



NORISYNC 4

Power Management Solutions

The NORISYNC 4 power management system (PMS) optimises the generation and use of electricity. It is a customised solution, made to efficiently manage the power generation including an optional energy storage systems (ESS) and the power distribution from manual to fully automated and to provide a comfortable system status overview at any time to the crew.

The system concept

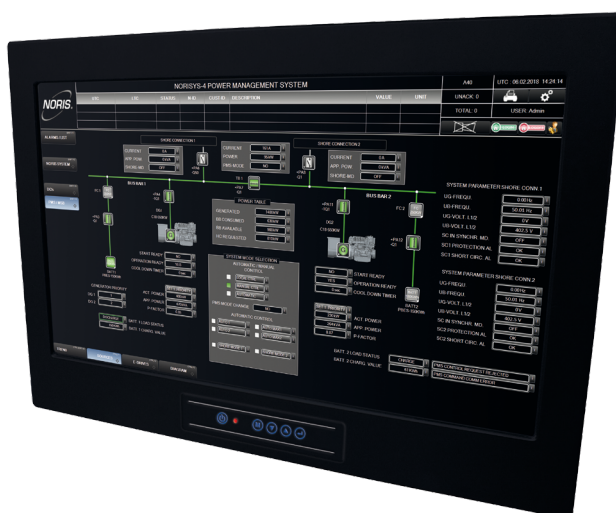
NORISYNC 4 is based on our open automation platform *NORISYS 4*, that was especially developed to automate marine applications. Core of the system is the power management controller *NORISYS 4 PMC* with an *ARM 32-bit Cortex™* processor. In its basic version, the PMC is used to switch generators to the power grid and is also suitable for use in stand-by power supply facilities. It is designed to be used for isolated and parallel operation. An automatic start and synchronisation function is additionally implemented to accelerate the generator, set to nominal speed as well as to synchronise and close the power circuit breaker. The system can be easily extended and customised via our *NORISYS 4* components, including a PC station and remote panels as HMI that visualises the system's status and the power distribution and further customised information. The standardised interfaces easily enable the connection to propulsion control or other higher level systems.

Your advantages

- Improvement of the energy balance and reduction of energy costs
- Prevention of blackouts (managing critical loads)
- Protection of generators and other electrical equipment
- Reduction of investment costs

