



User manual

Product description ORION Touch

www.deltapowersolutions.com



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About the Delta ORION controller

This document is valid for ORION software version V8.8x, where x represents minor software change.

ORION is a sophisticated power system controller that can be used for both small and very large, complex power systems. It consists of a single hot-pluggable central unit, which provides basic I/O periphery. A very robust and reliable CAN standard-based communication bus (IMBUS) provides easy expansion.

ORION uses external modules for monitoring system elements. This modular approach is perfect for expandable power systems with decentralized distributions (BDFB) and batteries in separate rooms. The integrated PLC offers the flexibility for monitoring and control of auxiliary devices, system upgrades, and capacity expansions.

The enhanced system functions provided by ORION help reduce operating costs and improve availability. Battery management, for example, is one of the key factors for the availability of a power system. Regular capacity tests by ORION significantly improve battery management. ORION also allows remote alarms by means of potential-free relay contacts, modem, or LAN/Ethernet or via SMS. The SNMP functionality offers enhanced remote alarms working with SNMP managers. The alarms are classified as critical, urgent or non-urgent alarms.

An integrated web server offers a user-friendly graphical interface for detailed monitoring and control using a web browser. The ORION can be accessed from virtually anywhere, over intranet or Internet, or by modem. The user interfaces can be localized, supporting up to two additional languages besides English.

2 Features overview

The key features of an ORION system include:

- Modular concept: ORION can be customized for both small and large systems
- Flexible setup and supervision of battery-, source- and load strings
- User friendly configuration handling with customer specific configuration files and battery profiles
- Remote system supervision over intranet, Internet and modem
- Remote software update of system components
- AC mains voltage measuring without external equipment

ORION offers the following features:

- Local system monitoring and basic setup with a smartphone like touch panel
- Flexible event processing for control and alarm management
- Localization of user interface, supporting up to three additional languages
- User friendly configuration handling with customer specific configuration files, user files and battery profiles
- Ethernet interface to PC or LAN
- IPv4 / IPv6 network connectivity using Zeroconf / Stateless Address Autoconfiguration (SLAAC) or DHCPv6 server
- Integrated IP packet filter
- Login control with user account lock-out management and access log
- Centralized access control by using Radius or TACACS+
- Syslog protocol according to RFC 5424
- MQTT client for remote monitoring
- RS232 and RS485 interfaces
- 3 inputs for shunt measurement, current and fuse supervision
- 4 inputs for battery middle point measuring
- 2 RECTS interfaces
- IMBUS interface based on CAN bus for connecting rectifiers, DC/DC converters, Boost converters, inverters, air conditioners and various I/O modules of ORION
- Optionally e-Nexus interface through a second CAN bus for connecting Eltek power modules
- 6 digital relay outputs (changeover contacts, pluggable clamp connection)
- 4 digital open collector outputs
- 4 digital inputs
- 2 inputs for temperature sensors
- Real time clock
- LVD driver relay output
- USB host interface for applications like WLAN adapter, mass storage etc.
- microSD card slot for the automatic backup

Additional HW and/or SW components extend the range of features to include:

- Expandable number of voltage measurements for battery blocks
- Rectifier positioning
- Expandable number of battery- / load- / source-strings (current, voltage, energy, temperature, fuse supervision)
- Expandable number of relay outputs for alarms or LVD/LVLD

- Expandable number of LED outputs for alarm or status indications
- Expandable number of digital inputs with individual threshold and hysteresis
- A user interface module with a touch screen
- AC measurement with external module (3-phase voltage, current, frequency, power, energy)
- Genset control including measurement of AC output parameters
- Static voltage regulation via SCR drivers / multiple tap transformer
- Healthy phase selector
- Rectifier phase selector
- Speed control for cooling fans of outdoor cabinets or containers
- Generic device integration for all MODBUS slave devices
- Generic device integration for devices supporting SNMP
- Generic device integration for devices that communicate with proprietary protocol over serial bus
- RS-485/Modbus interface for remote communication
- Modbus/TCP protocol for remote communication
- SNMP protocol for remote communication

3 Functional overview

The main task of the system controller is to enhance the reliability and lower the operating and maintenance costs by:

- Controlling the rectifiers to run at the highest efficiency.
- Extending the battery lifetime by providing the best possible conditions.
- Informing the user in case interventions are needed and providing the necessary information for corrective actions.

3.1 Battery functions

The system controller includes the following charge functions, with or without temperature compensation:

- Float charge
- Boost charge
- Equalize
- Event controlled charge (for example, generator set usage)

The test functions include:

- Constant current, capacity, real load, and time based battery tests
- Natural battery test (using the opportunity of a mains failure)
- Separate discharge/charge of a battery

The protection functions include:

- Disconnection (due to low voltage or mains failure plus delay)
 - Battery disconnection
 - Full and partial load disconnection
 - Disconnection is inhibited during a battery test
- Charging current limitation

The supervision functions include:

- Loss of back-up time
- Middle point voltage supervision
- String current comparison
- Block voltage measurement
- Battery life prediction
- Remaining backup time estimation

In addition to lead-acid batteries, ORION supports more advanced lithium and hybrid batteries that communicate with ORION over a digital bus.

3.2 Source string function

The current from solar converters and wind generators can be measured by shunts in so-called source strings and such upgrading a power plant to RHPS (Renewable Hybrid Power System).

3.3 Rectifier functions

The control functions include:

- Efficiency mode – optimizes the system for efficiency, switches off unused rectifiers, and so on
- Forced rectifier cycling - balancing the operation time of rectifiers

The supervision functions include:

- Redundancy supervision – alerts if there is no redundant rectifier
- Recharge power supervision – alerts if there is not enough power to recharge battery within specified time

3.4 DC/DC converter functions

The operating functions include:

- Programming of the converter configuration
- Reading of the converter operation data (measurements) and status
- Starting, stopping and resetting of any individual converter
- Configuring of advanced alarming functions.

The supervision functions include:

- Redundancy supervision – alerts if the system is not redundant.

3.5 Boost converter functions

The operating functions include:

- Programming of the converter configuration
- Reading of the converter operation data (measurements) and status
- Starting, stopping and resetting of any individual converter

The supervision functions include:

- Failure supervision and alarming

3.6 PV charger functions

The operating functions include:

- Programming of the converter configuration
- Reading of the converter operation data (measurements) and status
- Starting, stopping and resetting of any individual converter

The supervision functions include:

- Failure supervision and alarming

3.7 Inverter functions

The operating functions include:

- Programming of the inverter configuration
- Reading of the inverter operation data (measurements) and status

The supervision functions include:

Failure supervision and alarming

3.8 Rectifier functions

The operating functions include:

- Programming of the rectifier configuration
- Reading of the rectifier operation data (measurements) and status

The supervision functions include:

Failure supervision and alarming

3.9 Signal processing engine

ORION has a built in Signal Processing Engine, which allows defining reactions to react to events initiated by specified parameter changes. The user may define as many events as needed on all digital inputs as well as on measurements, such as voltage, current, and temperature using signal conditioning. Events may be combined using logical functions AND, OR, Boolean inversion, signal filtering, latching events, timer, counter and time counter events.

3.10 AC measurement function

ORION measures basic mains voltages using the connected rectifiers. The measured values can be viewed via local and / or web user interface. Optionally an HPS module or a 3rd party ac measurement module can be used to measure the parameters of the AC network.

3.11 Logging function

The logging function memorizes the system history permanently by writing measurements, events and system messages to a log file. As default, ORION has a Default Log for system messages and Access Log for login messages. Additionally there is a possibility to create different data logs. Each log has a name, a description, a set of measurements and events to be logged, sampling criteria and rules for the log files management. ORION can handle up to 18 user defined data logs. Following log types are provided:

- Continuous log
- Event controlled log
- Counter log
- Peaks log
- Min max average log

4 User interfaces

4.1 Web user interface

An integrated web server provides the interface for monitoring and controlling the power system by a computer with a standard web browser.

ORION configuration and supervision tool offers flexible and comprehensive configuration and supervision functions for power systems. It can be operated by almost all common web browsers. Access to controller and system functions is provided with user and session management features.

