MARINE & OFFSHORE

APPLICATION GUIDE

POWER EFFICIENCY SUPPORTING YOUR BUSINESS GOALS

AND EMISSION TARGETS WITH INNOVATIVE TECHNOLOGY,

OPTIMISED POWER MANAGEMENT SYSTEMS,

AND A PORTFOLIO OF PROVEN PRODUCTS AND SERVICES

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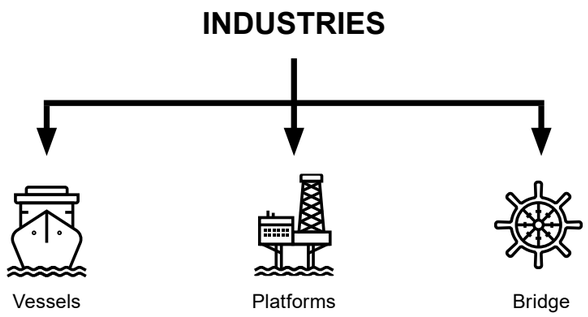
THE WORLD'S PREFERRED SUPPLIER*

**Our market share in marine bridge instrumentation is estimated at 40 %. See www.deif.com/marine*

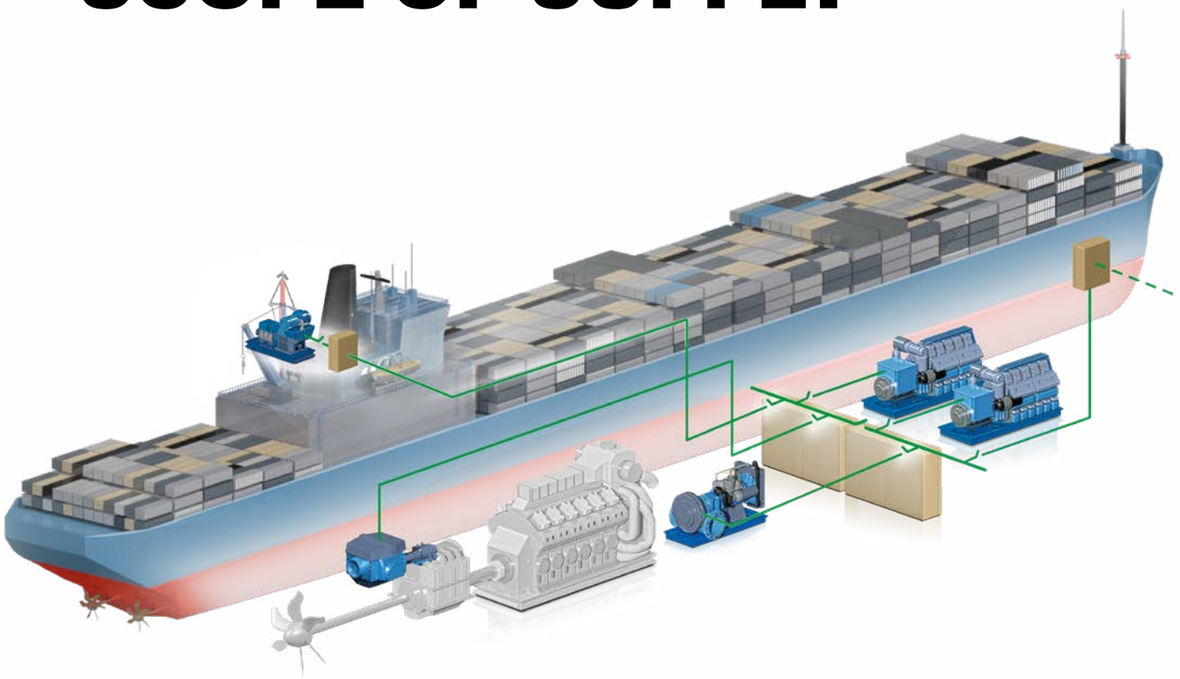
MARINE & OFFSHORE

DEIF has a long and rich history of providing class approved, reliable bridge instrumentation, switchboard equipment and power control.

Conceived and designed to anticipate user needs today and in years to come, DEIF products respond to market demands for easier integration, improved user-friendliness, fuel economy and high ROI. Most customers are able to install and commission our standard products working from data sheets only. In cases of doubt, DEIF's extended network of sales and application centres, distributors, customer care teams, and technical support teams is available to assist you and ensure you invest in and implement the best solution for your application.



SCOPE OF SUPPLY



SOLUTIONS

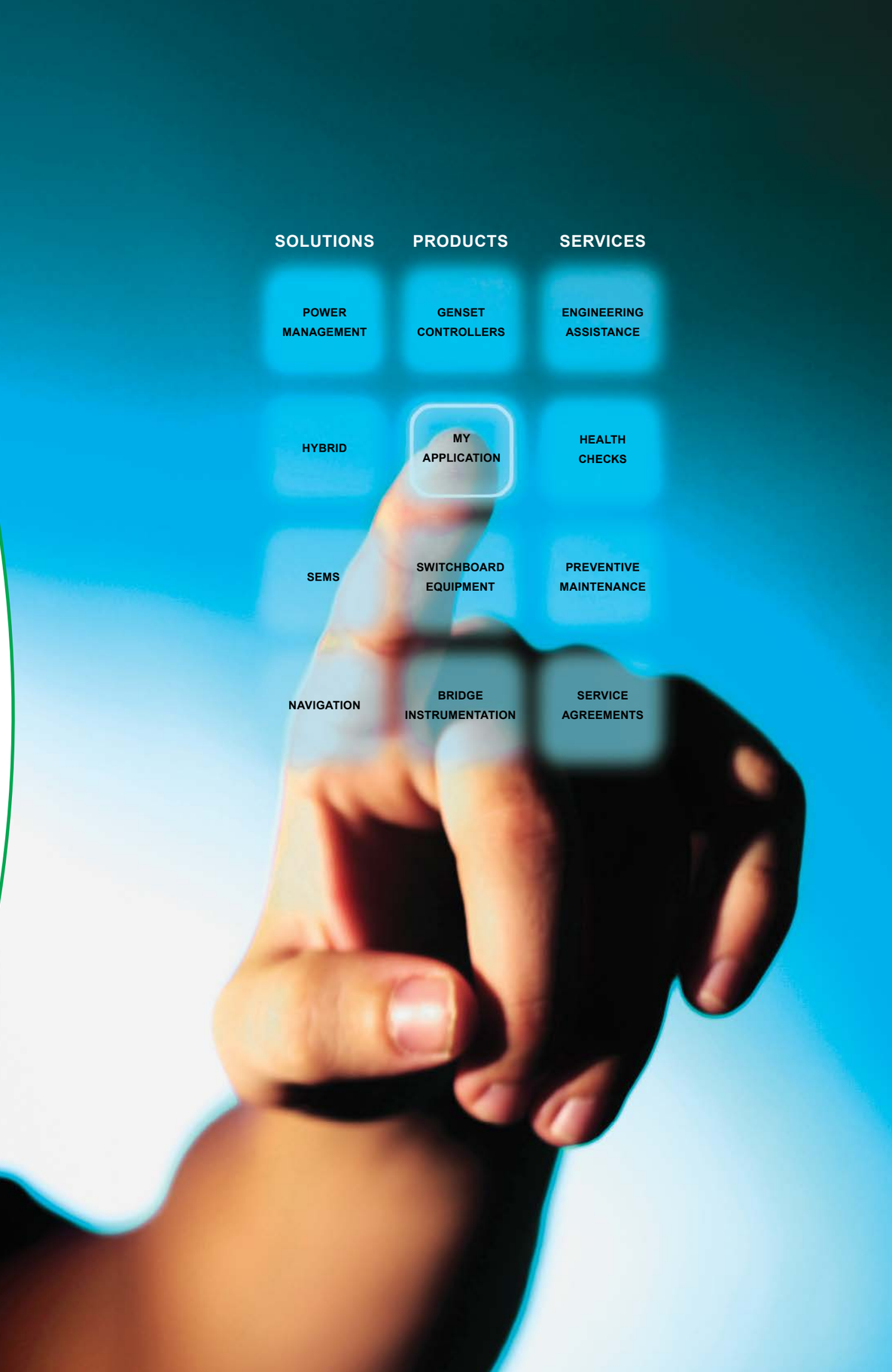
PRODUCTS

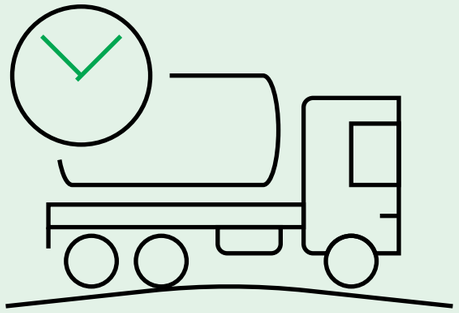
SERVICES

Full service & solutions provider

DEIF markets a complete scope of supply for refit and new build projects, ranging from simple instruments to complex and customised power engineering solutions. Hands-on practical training on real simulation equipment at 17 locations around the world ensures that you know how to fully utilise your DEIF solution.

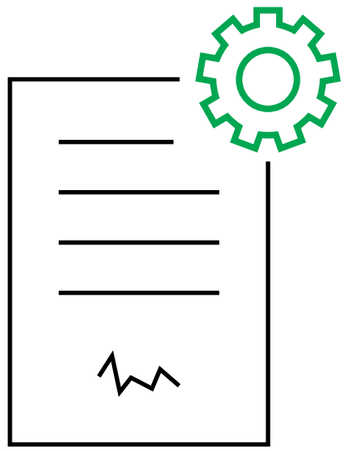
- ► Pre-engineering and design support
- ► Onsite commissioning, support, and service contracts
- ► Global hands-on training facilites in all regions of the world
- ► 24/7/365 global after-sales service & support

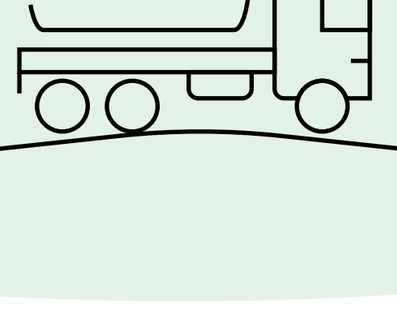




DEIF Ships
standard products
IN LESS THAN 3 DAYS.
Globally, 99 % of all DEIF
DELIVERIES ARE ON TIME.

SCALABLE
service contracts for system solutions and advanced plant management systems.





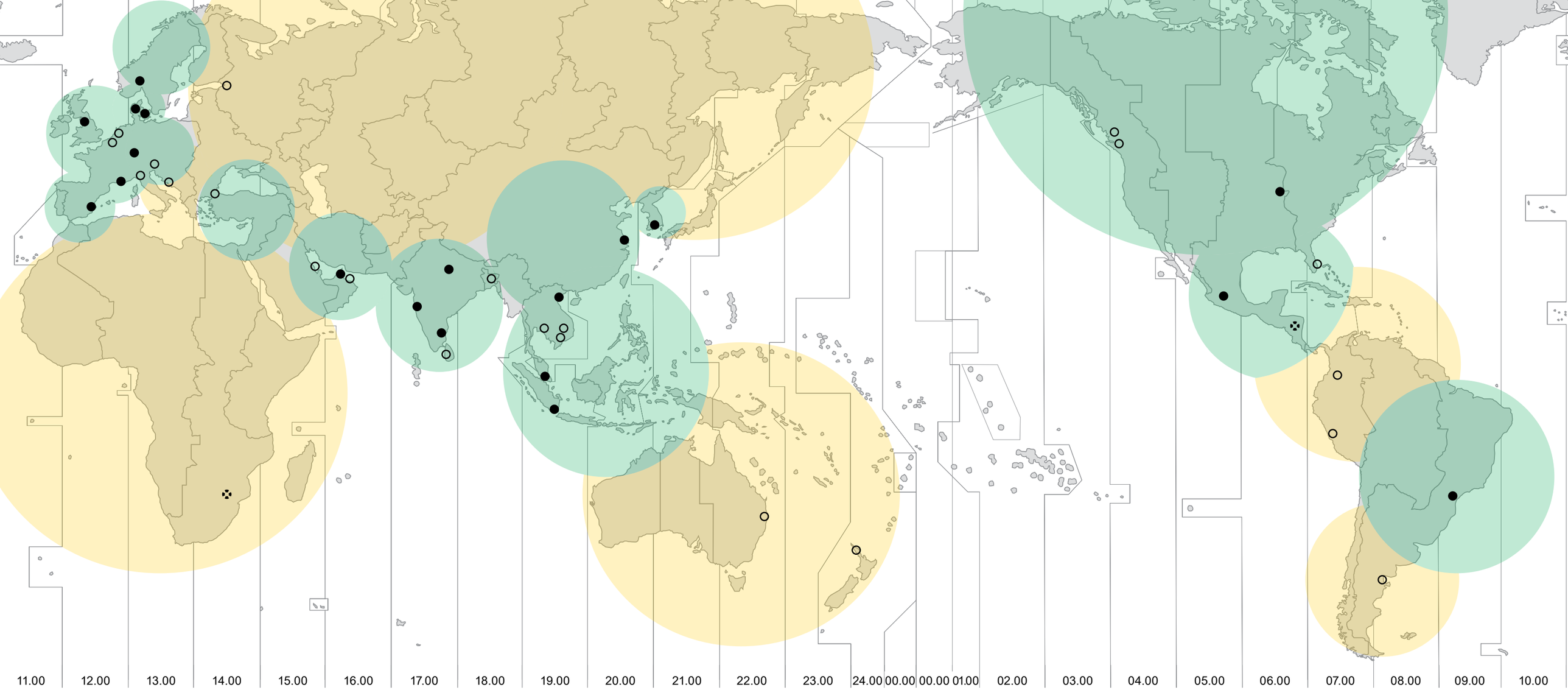
5 year guarantee supply
of spare parts for controllers & bridge instruments.

ONE-STOP-SHOP

FULL SERVICE & SOLUTIONS PROVIDER

Strenghten your product & system compatibility working with one supplier. DEIF markets a complete scope of supply ranging from simple instruments to complex and customised power engineering solutions.

- Pre-engineering and design support
- Commissioning, support, and service contracts
- 24/7/365 global after-sales service & support



OUR 24/7 GLOBAL REACH

We want to maximise your uptime

Offering you unrivalled response times, the DEIF Group's extended reach means we are on call for maintenance, repairs, replacements or upgrades 24/7/365 with regional and local anchors guaranteeing a "glocal" view.

- Sales offices, competence centres and training facilities in 17 key markets
- Global distributor, system integrator and trusted service partner network
- 5 year supply of spare parts for controllers and bridge instruments.

The DEIF group

- DEIF Asia Pacific
- DEIF Brazil
- DEIF China
- DEIF Denmark
- DEIF Germany
- DEIF India
- DEIF France
- DEIF Korea
- DEIF Mexico
- DEIF Middle East
- DEIF Norway
- DEIF Spain
- DEIF United Kingdom
- DEIF USA

STAY AFLOAT & POWERED UP

Flexible service concepts supported anywhere

Based on more than eight decades of experience in developing, manufacturing, testing and commissioning reliable and flexible engine and genset control solutions for both new and aging systems, DEIF knows how to avoid unplanned downtime. And also what it takes to keep power systems in prime condition, securing an operational and competitive fleet at all times.

DEIF’s flexible service concepts are fully scalable. Right from complimentary telephone or online support to onsite preventive maintenance service visits. DEIF's preventive maintenance plans are based on decades of service experience and reliability data accumulated in ISO standardisations and our quality control procedures.

Product support (complimentary)

- Product selection and configuration assistance
- Operator instructions, queries and fault-finding assistance
- Unrestricted online access to detailed technical documentation

Projects

- Technical advisory assistance and customised system solutions
- On-site service, commissioning and crew training
- Health check and preventive services
- Customised service agreements

Package solutions

- System specification (schematic drawings, system setup, customised software, etc.)
- Customised packages for retrofit, docking or engineering available
- DEIF takes full responsibility for your power application
- Onsite commissioning by DEIF engineers

PROJECTS

Getting it right from the start

We always recommend to select a complete DEIF project solution for your application. With the experience from more than 3,000 project solutions our project managers will take the full responsibility for the DEIF application solution and guide you right from specification to commissioning.

Each of our project solutions will be tested on dedicated test switchboards and approved by the classification societies.

When ordering a DEIF project solution each project will have a dedicated project manager and a unique project number. All information will be saved on our servers for availability even after many years.

- Participate on technical meetings as technical advisor
- Analysing and preparation of single line diagrams for DEIF product solutions
- Customised documentation of the DEIF system solution
- Developing of customised project software
- Factory acceptance test (FAT) with classification society
- Participate on technical meetings as your technical solution advisor (consultancy)
- Retrofit package solution incl. complete cabinet for DEIF controller, installation of DEIF equipment and certification of the DEIF solution
- Graphical touch screen project solution

PACKAGE SOLUTIONS

Retrofit, docking or engineering?

With the experience of more than 3,000 commissionings, we know that flexibility is crucially important. Our highly educated service technicians, project engineers and project managers are always ready to assist you in operating the vessel/platform in time and around the globe.

On-site software adjustments, optimising parameter settings, complete system checks, Harbour (HAT) and Sea Acceptance Test (SAT) and training of the crew are just a few examples of typical tasks our experts handle.

Our on-site services are backed up by our training, service and application centers in Europe, Asia and the Americas, our distributors, system integrators and service partners.

Call us if you need assistance – we offer fast and highly professional services & support in your time zone 24 hours a day.

Retrofitting

- Participate on technical meetings as technical advisor
- Analysing and preparation of single line diagrams for DEIF product solutions
- Customised documentation of the DEIF system solution

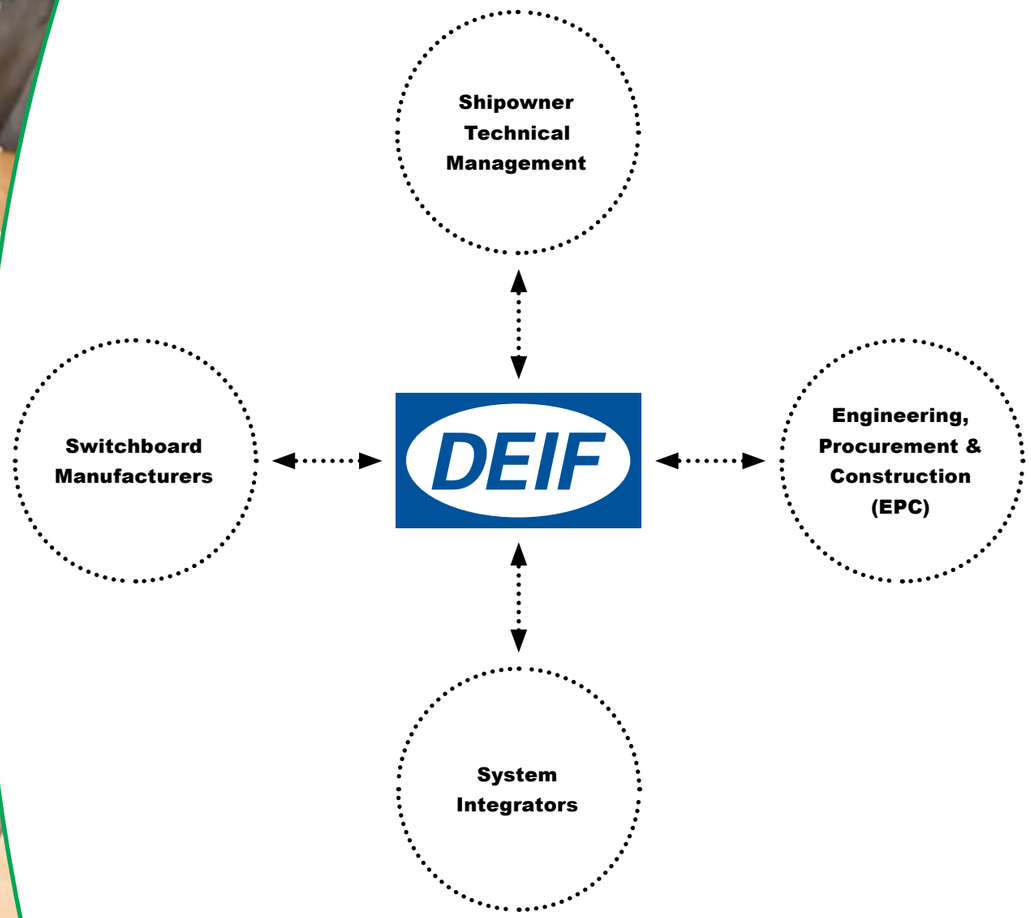
Docking

- Developing of customised project software
- Factory acceptance test (FAT) with classification society
- Participate on technical meetings as your technical solution advisor (consultancy)

Engineering

- Retrofit package solution incl. complete cabinet for DEIF controller, installation of DEIF equipment and certification of the DEIF solution
- Graphical touch screen project solution

CUSTOMER PROFILES



Powering business efficiency

Already acclaimed for our ability to customise products and solutions to match the exact needs of individual systems and conditions, we are focused on answering the specific needs of multiple industries and customer groups with benefits that generate competitive advantages.

To DEIF, Power Efficiency also means maximising your business potential, powering your competitive efficiency with innovative technology, market-leading logistics, and flexible solutions.

SHIPOWNERS

Peace of mind for your technical management

DEIF provides products, services, consultancy and project solutions that give shipowners and their technical management peace of mind to plan and execute competitive, safe and reliable operation of their fleets.

We design our advanced Power Management System (PMS) controllers and HMIs to be intelligent and intuitive with one-touch auto sequences and user display information messages. Reducing fuel and maintenance costs by up to 40 %, our Dynamic Propulsion (DP) mode balances both the main engine and shaft generator speed and the thruster pitch for minimised power requirements while maintaining full DP functionality.

Contrary to traditional PMS thinking on shaft and AUX long-term parallel operation, this system is likely to deliver above expectations on both consumption and new build or refit investment cost.

Offering training and education sessions at our local and regional offices, we can also provide your crew with the competences and proficiency that support this aim.

Innovative power management solutions

- Dedicated for DP diesel-hybrid-mechanic offshore supply vessels
- Dedicated for shaft-gen & CPP-equipped merchant vessels
- Full range of flexible genset controllers, bridge instrumentation & switchboard equipment

Reduced fuel & maintenance costs

- Up to 40 % reduction of fuel and maintenance costs
- Optimised genset operation reduces running hours
- Preventive maintenance service agreements

Global services & support

- Retrofit & upgrades
- Hands-on training for service & operation
- Fast service & support from 17 key offices & 35 distributors

ENGINEERING, PROCUREMENT & CONSTRUCTION

Taking your power control & monitoring solutions to a new level

Experienced in working with Engineering, Procurement and Construction (EPC) contractors globally, DEIF is dedicated to delivering a full range of reliable and documented quality solutions, products and services.

Combining our knowhow within standard and engineered solutions developed for quick and seamless installation and commissioning, we will help you simplify and speed up your system design process and time to market.

Engineering: One-stop-shop

- Standard and customised power management & genset control solutions
- Full range of bridge instrumentation & switchboard equipment
- Customisation of products & solutions possible

Procurement: Quality delivered in record-time

- In-house type test centre & laboratory
- ISO 9001 & ISO 14001 certified
- 99 % of all DEIF deliveries on time

Construction: Reduced installation time & costs

- Simplified system wiring
- Pre-configured products
- DEIF Emulation to test your design before installation
- Free online access to technical documentation

SYSTEM INTEGRATORS

Getting it right from the start

Working with integrators, our primary aim is to support your business success rates and customer satisfaction.

We achieve this aim by supplying market-leading solutions, products and services that help you cut your inventory, give you faster time to market, and reduce installation time.

Our market-leading delivery performance on standard products enables integrators to react with flexibility on demand and boost production at peaks. With shorter time to market, you also avoid locking cash in stock and costly inventory.

Find & test the right solution

- Optimum solution specified by DEIF engineers
- DEIF Emulation to test your design before installation
- Free online access to technical documentation

Easy & fast installation

- Universal communication standards
- Designed to meet compact space requirements
- Fully configurable controllers for fast retrofit installations
- Free software upgrade from deif.com for optimal operation

Global service & support 24/7/365

- Fast service & support from 17 key offices & 35 distributors
- Best-in-class delivery time
- Day-to-day spare part delivery

SWITCHBOARD MANUFACTURERS

A comprehensive product line for all marine & offshore applications

DEIF guarantees immediate and reliable delivery performance for projects of all sizes making us an ideal partner for switchboard manufacturers both locally and internationally.

On top, DEIF's advanced and basic controller systems have been designed with flexibility and versatility in view, giving EPC consultants, integrators and shipowners a range of options that enable them to meet all types of application requests.

One-stop-shop

- Standard and customised power management & genset control solutions
- Full range of bridge instrumentation
- Unmatched portfolio of switchboard equipment
- Customisation of products & solutions possible

Quality delivered in record-time

- In-house type test centre & laboratory
- Certified according to ISO 9001 and ISO 14001
- 99 % of all DEIF deliveries on time

Reduced installation time & costs

- Simplified system wiring
- Pre-configured products
- DEIF Emulation to test your design before installation
- Free online access to technical documentation

Uncompromising quality

In-house testing & classification approvals

All DEIF marine products are type-tested and tried in the harshest possible conditions before market release to ensure outstanding levels of accuracy, robustness, reliability and water-proof housing.

The tests are carried out in our own in-house test centre by our meticulous staff of specialised engineers. The test centre is part of our ISO 9001 certified quality management system and houses some of the most advanced testing facilities in the world. They allow us to carry out all the relevant tests for marine classification approvals, CE marking, MED approvals, UL, etc. – under our own roof.

Knowing that this, in turn, speeds up our clients' approvals, DEIF is vigilant in securing and maintaining all major international class type approvals on the market today for our product range. In fact, our products often exceed classification requirements. Why? – Because it ensures unproblematic operation for our customers.

To this end, we collaborate closely with the classification societies who regularly audit our test and measuring results as part of the certificate issuing processes.

Please visit www.deif.com to see approvals for specific products.

Application examples & cases

Intro

The following application examples and case studies document the scope of DEIF deliveries, from reliable systems for basic projects to ground-breaking technology for complex, frontrunner challenges in the power industry.

Please note that the examples are generic principles and not exhaustive.

From planning to commissioning, the DEIF Group is ready to support you with power efficient, market-leading solutions in critical power, standby power systems, plant management, rental, and more.

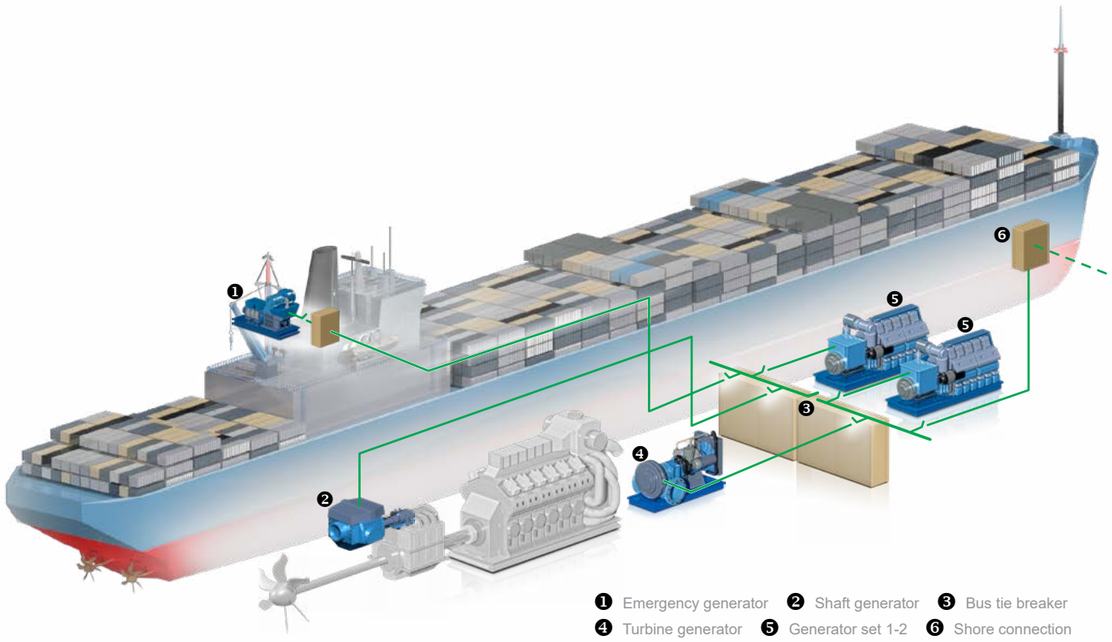
DEIF offers the full range of genset controllers, synchronisation & load sharing units, protection, switchboard equipment, along with:

- Project engineering, application and system solution design
- Wiring diagram design
- Complete pre-delivery testing
- On-site commissioning
- Training for you and your customers

Application examples and cases index

Commercial vessels

Acclaimed performance since 1933



1 Emergency generator 2 Shaft generator 3 Bus tie breaker
4 Turbine generator 5 Generator set 1-2 6 Shore connection

Quality products, outstanding support

DEIF has become a preferred control solution supplier to the biggest operators in the market not just because of our innovative, safe and reliable technology but because of our commitment in guiding you through all phases of your project, from specification to configuration and commissioning.

