

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:

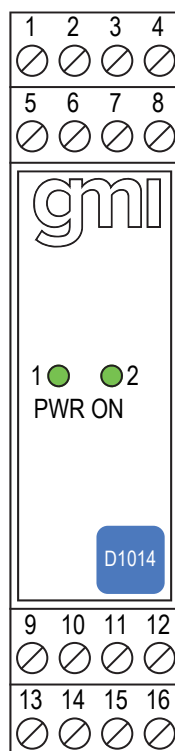
Fully compliant with CE marking applicable requirements.

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 Tproof = 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, IECEx, 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.

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 | |

Technical Data:

Supply:

12-24 Vdc nom (10 to 30 Vdc) reverse polarity protected, ripple within voltage limits ≤ 5 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 ≈ 25 mA).

Transmitter line voltage:

≥ 15.0 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 ≈ 25 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: ≤ 20 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 ± 1 °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 °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 °C, relative humidity max 95 %.

Storage: temperature limits -45 to +80 °C.

Safety Description:



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

IECEx: [Ex ia Ga] IIC, [Ex ia Da] IIC, [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 / I / 2 / ABCD / T4, NI / I / 2 / IIC / T4, AIS / I, II, III / 1 / ABCDEFG, AEx [ia] IIC

FM-C: NI / I / 2 / ABCD / T4, NI / I / 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 °C \leq Ta \leq 60 °C.

Approvals:

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

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

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

IECEx 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. TÜV 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 accommodate 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.

Parameters Table:

| Safety Description | Maximum External Parameters | | | |
|------------------------|-----------------------------|-------------------------|------------|--------------------------------|
| | Group Cenelec | Co/Ca (μF) | Lo/La (mH) | Lo/Ro ($\mu\text{H}/\Omega$) |
| 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:

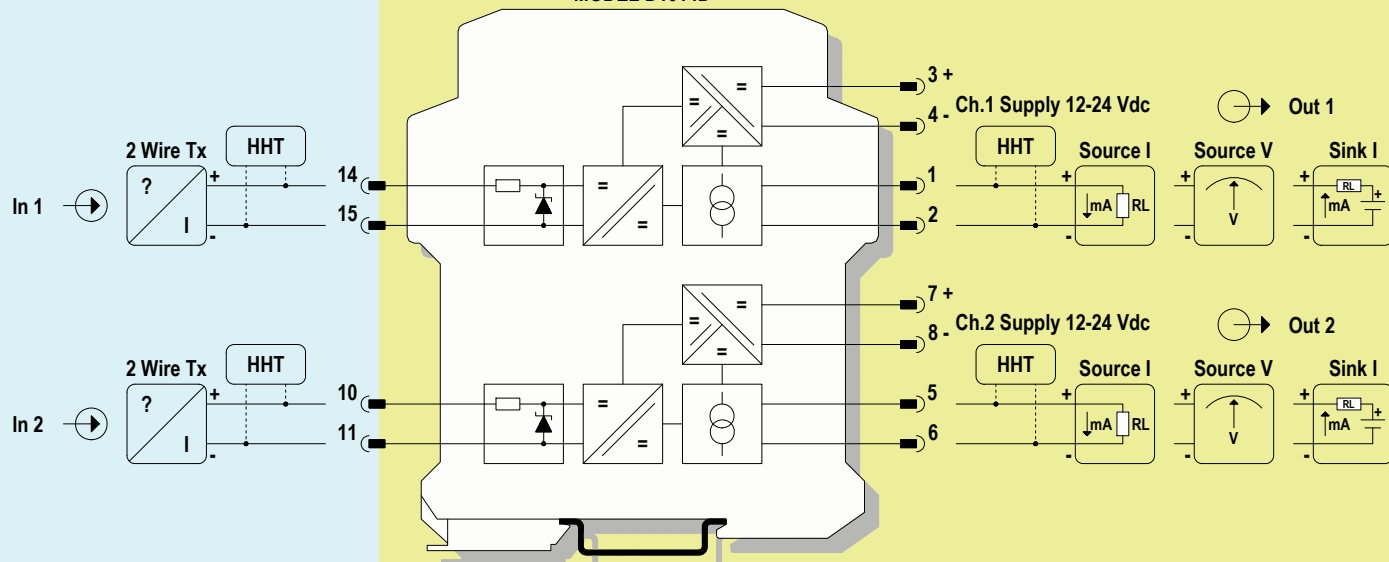


Function Diagram:

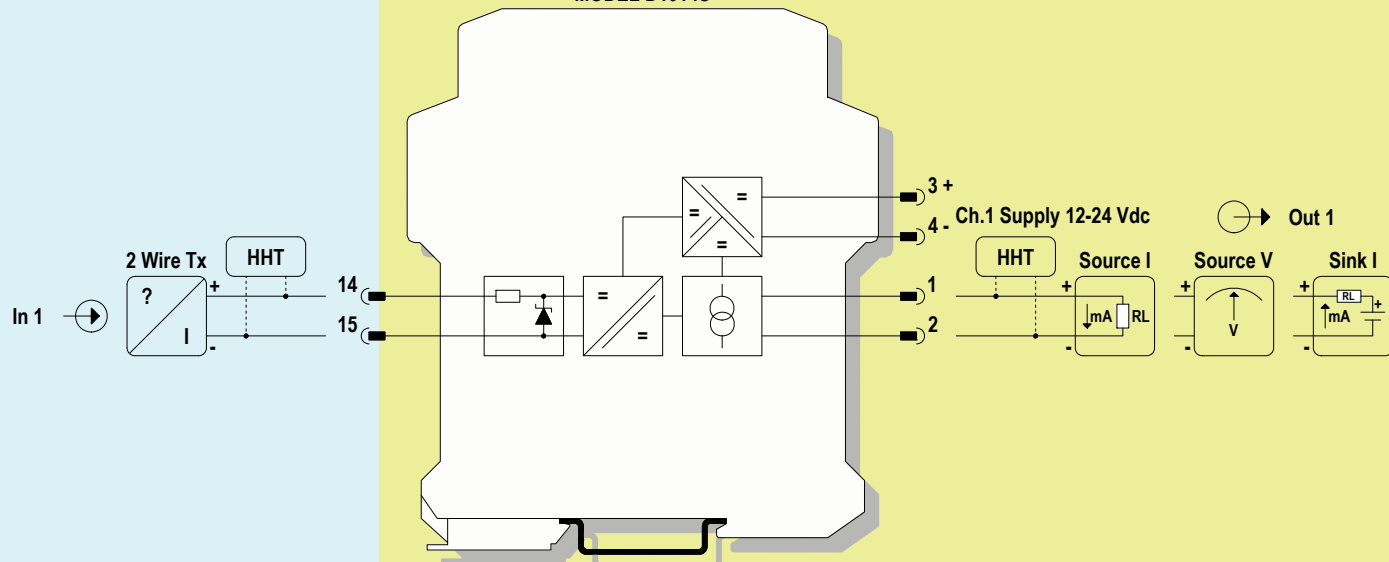
HAZARDOUS AREA ZONE 0 (ZONE 20) GROUP IIC,
HAZARDOUS LOCATIONS CLASS I, DIVISION 1, GROUPS A, B, C, D,
CLASS II, DIVISION 1, GROUPS E, F, G, CLASS III, DIVISION 1,
CLASS I, ZONE 0, GROUP IIC

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

MODEL D1014D



MODEL D1014S





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

UL

CE

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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.



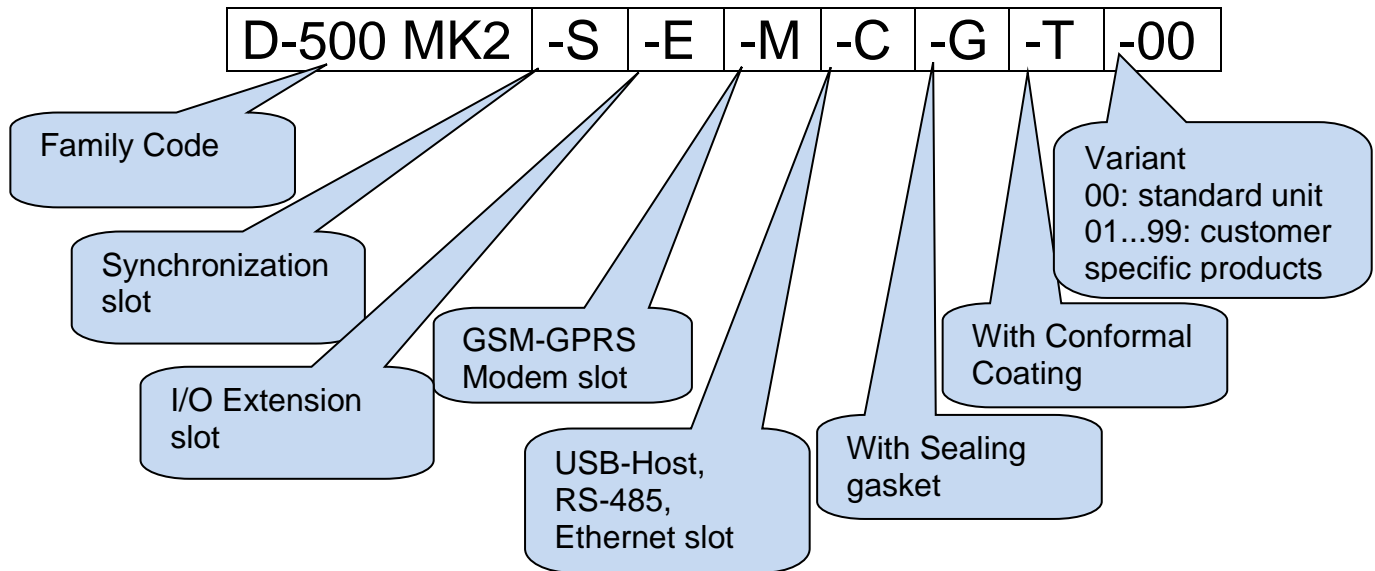
WARNING: Potential risk of malfunction or material damage.



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.**

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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

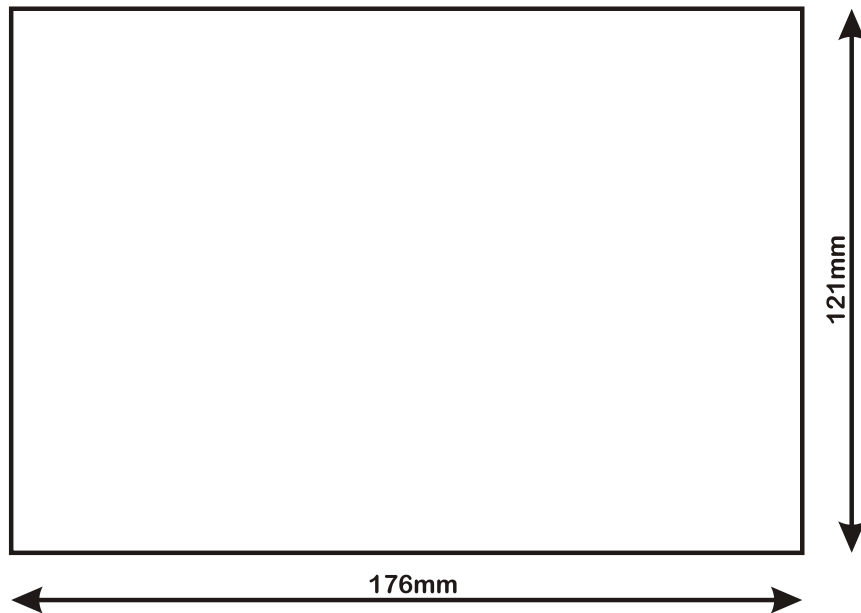
Weight: 500g (approx..)



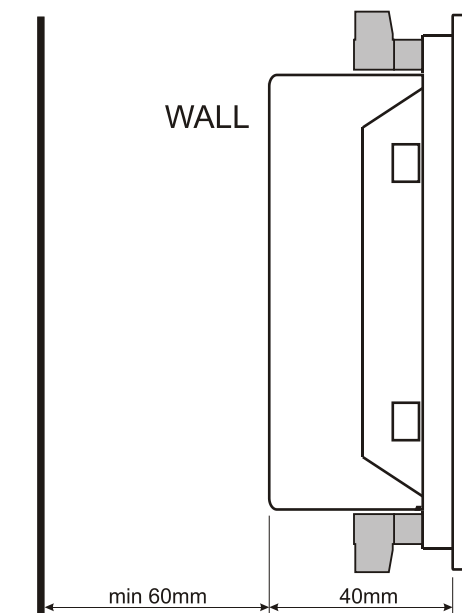
The unit is designed for panel mounting. The user should not be able to access parts of the unit other than the front panel.

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.



Panel Cutout



Required Panel Depth

Two different types of brackets are provided:



Screw type bracket



Self retaining type bracket



Installation of screw type bracket

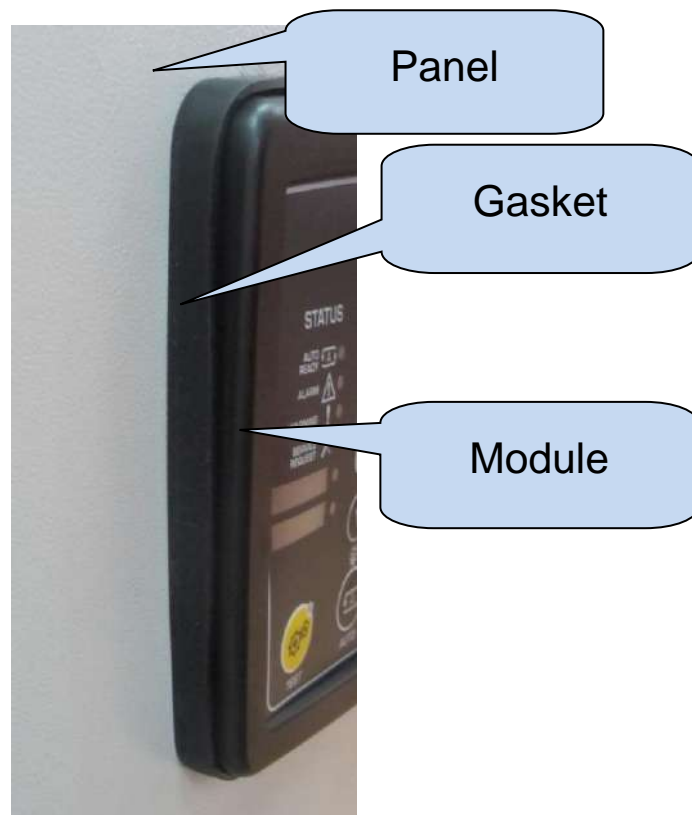


Installation of self-retaining type bracket



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) |

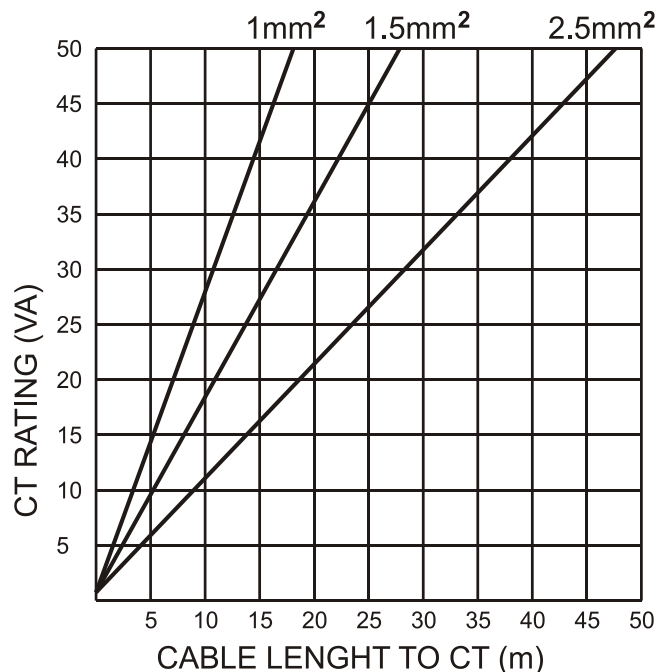
3.3. AC CURRENT INPUTS

| | |
|------------------------------------|--|
| 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 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.

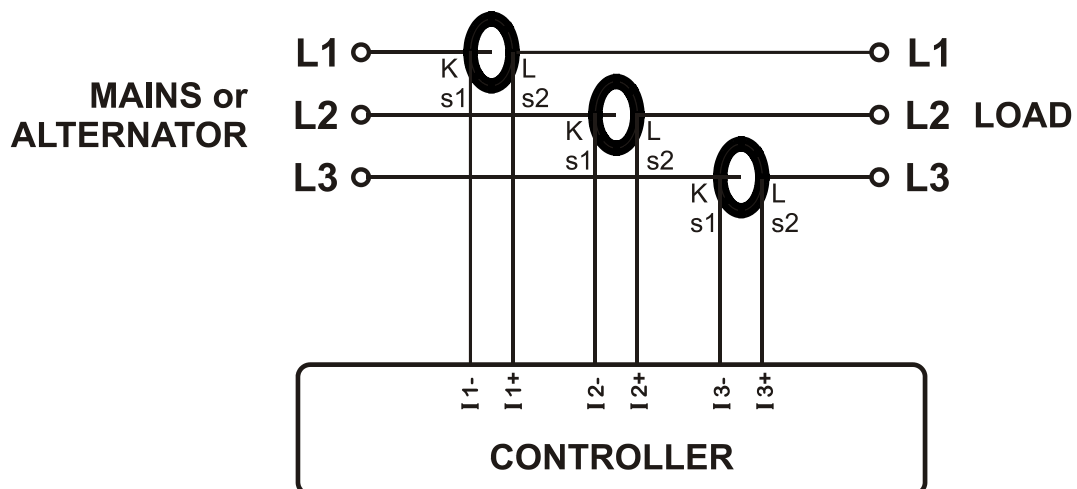


- **Current Transformers must be used for current measurement. No direct connection allowed.**
- **No common terminals or grounding allowed.**

CONNECTING CTs:

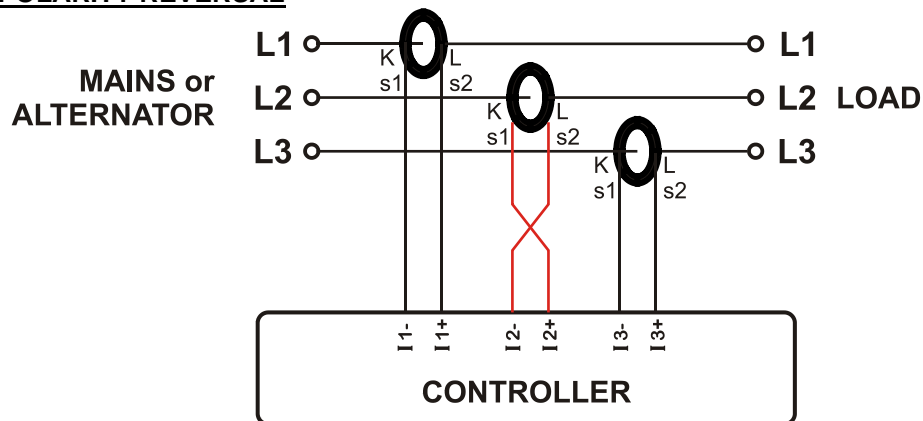
Be sure of connecting each CT to the related phase input with the correct polarity. Mixing CTs between phases will cause faulty power and pf readings.

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

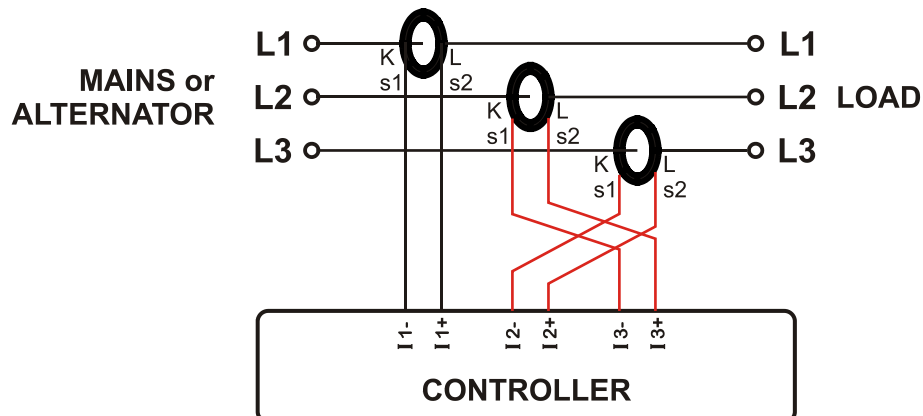
Let's suppose that the genset is loaded with 100 kW on each phase. The load Power Factor (PF) is 1. Measured values are as follows:

| | 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 |

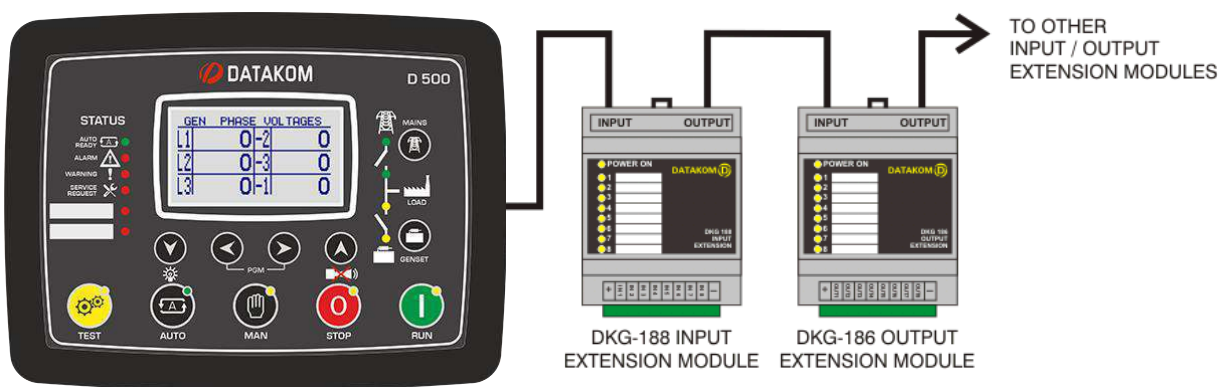
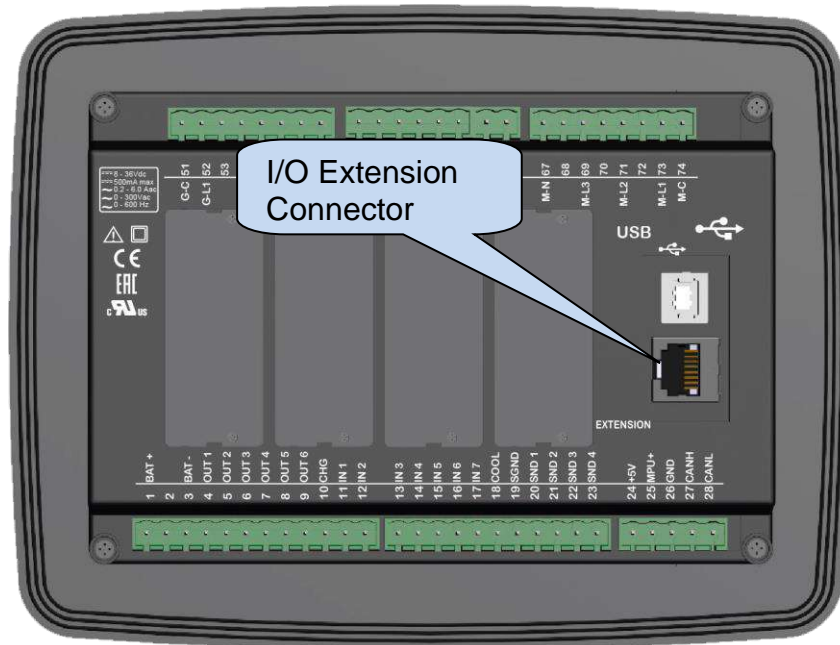
3.11. INPUT/OUTPUT EXTENSION

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.

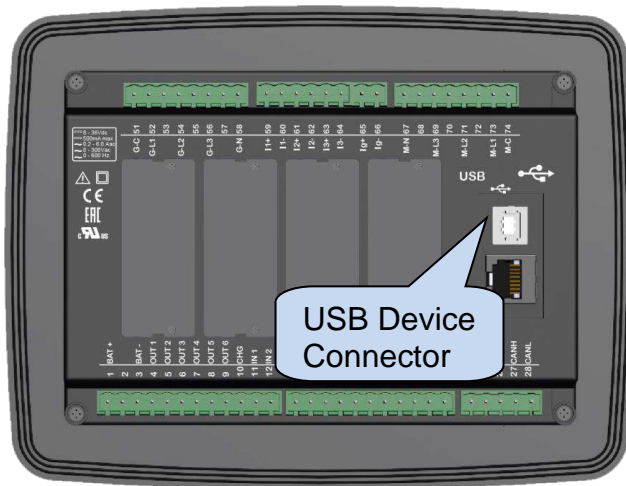
Input and output extension modules are connected to the main controller in a cascade structure, in any order. The connection cable is provided with each extension module.



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.

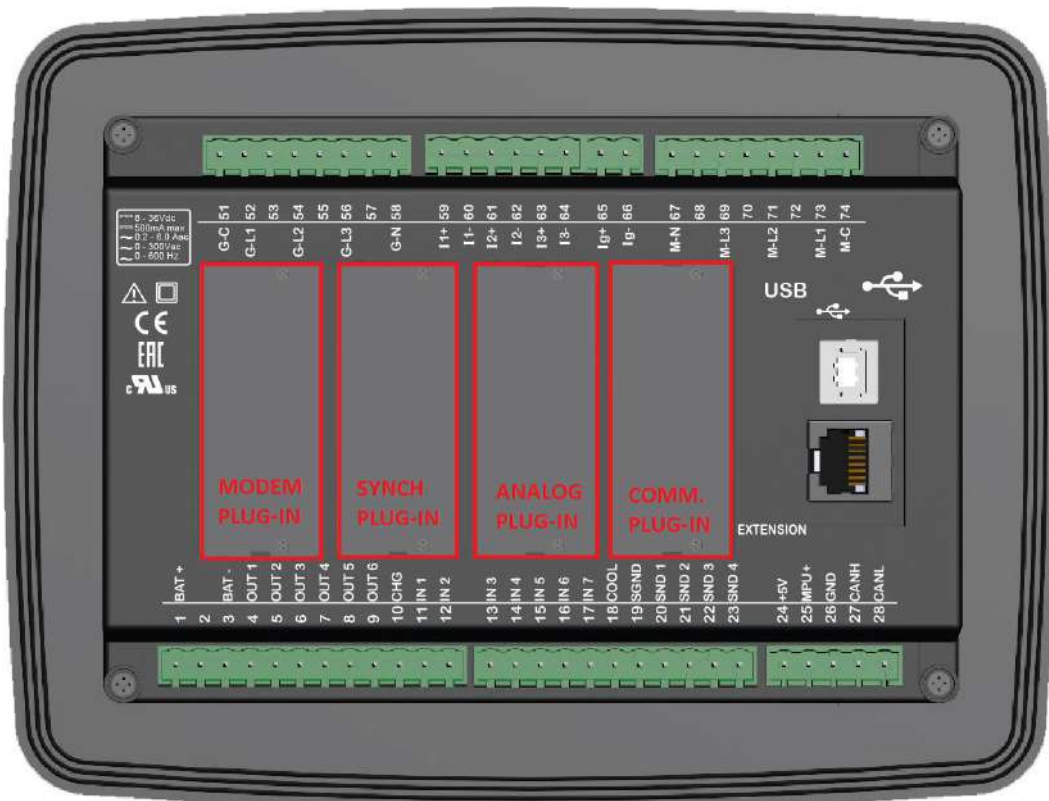
The connector on the module is of USB-B type. Thus, A to B type USB cable should be used. This is the same cable used for USB printers.

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



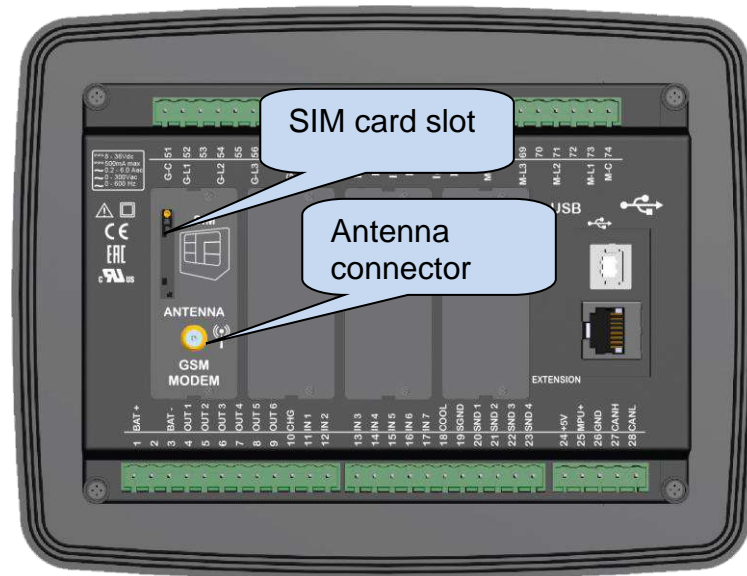
| PLUG-IN MODULES | |
|-------------------------|--|
| MODEM PLUG-IN | -2G Modem Slot, -3G Modem Slot, -4G Modem Slot, -Wi-Fi Slot, -Ethernet Slot, -RS-485 Slot |
| SYNCHRONIZATION PLUG-IN | -Synchronization Slot |
| ANALOG PLUG-IN | -Analog I/O Extension Slot, -3xMains CT Inputs Slot -DC Voltage and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

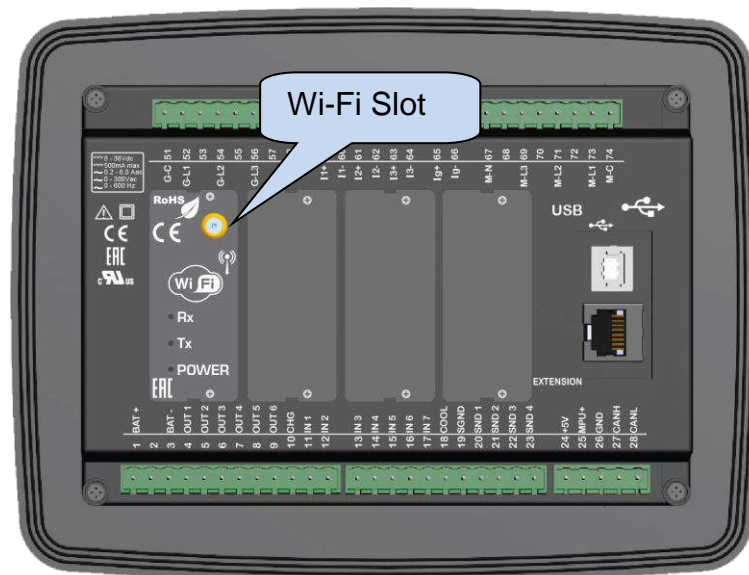
This feature is especially useful for the remote monitoring where the controller will appear automatically at its geo-position or for mobile gensets.

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.



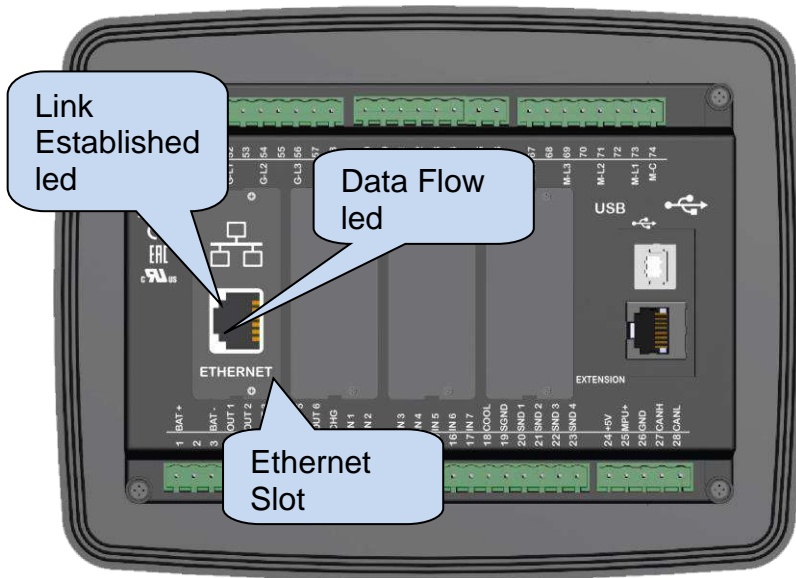
The location precision will depend of the GSM system. In highly populated areas, the precision is good (a few hundred meters), but rural areas may lead to errors of a many kilometers.

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

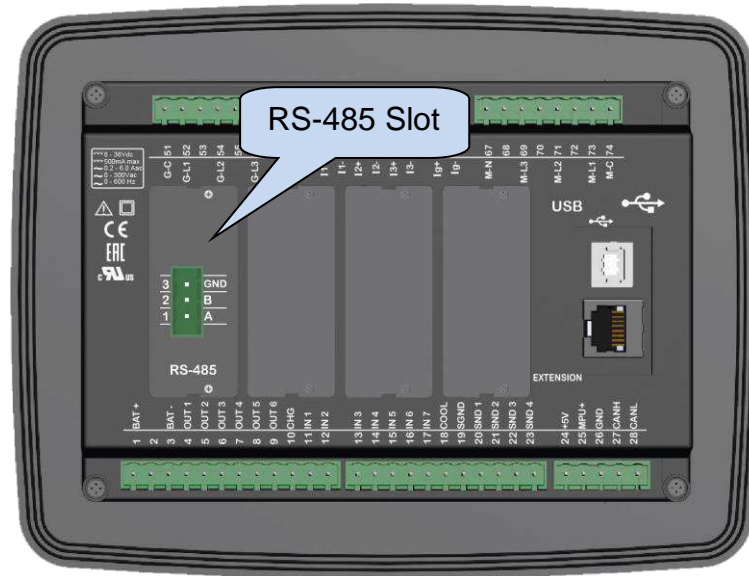
| | |
|-----------------------|--|
| Description: | IEEE802.3 compliant, 100 Base-TX RJ45 ethernet port with indicating leds |
| Data rate: | 100 Mbps, auto detecting |
| Connector: | RJ45 |
| Cable type: | CAT5 or CAT6 |
| Isolation: | 1500 VAC, 1 minute |
| Max distance: | 100m with CAT5 or CAT6 cable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



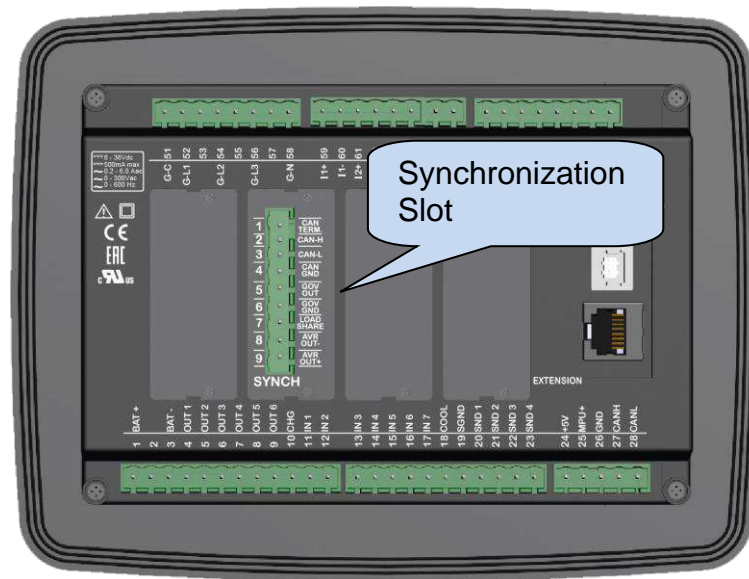
The Modbus register list is available at Datakom technical support.

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.

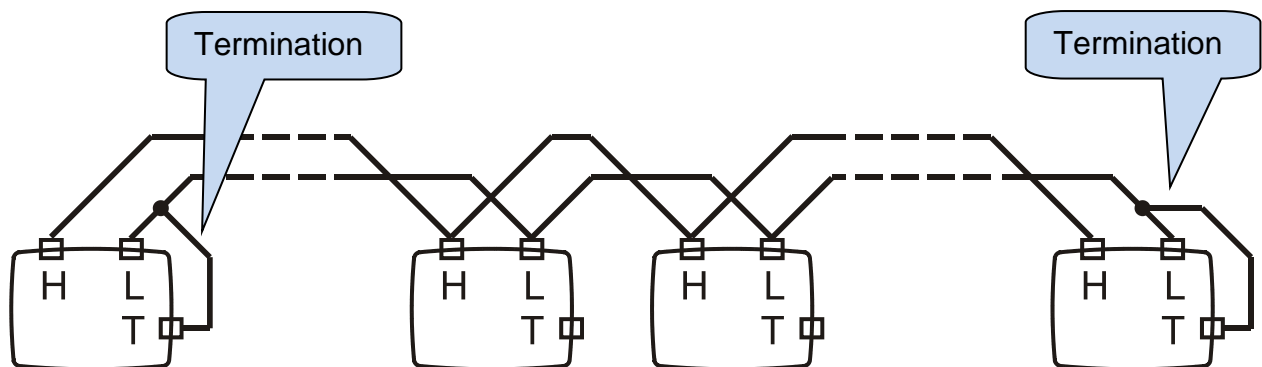


Figure illustrating the Datalink termination from two ends

4.2.4. ANALOG LOAD SHARE SIGNAL

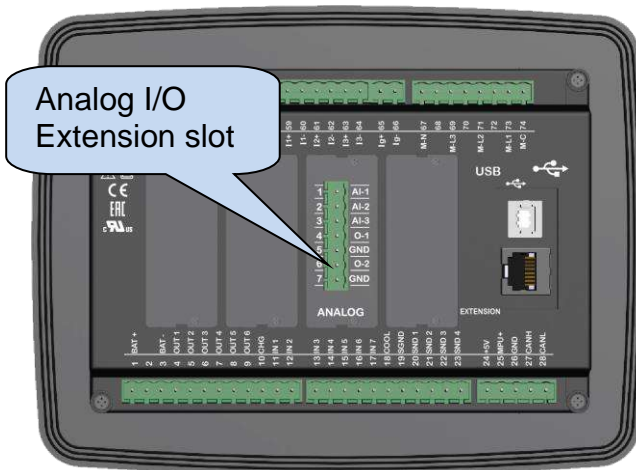
| | |
|--------------------------|--|
| Structure: | Non-isolated analog input & output, 0-10 VDC |
| Reference: | Battery negative |
| Output Impedance: | 1000 ohms |
| Precision: | 12 bits |
| Rest point: | Adjustable through program parameter |
| Sweep Range: | Adjustable through program parameter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

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



| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|----------------|-----|-----|-----|-----|-----|-----|-----|-----|
| AN_IN 5 RES | ON | --- | OFF | --- | --- | OFF | --- | --- |
| AN_IN 5 4-20MA | OFF | --- | ON | --- | --- | OFF | --- | --- |
| AN_IN 5 0-10V | OFF | --- | OFF | --- | --- | ON | --- | --- |
| AN_IN 6 RES | --- | ON | --- | OFF | --- | --- | OFF | --- |
| AN_IN 6 4-20MA | --- | OFF | --- | ON | --- | --- | OFF | --- |
| AN_IN 6 0-10V | --- | OFF | --- | OFF | --- | --- | ON | --- |
| AN_IN 7 4-20MA | --- | --- | --- | --- | ON | --- | --- | OFF |
| AN_IN 7 0-10V | --- | --- | --- | --- | OFF | --- | --- | ON |

The main configuration of the inputs is done with DIP switches located on slot.

