Solutions for
Marine Automation
Integrated ship solutions – everything from a single source

Customized automation solutions

Backed by almost 90 years of experience, NORIS offers customized ship automation solutions. As one of the few providers on the market to do so, we not only support you from the design, planning, implementation and commissioning stages through to servicing your system but we also develop, produce and market all the necessary products and components: from sensor systems through signal processing and visualisation to components and systems for complex control systems - where everything simply fits.
Our solutions – an overview

Sensors
- Measuring Speed
- Measuring Temperature
- Pressure Transducers, Rotation Angle Pick-ups, Tachogenerators

Signal Processing
- Multifunctional Devices, Measuring Transducers, Limit Value Switches

Emergency Order Telegraph System

Visualisation
- Analogue Indicator for Speed, Temperature, Pressure etc.

Remote Control System

Engine Room
- Engine Control Room
- Visualisation
- Analogue Indicator for Speed, Temperature, Pressure etc.

Emergency Order Telegraph System

Automation Systems
- Data acquisition systems
- Integrated alarm-, monitoring and control systems (IAMCS)
- Alarm extension systems
- Safety systems for combustion engines
- Power management systems
- Remote control systems for ship propulsion
- Emergency order telegraphs
- Tank level gauging
- Dead man systems

Sensors
- Speed sensors
- Temperature sensors
- Acceleration sensors
- Combi-sensors
- Speed pick-ups
- Pressure transducers
- Rotation angle pick-ups
- Tachogenerators
- Cable harnesses

Signal Processing
- Measuring transducers
- Limit value switches
- Multifunctional devices

Visualisation
- LED indicators
- Analogue indicators
- etc.

IAMCS - Local Visualisation
- Local Visualisation Displays, Signaling Units, Data Viewing Stations

IAMCS - I/O Components
- Alarm- and Monitoring, Data Acquisition, Pump-, Valve- and Fan Control, Tank Level Gauging, Power Management

IAMCS - Data Viewing Station

Alarm Extension System
We realise all automation engineering applications with our ultramodern, flexible and open automation platform NORISYS 4. The system is based on recognised industrial standards with perfectly matched hardware and software components as well as consistent communication design throughout. It is suitable for both simple as well as for highly dynamic and complex applications that require maximum operational reliability under the harshest conditions:

- Simple applications: speed measuring systems, data loggers, monitoring systems, control systems for pumps, valves, fans, etc.
- Local operating panels (LOPs): gearbox monitoring systems, safety systems for ship propulsion and generators, start-stop systems, etc.
- Integrated alarm, monitoring and control systems (IAMCS)
- Alarm extension and duty alarm systems
- Power management systems (PMS)
- Tank level measuring systems
- Highly complex and integrated platform management system (IPMS)
- Remote control systems for ship propulsion
- Emergency order telegraph systems
- Automation solutions for offshore and underwater technology applications

NORISYS - the open automation platform

The foundation for your application

System concept
The NORISYS 4 automation platform is a flexible master-slave system featuring a central control unit that is the heart of each and every application. Further I/O components with functionalities that cover a wide spectrum of applications are used to meet specific application requirements. Each automation system consists of one or several independent subsystems that are linked by a redundant bus. This configuration ensures maximum operational reliability. Thanks to the compact and robust design of the modules, the system is particularly suitable for use in the harshest of environments, e.g. directly next to engines and machinery.

The central control unit processes the data from the connected sensors, actuators or other systems. Equipped with a powerful 32-bit processor the system is particularly suitable for use in the harshest of environments, e.g. directly next to engines and machinery. The central control unit processes the data from the connected sensors, actuators or other systems. Equipped with a powerful 32-bit processor the system is particularly suitable for use in the harshest of environments, e.g. directly next to engines and machinery.