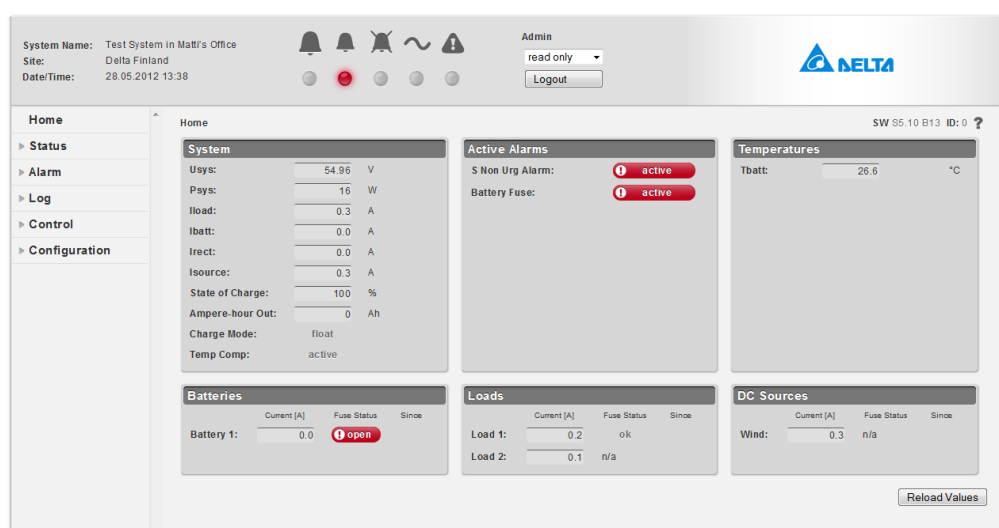


Figure 1. ORION configuration and supervision tool

The navigation bar on the left is used to navigate through the dialogue pages:

- Click on ► or a title in the table of contents to expand the desired menu.
- Click on an item in the list to access the desired function / window.
- Click on ? to get online help to the active window.
- Click on ▼ to collapse the sub menu.

Menu entries for HW modules as well as for installable and configurable components are not shown unless they are configured or installed.






4.2 Local user interfaces

The essential system configuration and monitoring can be conducted using the integrated user interface. ORION has a 2 inch TFT display with a touch sensor to provide intuitive and easy to use user interface.



Figure 2. ORION front view

The local user interface is operated by smartphone like gestures:

	Tap on an active element or an icon to enter a sub-screen or to execute an action. Active elements/icons are the ones coloured in blue.
	Long tap on the backspace icon in the Numeric Keypad cancels the entire value.
	Swipe left or right to navigate between the top level screens.
	Swipe right to dispose the current screen and go back to the previous screen. Note: A swipe right, that should returns to the top level, always goes to the MENU screen.
	Swipe up/down to scroll vertically.

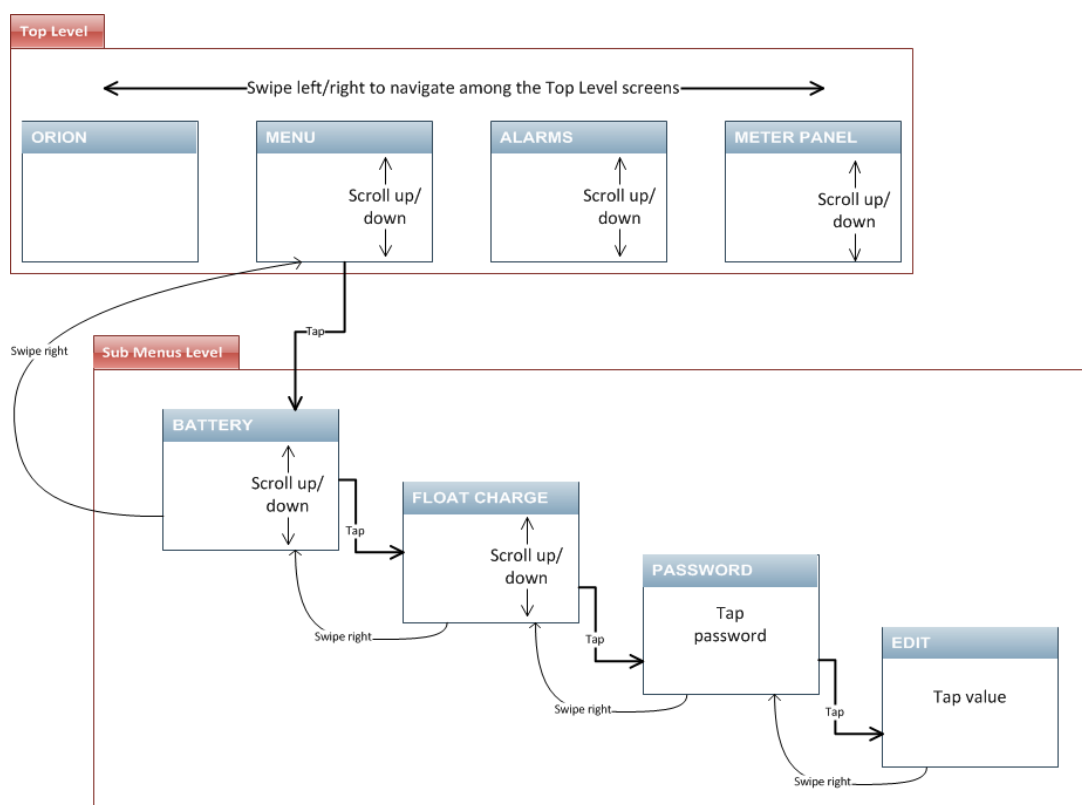
The Touch UI is organized in two levels: *top level* and *sub-menu level*.

The *top level* contains the most important screens used to monitor the system and to access the other screens in the *sub-menus level*. They are placed in a horizontal structure and can be navigated from left to right and back. It includes the screens:

- HOME
- MENU
- ALARM
- METER PANEL

All the other screens are in the *sub-menus level*. The *sub-menus level* is organized in a tree-based structure. The root screen of the tree is accessible from the *top level*. From the root screen it is possible to navigate to one of its sub-screen and to the sub-sub-screen and so on until there are no more sub-screens available. The number of sub-screens depends on the system configuration.

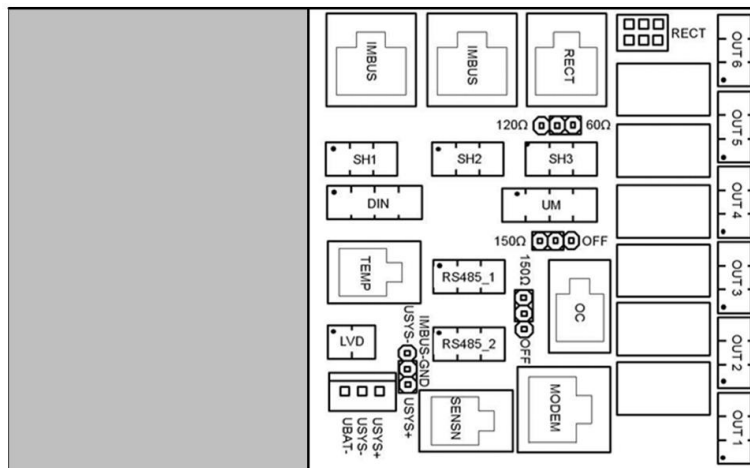
The concept is visualized in the picture below:



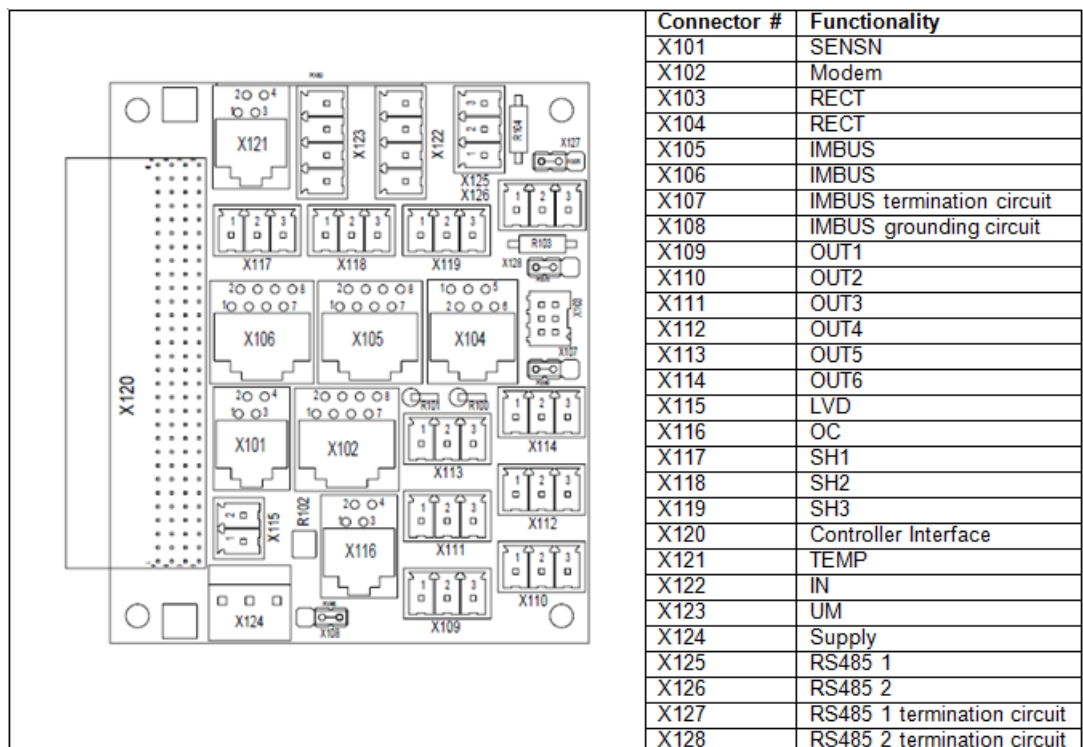
5 Physical connections

ORION has an Ethernet connection on the front panel for connection to a computer. This connection can be either direct to the computer, or over a local area network (LAN).

