3*1.5	MGP533	18	36	16,32	360 x 500 x 325
3 Gang with Cable 5 metres	MGP134	12	24	15,35	365 x 490 x 220
3 Gang with Cable 5 metres 3*1.5	MGP534	12	24	16,32	390 x 535 x 230
3 Gang with Cable 7 metres	MGP137	12	24	18,19	305 x 505 x 320
3 Gang with Cable 10 metres	MGP138	12	24	23,72	360 x 500 x 325
3 Gang with Cable 10 metres 3*1.5	MGP538	12	24	29,50	360 x 495 x 325
3 Gang with Cable 15 metres	MGP139	10	20	27,38	320 x 580 x 310
4 Gang without Cable	MGP151	20	80	13,40	325 x 440 x 380
4 Gang Pin Earthing, without Cable	MGP155	20	80	14,27	325 x 440 x 380
4 Gang with Cable 2 metres	MGP152	12	48	18,61	360 x 445 x 410
4 Gang with Cable 2 metres 3*1.5	MGP552	12	24	10,59	365 x 490 x 220
4 Gang Pin Earthing, with Cable 2 metres	MGP156	12	48	20,19	360 x 445 x 410
4 Gang with Cable 3 metres	MGP153	12	48	23,20	364 x 495 x 385
4 Gang with Cable 3 metres 3*1.5	MGP553	18	36	18,13	360 x 500 x 325
4 Gang with Cable 5 metres	MGP154	12	24	15,81	365 x 490 x 220
4 Gang with Cable 5 metres 3*1.5	MGP554	12	24	17,20	390 x 535 x 230
4 Gang with Cable 7 metres	MGP157	12	24	18,97	360 x 500 x 325
4 Gang with Cable 10 metres	MGP158	12	24	24,30	360 x 500 x 325
4 Gang with Cable 10 metres 3*1.5	MGP558	12	24	30,53	365 x 490 x 220
4 Gang with Cable 15 metres	MGP159	10	20	28,20	360 x 500 x 325
6 Gang without Cable	MGP181	15	60	12,30	360 x 445 x 410
6 Gang Pin Earthing, without Cable	MGP185	15	60	15,52	360 x 445 x 410
6 Gang with Cable 2 metres	MGP182	12	24	11,21	355 x 515 x 295
6 Gang with Cable 2 metres 3*1.5	MGP582	12	24	6,68	385 x 335 x 185
6 Gang Pin Earthing, with Cable 2 metres	MGP186	12	24	11,57	355 x 515 x 295
6 Gang with Cable 3 metres	MGP183	12	24	13,37	355 x 515 x 295
6 Gang with Cable 3 metres 3*1.5	MGP583	12	24	14,70	360 x 500 x 325
6 Gang with Cable 5 metres	MGP184	12	24	17,19	360 x 500 x 325
6 Gang with Cable 5 metres 3*1.5	MGP584	12	24	19,10	360 x 500 x 325
6 Gang with Cable 7 metres	MGP187	12	24	20,69	360 x 500 x 325
6 Gang with Cable 10 metres	MGP188	10	20	21,81	360 x 500 x 325
6 Gang with Cable 10 metres 3*1.5	MGP588	10	20	28,10	360 x 500 x 325
6 Gang with Cable 15 metres	MGP189	10	20	28,98	360 x 500 x 325

Product Name	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
3 Gang witch switch, without cable	MGP211	20	80	12,44	325 x 440 x 380
3 Gang Pin Earthed, wtih Switch, without Cable	MGP215	20	80	13,16	325 x 440 x 380
3 Gang with switch & cable 2 metres	MGP212	12	48	17,60	360 x 445 x 410
3 Gang with switch & cable 2 metres 3*1.5	MGP612	12	48	19,52	360 x 445 x 410
3 Gang Pin Earthed, wtih Switch & Cable 2 metres	MGP216	12	48	17,99	360 x 445 x 410
3 Gang with switch & cable 3 metres	MGP213	12	48	22,65	360 x 445 x 410
3 Gang with switch & cable 3 metres 3*1.5	MGP613	18	36	17,79	360 x 500 x 325
3 Gang with switch & cable 5 metres	MGP214	12	24	15,75	365 x 490 x 220
3 Gang with switch & cable 5 metres 3*1.5	MGP614	12	24	16,80	365 x 490 x 220
3 Gang with switch & cable 7 metres	MGP217	12	24	18,77	315 x 490 x 322
3 Gang with switch & cable 10 metres	MGP218	12	24	23,84	360 x 500 x 325
3 Gang with switch & cable 15 metres	MGP219	10	20	29,18	360 x 500 x 325
6 Gang witch switch, without cable	MGP231	12	48	13,35	360 x 445 x 410
6 Gang Pin Earthed, wtih Switch, without Cable	MGP235	12	48	14,00	360 x 445 x 410
6 Gang with switch & cable 2 metres	MGP232	12	24	11,69	355 x 515 x 295
6 Gang with switch & cable 2 metres 3*1.5	MGP632	12	24	10,64	365 x 490 x 220
6 Gang Pin Earthed, wtih Switch & Cable 2 metres	MGP236	12	24	12,03	355 x 515 x 295
6 Gang with switch & cable 3 metres	MGP233	12	24	14,90	365 x 515 x 290
6 Gang with switch & cable 3 metres 3*1.5	MGP633	12	24	15,19	365 x 515 x 290
6 Gang with switch & cable 5 metres	MGP234	12	24	17,50	365 x 515 x 290
6 Gang with switch & cable 5 metres 3*1.5	MGP634	12	24	19,73	360 x 500 x 325
6 Gang with switch & cable 7 metres	MGP237	12	24	21,26	360 x 500 x 325
6 Gang with switch & cable 10 metres	MGP238	10	20	22,15	360 x 500 x 325
6 Gang with switch & cable 15 metres	MGP239	10	20	19,08	360 x 495 x 325

Group Sockets

Group Sockets

Product Name	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
2 Gang without Cable	MGP101	25	100	8,10	330 x 380 x 300
2 Gang with Cable 2 metres	MGP102	12	48	11,90	325 x 440 x 380
2 Gang with Cable 3 metres	MGP103	12	48	14,95	325 x 440 x 380
2 Gang with Cable 5 metres	MGP104	12	48	21,00	355 x 495 x 330
2 Gang with Cable 7 metres	MGP107	12	24	13,86	290 x 490 x 250
2 Gang with Cable 10 metres	MGP108	12	24	18,95	310 x 500 x 270
2 Gang with Cable 15 metres	MGP109	10	20	21,53	360 x 500 x 325
3 Gang without Cable	MGP121	20	80	8,31	330 x 380 x 300
3 Gang with Cable 2 metres	MGP122	12	48	12,95	350 x 505 x 310
3 Gang with Cable 3 metres	MGP123	12	48	16,10	350 x 505 x 310
3 Gang with Cable 5 metres	MGP124	12	48	21,95	364 x 495 x 385
3 Gang with Cable 7 metres	MGP127	12	24	14,65	290 x 490 x 250
3 Gang with Cable 10 metres	MGP128	12	24	19,26	305 x 520 x 320
3 Gang with Cable 15 metres	MGP129	10	20	22,19	360 x 500 x 325
4 Gang without Cable	MGP141	20	120	15,80	335 x 470 x 455
4 Gang with Cable 2 metres	MGP142	12	48	14,35	350 x 505 x 310
4 Gang with Cable 3 metres	MGP143	12	48	17,10	360 x 445 x 410
4 Gang with Cable 5 metres	MGP144	12	48	23,25	364 x 495 x 385
4 Gang with Cable 7 metres	MGP147	12	24	15,22	360 x 500 x 325
4 Gang with Cable 10 metres	MGP148	12	24	19,64	360 x 500 x 325
4 Gang with Cable 15 metres	MGP149	10	20	22,91	322 x 545 x 265