DEIF's flexible product platform covers the full range of application possibilities. Most customers are able to install and commission our standard products working from data sheets only. But in cases of doubt, DEIF's far-reaching network of subsidiaries, distributors, customer care teams, and technical support teams is available to assist you and ensure you invest in and implement the best controller for your application.

Useful installation information can be found in the product quick start guide, and application setup is made easy with DEIF's Utility Software. For greater detail, please consult the product installation instructions or attend a DEIF training course on how to install and operate DEIF's standard controllers.

Relevant controllers

DM-4 Marine

PPM 300

PPM-3

PPU 300

GPU 300

Also consider these products

WQ

ASK

RMV

Green & reliable power management

Touch screen overview of consumed & available power

»With this update, we're anticipating substantial energy savings onboard«

Sean Crowly
Electrical & Automation Manager
Stolt-Nielsen Limited

Power efficiency

Built in 1995, the 3,716 gross tonnage chemical tanker Stolt Razorbill saw its entire power control and monitoring system retrofitted late in 2015.

Resulting in full bus tie breaker (BTB) control and based on DEIF's PPM 300 and ECU 100 controllers, the new power management system controls two auxiliary engines, one shaft generator and one emergency generator.

The redesigned switchboards are equipped with current transformers for BTBs, current relays for gensets and AC transducers for the power packs that provide hydraulic pressure for equipment on deck.

Completing the system revamp, an AGI touch screen solution was mounted in the cargo control room, offering a full overview of consumed and available power along with plant overviews indicating genset and BTB states.

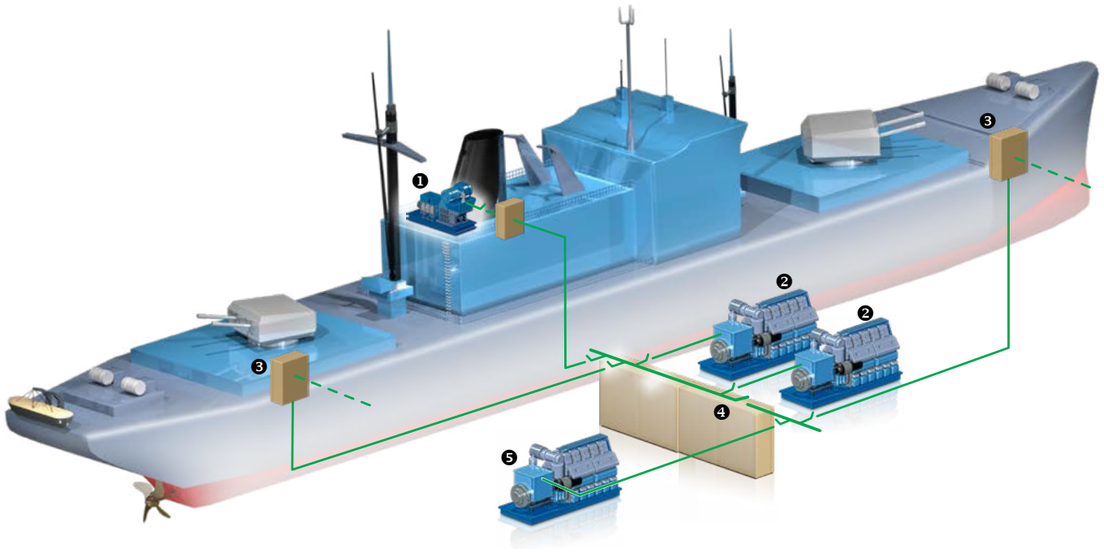
We're planning to install similar solutions on a range of other vessels in our fleet, Sean Crowly from Stolt-Nielsen ends.

Stolt-Nielsen Limited

Stolt-Nielsen Limited (SNL) is the world's leading provider of integrated transportation and storage solutions for specialty and bulk liquid chemicals and a wide range of other liquid products. SNL's aquaculture division is a leading high-tech producer of turbot and other premium fish and fish products.

Naval vessels

Strict, tough & systematic test procedures second to none



1 Emergency generator 2 Generator set 1-2
3 Shore connection / ship to ship 4 Bus tie breaker 5 Generator set 3

In pursuit of zero fault output

DEIF has become a preferred and trusted supplier of control systems for naval applications because our solutions meet and surpass international safety standards and specific high critical reliability and safety requirements in defense operations.

In our pursuit of zero fault output, DEIF exhaustively monitors product quality: using in-house test applications, our developers are able to simulate real-life operation in great detail, including HALT and vibration tests for performance in harsh environments.

DEIF controllers are tested for a temperature range of -40 to +70 °C, for instance, and can achieve 0.5 accuracy class. Shock test is performed with 50 g, 11 ms.

As a rule, our test procedures are followed by a 6-12 month customer field tests introduction phase.

See www.deif.com for further information on DEIF's market-leading range of type test certificates and approvals.

Relevant controllers


DM-4 Marine


PPM 300


PPM-3


PPU 300


GPU 300

Also consider these products


CSQ-3


2FQ96


2EVQ

Reliable power when life is at stake

Fully vibration & shock tested power control solutions

»In our pursuit of zero fault output, DEIF exhaustively monitors product quality: all products are subjected to internal and external quality control procedures prior to market release.«

Applications

Patrol boat

Frigate

Cruiser

Minehunter

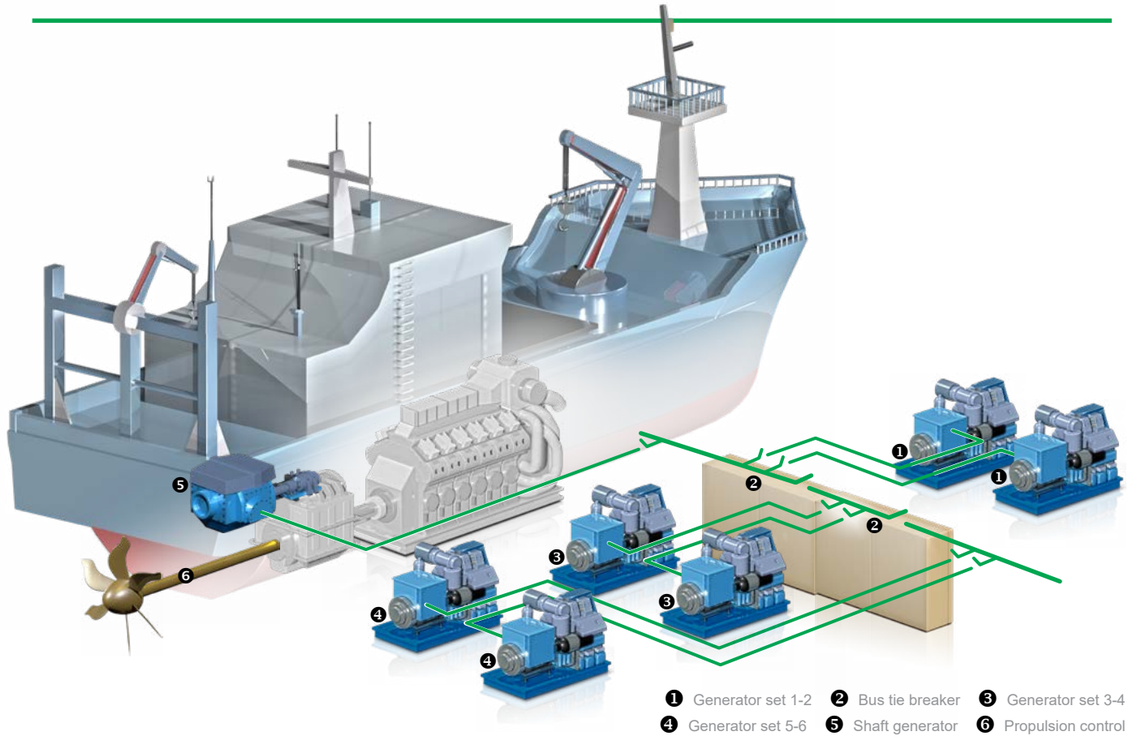
Corvette

Destroyer

Aircraft carrier

Special vessels

Bolstering customer requirements with cost-efficient solutions



❶ Generator set 1-2 ❷ Bus tie breaker ❸ Generator set 3-4
❹ Generator set 5-6 ❺ Shaft generator ❻ Propulsion control

Consider the longer life advantages

With a record of more than 80 years of proven experience and know-how, DEIF specialists have the experience and competences to give consultancy advice on external systems interfacing with DEIF equipment.

Catering to the particular needs of special vessels, DEIF develops solutions with integrated control concepts that bolster customer requirements for safe and accurate operation.

Getting it right from the start, we advise customers with specifications, project-specific documentation, I/O lists, and parameter lists including check of customer drawings.

Developed by our expert project managers with environmental and longer-life advantages for valuable equipment, more often than not these solutions are not just customised but cost-efficient alternatives to standard controllers.

Relevant controllers

DM-4 Marine

PPM 300

PPM-3

PPU 300

GPU 300

Also consider these products

AL8-2

EQ-sw

AAL-2

Boost mode for heavy fishing

Variable shaft generator frequency reduces fuel usage

»With the PTO mode, we're able to optimise the efficiency of the main engine, reducing both fuel consumption and service intervals.«

Jon Sigurd Samuelsen
Chief Engineer
Gitte Henning

Smooth sailing

Denmark's biggest fishing vessel Gitte Henning is equipped with a 5,220 kW main engine, a 3,000 kW shaft generator, two auxiliary generators (2,470 and 790 kW) and a small 140 kW emergency generator.

In cooperation with Scantechnic, DEIF delivered a complete Delomatic 4 PMS featuring one-touch operation for all six standard operation modes as well as custom-designed Power Take In (PTI) and shaft boost modes that are selectable only from the controller pitch propeller. Utilising the Power Take Out (PTO) mode split function of DEIF's Delomatic PMS system, however, the shaft generator frequency becomes variable between 50-60 Hz without triggering any busbar alarms. This allows for a wide variation in main engine speed without affecting constant voltage and frequency for the ship's electrical network.

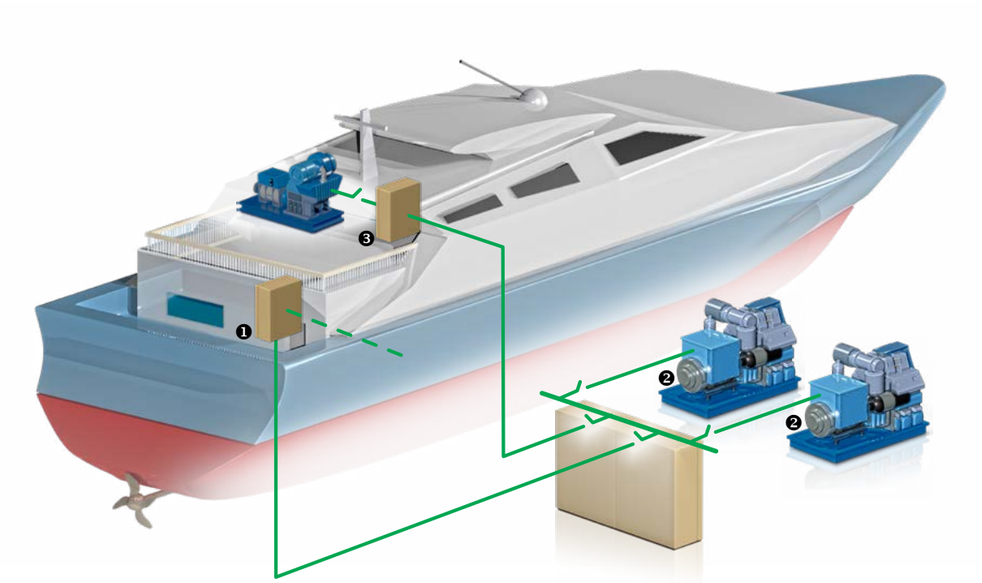
"With the PTO mode, we're able to optimise the efficiency of the main engine, reducing both fuel consumption and service intervals" says Jon Sigurd Samuelsen. *"It also makes for a smoother trip since it reduces vibrations in the vessel."*

Scantechnic

Scantechnic is a recognised supplier of electrical switchboards on the small and medium-sized ships market. The company builds main switchboards with generator control, synchronisation and load sharing using DEIF's Delomatic 4 Marine PMS.

Pleasure boats

Easy-to-use controller solutions, bridge instrumentation & switchboard equipment



❶ Shore connection ❷ Generator set 1-2 ❸ Emergency generator

Intuitive operation, smooth sailing

Maximising accommodation space is a primary challenge in contemporary yacht construction.

Understanding the need to optimise engine rooms and electrical switchboards, DEIF's control units have been designed to fit the smallest switchboards and require no PLCs.

With high levels of flexibility and configuration, it is simple to add features and functionality after HW installation using DEIF design tools and free software downloads from www.deif.com.

Utilising advanced power management calculations and redundant communication lines, our solutions generate safe, optimal and intuitive operation. Stressing how correct system handling and operation by educated personnel optimises fuel costs and maintenance, we also offer comprehensive hands-on training for your crew at our regional and local training centres.

Relevant controllers

PPM 300

PPM-3

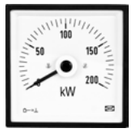
PPU 300

GPU 300

Also consider these products

MIC-2 MKII

EQ-sw



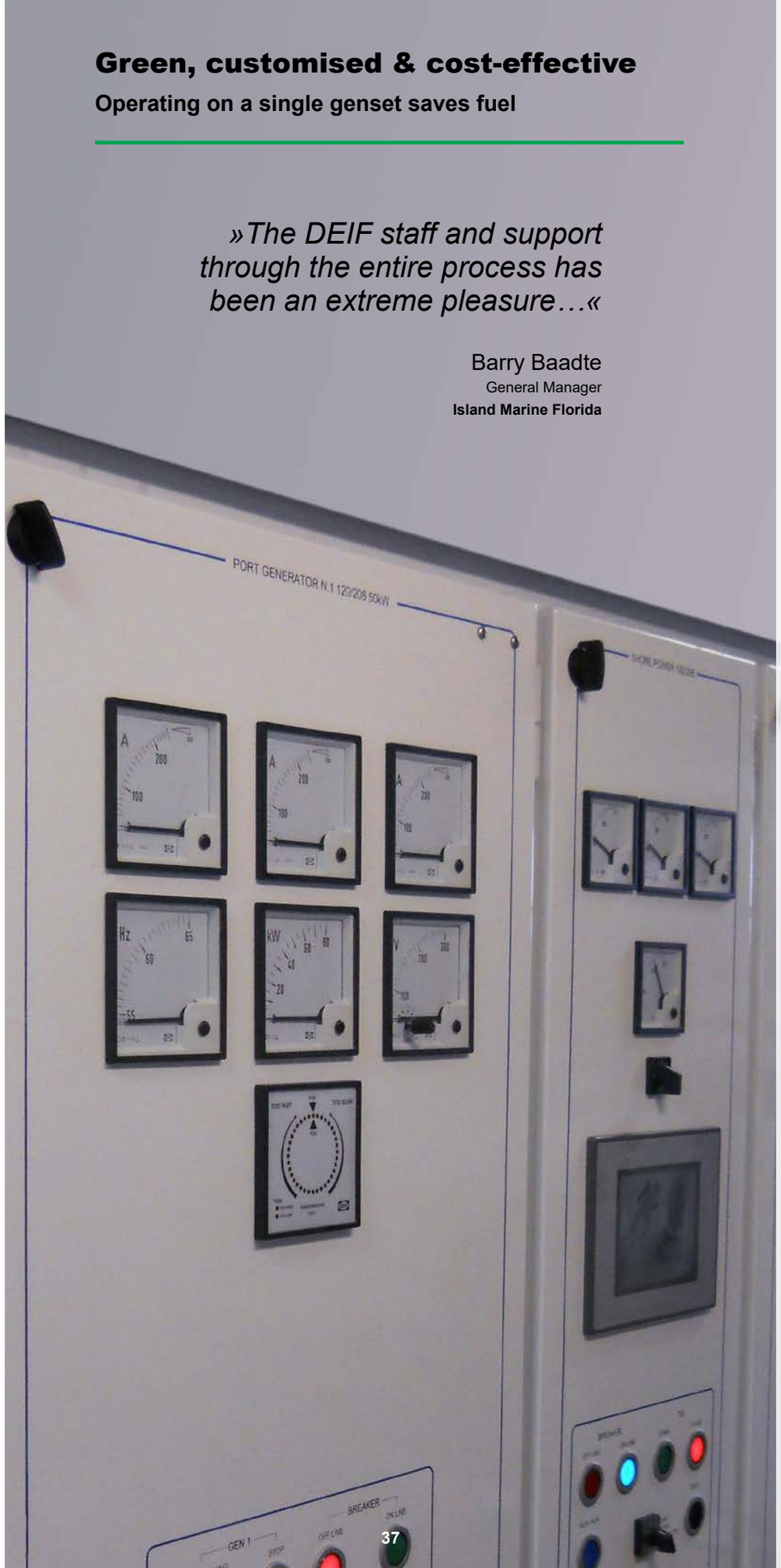
DQ

Green, customised & cost-effective

Operating on a single genset saves fuel

»The DEIF staff and support through the entire process has been an extreme pleasure…«

Barry Baadte
General Manager
Island Marine Florida



Island Marine Electric

Up to 15 % reduced fuel consumption

DEIF's PPM-3 solution enables pleasure boat Casual Water to operate on a single generator, saving fuel and generator maintenance cost. For Baadte, what truly makes the DEIF solution stand out, though, is, "Reliability, customer support and the system's incredible adaptability."

When Casual Water requested a unique mode for bow thruster operation – the system will automatically enter a split bus state – we delivered on the request, adding custom M-Logic programming featured in the PPM-3 controllers."

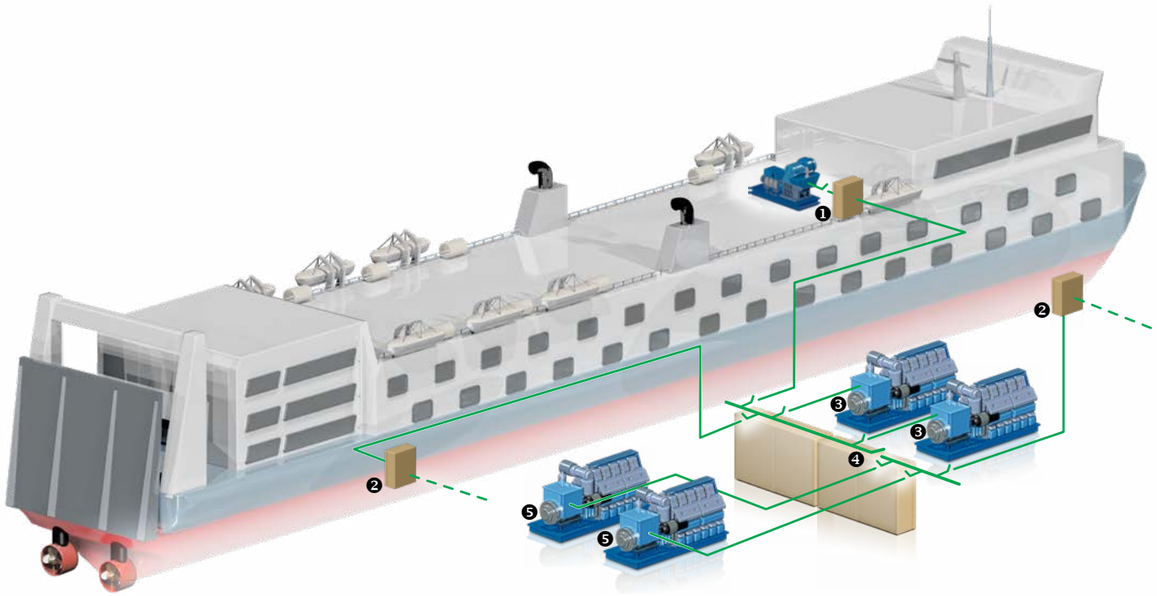
According to Island Marine, retrofitting the systems proved an exceptionally seamless and pleasant experience with new functionalities and options adapted specifically for the yacht. Island Marine is particularly hopeful about the return on investment of the retrofit: "The return on investment for the owner and crew should be very apparent. The system offers exceptionally intuitive operation along with a high level of reliability and required no major modification to the main distribution panel to implement. The yacht is quite happy."

Island Marine Electric

Operating out of Fort Lauderdale, Florida, since 1985, Island Marine Electric serves the yachting community in the United States and the Caribbean.

Passenger ships & ferries

Complete packages with outstanding safety & reliability



1 Emergency generator 2 Shore connection
3 Generator set 1-2 4 Bus tie breaker 5 Generator set 3-4

Reliable power control made simple

Fully commissionable without interrupting commercial operations, a DEIF power control solution is the innovative, safe and reliable choice for ferry route operators and their crews. We are committed to guiding you through all phases of your project, from specification to configuration and commissioning.

DEIF's flexible power control solutions contain leading technology genset controllers, the world's most sold range of bridge instrumentation and an exhaustive portfolio of switchboard equipment.

Advanced load-dependent start/stop, long-time parallel operation on diesel/shaft generators and combined emergency/harbour generator functionality reduce fuel consumption, and one-touch auto sequences, PTI, PTO, PTH and BOOST shaft generator modes along with preventive maintenance alarms make day-to-day operations easy and intuitive for the crew. Everything can be fully monitored and controlled on graphical touch screens.

Relevant controllers

DM-4 Marine

PPM 300

PPM-3

PPU 300

GPU 300

Also consider these products

TAS

PFQ

EQ

Power management made simple

Four predefined modes cover the entire route

»Easy to install. Easy to operate.
Full touch screen overview.
In simple terms: Perfect.«

Anders Efraimsson
Chief Engineer
Stena Line

Stena Line

Modular & intuitive

Operating the ferry route between Frederikshavn, Denmark, and Göteborg, Sweden, M/F Stena Gothica's power management system was fully upgraded in just three weeks with DEIF's new and modular PPM 300 power management solution.

For ease of operation, the installed solution offers four standard modes that cover the entire route. Auto for standard sailing, secure for near-coast sailing, harbour for harbour operation and shore for seamless shore-to-ship supply.

Fitted with DEIF's AGI touch screen, the delivered solution also improves overview and control for the crew.

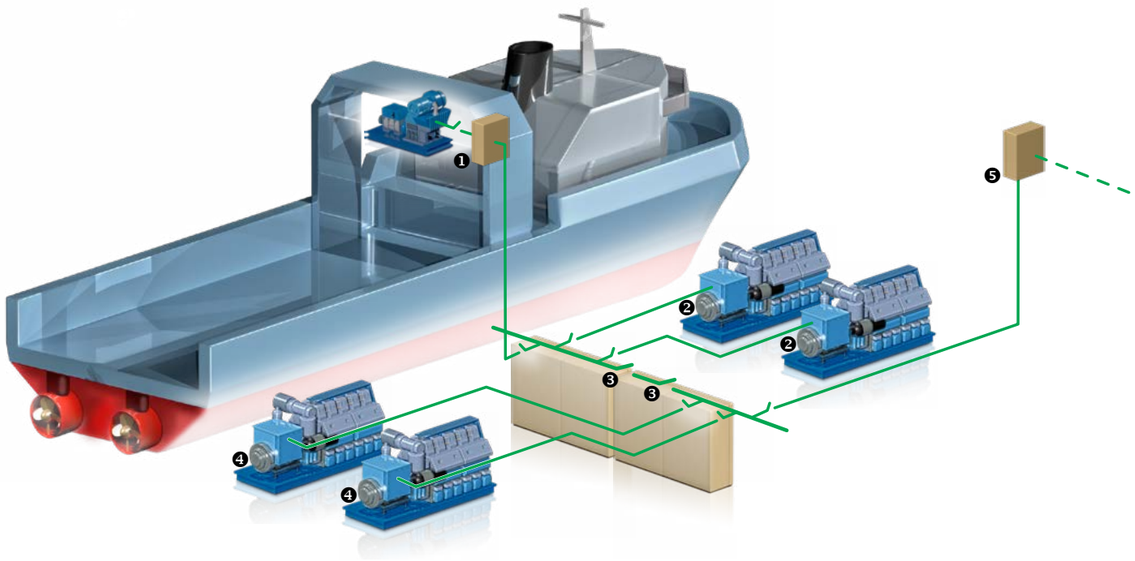
"Our crew can easily control the four gensets onboard using the intuitive PPM 300 menues and the four standard operation modes. It doesn't get much simpler than that".

Stena Line Group

Stena Line Group is an international transport and travel service company with Europe's most comprehensive route network.

Offshore support vessels

Complete packages with outstanding safety & reliability



❶ Emergency generator ❷ Generator set 1-2
❸ Bus tie breaker ❹ Generator set 3-4 ❺ Shore connection

Efficient Dynamic Positioning (DP) operation

DEIF is a market leader in offshore applications for diesel electrical drives and switchboards designed for dynamic positioning operation.

We specialise in optimising electrical power management systems to make applications more efficient. Our reliable and fuel-optimised solutions are class-approved for DP-2 operation, even with a closed bus tie breaker, just as our dynamic load sharing deviation protection and fast thruster load reduction are state-of-the-art.

Working with our dedicated project department for system solutions, you will soon experience how DEIF is more than a partner. Our know-how, experience and expertise guarantee advanced application solutions – quality-tested beyond marine standards.

DEIF has recently optimised our hardware modules for onshore and offshore production platforms with filters to be able to operate with frequency converters without influencing the measuring values.

Relevant controllers

DM-4 Marine

PPM 300

PPU 300

GPU 300

Also consider these products

ADL

MTR4-P

VDQ-sw

Subsea IMR vessel blackout prevention

Distributed power management system for award winner

»Engineered PMS for Ship of the Year award winners Far Solitaire and Seven Viking.«

Courtesy of: Ulstein Group/Christian Romberg

ULSTEIN®

Staying the course

A subsea inspection, maintenance and repair (IMR) vessel, one of the main success and classification criteria for Seven Viking is her ability to safely master the North Sea's unruly high seas and hold her position steady during maintenance operations.

The Delomatic 4 Marine solution engineered for Seven Viking by DEIF includes class-approved DP-2 operation with closed bus tie breaker and isochronous load sharing with compensated droop as fall back including special speed governor interface.