There are two HW versions of ORION. "ORIONc", the compact version of ORION, is a direct drop-in replacement for PSC 3, and the system wires are plugged directly to the controller module.

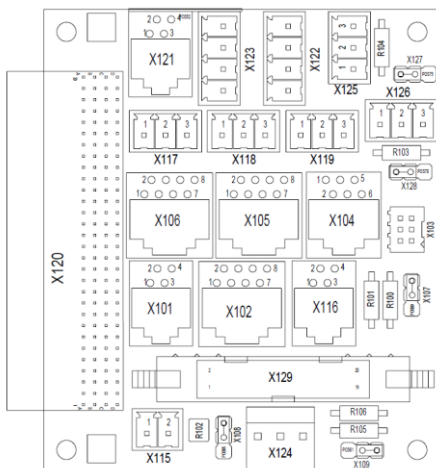


The system integration of "ORION" is done via backplane. The connector arrangement of the standard backplane is presented below.



To communicate with Eltek power modules by using e-Nexus protocol, ORION ID:E3 needs to be used together with a backplane that supports two CAN buses. The connectors X105 and X106 are separated on this board. In a standard backplane, they are in parallel. The second CAN for Eltek bus is identified by the green colour.

Connector #	Functionality
X101	SENSN
X102	Modem
X103	RECT
X104	RECT
X105	IMBUS
X106	CAN2 (eNexus, Green RJ45 for Eltek Modules)
X107	IMBUS termination circuit
X108	IMBUS grounding circuit
X109	CAN2 termination circuit
X129	Digital outputs (alarm terminal)
X115	LVD
X116	OC
X117	SH1
X118	SH2
X119	SH3
X120	Controller Interface
X121	TEMP
X122	IN
X123	UM
X124	Supply
X125	RS485 1
X126	RS485 2
X127	RS485 1 termination circuit
X128	RS485 2 termination circuit

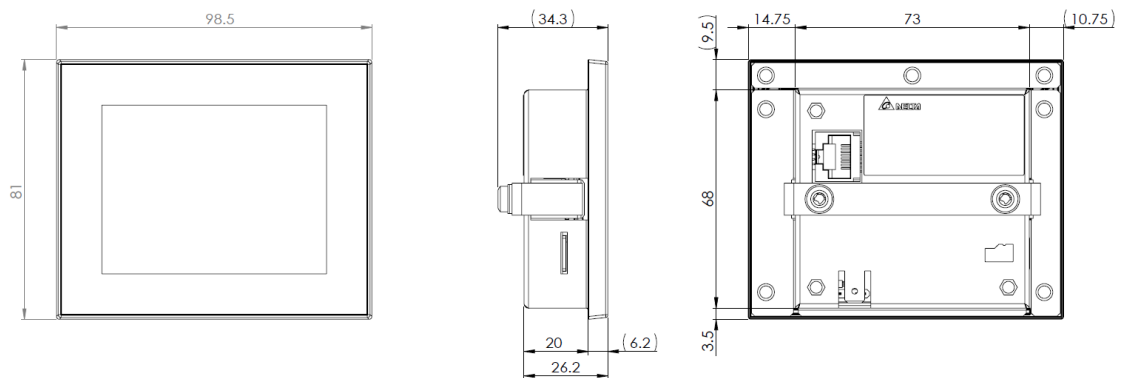


6 Modules

6.1 User interface module UIM Touch

UIM Touch is a user interface module for ORION Touch. It offers the same menu structure and touch functionality as the local touch interface, but in bigger size. (3.5 inch) It is designed to be mounted on a cabinet door, and too support easy system upgrades it fits into the same opening as the old UIM.

UIM touch is powered from ORION Touch over IMBUS cable, so it does not need a separate power feed. It starts working automatically when connected to IMBUS. No manual configuration is needed.



6.2 Fan speed control module FAN-CTRL

FAN-CTRL is a front end module which can be used for climatic control of outdoor cabinets and containers. Up to nine FAN-CTRL modules can be connected to IMBUS. FAN-CTRL module is powered from the 48V bus.

The FAN-CTRL module provides the following features:

- 3 inputs for temperature measurement with LM335 sensor
- 4 digital inputs
- 2 relays for heater control or for generic purpose
- 1 input for dc current measurement with Hall sensor
- 2 control outputs for fans

FAN-CTRL is available as an open frame module. For DIN Rail mounting, an optional case is available.

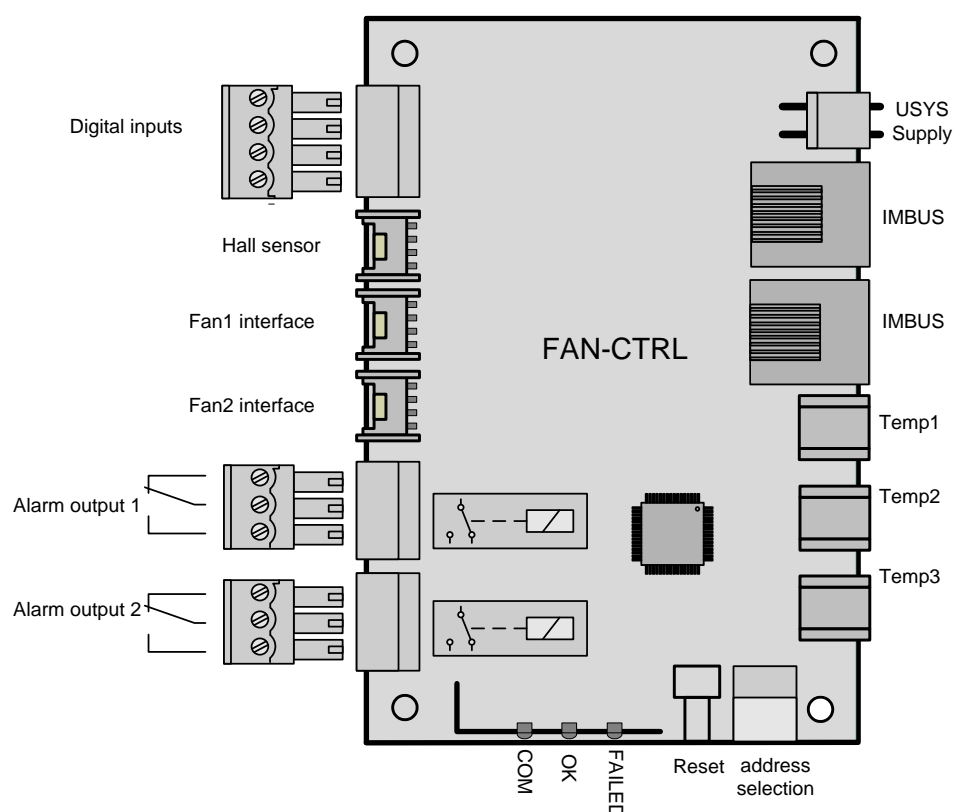


Figure 3. Open frame version of the FAN-CTRL

6.3 String Sensor Module IOM-String

The IOM-String is a front end module, which can be used to extend the amount of peripherals in a modular manner. Up to 30 IOM-String modules can be connected to the IMBUS. The power supply is provided from the DC system bus.

The IOM-String provides the following functions:

- 5 inputs for current measurement supporting shunts or Hall sensors
- 5 inputs for fuse detection
- 2 inputs for temperature measurement with LM335 sensor

This IOM-String is available as an open frame module. For DIN Rail mounting, an optional case is available.