Interfaces for system integration
Interfaces such as RS232/-422/-485 with MODBUS RTU or other user-defined protocols or redundant Ethernet for field bus connection ensure complete system flexibility. This layout effectively enables integration of and in third-party systems, in the ship's network as well as reliable access via Internet to the system (e.g. for maintenance purposes, system optimisation or to retrieve stored data).

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The system components

Central control unit
Master module with high performance 32-bit processor, 4 digital inputs, 4 relay outputs, redundant Ethernet/CANbus interface, data logger via SD (HC) card and integrated web interface.

I/O module for 24 digital channels
I/O module for processing up to 24 digital channels, software-configurable as input or output.

Universal I/O module for up to 8 analogue channels
I/O module configurable with up to 2 signal boards:
- AI board: 4 configurable analogue inputs, 1 digital input, 1 relay output
- AO board: 4 configurable analogue outputs, 1 digital input, 1 relay output
- Pt100 board: up to 8 Pt100 channels

Your benefits at a glance

- Fast, multitasking 32-bit processor for processing highly complex controls
- Open communication and programming standards (PLC conforming to IEC61131 with CODESYS) ensure a high degree of flexibility and compatibility
- Integrated web server with CODESYS Web Visualisation for fast and easy configuration
- Redundant bus systems (CANbus, Ethernet) ensure complete operational reliability
- Many application-specific modular expansions for exceptional flexibility
- Conforms to global shipbuilding standards

Integrated web server for straightforward and convenient configuration
The configuration of the NORISYS 4 automation platform is based on the powerful CODESYS software suite which was specifically developed for complex applications in industrial automation engineering and provides the user with integrated solutions ranging from engineering through visualisation to safety control and field bus technology. Straightforward configuration and parametrisation via a standard Internet browser (e.g. Internet Explorer).

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NORIMOS – Integrated alarm, monitoring and control system

System concept NORIMOS 4
NORIMOS 4 is our solution for simple measured data acquisition systems (data loggers) through to complex alarm and monitoring systems with integrated control functions (IAMCS). This solution is based on the components of the NORISYS 4 automation platform (see Page 7). Expansion modules that have been specifically developed for automation in shipbuilding and geared towards meeting the demands of modern monitoring of ship propulsion systems and controlling periphery are available for various applications.

One or several subsystems are installed decentralised on the ship (e.g. in the engine or generator room). A redundant Ethernet-based bus system is available for communication of the subsystems with each other and with the visualisation stations. Each subsystem works completely independently of each other and can perform simple tasks like the acquisition of measured data up to complex control, regulation and monitoring tasks. The acquired data and system status are instantly sent to the system and are available to the crew throughout the ship at the visualisation components as a basis for decisions and actions.

System availability
The subsystems are separately configured for the monitoring and control functions. In the event of a data connection failing, the system continues to communicate with the overall system via the redundant connection. This concept guarantees maximum availability.

Systemwide communication as well as the individual components are monitored for failure. Failure of a subsystem or of a component is identified in the system network and instantly reported, thus ensuring maximum operational reliability.

Comprehensive user management enables the assignment of different authorisation levels to different user groups for the system applications or system configuration. All actions of the crew are precisely documented and logged on a storage medium (e.g. SD card, USB, stick or hard disk). Each change as well as its effect on the system processes can thus be tracked at a later stage.

Power Management Controller
The Power Management Controller can be used as an expansion unit of the NORISYS components or as an autarkic system. In its basic version the PMC is used to connect and disconnect generators to and from the power supply system and is also suitable for use in stand-by power supply facilities. 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.
Your benefits at a glance

- Open and modular system concept for quick and easy customer-specific system adaptation also during commissioning or in operation
- Consistent software engineering with a comprehensive package of preprogrammed standard functions
- Decentralised system layout, redundant communication structure and system-internal monitoring and safety functions for maximum system reliability
- Large selection of flexibly configurable, multisignal-compliant I/O components for measured data acquisition and processing
- Convenient visualisation and signal configuration at PC stations or locally at the data loggers via web-based visualisation with intuitive user interface
- Secure database provided by multi-server network with decentralised data storage in data loggers
- Extremely robust components immune to interference: used in the engine room in the vicinity of the engine
- In-house hardware development and production: maximum availability of expertise, spare parts and dependable customer service over the entire service life
- Conforms to global shipbuilding standards