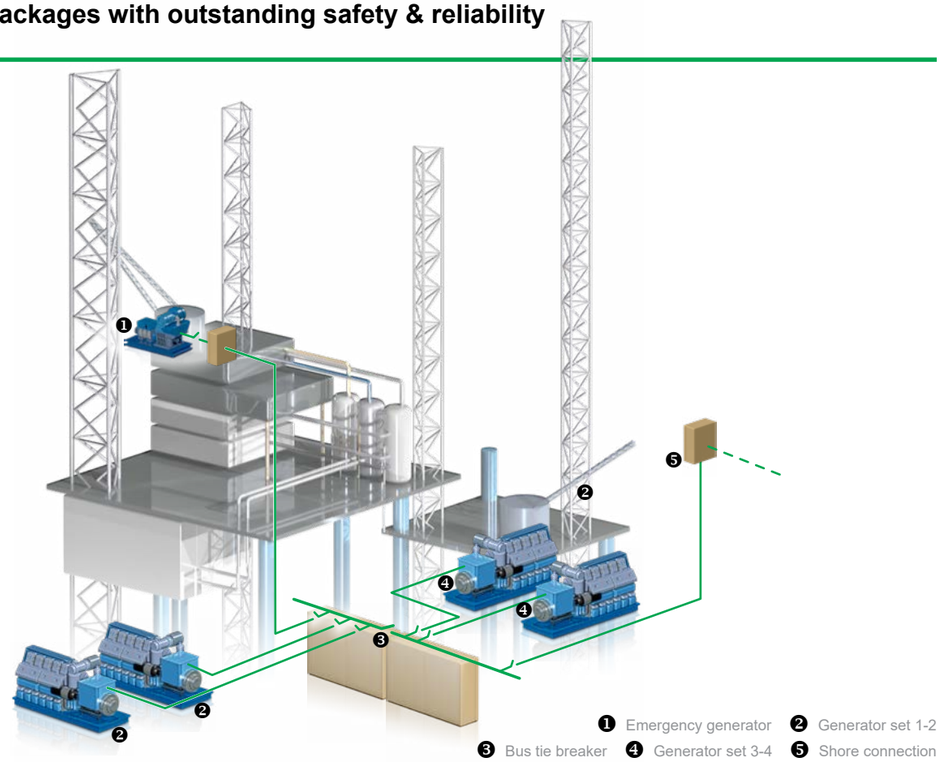
For safety reasons, the DEIF solution has special blackout preventive protection methods implemented, including thruster control with fast load reduction and trip of non-essential load groups in case of overload.
To be able to supervise and control the DEIF power management system from multiple locations, it is fully integrated in the vessel's alarm and monitoring system.

Ulstein

Norwegian ULSTEIN is an internationally renowned provider associated with quality and innovation in design and delivery of ship design, shipbuilding and system solutions.

Offshore platforms & rigs

Complete packages with outstanding safety & reliability



Offshore – a world of its own

DEIF's dedicated and experienced project department for offshore system solutions has a proven record of providing full customer satisfaction for complex offshore applications.

Tried and tested to meet and surpass offshore standards, DEIF's quality solutions for applications at offshore vessels and onshore/offshore rigs stand out for safety and reliability. Applying our technology incorporating fully automatic systems for stable operation, our specialists aim for record time commissioning to limit downtime and cut installation costs.

We advise customers with specifications, project-specific documentation, I/O lists, and parameter lists including check of customer's drawings.

Uniquely, applying DEIF's emulation solution technology enables you to test your design prior to delivery and installation. Minimising programming costs, we have also introduced broadcasting of application software.

Relevant controllers


DM-4 Marine


PPM 300


PPU 300


GPU 300

Also consider these products

SIM-Q


MTR-4

DQ

Redundant emergency power

Power to restart main power plant turbines after blackouts

»Reliable backup power is vital on-board platforms: restarting main power plant turbines after total blackout isn't possible without power from emergency generators.«

Esper Flodgaard
Senior Specialist
DEIF A/S

TALISMAN ENERGY

Out there – in control

Gyda's emergency power plant consists of two 1200 kW MTU gensets. The gensets are required to load-share when running in island operation, and to run in a fixed power configuration when paralleling with the four main turbine generators.

Requiring a fully redundant power management solution to replace the existing relay logic control system, the genset and control cabinets have been placed in two separate compartments and are capable of both as a single system and as two independent systems.

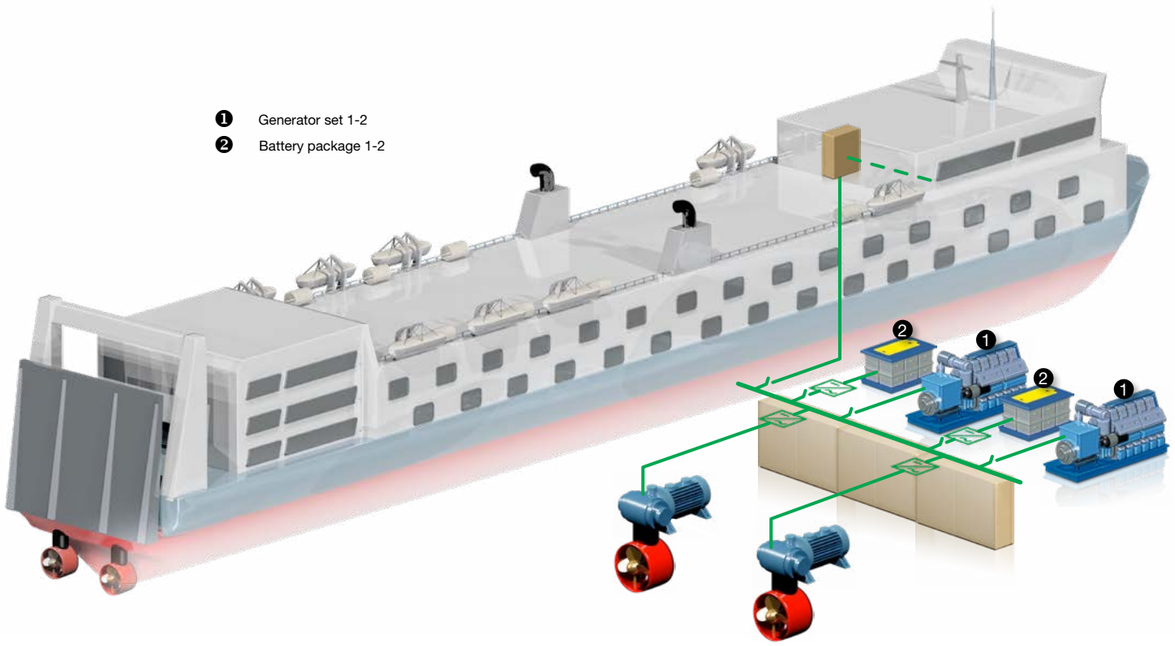
Minimising work on connected systems, DEIF reused all existing I/Os and delivered a tailored Delomatic 4 Marine solution featuring generator control, extensive engine and generator alarm and supervision, interface to SCADA, while controlling auxiliary equipment including HPU, firedamper and ventilation.

Talisman Energy Norge

Operated by Talisman Energy Norge AS, Gyda was discovered in 1980 and began production in 1990. The oil field has one conventional steel facility with production, drilling and living quarters.

Hybrid-powered vessels

Battery applications – AC bus



Prevent blackouts and reduce maintenance

Combining traditional diesel gensets with electric battery power, DEIF's integrated power control solution has the potential to reduce harmful emissions and wear and tear on your diesel generators. The charge/discharge management functionality of the solution enables for instance ferries to operate purely on batteries while recharging when in port.

In addition, energy storage in batteries optimises the entire propulsion solution since it provides smoother power for the main engines. Batteries avoid so-called transient engine loads, a major advantage for larger vessels such as cruise ships, which have a constant need for considerable amounts of energy. Batteries provide instant power in contrast to diesel gensets which can take up to half a minute to fire up. In other words, the batteries help prevent blackouts.

Features and benefits

- Blackout prevention
- Charge/discharge management
- Pure battery or diesel/battery combined
- Optimal load on fewer diesel gensets

Relevant controller

DM-4 Marine

Also consider these products

AGI 410

MIC-2 MKII

FCT

The world's largest battery-powered ship

640 batteries save 65% CO_2 onboard the ferry of the future

»We have been really, really satisfied in the way the DEIF system handles problems for us. We trust it.«

Henrik Fald Hansen
Senior Chief Engineer
M/F Tycho Brahe

Full case story

Scandlines
HELSINGØR-HELSINGBORG

Three operating modes secure daily operations

In the Oresund strait between Denmark and Sweden, the M/F Tycho Brahe is one of two ferries leading the way to tomorrow's marine transportation.Still equipped with the original diesel-powered engines, the ferry has battery containers on the top deck delivering around 4,160 kilowatt hours (kWh) of electrical power – enough to propel the ferry 2 times between harbours.

Tychoe Brahe can run on full battery, full diesel or a combined, hybrid set-up.

The DEIF system controls all power management with regard to diesel, battery and hybrid operation. It also switches among the three modes and takes care of load distribution in battery, hybrid and diesel modes.

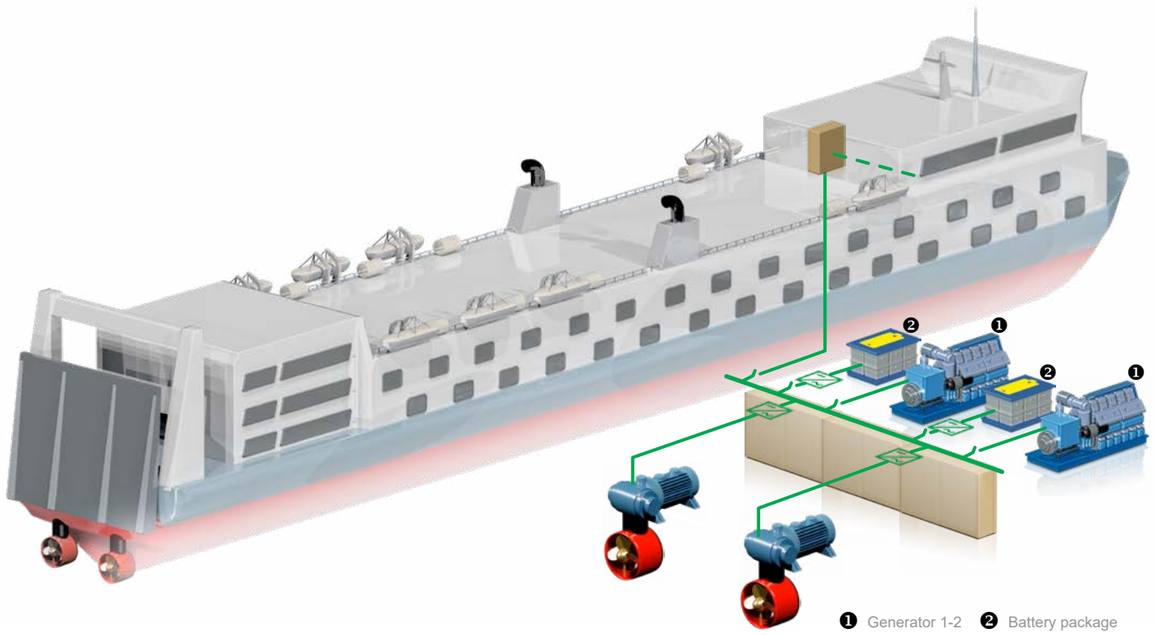
'We have four battery containers, and the DEIF system handles load distribution. If we get problems when running on batteries we have the option of switching to hybrid or diesel mode. That's also managed by the DEIF system', Senior Chief Engineer Henrik Fald Hansen ends.

HH Ferries

HH Ferries Group owns the ferry route between Helsingborg and Elsinore, which is marketed under the trademark Scandlines Helsingborg-Elsinore. Departing every 15 minutes, 5 ferries transport up to 50,000 passengers and 9,000 cars as well as 1,600 buses and trucks across Oresund on a daily basis.

Hybrid-powered vessels

Battery applications – DC bus



1 Generator 1-2 2 Battery package

Run your diesel gensets at variable speeds

Countering high fuel consumption, emissions and noise issues due to fixed engine speed in traditional electrical propulsion designs, DEIF's DC-bus solution for hybrid power supply allows you to run your diesel gensets at variable speeds. The integrated load management functionality incorporates advanced blacout prevention.

The DC-bus solution's architecture eliminates the risk of faults spreading across the electrical network resulting in network voltage and frequency disturbances.

We cooperate closely with renowned inverter manufacturers and other suppliers of equipment for marine hybrid solutions.

Features and benefits

- Variable speed control of gensets
- Thruster limitation & reduction
- Load management
- Close cooperation with renowned inverter manufacturers

Relevant controller

DM-4 Marine

Also consider these products

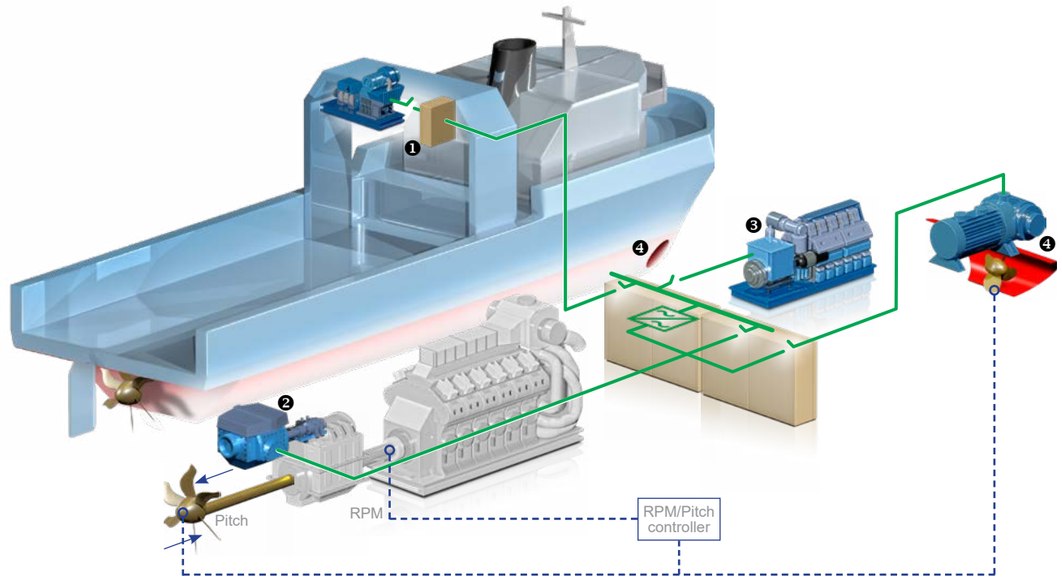
AGI 407

DQ

Shunt

Hybrid-powered vessels

Variable speed applications



1 Emergency generator 2 Shaft generator
3 Generator set 1-3 4 Tunnel thruster

Reduce engine RPM and maintain speed

The DEIF-patented DP-AIF "Dynamic Positioning Ambient Interactive Fuel-saving Concept" is adaptable to most OSVs with variable pitch propellers. The exact control method depends on power plant constellation and propulsion system.

Interacting with the DP controlling system, it will dynamically take responsive charge of the ambient conditions such as wind, tidal currents and wave movements. Both main engine and thrusters collaborate, automatically adjusting power requirements to propulsion and thrust to a minimum in order to maintain the defined position regardless of the ambient conditions. The system is an add-on to the Delomatic 4 Power Management System and is not available separately.

Fitted with DP-AIF, the Delomatic 4 power management system comprises all complex requirements for any type of vessel. You'll benefit from the simplicity in engineering, design, schematics, installation and service, all of which will reduce time consumption/costs related to commissioning, switchboard layout, installation and maintenance.

Features and benefits

- Variable pitch propellers & main engine speed
- Speed compensation for thrust demand
- Frequency converter reductions
- Complete system control designs

Relevant controller

DM-4 Marine

Also consider these products

AGI 407

MIC-2 MKII

DQ

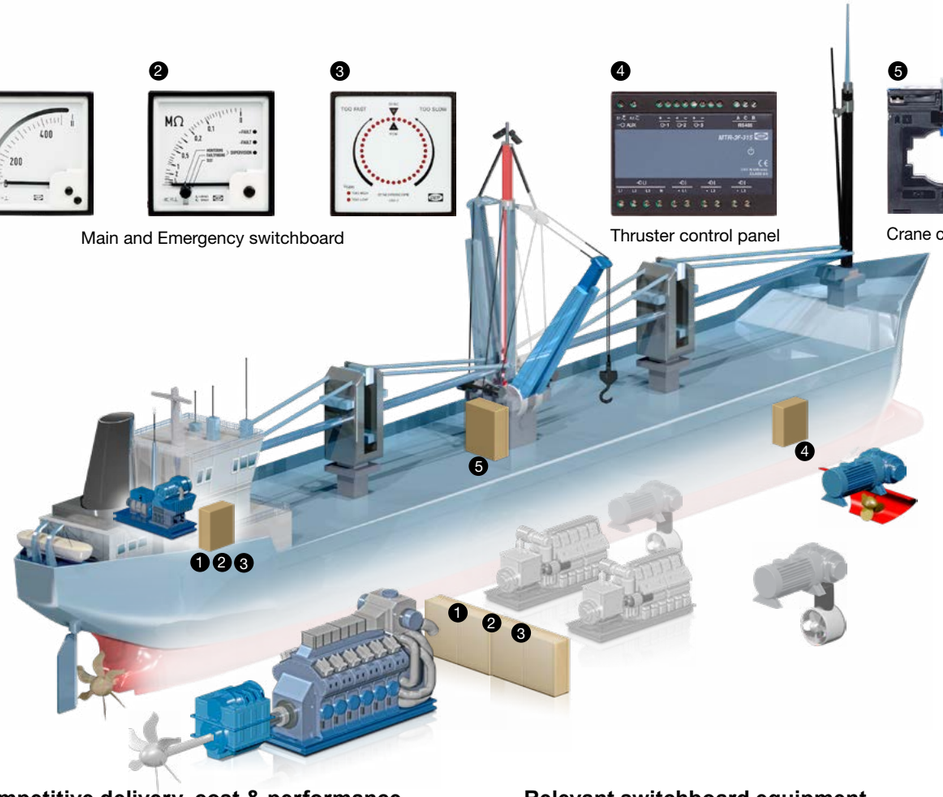
Switchboard equipment

Delivering lowest total cost of ownership

Main and Emergency switchboard

Thruster control panel

Crane control panel



Competitive delivery, cost & performance

Good logistics are crucial to maintaining competitive advantages.

We customise logo, scales and colours to customer specifications and deliver within one week, making an extra effort to ensure that our products reach their destination in record time, undamaged and ready for fast and easy commissioning and subsequent operation.

The main switchboard and a number of sub-distribution switchboards form the electrical central nervous system of the ship. Because they are critical to power supply, control and system monitoring, instrument robustness is among the most important quality parameters. Collaborating closely with classification societies, who audit our test results and methods before issuing certificates, our Type Test Lab performs measurements relevant for classification approvals and CE marking.

Relevant switchboard equipment

MTR-4

SIM-2

CSQ-3

2EQ

FAS

RMC

ASK

EPQ-2

DCP-2

Pumps made efficient & safe

Avoiding disturbances to class-approved equipment

»DEIF's insulation monitoring package supports our strategy to deliver safe, reliable & energy-efficient pump solutions that minimise the environmental footprint«

Palle Grankvist
Automation Manager
DESMI

DESMI

Green & safe pumping

Specialising in the development and installation of efficient and safe pump solutions for the global marine industry, DESMI is constantly looking to optimise their product and solutions portfolio.

Frequency converters are often applied in pump installations to increase their efficiency, slashing both fuel consumption and CO_2 emissions. An unfortunate side effect is that frequency converters can create disturbances in other class-approved equipment onboard vessels.

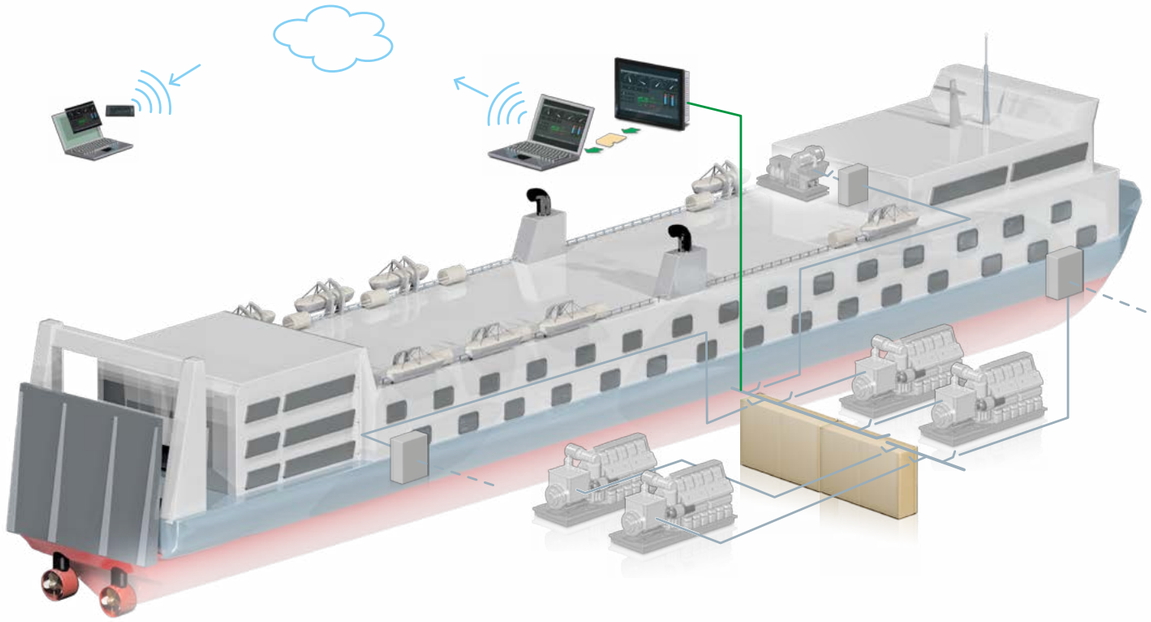
Designed specifically for installations with frequency converters generating AC voltage down to 5 Hz, DEIF's SIM-Q LF (Low Frequency) counters that issue, and it has now become the preferred choice when DESMI markets pump solutions in the marine industry.

DESMI

Founded in 1834, DESMI today stands out as a global company specialised in the development and manufacture of pump solutions for marine, industry, oil spill combating, defence & fuel and utility both locally and globally.

Ship energy monitoring system (SEMS)

Monitor and analyse energy generation and consumption



Power efficiency

DEIF's Ship Energy Monitoring System, SEMS, monitors real time and stores historical power data for analysis of energy generation and consumption. Use your insights to improve your power efficiency, save on fuel cost and reduce your environmental footprint.

Energy monitoring solution

- Preprogrammed AGI 410 touch screen
- Up to 16 power monitoring points
- Data from DEIF brand controller and/or DEIF MIC-2 power instruments
- Modbus TCP and RS-485 supported for DEIF controllers
- MIC-2 MKII using RS-485

Why choose DEIF's SEMS

- Simple solution for energy monitoring
- Plug & play
- Pre-programmed graphical views for local monitoring of energy consumption on AGI display.
- Free technical support for SEMS
- USB stick for historical data storage
- Data available on Modbus

Also consider these products

MIC-2 MKII

MIC-2 MKII DIN

AGI 410

MTR-4

KBU

FCT

Relevant controllers

PPM 300

PPU 300

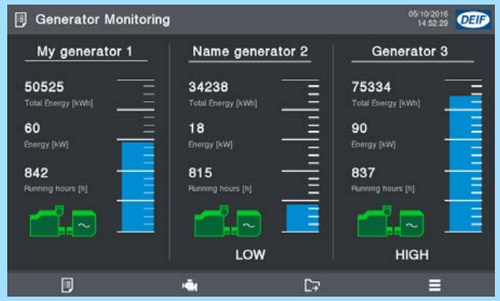
GPU 300

TORM Vita: The first of 38

The first of a fleet of 38 vessels to have DEIF SEMS installed

TORM

Display examples



Complete SEMS for 3 diesel generators

DEIF delivered complete SEMS solution with an AGI touch screen logging data and displaying all relevant data delivered by 3 DEIF multi-instruments.

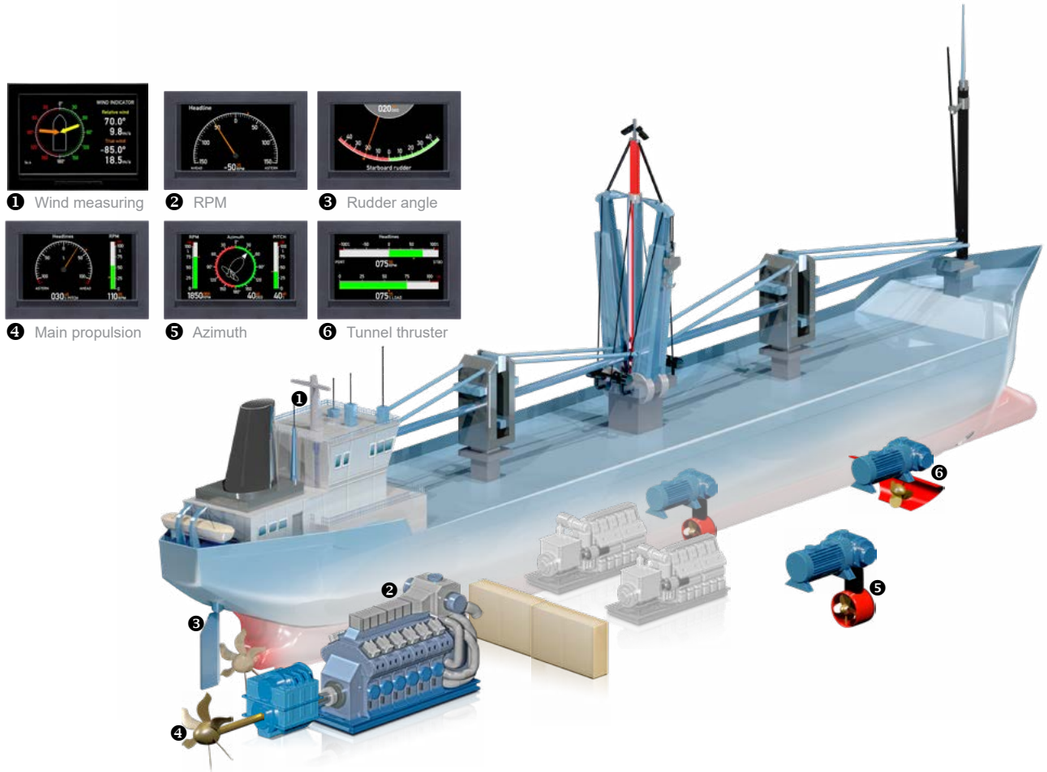
Parallel running hours reduced by approximately 10 %.

Installation & support

DEIF SEMS will be provided with a detailed installation and operation guide.
Contact DEIF Support at marinesupport@deif.com for further assistance.

Bridge instrumentation

A front-runner in marine bridge instrumentation



Game changers & customised solutions

A front-runner in marine bridge instrumentation, DEIF consistently invests in R&D and has developed a number of innovative products at our research centre and manufacturing site in Skive, Denmark. These include high-accuracy illuminated indicators based on patented microprocessor-controlled X-coil technology. Increasingly, vessels shift from using analogue indicators to CAN bus-based instrumentation. DEIF's complete range is now available with this compatibility also, just as we design and develop complete customised instrumentation system solutions.

DEIF's most recent patented illuminated indicator display series, Flexible Display Indicator, XDi, has been described as a game changer in bridge instrumentation. The XDi series replaces mechanical scales and pointers and takes indicator performance to a whole new level – without compromising DEIF's market-leading customisation standards and maintaining type approvals for all relevant applications.

Relevant bridge instruments


XDi


XL

XDi-N


WSS 500/550


WSS 750

XDi-N

Also consider these products


RTA 602


RTC 300


RTC 600

One indicator for all thruster modes

Switch between indicator modes – automatically

»The XDi has reduced the number of indicators, installation time, and simplified operation«

Johan Spruyt
R&D Engineer
ZF Marine Krimpen

Game changer cuts costs

Until recently, renowned ZF Marine Krimpen used traditional indicator technology for its retractable azimuth thruster solutions. Individually customised to each customer, this required numerous indicators for each azimuth propeller – one for each operation mode.

Reducing installation time and costs, DEIF's virtual indicator solution, the XDi, now allows ZF Marine Krimpen to automatically change the indicator scale depending on which mode the retractable azimuth thruster is in.