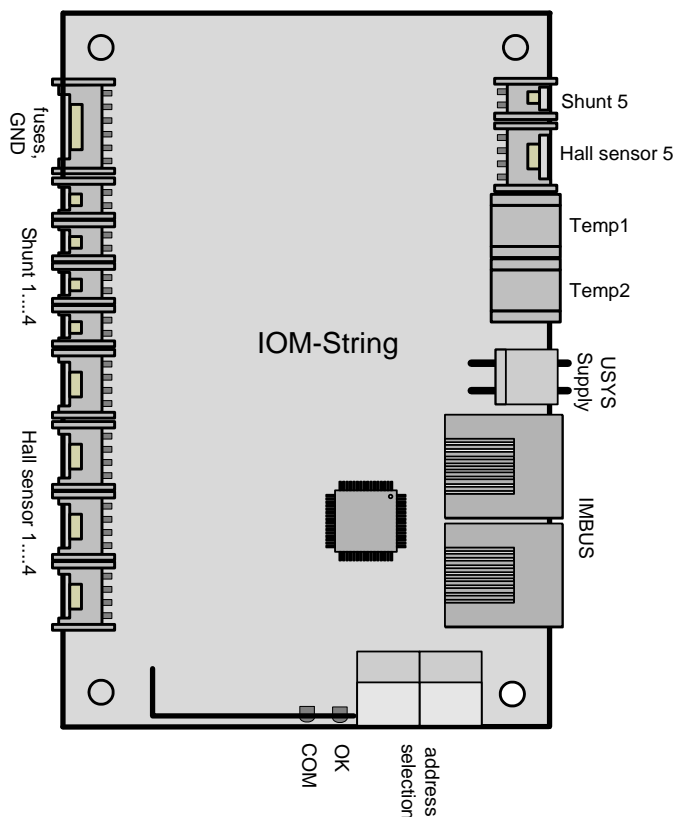


Figure 4. Open frame version of the String Sensor Module (IOM-STRING)

6.4 IOM-X1

The IOM-X1 module combines several I/O modules into a single board. The IOM-X1 provides fan speed control and fan monitoring functionality, several general purpose digital inputs and outputs, an LVD output and temperature measurements.

IOM-X1 is configured and monitored from ORION via IMBUS. Unlike the FAN-CTRL module, IOM-X1 is designed to work together with ORION and does not provide a standalone function.

The IOM-X1 provides the following functions:

- 4 inputs for current measurement with shunts
- 4 inputs for fuse detection
- 3 inputs for temperature measurement with LM335 sensor
- 8 digital inputs
- 4 relay outputs
- 1 LVD driver output with an optional redundant LVD control functionality
- 2 independent fan speed control outputs with three fan interfaces for each including fan rotation detection

IOM-X1 is available as an open frame module.

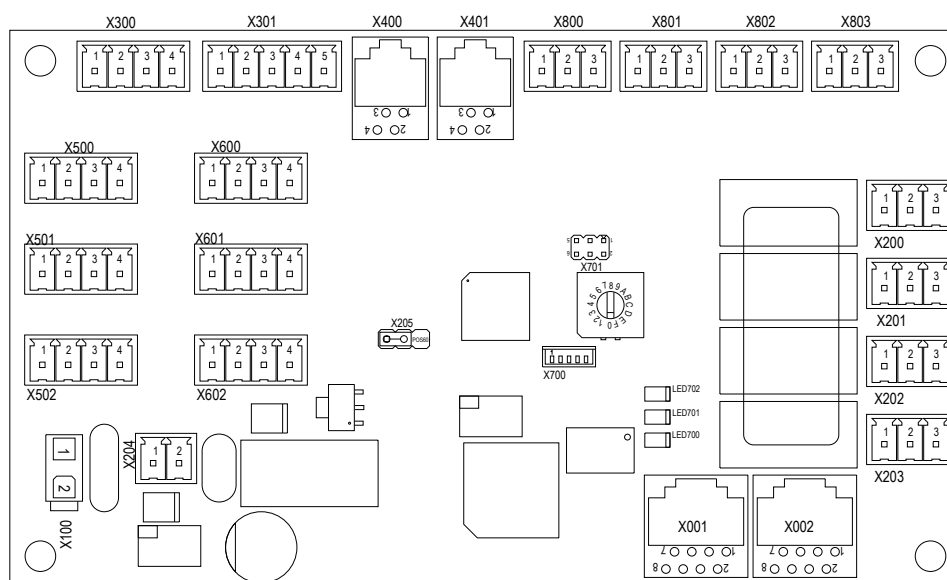


Figure 5. Open frame version of the IOM-X1

6.5 String Sensor Module SSM

The SSM is a front end module, which can be used to extend the amount of peripherals in a modular manner. Up to 31 SSMs can be connected to the IMBUS. The power supply is provided from the ORION.

The SSM provides the following functions:

- 3 relay outputs
- 4 digital inputs
- up to 3 SENSN modules can be connected to the SSM
- 1 voltage, current, temperature, or fuse monitoring per SENSN module

This SSM is available as an open frame module. For DIN Rail mounting, an optional case is available.

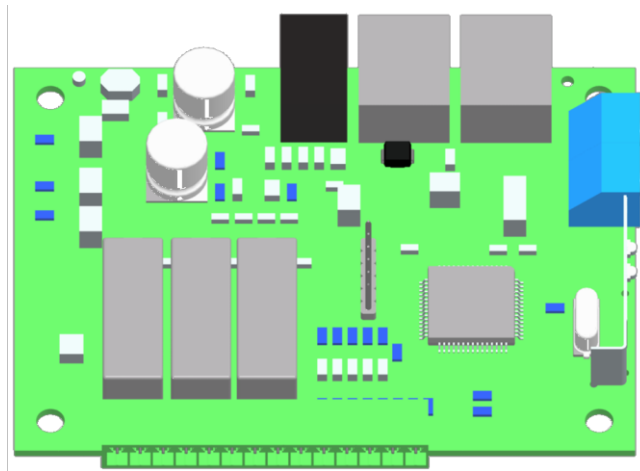


Figure 6. Open and closed frame version of SSM

6.6 Block Voltage Sensor Module BSM

The BSM provides inputs for up to 12 block voltage measurement and 3 digital inputs with software selectable activation and deactivation levels.

The block voltage measurements cover the range ± 77 Vdc.

With the addition of standard temperature sensor LM335, measurements in the range of -40 to +100 °C can be made.

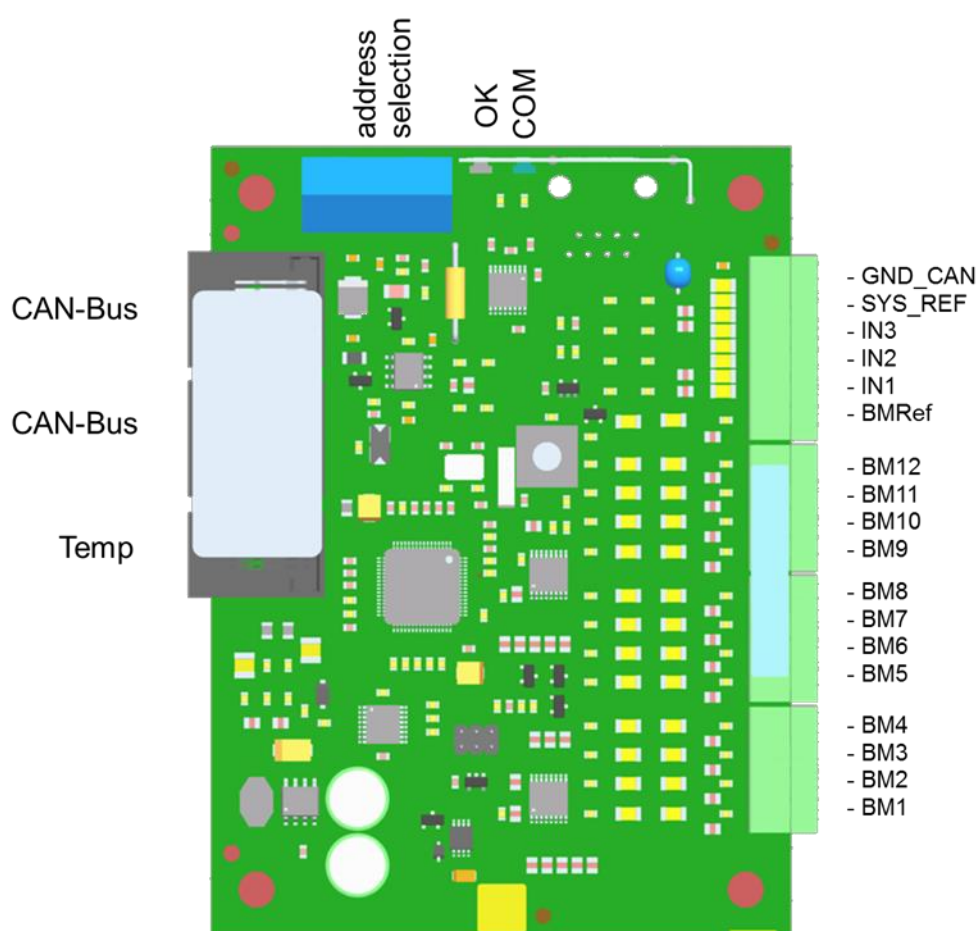


Figure 7. Block Voltage Module BSM ID:A1

6.7 Remote Alarm Board IOM-ALARM

The IOM-ALARM is a front end module, which can be used to extend the amount of peripherals in a modular manner. Up to nine IOM-ALARMS can be connected to the IMBUS. The IOM-ALARM is supplied from the 48V system bus.

