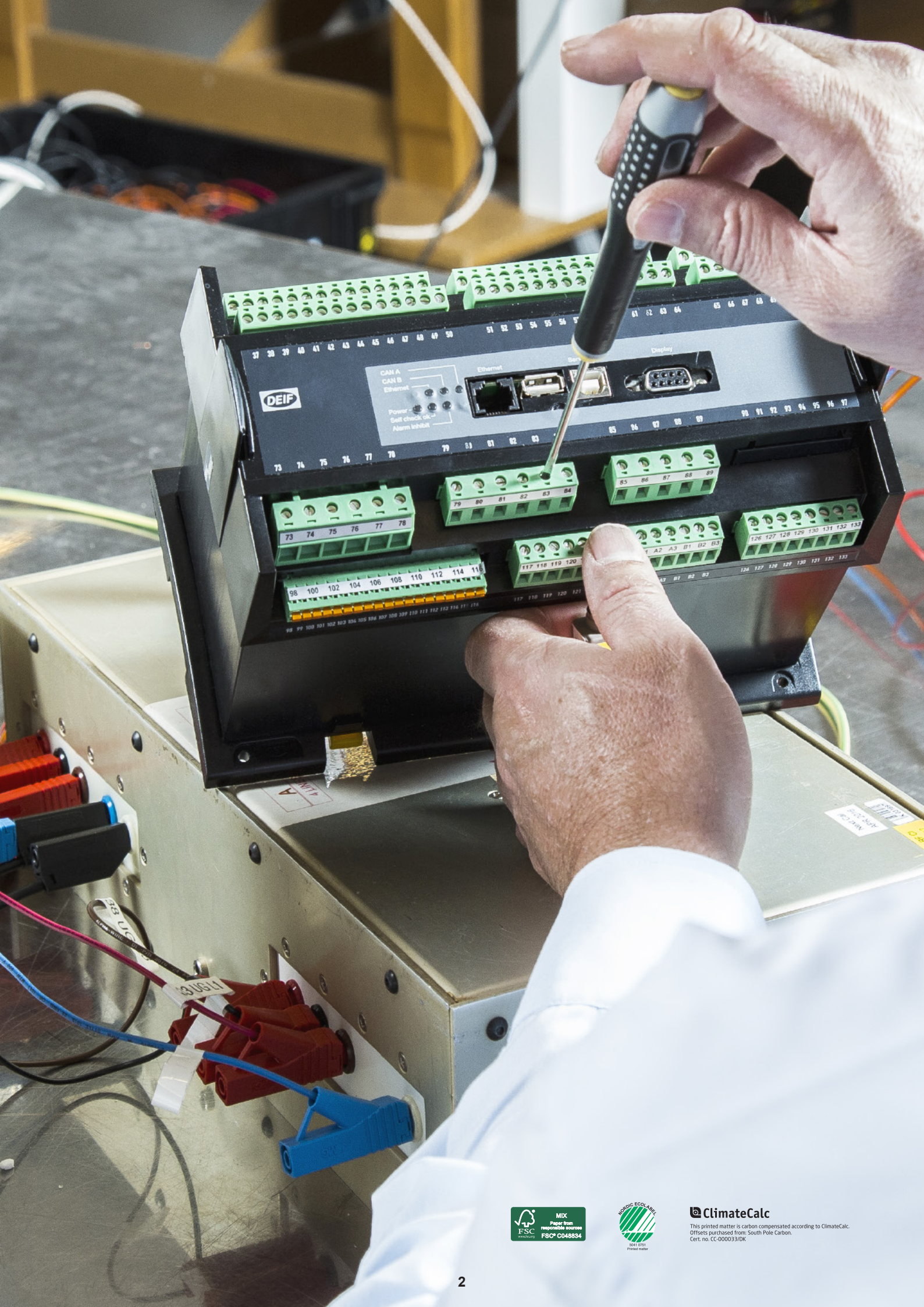




LAND POWER

APPLICATION GUIDE





DEIF

CAN A
CAN B
Ethernet
Power
Self check ok
Alarm inhibit

Ethernet

Display

98 100 102 104 106 108 110 112 114 116

73 74 75 76 77 78

79 80 81 82 83 84

85 86 87 88 89

117 118 119 120

126 127 128 129 130 131 132 133



ClimateCalc

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POWER EFFICIENCY

SUPPORTING YOUR BUSINESS GOALS

AND EMISSION TARGETS
WITH INNOVATIVE TECHNOLOGY,

OPTIMISED POWER MANAGEMENT SYSTEMS,

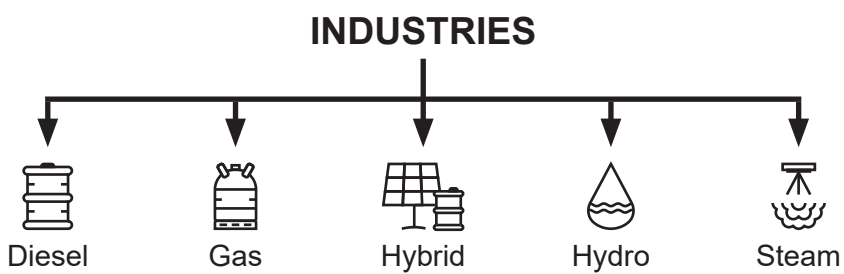
AND A PORTFOLIO OF
**PROVEN PRODUCTS
AND SERVICES**

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.

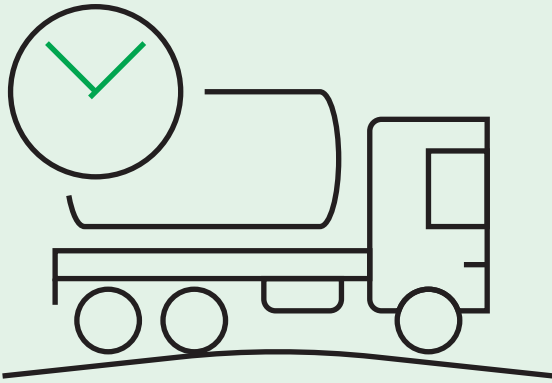
Whether we retrofit older installations or design projected setups, DEIF's **innovative solutions** can **cut fuel costs** compared to competitive products.



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

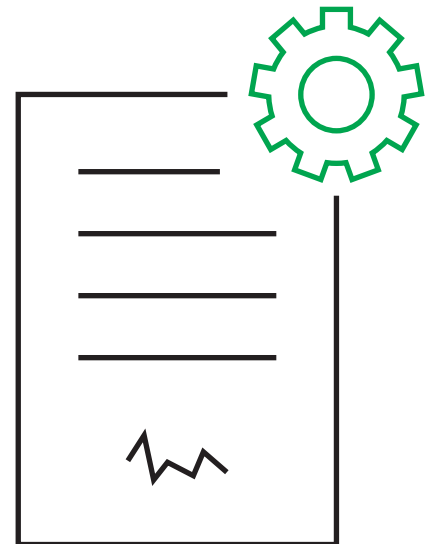


**NO MATCH IN POWER
CAPACITY & SCOPE***



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.



3 YEAR GUARANTEE SUPPLY
OF SPARE PARTS FOR
STANDARD CONTROLLERS.

10 YEAR SUPPLY
FOR STANDARD
SWITCHBOARD EQUIPMENT.

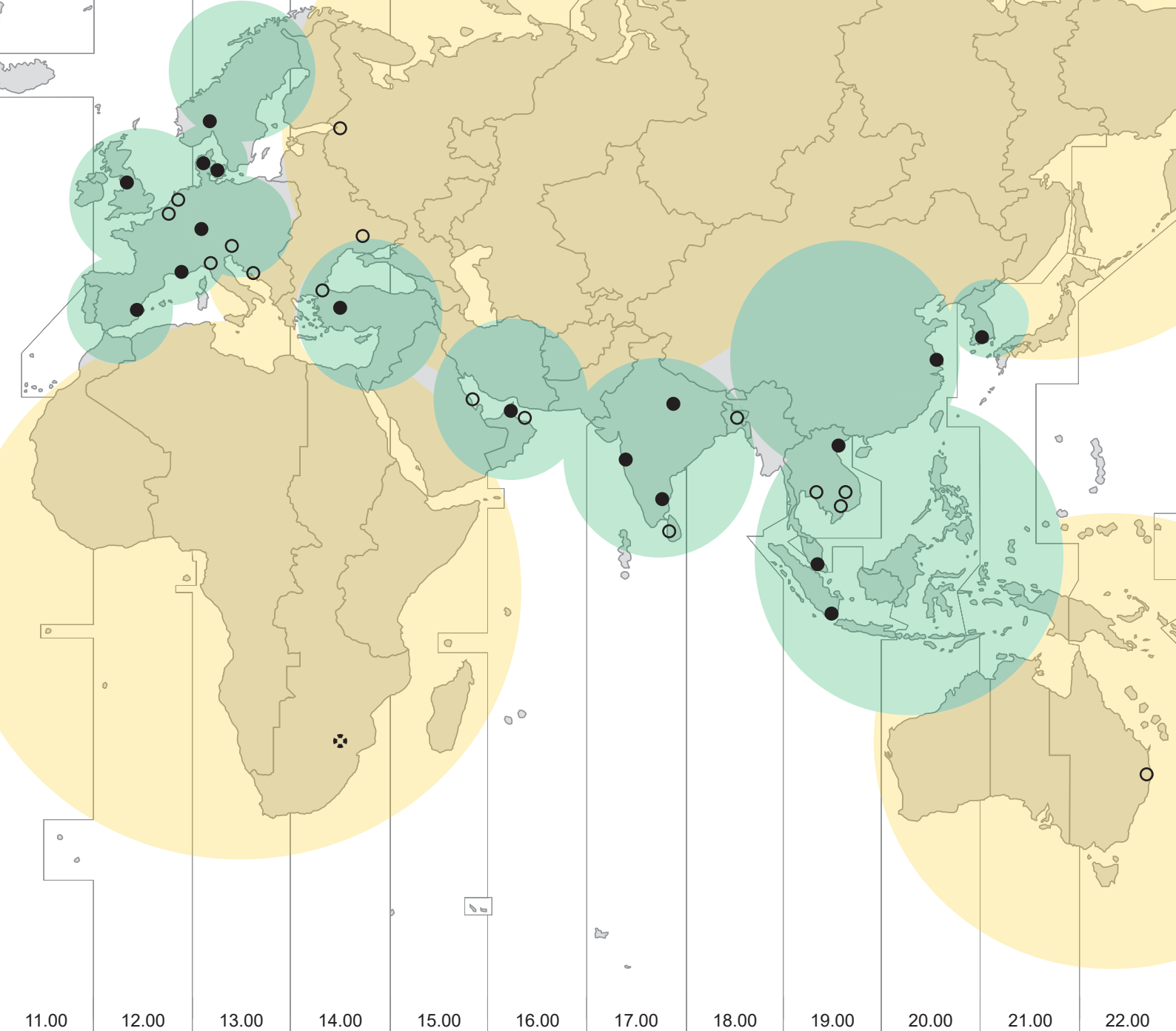


ONE-STOP-SHOP

FULL SERVICE & SOLUTIONS PROVIDER

Strengthen 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

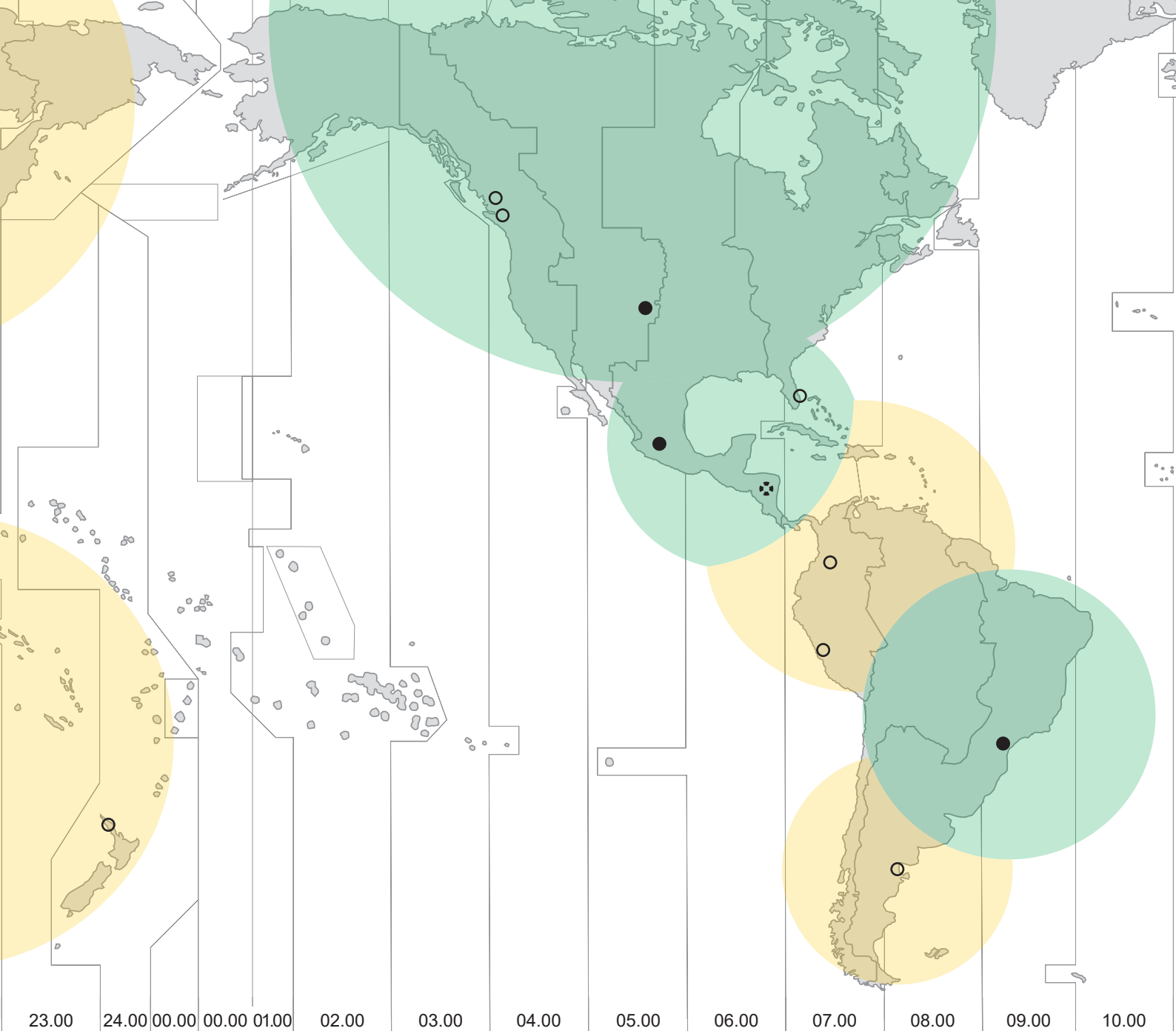


OUR 24/7 GLOBAL REACH

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
- ▶ Day-to-day spare part delivery, 3 year supply of spare parts for standard controllers.