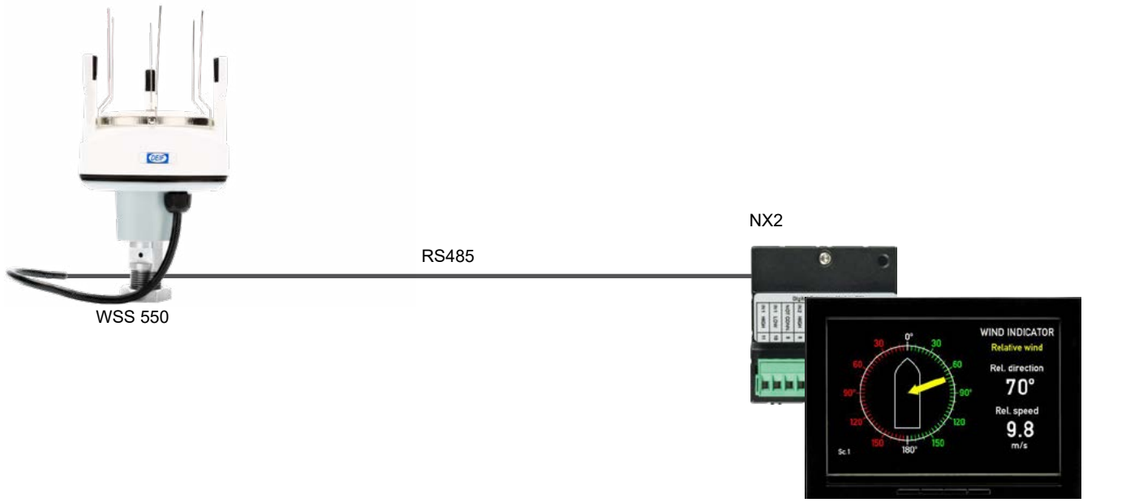
"With the XDi, we take up much less space in the bridge operator panel and also simplify daily operation since there is just one thruster indicator display regardless of operation mode", R&D Engineer Johan Spruyt from ZF Marine Krimpen states.

ZF Marine Krimpen

Formally known as HRP Thruster Systems, ZF Marine Krimpen has been active on the thruster market since 1973. The company designs and produces a wide range of steerable thrusters for all types of applications throughout the marine industry.

Bridge instrumentation

Standard relative wind indicator system



The RS485 port is used to receive NMEA data from the wind sensor

XDi 192-N w/standard wind indicator library

The ultrasonic measuring principle with no moving parts gives reliable performance without any wear-out problems and without requiring regular service.

The new WSS 550 version has a built-in heating element to prevent icing up.

WSS 500 or WSS 550 can be connected to an XDi-N wind speed and direction indicator. VDR and other ships systems can receive wind data from the RS422 NMEA output on the NX2 module mounted on the XDi-N.

An obvious alternative if you want high performance and reliability – not low-cost/high-maintenance!

Relevant bridge instruments

XDi

XL

XDi-N

Weather systems

WSS 500/550

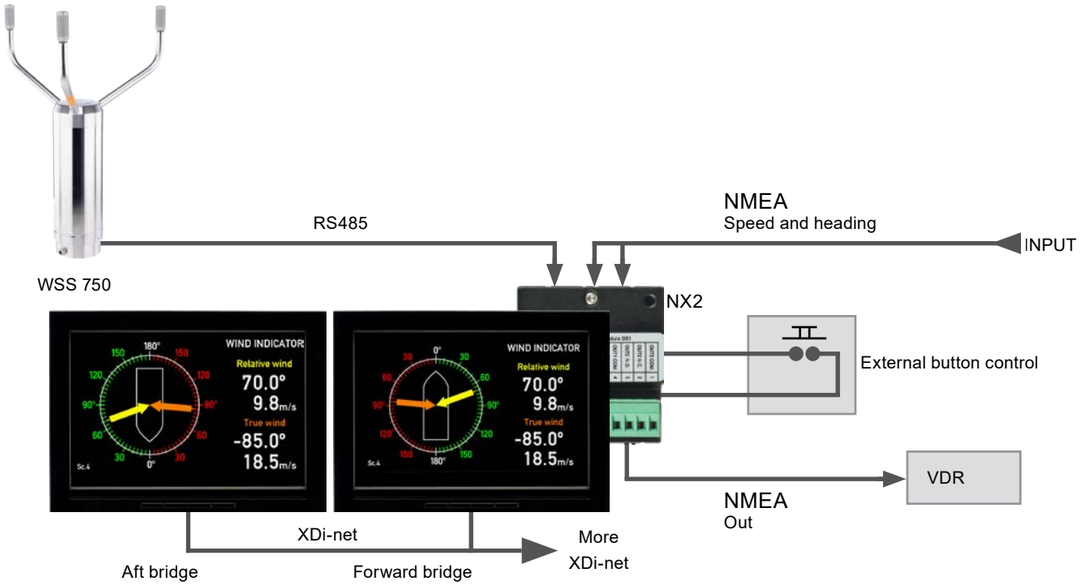
WSS 750

XDi-N

Weather transmitter

Bridge instrumentation

Advanced wind system



Two years of field testing in the North Sea and Norway's polar region have proven DEIF's WSS 750 wind sensors' reliability in providing superior wind measuring performance in all weather conditions.

The robust construction and high measuring accuracy make this sensor series the right choice for applications where precise and reliable wind data is essential to safe operation.

The WSS 750 is also highly recommended for use in dynamic positioning systems and other critical applications.

XDi-N can calculate true wind data when ship speed and heading data is available via the NMEA input.

Add one or more XDi-N wind indicators using XDi-net plug and play via CAN bus.

Relevant bridge instruments

XDi

XL

XDi-N

Weather systems

WSS 500/550

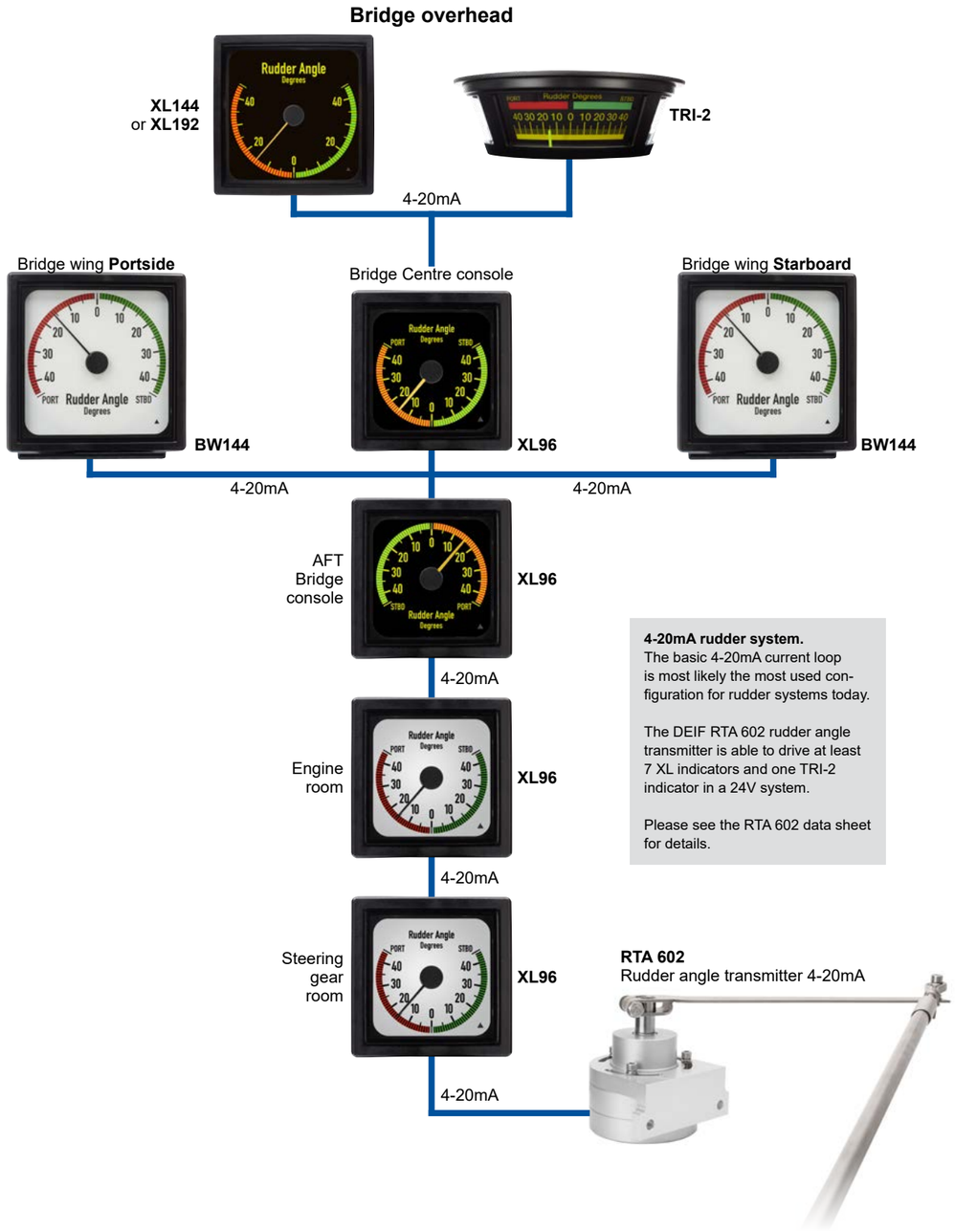
WSS 750

XDi-N

Weather transmitter

Bridge instrumentation

4-20mA rudder system



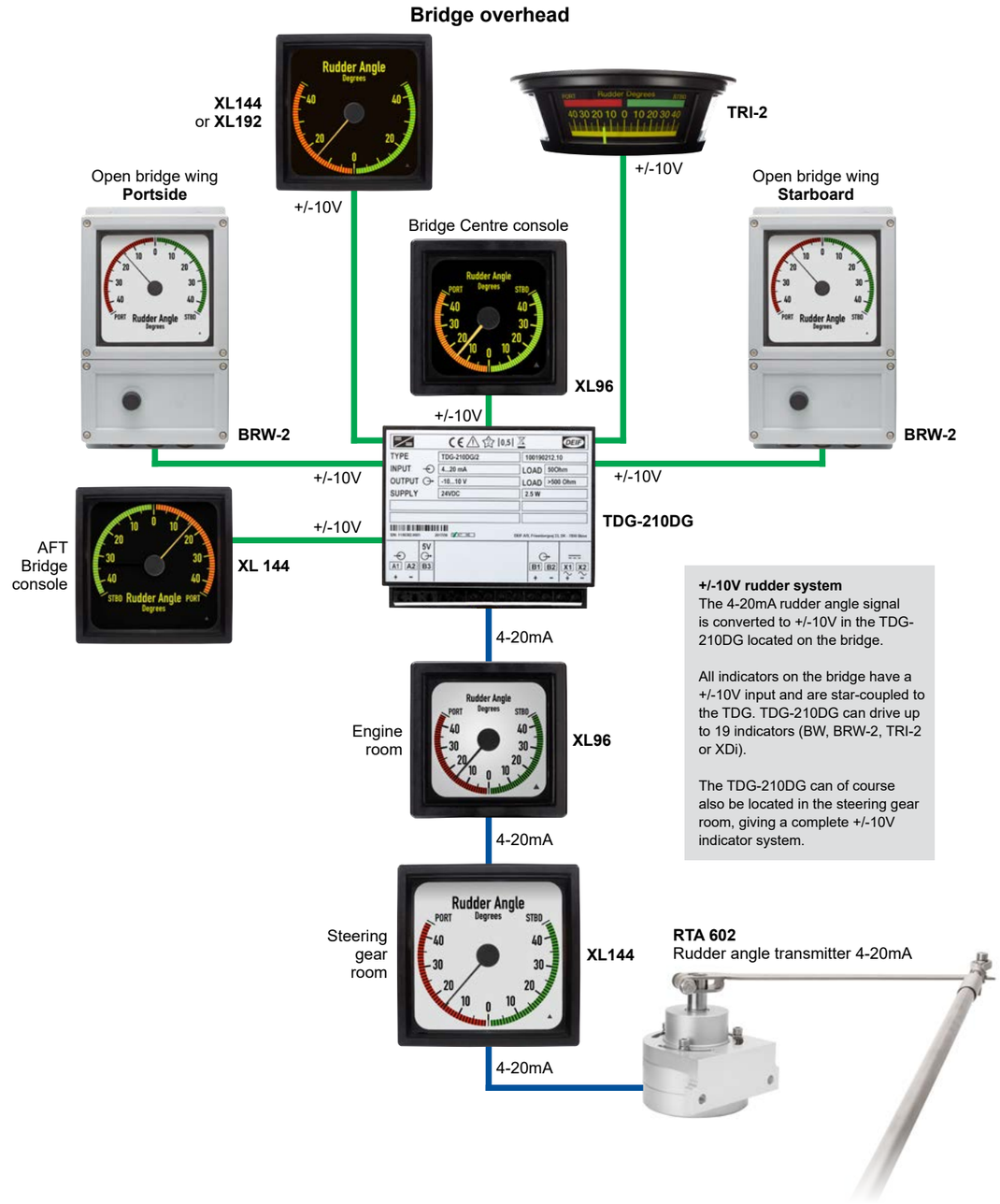
4-20mA rudder system.
The basic 4-20mA current loop is most likely the most used configuration for rudder systems today.

The DEIF RTA 602 rudder angle transmitter is able to drive at least 7 XL indicators and one TRI-2 indicator in a 24V system.

Please see the RTA 602 data sheet for details.

Bridge instrumentation

+/-10V rudder system



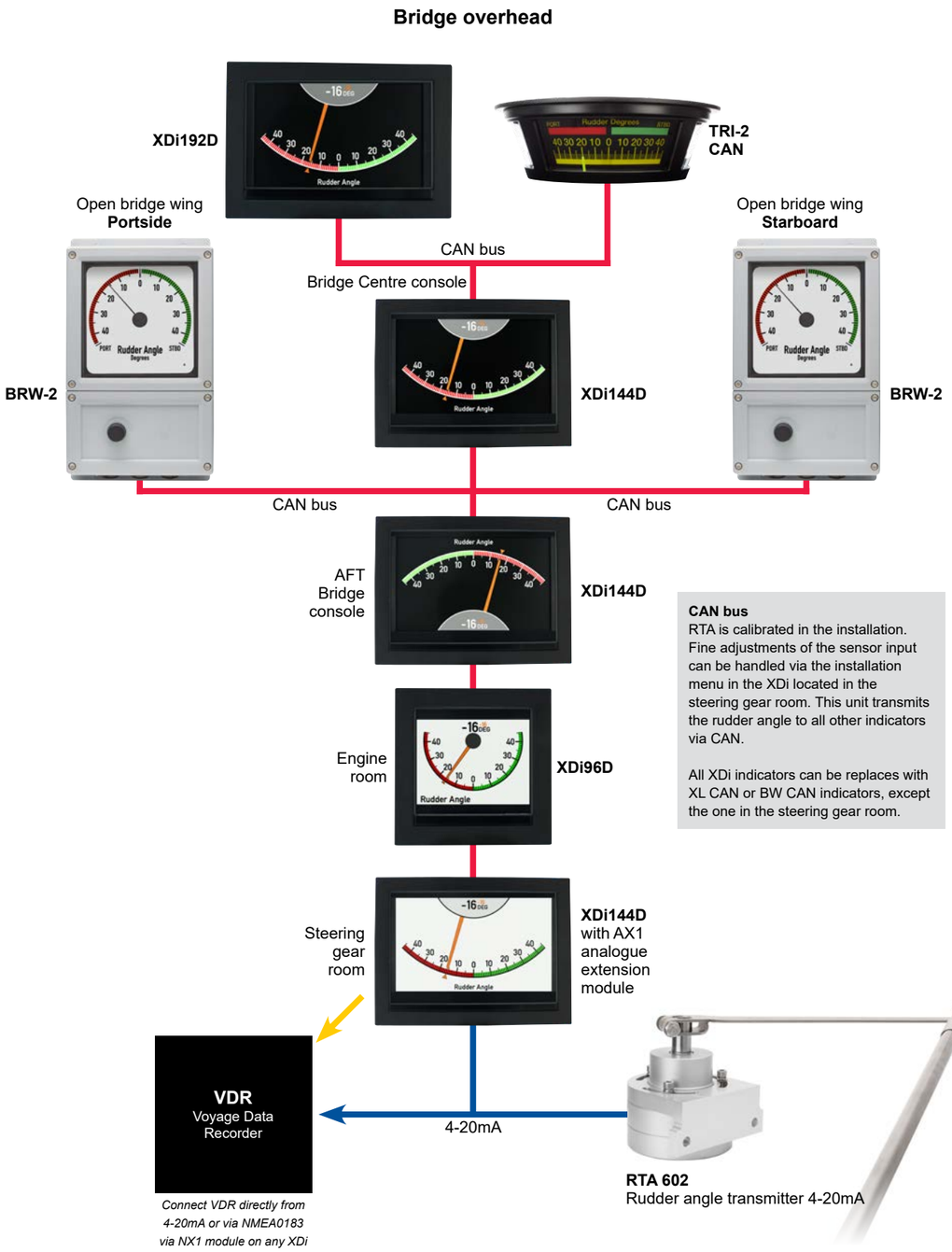
+/-10V rudder system
The 4-20mA rudder angle signal is converted to +/-10V in the TDG-210DG located on the bridge.

All indicators on the bridge have a +/-10V input and are star-coupled to the TDG. TDG-210DG can drive up to 19 indicators (BW, BRW-2, TRI-2 or XDi).

The TDG-210DG can of course also be located in the steering gear room, giving a complete +/-10V indicator system.

Bridge instrumentation

4-20mA/CANopen rudder system



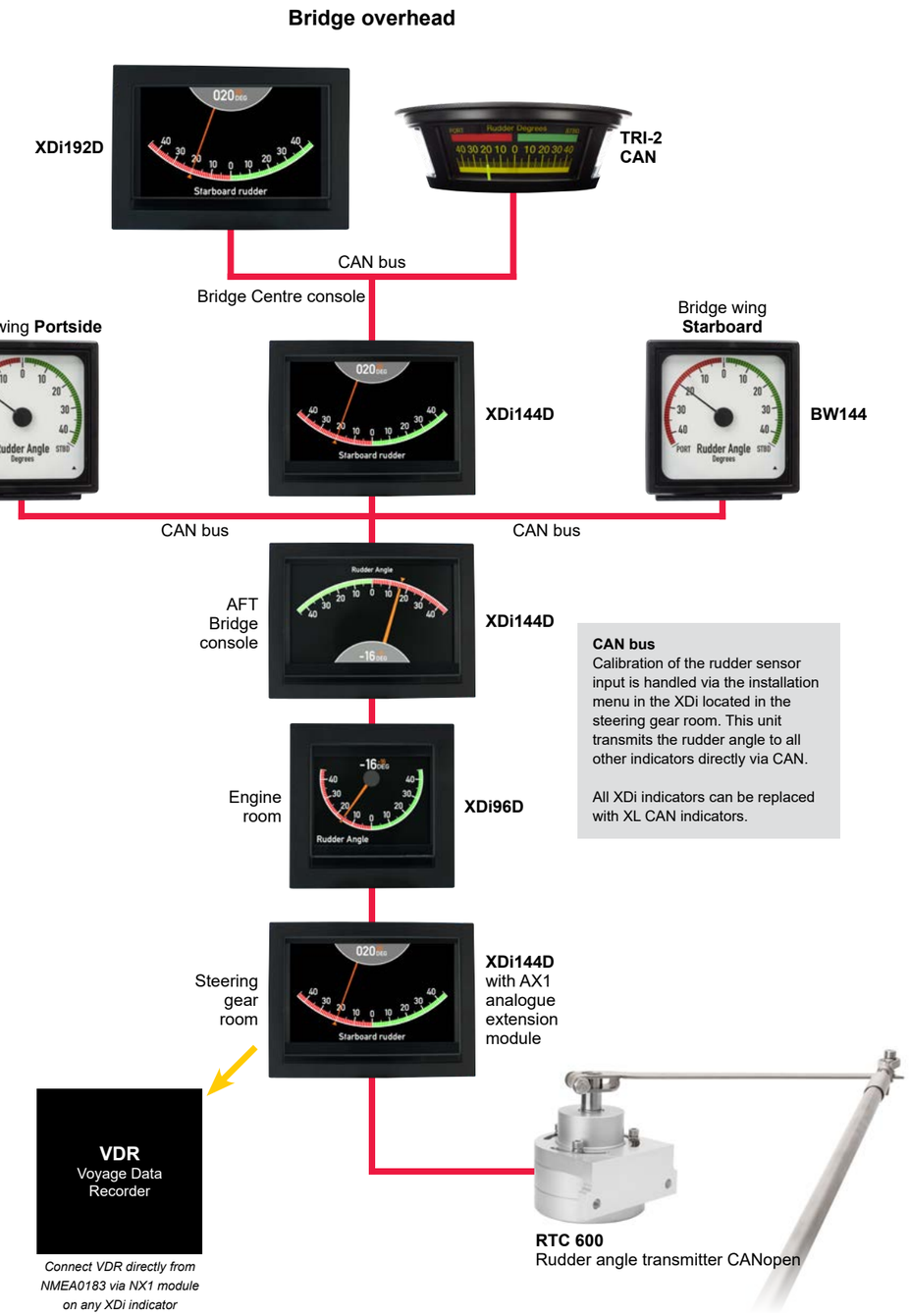
Connect VDR directly from 4-20mA or via NMEA0183 via NX1 module on any XDi indicator

CAN bus
RTA is calibrated in the installation. Fine adjustments of the sensor input can be handled via the installation menu in the XDi located in the steering gear room. This unit transmits the rudder angle to all other indicators via CAN.

All XDi indicators can be replaces with XL CAN or BW CAN indicators, except the one in the steering gear room.

Bridge instrumentation

CANopen rudder system



Connect VDR directly from NMEA0183 via NX1 module on any XDi indicator

CAN bus
Calibration of the rudder sensor input is handled via the installation menu in the XDi located in the steering gear room. This unit transmits the rudder angle to all other indicators directly via CAN.

All XDi indicators can be replaced with XL CAN indicators.

Platform & product type overviews

Intro

Leading the way in marine & offshore power control technology
DEIF Marine & Offshore's extensive product portfolio is one of the most comprehensive on the global markets for marine & offshore power control and monitoring, ranging from quality analogue relays and cost-effective single and multi-function controller platforms to engineered solutions for all types of vessels, offshore platforms and rigs. DEIF's control concepts eliminate the need for external controllers and are user-friendly alternatives to standard controllers.

Innovation has been of the heart of the remarkable success DEIF product lines have seen over the past decades, starting with the introduction of the Uni-line, single-function controller platform series in 1998. Acclaimed for its quality and reliability, DEIF's Uni-Line research led to the development of the Multi-line 2 multi-function controller, protection and power management platform, which again fostered the recent launch of the versatile and modular-based Multi-line 300 platform.

A DEIF solution is a greener choice because it means optimised operation: life extensions and other advanced technologies make our customers' assets more valuable and operationally more efficient.

Platform & product type overviews index

Multi-line 300

Platform overview

Marine power technology has changed
Anticipating user needs and responding to market demands in a changing world, DEIF is in the process of developing a ground-breaking range of advanced controller solutions that adapt to your application automatically. Named Multi-line 300, the quality controller range equals user-friendly operation and DEIF's hallmarks of green, safe and reliable performance.

Complete with built-in troubleshooting and fuel-efficient technology, Multi-line 300 is based on a versatile and modular base-mounted hardware platform developed for all levels of control solutions: from simple stand-alone engine control to complex and engineered power management systems. Using advanced processor technology, Multi-line 300 units feature redundant high speed internal communication lines capable of handling protection functions at record speeds.

The flexible units can be expanded with input and output modules, and an LED graphical colour display with intuitive one-touch sequences gives you immediate access to easy-read parameters, read-outs and service menus. Moreover, the unique and integrated emulation solution's exact reproduction of behaviour improves your planning, approvals and training.

Reducing risks of personal and equipment damage and letting you change parameters and sequences to simulate alternative setups to optimise your application, Multi-line 300's emulation feature is about giving you critical market advantages and cutting-edge, top-performing results.

GPU 300
Generator protection unit for PLC-based systems.

PPU 300
Paralleling & protection unit for PLC-based systems.

PPM 300
Protection & power management controller.

Features	GPU 300	PPU 300	PPM 300
Power management			×
Load sharing		×	×
Synchronisation & regulation		×	×
Engine control & protection		×	×
Emulation			×
Communication	×	×	×
AC measurement & protection	×	×	×
Graphical display	×	×	×
Custom logic	×	×	×
Codesys add-on		×	

Multi-line 2

Platform overview

Simplicity, reliability and safety
Our Multi-line 2 engine and genset controls have been designed for easy configuration and operation. This will reduce the need for training of your crew. But above all, updating your control system will result in improved power reliability and safety – something which is vitally important onboard ships.

As the result of dedicated and focused product development, our marine concept covers solutions ranging from standard controller units to customised power management systems (PMS). Our solutions are also ideal if you would like to optimise existing power supply controls onboard your ship. DEIF's power management controllers will for instance provide advanced load-dependent start/stop calculations during sea operation and automatic ship-to-shore connection during harbour operation.

Updating older control systems will cut your fuel costs and CO_2 emissions due to optimised genset operation. This again leads to reduced maintenance of your gensets.

All marine products from DEIF are tested above the requirements from the classification societies to ensure that they do not fail – even under the most extreme conditions.

GPU-3
Generator protection for PLC-based systems.

PPU-3
Paralleling & protection for PLC-based systems.

PPM-3
Protection & power management system.

DM-4 Marine
Customised power management solution.

Features	GPU-3	PPU-3	PPM-3	DM-4 Marine
Customised solution				×
Power management			×	×
Load sharing		×	×	×
Safety system for engine protection	×	×		×
Synchronisation	×	×	×	×
Generator & busbar protection	×	×	×	×
Engine control & protection	×	×	×	×
Serial communication	×	×	×	×
Engine communication (CANopen & CAN J1939)	×	×	×	×

Illuminated bridge indicators

Platform overview

Digital accuracy, analogue or display-based readability
DEIF's range of sturdy illuminated bridge indicators features high accuracy, meeting or exceeding international standards for optimal readability and precision.

Analogue indication: The XL series
Offering digital accurary and analogue readability, the well-proven XL series is based on DEIF's patented microprocessor-controlled X-coil technology. The range is available for panel, ceiling and bridge wing mounting with a variety of stocked standard designs. Custom designs are available on request.

Display-based indication: The XDi series
A game changer in bridge instrumentation, DEIF's patented illuminated indicator display series, XDi, offers highly accurate display-based indication. The compact, easy-to-install, versatile and user-friendly revolution in bridge instrumentation, gives you more flexibility and the ability to configure and make repairs on-site. The XDi series replaces mechanical scales and pointers with high quality displays without compromising DEIF customisation standards and maintaining approvals for all relevant applications. It is available in various sizes with dual-, multi-, wind, weather or navigation indicator libraries.

XL series
Q72, Q96, Q144 or Q192 with single-indicator display.
BW, BRW-2 bridge wing and TRI-2 panorama indicators.

XDi series
Available in various sizes with dual-, multi-, wind, weather or navigation indicator libraries.

Features	XL	XDi
CANopen interface	1 or 2	2
XDi Net		×
Analogue or Dual (COS/SIN) input	V/mA	V/mA* Selectable
Digital input e.g. RPM pickup		×*
Relay output		×*
Serial – NMEA0183 (IEC61162-1 & -2)		Input/Output*
Extention modules		AX1, DX1, NX1, NX2
Backlight dimmer	Analogue/CAN	CAN/Analogue*/Digital*/ NMEA*/Front buttons
Day/night scale	Fixed	Day/night (dusk)
Scale type	Printed scale	TFT Display
Display sizes		3.5, 5, 7"
X-coil indicator	×	
Library with multiple virtual indicators		×
Indication/readout	Fixed (needle/disc)	Selectable
Number of indications	1	1 or more
DIN Cut out	Q72, Q96, Q144, Q192	Q96, 144 × 96, 192 × 144
Outdoor bridge wing indicator	×	

* Extension module required

Power management and paralleling & operation

Product type overview

Systems

Integrated systems
Multi-function power management control system engineered to fit your specifications.

See page 73.

Controllers

Protection & power management
Control, protection and power management for simple to complex systems and applications.

See page 74-75.

Operator panels

Additional operator panel
Mounted directly in the panel front, the AOP offers alarm and lamp indications configured by you.

See page 76.

Emulation

Emulation solution
Visualising and verifying the functions of your power management system on a PC, this unit offers safe and simple testing without connection to a real genset.

See page 77.

Software

DEIF Utility Software
Configure, commission & supervise gensets & plants.

See page 78.

Paralleling & operation

Paralleling & protection unit
Paralleling & protection for PLC-based systems.

See pages 79-81.

Synchronisation & load sharing

Product type overview

Visual synchronisation

Check synchronising relay
With push-button programming of all set points.