The IOM-ALARM provides the following functions:

- 10 relay outputs

The IOM-ALARM is available as an open frame module. For DIN Rail mounting an optional case is available.

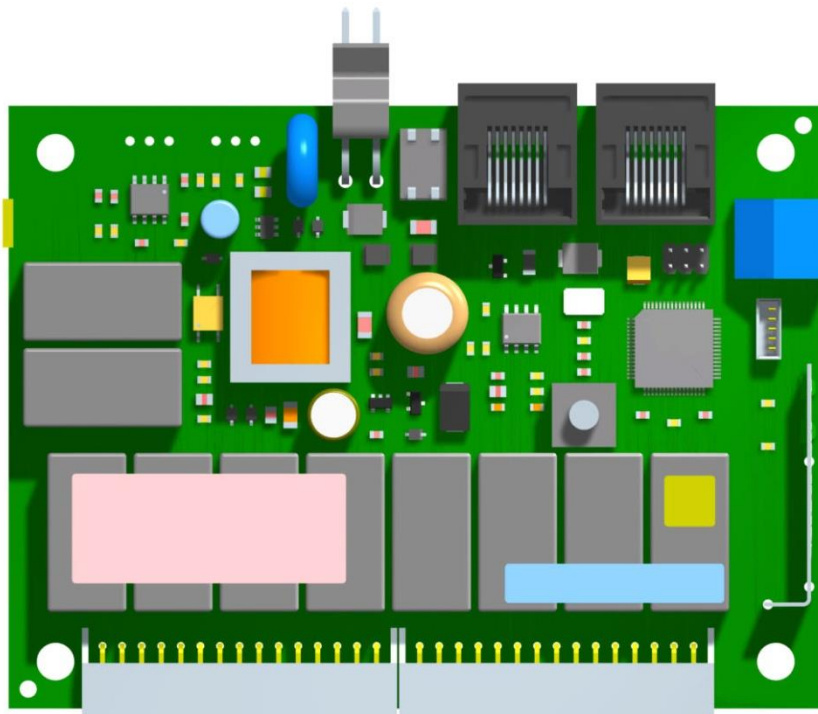


Figure 8. IOM-ALARM

6.8 LED Driver Board IOM-LED

The IOM-LED is a front end module, which can be used to extend the amount of peripherals in a modular manner. Up to nine IOM-LEDs can be connected to the IMBUS. The power supply is provided from the ORION.

The IOM-LED provides the following functions:

- 20 open collector outputs to drive LEDs
- 2 digital outputs

This IOM-LED is available as an open frame module. For DIN Rail mounting, an optional case is available.

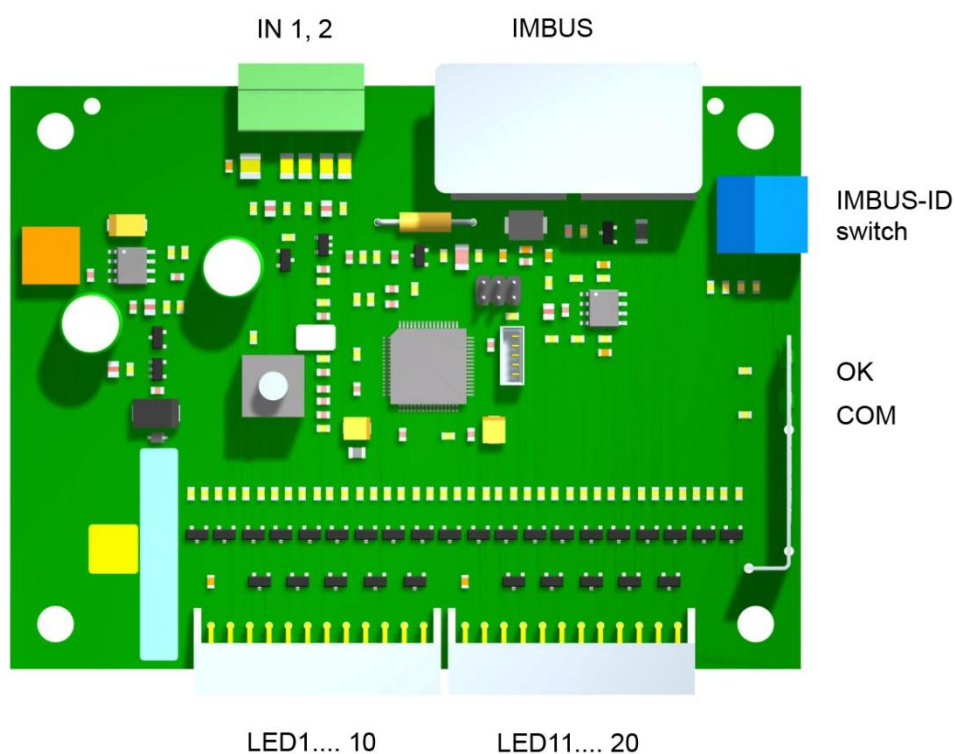


Figure 9. IOM-LED

6.9 Input/Output Module IOM-AC

The IOM-AC is a front end module, which can be used to extend the amount of peripherals in a modular manner. Up to nine IOM-ACs can be connected to the IMBUS. The power supply is provided from the ORION.

The IOM-AC provides the following functions:

- 6 relay outputs to drive contactors
- 2 digital inputs to detect AC voltages

This IOM-AC is available as an open frame module and needs to be protected on the system level.

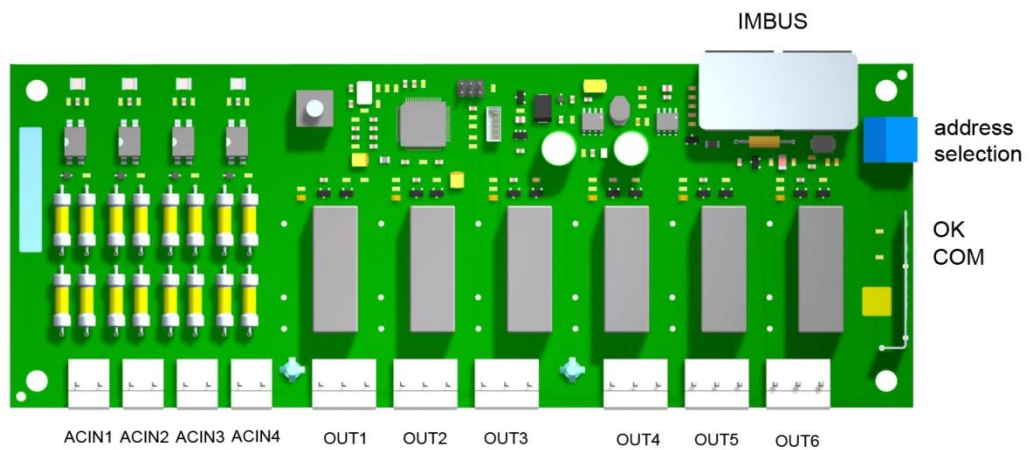


Figure 10. IOM-AC

6.10 Healthy Phase Selector HPS

The HPS is a front end module used to control so-called healthy phase selector equipment, which selects two best phases out of three. As this module measures AC parameters, it can also be used as an AC measurement module without the healthy phase selector hardware and function. When high accuracy is expected, it is recommended to use an AC measurement module and connect it to ORION Touch using RS485 and Modbus.

The HPS provides the following functions:

- 3-phase ACV / ACI / power / energy measurement
- Control of up to 6 contactors via relay (4 on board, 2 on additional extension board)

This HPS is available as an open frame module and needs to be protected on the system level.