Eco Earthed Group Sockets

Product Name	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
Eco 2 Gang without Cable	MGP311	20	80	7,37	330 x 380 x 300
Eco 2 Gang with Cable 2 metres	MGP312	12	48	14,96	360 x 445 x 410
Eco 2 Gang with Cable 3 metres	MGP313	12	48	18,59	360 x 445 x 410
Eco 2 Gang with Cable 5 metres	MGP314	12	24	13,20	365 x 490 x 220
Eco 2 Gang with Cable 7 metres	MGP317	12	24	18,14	305 x 505 x 320
Eco 2 Gang with Cable 10 metres	MGP318	12	24	23,31	360 x 500 x 325
Eco 3 Gang without Cable	MGP331	15	60	7,45	330 x 380 x 300
Eco 3 Gang with Cable 2 metres	MGP332	12	48	16,36	360 x 445 x 410
Eco 3 Gang with Cable 3 metres	MGP333	12	48	19,77	360 x 445 x 410
Eco 3 Gang with Cable 3 metres 3*1.5	MGP733	12	48	23,89	360 x 445 x 410
Eco 3 Gang with Cable 5 metres	MGP334	12	24	13,95	365 x 490 x 220
Eco 3 Gang with Cable 5 metres 3*1.5	MGP734	12	24	16,93	365 x 490 x 220
Eco 3 Gang with Cable 10 metres	MGP338	12	24	24,42	360 x 500 x 325
Eco 4 Gang without Cable	MGP351	20	80	11,87	325 x 440 x 380
Eco 4 Gang with Cable 2 metres	MGP352	12	48	17,15	360 x 445 x 410
Eco 4 Gang with Cable 3 metres	MGP353	12	48	20,65	364 x 495 x 385
Eco 4 Gang with Cable 5 metres	MGP354	12	24	14,36	365 x 490 x 220
Eco 6 Gang without Cable	MGP381	15	60	13,42	360 x 445 x 410
Eco 6 Gang with Cable 2 metres	MGP382	12	24	11,05	360 x 500 x 325
Eco 6 Gang with Cable 3 metres	MGP383	12	24	12,87	355 x 515 x 295
Eco 6 Gang with Cable 5 metres	MGP384	12	24	16,61	360 x 500 x 325

Eco Group Sockets

Product Name	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
Eco 2 Gang without Cable	MGP301	25	100	7,75	330 x 380 x 300
Eco 2 Gang with Cable 2 metres	MGP302	12	48	11,92	325 x 440 x 380
Eco 2 Gang with Cable 3 metres	MGP303	12	48	14,98	325 x 440 x 380
Eco 2 Gang with Cable 5 metres	MGP304	12	48	21,21	355 x 495 x 330
Eco 2 Gang with Cable 7 metres	MGP307	12	24	14,50	290 x 490 x 250
Eco 2 Gang with Cable 10 metres	MGP308	12	24	18,92	310 x 500 x 270
Eco 3 Gang without Cable	MGP321	20	80	8,31	330 x 380 x 300
Eco 3 Gang with Cable 2 metres	MGP322	12	48	12,77	350 x 505 x 310
Eco 3 Gang with Cable 3 metres	MGP323	12	48	16,19	350 x 505 x 310
Eco 3 Gang with Cable 5 metres	MGP324	12	48	22,78	364 x 495 x 385
Eco 3 Gang with Cable 7metres	MGP327	12	24	14,34	290 x 490 x 250
Eco 3 Gang with Cable 10 metres	MGP328	12	24	19,16	305 x 520 x 320
Eco 4 Gang without Cable	MGP341	20	120	15,53	335 x 470 x 455
Eco 4 Gang with Cable 2 metres	MGP342	12	48	14,17	350 x 505 x 310
Eco 4 Gang with Cable 3 metres	MGP343	12	48	17,19	360 x 445 x 410
Eco 4 Gang with Cable 5 metres	MGP344	12	48	23,46	364 x 495 x 385

Surge Protected Group Socket

Product Name	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
Shock protected Sixtet Earthed group outlet corded 1.8 meters	25064200	1	6	4,85	265 x 425 x 175

Distribution Boxes

Flush Mount & Surface Mount



Distribution Boxes

Color Options



Natural Walnut



Natural Pine



Dore



Metallic Silver



Fume

Difference on walls



Providing aesthetic solutions for eye distorting views on your walls, the Distribution Boxes Series provides secure insulation and with opaque cover and flush and surface mounted options, they are to take their places in your environments.



Halogen free

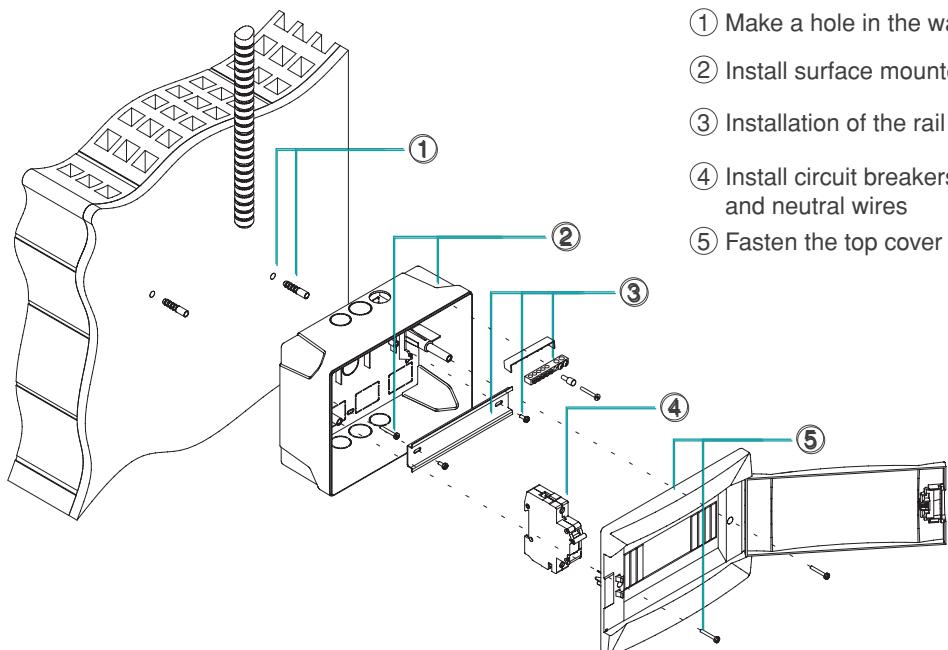
Makel Distribution Boxes produced from halogen free material does not contain halogen elements such as bromine, fluorine, iodine and chlorine thus they do not produce toxic gases in case of a fire and they can be used safely in public areas such as schools, hospitals, hotels, malls, cinemas etc.

General Specifications

- Halogen free
- Body resistant to heat and impacts
- Body resistant to flames and burning up to 650°C
- Easy to mount inner volume
- Easy usage with cover mechanism with spring
- Cover usable dual sided
- 180° moving cover
- In conformity with international standards
- Transparent and opaque colored cover options
- 35 mm rail
- IP 40 Protection Class
- Isolated neutral electrical connection

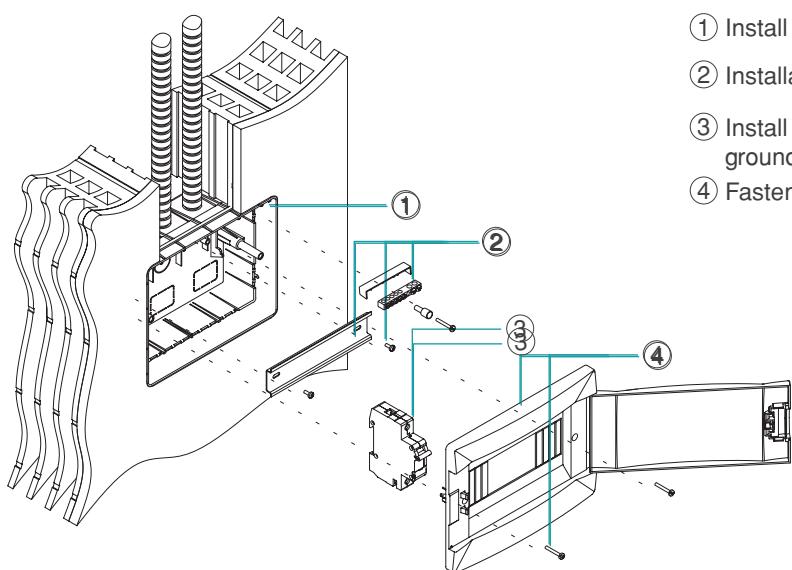
Assembly

Surface Mount Distribution Box



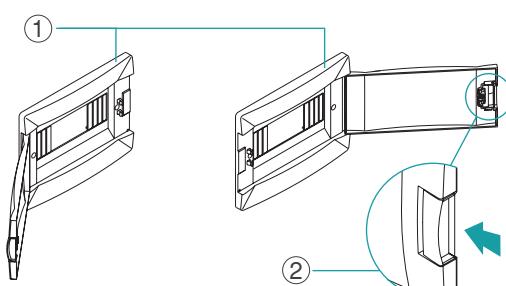
- ① Make a hole in the wall and install a peg into the hole
- ② Install surface mounted case to the wall and arrange wiring
- ③ Installation of the rail and the ground block with screws
- ④ Install circuit breakers and connect phase, ground and neutral wires
- ⑤ Fasten the top cover with screws included in packaging

Flush Mount Distribution Box



- ① Install surface mounted case to the wall and arrange wiring
- ② Installation of the rail and the ground block with screws,
- ③ Install circuit breakers and connect phase, ground and neutral wires
- ④ Fasten the top cover with screws included in packaging

Cover Assembly



- ① Upper frame can be mounted according to the direction of door opening
- ② Push the mechanism in the direction of the arrow to open the cover and pull it toward you.