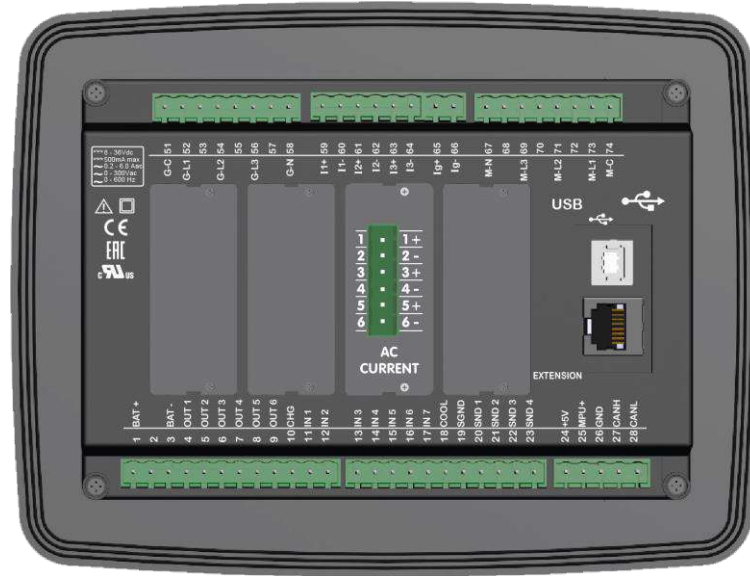


SND 8 cannot be switched to resistive input. The configuration can be 4-20 mA or 0-10 VDC.



Analog outputs will be functional with further firmware version.

4.3.2. 3 X MAINS CT INPUTS SLOT

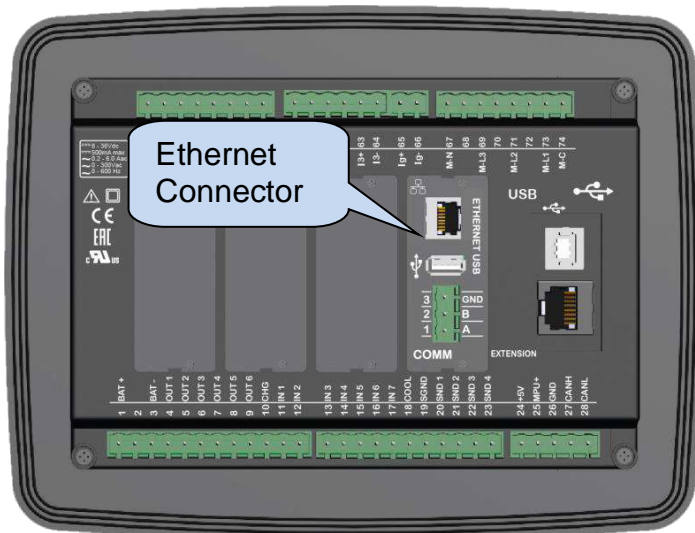


| | |
|------------------------------------|--|
| Measurement method: | True RMS |
| Sampling rate: | 8000 Hz |
| Harmonic analysis: | up to 31th harmonic |
| Supported topologies: | 3 ph 4 wires star, 3 ph 4 wires delta, 3 ph 3 wires delta 3 ph 3 wires delta L1-L2 3 ph 3 wires delta L2-L3 2ph 3 wires 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 (± 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:

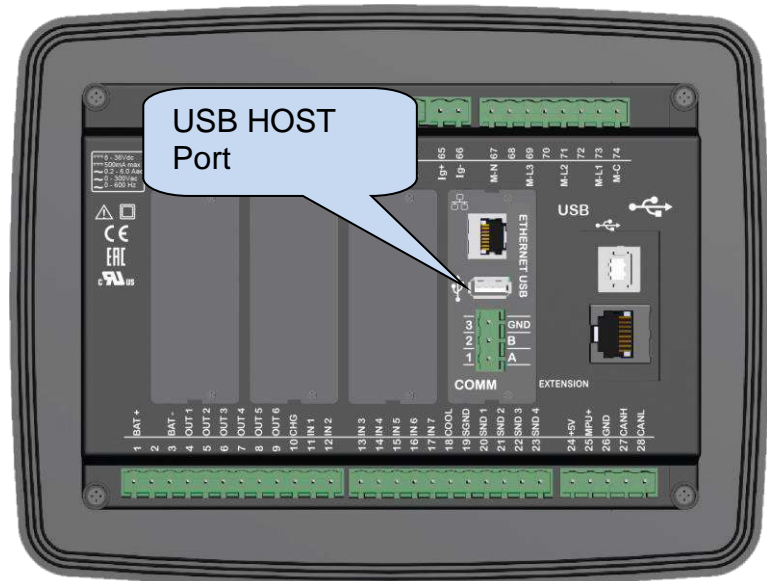
GREEN: This led turns on when the ethernet link is established (connector inserted)

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 Mbps/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.

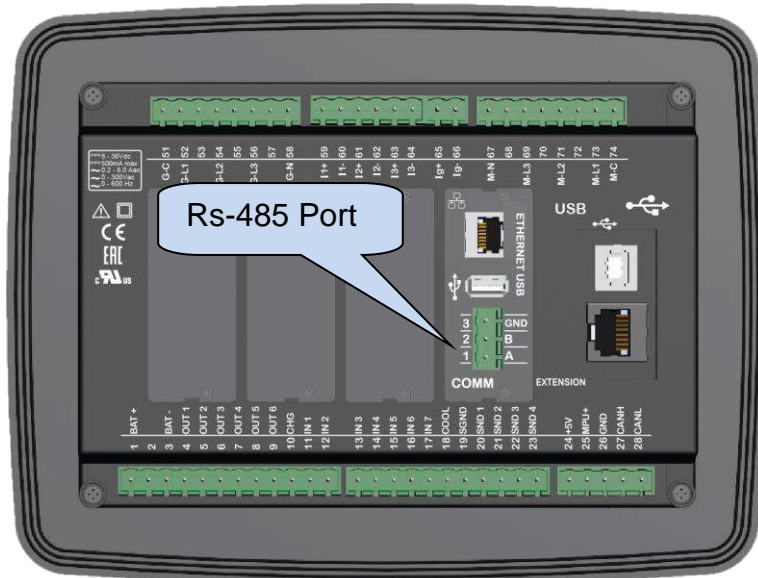
As soon as a USB flash memory is inserted, the unit will start data recording and continue until the memory is removed.

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

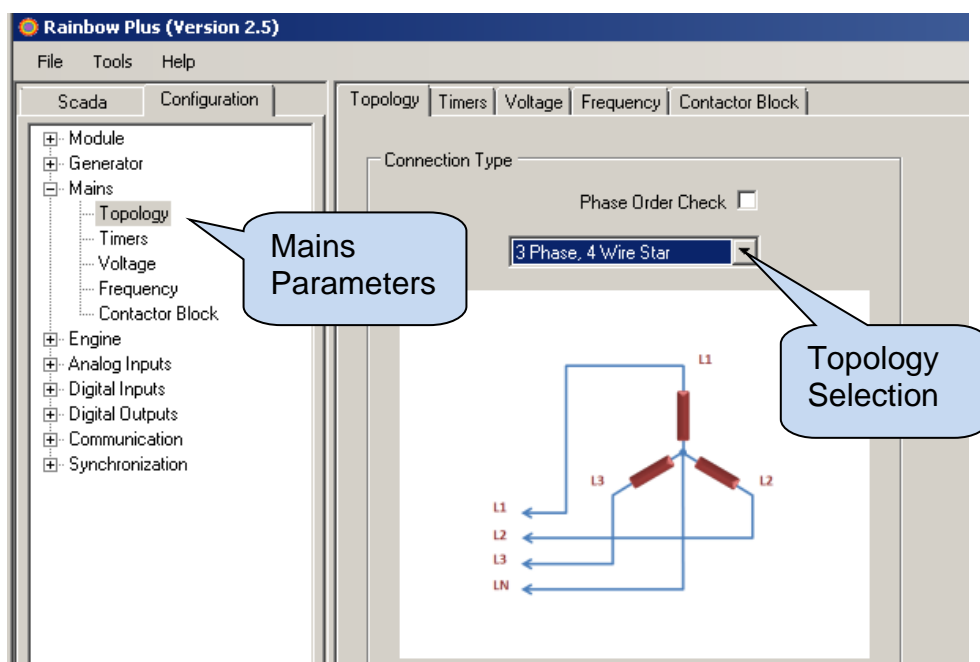
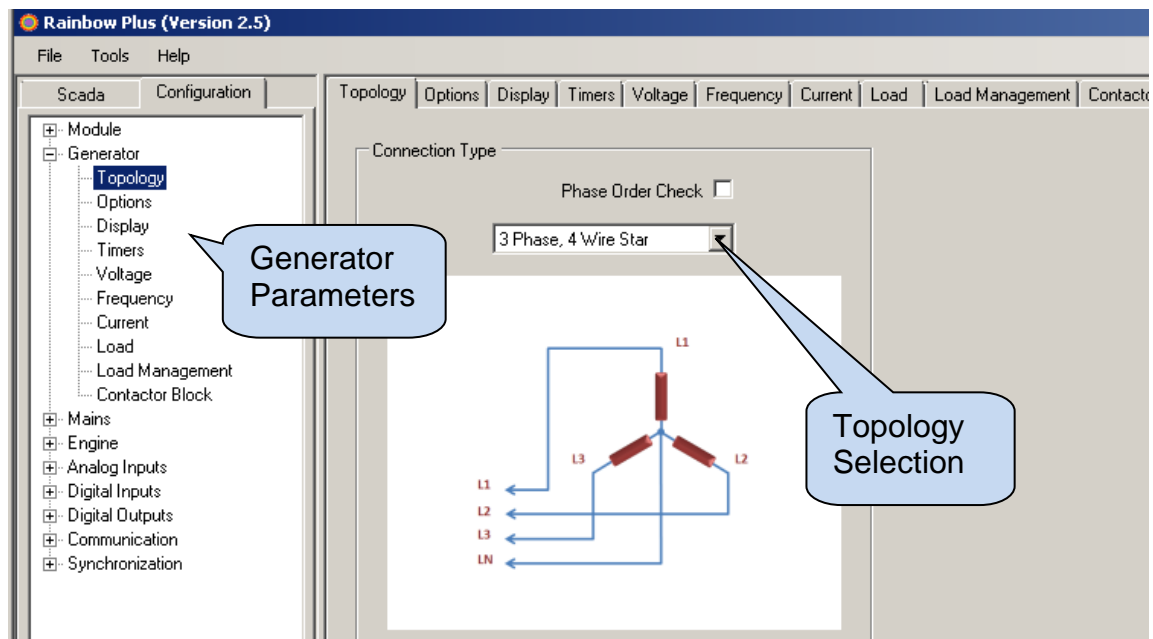
Various topologies are selectable through program parameter.

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

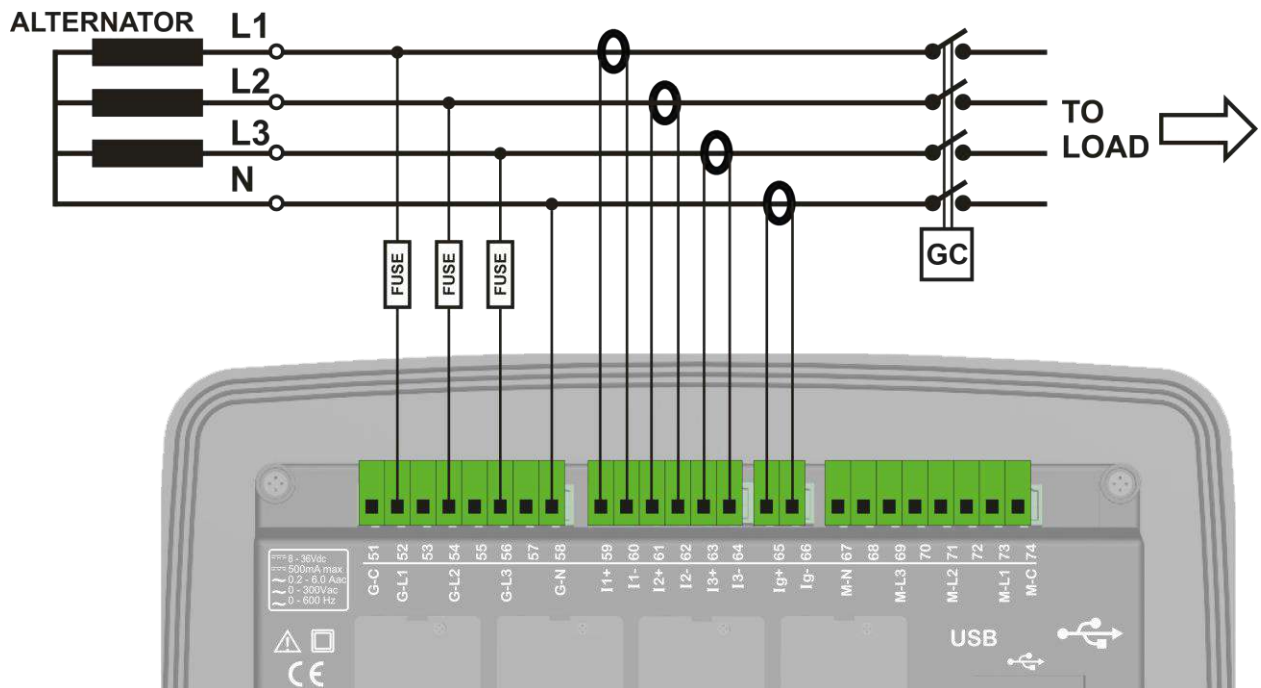
In following drawings, the connections are shown for the alternator. Current transformers are supposed connected to the alternator side.

Similar topologies are available for the mains side as well.

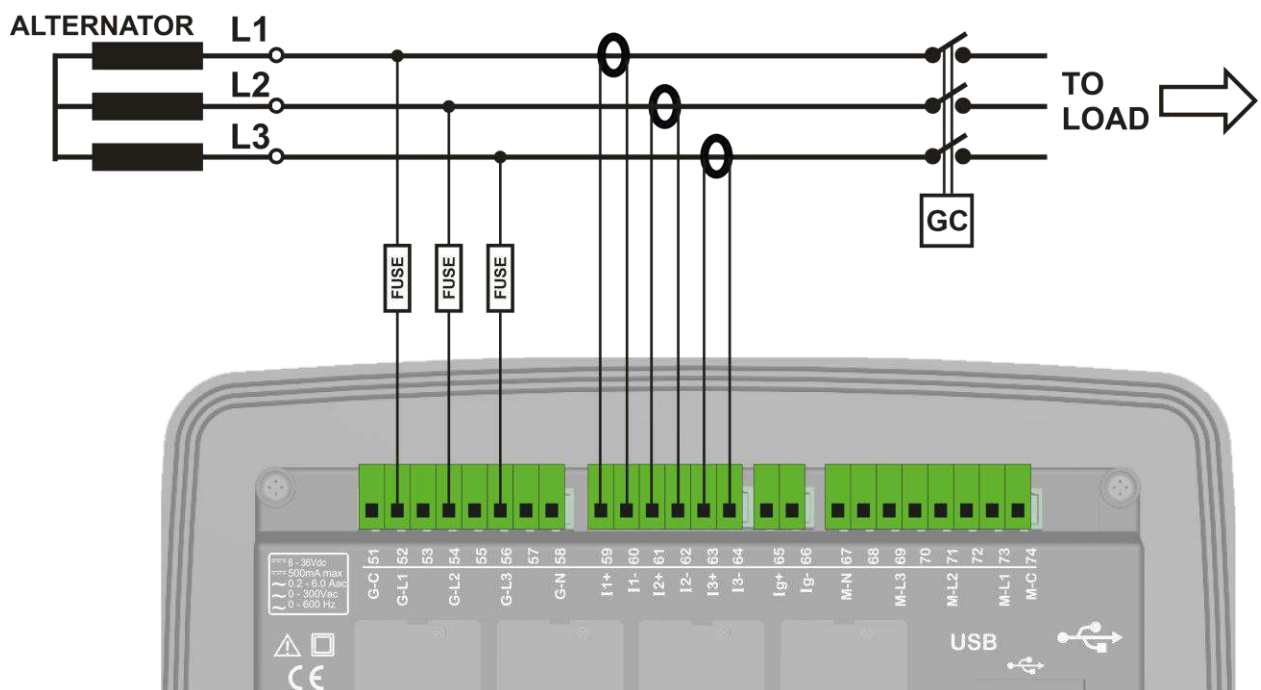
5.1. SELECTING THE TOPOLOGY



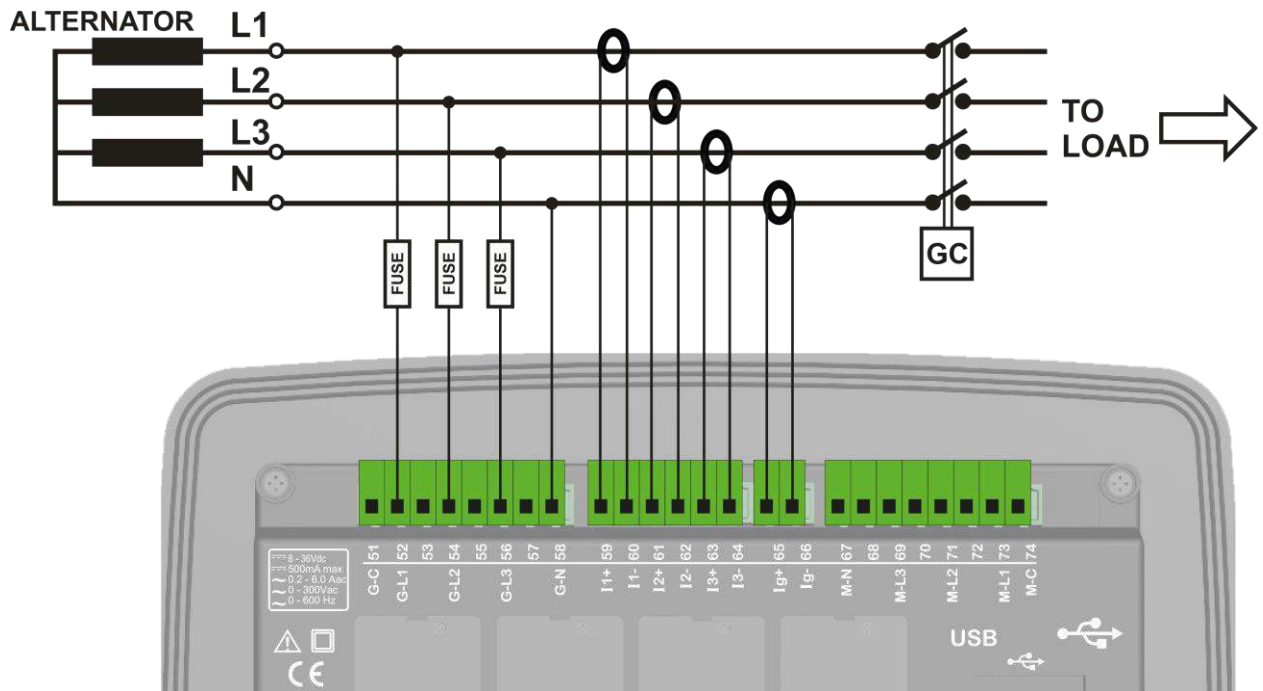
5.2. 3 PHASE, 4 WIRE, STAR



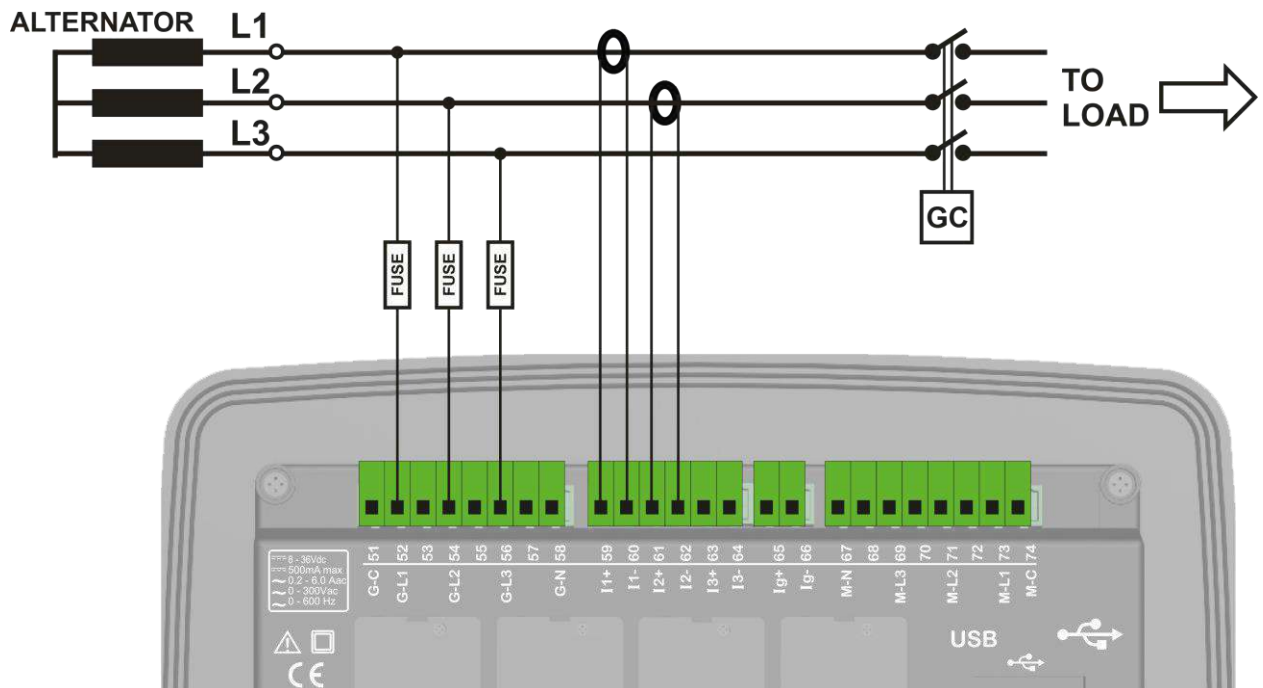
5.3. 3 PHASE, 3 WIRE, DELTA



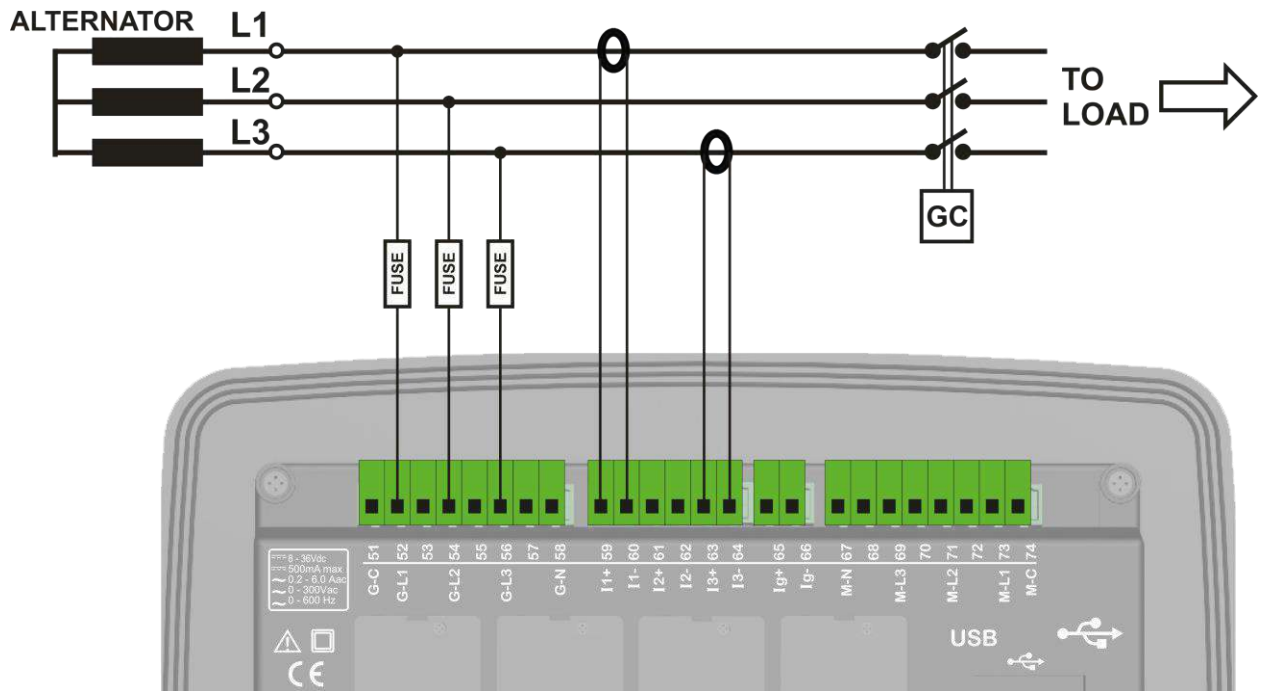
5.4. 3 PHASE, 4 WIRE, DELTA



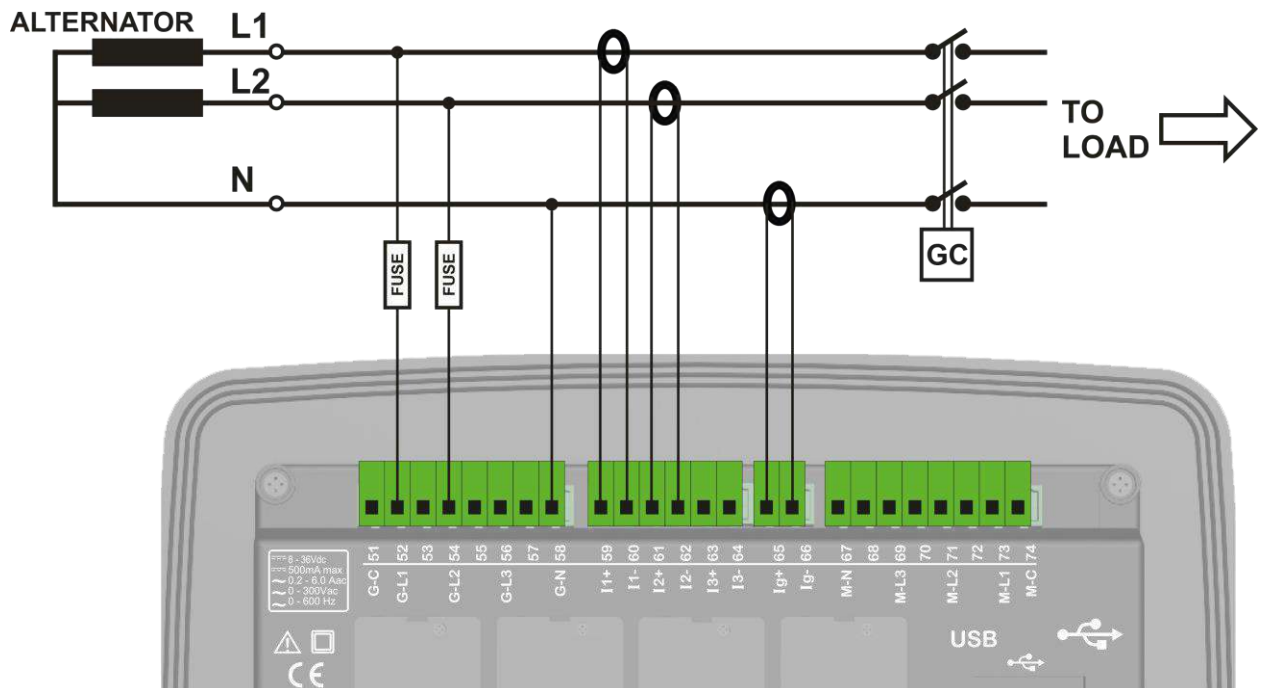
5.5. 3 PHASE, 3 WIRE, DELTA, 2 CT (L1-L2)



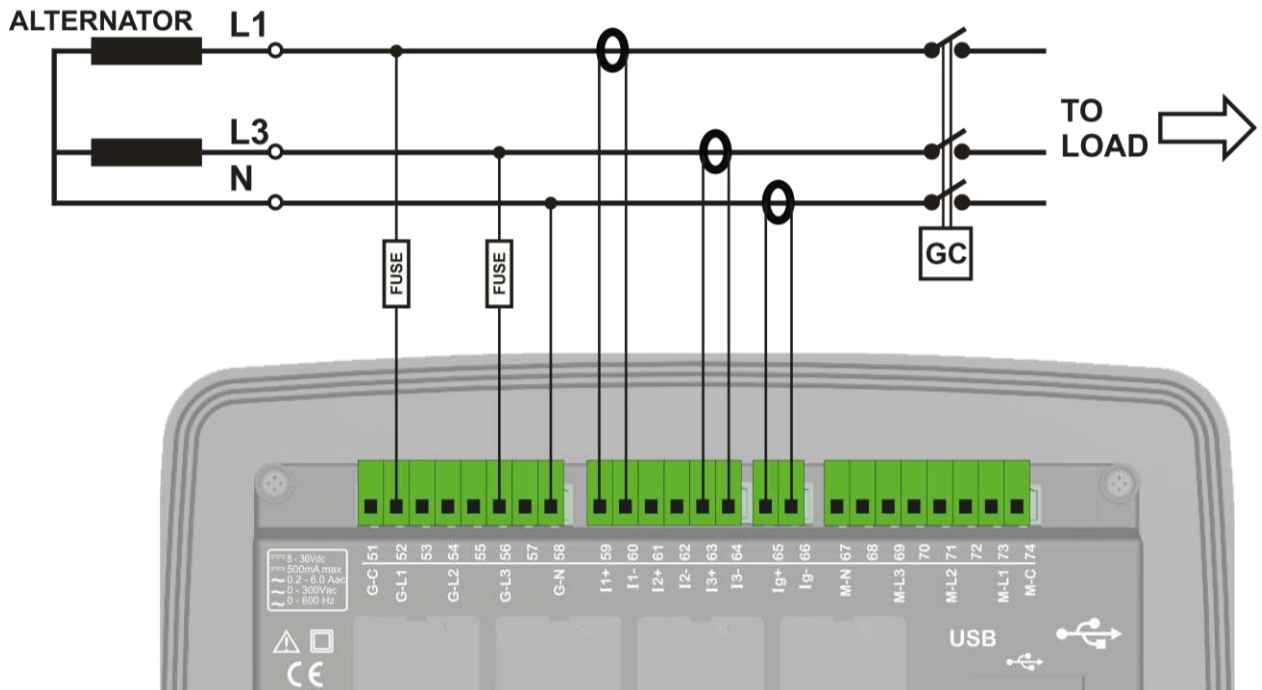
5.6. 3 PHASE, 3 WIRE, DELTA, 2 CT (L1-L3)



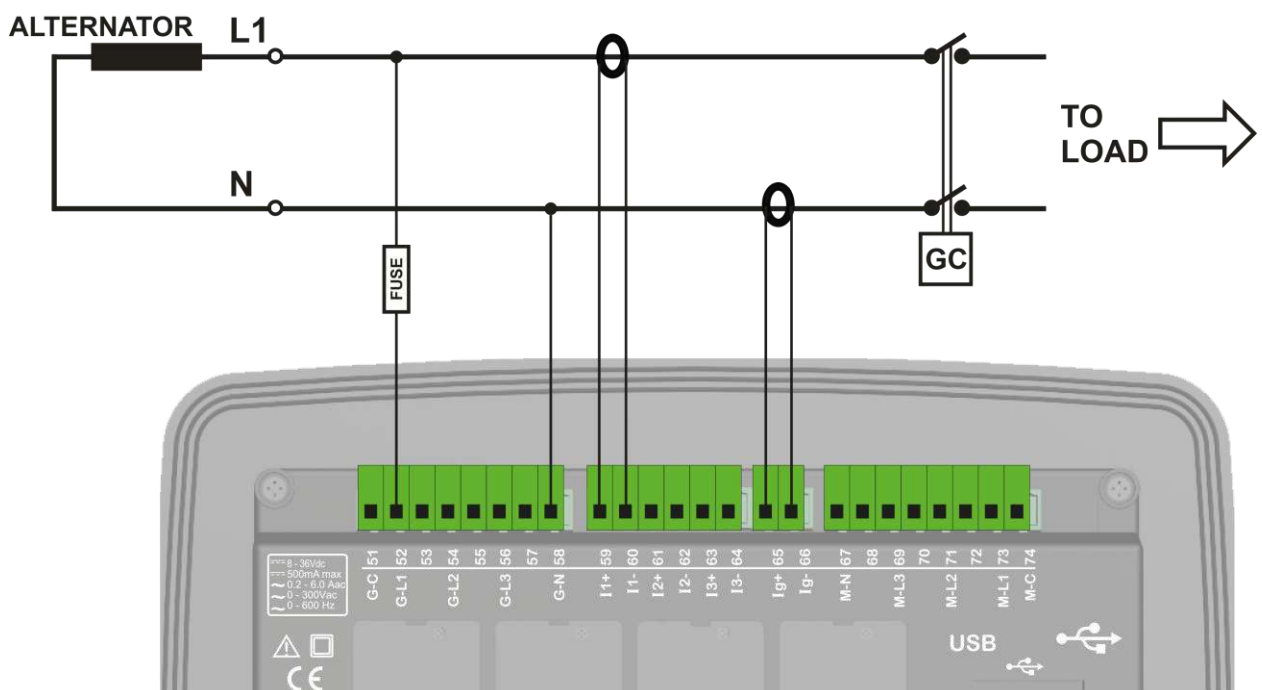
5.7. 2 PHASE, 3 WIRE, DELTA, 2 CTs (L1-L2)



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



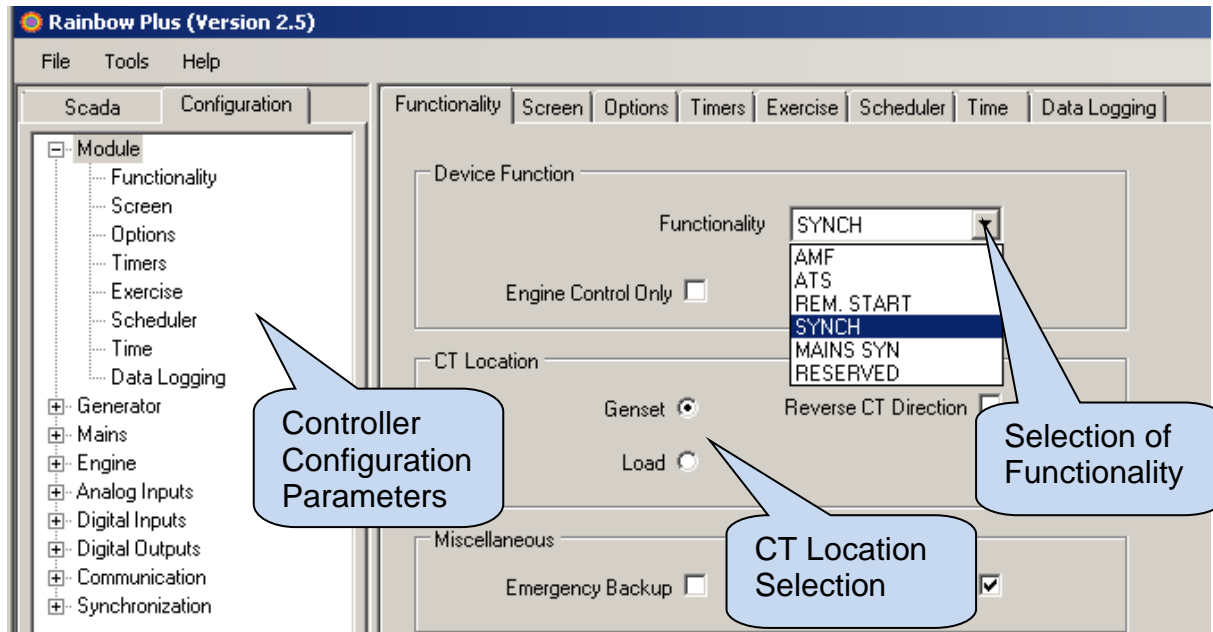
5.9. 1 PHASE, 2 WIRE



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.