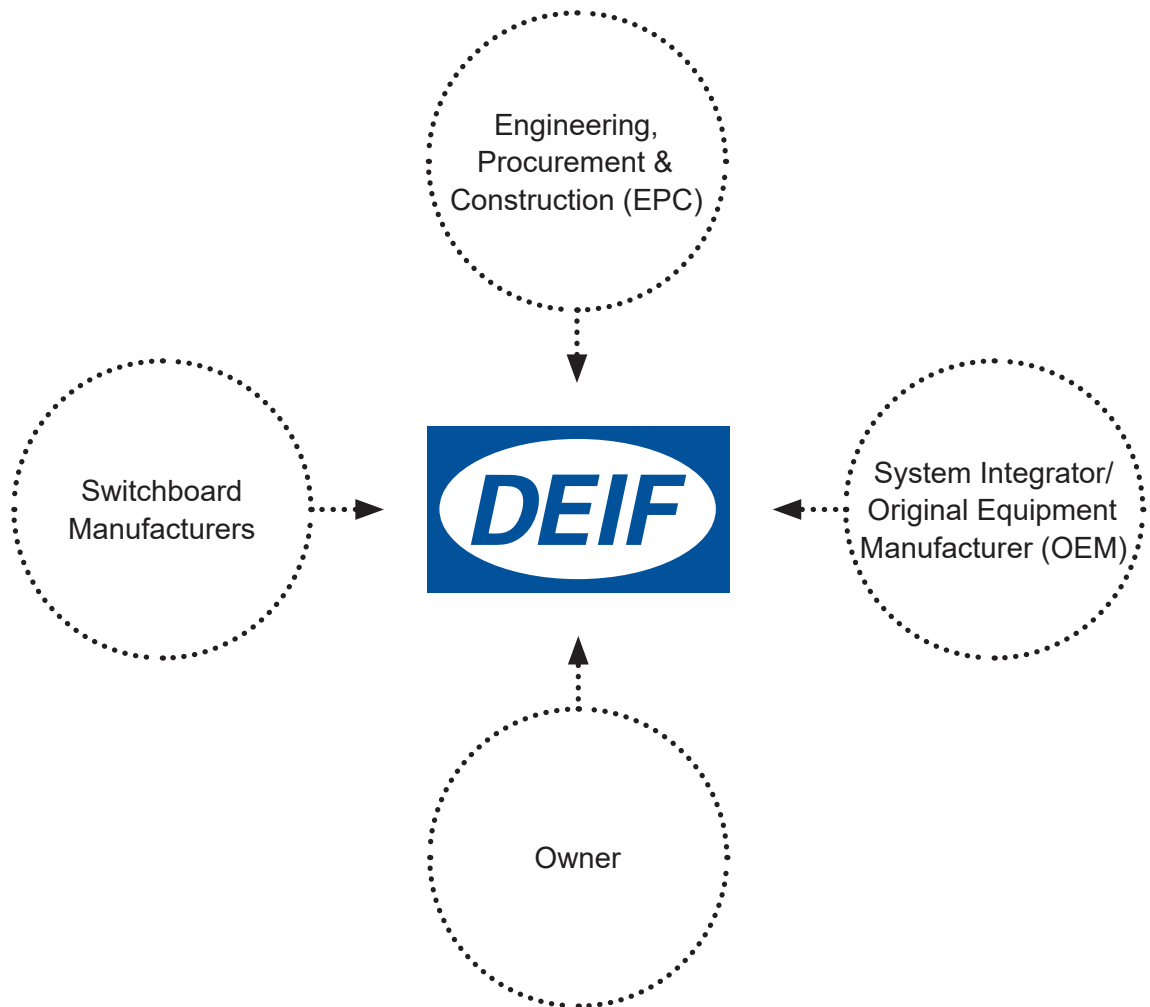
-  DEIF Office
-  DEIF Distributor
-  DEIF Service Partner

The DEIF group

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



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.

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:

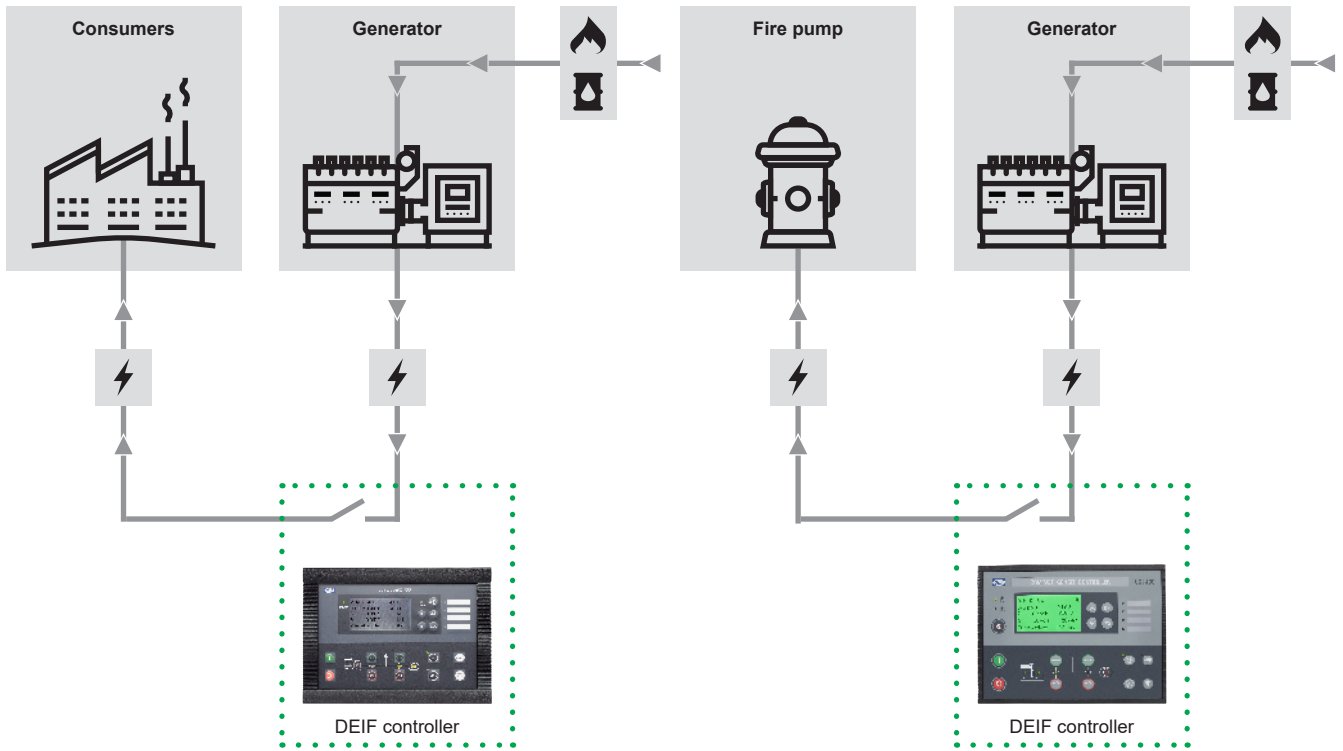
- ▶ Project engineering, application and system solution design
- ▶ Wiring diagram design
- ▶ Complete pre-delivery testing
- ▶ On-site commissioning
- ▶ Training for you and your customers

Application examples and cases index

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Island operation

No grid connection



Single generator applications

Island mode operation relates to power plants that operate in isolation from the national or local electricity distribution network.

There are two key types of island mode operation:

- ▶ Stand-alone generators not connected to the electricity grid
- ▶ Generators connected to the electricity grid in parallel mode, meaning they can generate power independently in the event of a grid power outage

Supply to consumers: with an option to choose between 50 and 60 Hz drive, these types of plants are typical of basic installations and mobile generator sets.

Fire pump drive meets VDS Germany regulations: this application is often used for emergency power plants, because all units are able to handle fire pump mode and wire break monitored inputs.

Relevant controllers

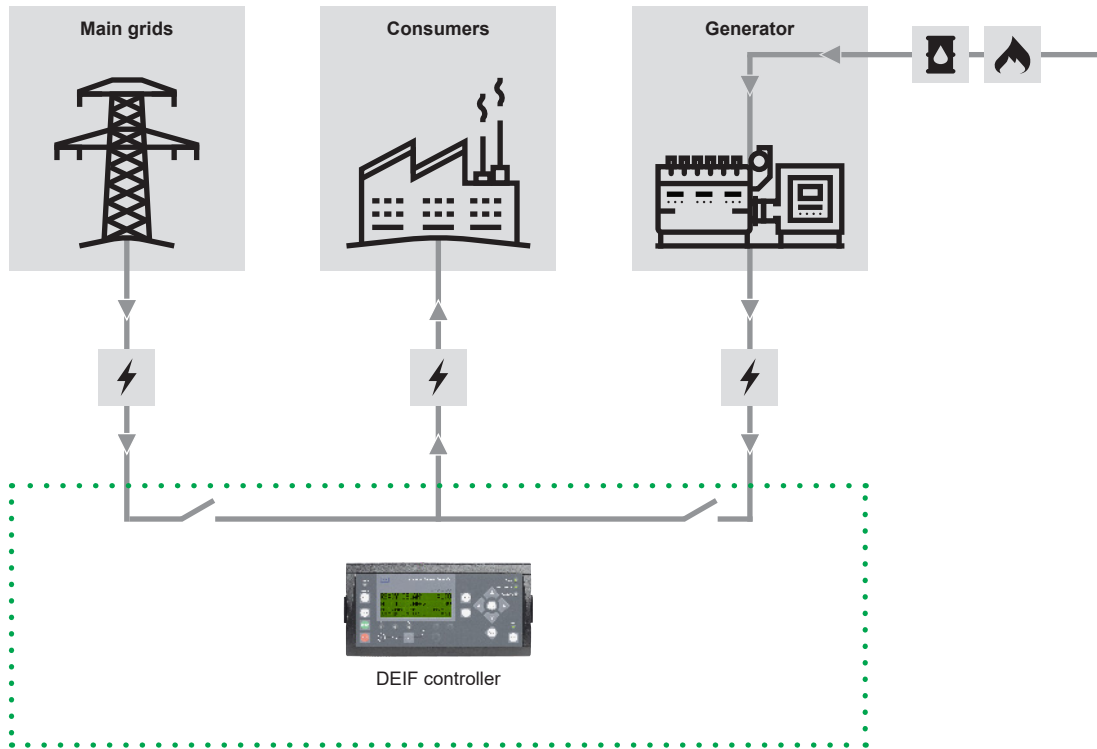


Also consider these products



Grid connection

With or without synchronisation



Automatic Mains Failure (AMF) applications

In the event of a significant loss of mains power or total blackout, Automatic Mains Failure (AMF) performs an automated power switch to emergency standby generators, preventing possible data loss and potential damage to electrical equipment.

AMF with synchronisation

With synchronisation preventing at least one blackout when switching from generator to mains supply, this is the most common AMF variant.

Select immediate opening of breaker, or with load across before opening.

You can also select overlap to make short-time parallel of generator to grid possible for, for instance, 0.1 second.

Controllers: AGC 200 / AGC-4

AMF without synchronisation

This application is mainly used for simple systems intended only for AMF control. In both cases, switching from mains to generator supply and back is performed with a short-term blackout.

Controllers: AGC 100/GC-1F / CGC 400

Relevant controllers



GC-1F



AGC 100



CGC 400



AGC 200



AGC-4

Also consider these products



DBC-1



ASK



EQ

A strong working relationship

Targetting Asia & the Far East markets

»DEIF has developed and adapted its AGC 100 and AGC 200 platforms to suit OEM needs exactly...«



Product range, delivery guarantee & customisation

In India, DEIF has built a strong working relationship with Sterling Generators, one of the subcontinent's largest genset builders. Assembling gensets with some of the biggest engine producers in India, Sterling also has substantial exports to the Middle East and Africa.

DEIF has become Sterling's preferred supplier not just because of the quality of our product range but because of reliable delivery performance and our ability to develop and customise controller products to precise specifications.

Developed for applications requiring reliable power supplies, DEIF's AGC 100 non-sync controllers offer a powerful processor and significant memory capacity.

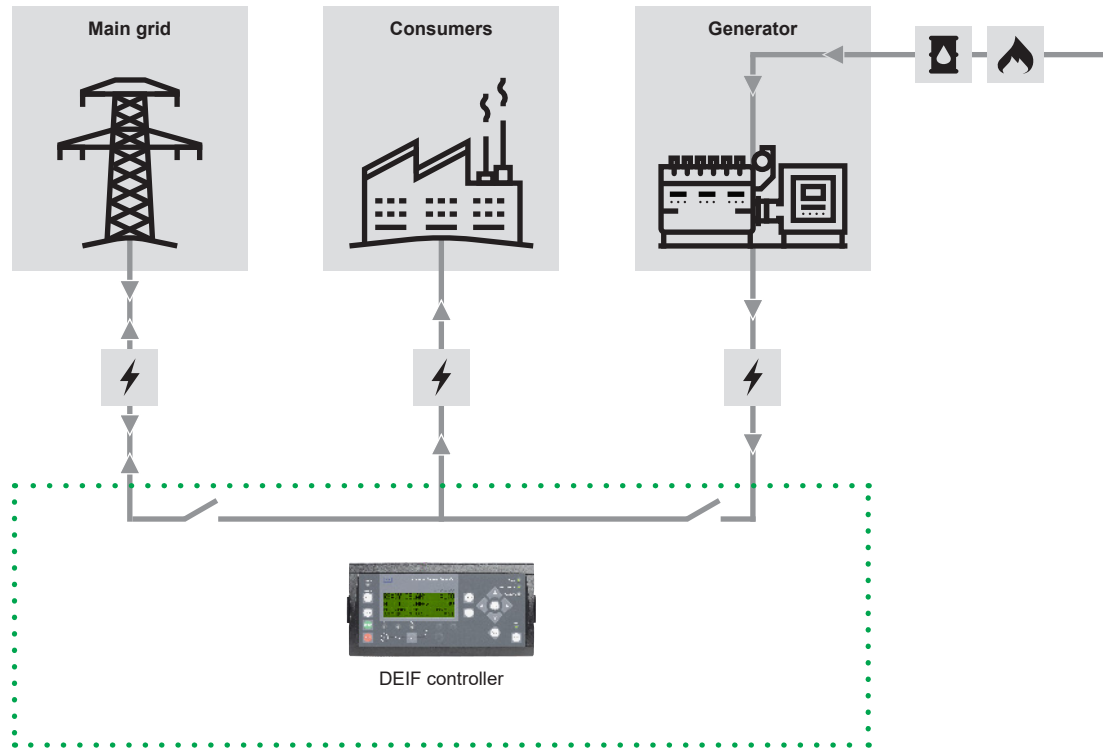
Vibration-tested and evaluated with HALT test, the sturdy controller unit offers reliable performance even under extreme conditions.

Sterling Generators

is a leading MEP Services company in India with more than 80 years of experience in project engineering and execution.

Single generator grid connection

Synchronisation to grid



Automatic Mains Failure (AMF) applications

Combining Automatic Mains Failure with a generator running long-time parallel enables the generator to provide power to the consumer as well as to the main grid simultaneously. In case of main grid failure, the mains breaker will open automatically while the consumer continues to run on generator power. When the grid returns, the mains breaker performs synchronisation and the system returns to its default operation mode. Soft transfer of load from generator to mains means the return to grid will pass unnoticed by the consumers, whether it is return to parallel with grid operation or pure grid supply. This happens when generator is started and put in parallel to grid: the generator will take load using a pre-defined ramping function in order not to disturb other parts of the system.

For AMF generator stand-by applications, an automated test run can be selected: the generator can be started automatically with pre-defined time intervals. The test run can be with or without paralleling to grid. Naturally, no matter what running mode is selected, the grid, generator and drive engine are protected at all times against failures by the DEIF controller. DEIF's controllers are compliant with European ENTSO-E rules and approved according to DIN VDE AR-N 105 and BDEW.

Relevant controllers



AGC 200



AGC-4

Also consider these products



DCP2



MIC-2 MKII



ASK

Customisation to meet market demands

Targetting Asia & the Far East markets

»To accommodate Sterling's market demands, DEIF developed a branded controller series based on the AGC 200 platform...«



Adapting and branding for Sterling

Working with Sterling, DEIF has adapted its AGC 200 platform to suit Sterling's requirements exactly in a specially branded Sterling controller series.

Designed with innovative technology, reliable and easy to operate, the AGC 200 integrates all necessary functions for superior protection and control of your genset.

Application possibilities range from single gensets to complex power plants.

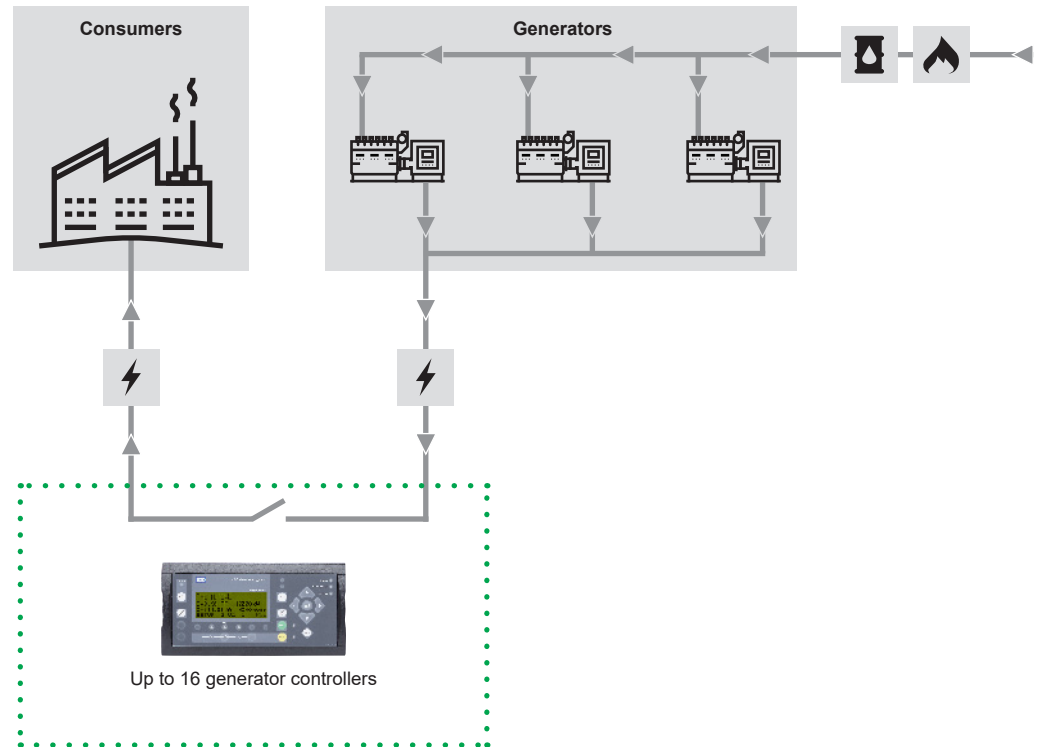


Sterling Generators

is a leading MEP Services company in India with more than 80 years of experience in project engineering and execution.