See page 83.

Single-function syncroscope
Indication of frequency difference.

See page 84.

Phase sequence meter
Squence check.

See page 85.

Synchronisation & circuit breaker closing

Synchronisation of generators & busbars
Versatile synchronisers for both slowly reacting diesel engines and swiftly reacting gas turbines.

See page 86.

Load sharing & governor interfacing

Load sharing, paralleling & operation
Load sharing between generators and governor interfacing through electronic potentiometers.

See page 87.

Electronic potentiometers for speed governor control

Potentiometer for DIN
Converts the relay output of a PI step controller to control voltage for the speed governor/AVR.

See page 88.

Potentiometer for panel
PWM output for speed control and speed droop settings. J1939 to analogue converter.

See page 89.

Analogue instruments for manual synchronisation

Double frequency meter
90 ° pointer or reed.

See page 90.

Double AC voltmeter
Separate or joint scales available.

See page 91.

Protection

Product type overview

Controllers

Generator protection unit
Generator protection for PLC-based systems.

See pages 93-94.

Engine control unit
Basic engine control, monitoring and protection.

See page 95.

Genset control unit
Basic genset control, monitoring and protection.

See page 96.

Relays

Differential/short-circuit protection relay
All measured and calculated values displayed on display.

See page 97.

MTR-4P
Stand-alone protection and measuring unit.

See page 98.

Voltage relay
Timer-controlled tripping for under-/over-voltage with LED indication.

See page 99.

Current & short circuit relay
Timer-controlled tripping for short circuit/over-current with LED indication.

See page 100.

Frequency relay
Timer-controlled tripping for under-/over-frequency with LED indication.

See page 101.

Power protection relay
Timer-controlled tripping for under-/over-voltage with LED indication.

See page 102.

Loss of excitation relay
Timer-controlled tripping for loss of excitation/over-excitation with LED indication.

See page 103.

Loss of mains relay
Detection of vector shift and mains disconnection on mains failure with LED indication.

See page 104.

Measuring – measuring centres

Product type overview

Transducers

Multi-transducer
Up to four user-configured analogue outputs, RS-485 Modbus and USB.

See page 106.

Selectable transducer
Factory-configured input/output. Wide range of one- or three-phase measurements.

See page 107.

Multi-instruments

Panel multi-instrument
Power analyser with display and Modbus communication, optional I/O and communication interfaces.

See page 108.

DIN multi-instrument
Power analyser with Modbus communication, optional I/O and communication interfaces. No display.

See page 108.

Flexible current transfomer
Accessory for FCT multi-instruments MIC-2 MKII FCT & MIC-2 MKII FCT DIN.

See page 123.

Insulation monitoring

AC/DC insulation monitor
Ideal for applications with frequency converters (from 5 Hz).

See page 109.

DC insulation monitor
Ideal for detection of symmetrical faults.

See page 110.

AC insulation monitor
Ideal for standard AC networks.

See page 111.

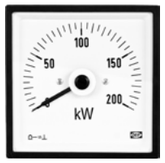
Measuring – analogue instruments

Product type overview

Meters

AC voltage or current meter
With 90 ° pointer.

See page 112.



AC or DC voltage or current meter
With 90 ° or 240 pointer °.

See page 113.

AC voltage meter with switch
4 or 6 measurements.

See page 114.

AC current meter with switch
6 measurements.

See page 115.

Power meter
For power or reactive power.

See page 116.

Combined kWh counter & power meter
90 ° or 240 ° pointer or double counter. Pulse output.

See page 117.

Frequency meter
90 ° pointer or reed.

See page 118.

Power factor meter
Measurement of cos phi.

See page 119.

Bi-metallic AC current meter
With max. reading pointer.

See page 120.

Combined ammeter
Combined indication of AC current and bi-metallic AC current.

See page 121.

Running hours counter
For AC and DC supply.

See page 122.

Measuring – AC/DC current measurement

Product type overview

Current transformers

Flexible current transfomer
Accessory for FCT multi-instruments MIC-2 MKII FCT & MIC-2 MKII FCT DIN.

See page 123.

Measuring transformer
For busbar and/or cable
– up to 7,500 A.

See page 124.

Split core transformer
Designed for retrofit
– up to 5,000 A.

See page 125.

Protection transformer
For busbar and/or cable – up to 2,000 A.

See page 126.

Primary winding transformer
Primary current from 1 to 100 A.

See page 127.

Summation transformer
Summation of 2 to 8 transformers – 1 A or 5 A.

See page 128.

DC measurements

Shunt resistor
Provides a milivolt output. Available with base.

See page 129.

Measuring – monitoring & alarms

Product type overview

Alarm panels

Alarm panel
8 configurable inputs and 2 outputs.

See page 130.

Power supply & battery chargers

DC power supply
Input:115/230/440 V AC
Output:12/24 V DC/5 to 40 A.

See page 131.

Battery charger
With boost and alarm output. 12 or 24 V DC and 5 or 10 A output.

See page 132.

HMI touch displays

Advanced graphical interface
Fully programmable graphical touch displays in various sizes.

See pages 133.

Bridge instrumentation

Product type overview

Indicators

Flexible display indicator
Display-based illuminated bridge indicators with preinstalled designs.

See page 135.

Flexible navigation indicator
Selection of standard or customised navigation indicators.

See page 136.

Illuminated indicator
Digital accuracy, analogue readability. Panel mounting.

See page 138.

Bridge wing indicator
Digital accuracy, analogue readability. In-/outdoor mounting.

See page 139.

Bridge wing indicator
Digital accuracy, analogue readability. Outdoor mounting.

See page 139.

Panorama rudder indicator
250 ° reading of rudder position. Analogue or CAN input.

See page 140.

Wind measuring

Wind sensor
Superior performance wind sensors. No moving parts; no wear.

See pages 143-144.

Wind display
Indicates relative and true wind speed and direction.

See page 142.

Transmitters

Rudder angle transmitter
No touch magnetic angle detection technology. Analogue or CANopen.

See page 141.

Weather transmitter
Measure air pressure, temperature and humidity.

See page 145.

Power management

Intro

DEIF Marine & Offshore's award-winning and innovative power management units are some of the most comprehensive on the market today, ranging from cost-effective single and advanced multi-function controller platforms to units suitable for innovative and fully engineered Power Management System solutions. As a rule, our control concepts eliminate the need for external controllers and are user-friendly alternatives to standard controllers.

Working with DEIF, you benefit from the advantages of collaborating with one qualified supplier.

We also offer outstanding product quality, expert support engineers for standard support, consultant application engineers to check specifications, and project managers ready to assume responsibility for turnkey power management solutions.

Power management index

Integrated Systems, DM-4 Marine

Power management control system engineered to specification

DEIF's Delomatic 4 Marine is a state-of-the-art multi-function PMS control system engineered to fit your specifications.

An ideal solution for applications that require large numbers of inputs with extra logic or increased flexibility for systems with large numbers of tie breakers, Delomatic 4 Marine can also be adapted for emergency generator control.

In spite of its complexity and comprehensive functionality, the Delomatic 4 Marine system has been designed for fast and easy installation, and DEIF offers market-leading support before, during and after commissioning and factory acceptance tests (FAT).

It communicates easily with other systems and with the optional graphical user interface as well as its operators.

The Delomatic has a multitude of different functionality levels available for your specific application.

Important elements in the concept are the standard open protocols for serial interface to integrated alarm, monitoring and control systems and our long list of state-of-the-art engine communications.

Delomatic after-sales service is performed by highly experienced service technicians with training as chief engineers or the equivalent. In order to commit completely to our customers' need for optimum service, we have regional service centres in Singapore, China, India and Europe to support our headquarter functions in Denmark.

DM-4 Marine features

- Internal system supervision
- Engine control, monitoring and protection
- 3-phase generator protections
- Automatic synchronisation
- Load sharing
- Dual ARCnet bus communication lines for redundancy
- Multiple display units and multiple Advanced Operator Panels
- Interface to the DEIF advanced graphical touch screen AGI
- 2 × Integrated RS-485 Modbus communication port
- 2 × CAN bus port for J1939 engine supervision, CANopen
- USB port for service software
- Up to 690 V AC direct AC inputs
- Alarm and event log
- Advanced load-dependent start/stop calculations
- Blackout prevention and recovery
- Priority selection
- Heavy consumer handling
- Base load function
- Trip of non essential load groups (preferential trip)
- Advanced fuel optimisation features
- One-touch auto sequences
- Dynamic positioning (DP-2) operation with closed bus tie breaker
- Fast dynamic load-share deviation protection
- Fast thruster load reduction
- Optimised load sharing
- 1 × Modbus TCP/IP
- Service software via ethernet for remote access

Protection & Power Management, PPM 300

Advanced processor technology & high-speed internal communication

Designed for applications in the marine and offshore industry, DEIF's innovative PPM 300 solution is a versatile, intelligent controller platform.

Incorporating an extensive range of control, protection and supervision functions, PPM 300 applications range from genset control and protection to engineered power management solutions developed for diesel generators (including emergency diesel generators), shaft generators, shore connections, and bus tie breakers.

PPM 300 power management systems control and monitor applications meet and maintain set power requirements and guarantee stable operation. PPM 300 power management systems also incorporate market-leading fuel optimisation technology.

In multi-master solutions, the integrated PPM 300 controllers connect and communicate as a closed circuit to eradicate single point failures: in cases of unit fall-out, the master functionality automatically moves to another host keeping the system not just operational but safe and reliable at all times.

Built as a sturdy piece of market-leading quality hardware, the PPM 300 features the latest processor technology and long-life adaptability.

Uniquely, the PPM 300's modular build supports on-site replacement of processor, communication, measurement and input-output modules with comprehensive class approvals. Changes to the unit at sea or in the field are assisted with automatic recognition functionality facilitating fast, easy and cost-saving service, repairs, and upgrades.

The controller display unit includes a 5" colour graphic screen with intuitive sequences and icons for fast readout of live data, and easy access to alarms handling and controller setup. Functionality is defined and targeted according to user permission levels.

PPM 300 features

- PMS with ring communicaiton
- One touch sequences for genset start & stop, and breaker close & open
- Automatic synchronise and deload breaker
- Fast load reduction of less than 100 ms
- Advanced heavy consumer control
- Advanced fuel optimisation feature
- Advanced blackout prevention and recovery
- Broadcast of software
- Emulation and supervision
- High resolution 5" colour graphic display with push-buttons
- Flexible and modular input/output with metal rack
- Plug & play, auto-configure I/O modules and network
- Integrated 5x RJ45 ports with auto-detected multi-function (e.g. display, PC Tool, Modbus TCP)
- All network controllers accessible through one Ethernet connection
- Context-sensitive help in the controller display unit
- Event and alarm log, with real-time clock
- Pre-defined control settings
- User-friendly logic configuration tool, based on ladder logic and function blocks with monitor operation
- Password-protected, with cutomisable permission levels
- 3 phase AC measurement up to 690 V AC directly, class 0.5
- Easy-to-use PC tool (PICUS)
- Advanced alarm handling with latch and shelve functionality
- Network storm protected

Protection & Power Management, PPM-3

Market-leading standard power management system

DEIF's PPM-3 is a market-leading Power Management System (PMS) standard suitable for a broad range of marine applications with up to 16 diesel generators, two shaft generators, two shore connections, eight bus tie breakers and two emergency/harbour generators including bus tie breaker control and the possibility of wrapped busbar applications.

The versatile and fully redundant multi-master system has been developed with fuel-efficient engine operation in view, and is an efficient and cost-effective solution with up to three powerful microprocessors.

Encompassing all necessary three-phase measuring circuits, values and alarms are displayed on a quality LCD screen.

Using a separate engine interface card as a backup shutdown unit, the PPM-3 also provides extra safety for your engine with a separate microprocessor and separate power supply.

Multiple display units and operator panels can be connected to each controller, making access to the system possible from any location on the ship. Dedicated to versatile application uses and intuitive configuration and operation installing, the redundant multi-master system is fast, easy, requiring limited space.

DEIF's programmable utility software allows for comprehensive customisation, including dedicating specific functions or logic conditions to different inputs and outputs. Applications with shaft generators, shore connections and bus tie breakers can be easily configured to the switchboard design itself. Operator-friendly one-touch sequences handle all automatic functions. Using the application tool, even complicated systems can be configured within a few minutes.

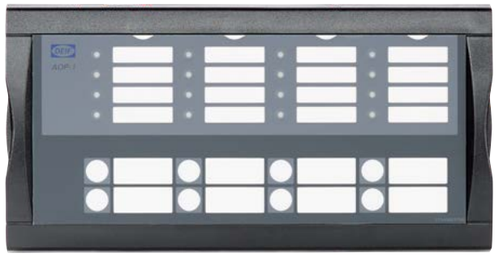
In addition, DEIF's innovative Emulation software solution allows for safe PMS testing at your desk, revolutionising the design and test of power management systems for multiple diesel gensets for instance.

PPM-3 features

- Internal system supervision
- Engine control, monitoring and protection
- 3-phase generator protections
- Automatic synchronisation and load sharing
- Internal redundant CAN bus and backup analogue load-share line
- Multiple display units and multiple Additional Operator Panels (AOPs)
- RS-485 and TCP/IP Modbus communication ports
- Interface to the DEIF advanced graphical touch screen AGI
- CAN bus port for J1939 engine supervision
- Alarm and event log, USB port for service software
- Up to 690 V AC direct AC inputs
- Advanced load-dependent start/stop calculations
- Blackout prevention and recovery
- Priority selection and base load function
- Heavy consumer handling and preferential trip
- Advanced fuel optimisation features
- One-touch auto sequences and M-Logic event builder
- Integrated emulation software solution

Additional Operator Panel, AOP

Alarm & function lamp indications configured by you



Developed for mounting directly in the panel front, the AOP is separately connected to the standard display via cable and has been developed specifically for end-users, who prefer lamp indications instead of display text messages.

The AOP makes it possible to optimise the panel perfectly for the exact application, displaying only information relevant to the operator.

In designing the AOP, customer-configuration was a direct goal on all functionality levels, and all LEDs and push-buttons can be configured separately during commissioning in close cooperation with the end-user.

All LEDs can be configured for both alarm and function indication via the PC software. The LED colour is also configurable (green, red or yellow):

- Red could be used for alarm indication
- Green could be used for “OK” indication
- Yellow could be used for status of different sequences

The push-buttons are also fully configurable and can be used for a multitude of functional purposes.

AOP features

- 16 configurable LEDs
- 3 colour LEDs
- 8 configurable push-buttons
- PC software configuration

Emulation Solution

Safe & simple system testing without connecting to real gensets

For project planning and commissioning, DEIF is the only solutions provider to offer Power Management System testing as a fast, simple and safe emulation procedure. Unlike PC-alone simulations, our patent-pending Emulation Solution uses and verifies the functions of the real system. Designed for safe testing of the entire application prior to switchboard installation, when applied with DEIF Utility Software (USW), even complex software functions can be programmed and tested and visualised on your PC or HMI in minutes.

Particularly suitable for retrofitting, the Emulation Solution lets you continue running existing applications while testing the new setup in your office, saving valuable time. This also makes it an ideal tool for demonstrations in connection with sales and for training sessions as the studies of the dynamics of the power management system can be performed without connecting to real gensets.

Improve planning, approvals and training

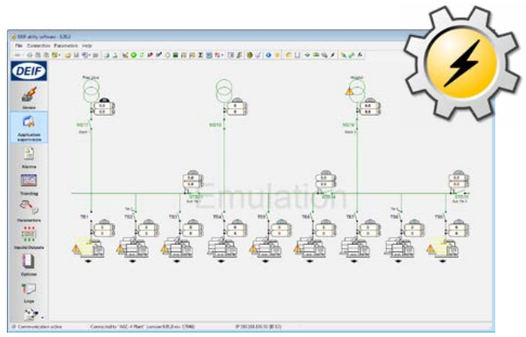
With the Emulation Solution, all you need to do to perform a complete test of your Power Management Systems is to turn on your controller and connect communications. The Emulation Solution’s focus on exact reproduction of system behaviour improves your planning, approvals and training. It is all done in a safe environment without the costly and excessive need of gensets and switchgear and without the risk of equipment damage and human injury. The innovative solution gives you a critical market advantage and guarantees your customers a cutting-edge, finished result.

Emulation Solution features

- Power management test before installation
- Customer approval of sequences before installing
- Breaker/engine/mains failure, load change and digital input signals test with only DEIF controllers, but no other external equipment
- Low voltage test environment (no AC)
- Desktop training facilities

DEIF Utility Software, USW-3

Configure, commission & supervise gensets & plants



DEIF's Utility Software v.3 (USW-3) is a unique tool for engineers, service personel and end-users to configure and supervise one or several interconnected genset controllers, available for free download from www.deif.com.

Easy to install, the general purpose software works off-the-shelf using Ethernet or USB cable communication to configure, commission and supervise both single gensets and plants of up to 256 units.

The utility tool is compatible with a range of DEIF controllers; it adjusts easily to the capabilities of the connected devices and has been designed with versatility in view.

M-Logic allows complex logic customisation with configuration and evaluation of up to 40 logic expressions, including for instance configuration of user level access, and features innovative pre-installation configuration and emulation of plant design.

Incorporating extensive functionalities including overviews of alarms, coolant temperatures, plant values, and fuel consumption, the USW-3 is also an intuitive, easy-to-use tool for end-users to operate on a day-to-day basis.

USW-3: design and commissioning

- Graphical tool for plant single line diagram
- Set controller parameters and configure advanced logic
- Configure controller I/O and external I/O equipment
- Translation of controller display texts
- AOP push-button configuration
- Controller firmware upgrade
- Security and access configuration
- Save/restore the entire plant setup to files

USW-3: monitoring/supervision

- User platform for emulation solutions
- Visualise dynamic plant and individual genset behaviour
- Display of all engine data
- Display of all electrical data
- Monitor the dynamic behaviour of measurements
- Display of fuel consumption and power production
- Emulate various external events
- Alarm monitoring

USW-3: general

- Localised to English, Russian and Chinese
- Connects over USB, RS-485 or TCP/IP to controllers

Paralleling & operation

Intro

Ideally suited for integration into PLC-based solutions
DEIF's paralleling and protection controllers have been developed for PLC applications, where the know-how of the overall application logic lies with the switchboard builder or integrator. With the right level of expertise in power management and PLC, the combination offers a highly flexible/versatile programming solution.

The units contain all necessary functions for protection and control of synchronous/asynchronous generators, including all required galvanically separated 3-phase measuring circuits.

Intended for marine-based applications, the units are designed for stand-alone and/or parallel with other generators. Particularly suited for PLC-controlled systems, they synchronise the generator and after synchronisation carry out all necessary generator control and protective functions. Interfacing can be done via digital and analogue I/Os or serial communication.

Fixed power (base load), frequency droop and load sharing regulation modes can easily be selected in the units, and the governor will be controlled accordingly.

If the automatic voltage regulator is controlled by the DEIF unit, the standard operation modes also include fixed voltage, fixed reactive power, fixed power factor, reactive load sharing and voltage droop.

Paralleling & operation index

Controllers

Paralleling & Protection Unit, PPU 300

Control & protection for PLC-based power management systems

The PPU 300 Paralleling and Protection Unit is a highly configurable controller designed for marine use. The controller contains the functions required to protect and control a generator and its breaker (specifically, a diesel generator, a shaft generator, a shore connection, or a bus tie breaker). You can connect up to 12 controllers to create one system, with load sharing sections.

Typically, a PLC or operator will send commands to the PPU 300 to close or open the breaker. For a diesel generator, the PLC or operator can also send commands to start or stop the generator, change the regulation mode, and change the regulation set points.

The controller display unit can have push-buttons for the operator to change the controller mode, close and open the breaker, and start and stop a diesel generator. The colour graphic screen shows status and info messages.

The screen also allows fast access to live data, and alarm management. With the right authorisation, the operator can also check and/or change the IO and parameter configuration. The light indicators of the display unit show the system status.

Each controller includes processors and high-speed internal communication. This provides fast protection functions. The controller design is modular, and hardware modules may be replaced or added in the field.

PICUS is a proprietary, free PC software interface to the controllers. The designer can use PICUS to configure the inputs, outputs and parameters for a controller. PICUS also offers system supervision, and management of permissions, backups and firmware.

The PPU 300 has been prepared for CODESYS.

PPU 300 features

- All-in-one controller: genset control, monitoring and protection, breaker operation
- Load sharing with ring communication
- Automatic synchronise and deload breaker
- Application supervision
- High resolution 5" colour graphic display with push-buttons
- Flexible and modular input/output in a metal rack
- Plug & play, auto-configure I/O modules and network
- Integrated 5x RJ45 ports with auto-detected multi-function (e.g. display, PC Tool, Modbus TCP)
- All network controllers accessible through one Ethernet connection
- Context-sensitive help in the controller display unit
- Event and alarm log, with real-time clock
- Pre-defined control settings
- User-friendly logic configuration tool, based on ladder logic and function blocks with operation monitoring
- Password-protected, with customisable permission levels
- 3-phase AC measurement up to 690 V AC directly, class 0.5
- Easy-to-use PC tool (PICUS)
- Advanced alarm handling with latch and shelve functionality
- Network storm protected
- Prepared for CODESYS

Software-like PLC embedded in Multi-line 300 controllers.

Your benefits:

- Stop using external PLCs and reduce your installation costs
- Create custom power management systems
- Approved standard hardware combined with flexible CODESYS programming

NEW:

CODESYS

Paralleling & Protection Unit, PPU-3

Control & protection for PLC-based power management systems

Easy to operate and configure, DEIF's PPU-3 control and protection unit is an ideal controller for PLC-based power management systems.

Apart from generator protection and synchronisation, the PPU-3 also features regulation modes including load sharing, fixed power, fixed frequency, etc. Serial communication enables easy interfacing with PLCs, SCADA-systems and more, and the unit features all necessary three-phase measuring circuits, displaying all values and alarms on a quality LCD screen.

Turning the PPU-3 into an engine control unit featuring start/stop and protection functionalities, the optional engine interface card also has a separate power supply and an independent microprocessor.

In cases of PPU-3 processor breakdowns, the engine interface card will enter into backup mode and ensure uninterrupted engine supervision.

In cases of shutdown alarms, the engine shuts down automatically, making it a reliable solution for control and supervision of marine gensets.

Additional Operator Panels (AOP) can easily be installed and integrated for further levels of remote control, supervision and status indication. Both displays and panels feature a dimmer function for use on the ship's bridge.

With a range of additional hardware options available, as well as DEIF's Multi-Line 2 Utility Software v.3 (USW-3) with programmable logic (M-Logic), you can customise the application to suit your needs exactly: dedicate specific functions or logic conditions to different inputs and outputs and tune all sequences according to your requirements.

Free software download and upgrade at www.deif.com.

PPU-3 features

- Internal system supervision
- Engine control, monitoring and protection
- 3-phase generator protections
- Automatic synchronisation
- Load sharing
- Internal CAN bus and analogue load-share line
- Multiple display units and multiple Additional Operator Panels (AOPs)
- RS-485 and TCP/IP Modbus communication ports
- Interface to the DEIF advanced graphical touch screen AGI
- CAN bus port for J1939 engine supervision
- Alarm and event log
- USB port for service software
- Up to 690 V AC direct AC inputs
- Trip of non essential load groups (preferential trip)
- Advanced fuel optimisation features
- M-Logic event builder
- Integrated emulation software solution

Synchronisation & load sharing

Intro

The safer choice in synchronisation
It is essential to synchronise genset breakers prior to connecting to a busbar already supplied by another power source. Microprocessor-controlled, easy-to-install packages with no moving parts, DEIF's synchronisers are market-leading choices for checks of frequency, voltage, phase angle and more.

DEIF's synchronising units always calculate when to close the breaker to get the most accurate synchronisation. The close signal will be issued when phase L1 of the synchronising genset is close to the 12 o'clock position compared to the busbar which is also in 12 o'clock position.

In dynamic synchronisation, the synchronising genset runs at a different speed from the generator on the busbar. Typically, the synchronising genset runs with this difference, called a positive slip frequency, meaning that it runs with a higher speed than the generator on the busbar. The objective is to avoid a reverse power trip following the synchronisation.

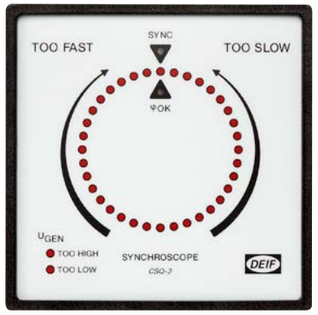
In these cases, it is possible to synchronise relatively fast because of the adjusted minimum and maximum slip frequencies: even while the unit is aiming to control the frequency towards its set point, synchronising can still occur as long as the frequency is within the limits of the slip frequency adjustments.

In static synchronisation, the synchronising genset runs at a speed close to the generator speed on the busbar. The aim is to let them run at exactly the same speed, and with the phase angles between the generator and busbar's 3-phase systems matching exactly.

Synchronisation & load sharing index

Multi-function synchroscope

Safe, simple & precise check synchronising relay



The CSQ-3 integrates synchroscope and check synchronising relay into a microprocessor-controlled, easy-to-install solution.

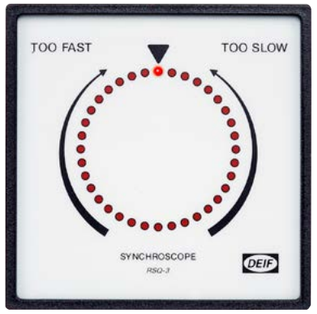
The CSQ-3 unit is operated from the front using push-buttons behind the removable front cover, protecting users from the near hazardous voltages during set point programming: an innovative DEIF feature usually seen in similar products where switchboards have to be opened to operate the synchroscope.

CSQ-3 features

- Multi-function precision LED synchroscope
- Easy push-button programming of all set points
- Very high user safety
- High immunity to harmonic distortion
- Dead-bus functionality
- Voltage measurement
- Frequency matching
- Phase angle comparison
- DIN standard size: Q96

Single-function synchroscope

Safe, simple & precise visual synchronisation



DEIF's RSQ- 3 precision LED synchroscopes are microprocessor-based synchronising units offering visual indication of relevant values for synchronising generators to net (busbar).

The units are suitable for all types of installation requiring manual synchronisation.

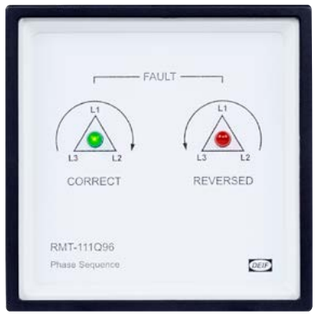
The synchroscopes are housed in a DIN standard case.

RSQ-3 features

- Precision LED synchroscope
- For indication of phase and voltage accordance
- galvanically separated ensures high immunity to harmonic distortion
- DIN standard size: Q96

Phase sequence meter

Indication of phase sequence



DEIF's phase sequence meters are applied to check and indicate correct and incorrect connection of the phases plus phase breakage of a shore connection.

A check of the phase sequence is required for connecting equipment to a new voltage source, e.g. when changing from the mains supply of a vessel to the mains at harbour.

The indicator can also be applied for alarm indication on phase breakage.

RMT-111Q96 features

- Sequence check (relay)
- 380 to 440 V AC, 45 to 65 Hz
- Continuous operation
- Clear indication of incorrect connection
- Clear indication of phase breakage
- DIN standard size: Q96

Synchronisation & circuit breaker closing

Synchronise your generator with voltage control

DEIF's synchronisers are applied for synchronisation of a generator to the busbar and closing of its circuit breaker when the voltage difference, the slip frequency and the phase angles are within the preset limits.

The synchronisers can be applied in conjunction with a wide range of prime movers, as its control pulses may be set to fit several types – from slow reacting diesel engines to fast reacting gas turbines.

General features

- Synchronisation of generator to busbar
- Circuit breaker time compensation
- Voltage control
- LED indication of status
- LED for activated control
- LED for synchronising signal
- 35 mm DIN rail or base mounting

Variants	Features
FAS-115DG	Automatic. Voltage regulation, breaker-time compensation.
FAS-113DG	Automatic. Voltage regulation, breaker-time compensation.
HAS-111DG	Semi-automatic, manual. Voltage control, sync. check

Variant overview


FAS-113DG


FAS-115DG


HAS-111DG

Load sharing, paralleling & operation

Standard load sharing

DEIF's load sharing units offer load sharing i various ways between generators and interfaces to a governor through an electronic potentiometer (EPQ96-2 or EPN-110DN).