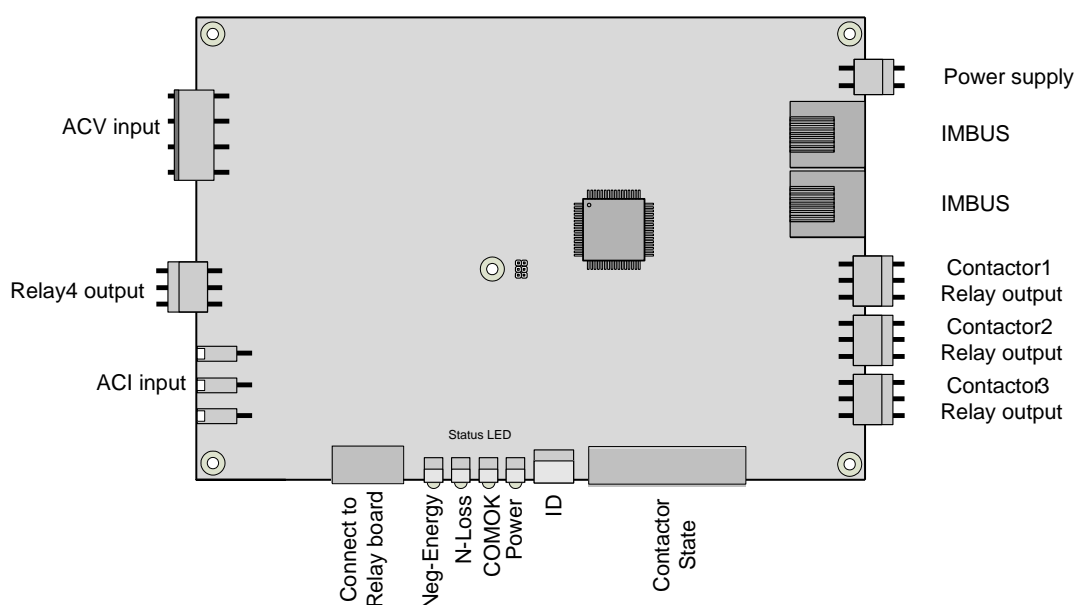


Figure 11. Healthy phase selector (HPS) board

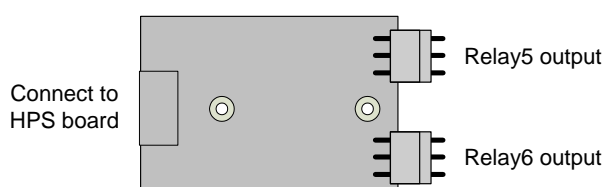


Figure 12. HPS relay extension board

6.11 Gateway Module GWM-MODBUS

The GWM-MODBUS is a gateway that provides an RS485 port to communicate with 3rd party devices using Modbus protocol. It can be used also as a gateway between ORION Touch and inverter systems from CE+. The power supply is provided from the ORION Touch as a part of IMBUS..

This GWM-MODBUS is available as an open frame module. For DIN Rail mounting, an optional case is available.

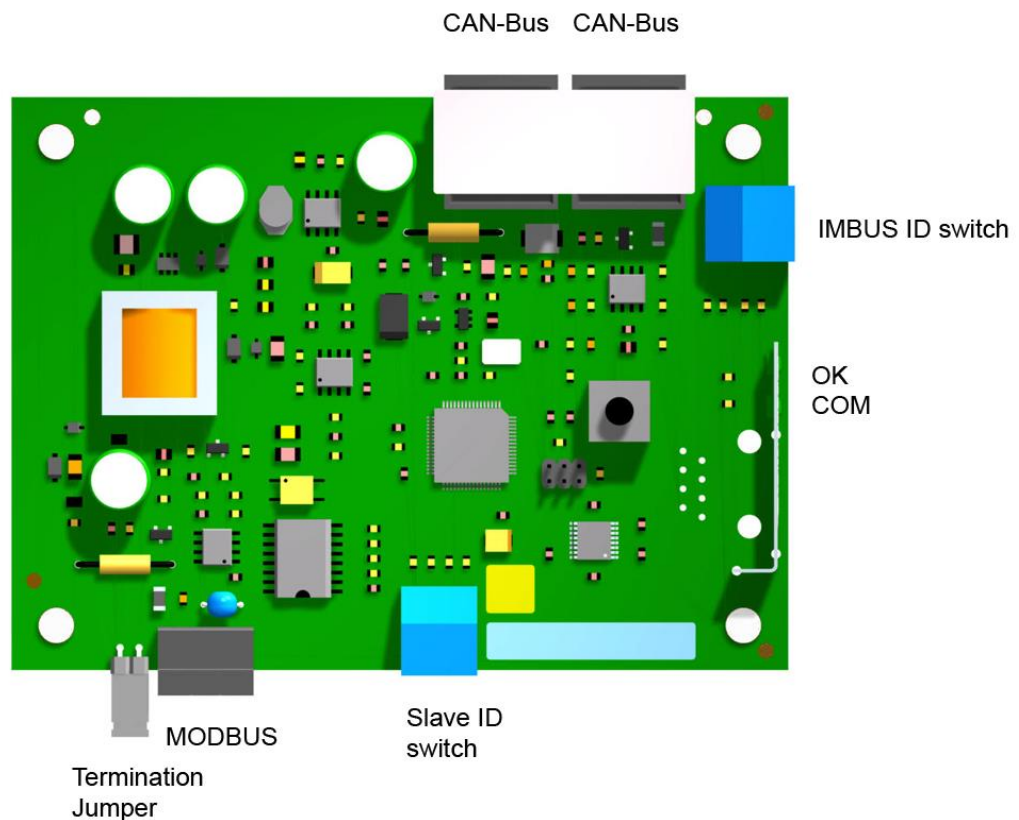


Figure 13. GWM-MODBUS

6.12 Gateway Module GWM-BATTERY

The GWM-Battery is a gateway between the ORION IMBUS and Lithium-Ion batteries using an RS 485 or CAN interface. Up to 9 GWM-BATTERY modules can be connected to the IMBUS. One module can communicate with up to 16 batteries.

GWM-Battery is available as an open frame module. For DIN Rail mounting, an optional case is available.

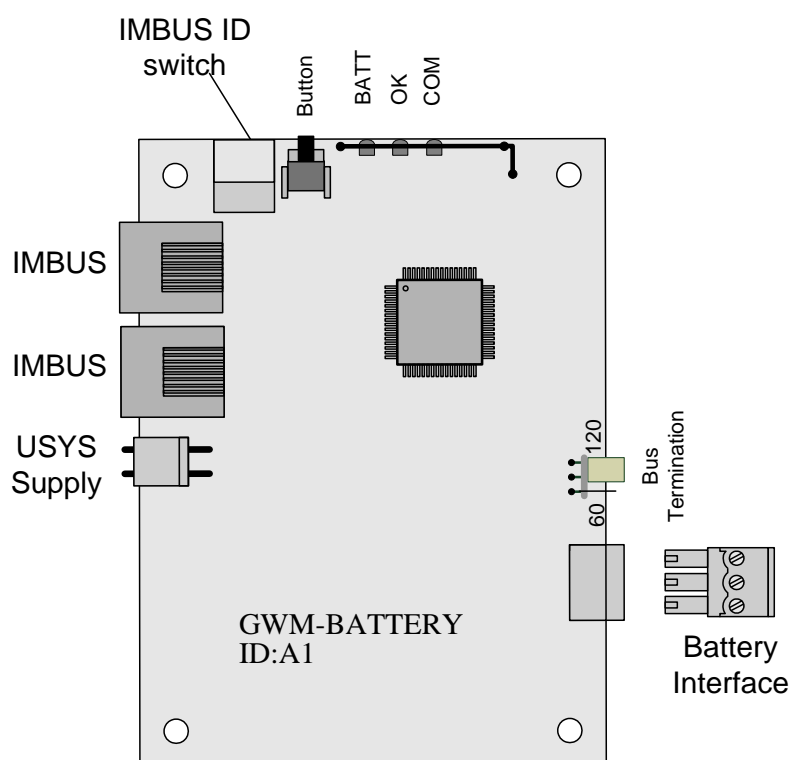


Figure 14. GWM-BATTERY

6.13 RS232 – RS485 Converter Module

The RS232-RS485 converter module can be used together with ORION controller to provide a bidirectional RS485 port for remote monitoring using Modbus protocol. The Module is supplied from system voltage and communicates with ORION via Modem/Serial port. (RS232)

This RS232-RS485 converter is available as an open frame module. For DIN Rail mounting, an optional case is available.

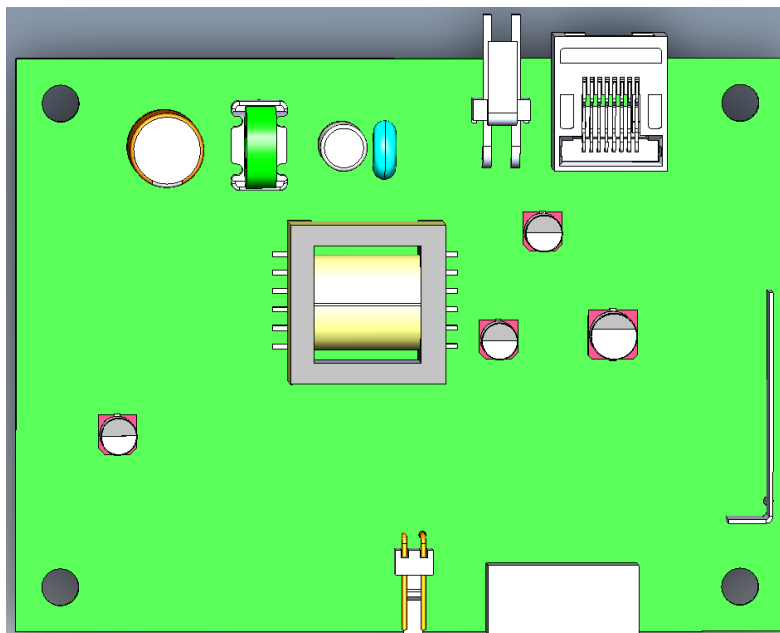


Figure 15. RS232-RS485 Converter

6.14 CAN Repeater Module IMBUSR1

The IMBUSR1 module provides repeater functions in the CAN bus. The IMBUSR1 repeats the bus signals and power supply. This enables large system with a high number of nodes to be constructed without signal loss or degrading of the power supply to the nodes.