User-friendly and intuitive HMI
NORIVIS, the state-of-the-art, web-based visualisation system, represents the interface between the crew and machine (HMI). With an intuitive user interface at visualisation stations in the engine control room, office area or on the bridge, the visualisation software displays system information application-specific and conveniently on the screen. In addition to alarm lists, status displays and event analysis, long-term diagnostics with trend curves, alarm and event history form an integral part and can be used later to optimise the engine management processes.

Decentralised operation and visualisation
Touch screen displays or other dialogue units that are connected to the monitoring and control system are used for local visualisation in the engine room or in the engine control room. They not only display the engine data and control functions but also allow the crew to operate the system and set operating parameters locally.

An alarm extension system which is optimally adapted to the automation platform has been developed for the cabins, messroom, office etc. In addition to displaying important system channels as well as visual and acoustic alarms in critical engine situations, duty assignment is managed according to class.

Interfaces
The integration of or in other systems is realised with interfaces of the NORISYS open automation platform (see Page 7).

System concept NORISTAR 4
NORISTAR 4 is a modular and flexible remote control system and our solution for fixed propeller, variable-pitch propeller, Azipod and diesel-electric propulsion systems. The system is based on the central control unit and I/O components of the NORISYS 4 automation platform (see Page 7). Several versions of the control desk are available for remote propulsion control on the bridge, aft bridge and wing control stands. Each control desk can be expanded with various operator control panels and can be easily adapted to any customer-specific application or requirement. All system components are interconnected by state-of-the-art field bus technology. The redundant bus concept of the control desk ensures maximum operational reliability.

Interfaces with external systems
The remote control system can be connected via a bus link to the Integrated Bridge System (IBS). An interface with the Voyage Data Recorder (VDR) is also integrated in the system.

Commissioning and service
Straightforward system configuration takes place on a touch screen display with a menu-supported user interface with the central control unit. The intuitive and standardised operating procedures allow customers to perform the commissioning procedure for the remote control system themselves.

Your benefits at a glance

- For CPP, FPP, POD and all types of thruster systems
- Can be adapted to any propulsion application
- Integrated protection to prevent engine overloading
- Defined control programs for various operating modes
- Integrated NFU control
- Interfaces with external systems (e.g. VDR, IBS, etc.)
- Integrated touch panel display for user-friendly configuration and monitoring
- Easy installation
- Commissioning by customer possible
- Maximum availability backed by worldwide service
- Optionally available with additional functions: Load distribution, electronic synchronisation, start-stop logic, connection to dynamic positioning and joystick systems, etc.
**Remote control system system concept**

NORISTAR-EOT is an emergency communication system used to transfer vital commands between the wheelhouse and engine room fast and reliably. Up to 12 emergency engine order telegraphs can be integrated in a master-slave system. Different versions are available for the bridge (ahead/astern) and engine room or engine control room.

Each emergency order telegraph is equipped with 11 order buttons. When an order button is pressed on a master unit on the bridge, the order is signalled visually by the corresponding button flashing and acoustically by an integrated buzzer on the slave devices in the machine room or machine control room. The order must then be confirmed by pressing the flashing order button on the slave unit.