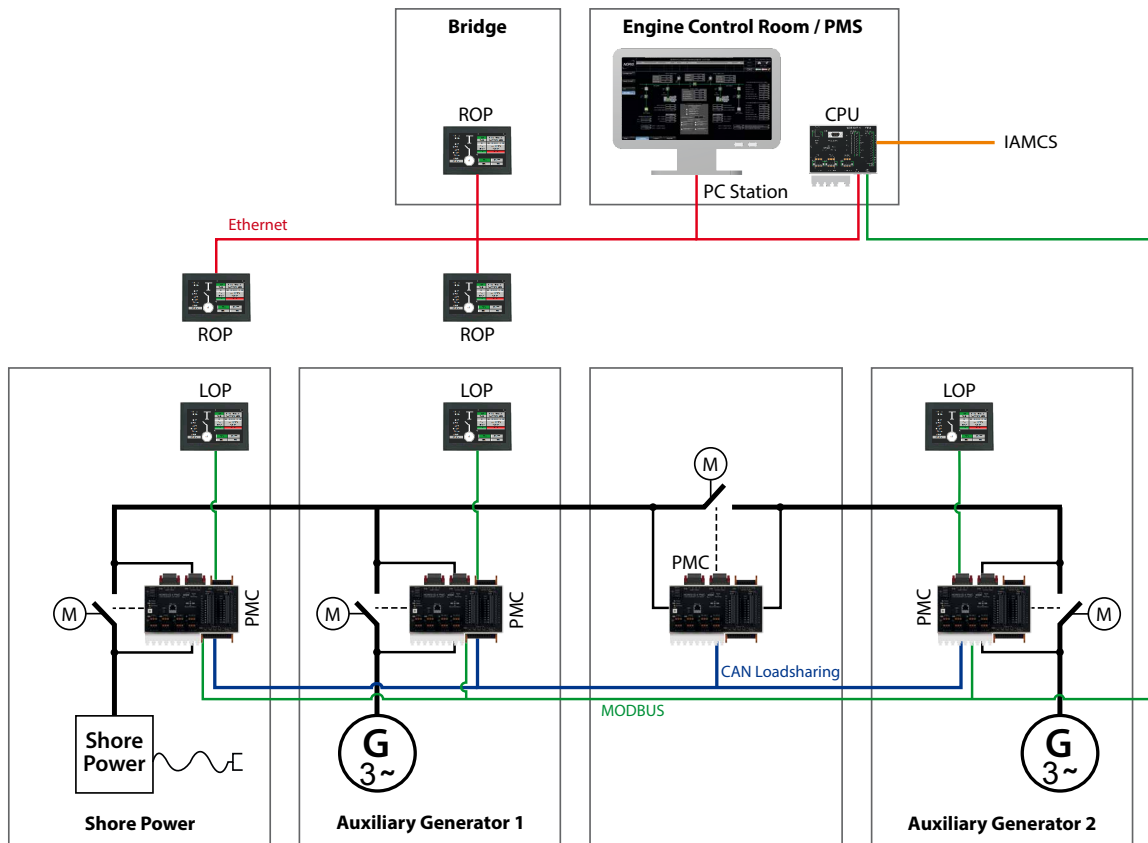
Features

- CPU based multi-master system
- Safety through redundant communication
- Remote access for maintenance and service
- Different operation modes
- Automatic shore connection
- Intelligent ESS control
- Interfaces to higher level systems
- Usable in DC-power-bus applications
- Approvals in preparation



DNV·GL
Approvals in preparation

NORISYNC 4 system overview



ANSI Functions (Extract)

according to IEEE standard C37.2-2008

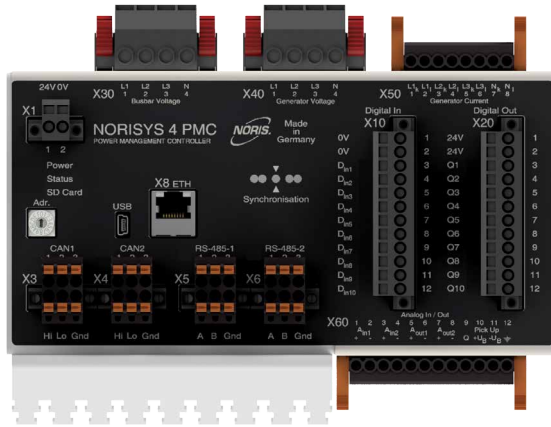
PC Workstation and remote panel displays for detailed visualisation

ANSI-No.	Protective Function
24	Overexcitation
27	Generator undervoltage
27B	Busbar undervoltage
32	Generator reverse power
32	Generator overload
40	Loss of excitation
46	Current unbalance
47	Phase sequence
50	Generator overcurrent
50BF	Breaker failure
51	Fast overcurrent
51 V	Voltage depend overcurrent
59	Generator overvoltage
59B	Busbar overvoltage
60	Busbar voltage unbalance
78	Vector surge
81	Generator over-frequency
81	Generator under-frequency
81B	Busbar over-frequency
81B	Busbar under-frequency



Graphical visualisation of all system parts

NORISYS 4 PMC



The *NORISYS 4 PMC* power management controller is the core of the NORIS PMS and can be used as autarkic system or easily expanded with components of our open automation platform *NORISYS 4*.

- Generator control with automatic start/stop function
- Parallel and isolated operation
- Automatic synchronisation
- Generator protection according to ANSI
- Power supply protection function, 3-phase
- Redundant CANbus interface for cross-linked operation
- Serial interface for optional I/O expansion or external interconnections
- Ethernet port for use with on-board webserver or external interconnections
- Circuit breaker control
- Load sharing and dead bus lock via CAN connection
- Optional connection of colour touch panel HMI for observation and control

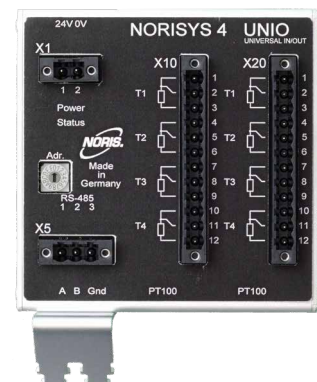
NORISYS 4 CPU and NORISYS 4 I/O modules



The *NORISYS 4 CPU* is a programmable logic controller according to the IEC 61131 standard featuring a 32-bit, 400 MHz processor and integrated web server and can be expanded with further different I/O modules. The CPU is used for PMC system expansion and comes with the following features:

- Integrated Webserver for comfortable configuration
- Embedded high performance Power PC processor with multithreading enabled CoDeSys runtime implementation
- Communication via redundant CANbus and redundant Ethernet interfaces and a freely programmable RS-232/-422/-485 interface
- Optional data logger function on SDHC cards.
- Remote access to ensure easy service

NORISYS 4 I/O Extension Modules



The *NORISYS I/O Modules* are used for PMS system extension. Together with the *NORISYS 4 CPU*, they form an I/O station. The I/O units can be easily configured via signal boards to connect binary or analogue sensors and actuators.

- Robust and reliable components for use in harsh environments
- Different models for different applications
- Easy installation

PBES Energy storage system

The PBES energy storage system (ESS) is the perfect economical PMS system extension. It prevents generators, is used to store energy, when generators are operating under loaded and thus, to maintain the generator operation with the optimum load. In case of peak loads, it prevents additional generators from going online.