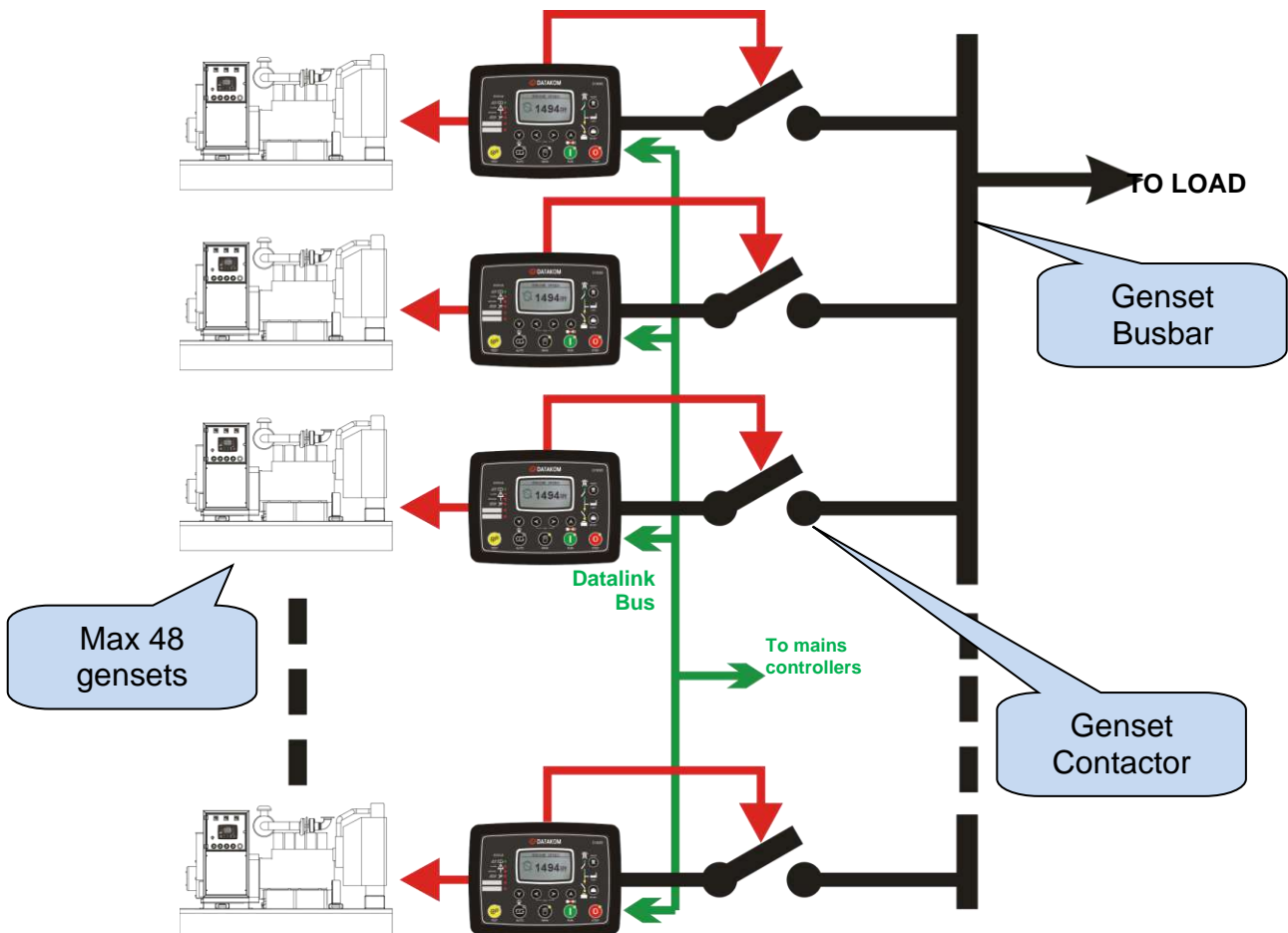
6.1. CT LOCATION SELECTION

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.

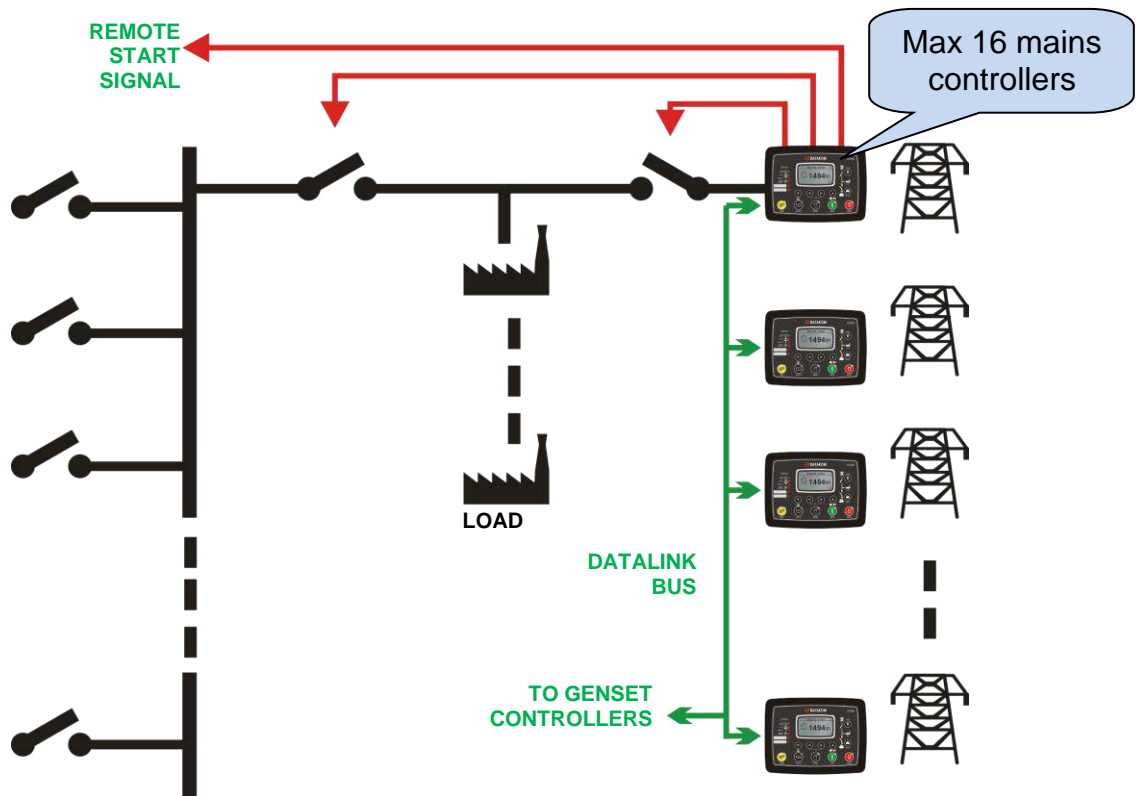
6.3 MAINS SYNCHRONIZATION FUNCTIONALITY

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.

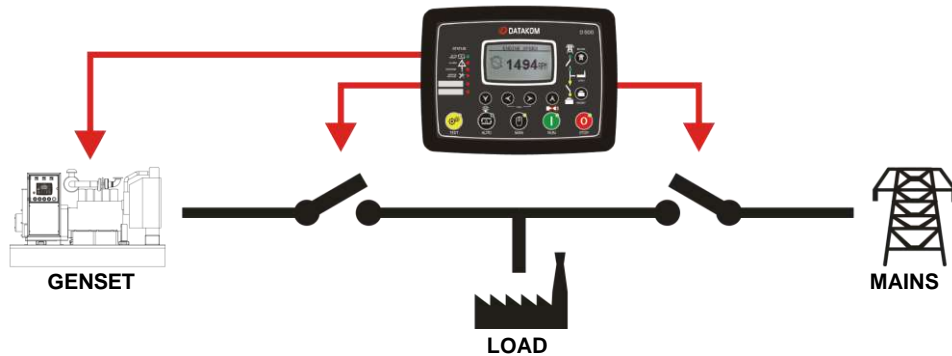
The controller has various built-in "mains failure during parallel" protections. These are necessary to prevent the genset system feeding the grid. Protections are capable of isolating gensets from the grid as fast as 2 to 5 cycles.

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.

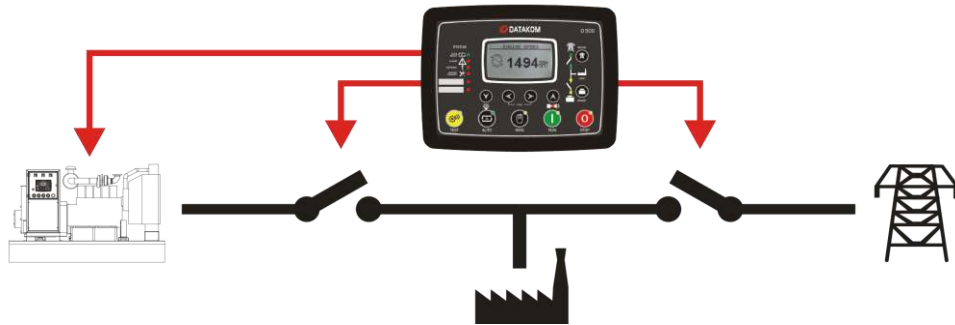
Continuous parallel operation for immediate recovery of mains failures is achieved in peak lopping mode.

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.

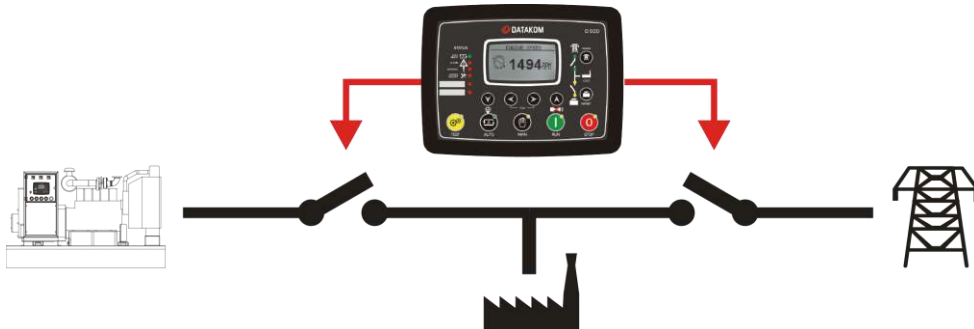


The unit features both MPU and J1939 CANBUS inputs. Thus both mechanical and electronic engines are supported.

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

6.6. ATS FUNCTIONALITY

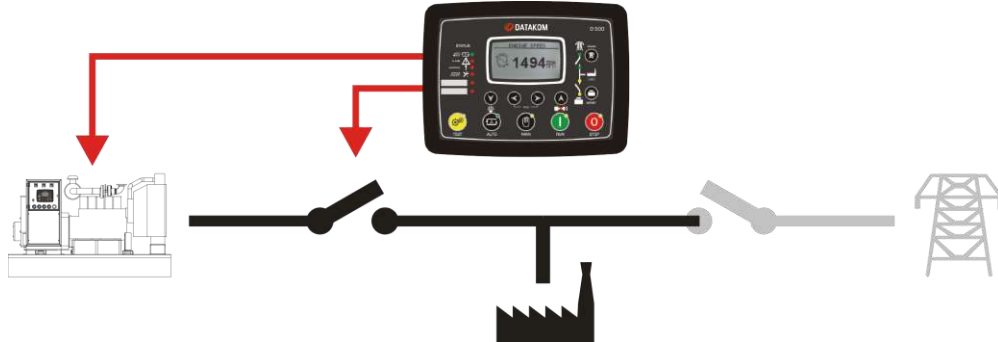
When ATS functionality is selected, the unit will monitor mains voltages, provide mains and genset contactor control and issue a Remote Start signal to the engine controller. It will provide alternator instrumentation and fault monitoring.



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

6.7. REMOTE START FUNCTIONALITY

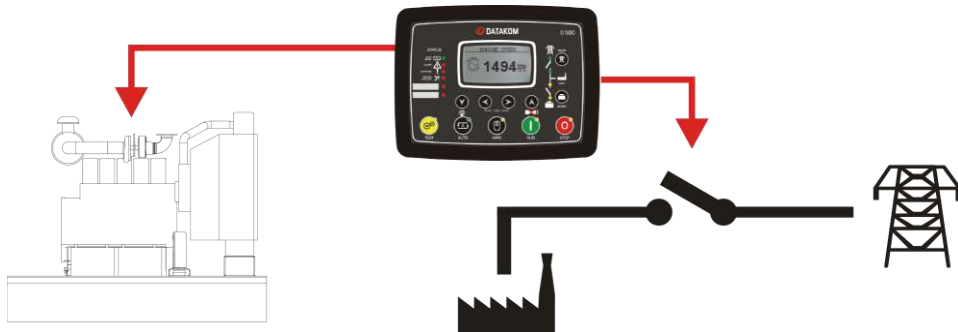
When the Remote Start functionality is selected, the unit will wait for a Remote Start signal from external controller. Upon reception of this signal, it will run the engine, and provide engine and alternator instrumentation and fault monitoring. The genset contactor/MCB control functionality will be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

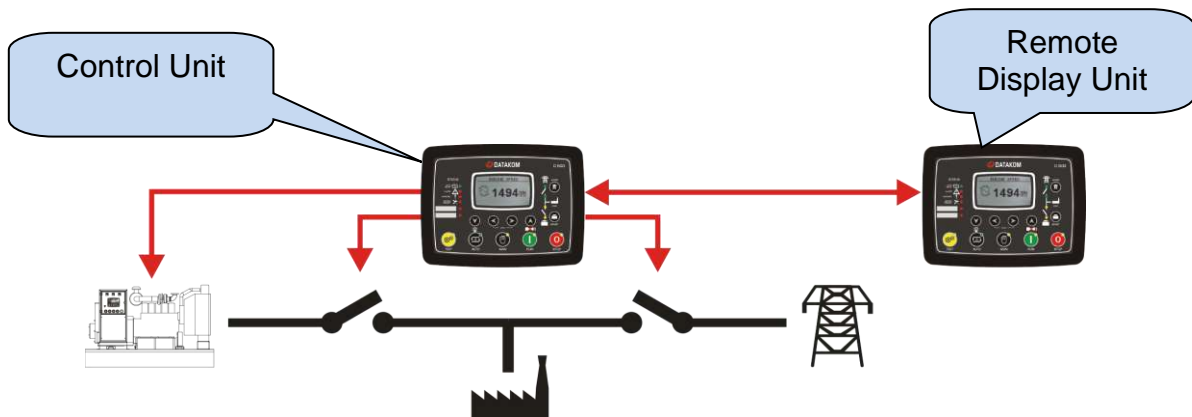
The unit features both MPU and J1939 CANBUS inputs. Thus both mechanical and electronic engines are supported.



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.

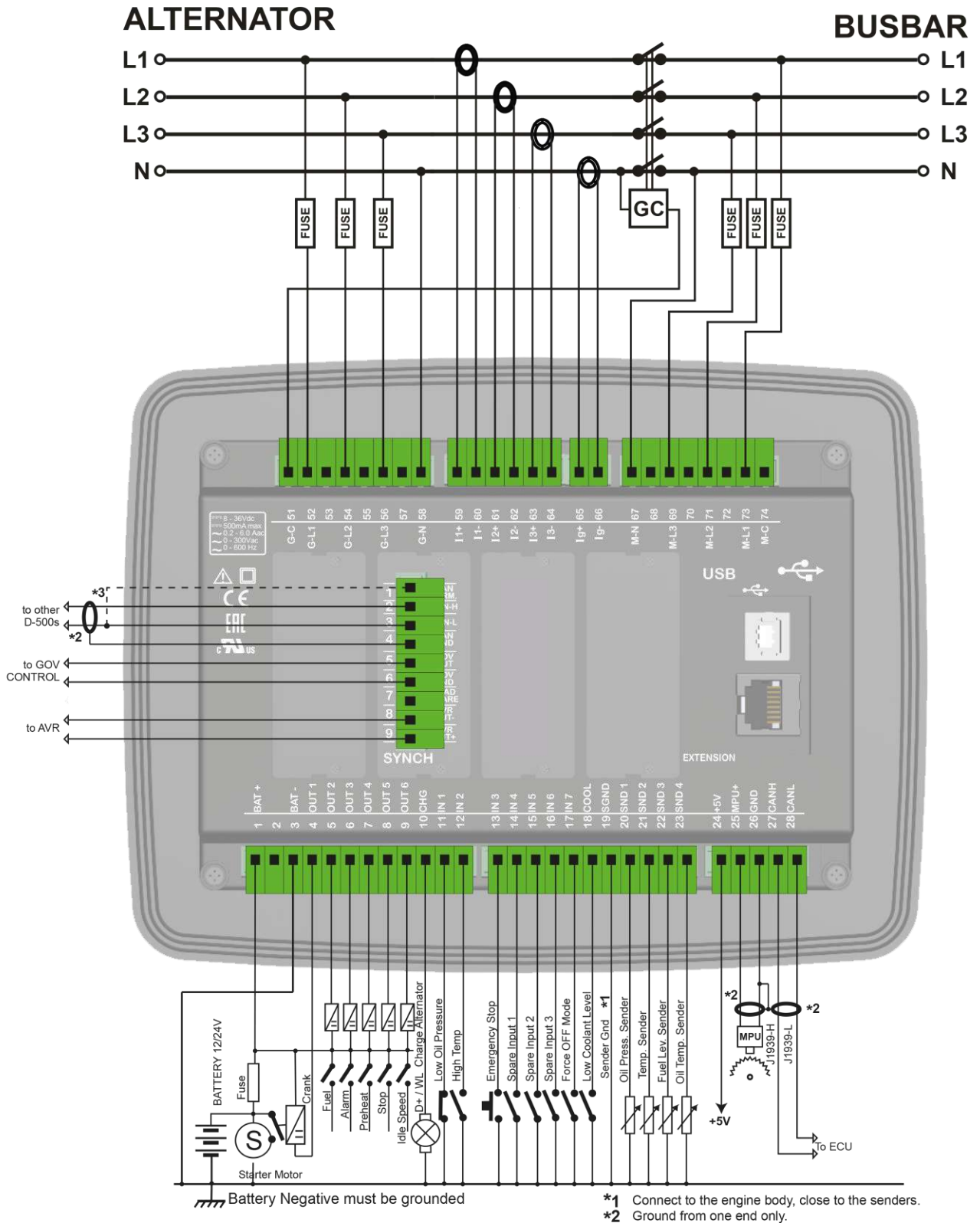
The bandwidth of the harmonic analyzer is limited to 1800Hz. Thus in case of a 400Hz system, only the 3rd harmonic will be displayed.

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

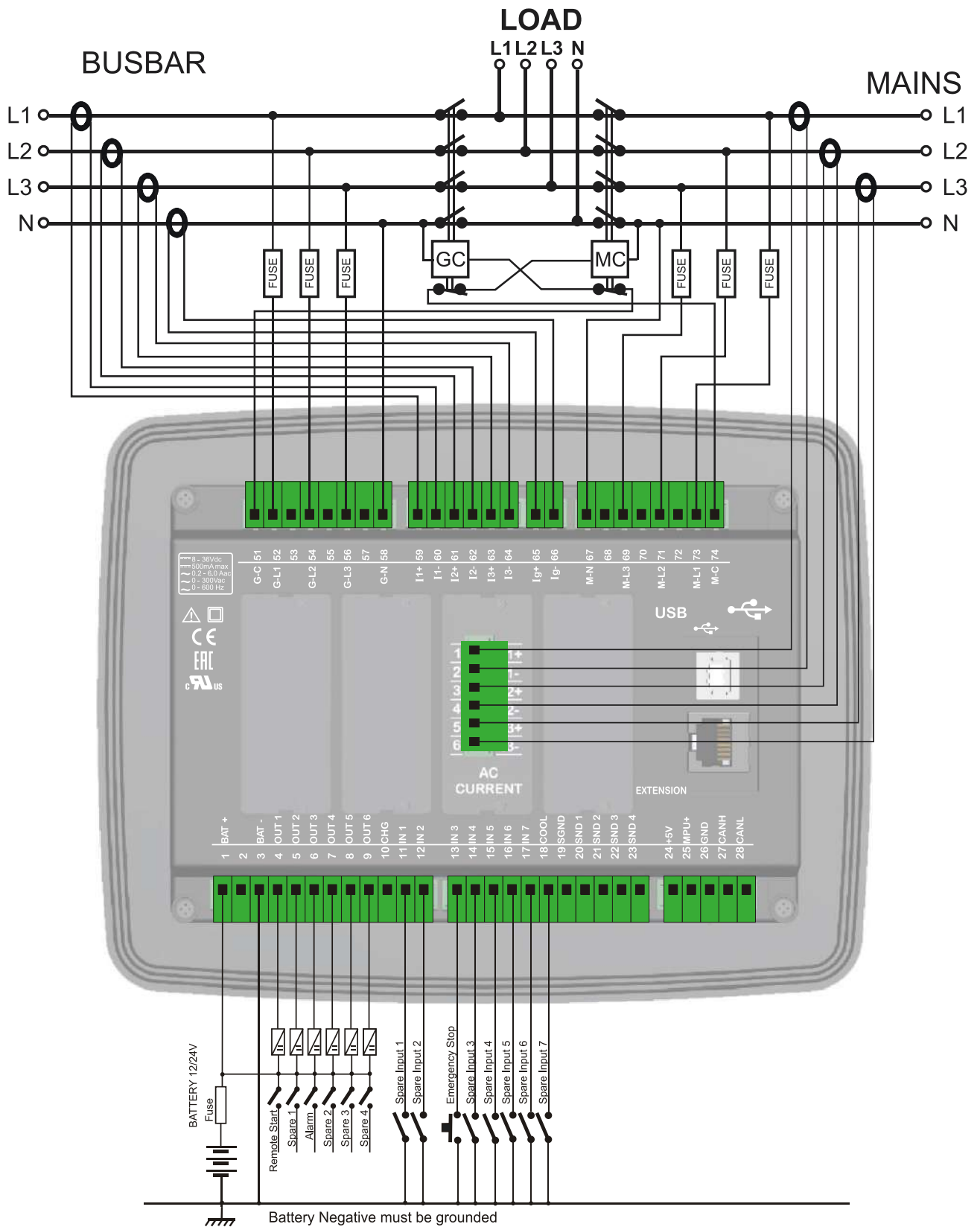
For more details please read chapter: "Waveform Display & Harmonic Analysis".

7. CONNECTION DIAGRAMS

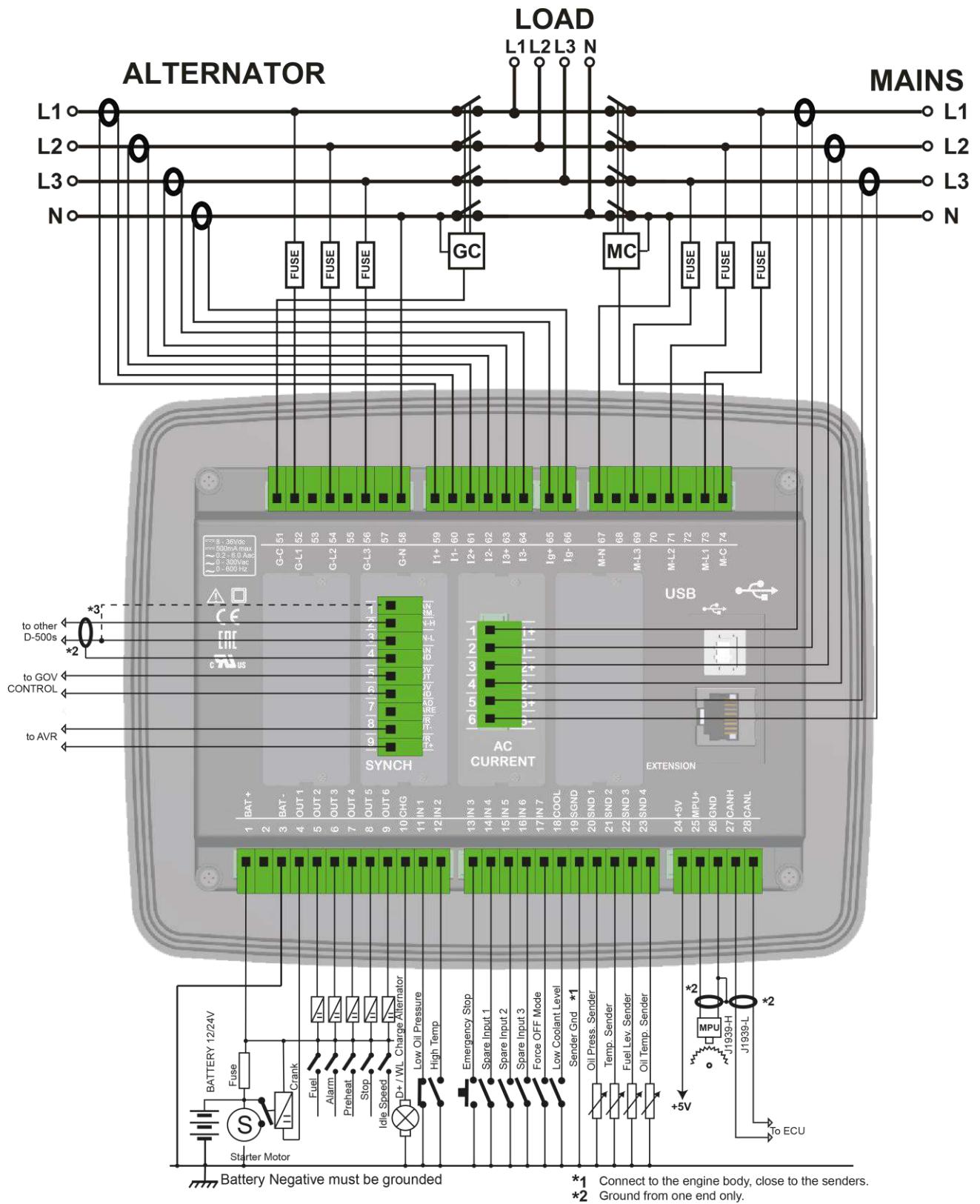
7.1. GENSET SYNCHRONIZATION FUNCTIONALITY



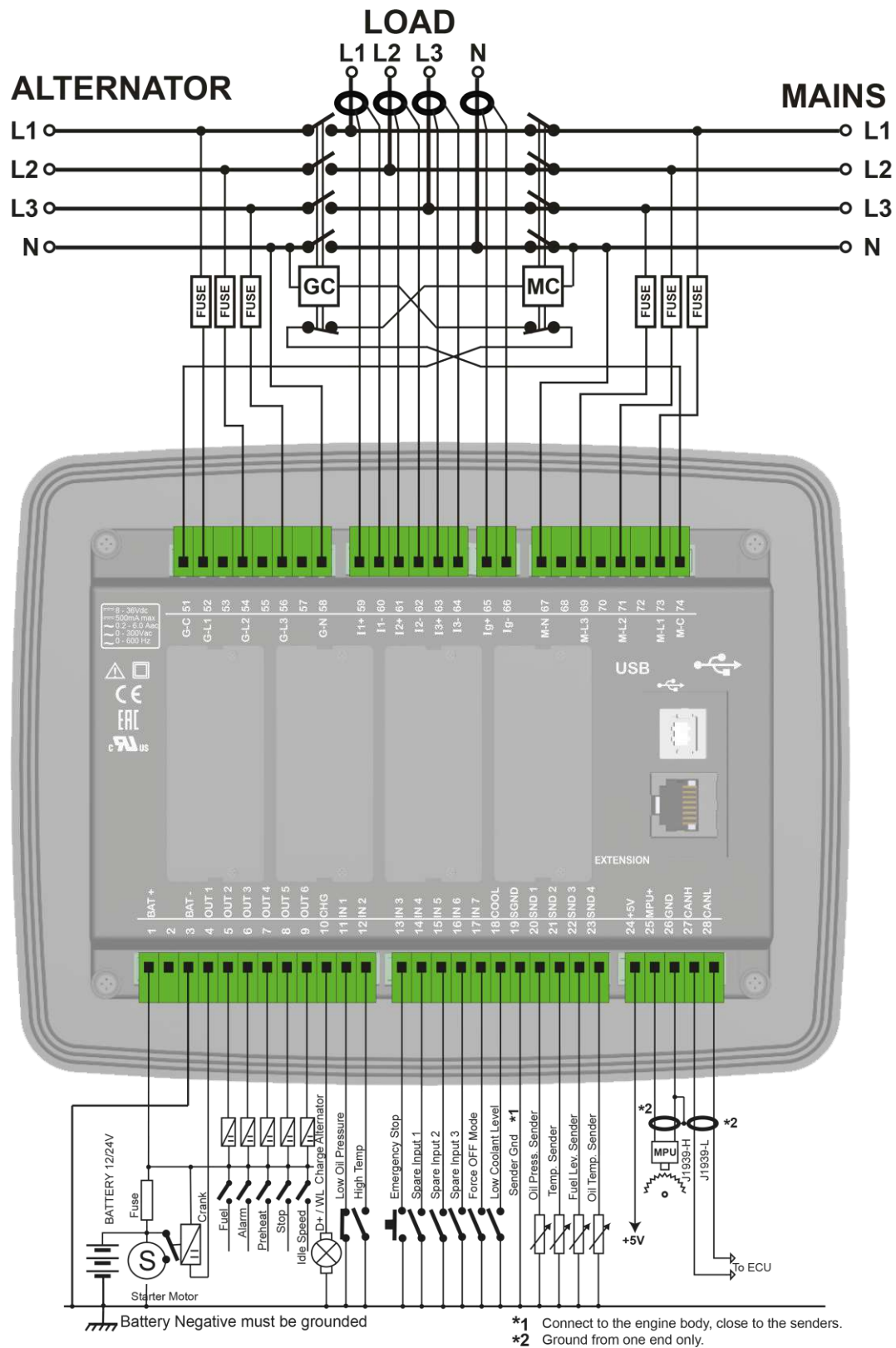
7.2. MAINS SYNCHRONIZATION FUNCTIONALITY



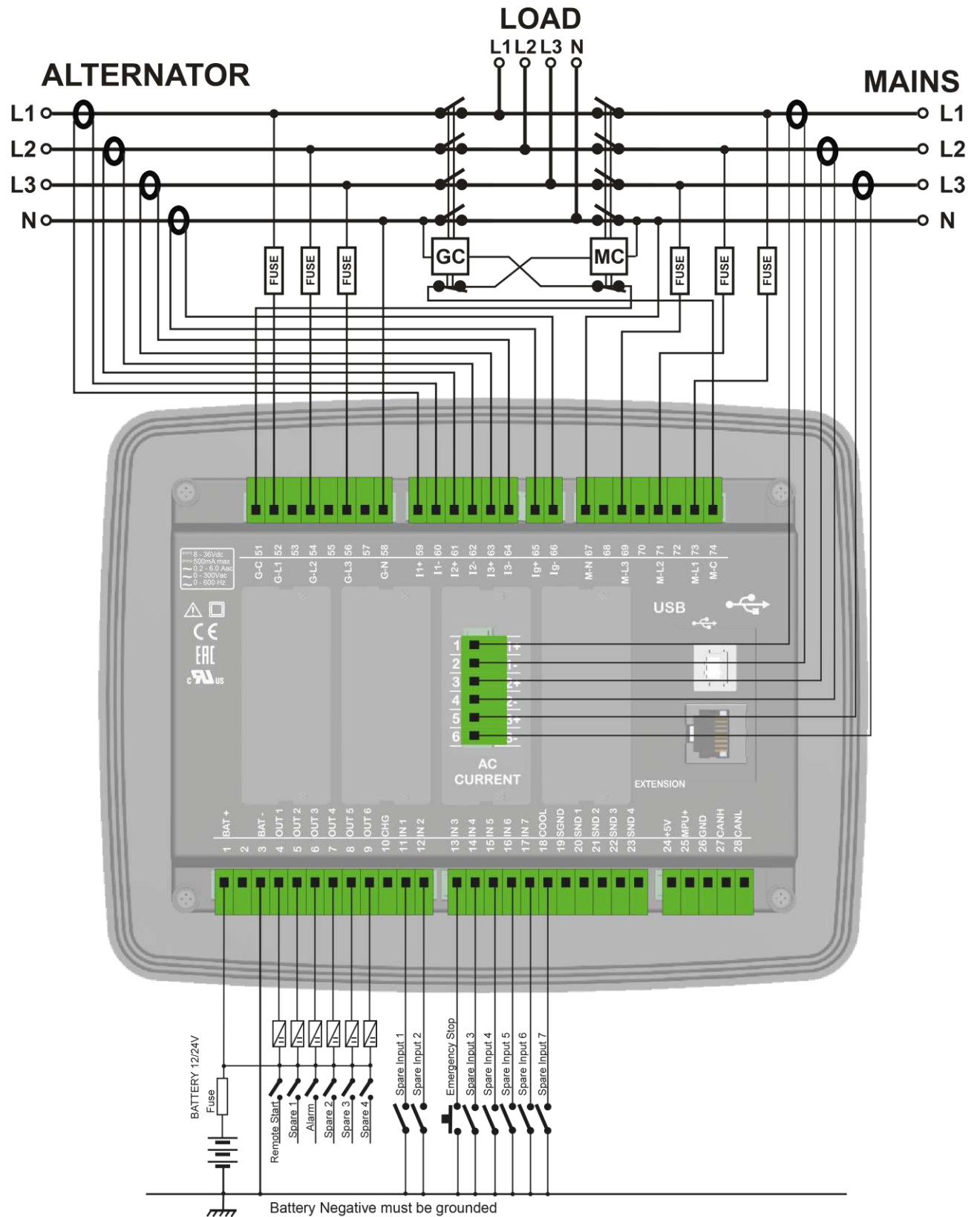
7.3. SINGLE GENSET PARALLEL WITH MAINS FUNCT.