Suitable for control of diesel and gas generators, for instance, they can control the power unit in stand-alone mode (performing frequency control) or parallel with other power units (performing frequency and power control).

The units have built-in power and frequency transducers that enable connection of external equipment. Constant power or isochronous mode is also possible. Speed control is conducted by two relays.

General features

- Built-in power and frequency transducer
- Constant power or isochronous mode
- LED indication of status
- LED indication for activated control
- 35 mm DIN rail or base mounting

Variants	Features
LSU-112DG	Frequency and power control.
LSU-113DG	Frequency and power control. With -P>.
LSU-114DG	Frequency and power control. With start/stop.
LSU-122DG	Reactive. U and Q control.

Variant overview


LSU-112DG


LSU-113DG


LSU-114DG


LSU-122DG

Electronic potentiometer for DIN

Manual or automatic control of electronic speed govenors

The potentiometer converts the relay output of a PI step controller to a control voltage for the speed governor/ AVR, including DEIF's load sharing unit type LSU, DEIF's synchronisers type FAS, or any other type of PI step controller with relay.

EPN-110DN features

- Control of electronic speed governors
- Setting of integrating time
- Adjustment of output signal
- Offset adjustment
- LED indication for activated input
- 35 mm DIN rail or base mounting

Electronic Potentiometer for panel

Manual or automatic speed governor control with J1939 CAN input

The EPQ96-2 is a digitally controlled electronic unit that replaces normal motor potentiometers for control of electronic speed governors.

The unit has both manual and auto mode options and converts the relay output from a PI controller to a control voltage/current, or PWM signal as input for the electronic speed governor. The EPQ96-2 also has a J1939 to analogue converter.

In case of supply voltage drop-outs, the potentiometer is automatically reset to adjusted pre-set values or, after reconnecting to the supply voltage, to values identical to readings prior to drop-out.

EPQ96-2 features

- Control of electronic speed governors
- Setting of integrating time (like variable gearboxes)
- Adjustment of output signal
- Offset adjustment
- Manual/auto mode
- Analogue and digital output
- Converts a J1939 CAN input to an analogue or a PWM output
- Q96 panel mounting

Double frequency meter

Highly accurate & linear read-out

DEIF's robust double frequency meters are highly accurate and compact. Offering linear read-outs, they provide visual indication of frequency for manual synchronisation of generators to net (busbar).

2FQ96 features

- Standard pointers, diagonal
- 5 to 65 Hz, 150 to 600 V AC.
- Robust and thoroughly tested construction
- Available in Q96 DIN size design
- High accuracy and linear read-out
- High immunity to 3rd harmonics

Double voltmeter

Highly accurate & linear read-out

DEIF's double voltmeters with two moving iron systems mounted in one housing. Offering linear read-outs, they provides visual indication of frequency for manual synchronisation of generators to net (busbar).

2EVQ96 features

- Dual diagonal pointers and scales
- Robust and thoroughly tested construction
- Available in Q96 DIN size design
- High accuracy
- High immunity to 3rd harmonics
- 150 to 600 V AC, 50/60 Hz

Protection

Intro

Protection is a vital process
Genset protection has been one of DEIF's core competences for decades.

We manufacture a wide tried and tested product range from simple single function protection units to advanced microprocessor-based fully automatic controllers integrating a maximum number of protection functionality as standard.

These protections are all of the definite time type, in other words after selected set point and time. For over-voltage, for instance, the timer will be activated if the set point is exceeded. If the voltage value falls below the set point value before the timer runs out, the timer will be stopped and reset. All of DEIF's units have been designed, produced and tested to surpass classification standards, whether they are stand-alone systems, backup systems or part of an integrated system.

Protection index

Controllers

Relays

Generator Protection Unit, GPU 300

Protection and synchronisation check

The GPU 300 Generator Protection Unit is designed for marine use. Each controller contains all the functions that are needed to protect electrical equipment with a breaker, for example, a diesel generator, a busbar, or a motor.

Each controller includes processor technology and high-speed internal communication to provide fast protection functions.

The controller design is modular. Processor, communication, measurement, and input/output hardware modules may be replaced or added in the field. The controller automatically recognises the new hardware modules.

The controller display unit colour graphic screen allows fast access to live data. The operator can use the screen to manage alarms. With the right authorisation, the operator can also check and/or change the I/O and parameter configuration. The light indicators of the display unit are visible over a long distance. The display processor can display all languages.

You can connect several GPU 300 controllers to create one communication network. Redundant communication between the controllers is possible.

DEIF's complimentary PICUS PC software interfaces with your controller, allowing you to configure the inputs, outputs and parameters for each controller.

GPU 300 features

- Comprehensive generator/busbar protection
- Smart synchronisation check
- Supervision
- High resolution 5" colour graphic display with push buttons
- Flexible and modular input/output with metal rack
- Plug & play, auto-configure I/O modules and network
- Integrated 5x RJ45 ports with auto-detected multi-function (e.g. display, PC Tool, Modbus TCP)
- All network controllers accessible through one Ethernet connection
- Context-sensitive help in the controller display unit
- Event and alarm log, with real-time clock
- Pre-defined control settings
- User-friendly logic configuration tool, based on ladder logic and function blocks with monitor operation
- Password-protected, with customisable permission levels
- 3 phase AC measurement, up to 690 V AC directly, class 0.5
- Easy-to-use PC tool (PICUS)
- Advanced alarm handling with latch and shelve functionality
- Network storm protected

Generator protection unit

Controller for PLC-based Power Management System

Easy to operate and configure, DEIF's Generator Protection Unit (GPU-3) is an ideal controller for PLC-based power management systems.

The GPU-3 offers comprehensive generator protection and synchronisation. Serial communication enables easy interfacing with PLCs, SCADA systems and more, and the unit features all necessary 3-phase measuring circuits and displays all values and alarms on a quality LCD screen.

Turning the GPU-3 into an engine control unit featuring start/stop and protection functionalities, the optional engine interface card also has a separate power supply and an independent microprocessor. In cases of GPU-3 processor break-downs, the engine interface card will enter into backup mode and ensure uninterrupted engine supervision. In cases of shutdown alarms, the engine shuts down automatically, making it a reliable solution for control and supervision of gensets.

With free software download and upgrade at www.deif.com, it is possible to customise the application to suit your needs exactly: dedicate specific functions or logic conditions to different inputs and outputs and tune all sequences according to your requirements.

GPU-3 features

- Generator/busbar protection
- Synchronisation
- Multiple display units and operator panels possible
- Engine protection with backup on shut-down channels
- Engine control and communication

Engine control unit

Engine control and protection

DEIF's front-mounted and compact controller platform, the Engine Control Unit, ECU 100, has been designed with performance and longevity in view and to secure reliable operation in harsh maritime environments.

Built for basic control, monitoring and protection of marine engines, the sturdy unit features protection, monitoring and control functionality with a graphic display for easy and accurate presentation of values and alarms.

ECU 100 features

- Engine start/stop
- Engine monitoring & protection
- CAN bus engine communication, J1939
- Modbus communication, RS-485
- Programmable logic, M-Logic
- Remote annunciator support, AOP-2
- Multiple language support
- Event and alarm LOG
- IP65 (with gasket)
- Integrated emulation software solution

Genset control unit

Emergency genset control

DEIF's front-mounted and compact controller platform, the Genset Control Unit, GCU 100, has been designed with performance and longevity in view and to secure reliable operation in harsh maritime environments.

Built for basic control, monitoring and protection of marine engines and gensets, the sturdy unit features protection, monitoring and control functionality with a graphic display for easy and accurate presentation of values and alarms. Moreover, it also features a three-phase AC voltage measuring circuit for generator and busbar to enable generator protection and breaker handling.

A variant with automatic black-out detection and genset start, the GCU 113 is available for emergency genset control: when power on the main busbar has been restored, the unit is able to automatically switch back to supply from main busbar and stop the emergency generator.

GCU 100 features

- Engine start/stop
- Engine monitoring & protection
- CAN bus engine communication, J1939
- Modbus communication, RS-485
- Programmable logic, M-Logic
- Remote annunciater support, AOP-2
- Multiple language support
- Event and alarm LOG
- IP65 (with gasket)
- Integrated emulation software solution

Variants	Features
GCU 111	Generator monitoring and protection.
GCU 112	Generator monitoring and protection. Breaker control
GCU 113	Generator monitoring and protection. Breaker control. Emergency genset control.

Differential protection/short-circuit protection relay

Protect your generator against internal short circuits

The MDR-2 is a state-of-the-art combined differential protection and short-circuit protection relay for generator protection against internal short circuits (leaking currents).

Even in cases of fail tripping, the MDR-2 offers an adjustable tripping characteristic function that compensates for unbalanced current measurements, avoiding fail trippings altogether.

The MDR-2 gives you direct access to all settings and a chronological log of up to 150 historical events/ alarms. The unit's integrated LCD screen displays all measured and calculated values, eliminating the need for additional meters or wiring, and facilitates fault-finding in connection with commissioning identifying fault locations.

Available options include a block (generator + step-up transformer) protection option and a short-circuit and over-current protection option.

MDR-2 features

- Short response time (70 ms)
- 3-phase current detection on both generator sides
- Active adjustment of non-balanced current measurements
- Measuring accuracy 1 %
- Display indicator for all measurements
- DIN rail or base mounting with remote mountable display

Multi-functional protection relay

Cost-effective multi-functional protection relay

Fast, simple and multi-functional, the programmable MTR-4P protection relay offers up to 13 different protection functions in six different logical categories: Voltage, current, frequency, asymmetry, load and loss of Mains (LoM). Simultaneously, the MTR-4P can be used as a dedicated measuring point reachable by communication and capable of measuring and calculating more than 50 parameters such as AC voltage, AC current, active/reactive apparent power, power factor, frequency, kWh, kvar, THD, dynamic and maximum demands.

MTR-4P is designed for use as a stand-alone protection and measuring unit or as component in large application solutions on single-phase or three-phase electrical power networks that require marine approval.

Featuring a universal power supply, the MTR-4P withstands high AC voltage inputs of up to 1000 V L-L and currents of up to 20 A. The typical response time less than 50 ms, from error occurs to trip. This makes the MTR-4P flexible and easy to install in new buildings, as replacement in retrofit projects, or even as a flexible spare part. Simply connect a USB 2.0 interface for fast and easy configuration of all setting parameters and outputs.

MTR-4P features

- Up to 1,000 V L-L AC voltage input
- Up to 20 A AC current input
- Accuracy class: 0.5
- Password protection
- Trip time typically below 50 ms
- Two-stage trip setting
- Start-up delay
- 13 different protection functions
- RS-485 serial Modbus communication
- Fast and simple commissioning and setup from M-set
- Universal power supply of 19 to 300 V DC/40 to 276 V AC
- Marine approval by GL/DNV

Variants	Relay output	RS-485
MTR-4P105	1	
MTR-4P205	2	
MTR-4P415	4	✖

ANSI code	Protection function	Symbol
59	Over-voltage	>U, >>U
27	Under-voltage	<U, <<U
50	Over-current	>I, >>I
50N/G	Over-current – earth	$>I_E$, $>>I_E$
87N	Over-current – differential	$>I_{diff}$, $>>I_{diff}$
81O	Over-frequency	>f, >>f
81U	Under-frequency	<f, <<f
32	Directional power	>P, >>P
32R/U	Power underrun	<P, <<P
46	Phase imbalance	$>I_{im}$, $>>I_{im}$
47	Voltage unbalance	$>U_{Un}$
78	Phase shift	> dPhi/dt
81R	ROCOF	df/dt

Voltage relay

Protect your generator, motor & transformer against under- & over-voltage

DEIF's RMV protective voltage relays are applied for generator, motor and transformer protection against adverse system voltage conditions.

The versatile unit features a number of adjustable parameters.

RMV features

- Under-voltage/over-voltage (U< + U>)
- ANSI code 27 and 59
- 3-phase measurement
- LED indication of fault condition
- Timer-controlled tripping
- LED indication for activated relay
- 35 mm DIN rail or base mounting

Variants	Features
RMV-112D ANSI code 27 and 59	Under- and over-voltage. U>: 100 to 120 %, U<: 80 to 100 %.
RMV-122D ANSI code 59	Over-voltage (double). U>: 100 to 120 %,U>: 100 to 120 %.
RMV-132D ANSI code 27	Under-voltage (double). U<: 80 to 100 %, U<: 80 to 100 %.
RMV-142D ANSI code 27 and 59	Under- and over-voltage. U>: 100 to 120 %, U<: 80 to 100 %. Single phase measurement.

Variant overview


RMV-112D


RMV-122D


RMV-132D


RMV-142D

Current and short circuit relay

Protect your generator & motor against currents & short circuits

DEIF'S RMC current protection relays are applied in cases where protection against over-current, short circuit, differential over-current or earth current protection is required (I>),(I>>),(I´>) or (iE>).

RMC features

- Short circuit, (differential) over-current and earth current protection
- ANSI code 50, 87, 50N/G and 64S
- Measurement of 3-phase currents
- LED indication of fault condition
- Timer-controlled tripping
- LED indication for activated relay
- 35 mm DIN rail or base mounting

Variants	Features
RMC-111D ANSI code 50	Short circuit. I>>: 100 to 400 %. <50 mS response time.
RMC-121D ANSI code 50	Short circuit. I>>: 100 to 400 %. 2 sets of contacts (parallel).
RMC-122D ANSI code 50	Short circuit and over-current. I>>: 100 to 400 %, I>: 50 to 150 %. Combined functionality.
RMC-131D ANSI code 87	Differential current. I´>: 100 to 400 %. 2 sets of contacts (parallel).
RMC-132D ANSI code 50	Over-current (double). I>: 50 to 150 %, I>: 50 to 150 %. Simple current load sharing.
RMC-142D ANSI code 50N/G, 64S	Earth current (double). iE>: 10 to 110 %, iE>: 2 to 20 %. Single phase measurement.

Variant overview

RMC-111D RMC-121D RMC-122D RMC-131D RMC-132D RMC-142D

Frequency relay

Protect your generator against under- & over-frequency

The digital RMF unit is part of DEIF's complete range of relays for generator protection and control.

Applied for protection against under-frequency and over-frequency by supervising the frequency (of generators) in single-phase and 3-phase networks, RMF is applicable for installations with a number of adjustable parameters.

RMF-112D features

- Combined under-frequency/over-frequency
- ANSI code 81 O/U
- For 1- and 3-phase networks
- LED indication of fault condition
- Timer-controlled tripping
- LED indication for activated relay
- 35 mm DIN rail or base mounting

Power protection relay

Protect your prime mover against overload

DEIF's power protection relays offer generator and prime mover protection against overload.

Protection against overload is crucial in setups where the prime mover is under-dimensioned in proportion to the AC generator.

The versatile units feature a number of adjustable parameters.

RMP features

- Generator and prime mover protection
- ANSI code 32
- 3-phase measurement
- LED indication of alarm condition
- Timer-controlled tripping
- LED indication for activated relay
- 35 mm DIN rail or base mounting

Variants	Features
RMP-111D ANSI code 32	Overload. P>: 25 to 125 %. 2 W 3, 3 W 3 (4).
RMP-112D ANSI code 32	Overload and reverse power. P>: 25 to 125 %, -P>: 0 to 25 %. 2 W 3, 3 W 3 (4).
RMP-121D ANSI code 32	Reverse power. -P>: 0 to 25 %. 1 W (4), 1 W 3.

Variant overview


RMP-111D


RMP-112D


RMP-121D

Loss of excitation relay

Protect generators running in parallel against under-excitation

DEIF's loss of excitation relays protect generators running in parallel with other generators from running as an induction generator due to under-excitation – particularly in cases where applying an under-voltage relay for protection is insufficient.

This can be caused by the system's remaining generators supplying sufficient reactive power to magnetise the faulty generator and maintain the terminal voltage.

The RMQ will thus protect the generator against damages caused by excessive heating due to slip frequency current flow, at the same time preventing transfer of reactive load from a faulty generator.

RMQ features

- Generator under-excitation protection
- ANSI code 40
- Single-phase measurement
- Timer-controlled tripping
- LED indication of fault/activated relay
- 35 mm DIN rail or base mounting

Variants	Features
RMQ-111D ANSI code 40	Loss of excitation. -Q>: 0 to 25 %. 1 var 3 (4).
RMQ-121D ANSI code 40	Overexcitation. Q>: 25 to 125 %. 1 var 3 (4).

Variant overview


RMQ-111D


RMQ-121D

Loss of mains relay

Protect your generator against damages due to loss of mains failure

DEIF's loss of mains relays protect generators against damage resulting from a non-synchronised reconnection to the grid after a temporary mains failure.

A mains failure will be detected, provided a disconnection at an arbitrary point of the network results in a swift change of the generator frequency (vector shift). An opening signal is then transmitted to the mains circuit breaker, and the generator will thus be protected against damages caused by an automatic reconnection to the high-voltage network.

LMR features

- Detection of vector shift
- ANSI code 78
- Mains disconnection on mains failure
- Ensures no asynchronous reconnection
- LED indication of fault condition
- LED indication for activated relay
- 35 mm DIN rail or base mounting

Variants	Features
LMR-111D ANSI code 78	Vector shift
LMR-122D ANSI code 78 and 81R	Vector shift and df/dt (ROCOF)

Variant overview

LMR-111D

LMR-122D

Measuring

Index

Multi-transducer

Cost-effective A/C measurement of more than 50 parameters

Efficient, fast and flexible, the programmable MTR-4 transducer offers the same performance as up to four standard transducers, measuring and calculating AC voltage, AC current, active/reactive apparent power, power factor, frequency, kWh, kvar, THD, dynamic and maximum demands.

Designed for use together with PLCs or analogue instruments, the MTR-4 measures, analyses and monitors single-phase or three-phase electrical power networks that require marine approval.

MTR-4 has up to four analogue outputs which can be set individually, and the response time is less than 50 ms. Output characteristics can be programmed with up to five breaking point output signals.

With configurable outputs for more than 50 parameters and a universal power supply (19-300 V DC, 40-276 V AC), it is possible to stock DEIF's transducers with future installations and reconfiguration for almost any application in view. Simply connect a USB 2.0 interface for fast and easy configuration of up to four analogue outputs.

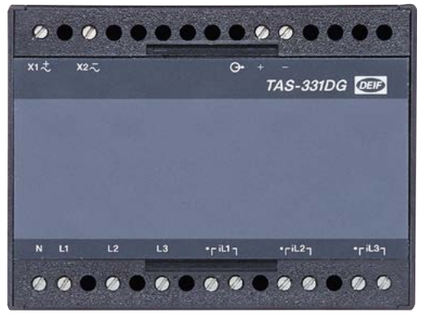
MTR-4 features

- Suitable for all 1- and 3-phase network topologies
- Up to 1,000 VL-L AC input
- Accuracy class: 0.5 or 0.3
- Up to 4 analogue outputs
- Fast response time, less than 50 ms
- Measures more than 50 parameters
- RS-485 serial Modbus communication
- Fully configurable by USB, no aux. supply required
- Universal power supply of 19 to 300 V DC/40 to 276 V AC

Variants	Analogue outputs	RS-485 Modbus
MTR-4 015	0	×
MTR-4 105	1	
MTR-4 215	2	×
MTR-4 315	3	×
MTR-4 415	4	×

Selectable transducer

Factory-configured inputs/outputs



Powerful, fast and compact, the TAS units in DEIF's transducer range measure sinusoidal alternating voltage and/or current signal and provide output signal as direct current or voltage signal proportional to measurements for PLCs, PCs, microprocessor control, indicators, alarm units etc.

TAS transducers are micro-controller-based with one analogue output for measurement of power, voltage, current etc. on an AC network. Because these transducers have no mechanical parts like potentiometers, the calibration stability is excellent.

TAS transducers can be delivered pre-configured to set measuring values and ranges or un-configured for customer configuration using DEIF's free PC tool.

TAS features

- Class 0.5 measurement
- Measuring voltage up to 690 V
- Pre-configuration or easy PC tool configuration
- Configurable up to three output slopes

Variants	Features
TAS-311DG	Factory-configured transducer for voltage, current, frequency or phase angle measurement. Aux supply: from 57 to 690 V AC. Aux supply: 24 to 220 V DC.
TAS-321DG	Factory-configured transducer for bi-directional current measurement. Aux supply: from 57 to 690 V AC. Aux supply: 24 to 220 V DC.
TAS-331DG	Factory-configured transducer for power or reactive power measurement. Aux supply: from 57 to 690 V AC. Aux supply: 24 to 220 V DC.

Variant overview


TAS-311DG


TAS-321DG


TAS-331DG

Multi-instrument for panels

Access monitoring data remotely via the internet

Versatile and intuitive, DEIF's multi-instrument MIC-2 MKII is perfectly suited for monitoring and analysis of all types of power systems.

The MIC-2 MKII helps you optimise your energy system. Capable of logging all applications from single low voltage to multiple high voltage applications, the sturdy unit offers a complete overview of your SCADA system.

A microprocessor-based measuring unit for most electrical quantities on 2-phase or 3-phase electric energy distribution networks, readings are displayed on a large built-in LCD screen.

Fitted with the ethernet TCP/IP module, the unit offers direct access to Modbus data and is easy to access remotely via standard browsers.

KWh counter reset and change of settings can be password-protected, and using DEIF's programmable utility software it is a simple and fast job to configure and adapt the unit to fit most applications.

The two FCT variants are fully compatible with DEIF's FCT flexible current transformers (up to 6,000A measuring range) which have been specifically designed to fit into panels or busbars where space is limited.

See page 124 for full product details.

MIC-2 MKII features

- Measures voltage, current/active/reactive and apparent power, frequency, energy kWh/kvarh, PF, THD, demand
- For all 2- and 3-phase AC network topologies
- Suitable for power quality analysis
- Measures individual harmonics from 2nd to 63rd
- Min./max. statistic with time stamp
- Customised alarm settings with 16 different parameters
- RS-485 Modbus communication
- Large LCD screen with white backlight
- Optional communication modules
  - Ethernet (Modbus TCP, HTTP, SMTP)
  - Profibus DP
- Optional I/O modules
- Free utility software with data logging
- Type approvals from all major classification societies

Variants	Features
MIC-2 MKII	Current input 5A
MIC-2 MKII FCT	FCT input 100mV
MIC-2 MKII DIN	Current input 5A
MIC-2 MKII FCT DIN	FCT input 100mV

I/O module	Input/Output
AXM-IO1	6 x DI, 2 x RO
AXM-IO2	4 x DI, 2 x DO, 2 x AO
AXM-IO3	4 x DI, 2 x RO, 2 x AI

Variant overview


MIC-2 MKII


MIC-2 MKII DIN


MIC-2 MKII FCT


MIC-2 MKII FCT DIN

Insulation monitor, AC/DC-networks

Insulation monitoring of your AC networks with self-test mode

DEIF's SIM-Q MKII insulation monitors supervise the insulation resistance between an insulated voltage distribution network and an earth/safety cable. The advanced measuring sequence performs an automatic offset adjustment to eliminate possible effects of uneven stray capacitance and DC voltages.

If a specific setpoint is required, the SIM-Q MKII can be ordered with a preset setpoint.

As standard, the unit will indicate the setpoint for 10 seconds every time it is powered up. With its advanced 4 second warning delay capability, the SIM-Q MKII minimises risks of false alarms.

SIM-Q MKII features

- Insulation monitoring of AC networks of up to 690 V AC
- Ideal for applications with frequency converters
- Fault-finding and self-test mode
- 10 M or 1 M ranges
- The leakage capacitance is up to 2,000 µF
- Complies with IEC 61557-8
  (Insulation monitoring devices for IT systems)

Option	Frequencies	Capacitances
LF	5 to 500 Hz	2,000 uF

Insulation monitor, DC-networks

Insulation monitoring of your DC networks

The ADL-111Q96 is used to supervise the insulation resistance between an isolated voltage distribution network and an earth/safety cable. The insulation monitor is applicable with DC networks for voltages of 24, 110 or 220 V DC. The ADL-111Q96 has a relay output with adjustable set point, and it can be configured to either NE (normally energised) or ND (normally de-energised).

The three advanced versions feature front-scale visible set point during adjustments and power-up. Moreover, they eliminate problems with activation of possible over-voltage protections due to the low injection voltage.

ADL-111Q96 features

- Advanced insulation monitoring of 24, 110 and 220 V DC networks
- Detects all types of insulation faults – including double faults
- Configurable alarm with adjustable set point

Variants	Meas. range	Capacitances
Standard:		
01 (24 V DC)	0 to 50 kΩ	≤20µF (1µF default)
02 (110 V DC)	0 to 250 kΩ	≤20µF (1µF default)
03 (220 V DC)	0 to 500 kΩ	≤20µF (1µF default)
Advanced:		
04 (24 V DC)	0 to 500 kΩ	≤120µF (1µF default)
05 (24 V DC)	0 to 1 MΩ	≤120µF (1µF default)
06 (24 V DC)	0 to 10 kΩ	≤120µF (1µF default)

Insulation monitor, AC networks

Insulation monitoring of your AC networks

The AAL-2 is used to supervise insulation resistance between an isolated AC voltage distribution network and an earth/safety cable.

The insulation monitor is applicable with single-phase and 3-phase networks with/without neutral for voltages up to 440 V AC.

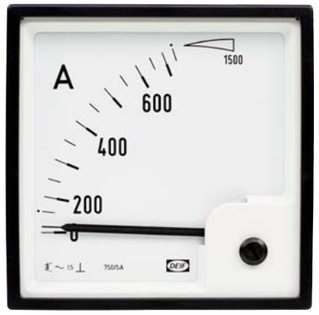
The AAL-2 has a built-in relay output and an adjustable warning set point.

AAL-2 features

- Insulation monitoring of AC networks of up to 440 V AC
- 10 M or 1 M ranges
- Adjustable warning set point
- Delay to prevent unwanted warnings

AC voltage and current with 90 ° pointer

Measure AC current & voltage in true RMS



The EQ is a versatile quadratic moving iron instrument for measuring AC currents and AC voltages within the range 16 to 65 Hz.

Measuring true RMS, the EQ instruments have been designed, produced and tested according to the present standards.

They are available in four different sizes – 48, 72, 96 and 144 mm – but can also be adapted to suit customisation requests.

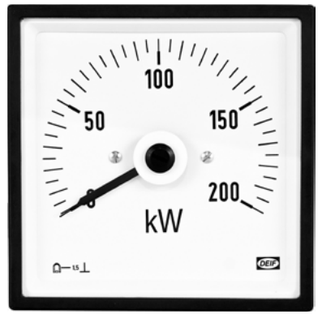
EQ features

- Accuracy class: 1.5
- 90 ° pointer deflection
- IP52 (IP54 on request)
- Customised and exchangeable scale available for 90 °
- Measuring range: 40 to 800 V (Q48: 40 to 300 V), 1 to 60 A (Q48: 1 to 40 A)

Variants	Features
EQ (V)	Voltage meter. 40 to 800 V, 16 to 65 Hz.
EQ (A)	Ammeter. 1 to 60 A, 16 to 65 Hz.

DC current and voltage with 90 ° or 240 ° pointer

Measure DC signals, voltage & current



The DQ moving coil meters from DEIF are applied to measure low power DC signals, voltage and current.

DQ features

- Measure DC signals, voltage and current
- 60 mV to 300 V DC, 1 mA to 40 A DC
- Accuracy class: 1.5
- 90 ° or 240 ° pointer deflection
- IP52 protection (IP54 on request)
- Customised and exchangeable scale available

AC voltage meter with switch

Space- & time-saving phase-to-phase voltage measuring

DEIF's voltage meters with switch have been designed to save switchboard builders space and installation time and do not require installation of a normal selector switch.

The meters measure AC phase-to-phase voltages and is available in 96 mm size only.