The PBES energy storage system is based on liquid cooled high battery power (3C rating) and is currently one of the safest in the world. The modular system concept makes it easy to customise your energy storage solution exactly to your application. The batteries come as „plug & play“ BBU modules and are installed in racks. This ensures an easy installation and replacement and reduces purchase and maintenance costs.

The BBU modules are available in two variants: *Power 65 (P65)* and *Energy 100 (E100)*. *Power 65* has been designed for high discharge power applications requiring high C-rates and faster cycling. *Energy 100 (E100)* has been designed for applications requiring lower discharge rates and greater energy density. Up to 15 BBU modules are interconnected in series and can be installed in one MBU rack. Up to 12 MBU racks are interconnected parallel in a PBU array to meet your energy requirements.

Application and Features

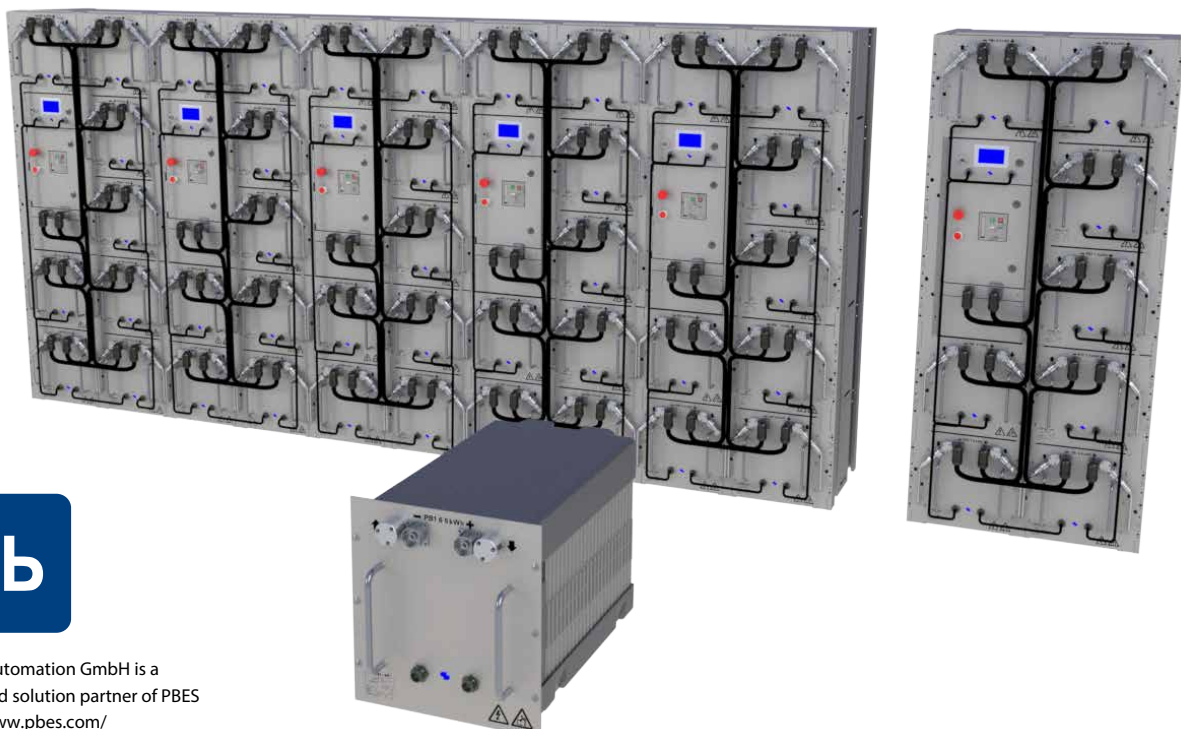
- Power Mode: Providing high energy in short time
- Energy Mode: Providing constant energy level over long time
- Peak Shaving Mode: Providing punctually energy to avoid load peaks
- Harbour Mode: Generate power without running your Diesel Generators or without shore connection – clean and silent!
- “Bring me to harbour” Mode: Your redundant system for propulsion – no noise, no pollution.

Your benefits at a glance

- Individual consulting for your application from experts
- Safe and reliable energy storage due to *PBES CellCool™ Liquid Cooling*
- High performance XALT Lithium-ion cells for maximum power and performance
- Simple integration into both new buildings and retrofits
- Modular concept (*CellSwap™*) ensures customisable power for your application and easy maintenance
- Optimised fuel consumption and lower engine maintenance costs by efficient energy usage
- Reduced blackout risk by operating ESS
- Reduced number of generator start/stops or even saves space due to the fact that less generators are necessary



BBU Module



NORIS Automation GmbH is a registered solution partner of PBES
<http://www.pbes.com/>