Repeater input CAN1

The repeater input CAN1 is connected to the IMBUS coming from ORION. There are two connectors in parallel to allow daisy chaining repeaters in large systems.

Repeater output CAN2

The output of the repeater can be wired as a start point or as an end-to-end connection. For more information about wiring and bus termination, see *System Installation and Commissioning Manual*.

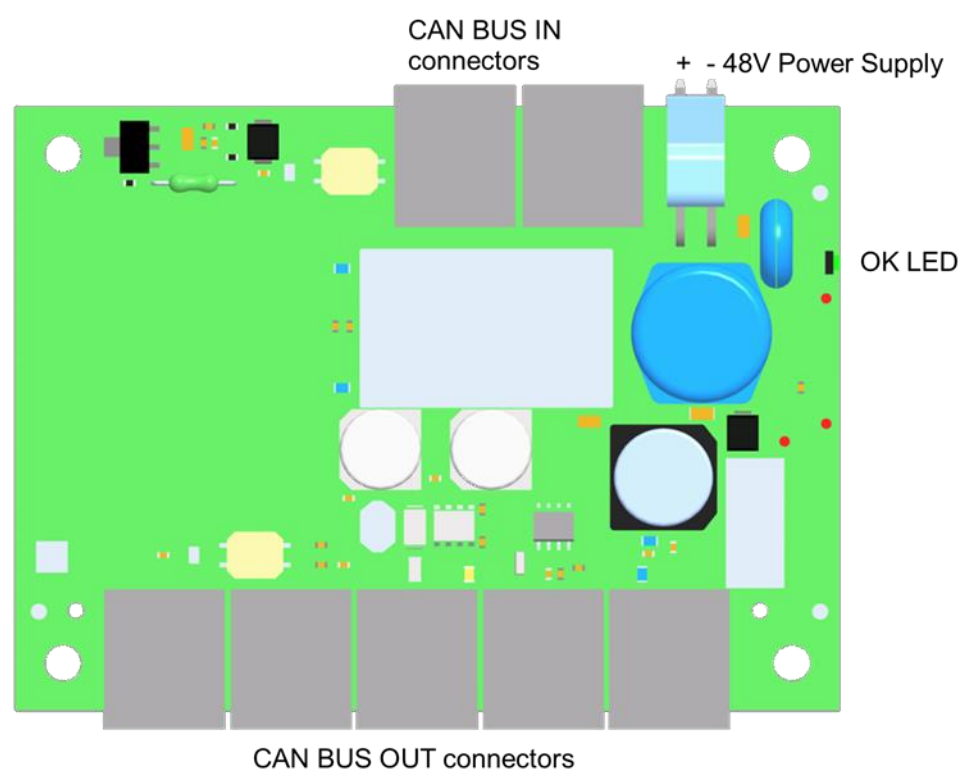


Figure 16. IMBUSR1 CAN Repeater Module

6.15 CAN Isolation Module CAN-ISO

The CAN-ISO module provides galvanic isolation in the CAN bus and can be used to interconnect CAN modules having different ground potential. The power supply is provided from the ORION, but the CAN modules connected to the secondary side need to be powered from elsewhere.

This CAN-ISO is available as an open frame module or with sheet metal enclosure.

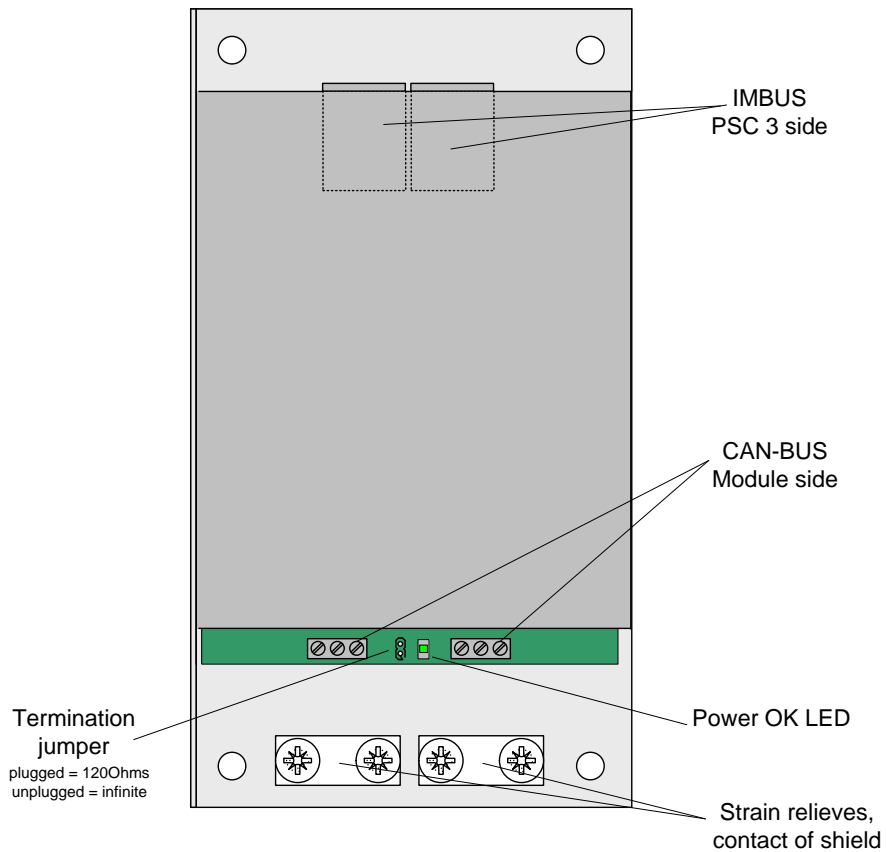


Figure 17. CAN-ISO

6.16 Generator Control Module GEN

The GEN module is used to control a simple genset having no built-in controller. Up to two GEN modules can be connected to the IMBUS. The power supply is provided from the start battery.

The HPS provides the following functions:

- Start and stop control of the engine
- Engine supervision:
 - Oil pressure
 - Temperature
 - Fuel level
 - Battery state
- Measurement of the generator
 - Voltage
 - Current
 - Frequency
 - Power
 - Energy

This GEN is available as an open frame module.

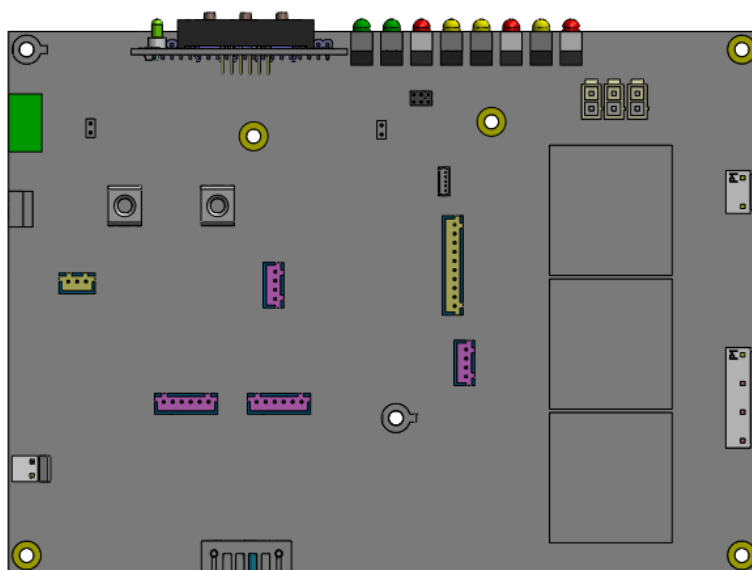


Figure 18. GEN

6.17 Static Voltage Regulator Module SVR

The SVR module is used to regulate 1-phase AC voltage from the variable input voltage. This works with static switch to control AC output with help of multiple tap transformer, this board has inbuilt SCR driver/sense circuits, it also includes AMF control and bypass control relay output, Input AC, output AC, Bypass AC(L-N) and transformer temperature monitoring.