Distribution Boxes

Flush Mount Distribution Box



Flush Mount Distribution Box with Terminal Module 2
63002
Color - White
IEC 60670-24
Size of Package (mm) - 330x603x315
Gross Weight (kg) - 10,54
Piece in Box / Package - 1 / 36



Flush Mount Distribution Box with Terminal Module 4
63004
Color - White
IEC 60670-24
Size of Package (mm) - 445x600x210
Gross Weight (kg) - 8,84
Piece in Box / Package - 1 / 24



Flush Mount Distribution Box with Terminal Module 6
63006
Color - White
IEC 60670-24
Size of Package (mm) - 375x505x310
Gross Weight (kg) - 9,08
Piece in Box / Package - 1 / 20



Flush Mount Distribution Box with Terminal Module 8
63008
Color - White
IEC 60670-24
Size of Package (mm) - 450x757x220
Gross Weight (kg) - 9,62
Piece in Box / Package - 1 / 16



Flush Mount Distribution Box with Terminal Module 12
63012
Color - White
IEC 60670-24
Size of Package (mm) - 475x595x215
Gross Weight (kg) - 7,35
Piece in Box / Package - 1 / 8

Surface Mount Distribution Box



Surface Mount Distribution Box with Terminal Module 2
63102
Color - White
IEC 60670-24
Size of Package (mm) - 330x603x315
Gross Weight (kg) - 10,55
Piece in Box / Package - 1 / 36



Surface Mount Distribution Box with Terminal Module 4
63104
Color - White
IEC 60670-24
Size of Package (mm) - 445x600x210
Gross Weight (kg) - 9,25
Piece in Box / Package - 1 / 24



Surface Mount Distribution Box with Terminal Module 6
63106
Color - White
IEC 60670-24
Size of Package (mm) - 375x505x310
Gross Weight (kg) - 9,02
Piece in Box / Package - 1 / 20



Surface Mount Distribution Box with Terminal Module 8
63108
Color - White
IEC 60670-24
Size of Package (mm) - 450x680x212
Gross Weight (kg) - 9,45
Piece in Box / Package - 1 / 16



Surface Mount Distribution Box with Terminal Module 12
63112
Color - White
IEC 60670-24
Size of Package (mm) - 445x600x210
Gross Weight (kg) - 7,3
Piece in Box / Package - 1 / 8

Flush Mount Distribution Box



Flush Mount Distribution Box with Terminal Module 16
63016
Color - White
IEC 60670-24
Size of Package (mm) - 475x735x220
Gross Weight (kg) - 8,8
Piece in Box / Package - 1 / 8



Flush Mount Distribution Box with Terminal Module 16 Double Decker
28001426
Color - White
IEC 60670-24
Size of Package (mm) - 455x470x355
Gross Weight (kg) - 11,76
Piece in Box / Package - 1 / 8



Flush Mount Distribution Box with Terminal Module 24 Double Decker
63024
Color - White
IEC 60670-24
Size of Package (mm) - 320x455x368
Gross Weight (kg) - 6,7
Piece in Box / Package - 1 / 4



Flush Mount Distribution Box with Terminal Module 36 Threelfold
63036
Color - White
IEC 60670-24
Size of Package (mm) - 450x475x330
Gross Weight (kg) - 9,62
Piece in Box / Package - 1 / 4

Surface Mount Distribution Box



Surface Mount Distribution Box with Terminal Module 16
63116
Color - White
IEC 60670-24
Size of Package (mm) - 475x735x220
Gross Weight (kg) - 8,8
Piece in Box / Package - 1 / 8



Surface Mount Distribution Box with Terminal Module 16 Double Decker
28001427
Color - White
IEC 60670-24
Size of Package (mm) - 455x470x355
Gross Weight (kg) - 11,44
Piece in Box / Package - 1 / 8



Surface Mount Distribution Box with Terminal Module 24 Double Decker
63124
Color - White
IEC 60670-24
Size of Package (mm) - 312x460x350
Gross Weight (kg) - 6,55
Piece in Box / Package - 1 / 4



Surface Mount Distribution Box with Terminal Module 36 Threelfold
63136
Color - White
IEC 60670-24
Size of Package (mm) - 450x475x330
Gross Weight (kg) - 9,7
Piece in Box / Package - 1 / 4

Sealed Distribution Box



Dual Surface Mounted Sealed Distribution Box
63140
Color - White
IEC 60670-24
Size of Package (mm) - 51x136x65
Gross Weight (kg) - 13,86
Piece in Box / Package - 1 / 240



Quadrupole Surface Mounted Sealed Distribution Box
63141
Color - White
IEC 60670-24
Size of Package (mm) - 87x136x65
Gross Weight (kg) - 12,5
Piece in Box / Package - 1 / 120

Distribution Boxes

Opaque Flush Mount Distribution Box



Flush Mount Distribution Box with Terminal Module
2 - Opaque
28001218
Color - White
IEC 60670-24
Size of Package (mm) - 330x603x315
Gross Weight (kg) - 10,54
Piece in Box / Package - 1 / 36



Flush Mount Distribution Box with Terminal Module
4 - Opaque
28001219
Color - White
IEC 60670-24
Size of Package (mm) - 445x600x210
Gross Weight (kg) - 8,84
Piece in Box / Package - 1 / 24



Flush Mount Distribution Box with Terminal Module
6 - Opaque
28001220
Color - White
IEC 60670-24
Size of Package (mm) - 375x505x310
Gross Weight (kg) - 9,08
Piece in Box / Package - 1 / 20



Flush Mount Distribution Box with Terminal Module
8 - Opaque
28001221
Color - White
IEC 60670-24
Size of Package (mm) - 450x757x220
Gross Weight (kg) - 9,62
Piece in Box / Package - 1 / 16



Flush Mount Distribution Box with Terminal Module
12 - Opaque
28001222
Color - White
IEC 60670-24
Size of Package (mm) - 475x595x215
Gross Weight (kg) - 7,35
Piece in Box / Package - 1 / 8

Opaque Surface Mount Distribution Box



Surface Mount Distribution Box with Terminal Module
2 - Opaque
28001226
Color - White
IEC 60670-24
Size of Package (mm) - 330x603x315
Gross Weight (kg) - 10,55
Piece in Box / Package - 1 / 36



Surface Mount Distribution Box with Terminal Module
4 - Opaque
28001227
Color - White
IEC 60670-24
Size of Package (mm) - 445x600x210
Gross Weight (kg) - 9,25
Piece in Box / Package - 1 / 24



Surface Mount Distribution Box with Terminal Module
6 - Opaque
28001228
Color - White
IEC 60670-24
Size of Package (mm) - 375x505x310
Gross Weight (kg) - 9,2
Piece in Box / Package - 1 / 20



Surface Mount Distribution Box with Terminal Module
8 - Opaque
28001229
Color - White
IEC 60670-24
Size of Package (mm) - 450x680x212
Gross Weight (kg) - 9,45
Piece in Box / Package - 1 / 16



Surface Mount Distribution Box with Terminal Module
12 - Opaque
28001230
Color - White
IEC 60670-24
Size of Package (mm) - 445x600x210
Gross Weight (kg) - 7,3
Piece in Box / Package - 1 / 8

Opaque Flush Mount Distribution Box



Flush Mount Distribution Box with Terminal Module
16 - Opaque
28001225
Color - White
IEC 60670-24
Size of Package (mm) - 475x735x220
Gross Weight (kg) - 8,8
Piece in Box / Package - 1 / 8



Flush Mount Distribution Box with Terminal Module
16 Double Decker - Opaque
28001475
Color - White
IEC 60670-24
Size of Package (mm) - 455x470x355
Gross Weight (kg) - 7,04
Piece in Box / Package - 1 / 8



Flush Mount Distribution Box with Terminal Module
24 Double Decker - Opaque
28001223
Color - White
IEC 60670-24
Size of Package (mm) - 320x455x368
Gross Weight (kg) - 6,7
Piece in Box / Package - 1 / 4



Flush Mount Distribution Box with Terminal Module
36 Threefold - Opaque
28001224
Color - White
IEC 60670-24
Size of Package (mm) - 450x475x330
Gross Weight (kg) - 9,62
Piece in Box / Package - 1 / 4