Multiple generators

Island applications



Up to 16 generators in one plant

DEIF's AGC 200 and AGC-4 controllers have been designed to create simple, easy-to-use power management systems for up to 16 generators, eliminating the need for a PLC.

These systems perform automatic frequency/voltage support of the plant, as well as load-dependent start/stop, load-sharing and var-sharing.

The controllers communicate with easy-to-install CAN bus lines.

If a multiple generator application requires section architecture, the controllers also manage bus tie breakers as an active part of the power management system.

Relevant controllers



AGC 200



AGC-4

Also consider these products



DVC 310



AGI 300



CIO 116

Choosing the best solution on the market

A long-standing partnership with a top 100 rental company

»Using one brand of controllers obviously facilitates operation of the A Geradora fleet...«

A GERADORA

Locação de Equipamentos

Setting the standard

In Brazil, DEIF has formed a long-standing partnership with A Geradora – a successful, can-do rental power supplier that shies away from few challenges, claiming they can solve any job, regardless of location or distance.

To meet all these different types of challenges, A Geradora tested several brands, looking for the most reliable and innovative solutions on the market.

“But since we implemented the first DEIF AGC-3 unit, DEIF and A Geradora have developed a trusted and dedicated partnership,” says Chief Engineer Sergio Alvarez. A Geradora hasn’t looked back.

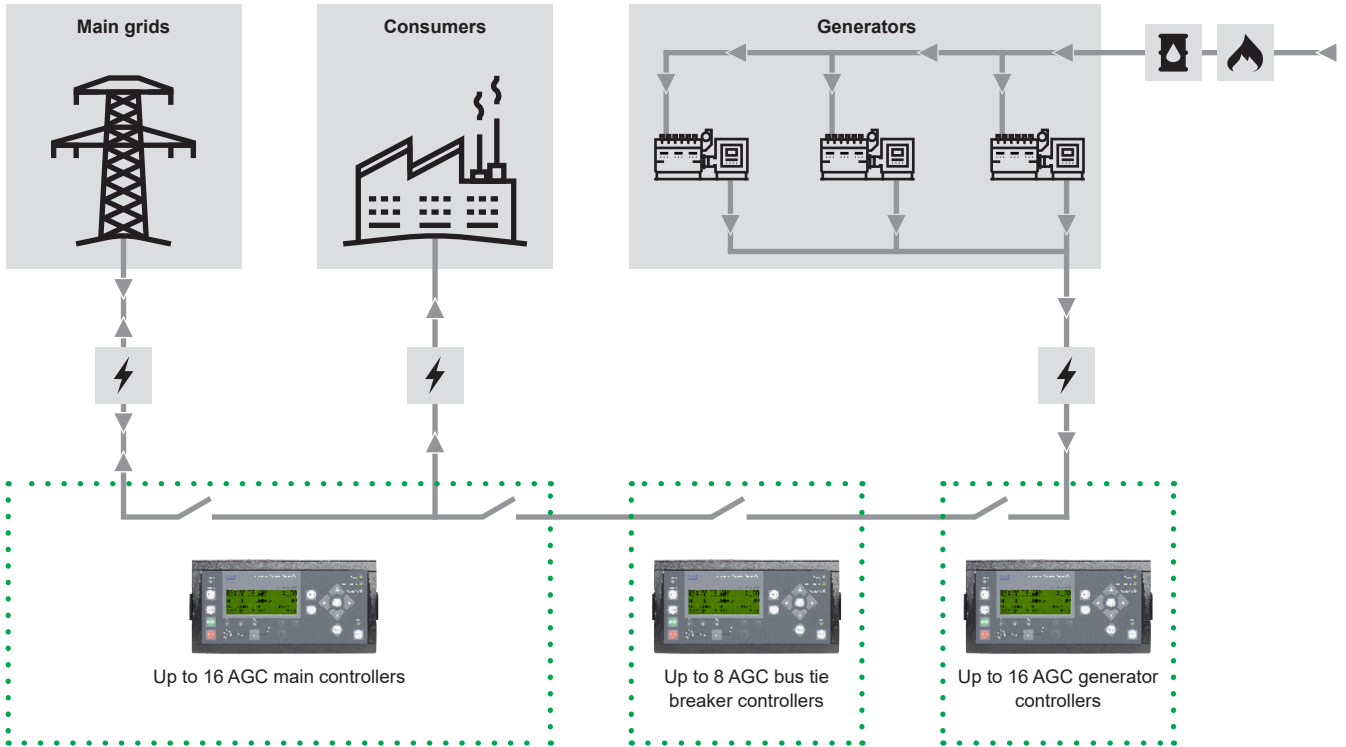
“We have come to believe so firmly in DEIF’s solutions that we now have approximately 500 gensets and transfer switches equipped with DEIF modules as part of a process that will see us standardise our whole fleet with DEIF solutions, including DEIF’s most recent technology.”

A Geradora

Rents and leases industrial machinery. The company offers power generators, air compressors, mobile platforms, loaders, diggers, and lighting equipment.

Parallel to grid

Multiple generator sets



Combined power plant and parallel to grid system; up to 56 breakers in one plant

Plant management parallel to grid typically runs in semi-automated and fully automated modes, using priority routines like fuel optimisation, running hours, multi-master, and plant modes like AMF, peak shaving, mains power export.

Use DEIF's free-of-charge PC Utility Software to construct the specifics of your plant layout within the AGC system.

The software is simple to use with explanatory graphic presentation.

The position of generators and bus tie breakers in the system can be selected freely.

Communication between the controllers is made using a single or double (redundant) CAN bus.

Relevant controllers



AGC 200



AGC-4

Also consider these products



DVC 310



AGI 300



CIO 116

Honouring unusual challenges

Providing full generator cover for the entire ferry terminal



»Covering a 4 km area, the distance between generators was an unusual challenge solved using DEIF's AGC-4.«

Reliable power

Being a major transport hub, the requirement for a secure power supply at the Port of Dover is essential.

The risk of potential power outages lead to the decision to upgrade the existing embedded generation system to provide full generator cover for all areas of the ferry terminal.

DEIF assisted with the application requirements, supplying AGC-4 Advanced Generator Controllers for local and remote control of mains connection, island operation, mains synchronisation and export control.

The Eastern Docks site required a fibre optic communication connection between generators over an extensive 4 km area for remote monitoring and generator functionality.

Using DEIF's patent pending Emulation Software, the solution was fully factory tested to comply with these distances prior to installation.

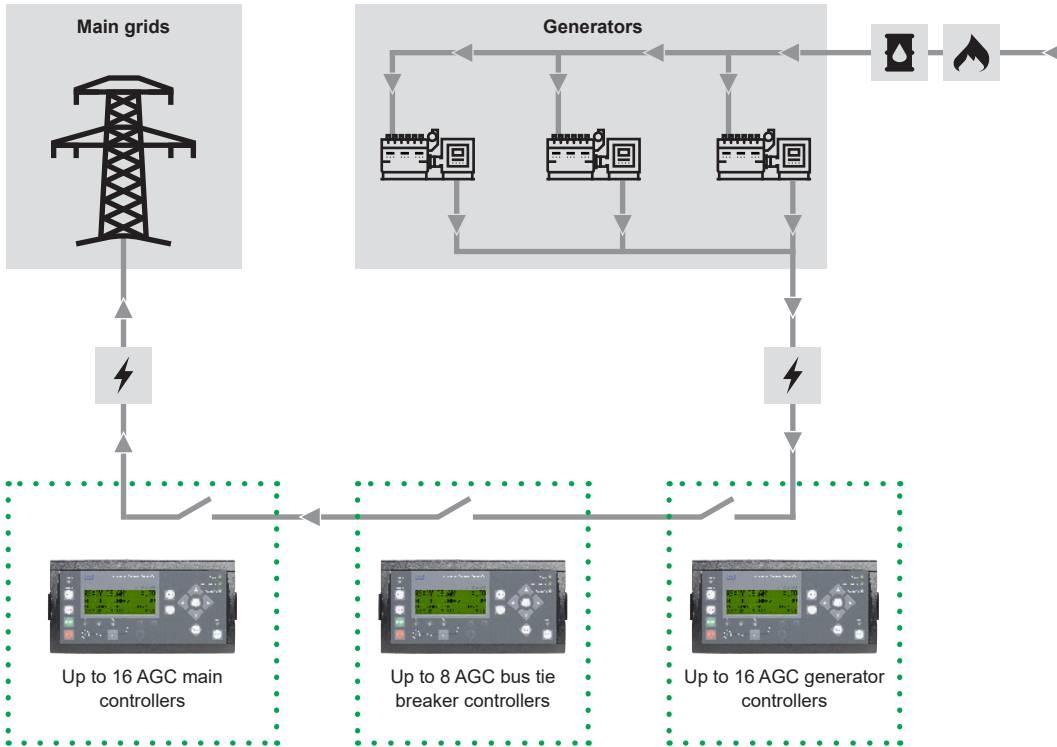
Port of Dover

Great Britain's Gateway to Europe, the Port of Dover is recognised as one of the busiest passenger ferry ports in the world.



Multiple grid connections

Parallel to grid power plant



Combined power plant and parallel to grid system, up to 40 breakers in one plant

Up to 16 grids, eight bus tie breakers and 16 generator controllers.

Use DEIF's free-of-charge PC Utility Software to construct your plant layout within the AGC system. The software is simple to use with explanatory graphic presentation.

The position of generators and bus tie breakers in the system can be selected freely.

Communication between the controllers is made using a single or double (redundant) CAN bus.

Relevant controllers



AGC 200



AGC-4

Also consider these products



DVC 310



AGI 300



CIO 116

Make or break with back-up power

A green, safe & reliable critical power solution

»Hiddenfjord is located on the island of Fútaklettur, one of the remote Atlantic Faroe Islands that provides ideal natural conditions for salmon farming.«



HIDDENFJORD®

Protection against power outages saves equipment and produce

A steady power supply can make or break a business like acclaimed salmon producer, Luna.

Raising and nurturing smolt is an extremely delicate process dictated by precise water temperatures and salt levels: a loss of power and a fall in water temperature would be catastrophic.

In cases of total blackout, DEIF's AGCs automatically continue to run in Automatic Mains Failure mode, saving Hiddenfjord's fragile smolt and its valuable equipment.

Hiddenfjord's plant would also help stabilise the grid and because SEV is responsible for the grid on the Faroe Islands, the company is very keen to establish additional model Power Hubs like Hiddenfjord's to guard the grid against total blackouts.

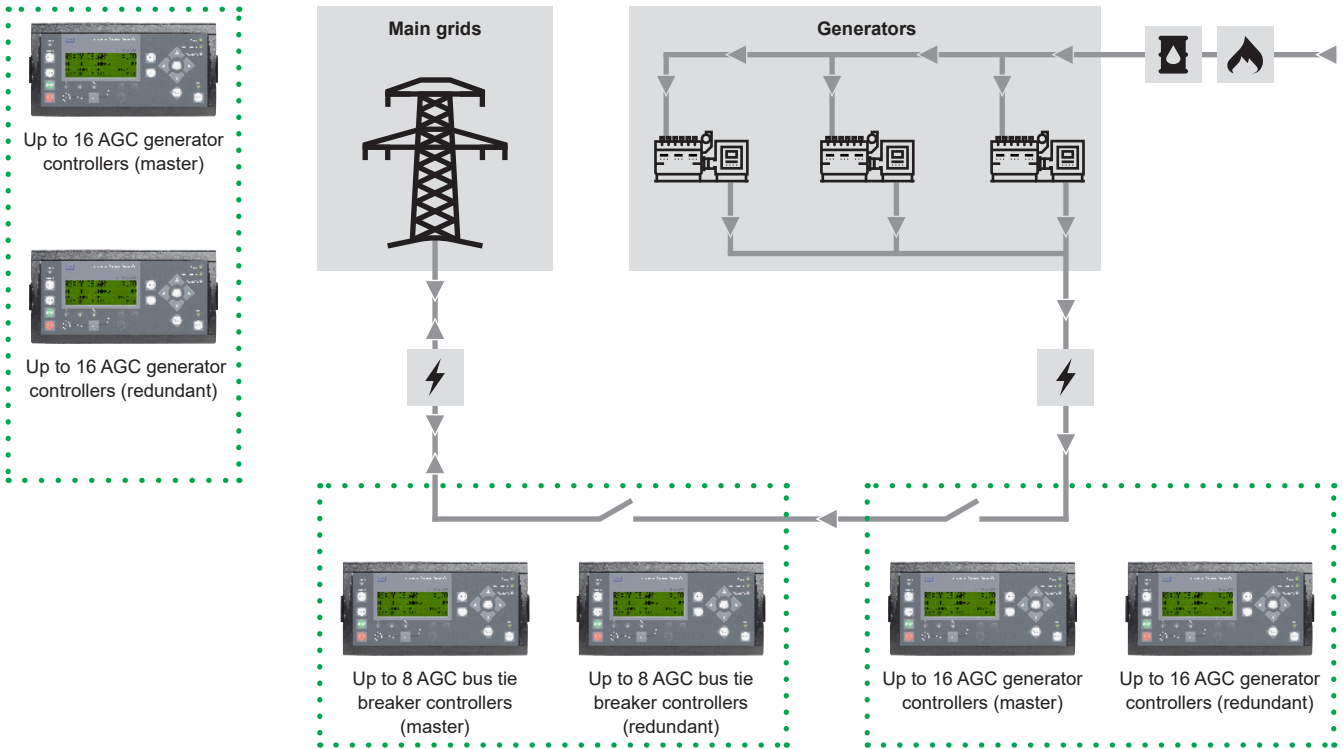
SEV is particularly interested in establishing more Hubs with critical power applications with plants in standby.

Hiddenfjord

In 2011, Luna created the HiddenFjord brand of premium salmon. The flagship brand reflects the most important characteristics of the company – integrity, excellence, purity, and innovation.

Redundant systems

Hot standby controllers



Combined power plant and parallel to grid system, fully redundant control system

Up to 16 grids, eight bus tie breakers and 16 generator controllers.

On top of the grid, bus tie and generator controls, the DEIF AGC-4 controllers carry out full power management, eliminating the need for PLCs.

DEIF's AGC-4-based power management systems also offer the option of having doubled (redundant) controllers on all positions. In case of failure from a master controller, Hot Standby kicks in immediately, protecting the rest of the system from interference.

Relevant controllers



AGC 200



AGC-4

Also consider these products



DVC 310



AGI 300



CIO 116

Reliable power is central to business

Putting DEIF critical power to the test



*»We know it works,
because we test it
the hard way.«*

Tore Heide Villund,
GlobalConnect

Mission-critical solutions

DEIF's critical power solution is central to GlobalConnect's business case because the company's customer portfolio includes server hosting for critical business institutions like banks and media organisations demanding comprehensive redundancy and tier classifications.

When customers ask, if they can be sure GlobalConnect's back-up power systems work, Senior Group Manager Tore Heide Villund's confident reply owes a great deal to his faith in DEIF's power management system: "We know it works, because we test it the hard way."

"As well as monitoring operation rigorously and performing and documenting simulation tests, we put the entire system to the ultimate test twice a month by cutting our connection to the grid. As the UPSs kick in and the gensets start up, synchronising and identifying a reliable, quality power production level for our premises, you can't get greater certainty, and that is the level we maintain."