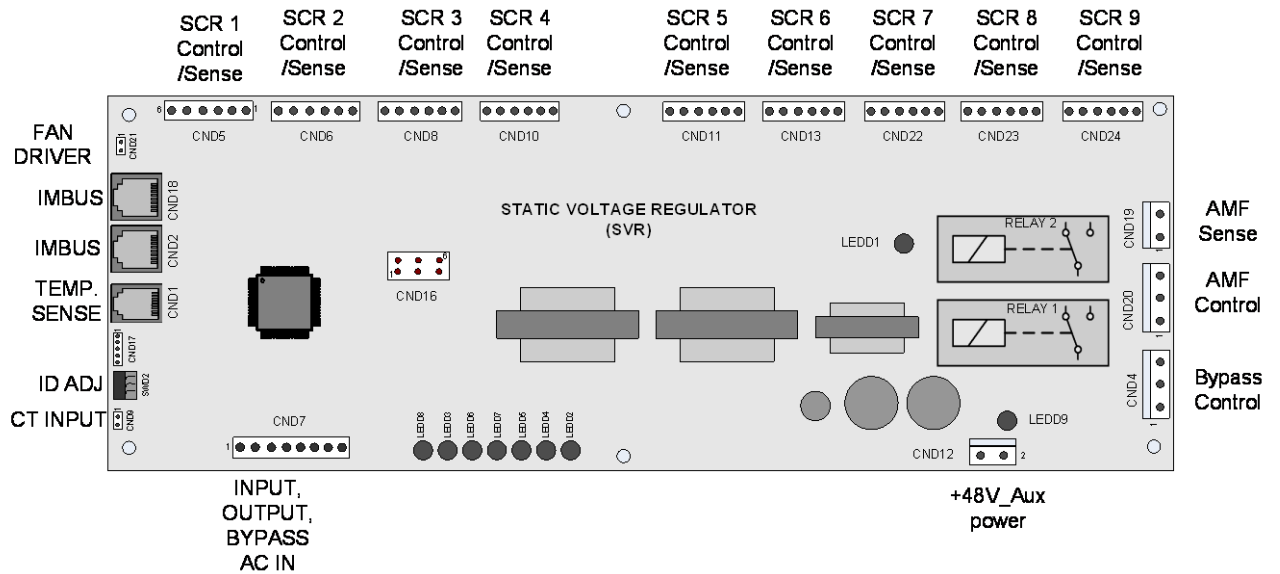


Figure 19. Static Voltage Regulator SVR

6.18 Fan Speed Controller PWM CTRL

PWM CTRL offers an interface between ORION and 2 DC Fans. It includes driver stages for the fans as well as error detection and signalization to ORION. The system can set different fan speeds by means of the open collector outputs. As soon as one of the fans stops turning, a digital failure signal is sent to ORION.

There are two versions of PWM-CTRL cards.

- ID:A1: with two input signals, for 3 fan speeds
- ID:A2: with three input signals, for 6 fan speeds (backwards compatible)

PWM-CTRL is available as an open frame module. For DIN Rail mounting, an optional case is available.

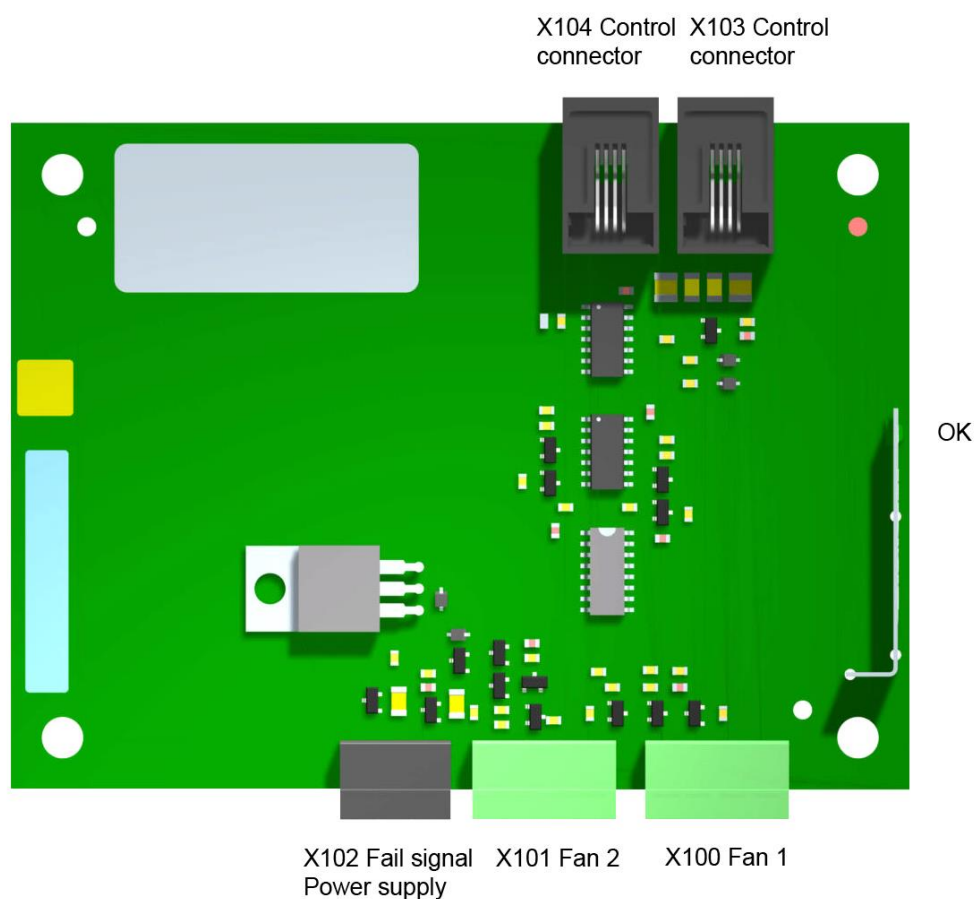


Figure 20. Fan Speed Controller PWM/CTRL

6.19 LVD/PLD driver board LVD 3

LVD3 is a driver board for LVD and PLD contactors. It is controlled by the open collector outputs of ORION and it can drive one contactor. LVD3 has one jumper to select one of the four open collector outputs to be used as a control signal, a second jumper to select either pulse or continuous control and a third jumper to select either Normally Open or Normally Closed contactor.

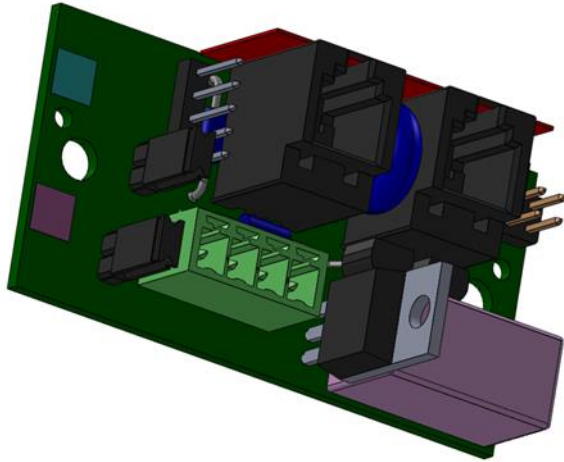


Figure 21. LVD3

6.20 SENSN device

The SENSN device is a front end module, which is assembled directly onto the shunt. This module monitors different strings in the power system individually. Up to 3 SENSN devices can be connected to a ORION or to each string sensor module SSM. The power supply is provided from the ORION or SSM.

One SENSN provides the following functions:

- 1 string current measurement (shunt)
- 1 string voltage measurement
- 1 temperature
- 1 string fuse monitoring

address selection

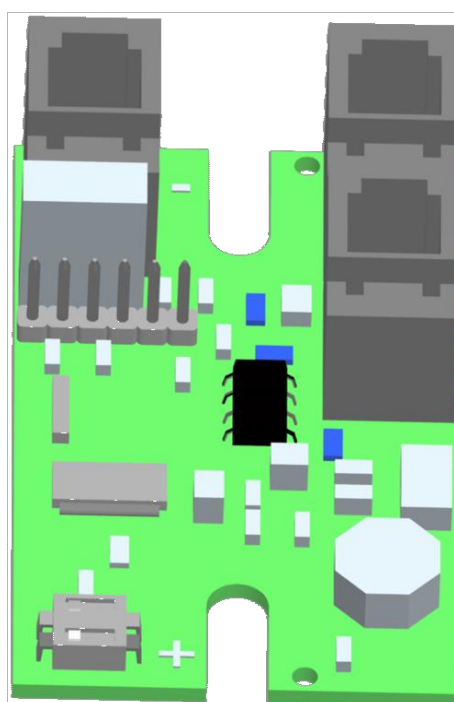


Figure 22. SENSN device



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