Opaque Surface Mount Distribution Box



Surface Mount Distribution Box with Terminal Module
16 - Opaque
28001233
Color - White
IEC 60670-24
Size of Package (mm) - 475x735x220
Gross Weight (kg) - 8,8
Piece in Box / Package - 1 / 8



Surface Mount Distribution Box with Terminal Module
16 Double Decker - Opaque
28001476
Color - White
IEC 60670-24
Size of Package (mm) - 455x470x355
Gross Weight (kg) - 6,21
Piece in Box / Package - 1 / 8



Surface Mount Distribution Box with Terminal Module
24 Double Decker - Opaque
28001231
Color - White
IEC 60670-24
Size of Package (mm) - 312x460x350
Gross Weight (kg) - 6,55
Piece in Box / Package - 1 / 4

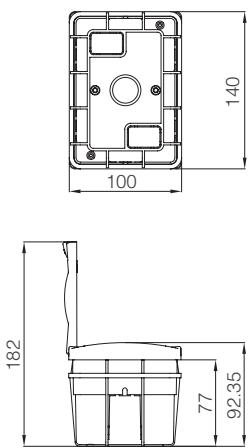


Surface Mount Distribution Box with Terminal Module
36 Threefold - Opaque
28001232
Color - White
IEC 60670-24
Size of Package (mm) - 450x475x330
Gross Weight (kg) - 9,7
Piece in Box / Package - 1 / 4

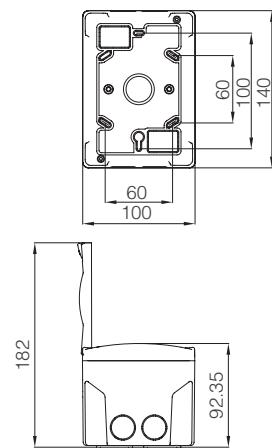
Distribution Boxes

Technical Drawings

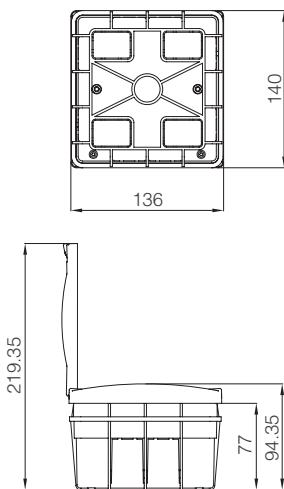
Flush Mount Distribution Box with Terminal Module 2



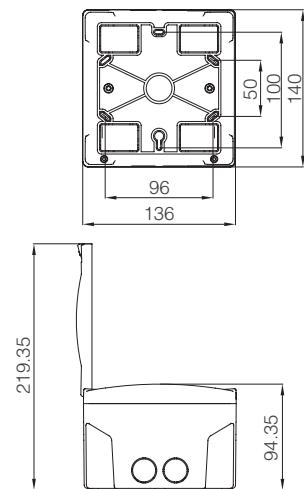
Surface Mount Distribution Box with Terminal Module 2



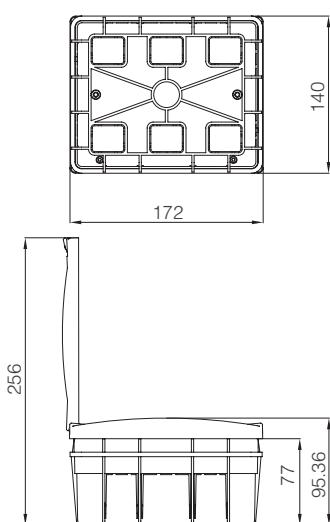
Flush Mount Distribution Box with Terminal Module 4



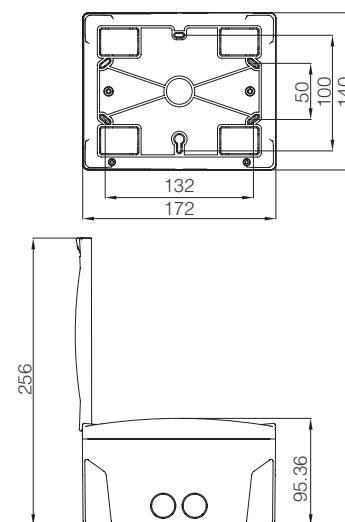
Surface Mount Distribution Box with Terminal Module 4



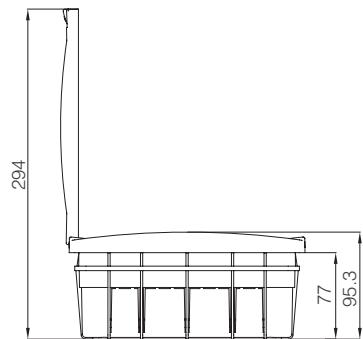
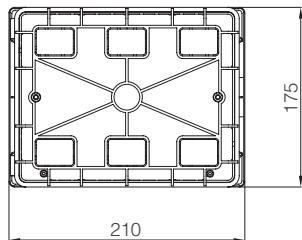
Flush Mount Distribution Box with Terminal Module 6



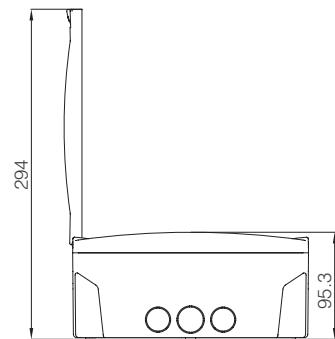
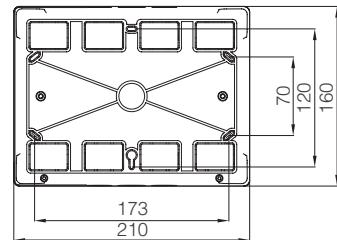
Surface Mount Distribution Box with Terminal Module 6



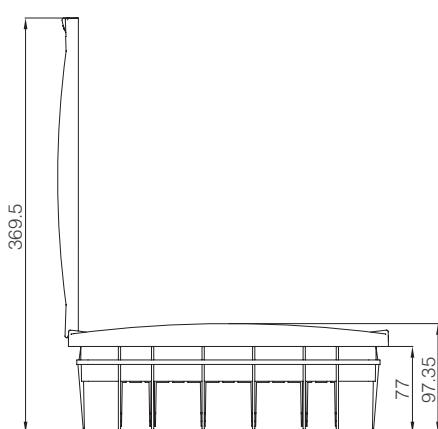
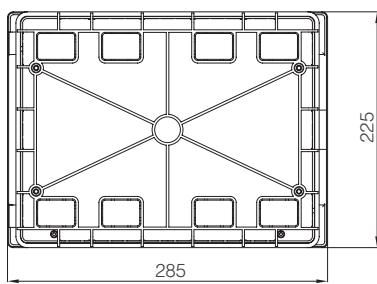
Flush Mount Distribution Box with Terminal Module 8



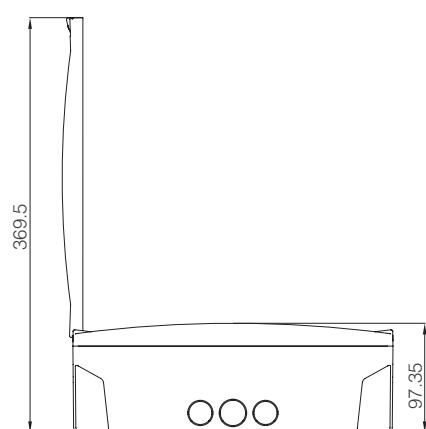
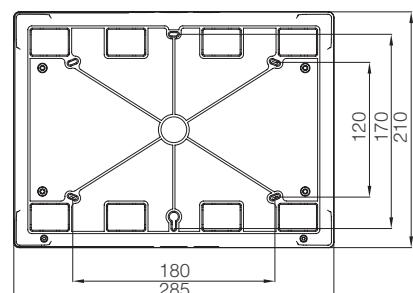
Surface Mount Distribution Box with Terminal Module 8



Flush Mount Distribution Box with Terminal Module 12



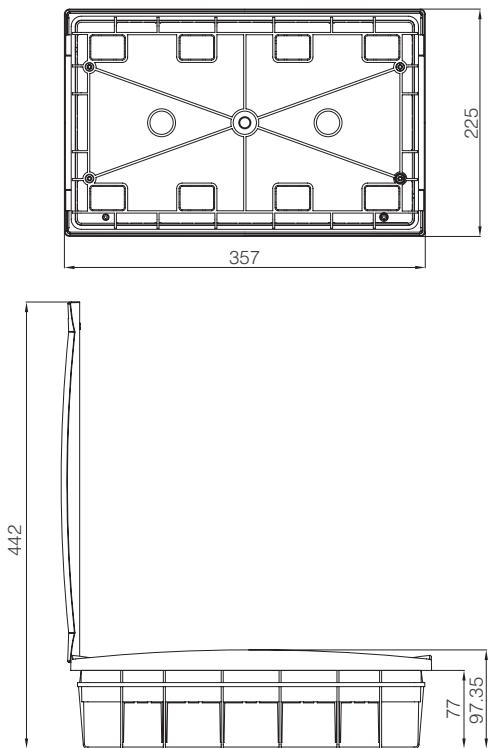
Surface Mount Distribution Box with Terminal Module 12