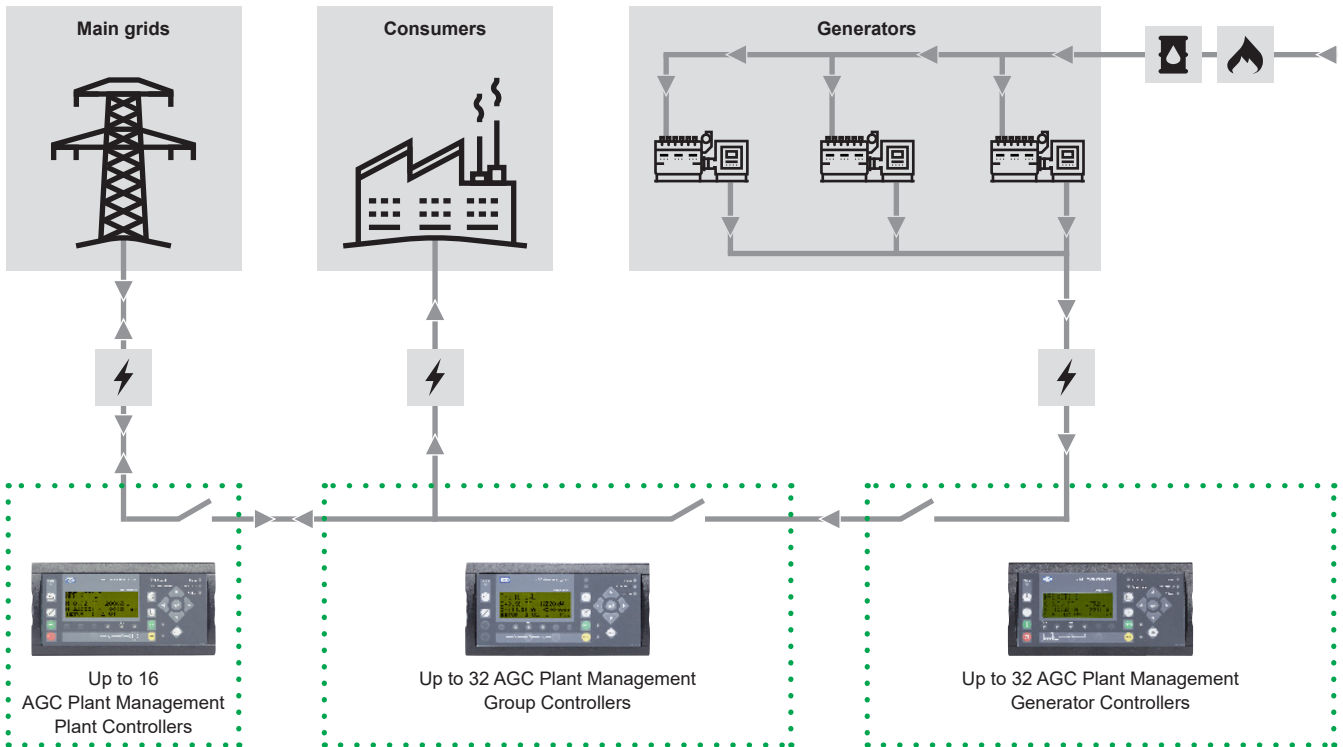
GlobalConnect

Is Denmark's leading alternative provider of fibre network, data centres and cloud solutions.



Independent power producers

Multiple generator set power plants made easy



Up to 16 grids and 992 generators

AGC Plant Management is a plant control system that not only handles genset controls, but features additional functions designated towards utility requirements, plant design, commissioning tools, and maintenance. The system is also fuel-efficient and ensures that required plant set point are met at all times. The AGC Plant Management can use the plant's generators directly to black-start large step-up transformers. With a proven ratio of up to 1:39 between the generator and the transformer, the system offers a cost-optimised solution for black start of plants in both island and fixed power mode, which reduces the need for high voltage breakers.

The AGC Plant Management carries out automatic frequency/voltage support of the grid. If the grid is overloaded with kW/kvar, causing the grid frequency/voltage to drop, the system will detect it and increase the power/reactive power production, maintaining a stabilised grid frequency/voltage. The AGC Plant Management is also able to keep a fixed power production at the connection point, automatically compensating for internal loads in the plant.

Relevant controllers



AGC Plant Management

Also consider these products



DVC 310



AGI 300



CIO 116

Expertise & flexibility on-site

Extending functionality for a 100 MW plant

»During construction, the plant status changed from peak shaving to primary power producer. DEIF engineers were able to implement new operation modes on-site.«



From peak shave to primary power

In Boa Vista, Brazil, DEIF supplied a complete AGC Plant Management System for a strategically important plant supplying more than 100 MW of continuous power with 34 Cat® C175-20 diesel generator sets for Eletrobras Distribuição Roraima, the government-operated electrical utility.

Originally designed to run as peak shaving and support a HV line, during construction, the plant status changed to primary power producer for the region.

With the Boa Vista plant replacing power previously supplied from Venezuela, the region will now have access to more reliable power and the capacity to become more self-sufficient, supporting economic and social development.

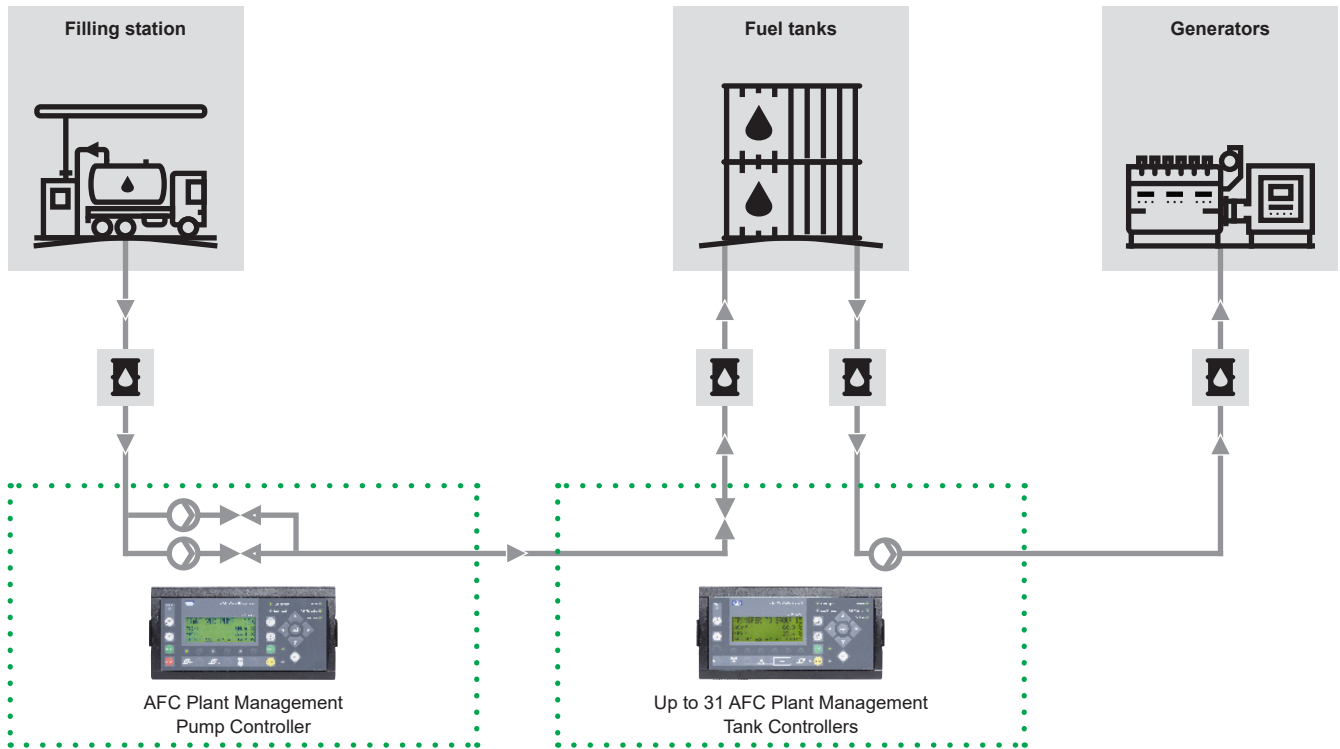
Within the scope of this comprehensive and flexible solution, on-site, DEIF engineers were able to change the functionality of the AGC Plant Management control system to handle the operation modes required for continuous power with customer benefits including easy push-of-a-button, automated operation, fuel-saving technology, and overall reliable control.

Oliveira Energia

Founded in 1972 and based in Manaus, Oliveira Energia specialises in retail, installation, and genset operation.

Automated fuel distribution

Fuel logistics automation for liquid fired power plants



Fuel distribution control for multiple generator power plants

The Automatic Fuel Controller, Plant Management (AFC PM) is a series of controllers designed to control fuel logistics in liquid fuel fired power plants.

AFC PM uses multiple, smaller, decentralised fuel tanks rather than large centralised fuel tanks. Fuel is transferred to the fuel tanks from designated pump station(s).

Manually controlled valves inserted on the fuel pipe can be used to separate pump station and fuel tanks.

The solution's maximum capability is 32 pump stations or fuel tanks; an application with one pump station can have a maximum of 31 fuel tanks, supporting a maximum of eight separation valves.

More systems can be added to operate individually.

Relevant controllers



AFC Plant Management

The most advanced power project

Island to grid switch at the push of a button

Altaaqa Global



»Whether it's an island mode/stand alone or grid, or a combination of all operational modes, we can exactly meet the mode requirements at a push of a button.«

Billy Wharton
Director of Global Operations
Altaaqa Global

MEE 2014 Power Project of the Year

In 2014, Altaaqa Global won the Power Project of the Year at the MEE Awards with a 54 MW temporary power plant in Yemen.

Referring to the DEIF Plant Management solution implemented at the site, Director of Operations of Altaaqa Global Billy Wharton called the project the most advanced in the power industry adding that Altaaqa, "is the only company in the Middle East who utilised an integrated control protection system that can switch from grid to island to grid in just minutes.

"This is also the most advanced Caterpillar electric power protection system in the world. Our control system provided the most flexible power solution to support base load, intermediate, peaking or standby power generation. Whether it's an island mode/stand alone or grid, or a combination of all operational modes, we can exactly meet the mode requirements at a push of a button."

Rental Power

Altaaqa Global

A subsidiary of Zahid Group. Collaborates with Caterpillar Inc. to deliver turnkey multi-megawatt temporary power solutions at customer sites in emerging markets.

Altaaqa Global

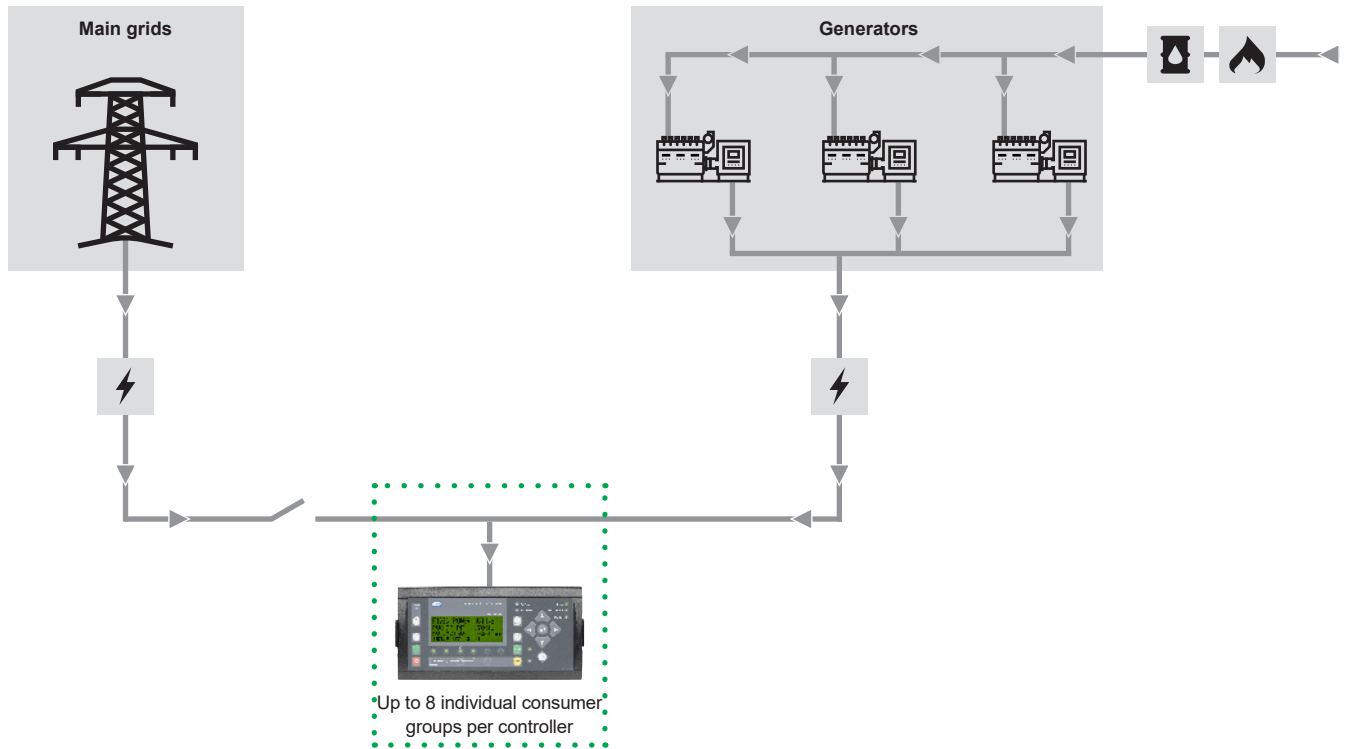


Bringing Power
To Solutions

www.altyaqglobal.com

Automatic load control

Information exchange between mains grid, generators & consumers



Automated control of load feeder breakers

The ALC Automatic Load Controller is an integrated part of DEIF power management systems. In case of generator drive when the mains grid is not available, it may be necessary to control the system load. When the ALC is placed in a section of the system, it will be capable of controlling up to 8 consumer feeder breakers.

One system can hold up to 16 ALC units, giving the possibility to control up to 128 feeder breakers. For each feeder breaker, the control can be based on a fixed power consumption value for the consumers connected to the feeder, or it can be based on a power measurement feeding a 4-20 mA signal into the ALC unit.

Based on the power calculation in the system, the ALC's can automatically connect and disconnect consumers in a pre-determined order. This means that if a generator is tripped for any reason, the system will calculate the power flow and disconnect the necessary number of consumer feeders in order to prevent overloading the plant. If a generator has been taken out and is made available again, the system will calculate if the generator is necessary to feed the system. If so, the generator is started and, when online, the consumer feeders will connect.

Relevant controllers



ALC



AGC-4



AGC Plant Management



AGC 200

Also consider these products



MTR-3



TAS-331DG



ASK

Comprehensive communication integration

Eliminates the cost & complexity of PLCs

»The main advantage of this system is that the combination of inter-communication provides fully automated control, eliminating risk of power cuts for important consumer groups.«

100 % automatic control

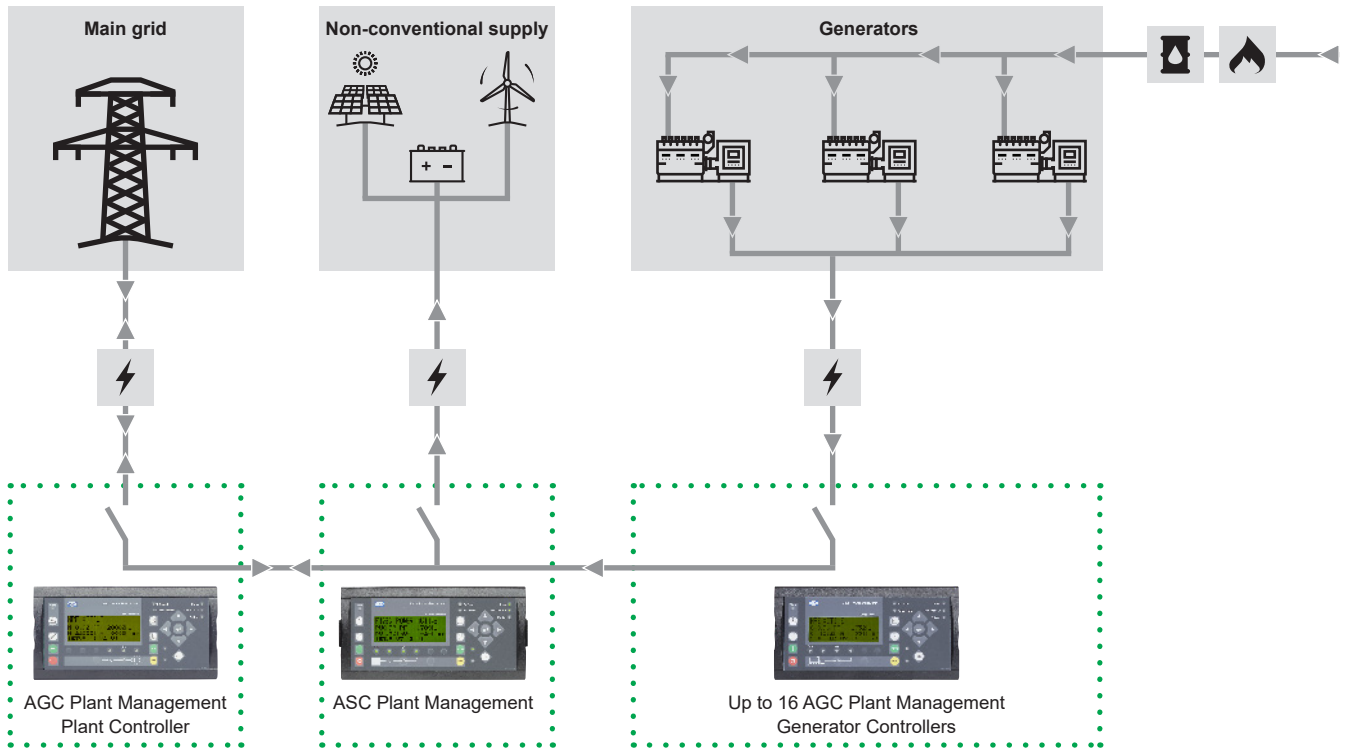
The main advantage of this system is that the combination of inter-communicating generator controllers, grid controllers, bus tie breaker controllers, and consumer group (load) controllers provides a fully automated control, not only over grid supply and generator supply (power management) but also over consumer groups (outgoing feeders).