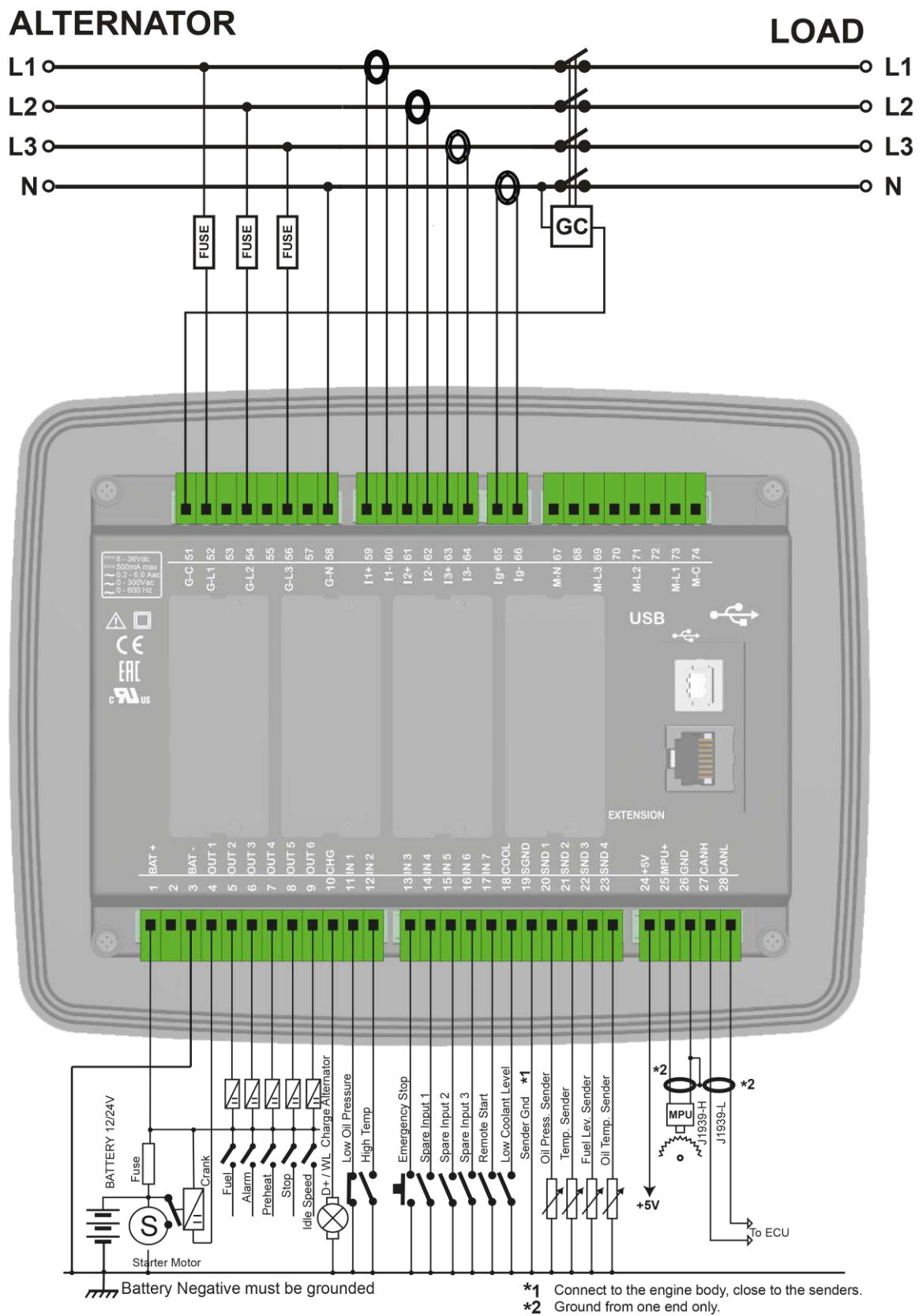
7.4. AMF FUNCTIONALITY



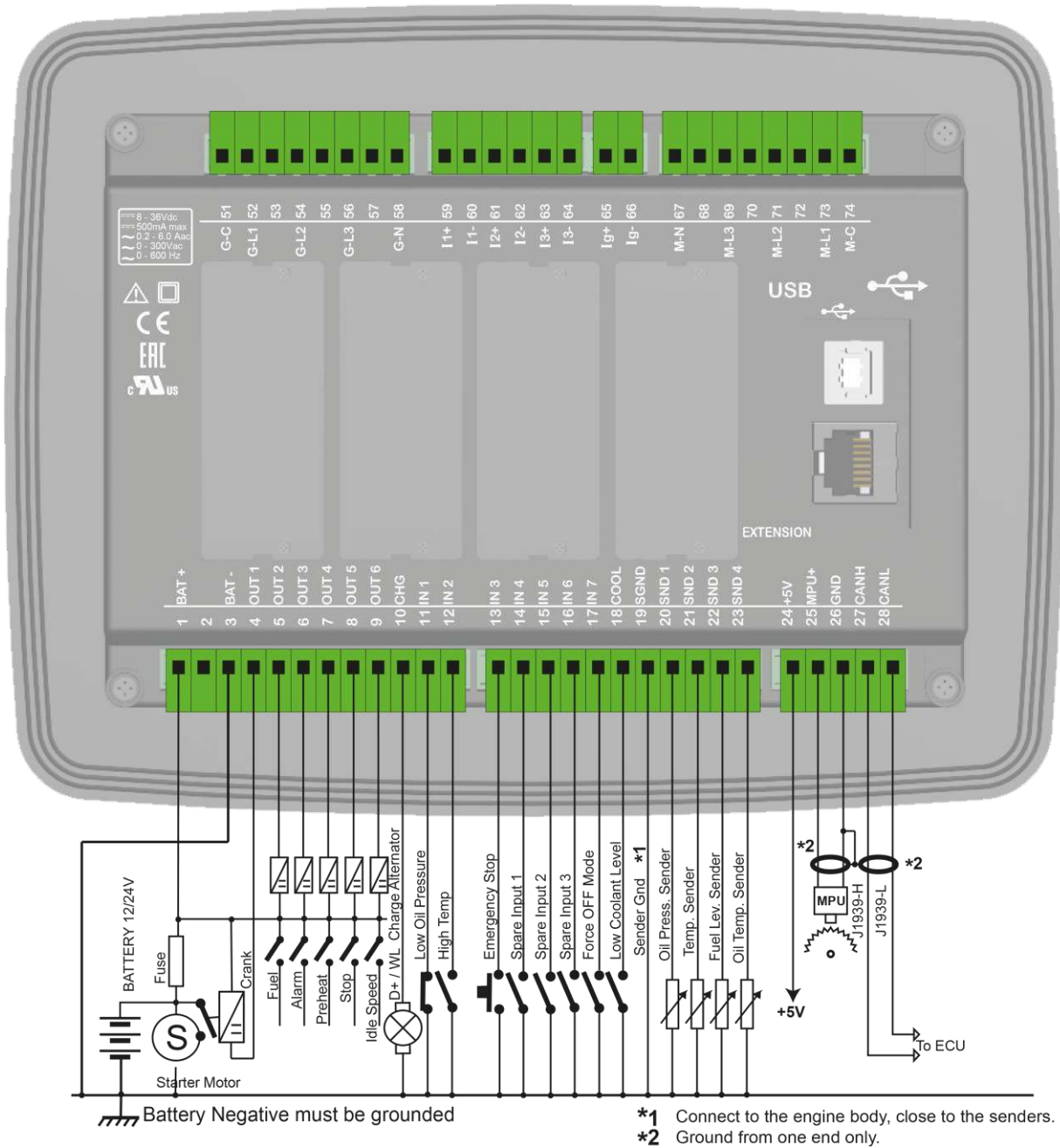
7.5. ATS FUNCTIONALITY



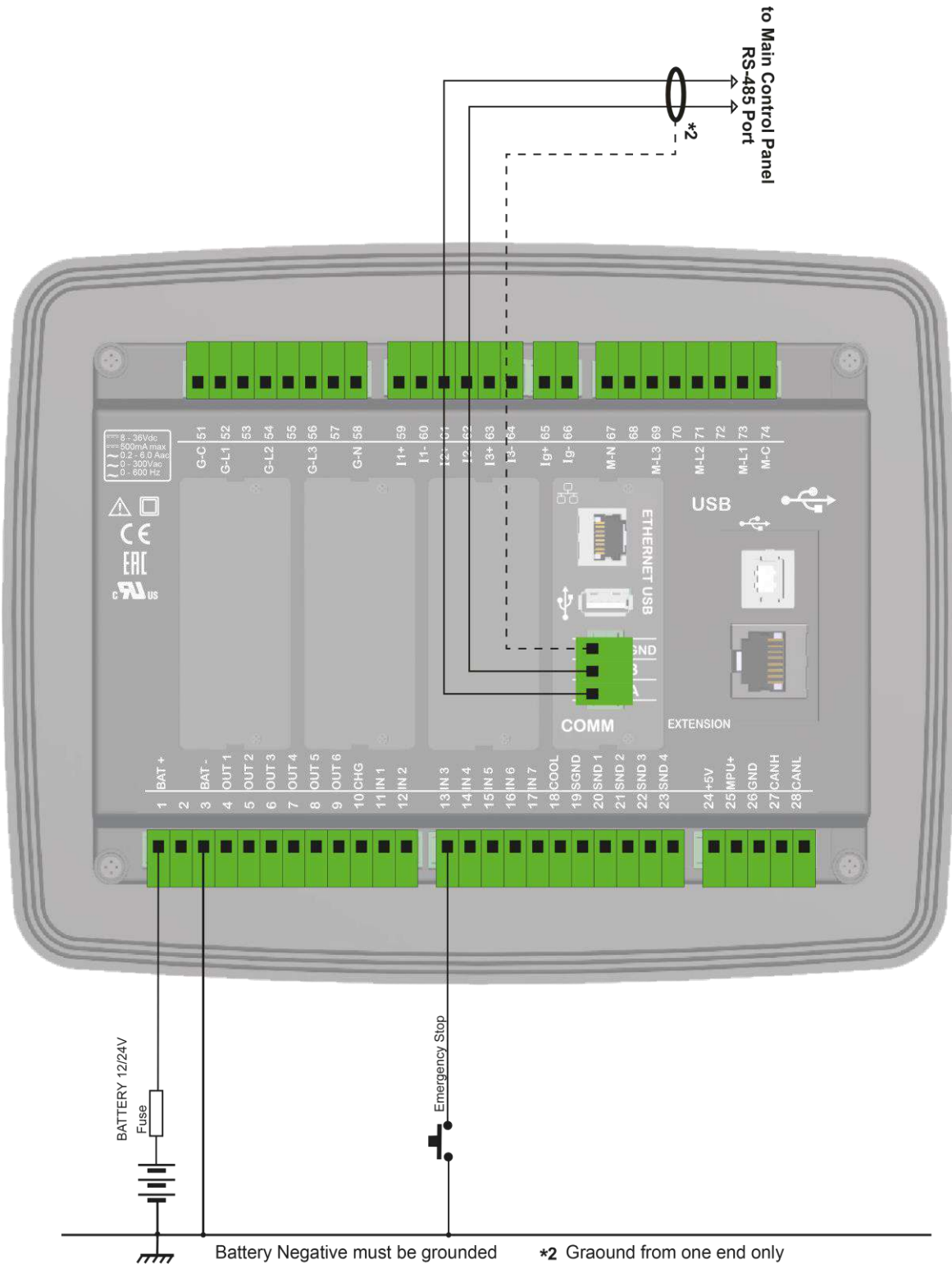
7.6. REMOTE START FUNCTIONALITY



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. 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. |
| 28 | CANBUS-L | | |

| 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 | <p>Connect the generator current transformer terminals to these inputs.</p> <p>Do not connect the same current transformer to other instruments otherwise this may damage the unit.</p> <p>Connect each terminal of the transformer to the unit's related terminal.</p> <p>Do not use common terminals. Do not use grounding.</p> <p>Correct polarity of connection is vital.</p> <p>The rating of the transformers should be identical for each of the 3 phases.</p> <p>The secondary winding rating shall be 5 Amperes. (ex: 200/5 Amps).</p> |
| 60 | GEN I1- | | |
| 61 | GEN I2+ | | |
| 62 | GEN I2- | | |
| 63 | GEN I3+ | | |
| 64 | GEN I3- | | |
| 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 | <p>Connect the mains phases to these inputs.</p> <p>The mains voltages upper and lower limits are programmable.</p> |
| 71 | MAINS-L2 | | |
| 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. 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. |
| 03 | DATA LINK_L | | |
| 04 | DATA LINK_GROUND | 0 VDC | Connect this terminal to the shield of the Datalink from one end only. |
| 05 | AVR - | Isolated Output, $\pm 3\text{VDC}$ | 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. Do not connect the same current transformer to other instruments otherwise this may damage the unit. Connect each terminal of the transformer to the unit's related terminal. Do not use common terminals. Do not use grounding. Correct polarity of connection is vital. The rating of the transformers should be identical for each of the 3 phases. The secondary winding rating shall be 5 Amperes. (ex: 200/5 Amps). |
| 02 | I1- | | |
| 03 | I2+ | | |
| 04 | I2- | | |
| 05 | I3+ | | |
| 06 | I3- | | |

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: ± 3 V-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:

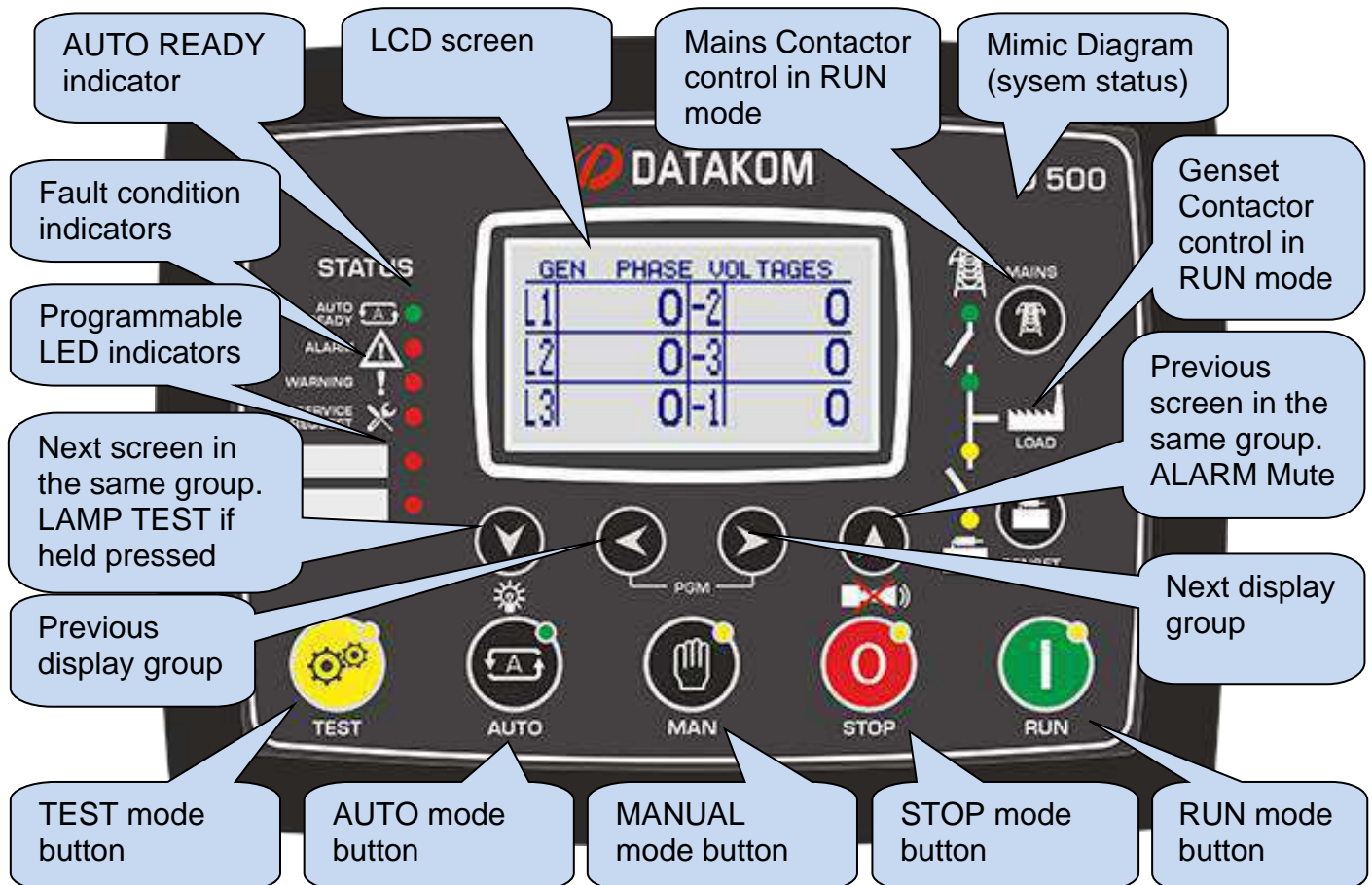
-UL 6200, Controls for Stationary Engine Driven Assemblies (Certificate # - 20140725-E314374)

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".

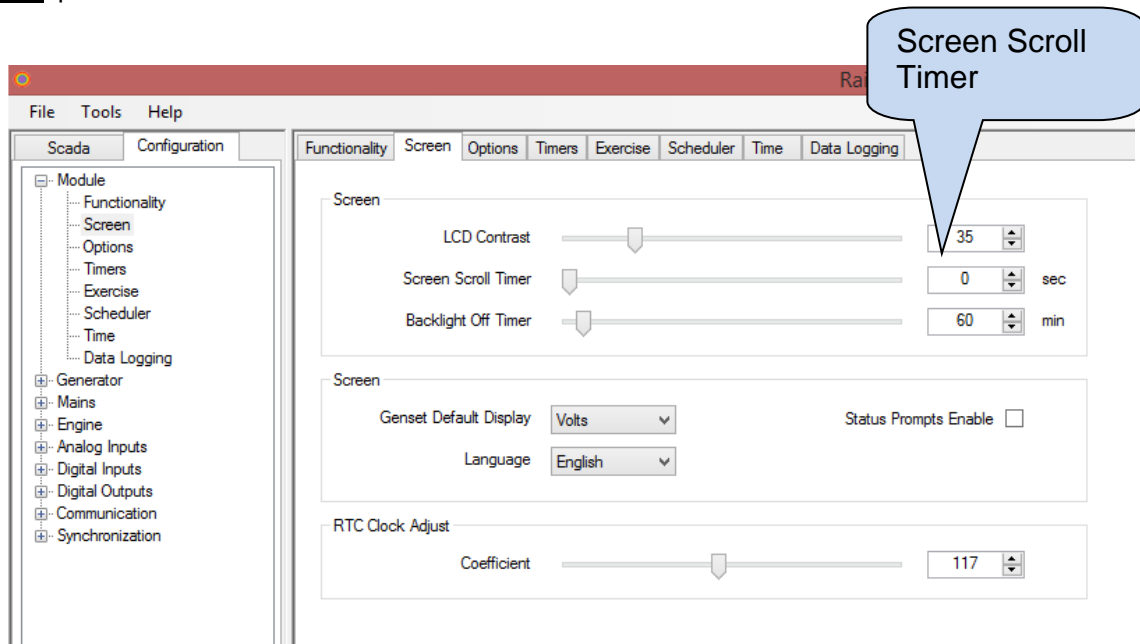
GSM Modem Parameters: Signal strength, counters, communication status, IP addresses etc...

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**.



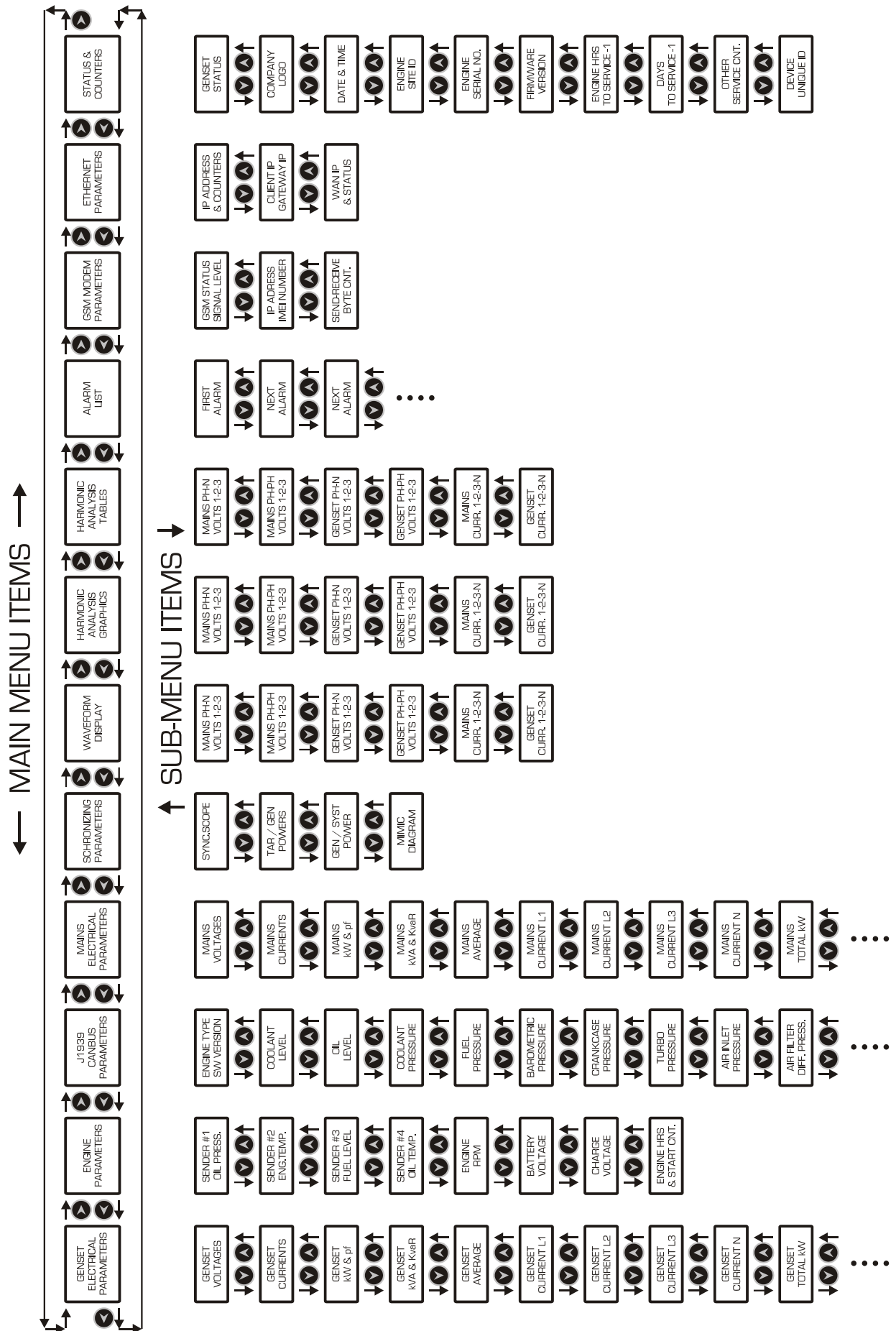
If the Screen Scroll Timer is set to zero, then scrolling will be disabled.



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:

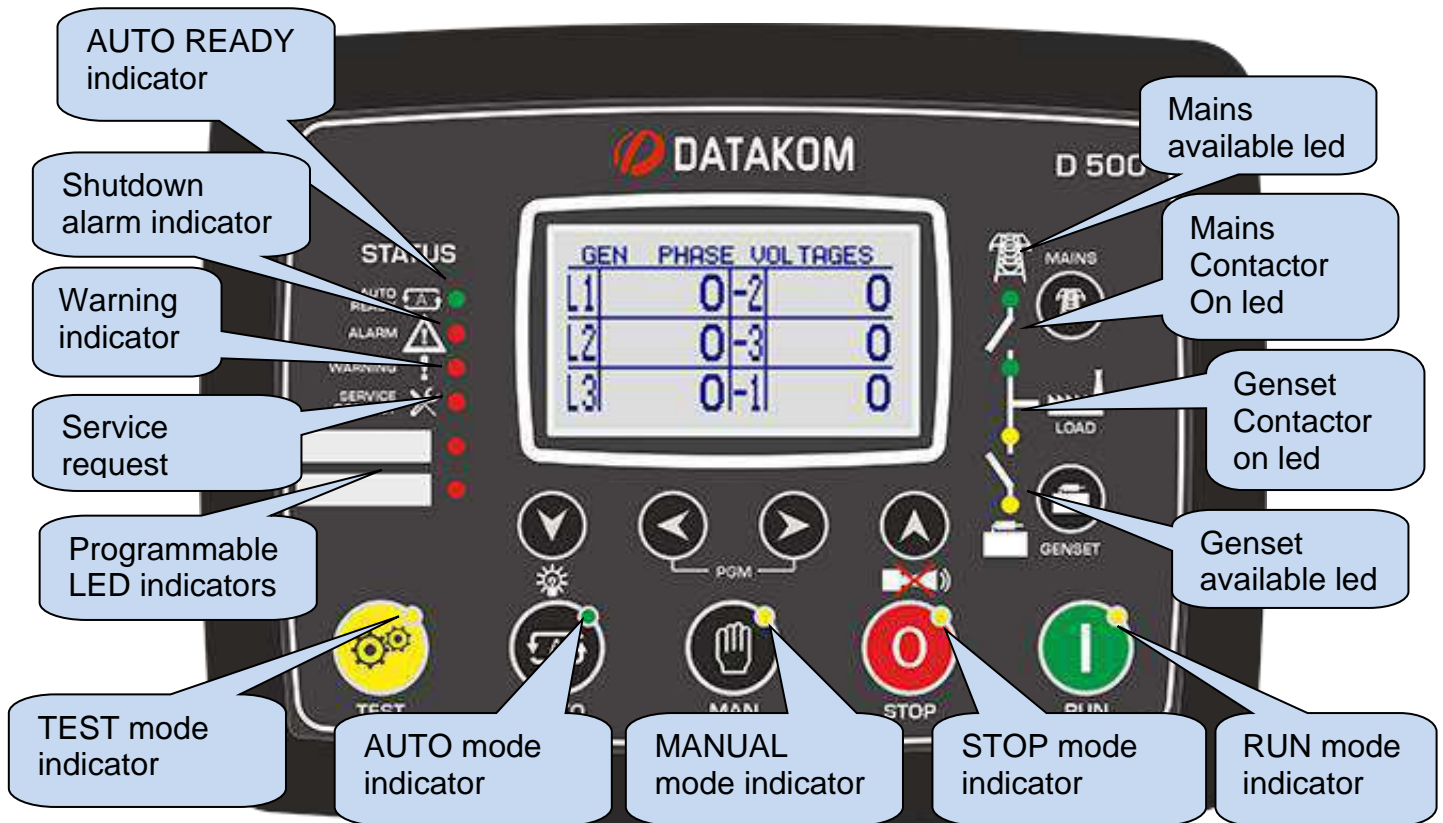
Engine speed (rpm)
Battery voltage,
Charge voltage

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.

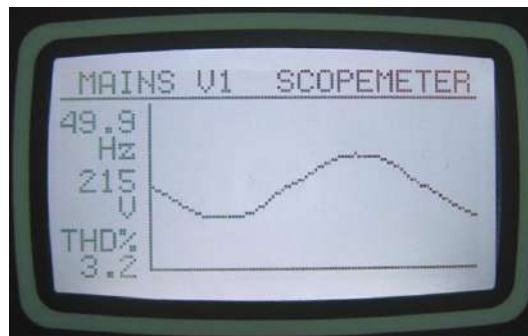
Available channels are:

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

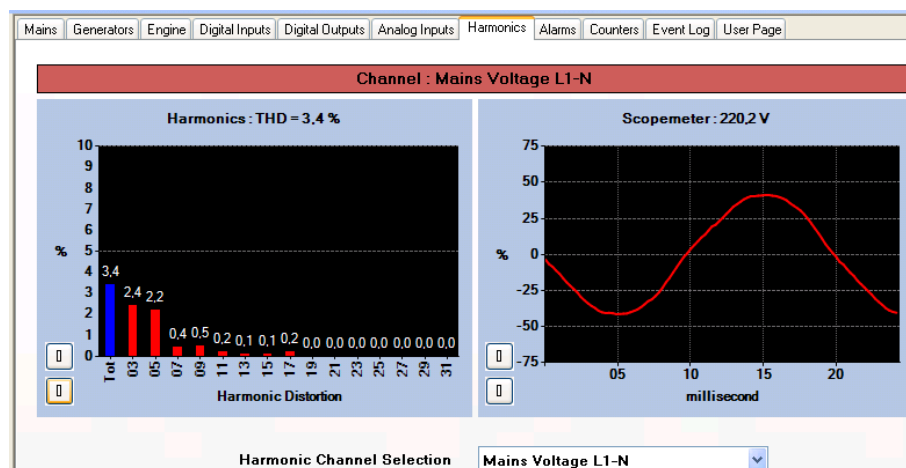


Alphanumeric Harmonics Table

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

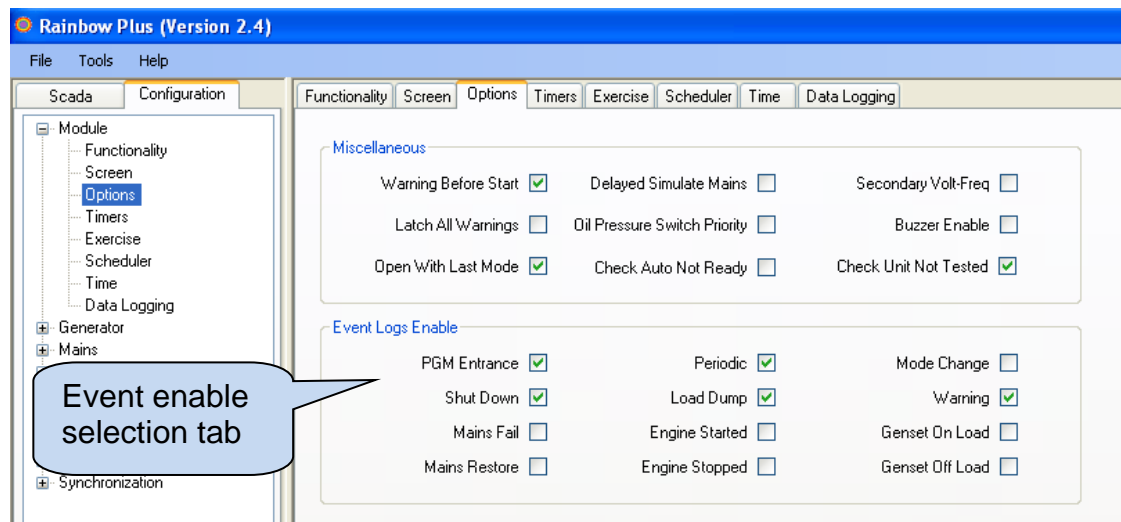
12. DISPLAYING EVENT LOGS

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

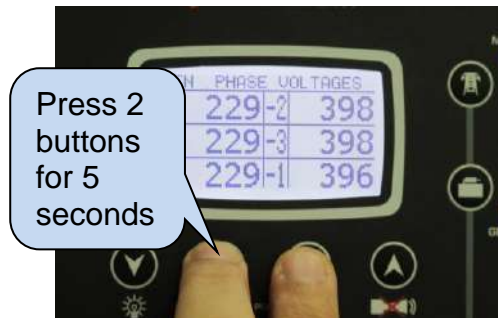
Engine started/stopped events: recorded when engine status is changed

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_DUMPS:** 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

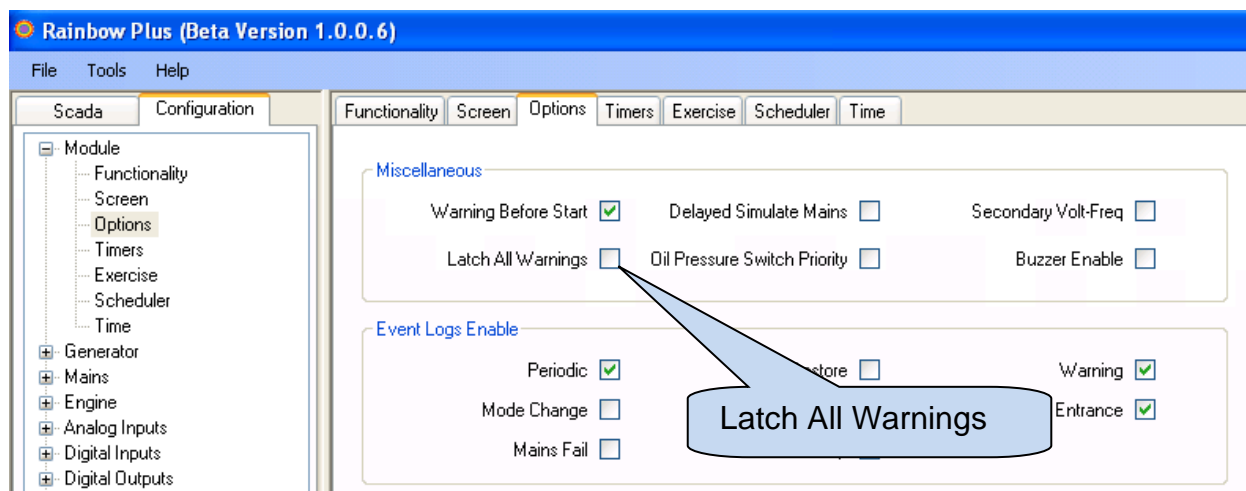


Digital input and analog sender alarms are fully programmable for the alarm name, sampling and action.



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.

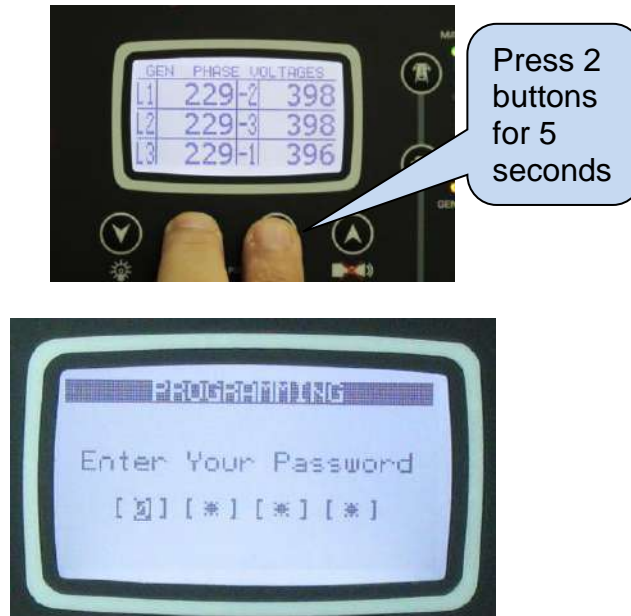
When modified, program parameters are automatically recorded into a non-erasable memory and take effect immediately.

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.

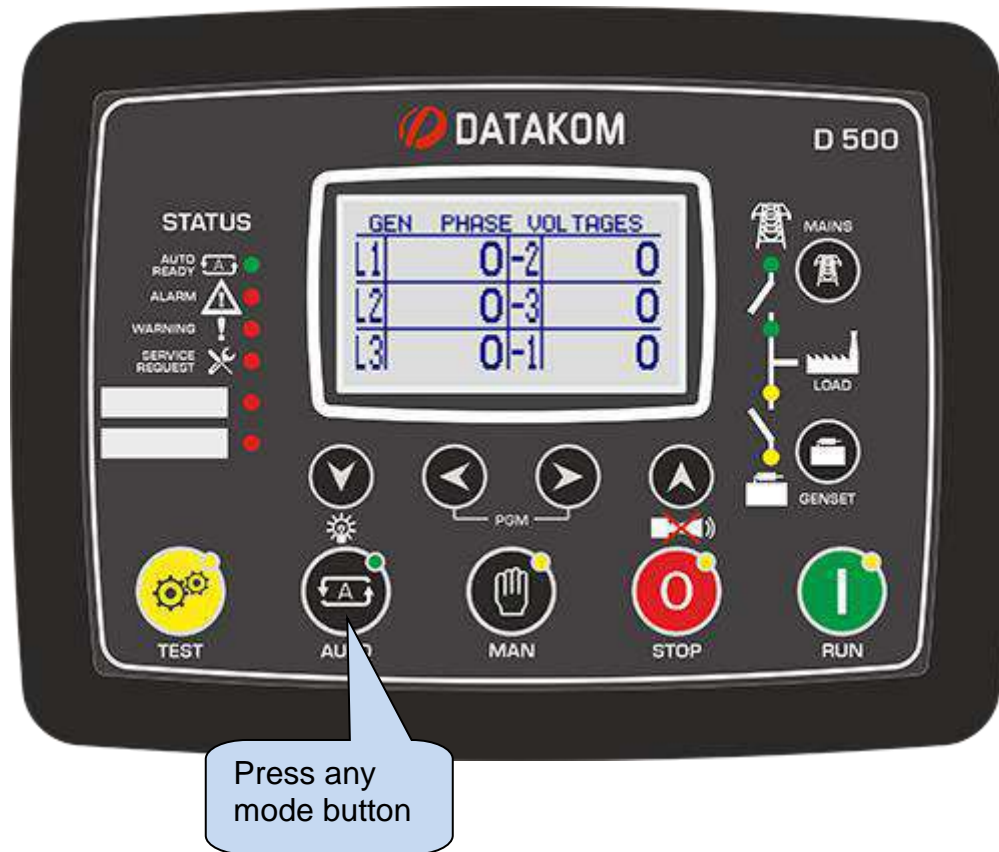


16.4. MODIFYING PARAMETER VALUE



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 | 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 |
| 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 | This parameter controls the activation of the ALARM output during "Engine Start Delay" timer before engine run. 0: no warning before start 1: warning before start |
| Latch all Warnings | - | 0 | 1 | 0 | 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. |
| Remote Control Enable | - | 0 | 1 | 1 | This parameter controls remote control of the unit through Rainbow, Modbus and Modbus TCP/IP. 0: remote control disabled 1: remote control enabled |
| Annunciator Mode | - | 0 | 1 | 0 | 0: normal operation 1: the unit becomes an annunciator of the remote unit. Engine/genset control functions are disabled. |
| CT Location | - | Genset | Load | Genset | 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. |
| Reverse CT Direction | - | 0 | 1 | 0 | This parameter is useful to invert all CT polarities at the same time. 0: normal CT polarity assumed. 1: reverse CT polarity assumed. |
| Buzzer Enable | - | 0 | 1 | 0 | Internal buzzer control 0: buzzer disabled 1: buzzer enabled |
| Log Record Period | sec | 5 | 3600 | 5 | This parameter adjusts the data logging frequency to micro-SD or USB Flash memories. Frequent recording will require more memory capacity. With a period of 2 seconds, 4GB per year of memory is necessary. With a period of 1 minute, 133MB is consumed per year. |

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 open doors 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 | 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. If this parameter is set to zero then the mains contactor is immediately released at mains failure. |
| 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 load dump 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 | This is the connection topology of mains voltages and CTs. Detailed explanations are given in the chapter: "TOPOLOGIES". 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 |
| Genset Connection Topology | - | 0 | 7 | 5 | This is the connection topology of genset voltages and CTs. Detailed explanations are given in the chapter: TOPOLOGIES. 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 |

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 mater genset controller does 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/CURS0R 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 excuded from engine ECU alarm list. |
| J1939 FMI Mask | - | 0 | 65535 | 0 | The FMI number written to this parameter is excuded 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.

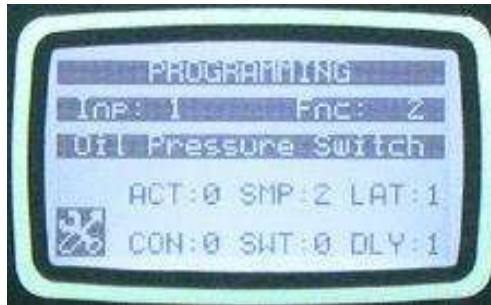
Each sender has 16 step programmable curves. The sender name and reading unit is freely programmable, thus the sender can be adapted to any type through programming.