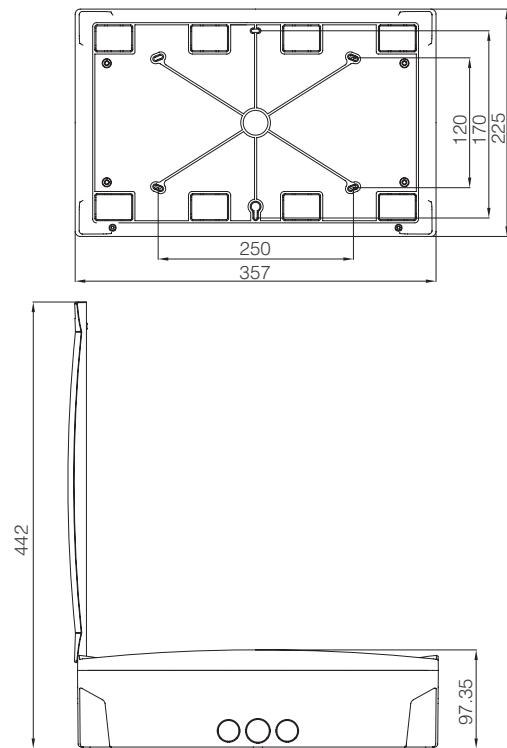
Distribution Boxes

Technical Drawings

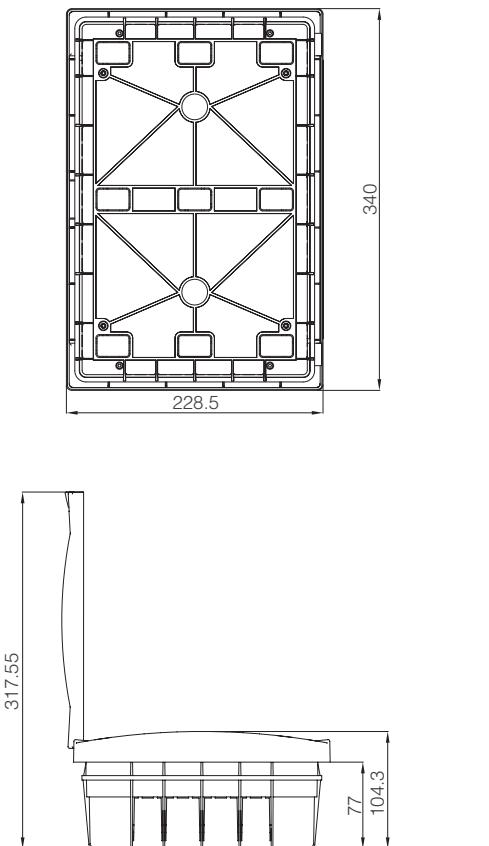
Flush Mount Distribution Box with Terminal Module 16



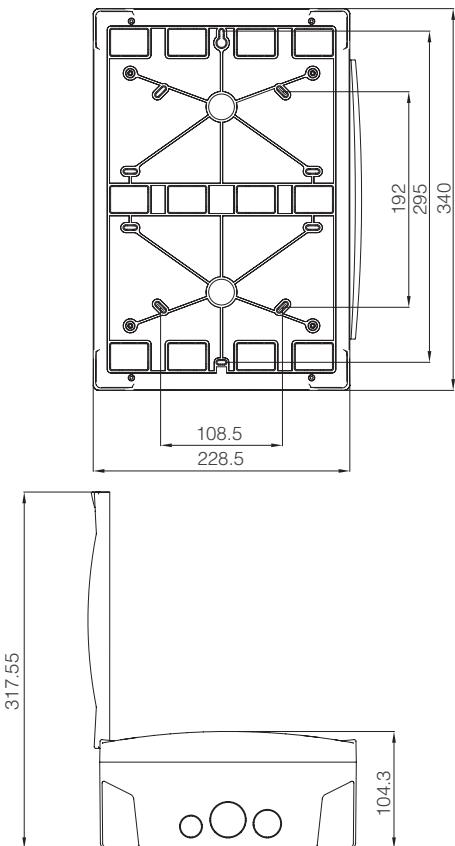
Surface Mount Distribution Box with Terminal Module 16



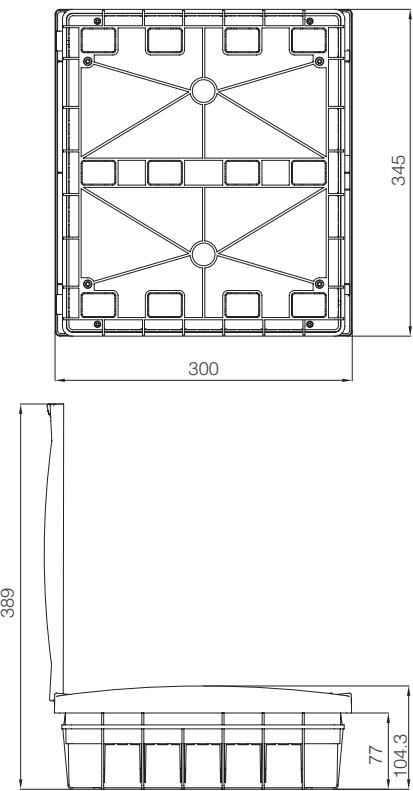
Flush Mount Distribution Box with Terminal Module 16 Double Decker



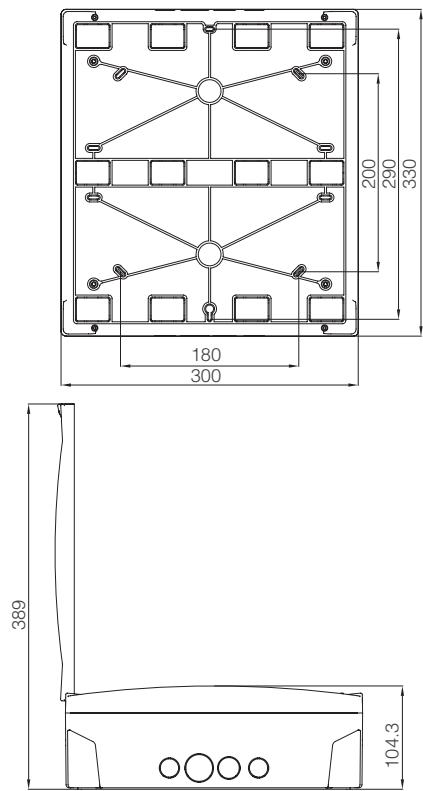
Surface Mount Distribution Box with Terminal Module 16 Double Decker



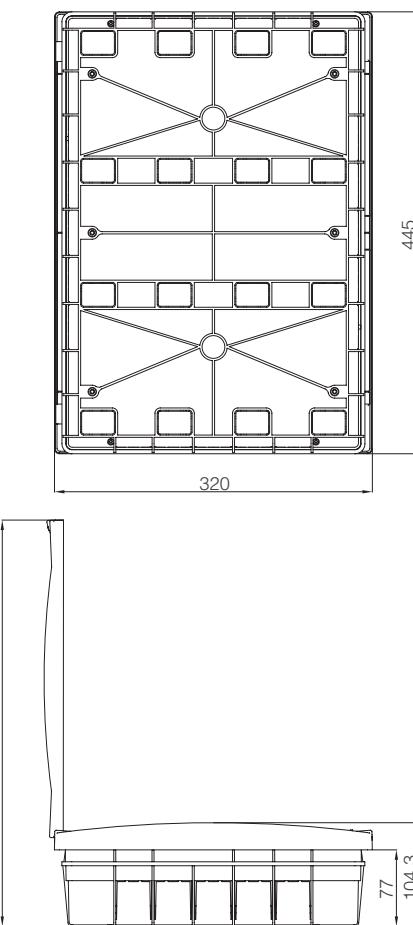
Flush Mount Distribution Box with Terminal Module
24 Double Decker