Using a pre-defined order of connection and disconnection of consumer groups, less important groups can be disconnected and re-connected based on the power available, and thereby more important consumer groups can remain online without being affected by power cuts.

This combination of intelligent controllers removes the need for using and programming PLC systems for load group controls.

Automatic

Island control of solar cells/battery bank/wind turbine



Conventional generators combined with solar cells/battery banks/wind turbine

The ASC PM interfaces with the inverters of the non-conventional generator supply to create systems that allow conventional generators to run in parallel with non-conventional supply: PV (solar), a battery or a wind turbine system for instance.

The non-conventional supply (NCS) is handled as a base loading power and reactive power provider, not as a voltage and frequency provider. This means, the ASC PM only operates the NCS when either utility or a genset constitutes a grid ready to receive power.

The maximum capability of stand-alone applications is 16 gensets, one mains and one NCS plant.

The ASC PM is fully integrated in the DEIF Application Configuration and SuperVision PC tool for DEIF Power Management Solutions. The DEIF power management system fully integrates the NCS plant and the conventional genset plant. The ASC PM can control pure off-grid, pure grid-tied, or a combination of the two.

Relevant controllers



Also consider these products



Ground-breaking solution in hybrid

Slashing operation costs, maintenance & emissions

This solution shares the load between solar PV group and diesel gensets with or without presence of utility power.

Sharing load between groups

Working with India's largest integrated solar company, DEIF India recently commissioned a 3.6 MW project with DEIF's Automatic Sustainable Controller, ASC Plant Management: a ground-breaking solution for systems with utility, diesel and solar power sources.

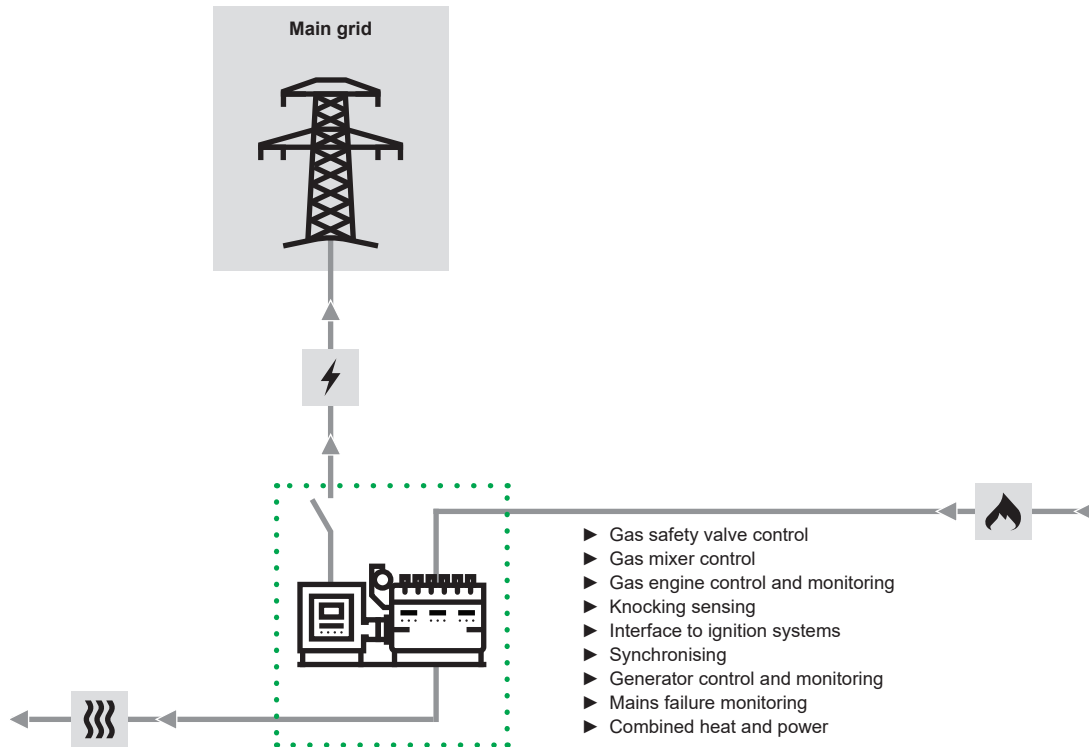
The end customer wanted to use solar power even in the absence of utility supply. Backup power was delivered by diesel gensets and the solar systems were to be designed to supply power along with the diesel gensets, sharing the load between the two groups.

An inappropriate design could cause burning of excess diesel by the genset, while a varying load could cause an inadvertent reverse power in the genset.

The ultimate goal of the solution was to enable the customer to share the load between the solar PV group and the diesel genset with or without presence of utility power with maximum solar penetration, thus maximising savings even during utility failure.

Gas engine driven generator control

Complete control & protection



Automatic control and protection

Compliant with European ENTSO-E grid protection codes, GPU-3 Gas is a multi-functional generator protection relay, while the GPC-3 Gas combines the GPU-3 Gas generator protections with synchronising, load sharing, fixed power, var, and power factor control.

AGC-4 Gas is a complete controller for smaller gas engine generators, combining the GPC-3 Gas functions with gas mixer and CHP control.

DM 400 Gas is the most sophisticated controller in the family, particularly suited for retrofitting of control and monitoring systems on gas engine generators from 500 kW and up. Because it interfaces with existing gas mixer and ignition systems, combined with the advanced knocking detection provided by the AKR 3 installation on existing sets offers a 1:1 conversion of the control system.

DVC 310 is an Automatic Voltage Regulator (AVR) which offers unsurpassed abilities to control a generator set through grid failure situations. AGI 300 is a family of easy-to-use graphical touchscreens of various sizes.

Relevant controllers



DM 400 Gas



AGC-4 Gas



GPC-3 Gas



GPU-3 Gas

Also consider these products



AKR 3



DVC 310



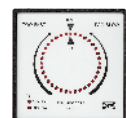
AGI 300



RMC-142D



MDR-2



CSQ-3

Power control for a 25 MW gas power plant

Sotreq chose reliability, protection levels, & easy operation

Sotreq



»The AGCs have been vital in ensuring optimum generator operation at all times and ultimately help us provide a more sustainable and reliable energy supply.«

Mauricio Garcia
Engineer Manager
Sotreq

Turning waste into gold

In the São Paulo district of São João, plastic pipes worth gold channel filtered landfill gas for the generators at a nearby 25 MW gas power plant.

Produced by the landfill waste and collected in a number of gas wells distributed across the 80 hectare 500 ft. landfill areas, the biogas is transported from the wells through the pipes to the on-site gas treatment facility located on the top of the landfill mountain.

Here the foul-smelling gas is cooled and the vapour that would otherwise clog the gas pipes and damage the machines later in the treatment process is removed.

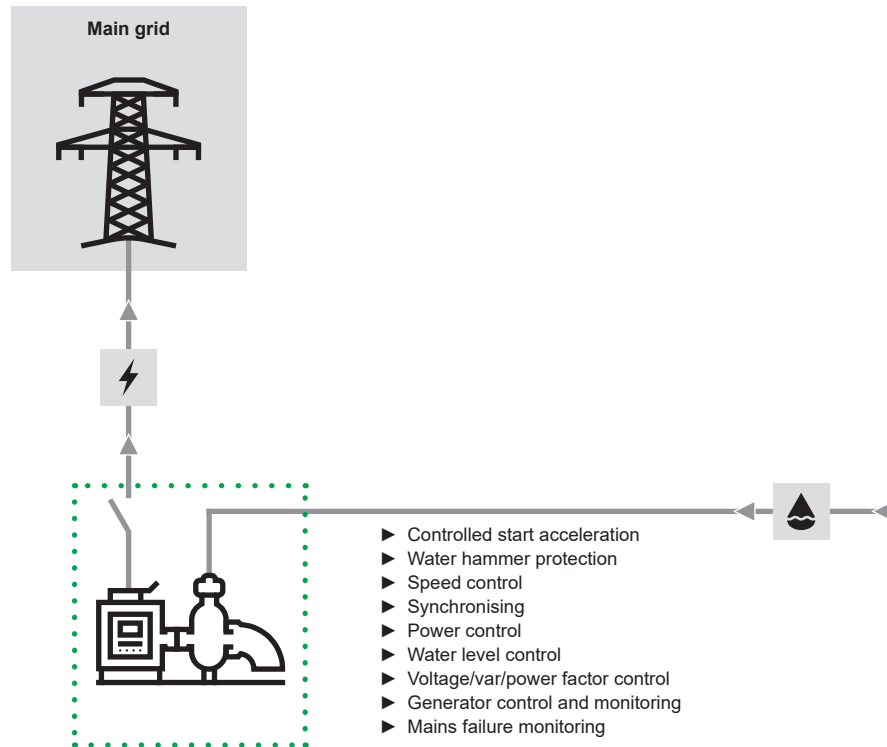
Equipped with 16 × 1.54 MW gensets and Caterpillar G3520C engines supplied by Sotreq, Brazil's biggest Caterpillar dealer, the plant features a DEIF power control system of AGC Automatic Genset Controllers.

Sotreq

Sotreq is a Caterpillar dealer with expertise in the fields of construction, mining, energy, oil and gas. Serving the Southeast, Center-west, north and northeast of Brazil, Sotreq provides CAT machinery, equipment, spare parts, and support.

Hydro turbine driven generator control

Complete control & protection



Automatic control and protection

The DEIF solutions for hydro turbine driven generators range from pure generator protection with GPU-3 Hydro to complete turbine, generator and auxiliaries control, e.g. hydraulic power pack control, lubrication, cooling etc., using GPC-3 Hydro and DM 400 Hydro.

DEIF offers standardised systems for the most common turbine types, Francis, Kaplan, and Pelton, but can supply control solutions for all types.

- ▶ Hydro turbine controller for parallel with mains or stand-alone generator
- ▶ Valve controls (main/drain/fill)
- ▶ Water level control
- ▶ Relay or analogue output, including proportional valve control, for speed/power control
- ▶ Turbine control, protection and supervision
- ▶ Generator control, protection and supervision
- ▶ Generator excitation control, with or without DEIF AVR, the DVC 310

Relevant controllers



DM 400 Hydro



GPC-3 Hydro



GPU-3 Hydro

Also consider these products



DVC 310



AGI 300



RMC-142D



MDR-2



CSQ-3



CIO 116

Automated hydro turbine control

Complete Retrofit of a Kaplan Hydro Turbine Plant



»DEIF's complete control and protection solution has automated and optimised daily operations.«

Thomas Kvist, CEO
Kvånum Energi



Automatic operation increases output

Cooperating with electrical engineering company Caverion in October 2015, DEIF developed and installed a complete retrofit solution including new cabling and switchboards for a new turbine and generator. These were fitted with a customised plant control solution containing the Delomatic 400 hydro plant controller, an AGI 307 HMI display and a range of analogue instruments.

The system solution cuts installation costs significantly compared to systems that require multiple units to provide synchronisation, protection and PLC functionality. Moreover, it offers fully automated control for stable and optimised operation and requires less maintenance.

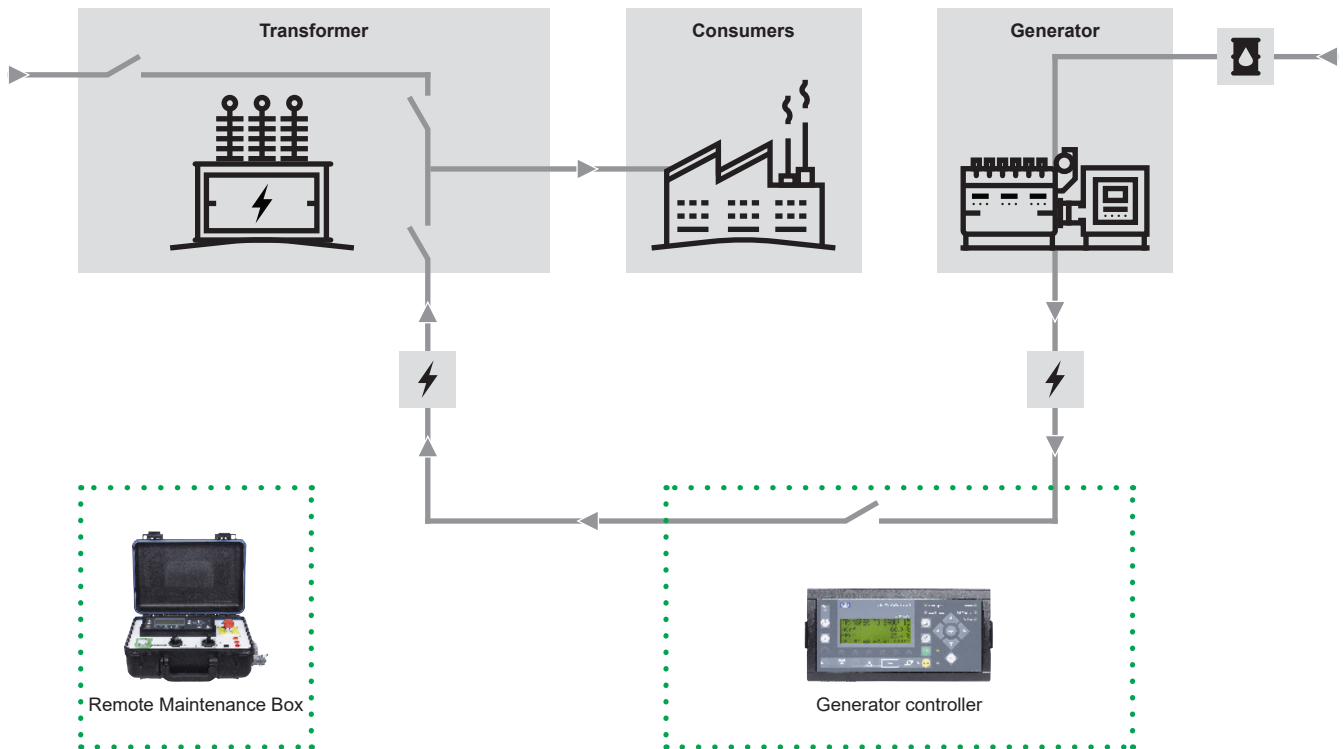
Critical functions such as speed governing, generator protections and synchronising are fully integrated with password-protected features for maximum security.

Halla Kraft

Constructed in 1956, rebuilt in 1987 and most recently in 2015, the Halla Kraft hydro power plant is fitted with one Kaplan 500 kW turbine, producing approximately 2 GWh per year. The plant is one of nine hydro power plants at the river Lidån and it is owned by Swedish Kvånum Energi. More than 1,000 hydropower plants account for roughly 50 % of Sweden's accumulated electricity production today.

Transformer maintenance

Maintenance without loss of power



Remote Maintenance Box control of a mobile generator

DEIF's Remote Maintenance Box (RMB) is a remote management tool for the safe maintenance at transformer substations or other electrical installations and operation in scenarios that require the interface/operator panel to be located close to the connection points.

The solution enables you to service your substation without interrupting the power supply to your customers and limits exposure to risks. Operation is extremely simple and service easy with both visual and audible indication guides alerting you the moment the generator is in phase with the mains, making it safe to reconnect the fuses.