**Your benefits at a glance**

- Robust devices for use in harsh environments
- Different versions for different applications
- Up to 12 emergency order telegraphs in one system
- Visual and audible alarm triggering
- Operating status indicator on each unit
- Dimmable lighting for bridge units
- 6 floating relay outputs per unit, e.g. for Wrong Way Alarm or for connecting external buzzers
- Connection to the Voyage Data Recorder (VDR)

**Emergency order telegraph system**

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**Your benefits at a glance**

- Available as a single or double drive lever
- Version also available for azimuthing and transverse thrusters
- Different scales available for each lever
- Position indicator for each lever
- Optionally with electrical shaft function and force feedback for each lever
- Configurable for different applications
- Factory preconfigured for easy installation and commissioning by customer
- Suitable for indoor and outdoor applications
- Interfaces: 2x CANbus or 1x CANbus + 1x RS232/485

**Drive lever systems for ship propulsion**

**System concept NORISYS lever system**

The NORISYS 4 drive lever system was developed for shipboard propulsion systems and is our solution for remote control applications. It is the ideal addition to the remote control system. The lever is available as a single or double lever with a simple design (with potentiometric or analogue standard signal outputs) or as a fully electronic version with integrated data interface and can be configured customer-specific for any application.

**Communication with other automation systems**

The fully electronic version of the drive lever can be connected to any automation system via a redundant CANbus or via the integrated RS-485 interface with MODBUS-RTU or the ExtBus protocol of our NORISYS 4 automation platform.

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**Remote control system**

1. NORISYS 4 LA4
2. NORISYS 4 LS4
3. NORISYS 4 LT4
Local operating panels (LOPs)

System concept
With the components of our automation platform we assemble local operating panels (LOPs) such as standalone exhaust systems, engine monitoring and control systems, gearbox monitoring and control systems, safety and start-stop systems for engines in one-off or series production. As a manufacturer of analogue indicators and sensors we clearly display measurements or supply suitable temperature, speed and pressure sensors as required.

Example applications
We have the right solution for your specific application. From simple display control cabinets to fully automatic control systems, from sensors through signal processing to analogue indicators or complex software-based visualisation. Everything from a single source.

Safety systems for combustion engines

N3000-SAP

System concept
The N3000-SAP safety system monitors the primary operating parameters of an engine. It is the central unit for triggering an emergency shut-down of the engine to avoid damage. Thanks to its compact yet robust design, the safety system is particularly suitable for use on ships and can be installed directly on the engine. Signal processing is purely digital. Together with fast and quartz-precise speed acquisition it ensures maximum safety and system reliability. A large number of preprogrammed engine types and the straightforward class-compliant configuration enable fast adaptation to existing applications.

System availability
In addition to a redundant operating voltage, the system availability is guaranteed by several internal monitoring functions:
- Operating voltage monitoring
- Input earth fault monitoring
- Input open-circuit monitoring
- Pick-up signal discrepancy monitoring

Clear visualisation of channel status
Relating to the measuring point, the channel statuses are indicated by three-colour status LEDs. Each LED is arranged on the front next to a labelled text field highlighted in colour.

System flexibility and scalability
The safety system can be expanded with our automation components to integrate a data logger or a start-stop system for example. As a further advantage, the interfaces of our components with other systems are then available (via MODBUS protocol or Ethernet).

Your benefits at a glance
- Suitable for almost all types of combustion engines
- Fast and quartz-precision speed acquisition
- Fast and reliable engine shut-down by open circuit monitored shut-down outputs
- Large number of preprogrammed engine types set via coding switches for easy configuration
- User-friendly installation in the control cabinet door
- Plug-in connections for easy servicing (screw or spring-type terminals)

Product | Reference information
--- | ---
Safety system N3000-SAP | FL-N3000-SAP
Solutions for offshore and underwater technology

For use in the offshore and underwater engineering sector, we have developed pressure-resistant versions of the NORISYS 4 components that are suitable for applications at depths of up to 6000 m. They feature pressure-proof and water-tight plug connections and an interface with underwater acoustic modems. They are particularly suitable for:

- Oceanic current, oceanic thermal or tidal power stations
- Wind power stations
- Sea mark automation
- Deep sea factories, deep sea mining, underwater robotics