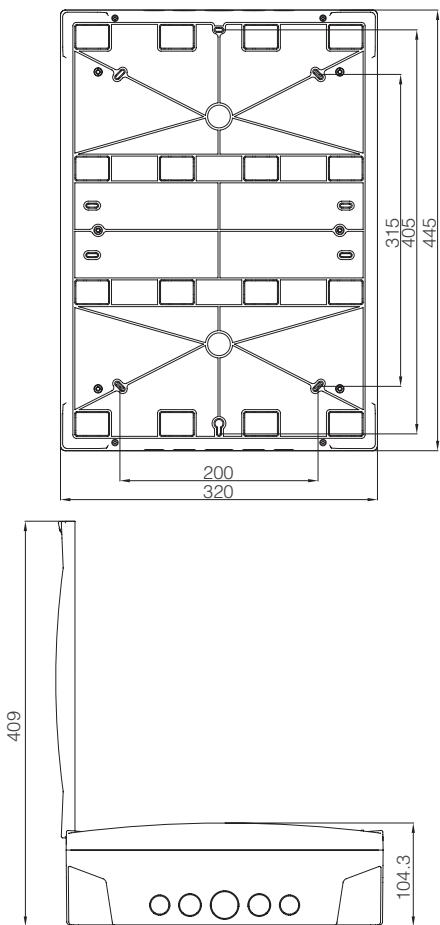
Surface Mount Distribution Box with Terminal Module
24 Double Decker



Flush Mount Distribution Box with Terminal
Module 36 Threefold



Surface Mount Distribution Box with Terminal
Module 36 Threefold



Distribution Boxes

Product Name	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
Flush Mount Distribution Box - Halogen Free					
2'pcs.	63002	1	36	10,54	330 x 603 x 315
4'pcs.	63004	1	24	8,84	445 x 600 x 210
6'pcs.	63006	1	20	9,08	375 x 505 x 310
8'pcs.	63008	1	16	9,62	450 x 757 x 220
12'pcs.	63012	1	8	7,35	475 x 595 x 215
16'pcs.	63016	1	8	8,80	475 x 735 x 220
16'pcs. Double layer	28001426	1	8	11,76	455 x 470 x 355
24'pcs. Double layer	63024	1	4	6,70	320 x 455 x 368
36'pcs. Threefold	63036	1	4	9,62	450 x 475 x 330

Surface Mount Distribution Box - Halogen Free

Product Name	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
Surface Mount Distribution Box - Halogen Free					
2'pcs.	63102	1	36	10,55	330 x 603 x 315
4'pcs.	63104	1	24	9,25	445 x 600 x 210
6'pcs.	63106	1	20	9,20	375 x 505 x 310
8'pcs.	63108	1	16	9,45	450 x 680 x 212
12'pcs.	63112	1	8	7,30	445 x 600 x 210
16'pcs.	63116	1	8	8,80	475 x 735 x 220
16'pcs. Double layer	28001427	1	8	11,44	455 x 470 x 355
24'pcs. Double layer	63124	1	4	6,55	312 x 460 x 350
36'pcs. Threefold	63136	1	4	9,70	450 x 475 x 330
2'pcs. Sealed	63140	1	40	3,30	283 x 266 x 272
4'pcs. Sealed	63141	1	30	3,55	335 x 283 x 275

Special Color Options

Product Name	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
Flush Mount Distribution Box - Halogen Free					
2'pcs	28 xxx 284	1	36	10,54	330 x 603 x 315
4'pcs	28 xxx 285	1	24	8,84	445 x 600 x 210
6'pcs	28 xxx 286	1	20	9,08	375 x 505 x 310
8'pcs	28 xxx 287	1	16	9,62	450 x 757 x 220
12'pcs	28 xxx 288	1	8	7,35	475 x 595 x 215
16'pcs	28 xxx 291	1	8	8,80	475 x 735 x 220
16'pcs. Double layer	28 xxx 474	1	8	11,76	455 x 470 x 355
24'pcs. Double layer	28 xxx 289	1	4	6,70	320 x 455 x 368
36'pcs. Threefold	28 xxx 290	1	4	9,62	450 x 475 x 330
Surface Mount Distribution Box - Halogen Free					
2'pcs	28 xxx 292	1	36	10,55	330 x 603 x 315
4'pcs	28 xxx 293	1	24	9,25	445 x 600 x 210
6'pcs	28 xxx 294	1	20	9,20	375 x 505 x 310
8'pcs	28 xxx 295	1	16	9,45	450 x 680 x 212
12'pcs	28 xxx 296	1	8	7,30	445 x 600 x 210
16'pcs	28 xxx 299	1	8	8,80	475 x 735 x 220
16'pcs. Double layer	28 xxx 476	1	8	11,44	455 x 470 x 355
24'pcs. Double layer	28 xxx 297	1	4	6,55	312 x 460 x 350
36'pcs. Threefold	28 xxx 298	1	4	9,70	450 x 475 x 330

Please specify your choice of color by applying below color codes into the 'xxx' marked space.

Colors	Code No.	Colors	Code No.
	xxx		xxx
Dore	057	Natural Pine	105
Metallic Silver	065	Natural Walnut	102
Fume	050		

Note: Additional electric terminal orders can be placed.

Product Name	Code No.	Piece in Box	Piece in Package	Gross Weight (kg)	Size of Package (mm)
Opaque Flush Mount Distribution Box - Halogen Free					
2'pcs	28001218	1	36	10,54	330 x 603 x 315
4'pcs.	28001219	1	24	8,84	445 x 600 x 210
6'pcs.	28001220	1	20	9,08	375 x 505 x 310
8'pcs.	28001221	1	16	9,62	450 x 757 x 220
12'pcs.	28001222	1	8	7,35	475 x 595 x 215
16'pcs	28001225	1	8	8,80	475 x 735 x 220
16'pcs. Double layer	28001475	1	8	7,04	455 x 470 x 355
24'pcs. Double layer	28001223	1	4	6,70	320 x 455 x 368
36'pcs. Threefold	28001224	1	4	9,62	450 x 475 x 330

Opaque Surface Mount Distribution Box - Halogen Free

2'pcs	28001226	1	36	10,55	330 x 603 x 315
4'pcs.	28001227	1	24	9,25	445 x 600 x 210
6'pcs.	28001228	1	20	9,20	375 x 505 x 310
8'pcs.	28001229	1	16	9,45	450 x 680 x 212
12'pcs.	28001230	1	8	7,30	445 x 600 x 210
16'pcs.	28001233	1	8	8,80	475 x 735 x 220
16'pcs. Double layer	28001476	1	8	6,21	455 x 470 x 355
24'pcs. Double layer	28001231	1	4	6,55	312 x 460 x 350
36'pcs. Threefold	28001232	1	4	9,70	450 x 475 x 330

LIGHT CONTROL PHOTODOMESTIC



Product & Family Code: 089 001 0003

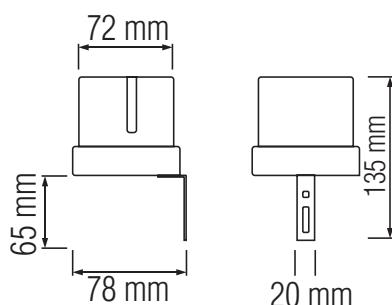
LUXOR

Technical Data

Voltage	AC 220-240V / 50-60Hz
Ambient Light	< 5-50Lux (Adjustable)
Load Power	2700W (25A)
Protection Class	II
IP Rating	44
Material	PC

WHITE

Technical Drawing



Applications

- Widely used: street light, highway, factories, garden, ports, airports, farm, parks, schools, and other places.

Features

- Easy to install and Convenient to use
- To turn on or off the light in day and night without manual operation



LED TUBE



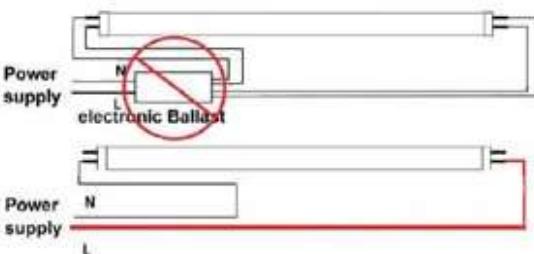
Product&Family Code: 002 001 0018

LED TUBE-120

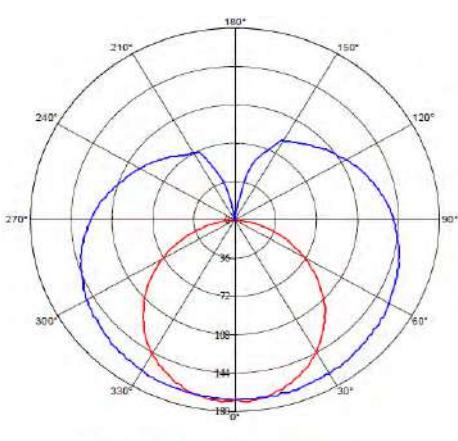
Technical Data

Voltage (V)	175-250V
Product Wattage (W)	18
Equivalence with incandescent lamp(W)	144
Colour Render Index (Ra)	>Ra80
Colour Temperature (K)	6400K
Materials	Glass
Dimmable	No
EEI	
Warm-up time up to 60 %of the full light output	Instant Full Light
Luminous Flux (lm)	1800
Luminous Efficacy (lm/W)	100
Rated Life (hrs) 	25.000
Power Factor	>0.7
Beam Angle	195°
Number of ON-OFF cycling	x15.000

Connection Diagram



Photometric Diagram


 C0 Plane beam angle(50%) C90 Plane beam angle(50%)
 C0 Plane beam angle(50%):109.5(DEG) C90 Plane beam angle(50%):262.4(DEG)

Applications

- Office, hospitality, industrial, car park.