Features

- ▶ Safe interruption of transformer substations
- ▶ Handles load jumps during synchronisation
- ▶ Voltage remains stable during load jumps, with max 2 % deviation
- ▶ Static synchronisation using phase, frequency and voltage control

Relevant controllers



RMB



AGC-4

Upgrading & enabling rental customers

DEIF's user-friendly solution strengthens business cases

Energyst



»DEIF's knowledge, combined with the technology of the AGC-4 and the RMB, has enabled Energyst to really move forward«

Joost van Driel
Energyst Cat® Rental Power

Moving forward

When Energyst Cat® Rental Power decided to upgrade 12 rental gensets, DEIF's role was crucial to the project's success according to Tactical Application Manager, Joost van Driel.

»DEIF's thorough understanding of the rental market and various applications was extremely useful to us«, the senior manager acknowledges.

»Their knowledge, combined with the technology of the AGC-4 and the RMB, has enabled us to really move forward«, he says.

Mr Van Driel oversaw the entire modernisation process of the 12 rental gensets. In his expert opinion, the units have become much easier to operate since the upgrade, including for customers who can now operate their rental units without assistance from Energyst's engineers.

Using the push-buttons next to the display on the AGC-4 unit, even relatively inexperienced operators can add and remove gensets according to preference.

Energyst

is a CAT Rental Company for power generation and temperature control.



Product overviews

Intro

Leading the way in land power technology

DEIF Land Power's extensive product portfolio is one of the most comprehensive on the global markets for land-based power generation, ranging from quality analogue relays and cost-effective single and multi-function controller platforms to engineered solutions for hybrid plants, critical emergency power installations and the IPP and rental businesses. 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 year 2000 Multi-Line 2, multi-function controller platform and, in 2004 and 2006, the ground-breaking introductions of the Delomatic 4, engineered controller platform and the Multi-Line 2 protection and power management range.

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.

Product overviews index

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Land power controllers

Overview

Diesel



CGC 200



CGC 400



GC-1F



AGC 100



GPU-3



GPC-3



AGC 200



AGC-4



AGC Plant Management



AFC Plant Management



ATC Plant Management



ALC Plant Management



DVC 310

Gas



AKR 3



GPU-3 Gas



GPC-3 Gas



AGC-4 Gas



DM 400 Gas



DM 400 Bio

Hydro



GPU-3 Hydro



GPC-3 Hydro



DM 400 Hydro

Hybrid



ASC Plant Management

Synchronisation & load sharing

Overview

Visual synchronisation for synchronising generators to busbar



CSQ-3



RSQ-3

Synchronisation of a generator to the busbar and closing of its circuit breaker



FAS-113DG



FAS-115DG



HAS-111DG

Load sharing between generators and interfaces to a governor



LSU-112DG



LSU-113DG



LSU-114DG



LSU-122DG

Potentiometers for control of electronic speed governors



EPQ96-2



EPN-110DN

Analogue instruments for synchronising applications



2FQ



2FTQ



2EVQ



2EQ



NEQ

Protection

Overview



MDR-2



RMV-112D



RMV-122D



RMV-132D



RMV-142D



RMF-112D



RMC-111D



RMC-121D



RMC-131D



RMC-132D



RMC-142D



LMR-111D



LMR-122D



RMP-111D



RMP-112D



RMP-121D



RMQ-111D



RMQ-121D

Switchboard equipment

Overview

Battery charger, 12 or 24 VDC and 5 or 10 A output



DBC-1

DC power supply, up to 40 A output



DCP2

Transducers for AC measurements



TAS-311DG



TAS-321DG



TAS-331DG



TAV-311DG



TAV-321DG



TAC-311DG



TAC-321DG



MTR-3

Multi-instrument for AC measurements and power analysis



MIB



MIC



MIC-2 MKII



MIC-2 MKII DIN

Insulation monitoring for AC and DC networks



AAL-2



SIM-Q



ADL-111Q96

Switchboard equipment

Overview

AC voltage and Current with 90 pointer



EQ

AC/DC current and voltage with 90 or 240 pointer



DQ



VDQ

Meters for power, frequency and power factor



WQ



FQ



FTQ



PFQ

AC/DC voltage and current with switch



EQ96-sw4



EQ96-sw7



VDQ96-sw

Bimetallic and combined meter



BQ



BEQ

Meters for DIN mounting



D45



E45



B45

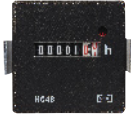
Switchboard equipment

Overview

Running Hours Counters



HC36/24



HC48

Measuring Transformer for cable and/or busbar



ASR



ASK



KBU

Protection transformer for cable or busbar



SASR



SASK

Primary Winding Transformer



WSK

Summation of 2 to 8 transformers



KSU



SUSK

Shunt Resistor provides a millivolt output



Shunt resistors

Plant design, commissioning & monitoring

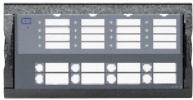
Overview



Emulation Solution



USW-3



AOP



AGI 300



RMB



Remote Gateway



CIO 116



CIO 208



CIO 308

Land power controllers

Intro

DEIF Land Power's award-winning and innovative controllers 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, engineered Power Management System solutions.

As a rule, DEIF's 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.

Land power controllers index

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Compact Genset Controller, CGC 200

Basic quality unit for OEMs & standby applications



The Compact Genset Controller (CGC 200) is a cost-competitive but high-quality controller range for standby applications.

The microprocessor-based control units have been created to meet the requirements of the OEM industry and feature manual or auto start, protection and control of engines and gensets.

The CGC modules monitor engine speed, frequency, voltage, and engine running hours, as well as warning and shutdown status of the engine or genset.

The controller is a highly versatile product with both fixed and flexible user-configurable inputs and outputs, enabling users to adapt the unit for a wide range of applications.

CGC 200 features

- ▶ Auto start and breaker control
- ▶ Engine parameter monitoring
- ▶ Warning or shutdown protections
- ▶ 5 Digital Inputs and 5 Outputs
- ▶ Configurable for other applications
- ▶ Configurable with DEIF Utility Software, USW-3
- ▶ Readings: engine speed, frequency, voltage, engine running hours



Compact Genset Controller, CGC 400

The cost-competitive solution with full flexibility



The Compact Genset Controller (CGC 400) is a cost-competitive but high-quality controller range for standby applications.

The microprocessor-based control units have been created to meet the requirements of the OEM industry and feature manual or auto start, protection and control of electronic and non-electronic gensets, as well as Automatic Mains Failure (AMF).

The CGC modules monitor engine speed, frequency, voltage, and engine running hours, as well as warning and shutdown status of the engine or genset.

The controller is a highly versatile product with both fixed and flexible user-configurable inputs and outputs, enabling users to adapt the unit for a wide range of applications.

CGC 400 features

- ▶ Auto start or Automatic Mains Failure applications
- ▶ Monitoring of electronic (J1939) or non-electronic engines
- ▶ Genset and busbar control and protection
- ▶ Up to 13 digital, 5 analogue inputs and 8 relay outputs
- ▶ Modbus communication RS-485
- ▶ Configurable for other applications
- ▶ Configurable with DEIF Utility Software
- ▶ Graphical display (multi-language)



Genset Controller Flat, GC-1F

Complete diesel engine protection & control



The Genset Controller Flat (GC-1F) is a micro-processor based control unit featuring complete functionality in diesel engine protection and control.

The unit contains a 3-phase AC voltage measuring circuit for genset and mains and is equipped with a graphical display presenting all values and alarms.

The GC-1F can be supplied with a number of different options, and the robust hardware is suitable for applications ranging from emergency power to power plants. That means costs saved on training and maintenance.

Using a modem or AOP-2 (a remote annunciator), you can control or monitor gensets remotely with the RS-485 Modbus.

GC-1F features

- ▶ Auto start or Automatic Mains Failure applications
- ▶ Monitoring of electronic or non-electronic engines (J1939)
- ▶ Genset/Busbar control and protection
- ▶ 8 digital inputs, 3 multi-inputs (digital or analogue) and 8 relay outputs
- ▶ Modbus communication RS-485
- ▶ Configurable with DEIF Utility Software
- ▶ Graphical display (multi-language)
- ▶ Programmable logic (M-Logic)
- ▶ Additional Operator Panel (AOP-2)
- ▶ External I/O (option)
- ▶ ATS controller option

GC-1F type approvals



Automatic Genset Controller, AGC 100

Designed for backup & emergency power applications



Developed for applications where safe and reliable power supplies are critical, DEIF's series of non-sync controllers offers a powerful processor and significant memory capacity.

Cost-efficient and intelligent, the versatile AGC 100 series features CAN bus power management for handling non-synchronised mains and Power Management System applications where multiple gensets supply load.

AGC 100 options

- ▶ AGC 110: engine control
- ▶ AGC 111: island control
- ▶ AGC 112: island control with generator breaker
- ▶ AGC 113: automatic mains failure (AMF)
- ▶ AGC 145: non-sync power management
- ▶ AGC 146: non-sync power management with tie breaker

AGC 100 features

- ▶ Auto start or Automatic Mains Failure applications
- ▶ Monitoring of electronic or non-electronic engines (J1939)
- ▶ Genset/Busbar control & protection
- ▶ 6 digital inputs, 3 multi-inputs (digital or analogue) and 8 relay outputs
- ▶ Modbus communication RS-485
- ▶ Configurable with DEIF Utility Software
- ▶ Graphical display (multi-language)
- ▶ Programmable logic (M-Logic)
- ▶ Additional Operator Panel (AOP-2)
- ▶ External I/O (option)
- ▶ Display parameter setup (multi-language)
- ▶ Non-sync power management
- ▶ Emulation for fast training and I/O test

AGC 100 type approvals



www.deif.com

Generator Protection Unit, GPU-3

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 back-up 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 back-up on shut-down channels
- ▶ Engine control and communication

GPU-3 type approvals



Generator Paralleling Controller, GPC-3

Versatile unit for application programming In PLC



The GPC-3 is a highly versatile and compact generator paralleling controller designed for engineers who prefer to carry out application programming in a PLC.

A multi-function component, the GPC-3 features protection, measurements, engine control and engine protection and communicates with all PLC and SCADA systems. Values and alarms are displayed on a large LCD screen.

Its simplicity and logic makes it the ideal controller for PLC-based power management systems.

The M-Logic configuration tool makes it possible to customise the application and dedicate specific functions or logic conditions to different inputs and outputs.

GPC-3 is easily compatible with additional display units and Additional Operator Panels (AOPs) for remote control, supervision and status indication.

GPC-3 features

- ▶ Synchronisation/Load sharing
- ▶ Mains/Generator/Engine protection
- ▶ Programmable logic (M-Logic)
- ▶ Engine protection with back-up on shut-down channels
- ▶ Governor and AVR control
- ▶ J1939 engine com/mirrored Modbus/Profibus/TCP/IP
- ▶ Multiple display units
- ▶ Additional Operator Panels
- ▶ Genset and busbar control and protection

GPC-3 regulation modes

- ▶ Load sharing
- ▶ Fixed frequency
- ▶ Fixed power
- ▶ Frequency droop

GPC-3 type approvals



www.deif.com

Advanced Genset Controller, AGC 200

Cost-effective & scalable controller platform



DEIF Advanced Genset Controller, AGC 200, meets and surpasses OEM needs for synchronisation. A cost-effective, compact, scalable and all-in-one product, the AGC 200 comes in several variants.

The advanced controller series integrates all necessary functions for genset protection and control, stands out for its reliability and operator-friendliness, and features patent-pending DEIF Emulation to speed up design, testing and commissioning, saving man hours and costs.

Applying asymmetric load sharing to ensure optimal load on the genset, the AGC 200 also cuts operating costs and reduces harmful emissions. With temperature-dependent cooling, the AGC 200 arrests cooling at pre-programmed cool-down temperatures and features automatic priority selection, setting the optimum combination of gensets for optimised fuel consumption.

AGC 200 options

- ▶ AGC 212: single genset in island operation
- ▶ AGC 213: single genset for automatic mains failure operation
- ▶ AGC 222: multiple genset with advanced power management in plants up to 16 generators (limited I/O)
- ▶ AGC 232: multiple genset in island applications with digital load sharing
- ▶ AGC 233: single genset for automatic mains failure, peak shaving, load take over and mains power export operation
- ▶ AGC 242: multiple genset with advanced power management in plants up to 16 generators
- ▶ AGC 243: control of single or multiple gensets
- ▶ AGC 244: bus tie breaker
- ▶ AGC 245: mains breaker control
- ▶ AGC 246: mains and tie breaker
- ▶ AGC 252: multiple gensets with advanced power management in plants up to 256 generators
- ▶ IOM 200: analogue interface for AGC 200 family

AGC 200 features

- ▶ Multiple operating modes in one software
- ▶ Synchronisation of up to 56 breakers in one plant
- ▶ Multi-master power management
- ▶ Load-dependent start and stop
- ▶ Load management
- ▶ Priority selection (manual, relative running hours, absolute running hours, fuel optimisation)
- ▶ Compatible with your existing AGC-3 and AGC-4 gensets
- ▶ User-programmable logic (M-Logic)
- ▶ Configurable inputs/outputs
- ▶ Engine, generator and load protection
- ▶ Voltage measuring range: 50 to 690 V AC (UL/cUL Listed 50 to 600 V AC)
- ▶ J1939 engine communication, supporting 11 different engine brands with the ability to easily handle other engine brands
- ▶ Readout of engine diagnostics in clear text
- ▶ Remote control via high speed TCP/IP, RS-485 Modbus or GSM modem
- ▶ High speed USB connection
- ▶ Multi-language interface
- ▶ -40°C operation temperature
- ▶ IP66 protection
- ▶ Lifetime logging stored on SD card

AGC 200 type approvals



www.deif.com

Automatic Genset Controller, AGC-4

The world's most comprehensive & robust genset controller



DEIF's Automatic Genset Controller (AGC-4) is the most comprehensive and flexible power management and protection unit on the market today. A further development of DEIF's AGC-3, the new generation controller is fully compatible with its predecessor and has been designed to allow for easy, intuitive, and smooth switch-overs for those looking to upgrade.

Suitable for a wide range of applications, the AGC-4's standard sequences include back-up power, start/stop, synchronisation, and load sharing.

The AGC-4 is simple to incorporate into both new and existing designs, customising the application to fit your needs, for instance dedicating specific functions or logic conditions to different inputs and outputs.

Technologically sophisticated, the AGC-4 is also the world's most robust power management controller, successfully tested to maintain reliability and durability in extreme weather and hazardous conditions. Approvals include TÜV and UL.

Patent-pending Emulation

A standard in the Automatic Genset Controller, AGC-4, using DEIF's Emulation Solution, all you need to do to perform a complete test of your Power Management Systems is turn on your controller and connect communications.

The Emulations Solution's focus on exact reproduction of behaviour improves your planning, commissioning 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.

Remote communication and control

The AGC-4 supports serial communication protocols including Modbus (RS-485, USB, and TCP/IP) and Profibus. This feature allows you to supervise and control your genset/plant from a remote location and minimise downtime or take immediate action on genset alarms or warnings.

AGC-4 features

- ▶ Multiple operating modes in one software
- ▶ Synchronisation of up to 56 breakers in one plant
- ▶ Multi-master power management
- ▶ Load-dependent start and stop
- ▶ Load management
- ▶ Emulation for fast training and I/O test
- ▶ Hot Standby – change to backup genset controller on the fly
- ▶ Close Before Excitation – synchronisation in less than 10 seconds

AGC-4 type approvals



www.deif.com

Automatic Genset Controller, AGC Plant Management

Fuel-optimised Plant Management for up to 992 gensets



Awarded Project/Initiative of the Year at the 2012 IPEE/Power Industry Awards in the United Kingdom, DEIF's ground-breaking AGC Plant Management solution controls systems of up to 16 grids and 992 generator breakers. Tried and tested at locations in Africa, Asia, and South America, AGC Plant Management solutions have been developed not just with an eye for safety but for fuel saving and optimised maintenance intervals. The system introduces fan control, black starts in both island and fixed power mode, and asymmetrical load sharing designs to cut running costs. Lifting genset control from single units to plant level, easily enabling comprehensive control and protection for large setups from one central point of intelligence, AGC Plant Management incorporates plant power and power factor control at connection points, load profile priorities routines and much more.

Cost-optimised design

The comprehensive AGC Plant Management solution uses the plant's generators to black-start large step-up transformers directly. With a proven ratio of up to 1:39 between the generator and the transformer, the solution cost-optimises black-start of plants in both island and fixed power mode, limiting the need for high voltage breakers. With a dedicated plant communication structure, SCADA systems are kept separate from the control system, limiting on-site installation to a minimum.