Your benefits at a glance

- Powerful 32-bit High PLC system
- Programming with CODESYS V2.3
- Long-term database with internal memory card (up to 32 GB)
- EIA - 232, 422, 485 / Ethernet / CAN redundant
- Interface with underwater acoustic modem
- Plug-in underwater connections
- Expansion with NORISYS 4 I/O module (see Page 7/8 for features)
- Immersion depths of up to 6000 m

Sensors and signal processing for your automation

We have been there from the very beginning. As one of the few manufacturers of automation components, we have gained almost 90 years of experience in the sensor, signal processing and visualisation sectors. Whether speed measurement for your ship propulsion, measurement of exhaust gas, oil, coolant and bearing temperatures, recording pressures in hydraulic systems or registering angle positions on mounted shafts: we have available the right sensors and control units for your system. Our products are designed to reliably operate for years and years under the most extreme environmental conditions in safety applications.

Speed sensors

Our speed sensors are used in speed measuring systems for engines, gearboxes, generators as well as in other machinery.

- Non-contact or mechanically driven sensors (pick-ups, tachogenerators)
- Various designs and different connections
- A range of measuring principles: Difference-hall, inductive-magnetic or eddy current for scanning ferromagnetic or aluminium gearwheels
- Different enclosure materials (e.g. brass, stainless steel or aluminium)

Temperature sensors

Our temperature sensors are used to measure exhaust gas, oil, coolant and bearing temperatures.

- Different designs, different immersion depths, different measuring elements: Pt100/Pt1000, NTC thermistors, thermocouples
- Different enclosure materials: brass, stainless steel, CuNiFer
- Enclosure protection class up to IP68

Combi-sensors

Up to 3 sensors in one enclosure for combined measurement of speed, temperature and acceleration (vibration)

Pressure transducers

You will find our pressure transducers on engines and gearboxes for measuring the lubricating oil pressure, on hydraulic and pneumatic pumps, on filters, compressors and pressure tanks as well as on tank installations for measuring fluid levels.

- Registering pressure of liquid and gaseous media
- Absolute and relative pressure measurement
- Standard signals 4...20 mA, 0...10 V
- With different connections

Rotation angle pick-up

- For precisely registering angular positions
- Mounted directly on the drive shaft
- Maintenance-free
Our indicator instruments feature stepper motor technology or are equipped with a moving-coil element. They are primarily used wherever great demands are placed on durability and reliability. The high electromagnetic compatibility as well as the immunity to shock and vibration as stipulated by the ship classification bodies enable continuous use under increased mechanical stress conditions.

### Analogue indicators for your application

Our indicator instruments feature stepper motor technology or are equipped with a moving-coil element. They are primarily used wherever great demands are placed on durability and reliability. The high electromagnetic compatibility as well as the immunity to shock and vibration as stipulated by the ship classification bodies enable continuous use under increased mechanical stress conditions.

### Analogue indicators

We make instrumentation to your specification. Whether to indicate speed, temperature, pressure, propeller pitch or rudder position. We make instrumentation to your specifications. In addition to different designs (round or square) and sizes, you can define the scale, scale colour, limit range, pointer lighting and much more. Additional functions are available on request, e.g., integrated direction of rotation recognition for measuring the speed of reversing propulsion systems, a status LED for showing when limits are exceeded as well as additional signal or relay outputs for signal processing.

### Pulse bands and attachments

Every application is different. Installation locations for sensors are dependent on the available space or the availability of suitable mounting options. For instance, there are often no gearwheels available on shafts that could be used for frequency scanning or they are not accessible. We have available the right equipment for all these cases.

Pulse bands can be mounted on smooth shafts to facilitate frequency scanning with speed sensors. For mounting non-contact speed sensors or mechanically driven pick-ups we have available retaining fixtures that allow sensors to be optimally aligned for scanning.

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### Analogue indicators

Analogue indicators DB-NIQ... (square), DB-NIR... (round)

### Pulse bands and attachments

Pulse bands and attachments PR-DMA

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