Technical Drawing

	15.000X ON / OFF	NO UV / IR	mA 95
%85 ENERGY Saving		25000h Lifetime	
	Start Up Time <0.5	195°	-10°C - 40°C
	Ra >80	Warm Up %60 < 0.5 s.	PF >0.5 Power Factor

Features

- High Lumen and CRI, Good quality & Constant Current driver.
- High heat dissipation, low carbon and environmental protection.
- SMD LED Lamp Base
- Very low energy consumption



LED TUBE

SERIES



LED TUBE FULL GLASS SERIES



Specification

T806	T812	T815
9W/10W/12W	18W/20W/24W	24W/28W/34W
120/140/160lm/w	120/140/160lm/w	120/140/160lm/w
25000h	25000h	25000h
320°	320°	320°
CRI>80	CRI>80	CRI>80
AC165–265V	AC165–265V	AC165–265V
50/60 Hz	50/60 Hz	50/60 Hz
φ600*29mm	φ1200*29mm	φ1500*29mm



NO
UV/IR



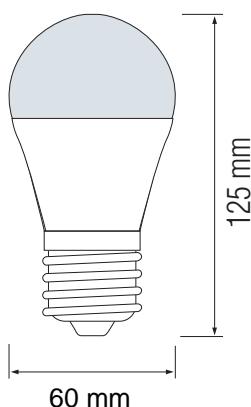
Hg
0,0mg



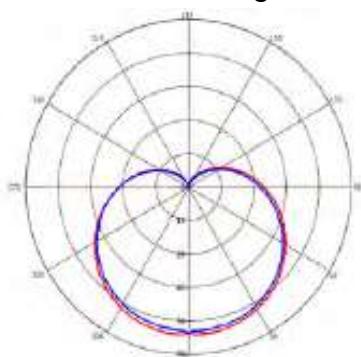
LED BULB



Technical Drawing



Photometric Diagram



Product&Family Code: 001 006 0015

PREMIER-15

Technical Data

Voltage (V)	175-250V
Product Wattage (W)	15
Equivalence with incandescent lamp	120
Colour Render Index (Ra)	>Ra80
Colour Temperature (K)	3000K-4200K-6400K
Materials	Aluminium Housing with PMMA Diffuser
Protection Class	-
Dimmable	No
EEI	
Warm-up time up to 60 %of the full light output	Instant Full Light
Luminous Flux (lm)	1500
Luminous Efficacy (lm/W)	100
Rated Life (hrs) 	25,000
IP Rating	-
Power Factor	>0.5
Beam Angle 	160 °
Starting Time	<0.5
Number of ON-OFF cycling	x12,500

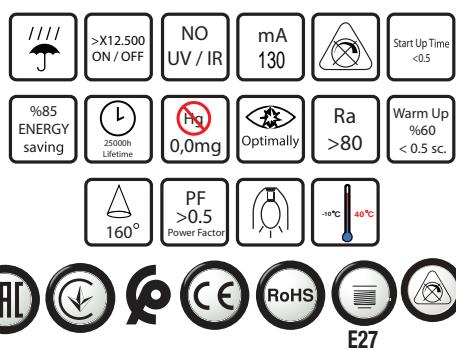
Applications

- The luminaire is an excellent solutions for market, museum, restaurant, show room, and other spot lighting needed.



Features

- Low power consumption
- Efficient replacement for incandescent lamps
- Mercury free, no UV and IR radiation
- Instant on, 100% light output



LED BULB

SERIES



LED T BULB ARTSTAR SERIES



Specification

20W	30W	40W	50W	80W	100W
6500K	6500K	6500K	6500K	6500K	6500K
90Lm/w	90Lm/w	90Lm/w	90Lm/w	90Lm/w	90Lm/w
E27	E27	E27	E27	E27	E27
PF>0.5	PF>0.5	PF>0.5	PF>0.5	PF>0.5	PF>0.5
AC150-265V	AC150-265V	AC150-265V	AC150-265V	AC150-265V	AC150-265V
50/60 Hz					
φ80*155mm	φ100*180mm	φ115*210mm	φ125*235mm	φ160*290mm	φ180*320mm



NO
UV/IR



0.3 sec

25.000h

50.000h
ON OFF



Hg
0.0mg



LED BULB



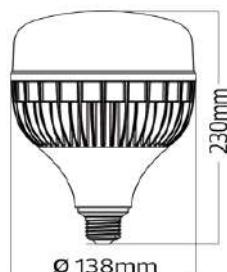
Product & Family Code: 001 016 0100

TORCH-100

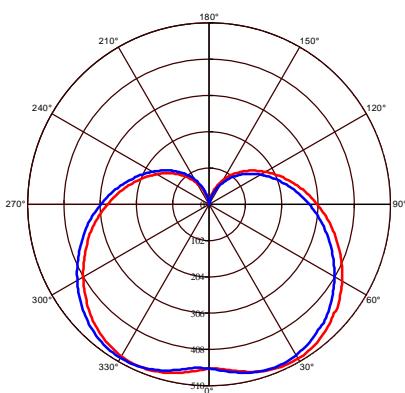
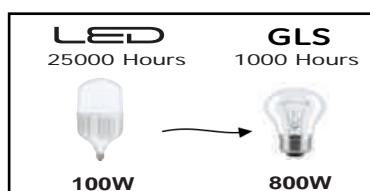
Technical Data

Voltage (V)	175-250V
Product Wattage (W)	100
Equivalence with incandescent lamp	557
Colour Render Index (Ra)	86
Colour Temperature (K)	6400
Materials	Aluminium + PC
Protection Class	-
Dimmable	No
EEI	
Warm-up time up to 60 % of the full light output	Instant Full Light
Luminous Flux (lm)	10.600
Luminous Efficacy (lm/W)	106
Rated Life (hrs)	25,000
IP Rating	-
Power Factor	>0.9
Beam Angle Δ	200 °
Starting Time	>0.2s
Number of ON-OFF cycling	x12.500

Technical Drawing



Photometric Diagram


 b CO Plane beam angle(50%) b C90 Plane beam angle(50%)
 CO Plane beam angle(50%):200.2(DEG) C90 Plane beam angle(50%):199.8(DEG)


Applications

- Applicable to the shops along the street, shops, shopping malls, supermarkets and other indoor lighting places.



Features

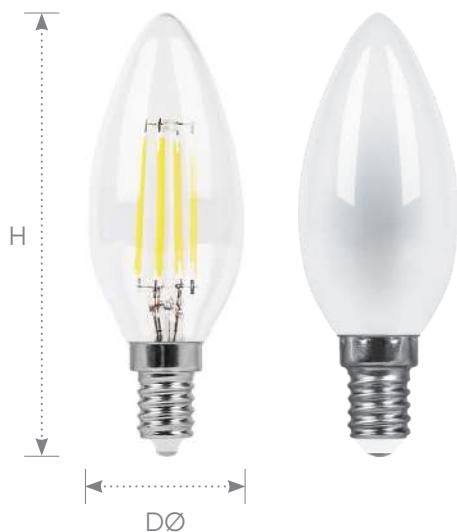
- Low power consumption
- Efficient replacement for incandescent lamps
- Mercury free, no UV and IR radiation
- Instant on, 100% light output



Светодиодная лампа филамент С35

Feron

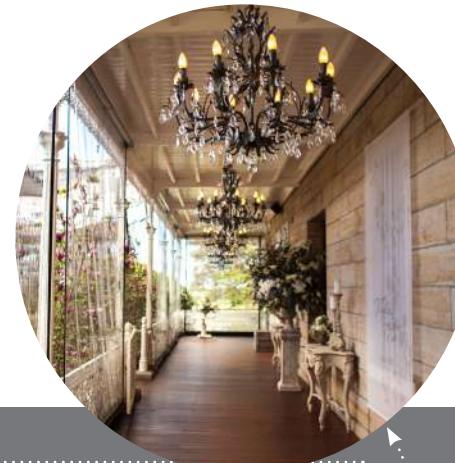
Материал рассеивателя: стекло



Высокое качество комплектующих и сборки.
Эффективное отведение тепла от корпуса.
Долгий срок службы светодиодов.