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 | No | Description | No | Description |
|----|----------------------|----|-------------------------|-----|-------------------------|
| 1 | Fuel | 46 | Pgm Mode Active | 91 | Remote Control Out 11 |
| 2 | Horn | 47 | Engine Running | 92 | Remote Control Out 12 |
| 3 | Crank | 48 | Genset Voltage Ok | 93 | Remote Control Out 13 |
| 4 | Stop Solenoid | 49 | Alarm Check Enable | 94 | Remote Control Out 14 |
| 5 | Genset Contactor | 50 | Oil Pressure Ok! | 95 | Remote Control Out 15 |
| 6 | Mains Contactor | 51 | Shutdown Alarm | 96 | Remote Control Out 16 |
| 7 | Idle Speed | 52 | Loaddump Alarm | 97 | Multi Load Add Out 1 |
| 8 | Preheat | 53 | Warning Alarm | 98 | Multi Load Subst. Out 1 |
| 9 | Alternate Crank | 54 | Shutdown or Loaddump | 99 | Multi Load Add Out 2 |
| 10 | Fuel Main Winding | 55 | Shut. or LDD or Warn | 100 | Multi Load Subst. Out 2 |
| 11 | Genset Close Pulse | 56 | Test Mode | 101 | Multi Load Add Out 3 |
| 12 | Genset Open Pulse | 57 | Auto Mode | 102 | Multi Load Subst. Out 3 |
| 13 | Genset UV Coil | 58 | Manual Mode | 103 | Multi Load Add Out 4 |
| 14 | Mains Close Pulse | 59 | Off Mode | 104 | Multi Load Subst. Out 4 |
| 15 | Mains Open Pulse | 60 | Not In Auto | 105 | Multi Load Add Out 5 |
| 16 | Mains UV Coil | 61 | Genset At Rest | 106 | Multi Load Subst. Out 5 |
| 17 | Flashing Relay | 62 | Waiting Before Fuel | 107 | Heavy Duty Active |
| 18 | Gas Solenoid | 63 | Preheating | 108 | ECU Power On |
| 19 | Fuel Pump Control | 64 | Waiting Oil Flash Off | 109 | Battery Charge Run |
| 20 | Choke | 65 | Engine Heating | 110 | Fire Circuit PS Active |
| 21 | Block Heater | 66 | Synchronizing | 111 | Pre-transfer Delay |
| 22 | Coolant Cooler | 67 | Cooling Down | 112 | Secondary Volt Freq. |
| 23 | Coolant Heater | 68 | Stopping | 113 | Lamp Test Active |
| 24 | Fan Control | 69 | Protections Disabled | 114 | Alarm Mute Active |
| 25 | Air Flap Control | 70 | Remote Start Input | 115 | Combat mode |
| 26 | Canopy Fan Control | 71 | Disable Auto Start | 116 | Busbar Ready |
| 27 | Ambient Fan Control | 72 | Force to Start | 117 | Droop Mode Active |
| 28 | Remote Start Output | 73 | Auto Restore Inhibited | 118 | Tertiary Volt Freq |
| 29 | Genset Ready | 74 | Gen.Loading Inhibited | 119 | Smart Load Management |
| 30 | Bus Bar Contactor | 75 | Inp.Expansion1Mounted | 120 | Follower mode active |
| 31 | Bus Bar Close Pulse | 76 | Inp.Expansion2Mounted | 121 | Oil pump output |
| 32 | Bus Bar Open Pulse | 77 | Out.Expansion1Mounted | 122 | Speed Up pulse output |
| 33 | Bus Bar UV Coil | 78 | Out.Expansion2Mounted | 123 | Speed down pulse output |
| 34 | Load Shedding | 79 | Master Unit | 124 | Volt up pulse output |
| 35 | Load Add | 80 | Multi Gen. Remote Start | 125 | Volt down pulse output |
| 36 | Load Substract | 81 | Remote Control Out 1 | 126 | Synch OK output |
| 37 | Service 1 Request | 82 | Remote Control Out 2 | 127 | Zero Power Relay output |
| 38 | Service 2 Request | 83 | Remote Control Out 3 | 128 | Fuel Pull-in Coil |
| 39 | Service 3 Request | 84 | Remote Control Out 4 | 129 | Crank-1/2 |
| 40 | Mains Ph.Order Fail | 85 | Remote Control Out 5 | 130 | Crank-2/2 |
| 41 | Genset Ph.Order Fail | 86 | Remote Control Out 6 | 131 | |
| 42 | Auto Ready | 87 | Remote Control Out 7 | 132 | |
| 43 | Weekly Schedule On | 88 | Remote Control Out 8 | 133 | |
| 44 | Exerciser On | 89 | Remote Control Out 9 | 134 | |
| 45 | Mains Fail | 90 | Remote Control Out 10 | 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 | 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". |
| User IP Mask 1 (2) (3) | 255.255.255.255 0.0.0.0 0.0.0.0 | 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. Thus access may be limited to the same LAN members (x.x.x.255) or strictly to predefined IPv4 addresses. |
| Domain Name | d500.dyndns-ip.com | This string is used in " Dynamic DNS " feature. The unit will register itself to the dynamic DNS server under this name. For more detailed information please review chapter on " Dynamic DNS Feature " and the document " Dynamic DNS Account Setting ". |
| Domain Name Extension | - | Rest of domain name if it is longer than 20 characters. |
| Membership Address | members.dyndns.org | This string is used in " Dynamic DNS " feature. This is the address used in registering to the dynamic DNS server. For more detailed information please review chapter on " Dynamic DNS Feature " and the document " Dynamic DNS Account Setting ". |
| Username/Password | | These strings are used in " Dynamic DNS " feature while registering to the dynamic DNS server. For more detailed information please review chapter on " Dynamic DNS Feature " and the document " Dynamic DNS Account Setting ". |
| Ping Address | www.google.com | This internet address is regularly accessed in order to check the availability of internet access. The access period is defined in parameter Controller Configuration>Ping Period . |
| 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 | These parameters accept both internet addresses and IPv4 addresses. Information for remote monitoring is sent to these addresses. The port information of these addresses are found in Controller Configuration group. |

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 E-mail Address-2 E-mail Address-3 | - - - | 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. |



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 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 rump-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. |

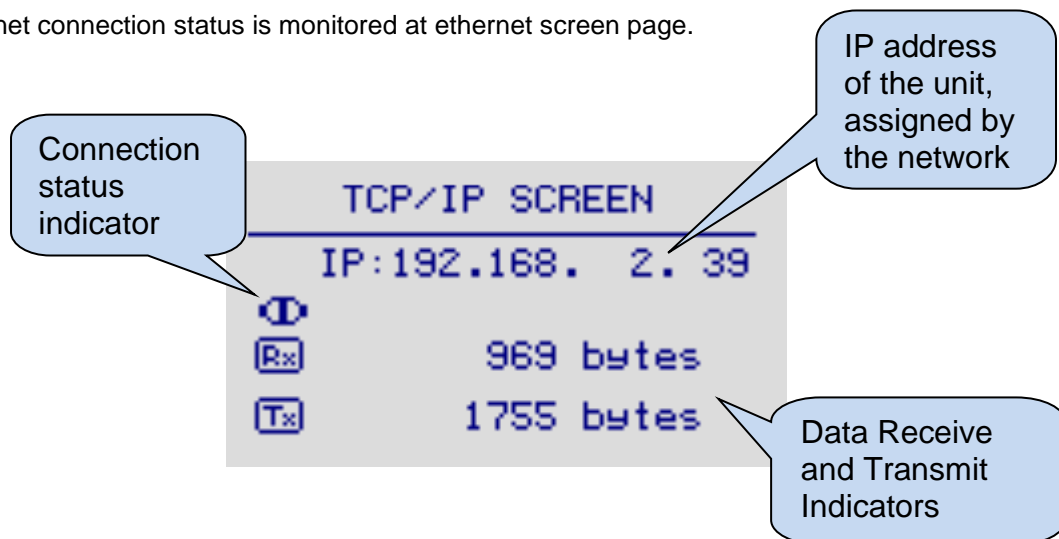
| Parameter Definition | Unit | Min | Max | Factory Set | Description |
|--|------|-----|------|-------------|---|
| Voltage Up/Down Pulse Maximum Duration | msec | 0 | 2000 | 0 | This parameter defines the maximum pulse width in voltage pulse control mode. If this parameter is set to zero then no maximum 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.

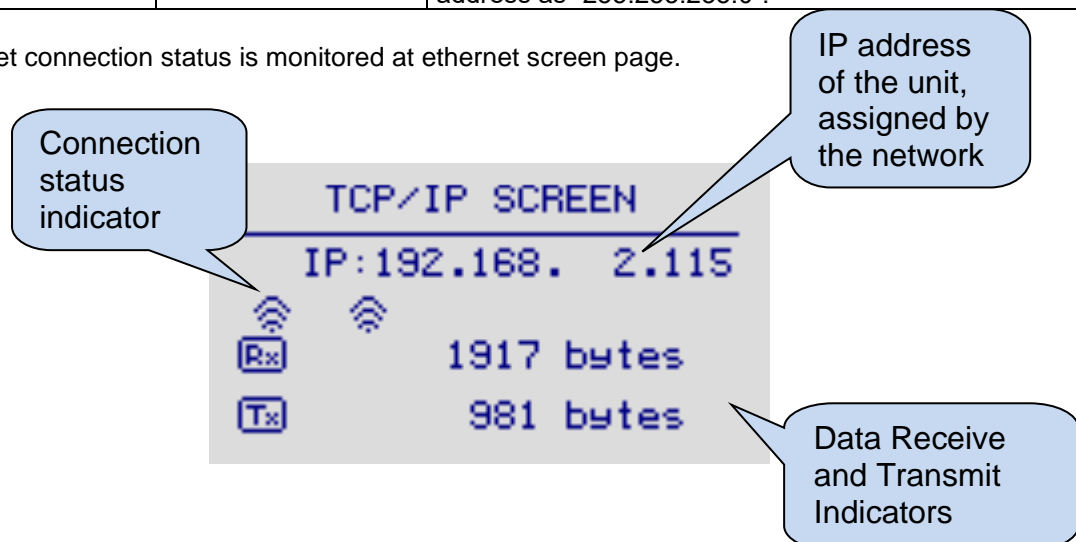


19. Wi-Fi CONFIGURATION

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.



Connected to network.



There are available networks but SSID can't be found.

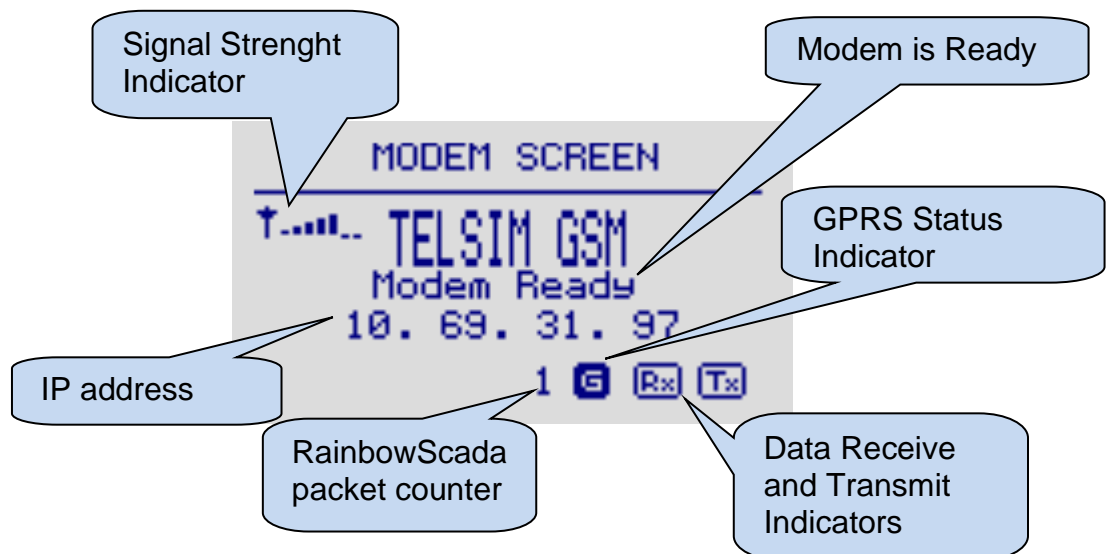


Wi-Fi password error.

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

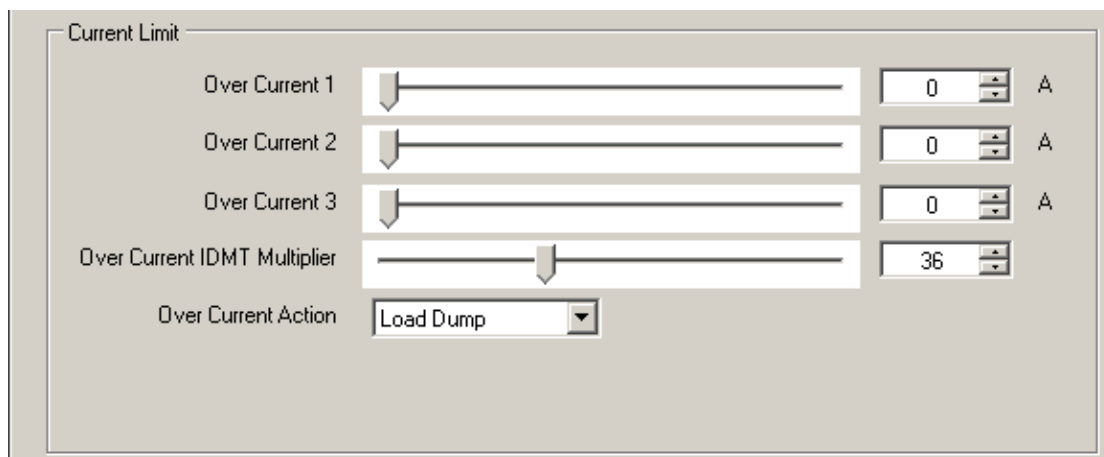
Currents below the overcurrent limit are allowed to flow for unlimited time. Currents above the limit will cause the IDMT protection to trigger with a delay depending on the strength of the overcurrent. Higher the current, faster the protection will trip.

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 Loadump (stop after cooldown) or shutdown alarm (immediate stop).

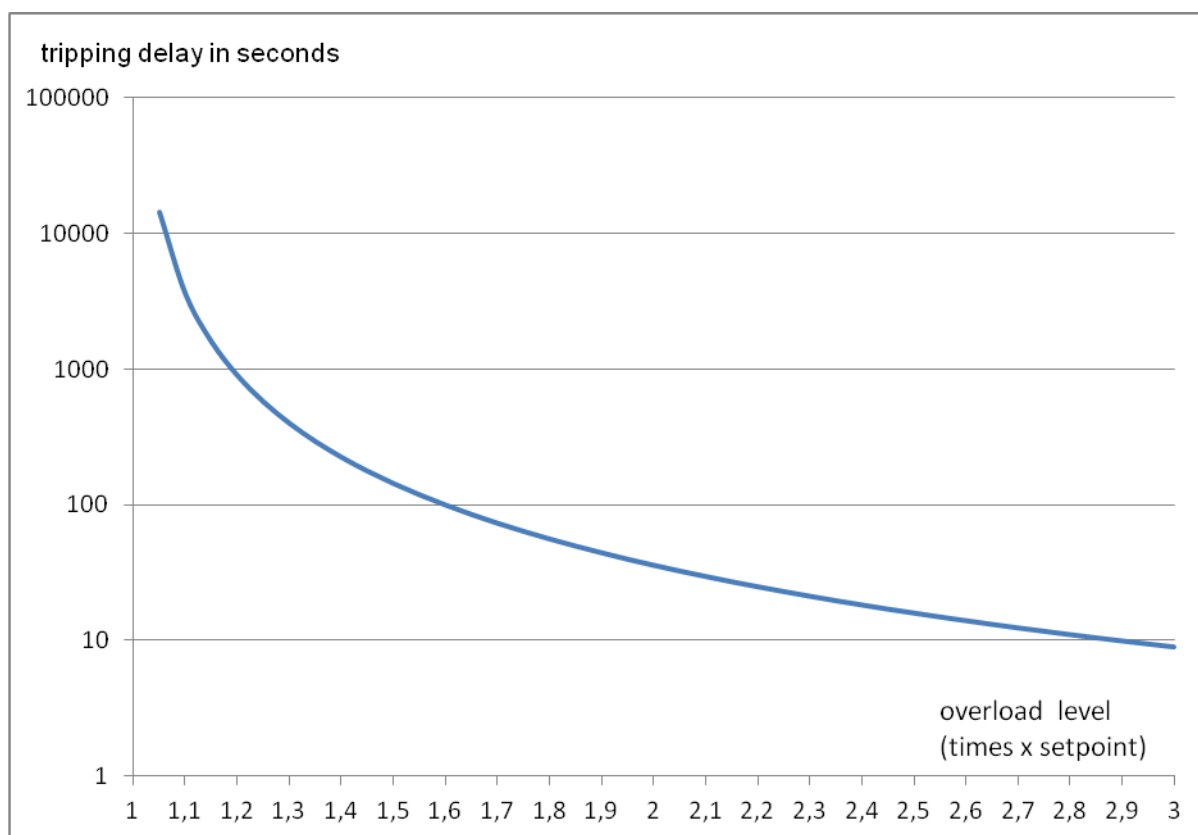


Screenshot from RainbowPlus configuration program, **Generator>Current** section

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):

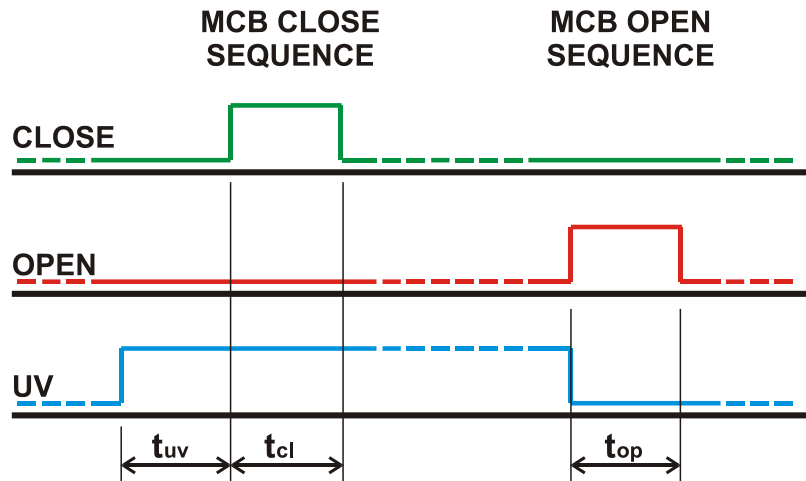


23. MOTORIZED CIRCUIT BREAKER CONTROL

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

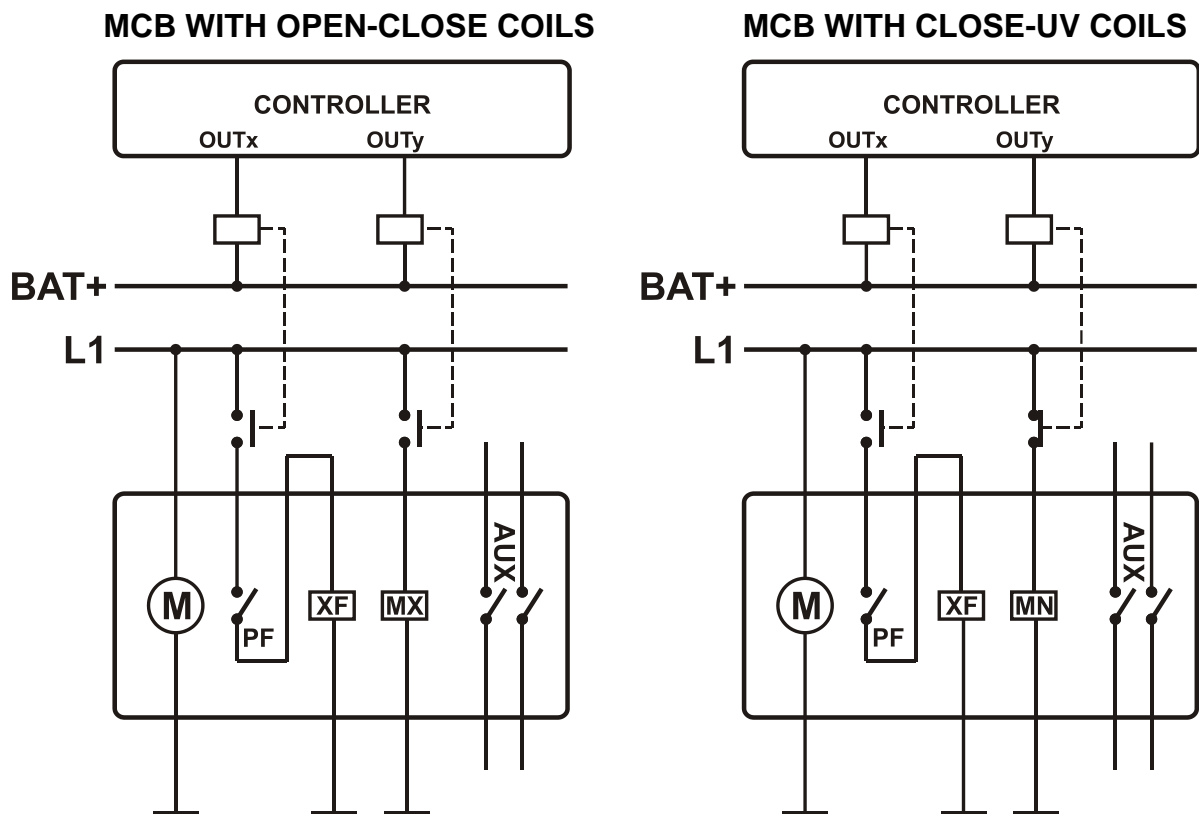
PF: ready to close contact

XF: close coil

MX: open coil

MN: undervoltage trip (release)

AUX: auxiliary contacts



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.

The image shows a software interface for configuring Governor and AVR parameters. It consists of two main sections: 'Governor' and 'AVR'. Each section has four sliders and three checkboxes. The values for the sliders are displayed in input boxes to the right of each slider.

| Parameter | Value (%) |
|-------------------------|-----------|
| Governor Out Low Limit | 0.0 |
| Governor Out Gain | 100.0 |
| Governor Out Rest Point | 50.0 |
| Governor Out Droop | 0.0 |
| AVR Out Low Limit | 0.0 |
| AVR Out High Limit | 100.0 |
| AVR Out Rest Point | 50.0 |
| AVR Out Droop | 0.0 |

Checkboxes (all are unchecked):

- Governor Droop Enable
- Governor Control Enable
- Governor Reverse Polarity
- AVR Droop Enable
- AVR Control Enable
- 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.

The screenshot displays two sections of the parameter configuration interface: 'Governor' and 'AVR'. Each section contains four sliders for output limits, gain, rest point, and droop, each with a corresponding numerical input field and a percentage sign. Below the sliders are three checkboxes for enabling or disabling specific features.

Governor

| Parameter | Value (%) |
|-------------------------|-----------|
| Governor Out Low Limit | 0,0 |
| Governor Out Gain | 100,0 |
| Governor Out Rest Point | 50,0 |
| Governor Out Droop | 0,0 |

Checkboxes: ☐ Governor Droop Enable, ☒ Governor Control Enable, ☐ Governor Reverse Polarity

AVR

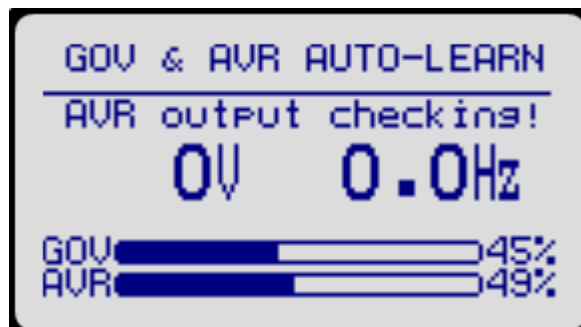
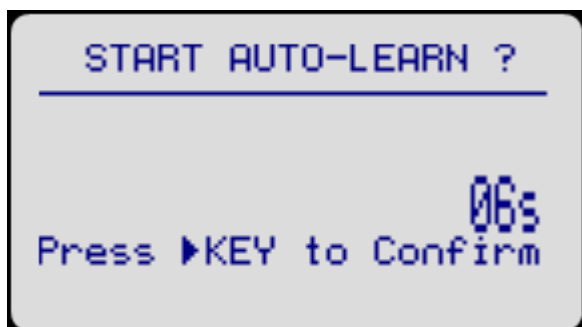
| Parameter | Value (%) |
|--------------------|-----------|
| AVR Out Low Limit | 0,0 |
| AVR Out High Limit | 100,0 |
| AVR Out Rest Point | 50,0 |
| AVR Out Droop | 0,0 |

Checkboxes: ☐ AVR Droop Enable, ☒ AVR Control Enable, ☐ 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.

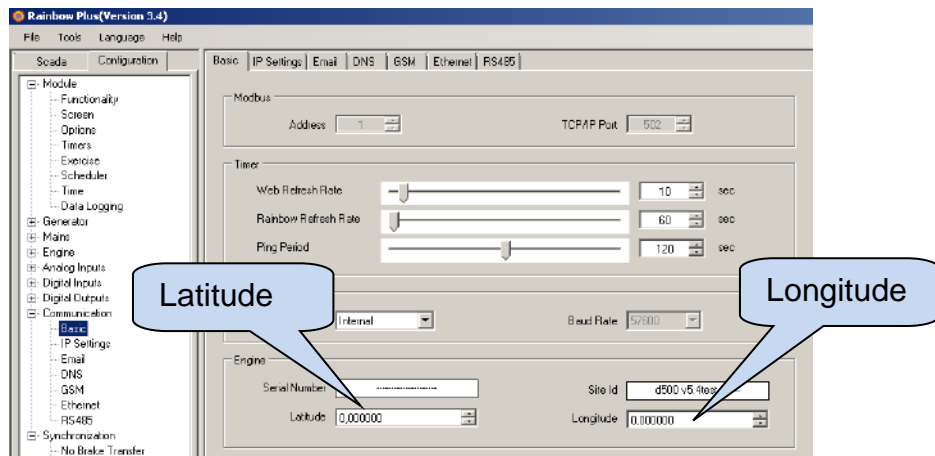


Detection of a USB-GPS is automatic. The unit will detect and use it without any programming.

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 | <i>OUT 1 = ON</i> |
| OUT1 OFF | Sets remote controlled output #1 to passive state | <i>OUT 1 = OFF</i> |
| OUTxx ON | Sets remote controlled output #xx to active state (xx denotes any number between 1 and 16). | <i>OUT xx = ON</i> |
| OUTxx OFF | Sets remote controlled output #xx to passive state (xx denotes any number between 1 and 16). | <i>OUT xx = OFF</i> |

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.

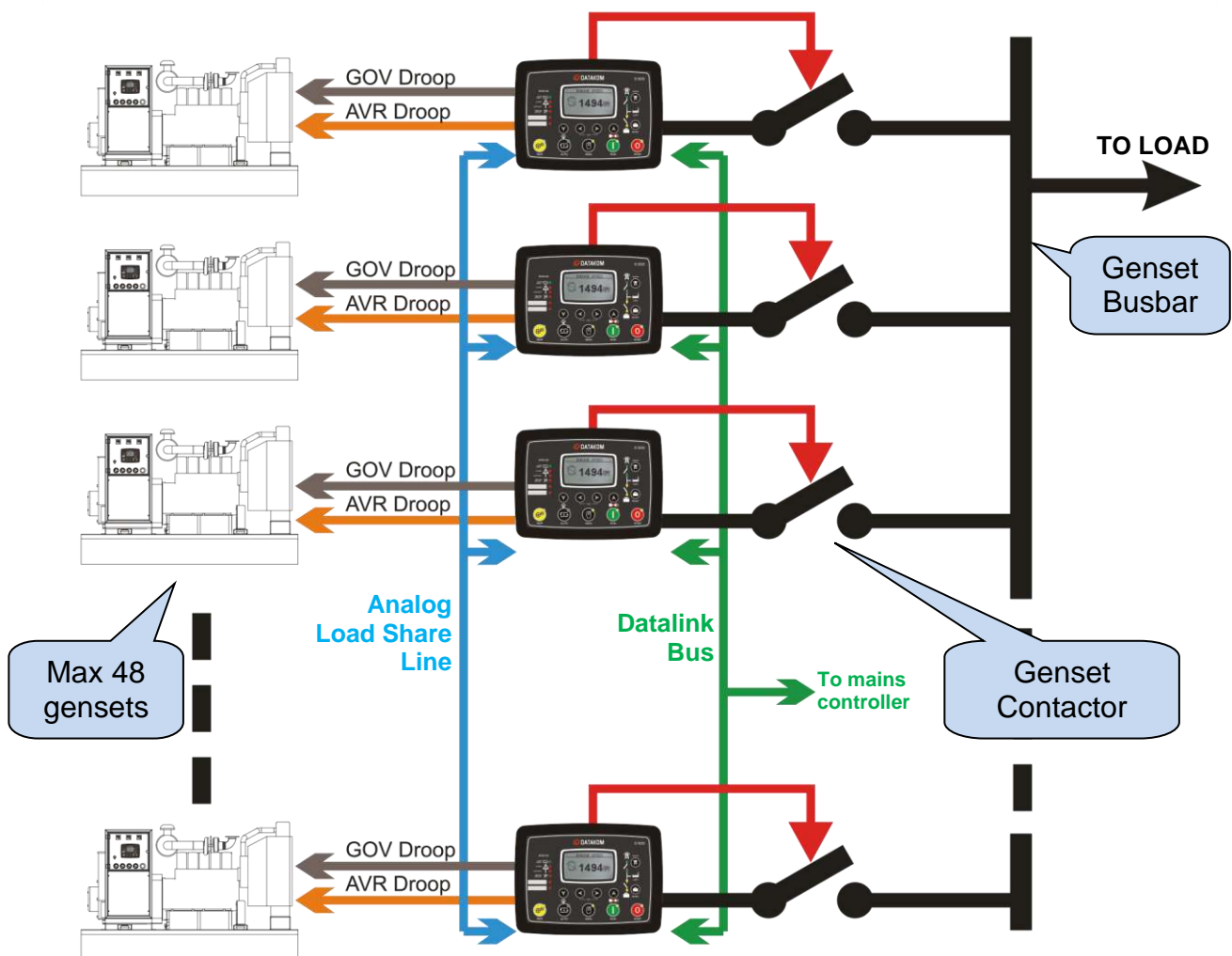
The load sharing functionality brings flexibility and economy to the genset system, where only the necessary number of gensets to supply the load run.

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
Governor Output Droop
AVR Droop Enable
AVR Output Droop
Dwell Timeout
Active Power Ramp (kW/sec)

Reactive Power Ramp (kVAr/sec)
Ramp On High Limit
Ramp Off Low Limit
Active Power Share G Gain
Reactive Power Share G Gain

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**.

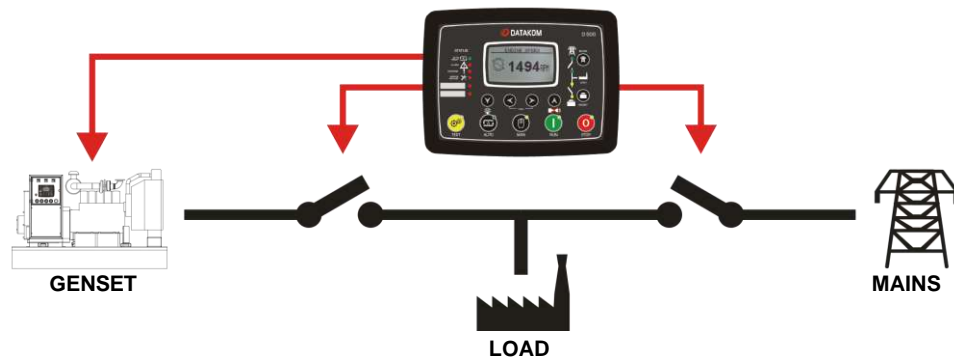
If a **mains failure** occurs during parallel operation with mains, the mains contactor will immediately de-energize, a general **Parallel Mains Fail** warning and a specific protection function warning will be generated. The load will be supplied by the multi genset system without interruption. When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

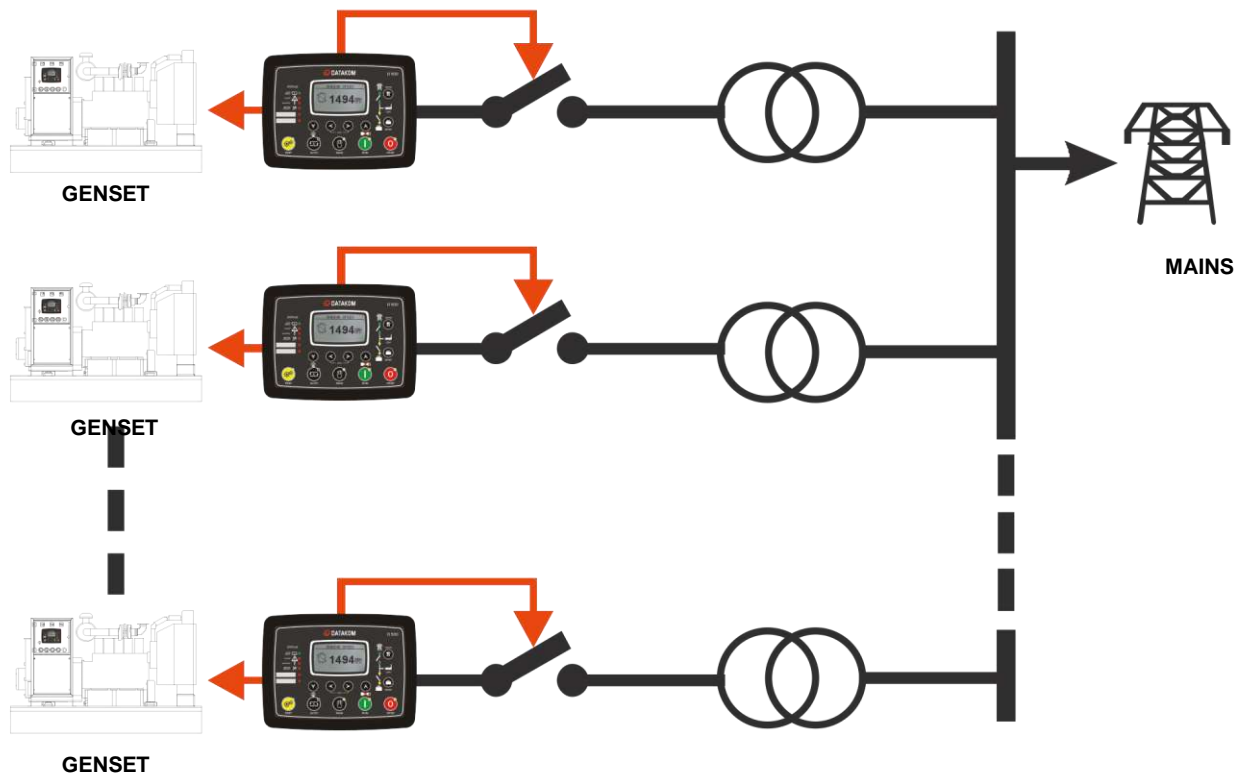
When the requested output power is reached, the ramping will be terminated. The requested power is defined by **Exported Power** program parameter.

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.

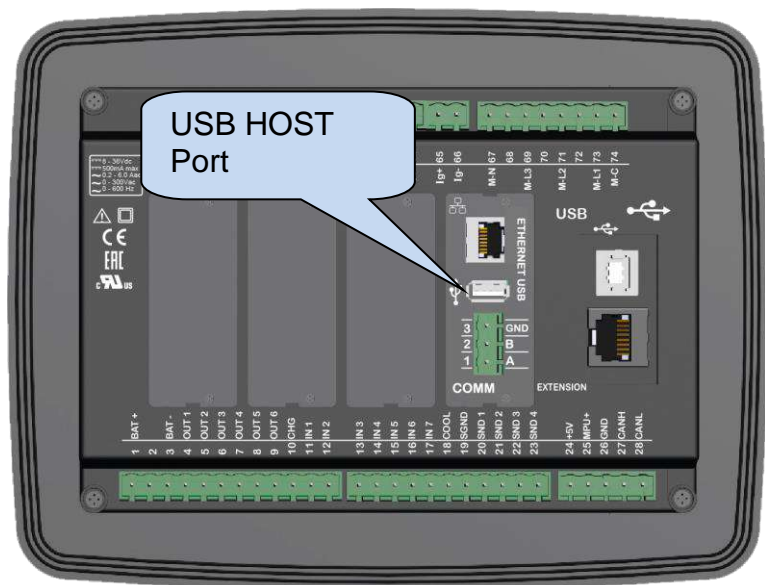
33. DATA RECORDING

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.



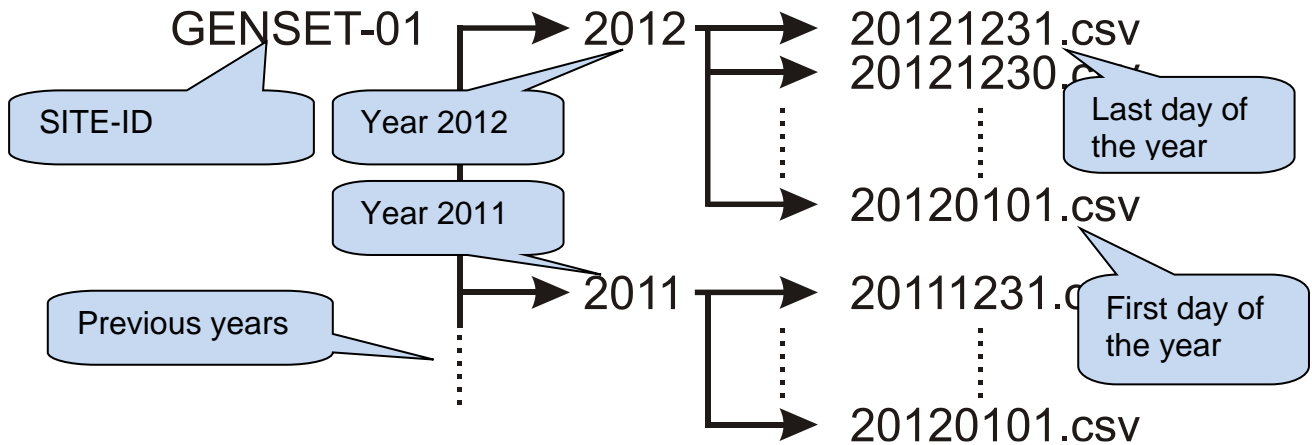
USB FLASH MEMORY



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_SUBTRACT output functions. Any digital output may be assigned to these signals.

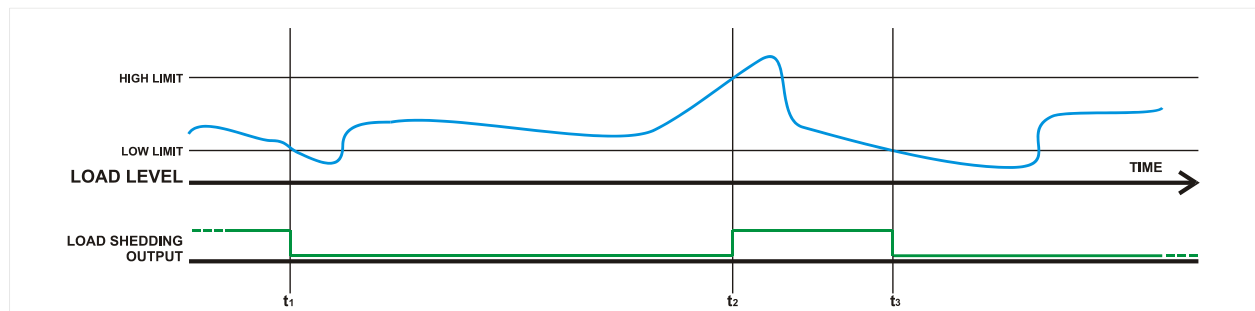
When the load is above the Load Shedding High Limit, the controller will activate the Load Shedding output.