Reduced fuel consumption

Another key feature of the solution fixes the generators at their preferred fuel-optimised power set point. If an engine fails, the system will use the spinning reserve from operating generators until a new generator starts up.

Grid support

Designed to monitor and detect grid abnormalities automatically, the AGC Plant Management system can reduce the amount of power produced to the grid in case the grid frequency rises. These functionalities are also useful for reducing the amount of kvar passed on to the next upstream transformer: as the upstream transformer current declines, the transformer's load performance will improve.

AGC Plant Management features

- ▶ Fully scalable multi-master system of up to 992 gensets
- ▶ Simple graphical configuration
- ▶ Easy control from one central point of intelligence
- ▶ Cost-optimised design
- ▶ Reduced fuel consumption
- ▶ Grid support
- ▶ Monitoring and supervision
- ▶ Emulation Solution – uses and verifies the functions of the real system for test, production and design



www.deif.com

Automatic Fuel Controller, AFC Plant Management

Maximise & monitor your tank capacity automatically



Designed to control fuel logistics in liquid fuel-fired power plants, DEIF's Automatic Fuel Controller (AFC Plant Management) is an automated, safe and reliable control solution with new and innovative features. Based on the idea of controlling larger numbers of smaller, decentralised fuel tanks rather than one large central fuel tank, the AFC Plant Management solution concept makes moving and commissioning your genset fleet as well as your fleet of fuel tanks more flexible and dynamic.

Safe truck unloading and tank levelling

In fuel transfer mode, the system can be pressurised to move fuel from the truck into the tanks. The system automatically monitors the tanks and stops pumps/valves when all tanks are filled to their maximum capacity. During refuelling, fuel is levelled between the tanks to equally share fuel between all operating gensets, raising the tanks' operating capacity until the process has been completed.

Maximise tank capacity with intelligent management

Usually, tank inventory systems automatically stop filling at 80 % to avoid problems with fluctuating fuel volume depending on changes in temperature. Maximising tank inventory intelligently, DEIF's Automatic Fuel Controller solution increases capacity by at least 10 % for the same type of tanks without compromising safety.

Automated day tank filling

The Tank Controller manages the integrated fuel pump and fuel transfers from tanks to the connected generators' day tank(s). When integrated with AGC Plant Management, the genset controller automatically stops fuel transfer to generator if day tank levels do not increase.

Complete inventory data

The system handles level inputs in the tanks, including simple resistive measurements and fuel levels determined by pressure. For reading and comparing the inventory, fuel temperature can also be measured for temperature-independent inventory value just as inventory and volume can be seen and displayed in actual values.

AFC Plant Management features

- ▶ Fully scalable multi-master system of up to 256 fuel tanks
- ▶ Simple graphical configuration
- ▶ Safe truck unloading
- ▶ Tank levelling
- ▶ Maximise Tank Capacity
- ▶ Automated day tank filling
- ▶ Complete inventory data
- ▶ Monitoring and supervision
- ▶ Emulation Solution – uses and verifies the functions of the real system for test, production and design



Automatic Transformer Controller, ATC Plant Management

Supervise electrical & temperature statuses & alarms



DEIF's Automatic Transformer Controller (ATC Plant Management) is a combined protection, HV breaker and transformer logic controller.

The controller handles all electrical and temperature protections and features status and alarm handling. Because all relevant data and statuses are available with TCP/IP communication, the ATC Plant Management can easily be integrated as part of a SCADA system. The ATC Plant Management also features built-in energy-saving transformer cooling logic to reduce parasitic loads in the plant.

Programmable tap setting

The ATC Plant Management can handle up to 50 different tap settings. Each tap setting can be programmed individually with the electrical alarm values following the settings.

Energy-saving transformer cooling

Rather than overcooling the transformer with a fixed airflow, the ATC cooling system automatically adapts to actual cooling requirements, saving energy and money.

Plant Management System solutions

For better performance, avoiding trips and increasing safety because the system blocks unauthorised operator interaction, the ATC can be successfully integrated with DEIF's AGC Plant Management solution. Extra automation features include automatic derate of production to avoid transformer overheating and automatically locking the generators when transformer protection is activated.

ATC Plant Management features

- ▶ Simple graphical configuration
- ▶ Protections, breaker handling and transformer Logic
- ▶ Programmable tap settings
- ▶ Energy-saving transformer cooling
- ▶ Plant Management System solutions
- ▶ Monitoring and supervision
- ▶ Emulation Solution – uses and verifies the functions of the real system for test, production and design



Automatic Load Controller, ALC Plant Management

Control feeder breakers & automatically connect or disconnect consumers



The ALC Automatic Load Controller is an integrated part of the power management system.

When placed in a section of the system, the ALC is capable of controlling up to 8 consumer feeder breakers. One system can hold up to 16 ALC units, giving the possibility to control up to 128 feeder breakers.

For each feeder breaker, the control can be based on a fixed power consumption value for the consumers connected to the feeder, or it can be based on a power measurement feeding a 4-20 mA signal into the ALC unit.

Based on the power calculation in the system, the ALCs can automatically connect and disconnect consumers in a pre-determined order. This means that if a generator is tripped, the system will calculate the power flow and disconnect the necessary number of consumer feeders in order to prevent plant overloading.

If a generator has been taken out and is made available again, the system calculates if the generator is necessary to feed the system. If so, the generator is started and, when online, the consumer feeders will connect.

ALC Plant Management features

- ▶ Control up to 8 consumer feeder breakers and 128 feeder breakers
- ▶ Automatically connect or disconnect consumers in a pre-determined order
- ▶ Measurement based on fixed or actual power consumption
- ▶ Prevents plant overloading
- ▶ Automatic generator reconnection



Digital Voltage Controller, DVC 310

Improve your genset performance



Designed for alternators with SHUNT, AREP or PMG excitation, DEIF's Digital Voltage Controller, DVC 310, is a digital automatic voltage regulator, which monitors and regulates the alternator output voltage. The controller can improve genset performance, delivering up to a 10 % increase of load impact capability and is suitable for any application in the critical power, IPP and rental segments. Critical power applications in particular will benefit from the improved control on the Close Before Excitation sequence, increasing safety & allowing faster start-up.

No generator oversizing required

Due to high inrush currents during start-up, generators for electric motor starting and transformer magnetisation are often oversized by up to 200%. Featuring inductive motor starting and magnetisation boosting, DEIF's DVC 310 reduces oversizing requirements to a minimum.

Increased performance

Compared to analog AVR's, DEIF's Digital AVR handles larger load-steps within the same frequency/voltage boundaries. Typically, the gensets will accept 10% additional nominal load. With the embedded help features, this increases performance.

Protect your generator from humidity

Condensation build-up during idle time is a common problem in tropical climates. With its dedicated ventilation mode, the DVC 310 removes humidity in windings using the alternator fan and only allows for power generation when it is safe to do so.

Genset control solution

The DVC 310's built-in J1939 based communication offers an exclusive communication channel to DEIF's advanced controllers. Providing a high number of alternator data for display, broadcast or predictive maintenance, this feature is unique on the market. Using CAN bus-based communication for voltage regulation reduces the potential number of failure sources. Use the DVC 310 together with our, AGC-4, AGC 200 or GPC-3 controllers to maximize your benefits.

DVC 310 features

- ▶ Start management capability with start on threshold, soft start, and Close Before Excitation (CBE) functions
- ▶ Voltage regulation accuracy +/-0.25 %
- ▶ Optimise genset performance and size using exclusive engine help functions (load acceptance module, negative forcing, U/f, soft voltage recovery and stator current limitation)
- ▶ Exclusive drying and ventilation mode
- ▶ Voltage regulation via CAN bus
- ▶ Increase accuracy of settings
- ▶ Consistent control of regulation loops



www.deif.com

Anti Knocking Regulator, AKR 3

Eliminate knocking tear & wear on your gas engine



DEIF's Anti Knocking Regulator (AKR 3) is a state-of-the-art unit with knocking sensing based on single cylinder detection.

For correct knocking sensing, the AKR 3 uses digital FFT (Fast Fourier Transformation) to break down vibration data into individual frequencies and individual levels.

The use of FFT enables the AKR 3 to create an engine "image", which represents the frequencies and levels produced by the normal engine state, including gear wheel noise, bearing noise, normal combustion noise etc.

Filtering the "image" frequencies precisely highlights knocking frequencies for monitoring and taking action when needed.

In combination with the DM 400 Gas and communication to the ignition system, the AKR 3 offers the possibility to control the ignition-firing angle for each individual cylinder and thereby prevent knocking without having to decrease the genset power output.

AKR 3 features

- ▶ Individual cylinder-knocking monitoring for up to 24 cylinders
- ▶ J1939 communication to controller
- ▶ Digital alarm outputs



Generator Protection Unit, GPU-3 Gas

Full generator protection package



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

The GPU-3 Gas 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.

For start/stop and protection functionalities, add the GPU-3 Gas engine control option, an engine interface card with separate power supply and independent microprocessor. In cases of GPU-3 Gas main processor failure, the engine interface card will activate its back-up mode to ensure uninterrupted engine supervision and automatic engine shutdown in case of shutdown alarm.

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 Gas features

- ▶ Generator/busbar protection
- ▶ Synchronisation
- ▶ Multiple display units and operator panels possible
- ▶ Engine control and communication

GPU-3 Gas type approvals



Generator Paralleling Controller, GPC-3 Gas

Designed for integration with PLC systems



The GPC-3 Gas is a highly versatile and compact generator paralleling controller designed for engineers who prefer to carry out application programming in a PLC.

A multi-function component, the GPC-3 Gas features protection, measurements, engine control and engine protection and communicates with all PLC and SCADA systems. Values and alarms are displayed on a large LCD screen.

Its simplicity and logic makes it the ideal controller for PLC-based power management systems.

The M-Logic configuration tool makes it possible to customise the application and dedicate specific functions or logic conditions to different inputs and outputs.

GPC-3 Gas is easily compatible with additional display units and Additional Operator Panels (AOPs) for remote control, supervision and status indication.

GPC-3 Gas features

- ▶ Mains/Generator/Motor protection
- ▶ The unique M-Logic, a simple configuration tool
- ▶ Engine protection with backup on shutdown channels
- ▶ Governor and AVR control
- ▶ J1939 engine com/mirrored Modbus/Profibus/TCP/IP
- ▶ Multiple display units and operator panels possible
- ▶ Additional Operator Panel (AOP)

GPC-3 Gas type approvals



www.deif.com

Automatic Genset Controller, AGC-4 Gas

Flexible genset control for small & medium-sized gas CHP plants



The AGC-4 Gas is a new flexible and scalable version of DEIF's award-winning AGC-4 controller developed to incorporate the standard model's wide feature range and dedicated engine controls and protections for gas systems.

When applied in connection with PLC-based CHP systems, the AGC-4 also controls MW-sized gas engine generator sets, but because the controller also features combined heat and power (CHP) functionality, this solution is an ideal choice for small and medium-sized gas-engine-driven CHP plants.

AGC-4 Gas supports serial communication protocols including Modbus (RS-485, USB and TCP/IP) and profibus, enabling you to supervise and control your genset/plant from a remote location, minimise downtime and take immediate action on genset alarms and warnings.

Because the AGC-4 Gas comes with a series of hardware and software options, it is compatible with all types of engine/generator/CHP configurations.

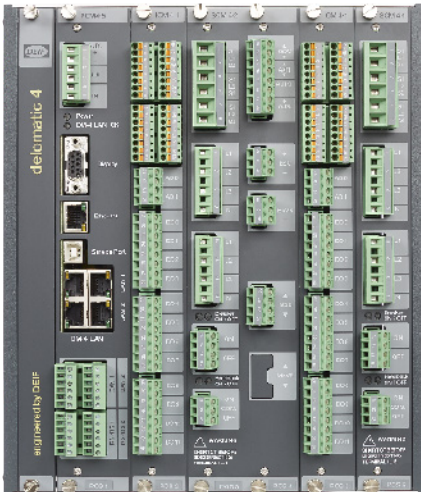
AGC-4 Gas features

- ▶ Gas engine start/stop sequences
- ▶ Gas mixer control (Lambda sensor or manifold p/T based)
- ▶ Parallel with grid operation
- ▶ Fixed power and Power Factor control
- ▶ Generator protections complying with international standards for parallel with grid protections
- ▶ Combined heat and power controls
- ▶ Heating circuit temperature-based power control
- ▶ Heating circuit temperature-based automatic start/stop
- ▶ CAN bus J1939 communication to engine controller and AVRs



Integrated Systems, DM 400 Gas

Fully automated operation without external controllers



Top of the range, DEIF's advanced Delomatic 400 Gas (DM 400 Gas) system is a comprehensive and versatile platform for controlling and monitoring all aspects of gas-engine-driven gensets up to full Combined Heat and Power (CHP) control, including valves, pumps and fans etc.

The DM 400 Gas controller is designed as a modular process control. It covers the special requirements for decentralised energy production plants with respect to reliability, robustness, flexibility, and remote accessibility.

The DM 400 Gas is typically used for Gas CHPs with combustion engines and generators for fully automated (unmanned) operation.

The unique integration combined with support from our gas competence centre results in a simple and very user-friendly installation and day-to-day operation of your gas CHP.

DM 400 Gas' high integration level eliminates the need for external controllers, making it a very cost-efficient solution.

DM 400 Gas features

- ▶ Gas engine and generator control, protection, synchronising and load sharing for both active and reactive power
- ▶ Mains protection including loss of mains detection
- ▶ Control of aux systems: gas mixture and gas circuit, air circuits/exhaust gas, cooling circuits/emergency coolers, heating circuits etc
- ▶ Emission control and communication to ignition system (Altronic CD200, Heinzmann Phlox 2 and others)
- ▶ PC touch interface including animated flow diagrams, log books and so on for easy supervision of the entire CHP (locally and remotely)

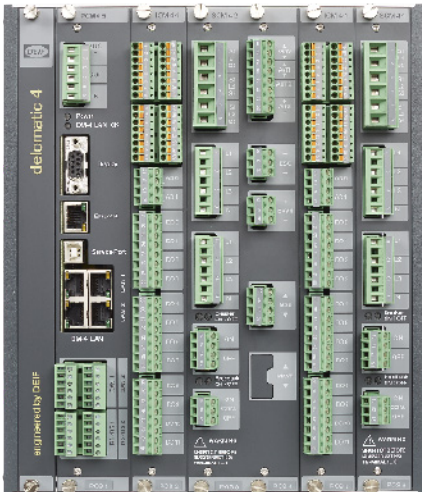
DM 400 Gas type approval



www.deif.com

Integrated Systems, DM 400 Bio

Fully automated operation without external controllers



The DM 400 Bio controller is designed as a modular process control. It covers the special requirements for decentralised energy production plants with respect to reliability, robustness, flexibility, and remote accessibility.

The DM 400 Bio is typically used for vegetable oil/bio oil CHPs with combustion engines and generators for fully automated (unmanned) operation.

The unique integration combined with support from our project managers results in a simple and very user-friendly installation and day-to-day operation of your CHP.

DM 400 Bio's high integration level eliminates the need for external controllers, making it a very cost-efficient solution.

DM 400 Bio features

- ▶ Bio oil engine and generator control, protection, synchronising and load sharing for both active and reactive power
- ▶ Mains protection including loss of mains detection
- ▶ Control of aux systems: fuel circuits/automatic change-over between fuel types, air circuits/exhaust gas, cooling circuits/emergency coolers etc
- ▶ Engine supervision including cylinder temperatures by direct thermocouple inputs
- ▶ PC touch interface including animated flow diagrams, log books, and so on for easy supervision of the entire CHP (locally and remotely)

DM 400 Bio type approval



www.deif.com

Generator Protection Unit, GPU-3 Hydro

Full generator protection package



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

The GPU-3 Hydro 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.

For start/stop and protection functionalities, add the GPU-3 Hydro turbine control option, a turbine interface card with separate power supply and independent microprocessor. In cases of GPU-3 Hydro main processor failure, the engine interface card will activate its back-up mode to ensure uninterrupted turbine supervision and automatic turbine shutdown in case of shutdown alarm.

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 Hydro features

- ▶ Generator/busbar protection
- ▶ Synchronisation
- ▶ Multiple display units and operator panels possible
- ▶ Turbine protection with back-up on shut-down channels
- ▶ Turbine control and communication

GPU-3 Hydro type approvals



Generator Paralleling Controller, GPC-3 Hydro

Designed for stand-alone or PLC solutions



The GPC-3 Hydro is a flexible and compact generator paralleling controller designed to be either the only controller in the system or to operate in conjunction with a PLC.

Especially suited as a single controller solution for micro and mini hydro plants, the GPC-3 Hydro also serves as a generator controller working as a slave for a power station PLC on hydro plants using digital communication.