General features

- Accuracy class: 1.5
- 90 ° pointer deflection
- IP52 protection
- Frequency: 40 to 60 Hz
- Scale: 0 to 300 V, 0 to 500 V, 0 to 600 V, 120 V for VT – x/100 V, 132 V for VT – x/110 V

Variants	Features
EQ96-sw4	3 measurements
EQ96-sw7	6 measurements

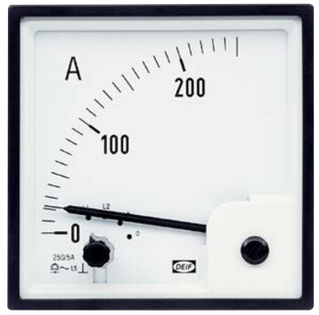
Variant overview

EQ96-sw4

EQ96-sw7

AC current meter with switch

Space- & time-saving phase-to-phase current measuring



The VDQ96-sw has been designed to save switchboard builders space and installation time and does not require installation of normal selector switch.

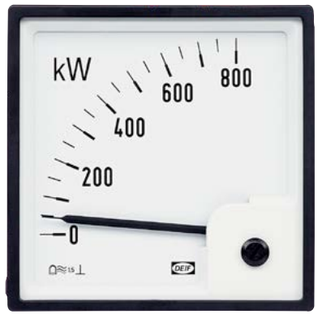
The instruments measure phase-to-phase currents and is available in 96 mm size only.

VDQ96-sw features

- Accuracy class: 1.5
- 90 ° pointer deflection
- IP52
- Customised and exchangeable scale available for 90 °
- Measuring range: 0 to 1 A, 0 to 5 A or from current transformer(s)

Power meter

Measure power or reactive power



The WQ measures power or reactive power using a moving coil movement and a built-in electronic watt or var transducer.

Measuring power in a single-phase or three-phase network, the transducer PCB converts the signal into a DC current which is then fed to the moving coil instrument.

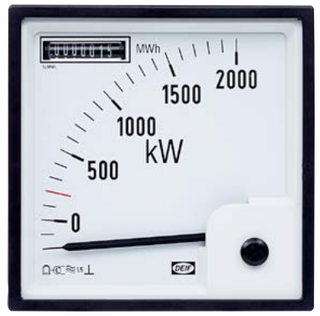
The DEIF WQ comes with a high degree of transient protection and is available in Q96 mm and Q144 mm sizes.

WQ features

- 1.5 accuracy class
- 90 ° and 240 ° pointer deflection
- IP52 protection (IP54 on request)
- Measuring voltage: 100 to 110 to 127 to 220 to 230 to 240 to 380 to 400 to 415 to 440 V AC
- Measuring range: Frequency: 45 to 65 Hz
- Measuring current: direct or from C.T.-/1 A or -/5 A
- Scale: customised and exchangeable scale available for 90 °

Combined kWh counter and power meter

Register & retain consumed or generated electrical energy



kWh counters are for registration of consumed or generated electrical energy. They are microprocessor-controlled and equipped with a 7-digit electromechanical counter which retains the reading in case of supply voltage failure.

General features

- Accuracy class 1.0 (EN 62053-21)
- For single-phase and 3-phase net-works
- Microprocessor-controlled meters with pulse output (SO)
- Simultaneous measurement of two quantities (except type WQR96 MKII)
- Scale: customised and exchangeable scale
- 60 to 400 V AC aux. power supply

Variants	Features
WQR96 MKII	1 seven-digit register (kWh or kvarh). One pulse output.
WQ2R96 MKII	2 seven-digit registers (kWh and kvarh). Two pulse outputs.
WQR96-x MKII	1 seven-digit register (kWh or kvarh) & 90 ° indication. One pulse output.
WQR96-c MKII	1 seven-digit register (kWh or kvarh) & 240 ° indication.

Variant overview

WQR96 MKII

WQ2R96 MKII

WQR96-x MKII

WQR96-C MKII

Frequency meter

Convert frequency to analogue readings

With high immunity to 3rd harmonics, DEIF's FQ frequency meters are suitable for all applications. The moving coil meters feature integrated electronics that convert frequency into analogue readings with accurate and linear readouts.

FQ general features

- Accuracy class: 0.5 and linear read-out
- High immunity to 3rd harmonics
- 90 ° movement pointer
- Robust and thoroughly tested construction
- DIN standard sizes: Q72 and Q96
- Exchangeable scale

Variant overview

FQ

FTQ

Power factor meter

Measure power factor

The PFQ power factor meter measures cos phi with a moving coil movement and an electronic transducer. The transducer measures the phase angle between an AC voltage and the corresponding AC current, converting the signal into a proportional DC current which is then fed to the moving coil instrument.

PFQ features

- Accuracy class: 1.5
- 90 ° and 240 ° pointer deflection
- Available in size Q96

Variants	Features
PFQ-x	Power factor, 90 ° movement
PFQ-c	Power factor, 240 ° movement

Variant overview

PFQ-x

PFQ-c

Bi-metallic meter

Monitor maximum current demand

Bimetallic meters (maximum demand ammeters) are specifically suitable for thermic control of cables, transformers, etc.

Due to the inertia of the system, the meter is not affected by brief current pulses.

BQ features

- 3.0 accuracy class
- 90 ° pointer deflection
- IP52 protection
- Approved by classification societies
- Scale: always 120 % of the current transformer
- Measuring range: 0 to 6 A or 0 to 1.2 A
- DIN standard sizes: Q48, Q72, Q96
- Exchangeable scale
- 4 to 15 min/max demand variant

Combined ammeter

Measure & monitor current with maximum demand indication

The BEQ meter is specifically suited for indication of thermal loads in conjunction with cables, transformers, etc.

The meter is equipped with a bimetallic system and a moving iron system, used for maximum reading and instantaneous reading respectively.

BEQ features

- 3.0 accuracy class (1.5 for moving iron)
- 90 ° pointer deflection
- IP52 protection
- Scale: always 120 % of the current transformer
- Measuring range: 0 to 6 A or 0 to 1.2 A
- DIN standard sizes: Q72, Q96
- Exchangeable scale

Running hours counter

Monitor operating time, warranty periods & maintenance intervals

DEIF's running hours counters have been designed to establish and monitor operating time, warranty period and maintenance intervals on electrically driven machines and devices, mainly in the mechanical processing industry.

The units can also be applied to central heating boilers, electrical furnaces, power drives and marine applications.

General features

- For AC or DC measuring voltage
- Synchronous motor (AC version)
- Step motor (DC version)

Variants	Features
HC 48	48 × 48 mm. IP40 or IP65. Adapter frames: 55 × 55 mm, 72 × 72 mm. For panel mounting.
HC 36/24	36 × 24 mm. For flush mounting.

Variant overview


HC 48

HC 36/24

Flexible current transformer

Accessory for MIC-2 MKII FCT's: Installs in panels or busbars where space is limited

DEIF´s FCT flexible current transformers are an accessory for DEIF's MIC-2 MKII FCT and MIC-2 MKII FCT DIN multi-instruments (*see page 108 for full product details*). The FCT's have been designed to easily fit into panels or busbars where space is limited. Installation is a simple task performed in less than five minutes.

Ideally suited for retrofit projects and DEIF's Ship Energy Monitoring System (SEMS), the FCT's come in the following three variants:

- FCT1200
  – measuring range 5A to 1200A and window size 106mm
- FCT3000
  – measuring range 12.5A to 3000A and window size 178mm
- FCT6000
  – measuring range 25A to 6000A and window size 271mm

The FCT's fit into any type of configuration, ranging from panels, wire bundles or busbars where regular solid core CT or split core CT cannot be used.

FCT features

- The flexible current transformer is designed for easy integration in a variety of applications and systems
- Ideal for power quality monitoring
- ≤ 1% Maximum measurements error (of final range value). MIC-2 MKII FCT and MIC-2 MKII FCT DIN including flexible current transformer
- Wire lead length 2 meters included
- Coil diameter 15.5mm

Variants	Meas. range	Window size
FCT1200	5A to 1200A	106 mm
FCT3000	12.5A to 3000A	178 mm
FCT6000	25A to 6000A	271 mm

Variant overview


FCT1200


FCT3000


FCT6000

Measuring transformer

Measuring transformers for cables & busbar

Part of DEIF's current transformer range, these measuring transformers convert high current into lower nominal current value, thus making it possible to use instruments and relays with standardised values of rated current.

DEIF offers 41 different physical sizes of the measuring transformers. The range is suitable for cables and several busbar combinations and positions.

In order to ensure short delivery time, we always keep transformers in stock.

General features
► Designed for cables and busbar
► Secondary current: 5 or 1 A
► Accuracy class:/protection class: 0.5 or 1.0

Variants	Features
ASR	Designed for round cables. Primary current: 40 to 600 A. Burden from 1.0 to 10 VA.
ASK	Designed for round cables and busbar. Primary current: 40 to 7,500 A. Burden from 1.0 to 30 VA.

Variant overview

ASK

ASR

Split core transformer

Cost-effective & fitted for uninterrupted power supply during installation

DEIF's split-core current transformers are cost-saving and easy-to-install units for responsible and efficient energy management solutions and for retrofitting existing installations.

Because the split-core transformers can be mounted with a click and without interrupting the power supply, installation is smooth and executed in no time.

KBU is the ideal split core transformer for retrofit projects where DEIF covers the range from 250 A to 5,000 A.

KBU features
► Primary current: 250 to 5,000 A
► Secondary current: 5 or 1 A
► Burden: 1.25 to 30 VA
► Accuracy class: 0.5 or 1.0

Protection transformer

Protection transformer for cables & busbar

Part of DEIF's current transformer range, the protection transformers are used for over-current and earth fault protection in balanced protection systems.

DEIF offers 14 different physical sizes of the protection transformers.

The housing of the transformers is made of impact-resistant thermoplastic to ensure a highly reliable quality. The terminals of the transformers are protected by a cover.

In order to ensure short delivery time, we keep an extensive programme of transformers in stock.

General features
► Designed for cables and busbar
► Secondary current: 5 or 1 A
► Accuracy class/protection class up to 10P10

Variants	Features
SASR	Designed for round cables Primary current: 100 to 300 A Class: 5P5, 5P10
SASK	Designed for round cables and busbar. Primary current: 50 to 1,600 A. Class: 5P4, 5P5, 5P10, 10P5, 10P10.

Primary winding transformer

Reduced installation costs & minimal space requirements

Primary Winding Transformer, WSK, is the perfect choice for low currents in the range 1 A to 100 A.

The housing of the transformers is made of impact-resistant thermoplastic to ensure a highly reliable quality. The terminals of the transformers are protected by a cover.

WSK features
► Primary current: 1 to 150 A
► Secondary current: 5 or 1 A
► Burden: 2.5 to 15 VA
► Accuracy class: 0.5 or 1.0

Summation transformer

Summation transformer with up to 3 inputs

Part of DEIF's current transformer range, the summation transformers summarise the secondary currents of up to 8 main current transformers to a common secondary signal.

The housing of the transformers is made of impact-resistant thermoplastic to ensure a highly reliable quality. The terminals of the transformers are protected by a cover.

In order to ensure short delivery time, we keep an extensive programme of transformers in stock.

General features
► Primary current: 1 or 5 A
► Secondary current: 5 or 1 A
► Accuracy class/protection class: 0.5 or 1.0

Variants	Features
KSU	For 2 or 3 inputs. Burden from 5 to 15 VA.
SUSK	For 3 to 8 inputs. Burden from 5 to 30 VA.

Shunt resistor

Measure DC current

Shunts provide an accurate DC milivolt signal to drive moving-coil ammeters, overload protection and control units for higher ampere range.

Shunt resistor features
► Dimensions to DIN 43703
► Class 0.5
► Extensive programme
► Standard versions in stock

Alarm panel

Configure up to 8 alarm inputs

AL8-2 features

- Compact Q96 design
- Extremely easy push-button programming
- Individual programming of each input: N/O or N/C, time delay, alarm inhibit, output and cable supervision
- Up to five units in master/slave configuration
- Clear identification of first alarm received in case of successive alarms
- Approved by classification societies

With eight digital alarm inputs, three relay outputs and many flexible features, the AL8-2 alarm panel is suitable for alarm monitoring at industrial and marine plants.

Alarm inputs: the alarm panel is provided with eight alarm inputs to facilitate external mechanical alarm contact connections. The inputs are individually programmable for N/O or N/C alarm contacts.

Time delay: the alarm inputs are individually programmable with a time delay to allow alarm condition registration at pre-set times within the 0.40 s range in steps of 1 s.

Alarm indicators: the AL8-2 is equipped with eight LEDs marked 1 to 8 for precise indication of alarm conditions for the individual alarm inputs. When an alarm condition occurs, the LED for the relevant input channel will flash with a red light. If more than one alarm occurs before the push-button “LAMP RESET” is activated, the first alarm LED will flash ahead of the others.

Alarm outputs: the alarm panel is provided with three relay outputs, one of which is used for connection to an audible/visual alarm.

The remaining two relay outputs are individually programmable by the user to follow certain alarm inputs.

DC power supply

Highly efficient DC supply

DCP2 features

- Automatic and electronic protection features
- Automatic restart after fault conditions
- Automatic output power derating for high ambient temperatures
- Green LED indication for aux. power connected
- Current output up to 40 A
- Adjustable output voltage
- No moving parts – no maintenance
- DIN rail-mounted

Using switch mode technology to ensure an extremely low ripple, the DCP2 is a safe choice both as a battery charger and/or a DC power supply. The DCP2 is available with 12 V or 24 V voltage and 5, 10, 20 or 40 A current output.

Furthermore, high efficiency, protections and low weight are key words in most applications.

Variants	Outputs	Aux. supplies
DCP2-1205	12 V DC, 5 A, 60 W	115/230 V AC
DCP2-1210	12 V DC, 10 A, 120 W	115/230 V AC
DCP2-2405	24 V wDC, 5 A, 120W	115/230 V AC
DCP2-2410	24 V DC, 10 A, 240 W	115/230 V AC
DCP2-2420	24 V DC, 20 A, 480 W	115/230 V AC or 3 × 400 V AC
DCP2-2440	24 V DC, 40 A, 960 W	3 × 400 V AC

Battery charger

Durable, highly efficient & compact

Tested and certified as a first grade quality unit with a robust aluminium housing and black plastic cover, the DBC-1 has a long and reliable product life and withstands years of everyday wear and tear. The DBC-1 is available with 12 V or 24 V voltage and 5 or 10 A current output.

Using switch mode technology to reduce energy waste, the unit is also vibration-resistant and features dry contact alarm relay activation in cases of fault detection, as well as boost/equalisation for extended battery lifetime, and advanced over-voltage (transient) protection.

DBC-1 features

- Automatic and electronic protection features
- Automatic restart after fault condition
- Alarm relay
- Automatic output power derating for high ambient temperatures
- LED indication of faults, boost charging and normal operation
- Boost mode
- Adjustable output voltage
- No moving parts – no maintenance

Variants	Outputs	Aux. supplies
DBC-1 1205	12 V DC, 5 A	230 V AC
DBC-1 1210	12 V DC, 10 A	230 V AC
DBC-1 2405	24 V DC, 5 A	230 V AC
DBC-1 2410	24 V DC, 10 A	230 V AC

Advanced graphical interface

Multi-touch widget HMI for system monitoring & control

A comprehensive HMI solution, DEIF's AGI 400 series connects to all DEIF Multi-line controllers, as well as third party electronics, via standard defined communication protocols, featuring functionalities which eliminate the need for other instruments, thus saving you both space and wiring.

The AGI 400 series is intended for visualisation and active control in multiple applications managed on board maritime vessels or platforms, where it provides full graphical overviews and user-friendly touch screen control with a quality display that is easily readable even at sharp angles. Monitor or control multiple setups simultaneously, or share data via Ethernet connections, effectively enabling the DEIF HMI to be used as a small SCADA system. AGI 400 supports multiple users levels, and LAN clients, ensuring user control in several levels.

Application examples

- Power management systems – control and supervision: one point management, control and supervision of multiple gensets and bus tie breakers.
- Alarm – handling and monitoring: view historical alarm data and accept active alarms.
- Ship energy monitoring system (SEMS): track your energy consumption to optimise and implement energy awareness on board your vessel.
- Graphical interface – mechanical and electrical systems: system overviews for mechanical and electrical equipment. Trend measured values to monitor operation performance or when carrying out fault-finding procedures.
- Data acquisition and storage

AGI 400 features

- State-of-the-art HMI
- Multi-touch widgets
- Advanced programming tool
- Data-logging and alarm handling
- Complimentary DEIF app templates
- Multiple remote options
- Phone/tablet compatible
- Pinch zoom
- Designed for harsh marine environments
- Available in 7", 10", 15" and 21" sizes

Variant overview


AGI 407


AGI 410


AGI 415


AGI 421

Bridge instrumentation

Intro

Technology leader
A front-runner in marine bridge instrumentation, DEIF consistently invests in R&D and has developed a number of innovative products at our research centre and manufacturing site in Skive, Denmark.

These include high-accuracy illuminated indicators based on patented microprocessor-controlled X-coil or display-based technology. Increasingly, vessels shift from using analogue indicators to CAN bus-based instrumentation. DEIF's complete range is now available with this compatibility also, just as we design and develop complete customised instrumentation system solutions.

Safety and steady performance are key criteria that apply to all DEIF products and guide our ambitious quality test programmes, research, and development goals.

Uncompromising quality
All DEIF marine products are type-tested and tried in the harshest possible conditions to ensure outstanding levels of accuracy, robustness, reliability, water-proof housing etc.

DEIF is vigilant in securing and maintaining all major international class type approvals on the market today for our product range, including the Wheel Mark of the EU Marine Equipment Directive. This also helps our clients speed up their approval process.

To this end, we collaborate closely with the classification societies who regularly audit our test and measuring results as part of the certificate-issuing processes.

Bridge instrumentation index

Flexible display indicator

The game changer in illuminated bridge instrumentation

DEIF's XDi illuminated indicator display series is a compact, easy-to-install, versatile and user-friendly revolution in bridge instrumentation.

The ultimate all-in-one solution, the XDi saves you panel space and installation time, gives you greater choice, more flexibility and the ability to configure and make repairs on-site.

With the XDi series, we have replaced mechanical scales and pointers with high quality displays, taking indicator performance to a new level without compromising DEIF customisation standards and maintaining approvals for all relevant applications.

XDi features high accuracy analogue readout (no mechanical or parallax's reading error), high precision digital readings, wide viewing angle and optimised day and night colour pallets, even a custom dusk pallet.

The XDi series comes in two different sizes with dual- or multi-indicator display libraries. You can order XDi with a DEIF standard indicator library – or you can have your own customised. Already a market-leader with record delivery times, the XDi series also enables us to ship your orders even faster.

Depending on functionality, all units are MED-certified. Approvals from major classification societies are available depending on application. DEIF has developed the XDi series cooperating closely with DNV GL.

XDi features

- TFT graphical LED 3.5, 5 or 7" display
- Multiple virtual indicator layouts selectable from library
- Standard and custom scale designs
- Displays 1 or more values
- 96, 144 or 192 DIN cutouts
- XDi-Net – a short-cut to CAN open
- Double CAN as standard
- Reduced wiring and installation
- Instant repairs on board
- Analogue and digital readout combined
- Standard day and night designs
- Dusk designs on request
- Redundant power inputs
- Optional analogue or digital input
- Optional NMEA or relay outputs
- MED and other relevant class approvals
- Optional double CAN connectors for daisy chaining
- Optional IP66 protection

Variants	No. of input values
XDi Dual	1 or 2
XDi Multi	Application-dependent

Accessories

- AX1 analogue extension module
- DX1 digital extension module
- NX1 NMEA output extension module
- NX2 NMEA I/O extension module
- Front frames
- Dimmer potentiometer kit
- Azimuth/rudder transmitters RTA 602, RTC 300 or 600
- Front frame kit with dimmer buttons

Variant overview


XDi 96 Dual


XDi 96 Multi


XDi 144 Dual


XDi 144 Multi


XDi 192 Dual


XDi 192 Multi

Flexible display indicator – navigation

Advanced navigation indicators

Offering a number of advanced functions, including direct access to the main functions using the pushbuttons on the front, the XDi Navigation version (XDi-N) is the top model of DEIF's display-based indicator range.

With the XDi-N you can implement the same design across your bridge and combine propulsion and steering indication with a number of navigation indicators. Use DEIF's standard libraries or have your own created. Utilise the two standard CAN busses and the XDi-net data sharing and system integration functions to optimise your system with centralised group control functions.

XDi-N main NMEA indicator
The XDi-N main indicator is delivered with one NX2 NMEA input/output (I/O) module that in most cases covers all the needs for NMEA I/O.

XDi-net indicator
The standard XDi-N without NMEA extension module will use data transmitted via XDi-net from a main XDi-N indicator on the CAN bus. The XDi-net plug & play protocol is built on top of CANopen and makes system integration easy and cost effective.

XDi-N navigation indicator library
DEIF offers a selection of standard navigation or wind indicator libraries. Over time, these will come to include heading, rate of turn, speed, depth, position, date/time, steering and WP info, distance, weather, etc.

NMEA data interface
NMEA data in compliance with IEC 61162-1 and IEC 61162-1 is standard for the XDi-N which supports more than 80 different data types, including dimming control.

NMEA setup features:
► Automatic NMEA input scanning and selection
► Input overview with easy access to make changes
► NMEA sentence routing from input to output
► NMEA output configuration

XDi-N features
► TFT graphical LED 3.5, 5 or 7" display
► Two CAN ports with CANopen and XDi-net
► Redundant power inputs
► XDi-Net – add multiple XDi indicators
► Up to six NMEA inputs & up to four outputs
► NMEA data offset and averaging functions
► Dimmer controllable using front/external pushbuttons, analogue, NMEA or CAN/XDi-net.
► 3 level priority data fall-back function
► True wind data calculation
► Calculate magnetic or true heading
► XDi-net group dimmer and day/night colour shift
► Toggle between up to four predefined indicator screens using the mode function
► Quick-switch between measuring units either locally or for the entire system
► Customised indicator designs available on request
► Standard day and night designs, dusk on request
► Optional analogue or digital inputs
► Optional warning and alarms/relay output
► MED and other relevant class approvals

Variants	Extension modules
XDi-N Main	NX2
XDi-net indicator	None required

Accessories
► AX1 analogue extension module
► DX1 digital extension module
► NX1 NMEA output extension module
► NX2 NMEA I/O extension module
► Front frame with or without buttons
► Dimmer potentiometer kit

Variants

Solutions customised to your requirements

Variants

XDi Dual
1 or 2 input values displayed.


XDi 96 Dual


XDi 144 Dual


XDi 192 Dual

XDi Multi
Application-dependent no. of input values displayed.


XDi 96 Multi


XDi 144 Multi


XDi 192 Multi

XDi-N
With NX2 NMEA input/output module (share on XDi-net).


XDi 96 N


XDi 144 N


XDi 192 N

XDi Dual / Multi versus **XDi-N**

XDi-D / M	XDi-N (platform 2)
► Analogue digital and CAN interface	► Analogue digital and CAN interface NMEA0183 interface (IEC61162-1 and IEC61162-2) Incl. data calculation Routing NMEA data from input to output
► Hidden buttons (setup only)	► 4 front pushbuttons for operation
► Presents one fixed virtual indicator from library (D, M)	► Presents either one fixed virtual indicator *or* Toogle between up to 4 screens in one virtual indicator using the pushbuttons and/or XDi-net or CAN
	► Prioritised input fall-back function (2 or 3 inputs)
	► Shift units presented on display (Unit profile shift via CAN)
	► Dimmer/Colour control via front buttons
► New option: Front frame w/4 pushbuttons for dimmer/colour control only. (Platform 2 required)	► Optional front frame without buttons

Illuminated panel indicator

Digital accuracy, analogue readability

Patented range of illuminated panel indicators designed to indicate e.g. rpm, pitch and rudder angle. These indicators are based on microprocessor-controlled X-coil technology.

XL scale designs
DEIF stocks a wide range of recommended standard scale designs, including scale designs for rpm, pitch, rudder, rate-of-turn and azimuth.

The range has been designed to meet international standards for optimal readability and precision – see www.deif.com for the current list.

DEIF can also handle customised scale designs, adding logos/text or create a new visual layout to identify your brand.

XL features

- High shock/vibration resistance (robust)
- Class 0.5 accuracy
- 360 ° deflection
- Analogue or CANopen interface
- Optional IP66 protection
- LED illumination
- DIN standard sizes: Q72, Q96, Q144 and Q192

Variant overview

XL

Outdoor bridge wing indicator

Digital accuracy, analogue readability, outdoor mounting

Patented range of illuminated bridge wing indicators for outdoor mounting based on microprocessor-controlled X-coil technology. DEIF stocks a wide range of recommended standard scale designs, including scale designs for rpm, pitch, rudder, rate-of-turn and azimuth.

The range meets international standards for optimal readability and precision – see www.deif.com for the current list. DEIF also handles customised scale designs.

BRW-2 features

- Outdoor bridge wing mounting
- Front-mounted dimmer
- High shock/vibration resistance (robust)
- Class 0.5 accuracy
- 360 ° deflection
- Analogue or CANopen interface
- IP66 protection
- LED illumination

Indoor & outdoor bridge wing indicator

Digital accuracy, analogue readability, indoor & outdoor mounting

Patented range of illuminated bridge wing indicators for indoor and outdoor mounting based on microprocessor-controlled X-coil technology. DEIF stocks a wide range of recommended standard scale designs, including scale designs for rpm, pitch, rudder, rate-of-turn and azimuth.

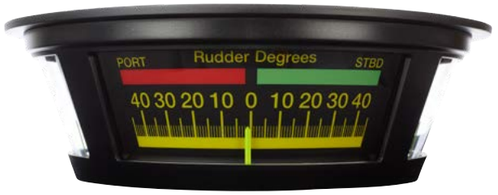
The range meets international standards for optimal readability and precision – see www.deif.com for the current list. DEIF also handles customised scale designs.

BW features

- Indoor and outdoor bridge mounting hanging or standing on pivot foot
- Rear-mounted dimmer
- High shock/vibration resistance (robust)
- Class 0.5 accuracy
- 360 ° deflection
- Analogue or CANopen interface
- IP66 protection
- LED illumination

Panorama rudder indicator

Quick & easy reading from angles up to 250 °



TRI-2 is applied for the indication of the rudder position on the bridge. The indicator consists of a robust moving coil system equipped with 3 pointers mounted on a common shaft. It is suitable if you require analogue input. For CAN input, please refer to the TRI-2 with CAN interface.

With its large scales, the TRI-2 ensures a quick and easy reading of the rudder position from any angle up to 250 ° and from a distance of up to 5 metres from the indicator. The TRI-2 is housed in a matt black case for ceiling mounting.

TRI-2 features
► 3 extra large, easy-to-read scales
► Readable from up to 5 meters
► Black or white scales
► Long-life LED illumination
► Built-in dimmer
► Analogue interface or CAN

Variants	Features
TRI-2	Analogue input
TRI-2 CAN	CAN-based input

Rudder angle transmitter

Indication of rudder, azimuth & pitch angles

DEIF's rudder/azimuth angle transmitters convert the rudder or azimuth thruster's position angles into either electrical 4-20 mA current signals or digital data values with a 16 bit resolution (+/-180de.g. = +/-32767).

Unlike potentiometers, DEIF's angle transmitters use a "no touch" magnetic angle detection technology. The technology guarantees optimal accuracy and performance and longer life for the transmitters as they have no electromechanical parts.

DEIF's rudder and azimuth systems are MED-approved for easy use and immediate class approval.

The robust mechanical design and IP67 protection make the transmitters ideal for use aboard any ship.

General features
► "No touch" magnetic angle detection – no wear & tear
► Accuracy < 0.25°
► Analogue or CAN bus output for direct connection of one or more indicators
► Angle position range from +/- 20° to +/-180°
► Continuous shaft rotation
► Clockwise/counterclockwise, zero set & max./min. adjustment

Variants	Features
RTA 602	Analogue. 2 wire 4 to 20 mA DC. Ø19mm stainless steel shaft for direct rudder connection. Available with 90° mounting bracket Directly compatible with DEIF's RT-2 rudder angle transmitter*.
RTC 300	CAN bus. Ø6mm standard axel. Available with 90° mounting bracket Mechanically compatible with DEIF's RT-2 rudder angle transmitter*.