Идеальное решение для хрустальных люстр и
открытых светильников, в которых источник света
является частью дизайна. Применяются как для
общего, так и для декоративного освещения.



Артикул	Модель	Мощность, Вт	Рассеиватель	Световой поток, Лм	Цветовая температура, К	Размер, мм	Цоколь	Кол-во штук в упаковке
25572	LB-58	5	прозрачный	530	2700	Ø 35x100	E14	10/100
25573	LB-58	5	прозрачный	550	4000	Ø 35x100	E14	10/100
25726	LB-66	7	прозрачный	740	2700	Ø 35x100	E27	10/100
25780	LB-66	7	прозрачный	760	4000	Ø 35x100	E27	10/100
25785	LB-66	7	матовый	710	2700	Ø 35x100	E14	10/100
38227	LB-66	7	прозрачный	780	6400	Ø 35x100	E14	10/100
38271	LB-66	7	прозрачный	760	4000	Ø 35x100	E14	10/100
38272	LB-66	7	прозрачный	760	6400	Ø 35x100	E14	10/100
25870	LB-166*	7	прозрачный	740	2700	Ø 35x100	E14	10/100
25871	LB-166*	7	прозрачный	760	4000	Ø 35x100	E14	10/100
25955	LB-73	9	матовый	800	2700	Ø 35x100	E14	10/100
25956	LB-73	9	прозрачный	840	2700	Ø 35x100	E14	10/100
25957	LB-73	9	матовый	820	4000	Ø 35x100	E14	10/100
25958	LB-73	9	прозрачный	860	4000	Ø 35x100	E14	10/100
38229	LB-73	9	прозрачный	880	6400	Ø 35x100	E14	10/100
38005	LB-713	11	матовый	910	2700	Ø 35x100	E14	10/100
38006	LB-713	11	прозрачный	950	2700	Ø 35x100	E14	10/100
38007	LB-713	11	матовый	930	4000	Ø 35x100	E14	10/100
38008	LB-713	11	прозрачный	970	4000	Ø 35x100	E14	10/100
38231	LB-713	11	прозрачный	990	6400	Ø 35x100	E14	10/100
38273	LB-713	11	прозрачный	970	4000	Ø 35x100	E27	10/100
38274	LB-713	11	прозрачный	970	6400	Ø 35x100	E27	10/100
38255	LB-717	15	матовый	1230	2700	Ø 35x100	E14	10/100
38256	LB-717	15	прозрачный	1270	2700	Ø 35x100	E14	10/100
38257	LB-717	15	матовый	1280	4000	Ø 35x100	E14	10/100
38258	LB-717	15	прозрачный	1320	4000	Ø 35x100	E14	10/100
38259	LB-717	15	прозрачный	1340	6400	Ø 35x100	E14	10/100

*диммируемые лампы

Feron.ru

ALUMINIUM BULKHEAD LAMP



Product&Family Code: 070 014 0100

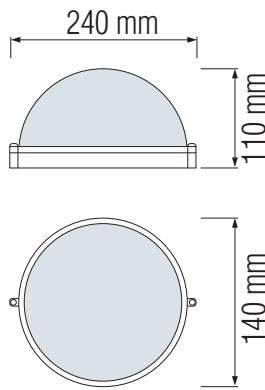
MUNZUR

Technical Data

Voltage (V)	220-240V
Product Wattage (W)	Max. 100W
Lamp Type	E27
WEEE Regulation Appropriate	Yes
Operation Temperature	-20 / +40
Materials	Aluminium + Glass
Protection Class	I
Dimmable	No
EEI	-
IP Rating	54

WHITE
BLACK

Technical Drawing



Applications

- Designed outdoor applications: Ceiling mounting, Wall (surface)



Features

- Easy installation
- High heat dissipation, low carbon and environmental protection.
- Low energy bulb (Bulb not included)



LED PROJECTOR


BLACK

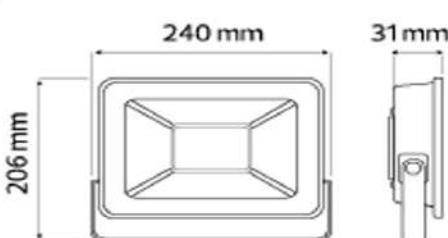

Product Code: 068 003 0100

PUMA-100

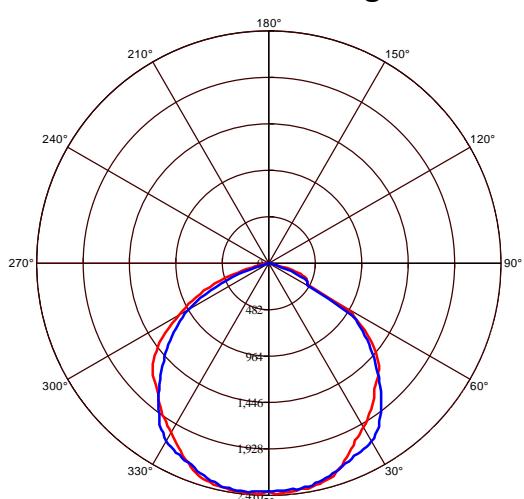
Technical Data

Voltage (V)	175-250V
Product Wattage (W)	100
Equivalence with incandescent lamp(W)	800
Colour Render Index (Ra)	>Ra 70
Colour Temperature (K)	6400K
Materials	Aluminium Die Casting Body
Protection Class	I
Dimmable	No
EEI	
Warm-up time up to 60 %of the full light output	Instant Full Light
Luminous Flux (lm)	10000
Luminous Efficacy (lm/W)	100
Rated Life (hrs) (L)	20.000
IP Rating	65
Power Factor	>0.9
Beam Angle	120°
Starting Time	<0.2s
Number of ON-OFF cycling	x10.000
Working Temperature	-40C / +55C

Technical Drawing



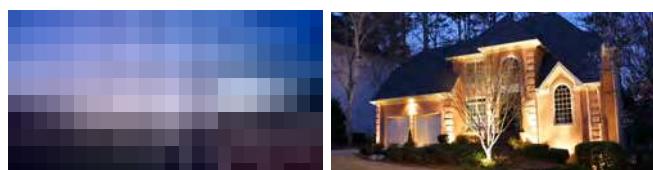
Photometric Diagram


b C0 Plane beam angle(50%) b C90 Plane beam angle(50%)

C0 Plane beam angle(50%):111.8(DEG) C90 Plane beam angle(50%):107.9(DEG)

Applications

- Stadiums, Outdoor



Features

- High Lumen and CRI, Good quality & Constant Current driver.
- High heat dissipation, low carbon and environmental protection.
- SMD LED Lamp Base.
- Very low energy consumption.



LED STREET LAMP


GRAY

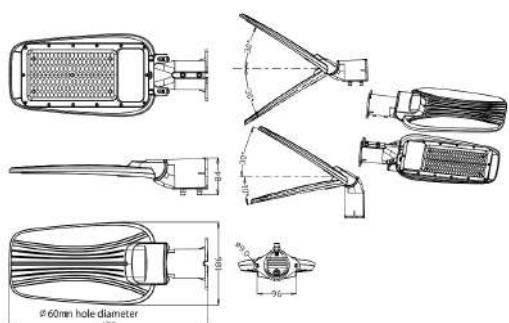

Product & Family Code: 074 014 0100

FLORIDA-100

Technical Data

Voltage (V)	100-265V
Product Wattage (W)	100
Equivalence with incandescent lamp (W)	800
Colour Render Index (Ra)	>Ra80
Colour Temperature (K)	6400K
Materials	Aluminium + PC
Protection Class	I
Dimmable	No
EEI	
Warm-up time up to 60 % of the full light output	Instant Full Light
Luminous Flux (lm)	10000
Luminous Efficacy (lm/W)	100
Rated Life (hrs) 	40.000
IP Rating	65
Power Factor	>0.9
Beam Angle	90 °
Hole Diameter (mm)	60mm
Installation Height (m)	8-9m

Technical Drawing



Applications

Street.



Features

- High Lumen and CRI, Good quality & Constant Current driver..
- High heat dissipation, low carbon and environmental protection..
- SMD LED Lamp Base.
- Aluminum Body