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 / SUBSTRACT

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.

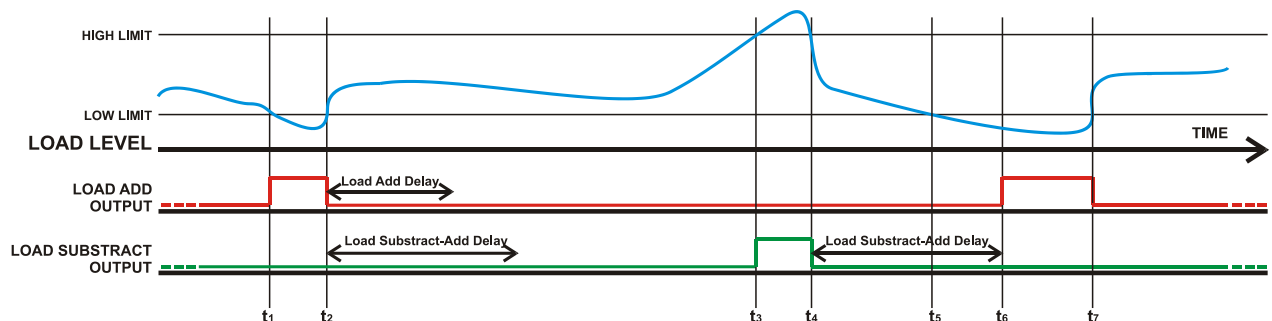
The parameters used in Load Shedding feature are in the Electrical Parameters Group:

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.

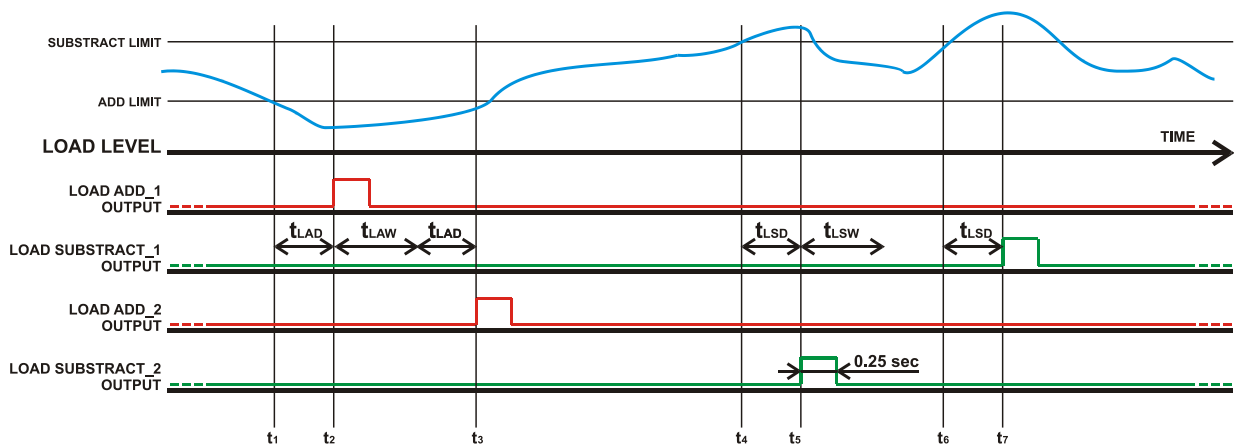
Multi Load Add Power Level: When the genset active power goes below this limit, the controller will start adding load.

Multi Load Subtract Start Delay (t_{LSD}): 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 (t_{LSW}): This is the minimum period between two load subtract pulses.

Multi Load Add Start Delay (t_{LAD}): 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 (t_{LAW}): 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 Cooldown 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**” load dump 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 | $157V > L1 \& L2 \& L3 > 92V$ | Overcurrent limit x2 | Overload limit x 1 |
| High Zigzag | $276V > L1 \& L2 > 204V$ | Overcurrent limit x1 | Overload limit x 2/3 |
| Low Zigzag | $136V > L1 \& L2 > 84V$ | Overcurrent limit x2 | Overload limit x 2/3 |

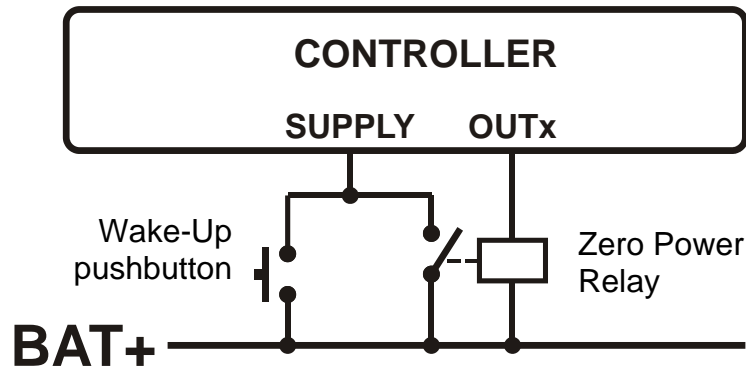
34.24. ZERO POWER AT REST

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 L3 voltage |
| 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-L1 voltage |
| 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 | - | Load dump 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

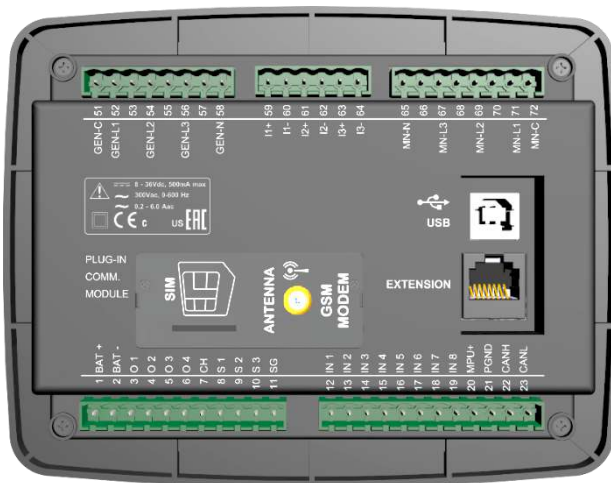
EAC

cULus

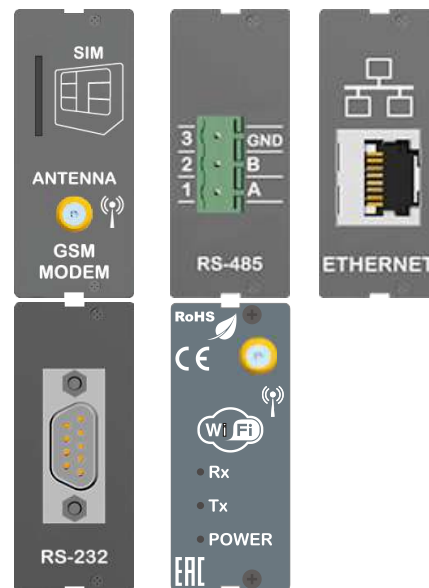
CE

 DATAKOM

PLUG-IN MODULES

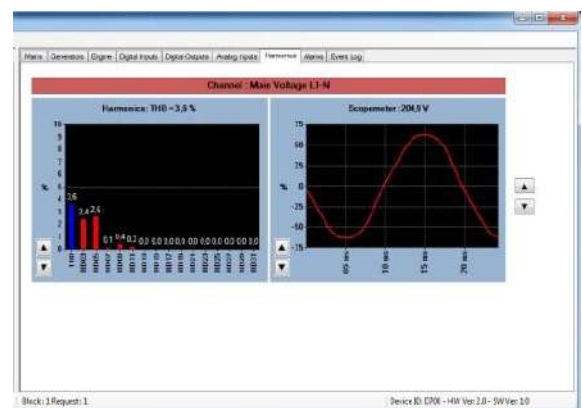
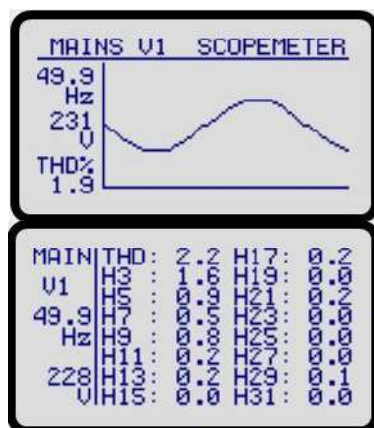


Backpanel view

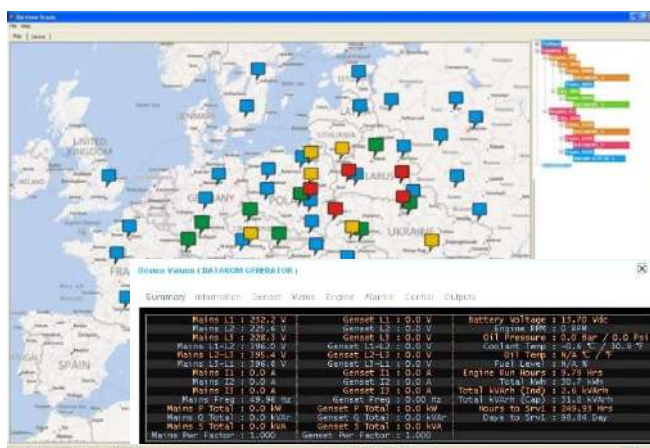


Plug-in modules

SCOPEMETER & HARMONICS



RAINBOW SCADA CENTRAL MONITORING

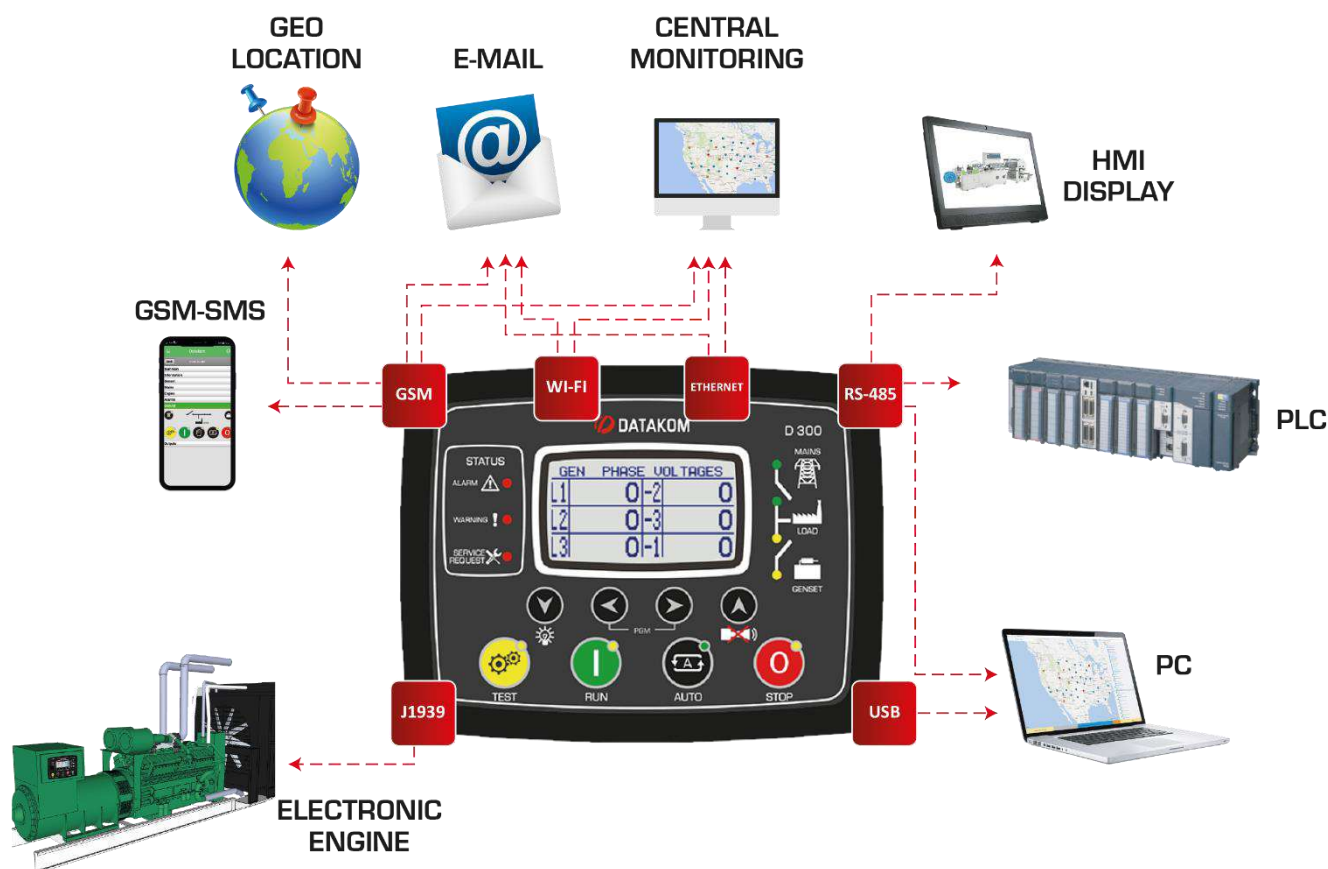


Display on Map, online monitoring



Smartphone Support

COMMUNICATIONS



TECHNICAL SPECIFICATIONS

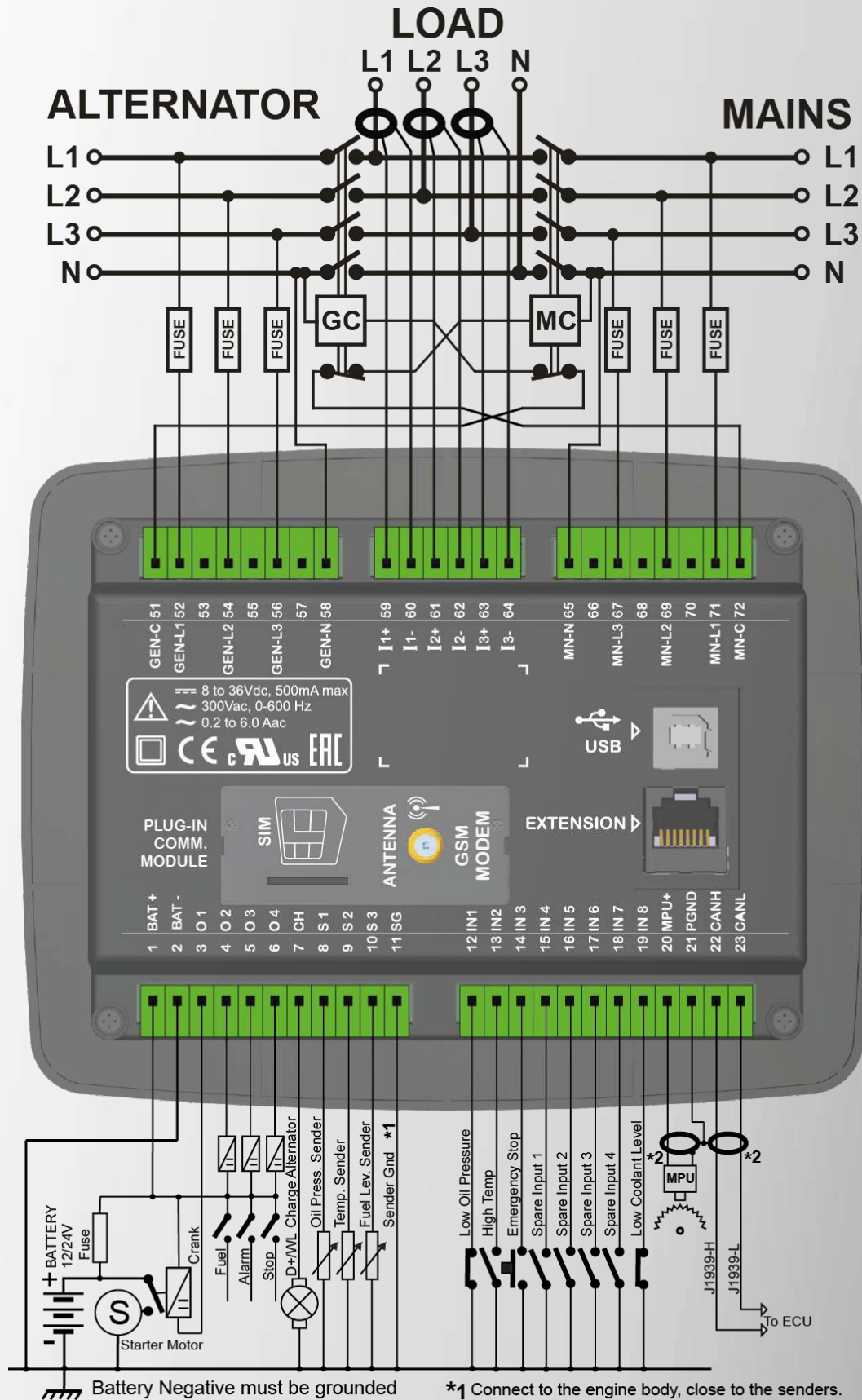
Alternator voltage: 0 to 300 V-AC (Ph-N)
Alternator frequency: 0-600 Hz.
Mains voltage: 0 to 300 V-AC (Ph-N)
Mains frequency: 0-600 Hz.
Topology: 1-2-3 phases, with or without neutral
DC Supply Range: 8.0 to 36.0 V-DC.
V-A-cos Accuracy: 0.5% + 1 digit
kW-kVA-kVAr Accuracy: 1.0% + 1 digit
Current consumption: 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

Specificatii



Easy9 RCBO 1P+N 4500 AC 30mA C 16A

EZ9D32616

Principale

| | |
|---|---|
| Gama | Easy9 |
| Tip produs sau componenta | Residual current breaker with overcurrent protection (RCBO) |
| Poli | 1P + N |
| pozitie neutrului | Stanga |
| numarul polilor protejati | 1 |
| [In] curent nominal | 16 A |
| Tip retea electrica | C.a. |
| tehnologie unitate de declansare | Termo-magnetic |
| cod pentru curba | C |
| sensibilitatea legaturii la pamant | 30 mA |
| temporizare protectie pentru scurgeri la pamant | Instantaneu |
| clasa de protectie pentru scurgeri la pamant | Type AC |
| capacitate de rupere | 4500 A |

Suplimentare

| | |
|--|------------------|
| aplicatie a dispozitivului | Protectie |
| locatia dispozitivului in sistem | Iesire |
| frecventa retea electrica | 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 |

Declinare de responsabilitate: Această documentație nu se substituie și nu trebuie utilizată pentru stabilirea adecvării sau fiabilității acestor produse pentru aplicații utilizator

| | |
|---------------------------------|---|
| durabilitate electrica | 4000 cic |
| conexiuni - borne | Terminal tip tunel (sus sau jos) 1...16 mm² rigid Terminal tip tunel (sus sau jos) 1...10 mm² flexibil |
| cuplu de strangere | 2 N.m sus sau jos |
| protectie de scurgere 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 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 | 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 |

Garanție contractuală

| | |
|--------------------|----|
| Garantie (in luni) | 18 |
|--------------------|----|



Environmental Data

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 duratei de viata | Da |
| Eticheta WEEE |  În Uniunea Europeana, produsele trebuie reciclate respectand sistemul specific de colectare a deseurilor si nu trebuie sa ajunga in pubelele de colectare a deseurilor menajere. |

Fișă tehnică produs

Specificatii



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 | Distributie |
| descriere poli | 3P + N |
| numarul polilor protejati | 3 |
| pozitie neutrului | Stanga |
| [In] calibru | 25 A |
| Tip retea electrica | C.a. |
| frecventa retea electrica | 50/60 Hz |
| tehnologie unitate de declansare | Termo-magnetic |
| cod pentru curba | C |
| sensibilitate legatura de punere la pamant | 30 mA |
| adekvare pentru izolatie | Da conformitate cu SR EN 60947-2 |
| etichete privind calitatea | EAC IMQ |

Suplimentare

| | |
|--|--|
| locatia dispozitivului in sistem | Iesire |
| [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 scurgeri la pamant | Instantaneu |
| clasa de protectie pentru scurgeri 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 |

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| | |
|--|---|
| [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 jos1...16 mm² rigid Borne tip tunel sus sau jos1...10 mm² flexibil |
| lungimea de dezizolare a cablului | 14 mm for sus sau jos connection |
| cuplu de strangere | 2 N.m sus sau jos |
| protectie de scurgere 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 electromagnetica | 8/20 µs ţinere 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 |
|--------------------|----|



Environmental Data

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[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 Europeana, produsele trebuie reciclate respectand sistemul specific de colectare a deseurilor si nu trebuie sa ajunga in pubelele de colectare a deseurilor 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 mm² |
| 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 |

The information provided in this documentation contains general descriptions and/or technical characteristics of the performance of the products contained herein. This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications. It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof. Neither Himel nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information contained herein.

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 mm² |
| 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 |

The information provided in this documentation contains general descriptions and/or technical characteristics of the performance of the products contained herein. This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications. It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof. Neither Himel nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information contained herein.

| | |
|---------------------------------------|---|
| 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 |
| [Uimp] 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) |

Disclaimer: This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications

| | |
|-------------------------|---|
| Mechanical durability | 10000 cycles |
| Electrical durability | 4000 cycles |
| Connections - terminals | Tunnel type terminal (top or bottom) 1...25 mm² rigid Tunnel type terminal (top or bottom) 1...16 mm² 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 |



Buton incastrat complet, rosu Ø22 cu revenire cu arc 1NC "nemarkat"

XB4BA42

Principale

| | |
|---|--|
| gama de produse | Harmony XB4 |
| nume scurt al dispozitivului | XB4 |
| Tip produs sau componenta | Intrerupator cu revenire |
| material rama | Metal cromat |
| material inel de fixare | Zamak |
| diametrul de montaj | 22,5 mm |
| cantitate indivizibila de vanzare | 1 |
| forma a capului unitatii de semnalizare | Rotund |
| tip de operator | revenire cu arc |
| profil utilizator | Rosu Incastrat, nemarkat |
| tip cap | Standard |
| tip si compozitie contacte | 1 NC |
| operare contacte | Decuplare lenta |
| conexiuni - borne | Borne cu surub, <= 2 x 1.5 mm² cu pini conformitate cu IEC 60947-1 Borne cu surub, 1 x 0.22...2 x 2.5 mm² fara terminale de cablu conformitate cu IEC 60947-1 |

Suplimentare

| | |
|--|--|
| inaltime | 47 mm |
| latime | 30 mm |
| adancime | 52 mm |
| descriere borne ISO nr. 1 | (21-22)NC |
| greutate neta | 0,08 kg |
| rezistenta la spalare cu presiune inalta | 7000000 Pa la 55 °C, distanta : 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) |
| forta de actionare | 3,5 N schimbare stare electrică NC |
| durabilitate mecanica | 10000000 cic |
| cuplu de strangere | 0,8...1,2 N.m conformitate cu IEC 60947-1 |

Declinare de responsabilitate: Această documentație nu se substituie și nu trebuie utilizată pentru stabilirea adecvării sau fiabilității acestor produse pentru aplicații utilizator

| | |
|---|---|
| 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 cartuş 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 |
| [Uimp] 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 | $\Lambda < 10\exp(-6)$ la 5 V si 1 mA în mediu curat conformitate cu SR EN 60947-5-4 $\Lambda < 10\exp(-8)$ la 17 V si 5 mA în mediu curat conformitate cu SR EN 60947-5-4 |
| prezentare dispozitiv | Produs complet |

Mediu

| | |
|---|---|
| tratament protector | TH |
| temperatura ambietala 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 |

| | |
|----------------------|--|
| rezistentă la socuri | 30 gn (durata = 18 ms) pentru half sine wave acceleration conformitate cu IEC 60068-2-27 |
| | 50 gn (durata = 11 ms) pentru half sine wave acceleration conformitate cu IEC 60068-2-27 |
| | 60068-2-27 |

Unitati de ambalare

| | |
|---|------------|
| Unitate de masura pentru prima forma de impachetare | PCE |
| Număr de produse în pachet | 1 |
| Inaltime prima forma de impachetare | 3,500 cm |
| Latime prima forma de impachetare | 5,500 cm |
| Lungime prima forma de impachetare | 8,500 cm |
| Greutate colet(Lbs) | 78,900 g |
| Unitate de masura pentru a doua forma de impachetare | S03 |
| Numar unitati in a doua forma de impachetare | 150 |
| 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 | 12,268 kg |
| Unitate de masura pentru a treia forma de impachetare | P06 |
| Numar unitati in a treia forma de impachetare | 1200 |
| Inaltime a treia forma de impachetare | 75,000 cm |
| Latime a treia forma de impachetare | 80,000 cm |
| Lungime a treia forma de impachetare | 60,000 cm |
| Greutate a treia forma de impachetare | 106,144 kg |

Garanție contractuală

| | |
|--------------------|----|
| Garantie (in luni) | 18 |
|--------------------|----|



Environmental Data

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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 | Declaratia REACH |

Use Longer

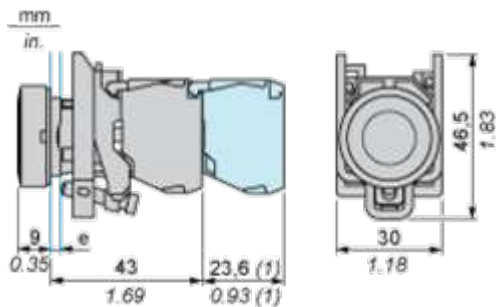
| Prelungire durata de viata | |
|----------------------------|-------------------|
| Reparare | Nu |
| Index reparare produs | A |

Use Again

| Reambalare si refabricare | |
|--|--|
| Profil circularitate | Informatii privind sfarsitul duratei de viata |
| Preluare la sfarsitul duratei de viata | Da |
| Eticheta WEEE |  În Uniunea Europeana, produsele trebuie reciclate respectand sistemul specific de colectare a deseurilor si nu trebuie sa ajunga in pubelele de colectare a deseurilor menajere. |

Dimensions Drawings

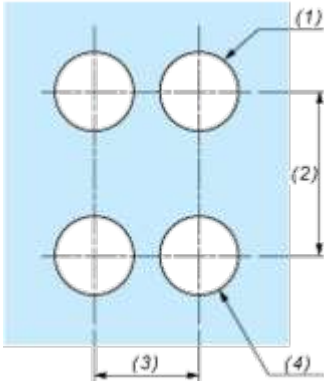
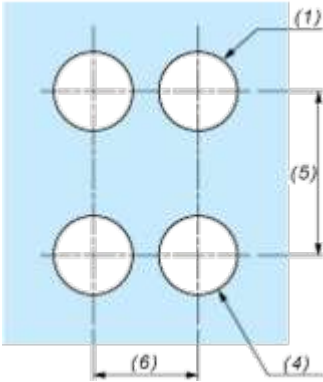
Dimensions



e : clamping thickness: 1 to 6 mm / 0.04 to 0.24 in.
(1) Additional row of contacts or double contact.

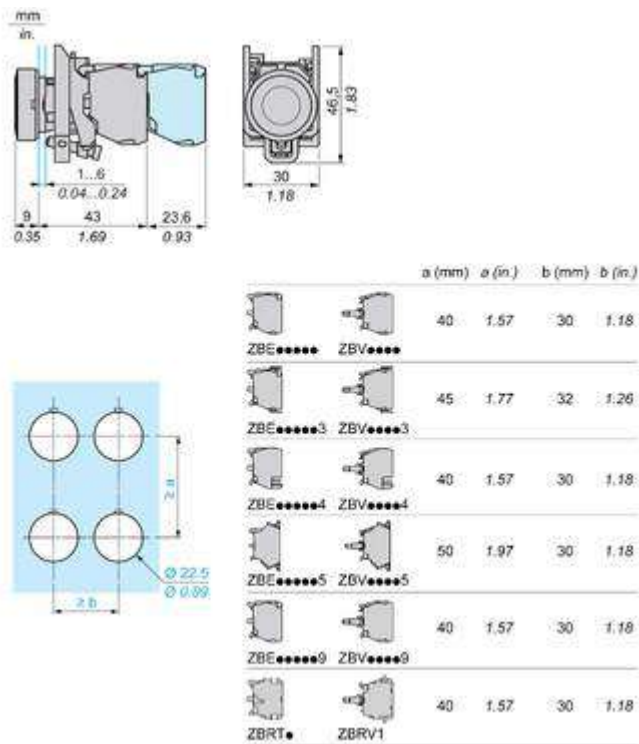
Mounting and Clearance

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 |
|---|--|
|  |  |
| <div>(1) Diameter on finished panel or support</div> <div>(2) 40 mm min. / 1.57 in. min.</div> <div>(3) 30 mm min. / 1.18 in. min.</div> <div>(4) Ø 22.5 mm / 0.89 in. recommended (Ø 22.3 mm₀^{+0.4} / 0.88 in.₀^{+0.016})</div> <div>(5) 45 mm min. / 1.78 in. min.</div> <div>(6) 32 mm min. / 1.26 in. min.</div> | |

Technical Illustration

Dimensions



Offer Marketing Illustration

Product benefits / Features



Offer Marketing Illustration

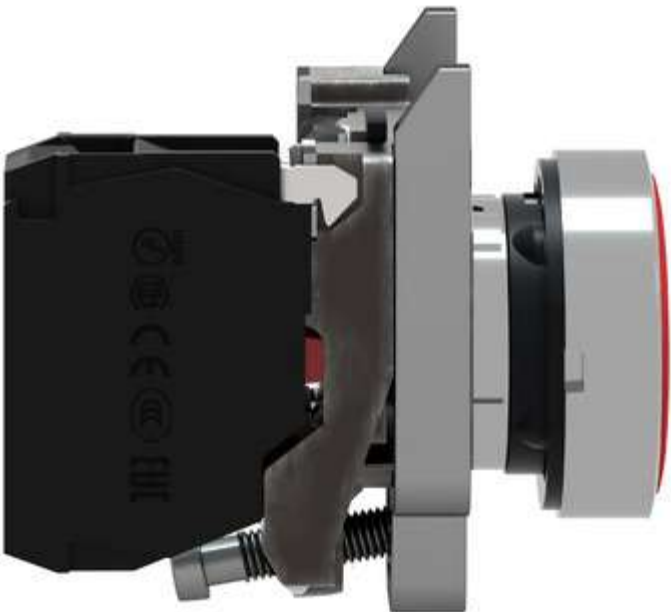
Product benefits / Features



Image of product / Alternate images

Alternative





Fișă tehnică produs

Specificatii



Fisa Mobila Mureva, Dreapta, 16 A,
3P + N + E, 380, 415 V Ac, Ip44

PKE16M435

Principale

| | |
|------------------------------|-------------|
| Gama | Mureva |
| Tip produs sau componenta | Wander plug |
| nume scurt al dispozitivului | Mureva plug |
| Plug, socket category | Low voltage |
| descriere poli | 3P + N + E |
| Tip retea electrica | C.a. |
| standard priza | Industrial |

Suplimentare

| | |
|-------------------------------|--|
| forma fisa, priza, carcasa | Drept |
| [In] curent nominal | 16 A |
| [Ue] tensiune nominala | 380...415 V |
| frecventa retea electrica | 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 |
| sectiune cablu | 1...4 mm² |
| diametru exterior cablu | 8...15 mm |
| intrare cablu | Fair lead Presetupa |
| tip filet | Pg 21 |
| greutate neta | 0,19 kg |
| inaltime | 142 mm |
| latime | 74 mm |
| adancime | 74 mm |
| culoare | Gri (RAL 7035) |
| Voltage colour | Red |

Mediu

| | |
|----------------------|--------------------------------|
| standarde | IEC 60309-1 IEC 60309-2 |
| grad de protectie IP | IP44 conforming to SR EN 60529 |

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| | |
|--|---|
| 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 |
| altitudine 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 |

Garanție contractuală

| | |
|--------------------|----|
| Garantie (in luni) | 18 |
|--------------------|----|



Environmental Data

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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 duratei de viata | No |
| Eticheta WEEE |  În Uniunea Europeana, produsele trebuie reciclate respectand sistemul specific de colectare a deseurilor si nu trebuie sa ajunga in pubelele de colectare a deseurilor 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 °С;
- высота над уровнем моря – не более 2000 м;
- относительная влажность воздуха до 50 % при плюс 40 °С,

допускается эксплуатация контакторов при относительной влажности воздуха до 90 % и температуре плюс 20 °С;

- 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 AC-3 и AC-1(lth) 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 AC-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 AC-3 ($U_n \leq 400$ В), А | | 9 | 12 | 18 | 25 | 32 | 40 | 50 | 65 | 80 | 95 |
| Условный тепловой ток I_{th} ($t^\circ \leq 40^\circ$), категория применения AC-1, А | | 25 | 25 | 32 | 40 | 50 | 60 | 80 | 80 | 125 | 125 |
| Макс. кратковременная мощность по AC-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÷1,1)U _c | | | | | | | | | |
| | Отпускание | (0,2÷0,75)U _c | | | | | | | | | |
| Мощность потребления катушки при U _c , ВА | Срабатывание cos φ = 0,75 | 60 | 60 | 60 | 90 | 90 | 200 | 200 | 200 | 200 | 200 |
| | Удержание cos φ = 0,3 | 7 | 7 | 7 | 7,5 | 7,5 | 20 | 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 | 20–35 |
| | Размыкание | 4–19 | 4–19 | 4–19 | 5–19 | 5–19 | 8–12 | 8–12 | 8–12 | 6–20 | 6–20 |
| Мощность рассеяния, Вт | | 3 | 3 | 3 | 3,5 | 3,5 | 10 | 10 | 10 | 10 | 10 |
| Эл. износост., млн. ком. циклов | АС-3 | 1,7 | 1,7 | 1,4 | 1,4 | 1,6 | 1,5 | 1,4 | 1,4 | 1,2 | 0,9 |
| | АС-1 | 0,55 | 0,7 | 1,0 | 1,3 | 1,3 | 1,3 | 1,3 | 1,4 | 0,7 | 1,2 |
| Мех. износостойчивость., млн. ком. циклов | | 2 | 2 | 2 | 2 | 2 | 2 | 1,5 | 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° ≤ 40°) I _{th} , А | | 10 | | | | |
| Минимальная включающая способность | U _{min} , В | 17 | | | | |
| | I _{min} , мА | 15 | | | | |
| Защита от сверхтоков – предохранитель gG, А | | 10 | | | | |
| Максимальная кратковременная нагрузка (t ≤ 1с), А | | 100 | | | | |
| Сопrotивление 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 | | | | |

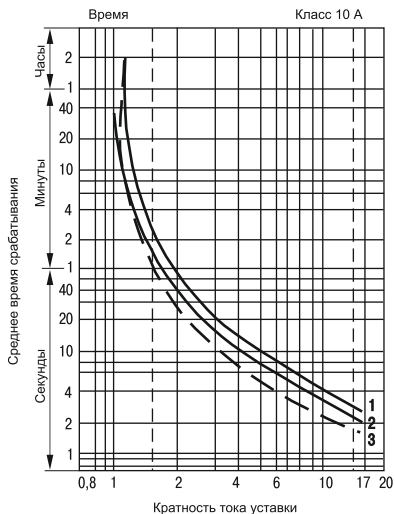
Таблица 7

| Параметры | | Значение |
|--|-------|----------|
| Тип дополнительного контакта | | 1з |
| Ток термической стойкости, А | | 5 |
| Максимальная мощность катушки контактора в зависимости от напряжения, ВА | 380 В | 600 |
| Защита от сверхтоков – предохранитель gG, А | | 5 |
| Сечение присоединяемых проводников, мм ² | | 1–2,5 |
| Момент затяжки, Н·м | | 1,2 |

2.8 Времятоковые 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

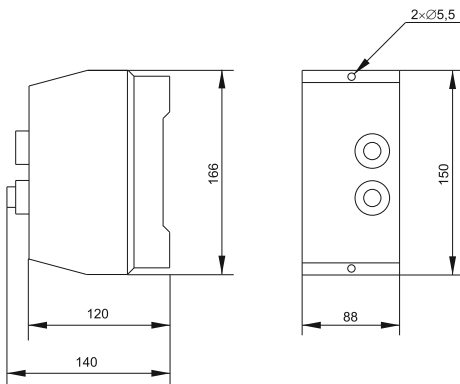


Рисунок 2 – КМИ 10960, КМИ 11260, КМИ 11860

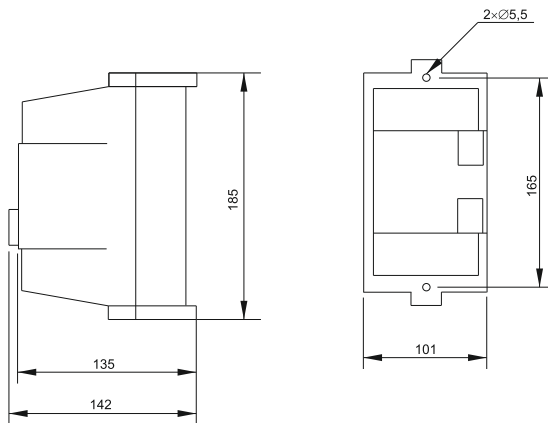


Рисунок 3 – КМИ 22560, КМИ 23260

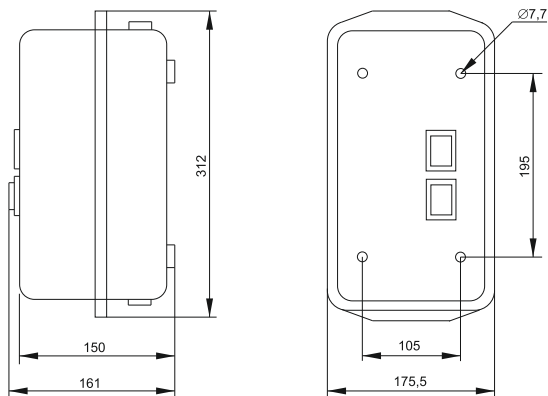


Рисунок 4 – КМИ 34062, КМИ 35062, КМИ 46562, КМИ 48062, КМИ 49562

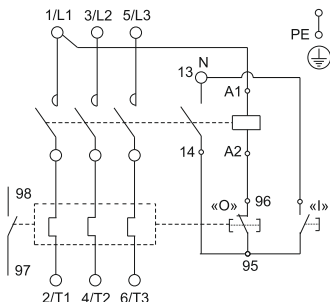


Рисунок 5 – Схема электрическая контакторов с катушкой управления 230 В~

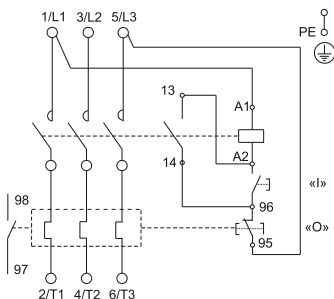


Рисунок 6 – Схема электрическая контакторов с катушкой управления 400 В~

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:

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www.iek.ru

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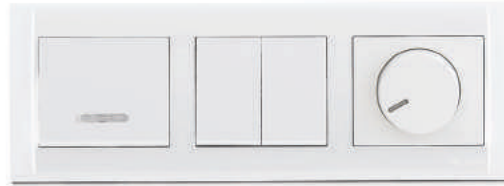
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10 AX, 250 V~

EN 60669-1

Piece in Box / Package - 12 / 120



Two-Circuit Switch Illuminated *

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10 AX, 250 V~

EN 60669-1

Piece in Box / Package - 12 / 120



Light Switch *

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10 A, 250 V~

EN 60669-1

Piece in Box / Package - 12 / 120



Light Switch Illuminated *

42001024

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Two-Way Switch Illuminated *

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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 *

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10 A, 250 V~

EN 60669-1

Piece in Box / Package - 12 / 120



Intermediate Switch *

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10 AX, 250 V~

EN 60669-1

Piece in Box / Package - 12 / 120



Intermediate Switch Illuminated *

42001040

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**Bell Switch Illuminated 12V***

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EN 60669-1

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**Bell Switch With Label***

42001010

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**Bell Switch Illuminated ***

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EN 60669-1

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42001094

10 AX, 250 V~

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Socket Outlet with Earthing Pin and Child Protection *

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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

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**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 Horizontal Frame
42001702



Triple Horizontal Frame
42001703



Quartet Horizontal Frame
42001704



Fiftet Horizontal Frame
42001705



Sixtet Horizontal Frame
42001706



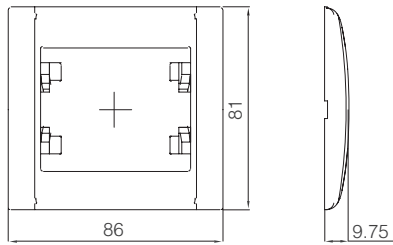
Double Vertical Frame
42001707



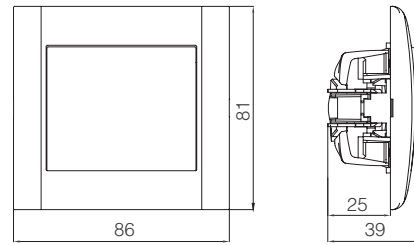
Triple Vertical Frame
42001708

Technical Drawings

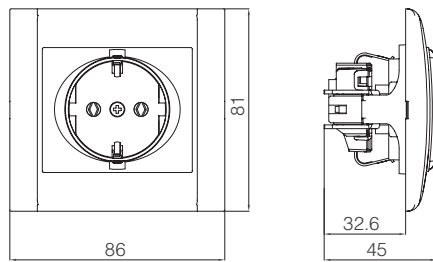
Frame



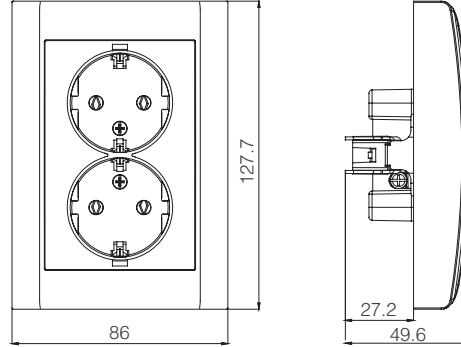
One Way Switch



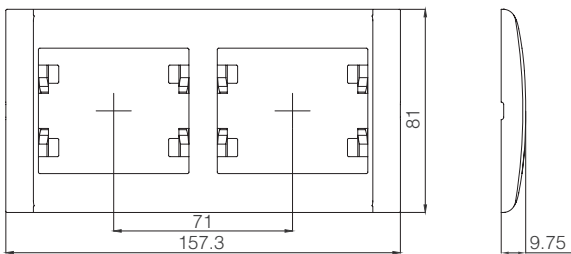
Schuko Socket Outlet



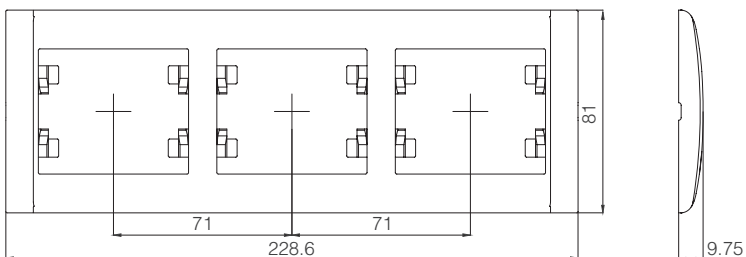
Double Schuko Socket Outlet



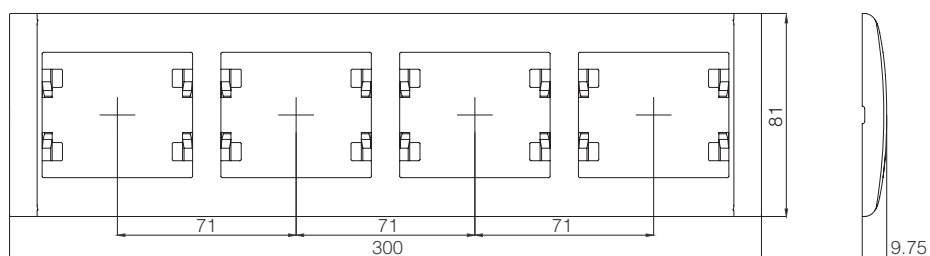
Double Horizontal Frame



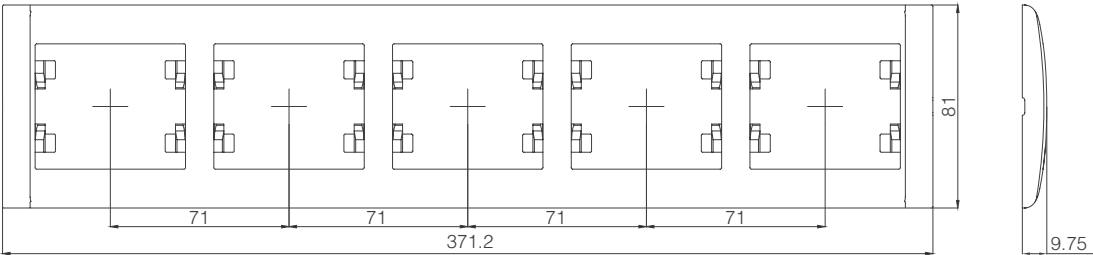
Triple Horizontal Frame



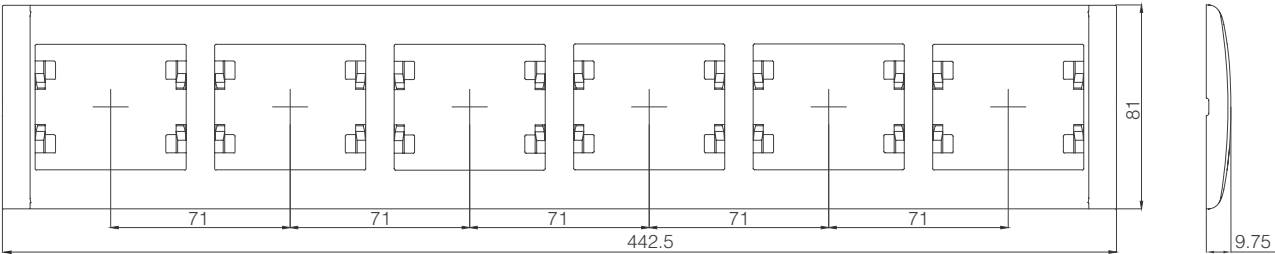
Quartet Horizontal Frame



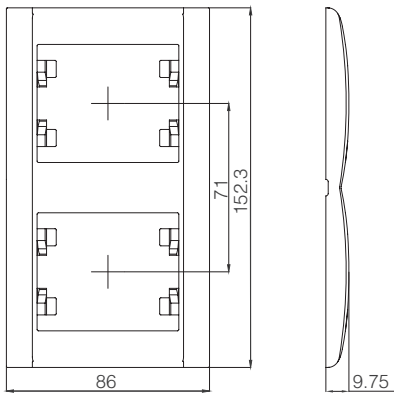
Fiftet Horizontal Frame



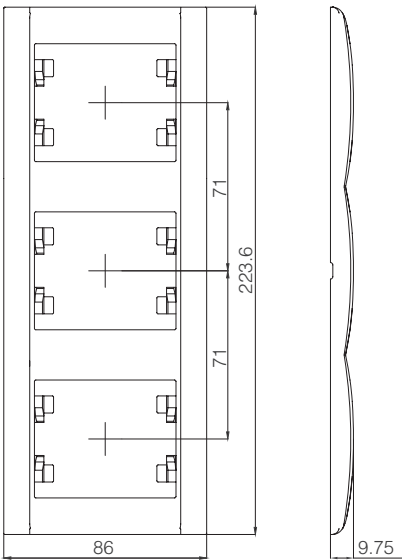
Sixtet Horizontal Frame



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 ProtectionSchuko Socket Outlet with | 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..

| | Code No | | Code No | | Code No |
|---------------------|---------|-----------------|---------|----------------|---------|
| 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 | | |

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



Module
(With Rocker /
Cover Plate)

+



Frame

=



Complete Product

(*) Marked products are available with screwless terminal option.

SAMPLE

| | Product Name | Code No |
|-------|---------------------------|-------------|
| White | Screw Switch | 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.

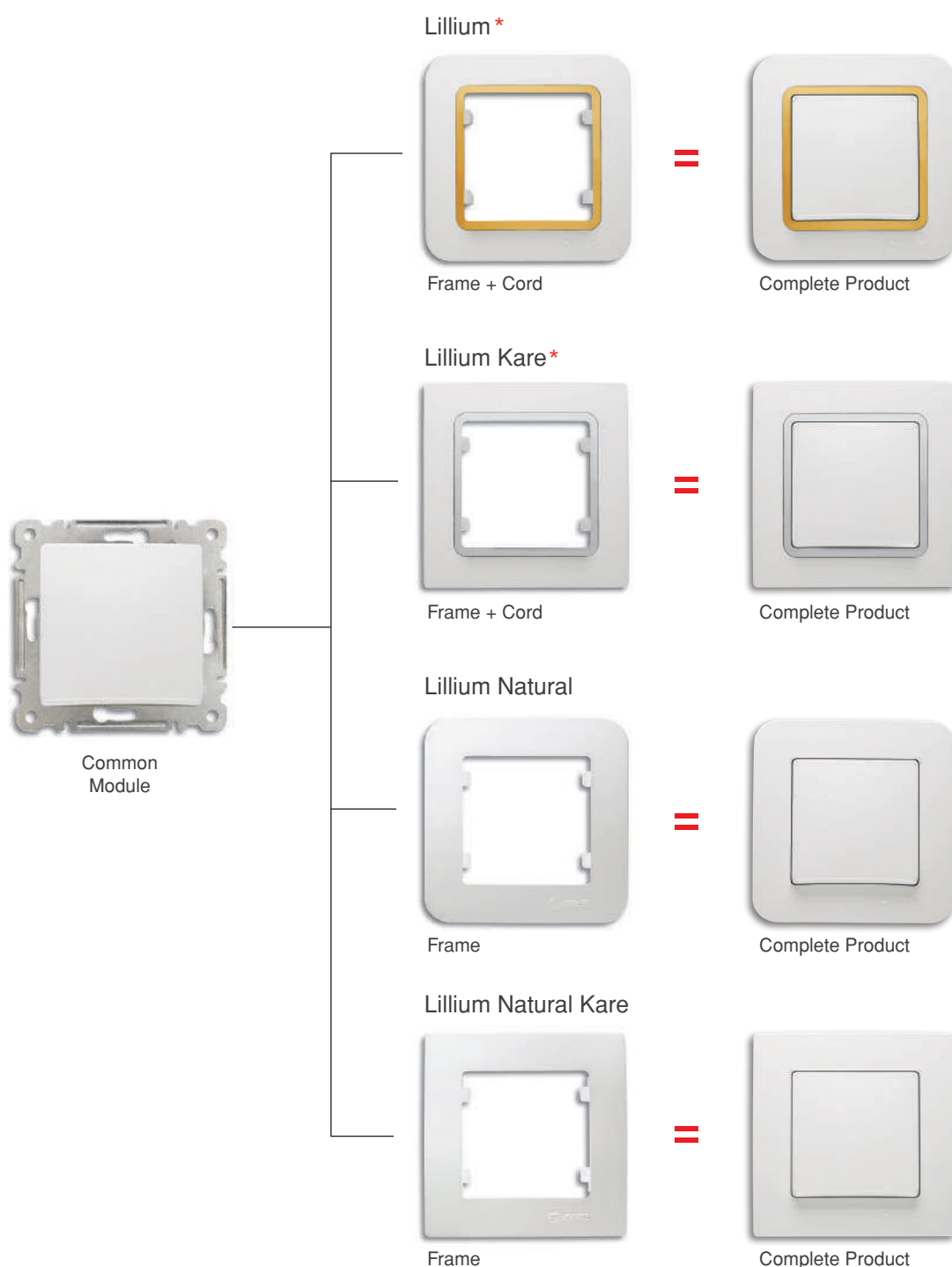
| Colors | Code No | Colors | Code No |
|---------|---------|-------------|---------|
| Yellow | 074 | Blue | 092 |
| Lilac | 078 | Rose | 093 |
| Magenta | 085 | Orange | 094 |
| Green | 091 | Light Lilac | 095 |

Within frame codes showing 'xxx', enter the color codes from the table below.

| Colors | Code No | Colors | Code No | Colors | Code No |
|---------------------|---------|-----------------|---------|----------------|---------|
| 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 |

Lillium Frames

| 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 Gross Weight (kg)*** | Size of Package (mm) |
|------------------------------------|---|--|------------------------|--------------|------------------|---|----------------------|
| 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 |

Lillium Kare Frames

| Product Name | Code No. | Piece in Box | Piece in Package | Without Thin Frame Gross Weight (kg)*** | Size of Package (mm) |
|------------------------------------|------------|--------------|------------------|---|----------------------|
| 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

| | Product Name | Code No |
|-------|---------------------------|-------------|
| White | 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

| | Code No | |
|--------|---------|---|
| Colors | 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 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 | 12 | 120 | 2,36 | 185 x 365 x 205 |
| Double Horizontal Frame | 55 x 12 | 57 x 12 | 55 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 | 20 | 200 | 7,74 | 417 x 455 x 290 |
| Quartet Horizontal Frame | 55 x 39 | 57 x 39 | 55 x 39 | 56 x 39 | 25 | 250 | 11,54 | 400 x 600 x 345 |
| Fiftet Horizontal Frame | 55 x 59 | 57 x 59 | 55 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 | 5 | 60 | 4,40 | 440 x 450 x 140 |
| Double Vertical Frame | 55 x 32 | 57 x 32 | 55 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 | 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 | 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 | 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 |
| Fiftet 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.

| | Code No | |
|--------|---------|---|
| | xxx | x |
| Colors | 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.

| | Code No | | Code No |
|---------|---------|-------------|---------|
| Colors | xxx | Colors | xxx |
| Yellow | 074 | Blue | 092 |
| Lilac | 078 | Rose | 093 |
| Magenta | 085 | Orange | 094 |
| Green | 091 | Light Lilac | 095 |

Note: Pastel colored frame option is valid for only Lillium Natural Square.

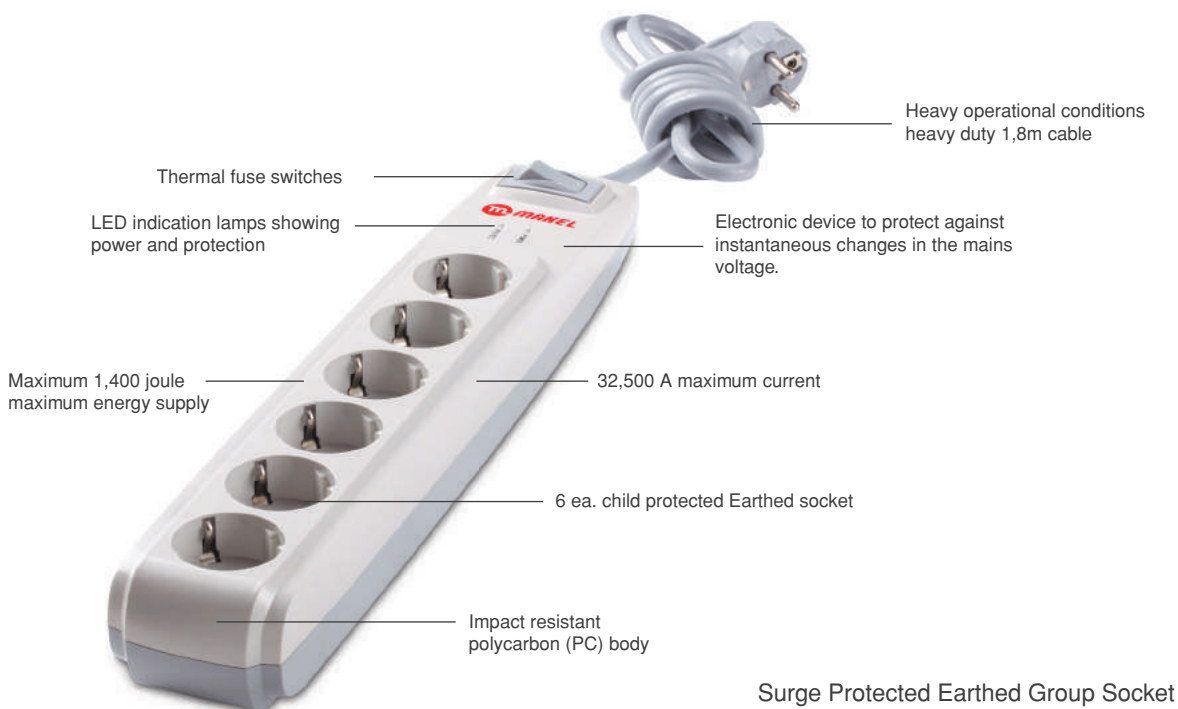
Group Sockets



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 lightening 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

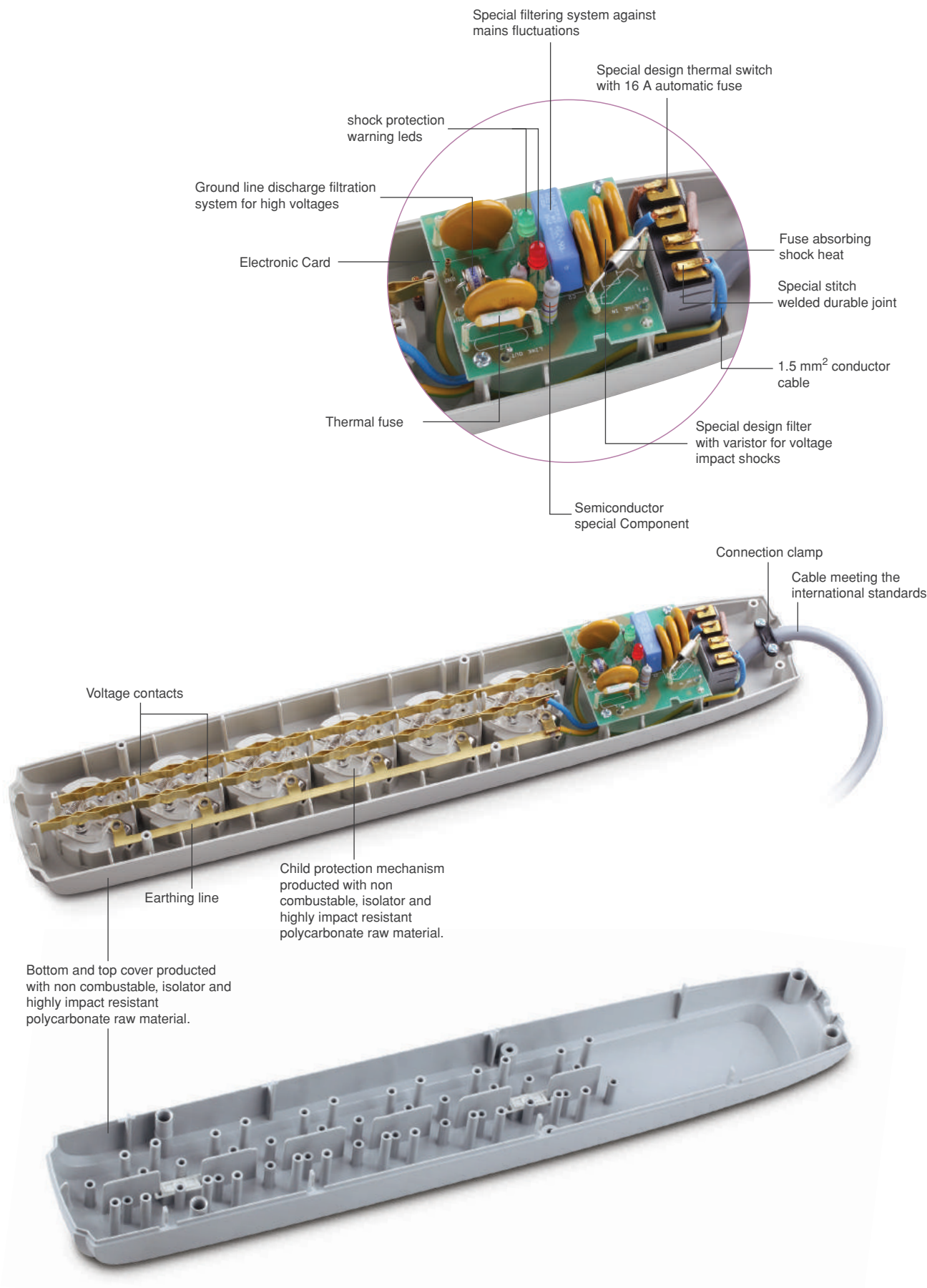
25064200

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

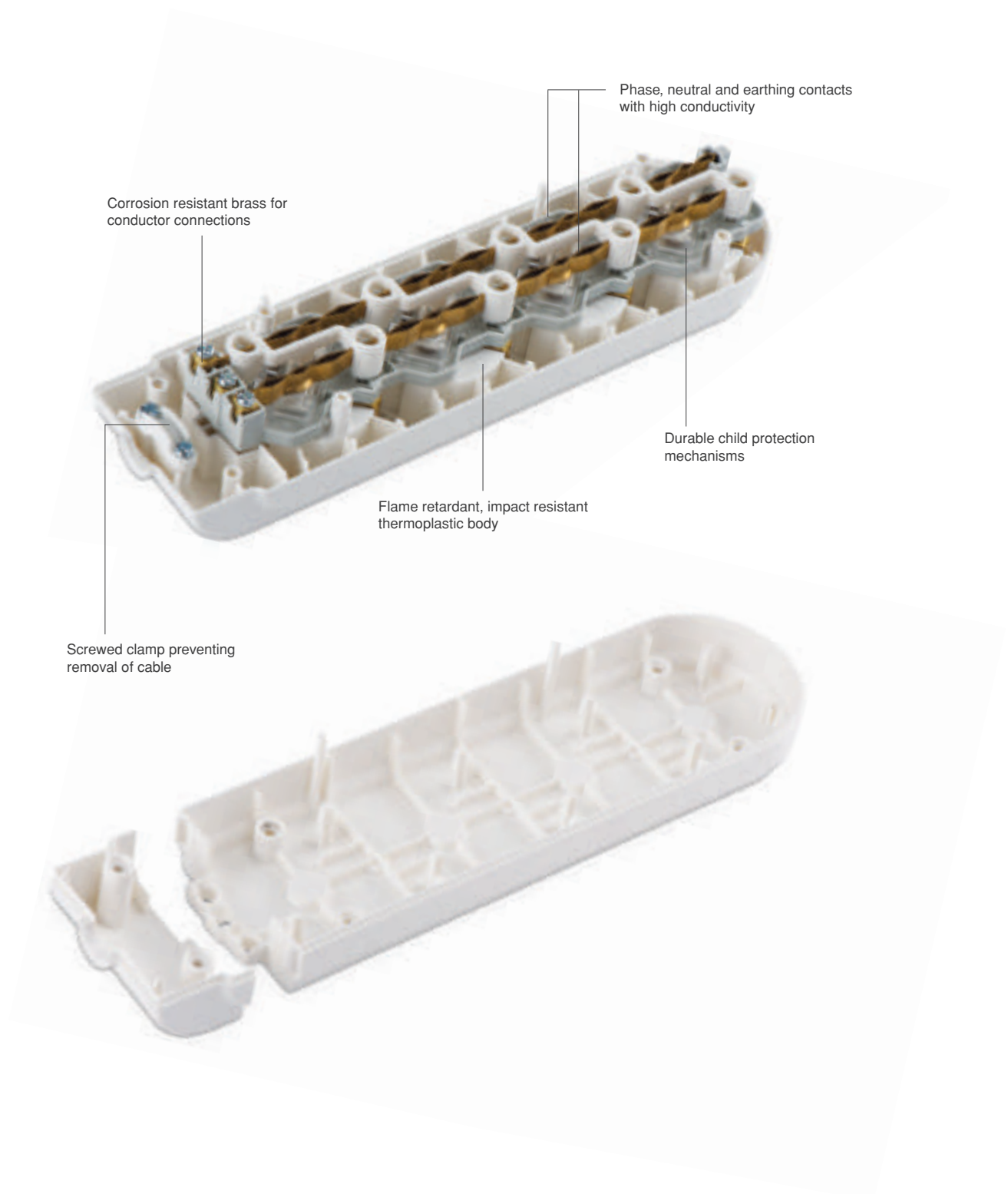


4 Gang Multiple Earthed Socket with Switch, without Cable



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 retardent 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

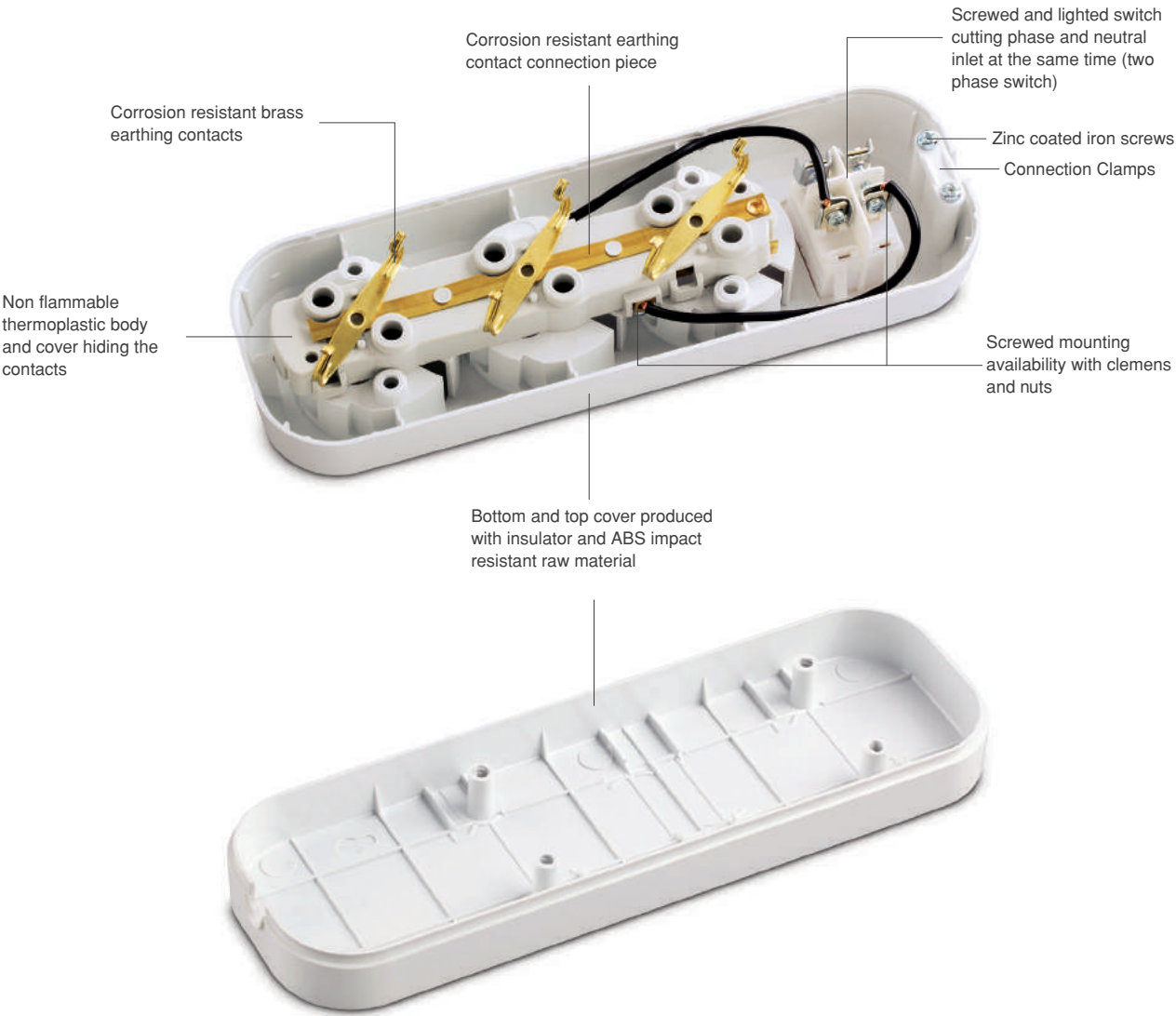


4 Gang Multiple Earthed
Socket with Cable



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

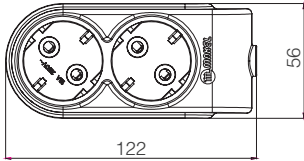
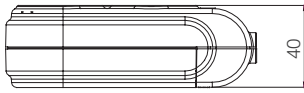
N6301063 / N6311063 * - 5m - Piece in Box / Package - 12 / 24

16 A, 250 V~
IEC 60884-1

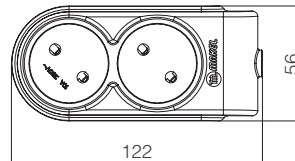
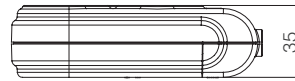
* Childproof



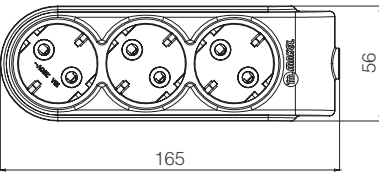
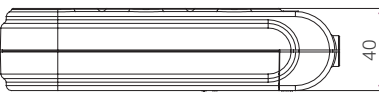
Technical Drawings



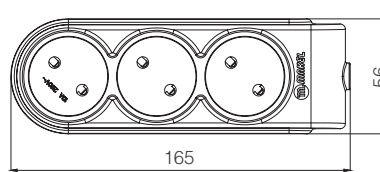
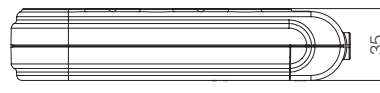
2 Gang Earthed Socket



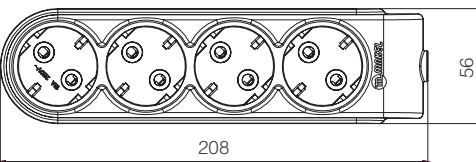
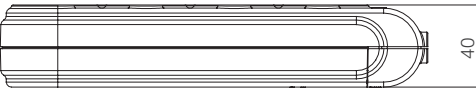
2 Gang Socket without Earthed



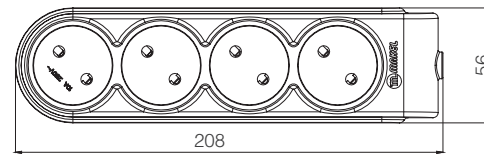
3 Gang Earthed Socket



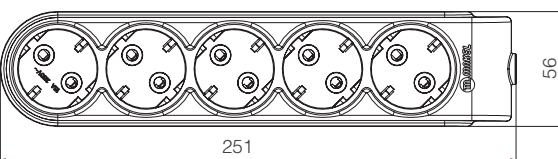
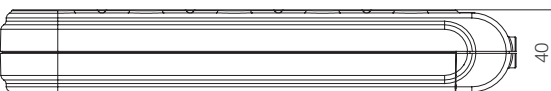
3 Gang Socket without Earthed



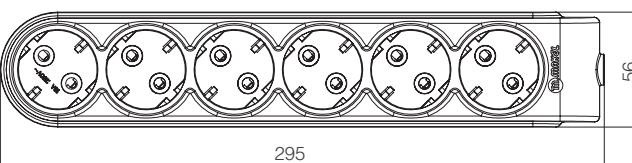
4 Gang Earthed Socket



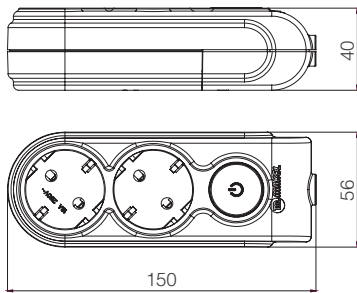
4 Gang Socket without Earthed



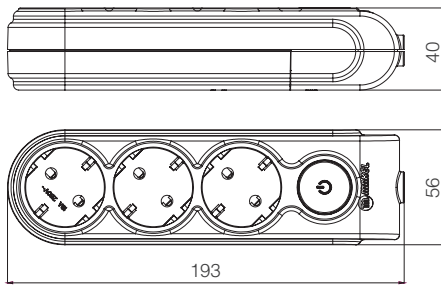
5 Gang Earthed Socket



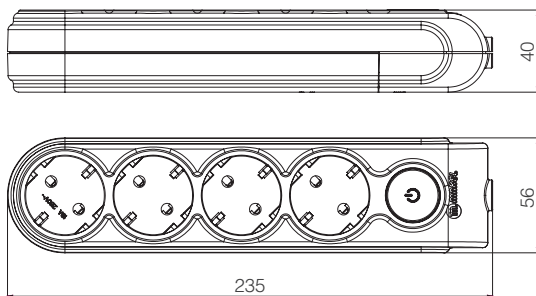
6 Gang Earthed Socket



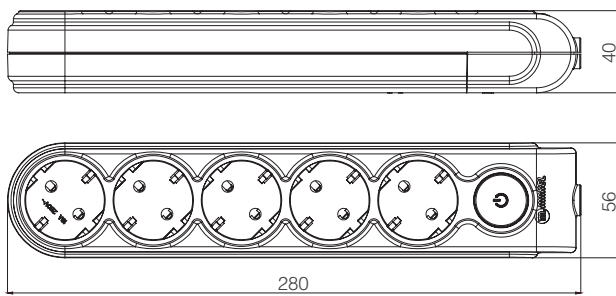
2 Gang Earthed Socket with Switch



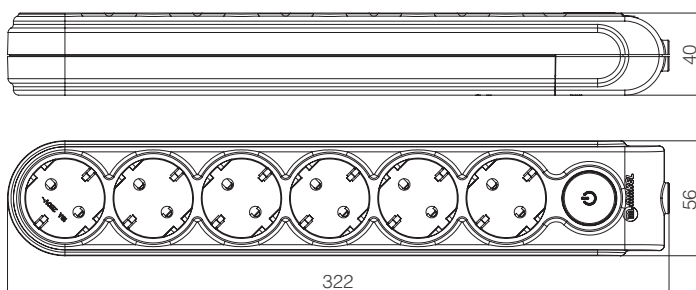
3 Gang Earthed Socket with Switch



4 Gang Earthed Socket with Switch



5 Gang Earthed Socket with Switch



6 Gang Earthed 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



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



3 Gang Multiple Earthed 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 Earthed Socket with Switch & Cable

MGP216 - 2m

16 A, 250 V~

Piece in Box / Package - 12 / 48



6 Gang Multiple Earthed Socket with Switch, without Cable

MGP231

16 A, 250 V~

IEC 60884-1

Piece in Box / Package - 12 / 48



6 Gang Multiple Pin Earthed 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

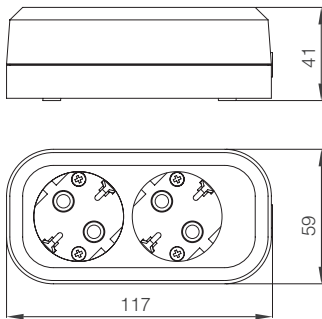
MGP343 - 3m - Piece in Box / Package - 12 / 48