* Not recommended for new designs

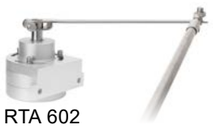
Accessories	Features
Mounting bracket	Available for RTA 602 and RTC 600
Position linkage	Available for RTA 602 and RTC 600 Length: 317 mm
Adjustable lever	Available for RTA 602 and RTC 600 Max. length: 1127 mm
TDG-210 DG	Converts 4-20mA to +/- 10 V or 0-10V

Variants & accessories


RTA 602


RTC 600


RTC 300


RTA 602
w/position linkage and lever


TDG210 DG

Flexible display indicator – wind

Flexible wind system solution in control

The XDi Navigation version (XDi-N) is the top model of the XDi series of display-based indicators. Compact, easy-to-install, versatile and user-friendly, the complete range of XDi bridge indicators takes the well-known DEIF qualities in both product performance and logistic handling to a new level.

The ultimate all-in-one solution, the XDi-N saves you panel space and installation time, gives you greater choice, more flexibility and the ability to configure and make repairs on-site.

XDi-N main wind indicator
The XDi-N main indicator is delivered with one NX2 NMEA input/output (I/O) module that in most cases covers all the needs for NMEA I/O. Adding one extra NX2 extension module on the XDi 144 N or XDi 192 N adds another set of I/O ports.

XDi-N wind repeater
The XDi-N wind repeater indicator has the same functions as the main unit, use exactly the same indicator library, but receives data via CAN bus (XDi-net), and therefore no NMEA extension module is required.

NMEA data interface
The standard input for XDi navigation indicators is NMEA data in compliance with IEC 61162-1 and IEC 61162-2. Supported NMEA data for wind indicators:

- Relative wind speed and direction
- True and geographic true wind speed and direction
- Heading, water speed, speed over ground, longitudinal speed for true/geographic wind calculations

XDi-N features

- TFT graphical LED 3.5, 5 or 7" display
- 96, 144 or 192 DIN cutouts
- Two CAN ports for easy interfacing
- XDi-Net – add multiple XDi indicators
- Redundant power inputs
- Compatible with wind sensors providing NMEA data (such as DEIF's ultrasonic wind sensors)
- Up to six NMEA compatible inputs
- Up to four NMEA outputs
- Relative, true & geographic wind indication
- Toggle between up to four predefined indicator screens
- Quick-switch between wind speed measuring units (knots, m/s or m/h, km/h, beaufort)
- Dimmer controllable using front/external push-buttons, analogue, NMEA or CAN/XDi-net
- Standard day and night designs
- Customised indicator designs available on request
- Optional analogue or digital input
- Optional wind warning and alarms/relay output
- Optional IP66 protection

Variants	Extension modules
XDi-N Main	NX2
XDi-N Repeater	None required

Accessories

- Wind sensor extension cables
- IP66 connector box kit
- IP67 connector kit (WSS 500 series)
- Dimmer potentiometer kit
- AX1 analogue extension module
- DX1 digital extension module
- NX1 NMEA output extension module
- NX2 NMEA I/O extension module
- Front frames

Wind sensor static, WSS 500/550

Ultrasonic measuring equals no wear, no tear

The ultrasonic measuring principle with no moving parts gives reliable performance without any wear-out problems and without requiring regular service.

The new WSS 550 version has a built-in heating element to prevent icing up. WSS 500 or WSS 550 can be connected to an XDi-N wind speed and direction indicator. VDR and other ships systems can receive wind data from the RS422 NMEA output on the NX2 module mounted on the XDi-N. Both versions can also be used as stand-alone sensors.

An obvious alternative if you want high performance and reliability – not low-cost/high-maintenance!

WSS 500/550 features

- Measures wind speed and direction
- IP66 housing
- Intelligent heating prevents icing up
- Working temperature down to -40 °C
- Well-proven and robust technology
- Advanced system integration with XDi-N
- Plug'n'play replacement for WSS/WSS-L
- Fully compatible with WSDI-2 indicators
- All relevant major class approvals

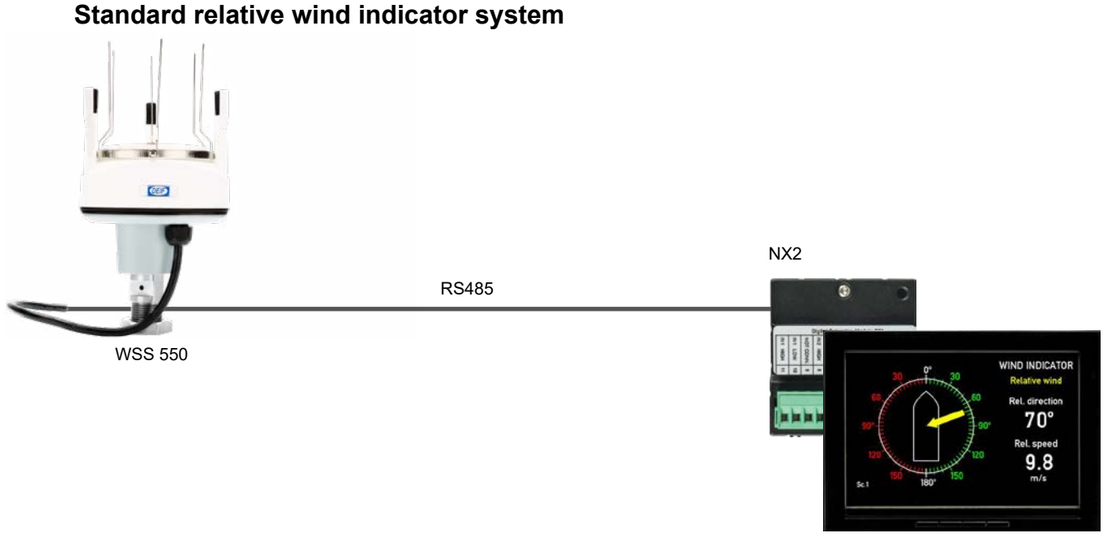
Variants	Features
WSS 550	With heating
WSS 500	Without heating

Accessories

- Extension cables (30, 40, 50 or 100 m)
- IP66 or IP67 cable extension box

Application example

Standard relative wind indicator system



The RS485 port is used to receive NMEA data from the windsensor

XDi 192-N w/standard wind indicator library

Wind sensor, WSS 750

Superior accuracy perfect for critical applications

Two years of field testing in the North Sea and Norway's polar region have proven DEIF's WSS 750 wind sensors' reliability in providing superior wind measuring performance in all weather conditions.

The robust construction and high measuring accuracy make this sensor series the right choice for applications where precise and reliable wind data is essential to safe operation.

The WSS 750 is also highly recommended for use in dynamic positioning systems and other critical applications.

WSS 750 features

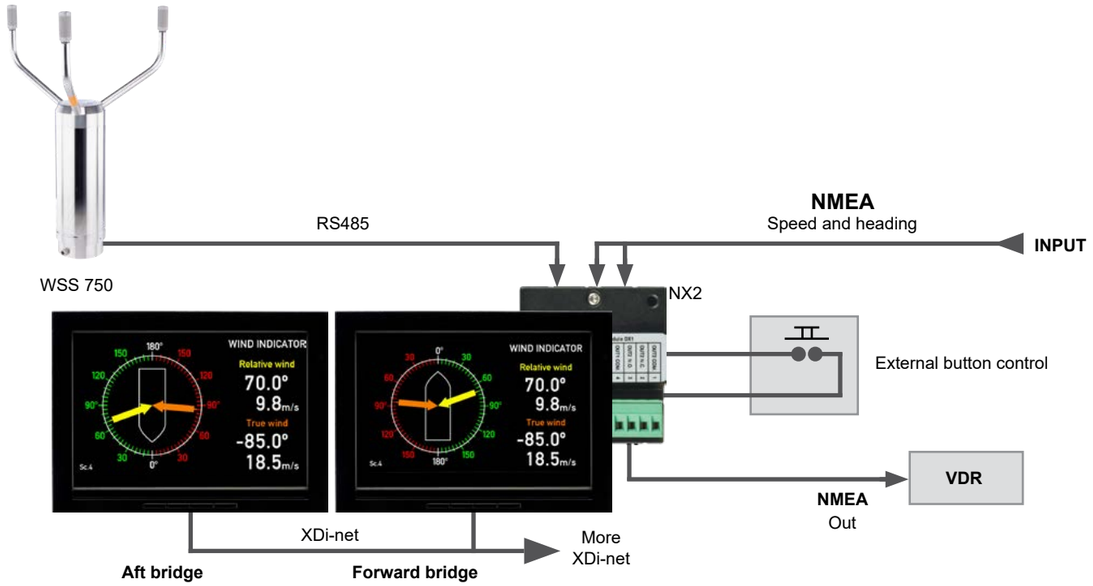
- Well-suited for dynamic positioning systems
- All stainless steel construction
- High power ultrasonic transducers in an equal-sided triangle constellation
- No moving parts; no wear
- Wind speed up to 65 m/s (120 Knot)
- Speed accuracy better than 3 % (min. +/-0.2 m/s)
- Direction accuracy better than +/- 2°
- NMEA protocol
- IP66 and IP67 fully waterproof
- Automatic power and gain control – automatic signal strength increase in case of rain or snow
- Built-in heating
- Working temperature down to -40 °C
- Advanced system integration with XDi-N
- Plug'n'play upgrade for WSS/WSS-L
- All relevant major class approvals

Accessories

- Extension cables (30, 40, 50 or 100 m)
- IP66 or IP67 cable extension box

Application example

Advanced wind system - Relative, true, geographic with NMEA output



Weather transmitter

Measure air pressure, temperature and humidity

Measuring temperature, humidity and barometric pressure, the WXT534 makes it easy to implement metrological data in small weather systems using the standard display of DEIF's XDi illuminated indicator series.

Barometric pressure, temperature and humidity measurements are combined in a PTU module using capacitive measurements to measure each parameter.

Presentation of weather data
With the standard weather library pre-installed on the XDi-N, data delivered by the WXT534 is easily presented in a simple and appealing design. When the unit is powered up for the first time, a setup guide will help you configure the XDi-N before data is presented.

WXT534 features

- Measures air pressure, temperature and humidity
- NMEA0183 output
- Easy installation, simple wiring
- Direct connectivity with XDi-N
- Barometric pressure performance:
  Observation range 600 … 1100 hpa
  Output resolution 0.1 hPa 0.1
- Air temperature performance:
  Observation range -52 … +60°C (-60 …+140 °F)
  Output resolution 0.1 °C (0.1 °F)
- Relative humidity performance:
  Observation range 0 … 10 % RH
  Output resolution 0.1 % RH

Spare parts & replacement policies

Intro

DEIF is committed to providing industry-leading products and services. Controls, equipment and instrumentation products reach the end of their product lifecycle (EOL) as changes occur in market demand, technology innovation, new product development, or simply when a product ages and is replaced by a richer technology.

DEIF understands that end-of-life programmes often encourage companies to review the way in which end-of-life activities may affect their business systems and practices. To accommodate customers' product planning strategies, DEIF has established an official "End-of-Life" Policy to help you plan for, and transition to new, more advanced product offerings.

The EOL policy described on the following pages applies to DEIF standard products. It does not apply for customer-specific products including such products that represent modifications or adaptations (hardware and/or software) of standard products to accommodate individual customer solutions. Special EOL terms may be included in individual agreements covering the supply of such products.

Spare parts and replacement policies index

Spare parts & replacement policies

Passive status & last time buy

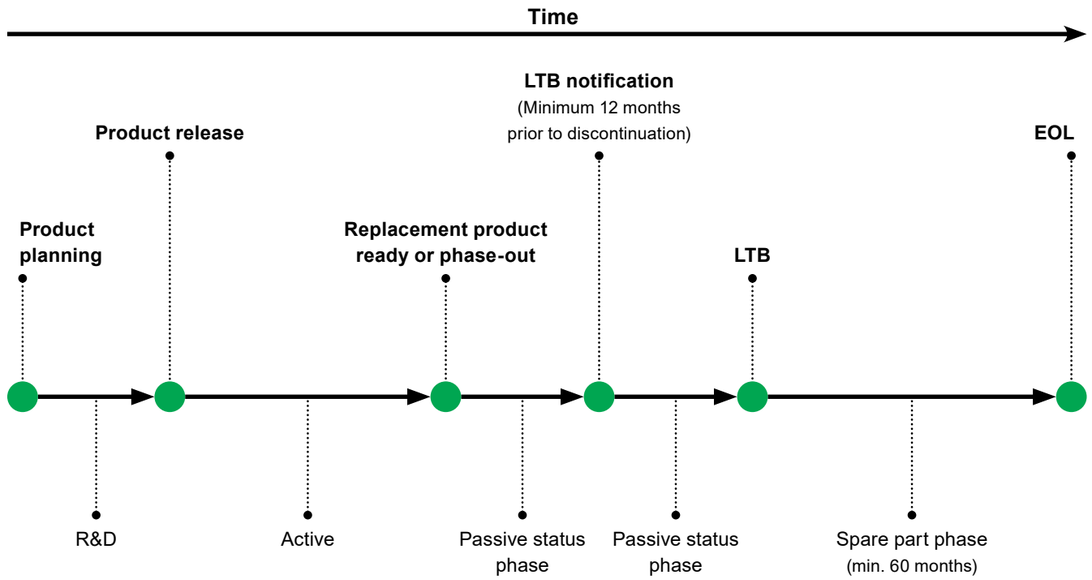
End-of-Life (EOL) policy
To accommodate our partners' product planning strategies and enable smooth switch-overs to new product lines, DEIF follows an established EOL policy. The EOL policy applies to DEIF standard genset controller products only and does not cover customised products or solutions.

Passive status phase
Passive status for standard products are announced at www.deif.com and in data sheets. The passive status phase precedes the discontinuation stages, product development is halted and we advise against further purchases recommending alternative replacement products.

Last Time Buy (LTB) notification
In connection with termination of serial manufacturing and/or stocking standard products, we endeavour to give a minimum of 12 months' notice to customers who have made a purchase of the product number in question within two previous years. Notifications will advise customers of LTB* and last shipment date**. New orders will be "Non-Cancellable/Non-Returnable (NCNR)". In connection with LTB notifications, we advise customers of compatible replacement products.

*Last Time Buy = final order date.
**Last shipment date = final delivery date.

Product life cycle



Spare parts & replacement policies

Spare part policy and replacements

DEIF follows a comprehensive spare part policy and aims to maintain stocks of critical wear & tear parts for a minimum period of 36 months following the LTB date.

Spare part phase

List prices, previous price quotations and previous lead times placed after the LTB date are no longer valid.

Purchase orders received after the LTB date are classified as spare part orders and subject to component availability and manufacturing capacity. Special lead times and price mark-ups over previous list prices apply.

Alternatively, DEIF will suggest replacement products with similar functionality at list price and under the standard terms applicable to the product in question.

Product type	Old product	Replacement product
Power management		
▸ Integrated systems (engineered)	Delomatic 3	DM-4 Marine
▸ Integrated systems (standard)	PPM-2	PPM-3
Parallel operation		
▸ Paralleling & protection unit	PPU-2	PPU-3
▸ Load sharing units	DGC-1TB	LSU-112DG & LSU-113DG
▸ Paralleling and protection unit	MGC-1	PPU-3
Synchronisation & load sharing		
▸ Check synchronising relay	CSQ-2	CSQ-3
▸ Read synchroscope	RSQ-2	RSQ-3
▸ Synchroniser	FAS-2N	FAS-113DG
▸ Synchroniser	FAS-3N	FAS-115DG
▸ Synchroniser	HAS-2N	HAS-111DG
▸ Synchroniser	FAS-2N-P	GPU-3
▸ Synchroniser	FAS-3N-P	GPU-3
Protection		
▸ Generator protection unit	GPU-2	GPU-3
▸ Multi-differential relay	MDR-1	MDR-2
▸ Generator protection unit	MGP-1	GPU-3

Spare parts & replacement policies

Replacements

Product Type	Old Product	Replacement Product
Bridge instrumentation		
▸ Wind sensor	WSS	WSS 550/WSI or WSS 750/WSI
▸ Bridge wing indicator	BRW-1	BRW-2
▸ Illuminated marine bridge instrument	DLQ	XL series
▸ Illuminated 360 ° azimuth Indicators	DLQA	XL series
▸ Watertight marine instruments with illumination	DLQW	XL series
▸ Rudder transmitter	RT-1	RTA 602
▸ Rudder angle transmitter	RT-2	RTA 602
▸ Rudder angle indicator	TRI-1	TRI-2
▸ Bridge wing indicator	VTR-5	BW
▸ Bridge wing indicator	VTR-3	BW
▸ Indicator	WSDI (879.50)	XDi-N Wind
▸ Indicator	WSDI (879.521)	XDi-N Wind
▸ Indicator	WSDI-2	XDi-N Wind
Switchboard equipment		
▸ Electronic potentiometers	EPQ96	EPQ96-2
▸ Insulation monitoring	DIM-Q	SIM-2
▸ Running hours counter	HCQ48	HC 48
▸ Multi transducer	MTR-1	MTR-4
▸ Multi transducer	MTR-2	MTR-4
▸ Watt transducer	TAP-210DG	TAS-331DG
▸ Watt transducer	TAQ-210DG	TAS-331DG
▸ Dual output power transducer	TAX-312DG-1	TAS-331DG
▸ Mains frequency transducer	TMF-210DG	TAS-311DG
▸ Single-function transducer	TAC-311DG/TAC-321DG	TAS-311DG
▸ Single-function transducer	TAV-311DG/TAV-311DG	TAS-311DG
▸ Multi-instrument	MIQ96	MIC-2 MKII
▸ Multi-instrument	MIQ96-2	MIC-2 MKII
▸ Multi-instrument	MIQ96-3	MIC-2 MKII
▸ Advanced graphical interface	AGI 100	AGI 300

Why DEIF

The corporate values & services that make DEIF the best choice

VISION

Our vision is to be the preferred global supplier of green, safe and reliable energy control solutions

MISSION

Our mission is to enhance the competitive advantage of our customers.

To achieve this, we:

- Identify their needs and wants in detail
- Develop high-quality products
- Stay logistically efficient
- Offer unsurpassed technical service and support

VALUES

The company culture at DEIF is based on a set of common values. Every employee is encouraged to make the right decisions based on these values – supported by rules and policies when relevant:
Ambition, Perspective & Respect

Why DEIF index

FIND NEW OPPORTUNITIES

DEIF's business ethic is based on knowledge sharing and informed by environmental awareness. Working with global experience of customer needs across the full range of power management applications, collaborating with DEIF you will find new opportunities.

WIN SUPERIOR CONTROL

20 % of DEIF's employees work in R&D. Their focus is innovation and progress for the industry as a whole, and in creating customised solutions with end-to-end system integrity. With DEIF, you win superior control thanks to our experience and expertise across multiple industries.

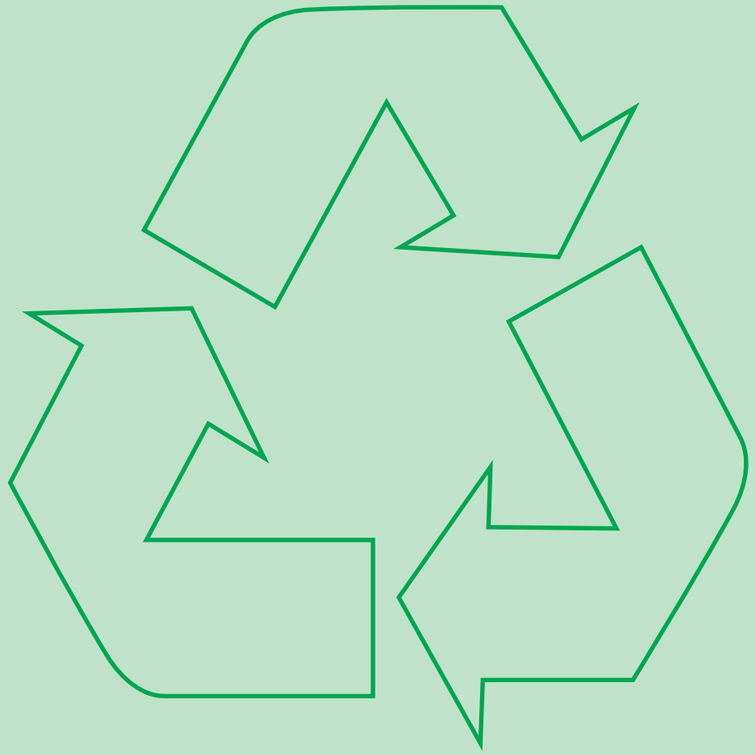
SECURE MAXIMUM UPTIME

Our tried-and-tested equipment, advanced automation technology, training programmes, and 24/7 support will boost your business goals by providing steady, maximum uptime.

LAND POWER MARINE & OFFSHORE WIND POWER

POWERED BY

DEIF

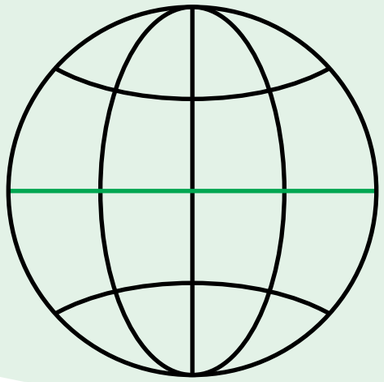


GREEN AMBITION

Environmentally improved

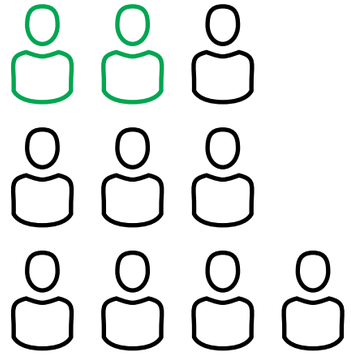
DEIF’s intelligent power management solutions and cleantech products meet growing needs for reliable power while supporting the world’s environmental transition.

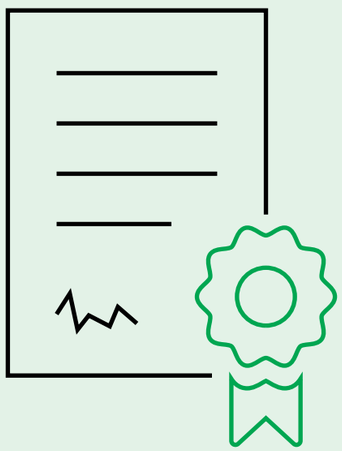
- Cut fuel consumption and harmful emissions
- Extend maintenance intervals
- Increase performance



SALES, TRAINING & COMPETENCE CENTRES IN **17 KEY MARKETS**. DISTRIBUTORS IN 35 COUNTRIES AND TERRITORIES

20 % OF DEIF’S **600+ EMPLOYEES** WORK EXCLUSIVELY IN **RESEARCH & DEVELOPMENT**





DEIF IS **ISO 9001** AND **ISO 14001** CERTIFIED

CORPORATE SOCIAL RESPONSIBILITY

»With the revamped power control solution from DEIF, our surgeons no longer fear blackouts during surgery«

Jens-Erik Engelbrecht
CEO & MSDK board member
Mercy Ships

Powering aid to the third world

Just 2.3 doctors per 1,000 people (33.3 in Europe). And up to 69 % of all citizens living on $ 2 or less a day. Those are the conditions in Sub-Saharan Africa. So, for most, healthcare is not an option, simply because it is physically or financially out of reach. As a result, a large proportion of the 85 % of African children expected to need surgical treatment before the age of 15 remain untreated, leading to complications, lifelong disability or death.

DEIF and Mercy Ships agree that a ship is the most efficient hospital platform in this region where clean water, electricity, medical facilities and personnel is limited or nonexistent. Since more than 50 % of the world's population live within 100 miles of the coast, we can reach more people who need care too. More impact for less money.

Cooperating with Mercy Ships is one of the ways DEIF offers charity help to the global community by doing what we do best. Delivering our brand promise: Power Efficiency.

When power is the difference between life & death

The largest NGO hospital ship in the world with 78 patient beds and an onboard surgical capacity exceeding 7,000 interventions per year, the Africa Mercy depends on 100 % reliable power supply at all times to avoid loss of life.

Having experienced numerous blackouts in recent years, a power management retrofit was required. A charity donation, DEIF installed and commissioned a solution consisting of four genset controllers (PPM 300), one synchroniser (FAS) and one touch screen (AGI).

"*With the revamped power control solution from DEIF, our surgeons no longer fear blackouts during surgery*", Jens-Erik Engelbrecht, CEO & MSDK board member at Mercy Ships happily concludes.

Mercy Ships
Mercy Ships is a global charity founded in 1978. Having completed more than 581 port visits in 57 nations, Mercy Ships has performed services valued at more than $1 billion, impacting more than 2.48 million of the world's most desperate people.

CODE OF CONDUCT

Committed to working according to the ten principles expressed in the UN Global Compact since 2014, the overall goal of DEIF is to develop the company's long-term value, observing high ethical standards in relation to DEIF employees, business partners, and the global community.

Human rights:

1. we support and respect internationally proclaimed human rights
2. we ensure that we are not complicit in human rights abuses

Labour rights:

3. we uphold the freedom of association and recognise effectively the right to collective bargaining
4. we support the elimination of all forms of forced and compulsory labour
5. we support the efforts to abolish child labour
6. we eliminate discrimination in respect of employment and occupation

Safety & environment:

7. we support a precautionary approach to safety and environmental challenges
8. we undertake initiatives to promote greater environmental responsibility
9. we encourage the development and diffusion of environmentally friendly technologies

Anti-corruption:

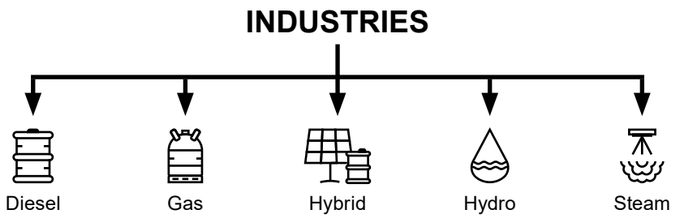
10. we work against corruption in all its forms, including extortion and bribery

LAND POWER

CHOOSE DEIF LAND POWER TO INCREASE PERFORMANCE & EFFICIENCY

Working with EPC, switchboard manufacturers, system integrators/ OEMs and asset owners, DEIF LAND POWER identifies new ways to **increase performance and efficiency** for the IPP, rental, critical power and standby power markets.

Whether we retrofit older installations or design projected setups, DEIF's **innovative solutions** can **cut fuel costs** compared to competitive products.



*16 grids and 992 generator breakers in one application.
See www.deif.com/IPP for more about our award-winning IPP solutions.*

NO MATCH IN POWER CAPACITY & SCOPE*

EUROPE'S LARGEST ONSHORE WIND PARK*

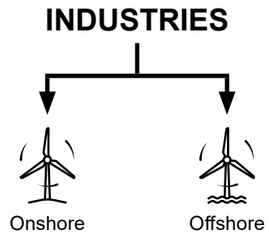
*See www.deifwindpower.com

WIND POWER

ROBUST SOLUTIONS AND KNOWLEDGE SHARING ARE HALLMARKS OF DEIF WIND POWER.

As a renowned supplier of robust components for turbine pitch and control, DEIF Wind Power designs and manufactures **complete control systems** for both new and existing wind turbines of any size.

Building on years of experience, DEIF's **performance-optimising solutions** include wind turbine operation, modeling, control strategies, grid compliance, and pitch and park control systems. Controlling wind park power production accurately and quickly, they will help you produce more green power at the **lowest possible cost**.



EIGHT DECADES OF ACHIEVEMENT

1933
Erling Foss, founder

1943
Production

1956
Exhibition

1975
DEIF's HQ

1987
Toke Foss

2009
DEIF's HQ

1933
DEIF founded

1930s
B-225 Ammeter

1950s
VTR-1

1960s
Electrometer 34

1980s
Delomatic

1990s
Uni-line

2000s
Multi-line 2

2015
DEIF ML 300

A record of progress and innovation

A family-owned company, DEIF's record of innovation, service and support dates back to 1933, when the company was first founded in the Danish capital Copenhagen by Mr Erling Foss.

The acronym DEIF is derived from the company's original name, Danish Electro Instrument Factory.

With market insights and applications understanding second to none, today DEIF is an award-winning global supplier of green, safe and reliable engine and genset controls, marine bridge instrumentation, switchboard instrumentation and renewable energy controls.

DEIF's cost-effective technologies meet the toughest customer demands and performance needs. The company is dedicated to delivering environmentally improved solutions with a product and solutions portfolio unmatched in the industry.

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