MGP344 - 5m - Piece in Box / Package - 12 / 48

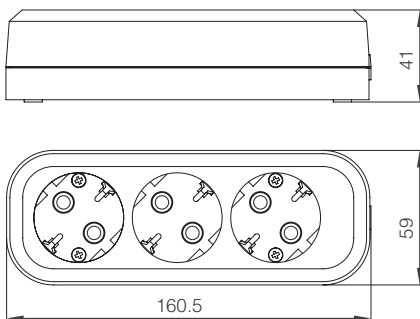
10 A, 250 V~

IEC 60884-1

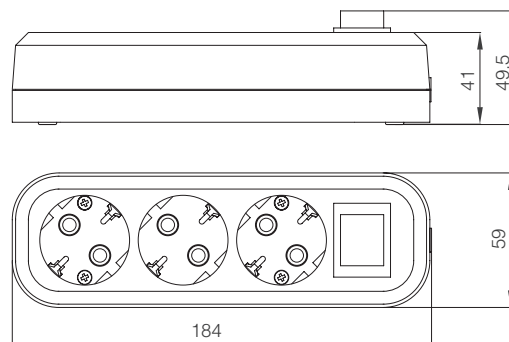
Technical Drawings



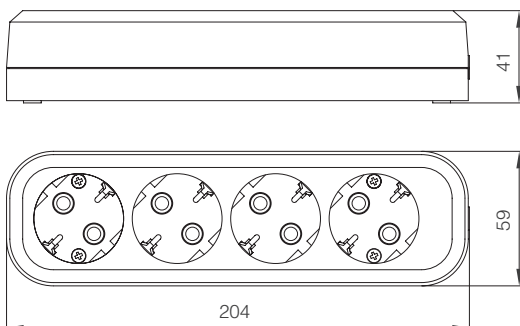
2 Gang Earthed Socket



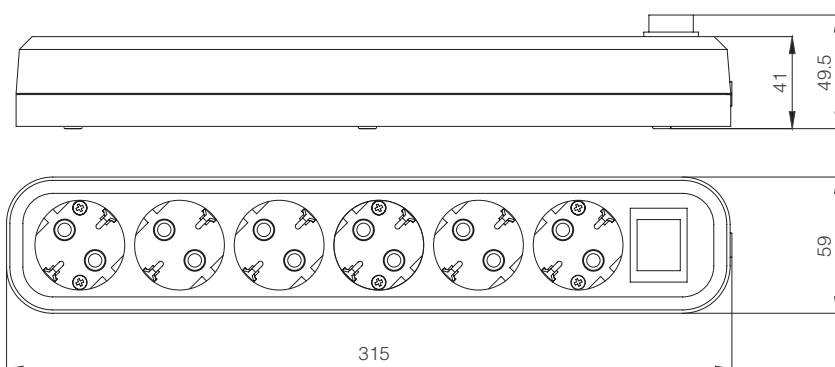
3 Gang Earthed Socket



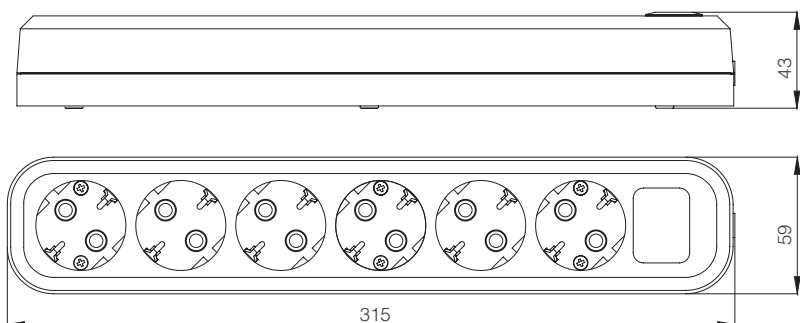
3 Gang Earthed Socket with Switch



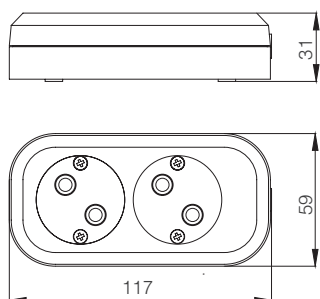
4 Gang Earthed Socket



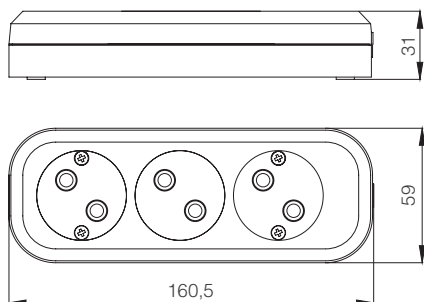
6 Gang Earthed Socket with Switch



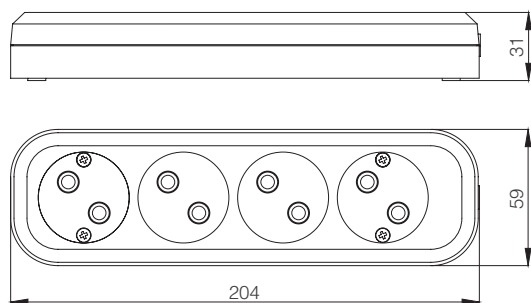
6 Gang Earthed Socket



2 Gang Socket without Earthed



3 Gang Socket without Earthed



4 Gang Socket without Earthed

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 witch 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 witch 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 witch 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 witch 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 witch 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 Earthed, 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 Earthed, 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 Earthed, 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 Earthed, 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 metre 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 Earthed, 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 Earthed, 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*15 | 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



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

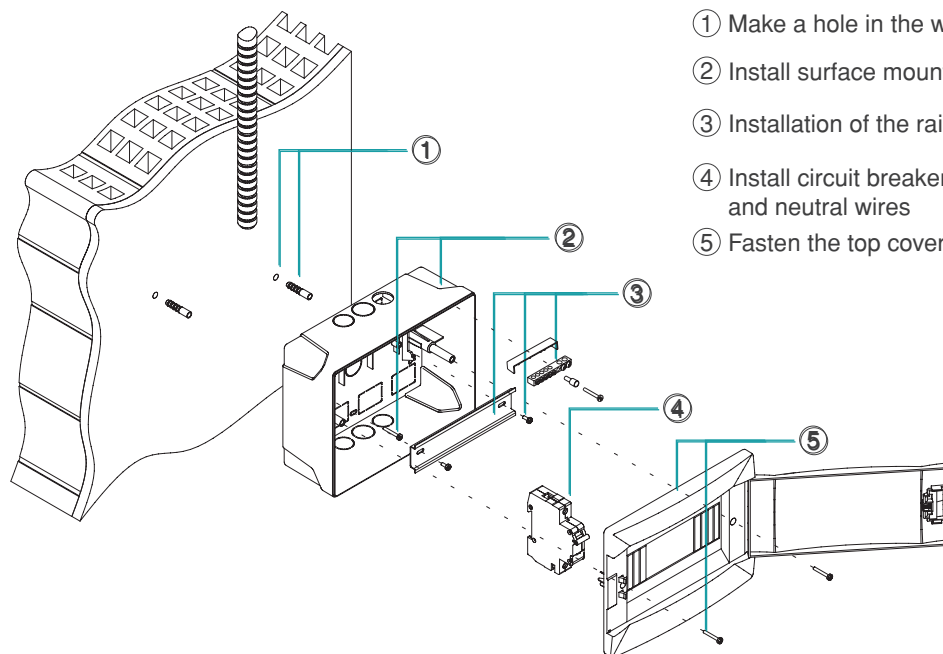
Makel Distribution Boxes produced from halogene free material does not contain halogene elements such as bromine, fluorine, iodine and chlorine thus they do not produce toxic gases in case of a fire and they can be used safely in public areas such as schools, hospitals, hotels, malls, cinemas etc.

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

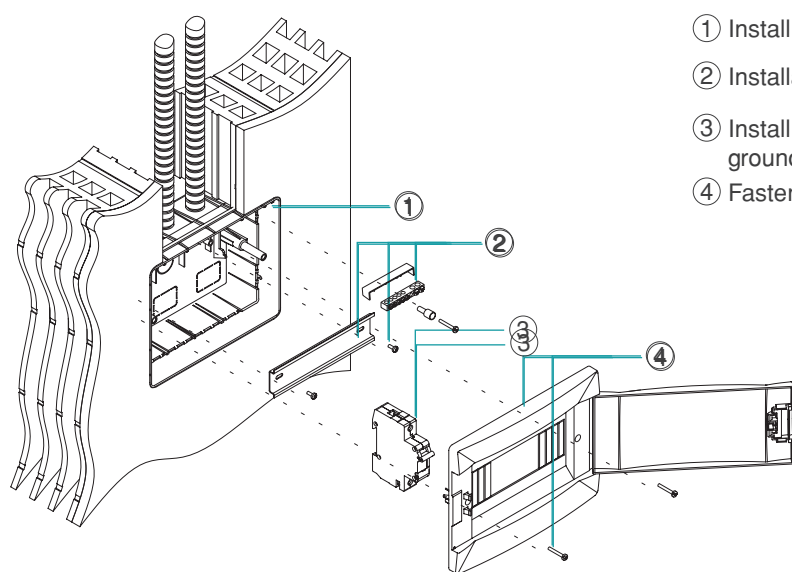
Assembly

Surface Mount Distribution Box



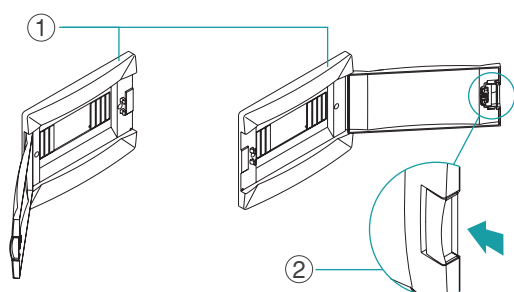
- ① Make a hole in the wall and install a peg into the hole
- ② Install surface mounted case to the wall and arrange wiring
- ③ Installation of the rail and the ground block with screws
- ④ Install circuit breakers and connect phase, ground and neutral wires
- ⑤ Fasten the top cover with screws included 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.

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 Threefold**
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 Threefold**
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



**Quadrapole 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



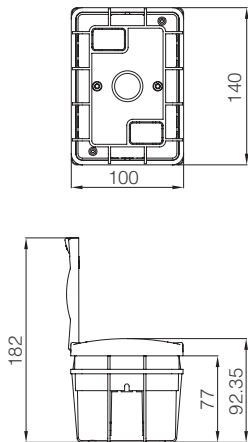
**Surface Mount Distribution Box
with Terminal Module
24 Double Decker - Opaque**
28001231
Color - White
IEC 60670-24
Size of Package (mm) - 312x460x350
Gross Weight (kg) - 6,55
Piece in Box / Package - 1 / 4



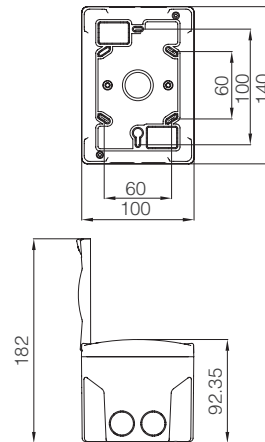
**Surface Mount Distribution Box
with Terminal Module
36 Threefold - Opaque**
28001232
Color - White
IEC 60670-24
Size of Package (mm) - 450x475x330
Gross Weight (kg) - 9,7
Piece in Box / Package - 1 / 4

Technical Drawings

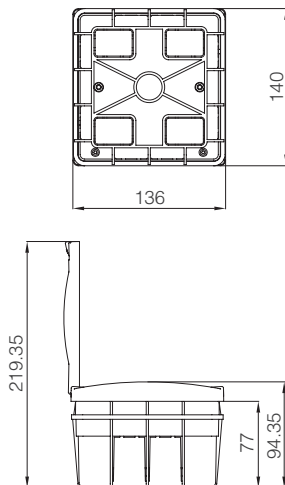
Flush Mount Distribution Box with Terminal Module 2



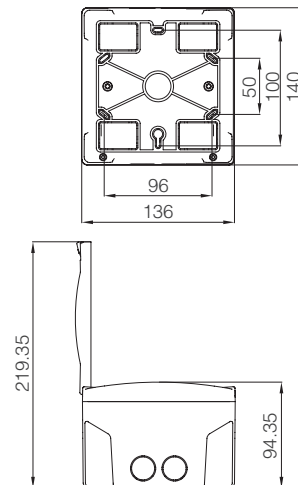
Surface Mount Distribution Box with Terminal Module 2



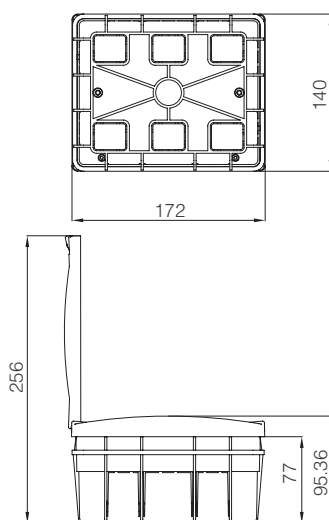
Flush Mount Distribution Box with Terminal Module 4



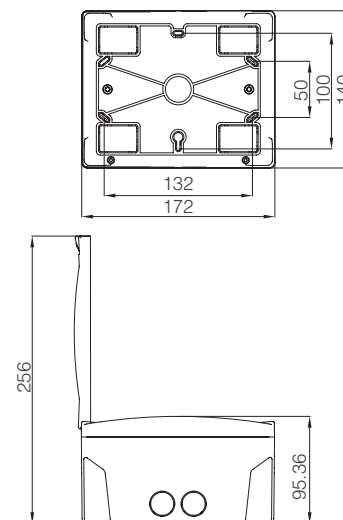
Surface Mount Distribution Box with Terminal Module 4



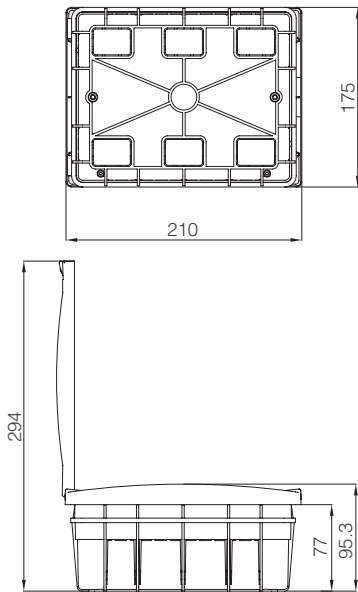
Flush Mount Distribution Box with Terminal Module 6



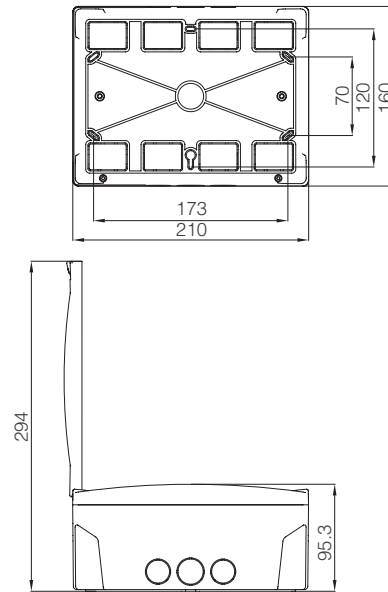
Surface Mount Distribution Box with Terminal Module 6



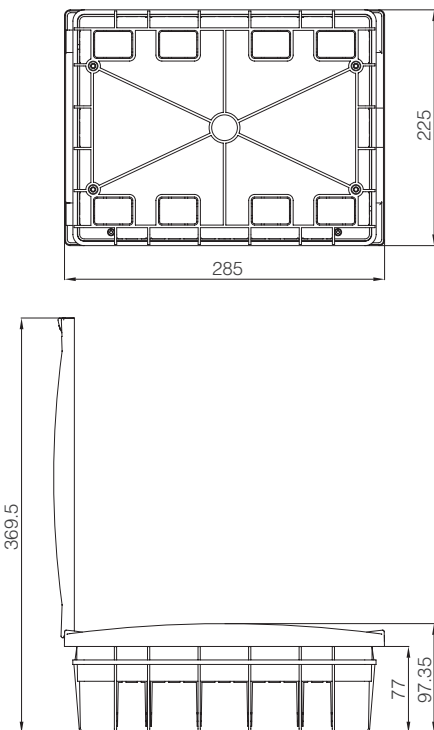
Flush Mount Distribution Box with Terminal Module 8



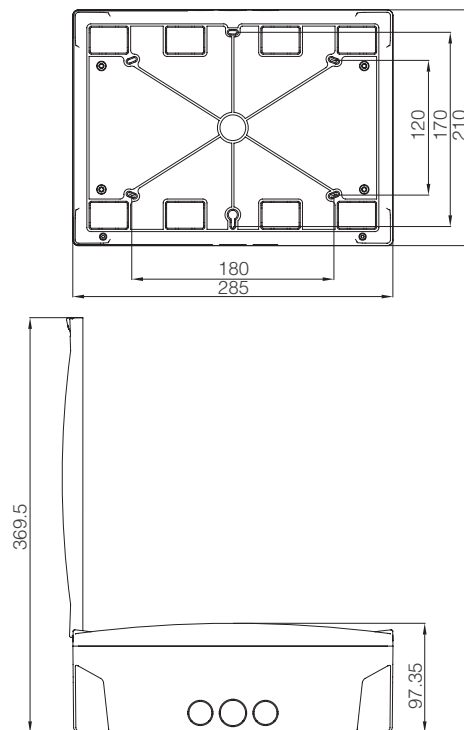
Surface Mount Distribution Box with Terminal Module 8



Flush Mount Distribution Box with Terminal Module 12

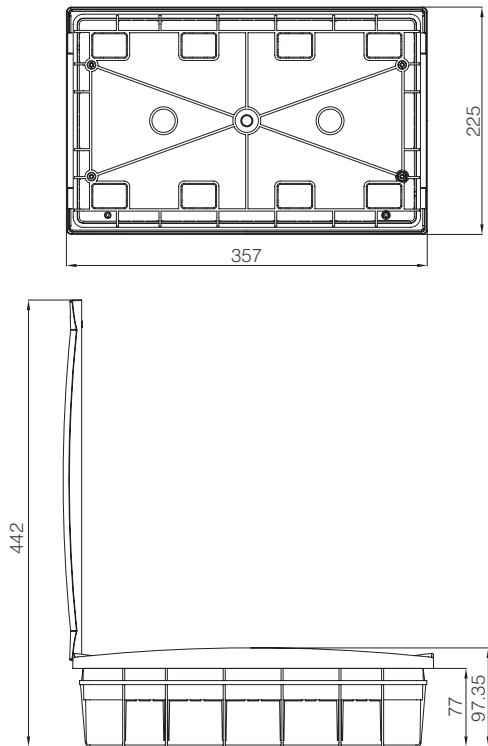


Surface Mount Distribution Box with Terminal Module 12

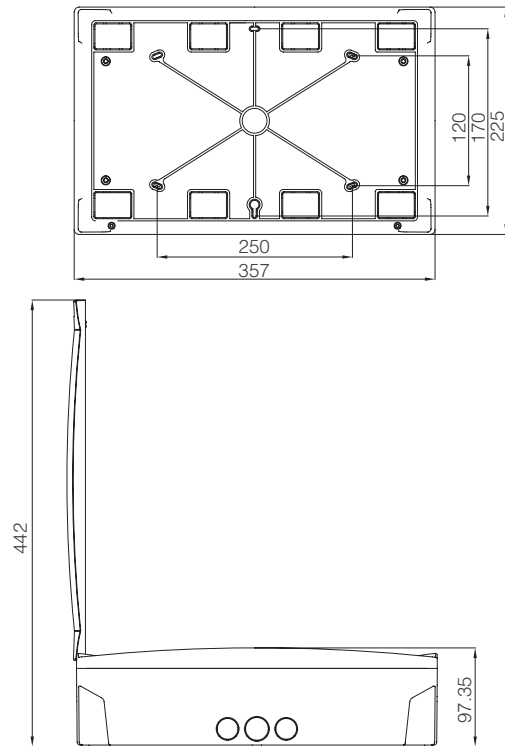


Technical Drawings

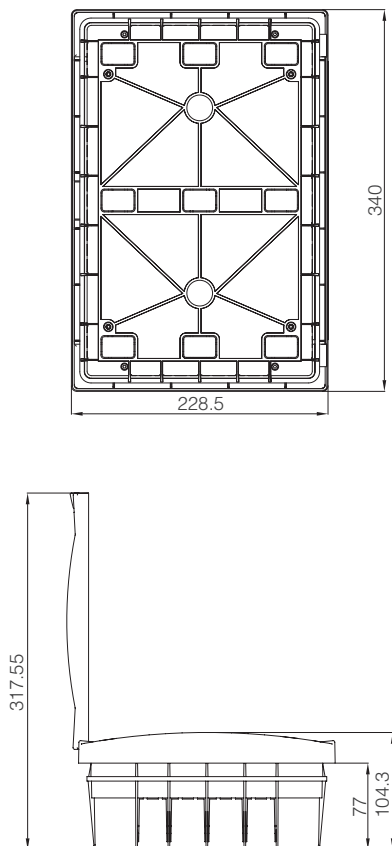
Flush Mount Distribution Box with Terminal Module 16



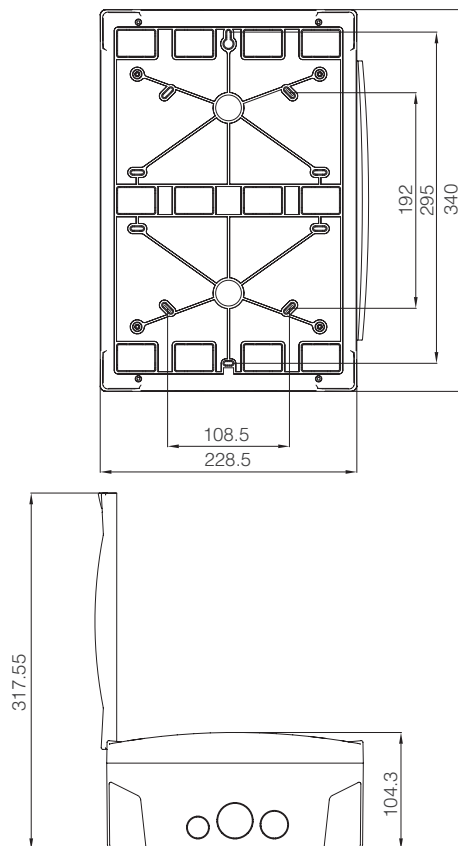
Surface Mount Distribution Box with Terminal Module 16



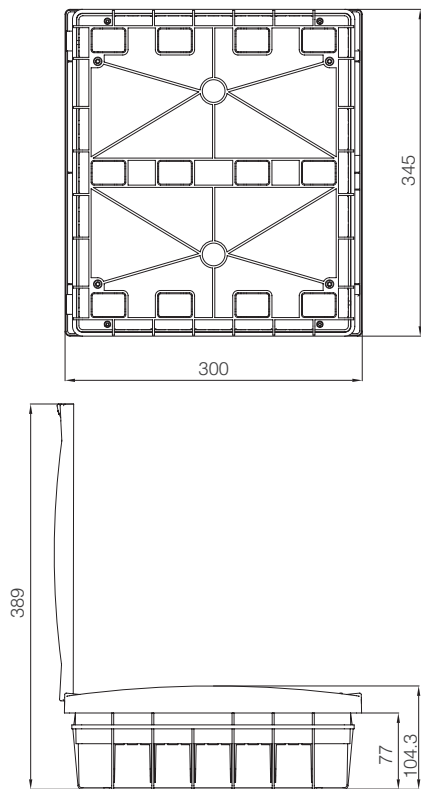
Flush Mount Distribution Box with Terminal Module 16 Double Decker



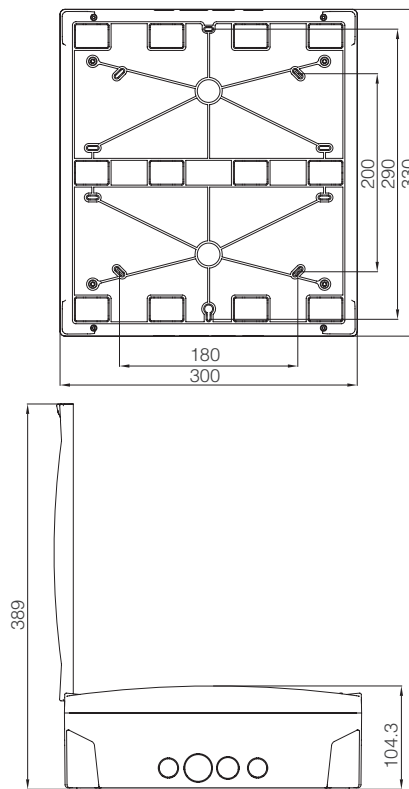
Surface Mount Distribution Box with Terminal Module 16 Double Decker



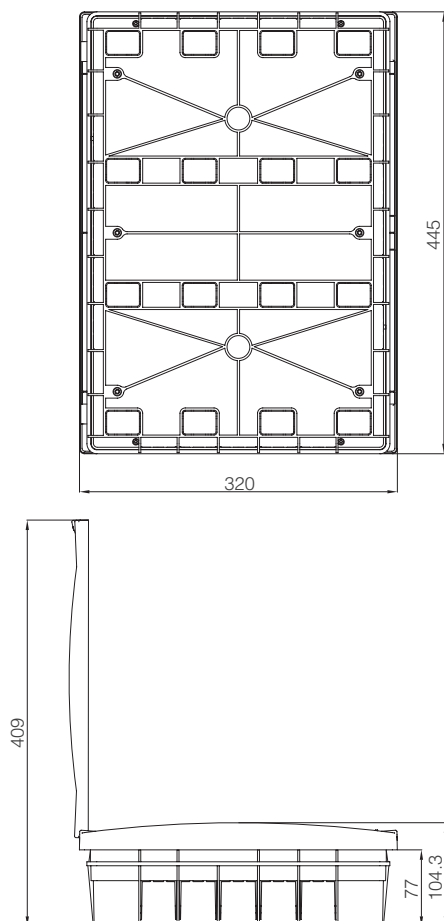
Flush Mount Distribution Box with Terminal Module
24 Double Decker



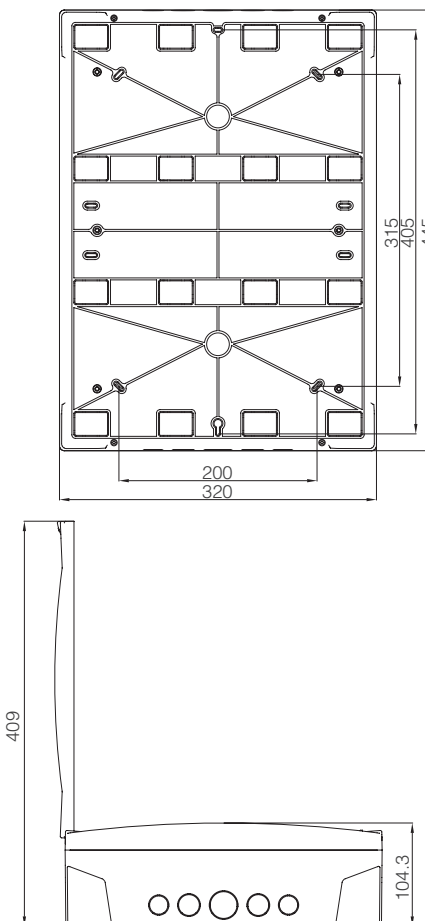
Surface Mount Distribution Box with Terminal Module
24 Double Decker



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

| | | | | | |
|----------------------|----------|---|----|-------|-----------------|
| 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.

| | Code No. | | Code No. |
|-----------------|------------|----------------|------------|
| Colors | xxx | Colors | 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 PHOTOSENSOR

Product&Family Code:

089 001 0003

LUXOR

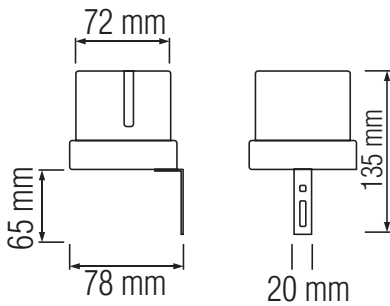


WHITE

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 |

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:

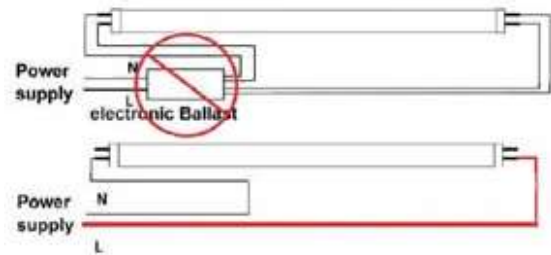
002 001 0018

LED TUBE-120

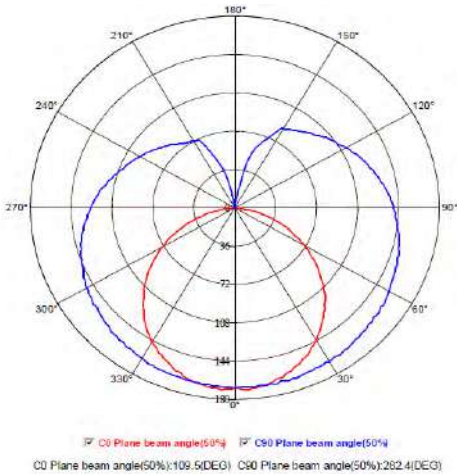
Technical Data

| | |
|--|--------------------|
| 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 | A F |
| 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

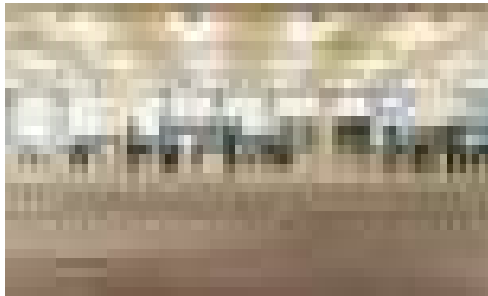


Photometric Diagram

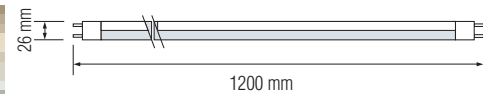


Applications

- Office, hospitality, industrial, car park.



Technical Drawing



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

| | | | |
|--------------------|------------------------|----------------------|-----------|
| /// | 15.000X ON / OFF | NO UV / IR | mA 95 |
| %85 ENERGY Saving | 25000h Lifetime | 0,0mg | Optimally |
| Start Up Time <0.5 | 195° | -10°C | 40°C |
| Ra >80 | Warm Up %60 < 0.5 s.c. | PF >0.5 Power Factor | |



LED TUBE

SERIES



LED TUBE FULL GLASS SERIES



Specification

T806

9W/10W/12W
120/140/160lm/w
25000h
320°
CRI>80
AC165-265V
50/60 Hz
φ600*29mm

T812

18W/20W/24W
120/140/160lm/w
25000h
320°
CRI>80
AC165-265V
50/60 Hz
φ1200*29mm

T815

24W/28W/34W
120/140/160lm/w
25000h
320°
CRI>80
AC165-265V
50/60 Hz
φ1500*29mm



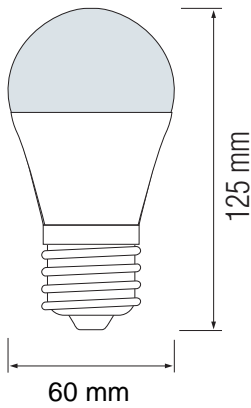
LED BULB

Product&Family Code: 001 006 0015

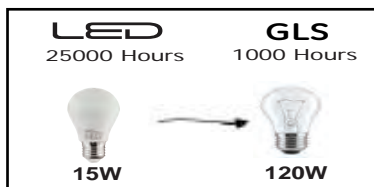
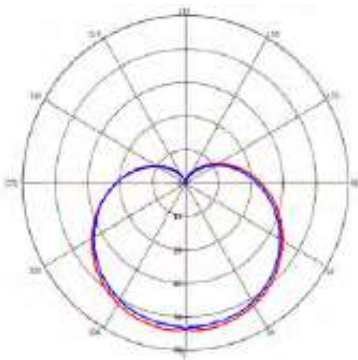
PREMIER-15



Technical Drawing



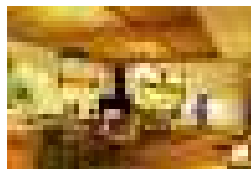
Photometric Diagram



| 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 | F |
| 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 |

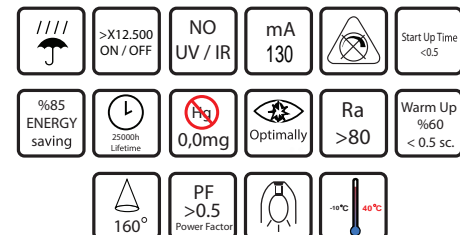
Applications

- 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

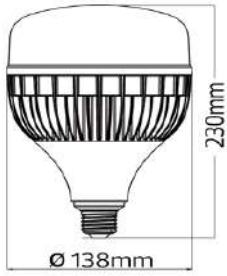
| | | | | | |
|------------|------------|------------|------------|------------|------------|
| 20W | 30W | 40W | 50W | 80W | 100W |
| 6500K | 6500K | 6500K | 6500K | 6500K | 6500K |
| 90Lm/w | 90Lm/w | 90Lm/w | 90Lm/w | 90Lm/w | 90Lm/w |
| E27 | E27 | E27 | E27 | E27 | E27 |
| PF>0.5 | PF>0.5 | PF>0.5 | PF>0.5 | PF>0.5 | PF>0.5 |
| AC150-265V | AC150-265V | AC150-265V | AC150-265V | AC150-265V | AC150-265V |
| 50/60 Hz | 50/60 Hz | 50/60 Hz | 50/60 Hz | 50/60 Hz | 50/60 Hz |
| φ80*155mm | φ100*180mm | φ115*210mm | φ125*235mm | φ160*290mm | φ180*320mm |



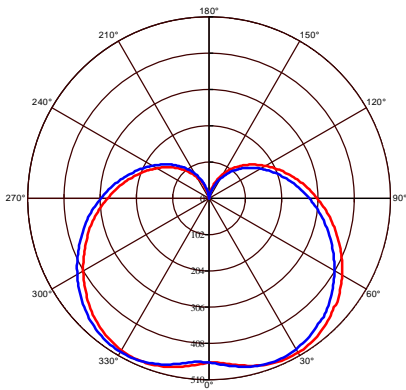
LED BULB



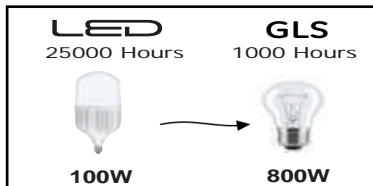
Technical Drawing



Photometric Diagram



C0 Plane beam angle(50%):200.2(DEG) C90 Plane beam angle(50%):199.8(DEG)



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 |
| EEL | A1G F |
| 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 ☆ | 200 ° |
| Starting Time | >0.2s |
| Number of ON-OFF cycling | x12.500 |

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



E27 / E40

Светодиодная лампа филамент С35

Feron

Материал рассеивателя: стекло

коэффициент
>5%
пульсации

230V

ГАРАНТИЯ
24
МЕСЯЦА



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

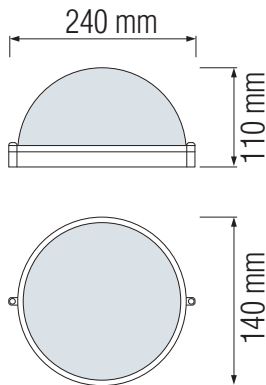
MUNZUR



WHITE

BLACK

Technical Drawing



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 |
| EEL | - |
| IP Rating | 54 |

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


Product Code: 068 003 0100

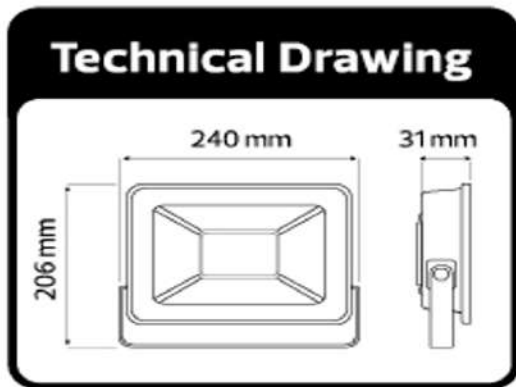
PUMA-100



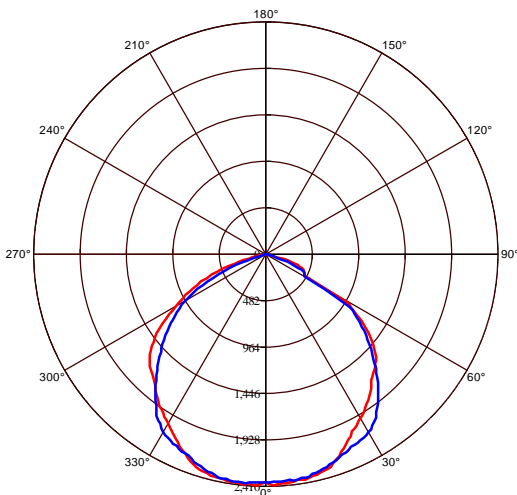
BLACK

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) ⌚ | 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 |



Photometric Diagram

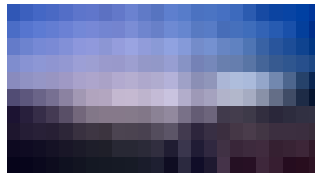


↳ C0 Plane beam angle(50%) ↳ C90 Plane beam angle(50%)

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

Product&Family Code:

074 014 0100

FLORIDA-100



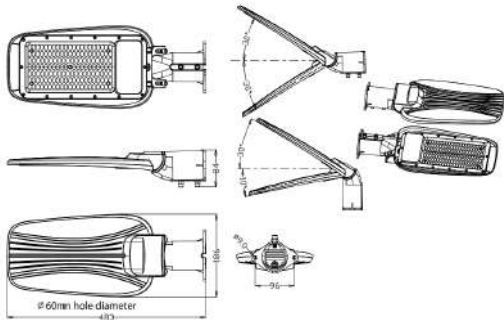
GRAY



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