The GPC-3 Hydro is a multifunction component and offers all functions needed for a modern hydro turbine generator controller. GPC-3 Hydro contains complete protections, measurements and turbine control and protection and can communicate with all PLC and SCADA systems. The GPC-3 Hydro displays values and alarms on a LCD screen.

DEIF's M-Logic configuration tool supports easy application customisation and enables you to dedicate specific functions or logic conditions to different inputs and outputs.

If you require remote control, supervision and status indication, additional display units and additional operator panels (AOPs) as well as graphical displays are easily installed.

GPC-3 Hydro features

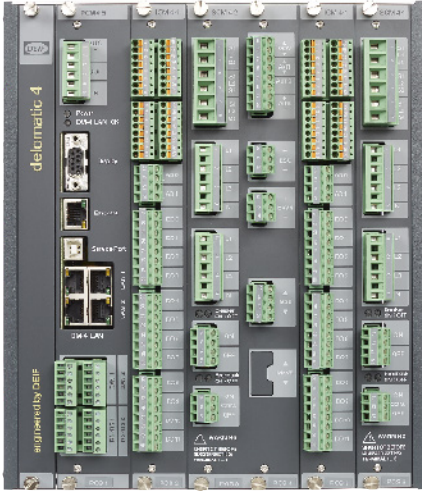
- ▶ Mains/Generator/Motor protection
- ▶ The unique M-Logic, a simple configuration tool
- ▶ Turbine protection with back-up on shut-down channels
- ▶ Turbine speed and AVR control
- ▶ Multiple display units and operator panels possible
- ▶ Additional Operator Panel (AOP)

GPC-3 Hydro type approvals



Integrated Systems, DM 400 Hydro

Fully automated operation for all turbine types



A customised solution, DEIF's integrated Delomatic 400 Hydro (DM 400 Hydro) system cuts installation costs significantly compared to systems that require multiple units to provide synchronisation, protection and PLC functionality.

DM 400 Hydro-controlled plants offer fully automated control for stable optimised operation and require less maintenance and fewer man hours.

The DM 400 Hydro is compatible with all types of turbines and flexible and easy to adapt with simple parameter settings.

Critical functions such as speed governing, generator protections and synchronising are fully integrated with password-protected features for maximum security.

Apart from valve control (main valve, drain valve, fill valve), turbine adaptation options include the following:

Francis and similar

Control of wicket gate, UP/DOWN digital commands or analogue for hydraulic proportional valves.

Kaplan

As Francis, plus control of runner pitch. The relation between wicket gate opening and runner pitch is a configurable curve laid into the DM 400 Hydro.

Pelton/Turgo

Configurable sequential control of multiple nozzle/spear valves. Control can be UP/DOWN digital commands or analogue. Control of deflector/bypass.

Other turbine types

The DM 400 Hydro can be adapted to all turbine types.

DM 400 Hydro features

- ▶ Hydro Turbine Controller for parallel with mains or stand-alone generator
- ▶ Valve controls (main/drain/fill)
- ▶ Water level control
- ▶ Relay or analogue output for speed/power control
- ▶ Turbine control, protection and supervision
- ▶ Generator control, protection and supervision

DM 400 Hydro type approval



Automatic Sustainable Controller, ASC Plant Management

A new link between PV & genset power plants



Serving as a link between photovoltaic (PV) power plants and genset power plants, DEIF's Automatic Sustainable Controller (ASC Plant Management) is a safe and reliable control solution for PV/genset hybrid plants.

Stand-alone and Power Management applications

In stand-alone applications, the ASC Plant Management knows little about the surrounding environment in which it is placed. Based on transducer power readings and hardwired feedbacks alone, the ASC Plant Management determines the PV plant power references. This approach is applicable for integrating PV power in already commissioned genset plants with or without DEIF controllers. Stand-alone applications support applications containing up to six gensets.

The DEIF Power Management system fully integrates the PV plant and the genset plant into a unity. The ASC Plant Management is connected to the CAN bus constituting the internal DEIF Power Management communication link. This requires your genset plant to be equipped with AGC Plant Management controllers from DEIF.

Maximising PV penetration

The ASC Plant Management automatically maximises PV penetration in all operation modes according to the total genset/PV hybrid's load demand without compromising constraints such as minimum genset load demand.

Minimum genset load in island operation

Minimum genset load constraint applies to island operation only. It causes the PV penetration to decrease if compromised. This secures a certain amount of load on the gensets, eliminating the risk of reverse power situations and impure combustion and exhaust problems.

Spinning reserve

Defined as a percentage of the PV plant power production, the spinning reserve ensures sufficient genset plant reserves to compensate for potential PV production decreases. Available for power management applications only.

ASC Plant Management features

- ▶ Fully integratable in AGC PM Power Management applications
- ▶ Support of SunSpec protocol
- ▶ Simple graphical configuration
- ▶ Maximising PV penetration
- ▶ Minimum genset load requirement
- ▶ Spinning reserve demand
- ▶ Monitoring and supervision
- ▶ Minimum genset load requirement
- ▶ Record time commissioning with DEIF Emulation – uses and verifies the functions of the real system for test, production and design



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.

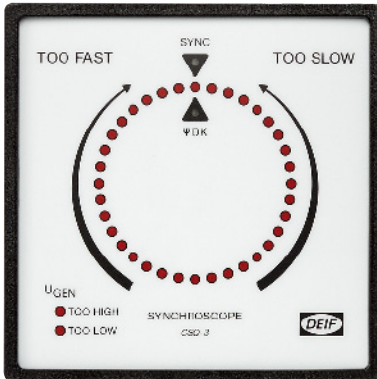
In static synchronisation, the synchronising genset runs at a speed close to the generator speed on the busbar. The aim is to let them run at exactly the same speed, and with the phase angles between the generator and busbar's 3-phase systems matching exactly.

Synchronisation and load sharing index

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Check Synchronising Relay, CSQ-3

Safe, simple & precise multi-function synchrosopes



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

CSQ-3 type approvals



www.deif.com

Read Synchroscope, RSQ-3

Safe, simple & precise single-function synchrosopes



The RSQ-3 is a microprocessor-based synchronising unit that gives visual indication of relevant values for synchronising generators to net (busbar).

The unit is suitable for all types of installation that require manual synchronisation.

RSQ-3 features

- ▶ Precision LED synchroscope
- ▶ High immunity to harmonic distortion
- ▶ DIN standard Q96 size

RSQ-3 type approvals



Synchroniser, FAS-113DG

Automatically synchronise your generator with voltage control



The FAS-113DG synchroniser is 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.

Part of the Uni-line product range, FAS-113DG 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.

FAS-113DG 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

FAS-113DG type approvals



www.deif.com

Synchroniser, FAS-115DG

Automatically synchronise your generator with voltage regulation



The FAS-115DG synchroniser is 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. Moreover, this synchroniser offers voltage regulation.

Part of the Uni-line product range, FAS-115DG 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.

FAS-115DG features

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

FAS-115DG type approvals



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Synchroniser, HAS-111DG

Manual or semi-automatic synchronisation



The HAS-111DG synchroniser is applied to check the synchronisation conditions. It can be used in installations requiring manual or semi-automatic synchronisation, like tie breakers.

The paralleling Uni-line relay transmits a synchronisation pulse when the phase angle, frequency and voltage deviations are within the set limits.

HAS-111DG also comes with two analogue outputs for regulating purposes with DEIF's Load Sharing Units.

HAS-111DG features

- ▶ Synchronisation of generator to busbar
- ▶ Setting of phase angle difference
- ▶ Setting of frequency and voltage difference
- ▶ LED indication of status
- ▶ LED for synchronising signal
- ▶ 35 mm DIN rail or base mounting

HAS-111DG type approvals



Load Sharing Unit, LSU-112DG

Standard load sharing



DEIF's Uni-line Load Sharing Unit, the LSU-112DG, provides standard load sharing 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, the LSU-112DG can control the power unit in stand-alone mode (performing frequency control) or parallel with other power units (performing frequency and power control).

The LSU-112DG has 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.

LSU-112D 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

LSU-112DG type approvals



Load Sharing Unit, LSU-113DG

Load sharing with reverse power protection & low power detection



DEIF's Uni-line Load Sharing Unit, the LSU-113DG, provides load sharing with reverse power protection and low power detection 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, the LSU-113DG can control the power unit in stand-alone mode (performing frequency control) or parallel with other power units (performing frequency and power control).

The LSU-113DG has 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.

LSU-113D 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

LSU-113DG type approvals



Load Sharing Unit, LSU-114DG

Load sharing & automatic start/stop outputs



DEIF's Uni-line Load Sharing Unit, the LSU-114DG, provides load sharing with automatic start/stop outputs 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, the LSU-114DG can control the power unit in stand-alone mode (performing frequency control) or parallel with other power units (performing frequency and power control).

The LSU-114DG has 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.

LSU-114D 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

LSU-114DG type approvals



Load Sharing Unit, LSU-122DG

Var load sharing with AVR control



DEIF's Uni-line Load Sharing Unit, the LSU-122DG, offers var load sharing with AVR control 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, the LSU-122DG can control the power unit in stand-alone mode (performing frequency control) or parallel with other power units (performing frequency and power control).

The LSU-122DG has 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.

LSU-122D 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

LSU-122DG type approvals



Electronic Potentiometer, EPQ96-2

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

EPQ96-2 type approval



Electronic Potentiometer, EPN-110DN

Manual or automatic control of electronic speed governors



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

EPN-110DN type approval



Double Pointer Frequency Meter, 2FQ

Highly accurate & linear read-out



2FQ double pointer frequency meter is a compact instrument with accurate and linear read-out, constructed of two moving coil instruments mounted diagonally in one house.

2FQ features

- ▶ Robust and thoroughly tested construction
- ▶ Available in Q96 DIN size design
- ▶ High accuracy and linear read-out
- ▶ High immunity to 3rd harmonics

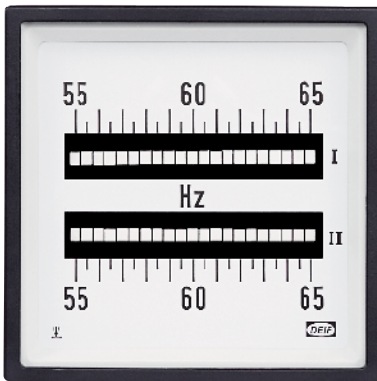
2FQ type approval



www.deif.com

Double Reed Frequency Meter, 2FTQ

Vibration-based read-out



2FTQ double reed frequency meter features two rows of reeds mounted in one housing with exchangeable scale.

2FTQ features

- ▶ Robust and thoroughly tested construction
- ▶ Available in Q96 DIN size design
- ▶ Vibration-based read-out
- ▶ High immunity to 3rd harmonics

2FTQ type approval



www.deif.com

Double Voltmeter, 2EVQ

Highly accurate & linear read-out



2EVQ double voltmeter with two moving iron systems mounted diagonally in one housing.

2EVQ features

- ▶ Robust and thoroughly tested construction
- ▶ Available in Q96 DIN size design
- ▶ High accuracy
- ▶ High immunity to 3rd harmonics

2EVQ type approval



www.deif.com

Double Voltmeter, 2EQ

Highly accurate & joint-scale linear read-out



2EQ double voltmeter has two mutually independent moving iron systems with a joint scale. The point of rotation for both systems is at the lower right corner.

2EQ features

- ▶ Robust and thoroughly tested construction
- ▶ Available in Q96 DIN size design
- ▶ 90 degree joint-scale read-out
- ▶ High immunity to 3rd harmonics

2EQ type approval



www.deif.com

Zero Voltage Meter, NEQ

Measure the differential voltage between busbar & generator



The zero voltage meter type NEQ is a moving iron instrument calibrated to full scale deflection at twice the nominal mains voltage, whereas 2/3 deflection corresponds to nominal mains voltage.

NEQ features

- ▶ Simple and thoroughly tested synchronisation supervision
- ▶ Easy-to-read scale
- ▶ DIN standard sizes: Q72 and Q96

NEQ type approval



Protection

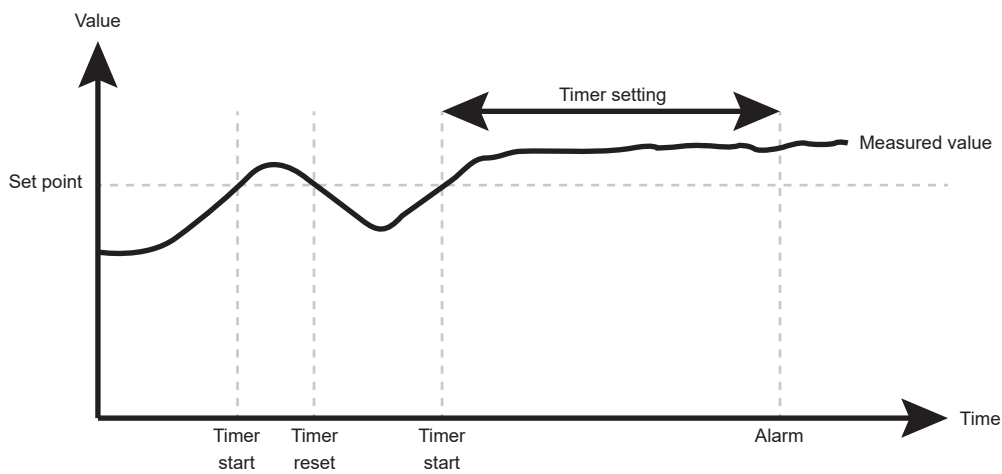
Intro

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.



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Multi-Differential Relay, MDR-2

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

MDR-2 type approvals



www.deif.com

Protective Voltage Relay, RMV-112D

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



The RMV-112D Uni-line protective voltage relay is applied for generator, motor and transformer protection against adverse system voltage conditions.

The versatile unit features a number of adjustable parameters.

RMV-112D 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

RMV-112D type approvals



www.deif.com

Protective Voltage Relay, RMV-122D

Protect your generator, motor & transformer against over-voltage



The RMV-122D Uni-line protective voltage relay is applied for generator, motor and transformer protection against adverse system voltage conditions.

The versatile unit features a number of adjustable parameters.

RMV-122D features

- ▶ Over-voltage (2 levels: $U>$ + $U>>$)
- ▶ ANSI code 59
- ▶ 3-phase measurement
- ▶ LED indication of fault condition
- ▶ Timer-controlled tripping
- ▶ LED indication for activated relay
- ▶ 35 mm DIN rail or base mounting

RMV-122D type approvals



www.deif.com

Protective Voltage Relay, RMV-132D

Protect your generator, motor & transformer against under-voltage



The RMV-132D Uni-line protective voltage relay is applied for generator, motor and transformer protection against adverse system voltage conditions.

The versatile unit features a number of adjustable parameters.

RMV-132D features

- ▶ Under-voltage (2 levels: $U<$ + $U<<$)
- ▶ ANSI code 27
- ▶ 3-phase measurement
- ▶ LED indication of fault condition
- ▶ Timer-controlled tripping
- ▶ LED indication for activated relay
- ▶ 35 mm DIN rail or base mounting

RMV-132D type approvals



www.deif.com

Protective Voltage Relay, RMV-142D

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



The RMV-142D Uni-line protective voltage relay is applied for generator, motor and transformer protection against adverse system voltage conditions.

The versatile unit features a number of adjustable parameters.

RMV-142D features

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

RMV-142D type approvals



www.deif.com

Frequency Relay, RMF-112D

Protect your generator against under- & over-frequency



The digital RMF-112D 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-112D is applicable for installations with a number of adjustable parameters.

RMF-112D features

- ▶ Combined under-frequency/over-frequency
- ▶ 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

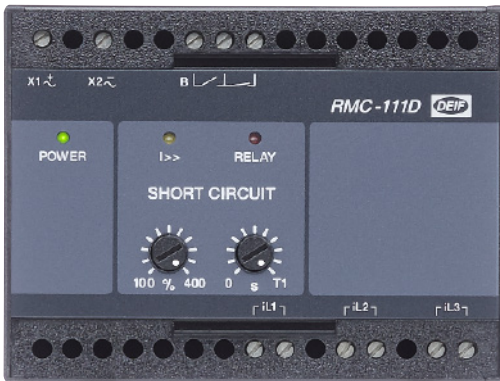
RMF-112D type approvals



www.deif.com

Short Circuit Relay, RMC-111D

Protect your generator against short circuits



The RMC-111D short circuit relay is applied in cases where only protection against short circuit currents is required (I>>).

RMC-111D has one set of contacts.

RMC-111D features

- ▶ Short circuit relay (I>>)
- ▶ ANSI code 50 and 51
- ▶ 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

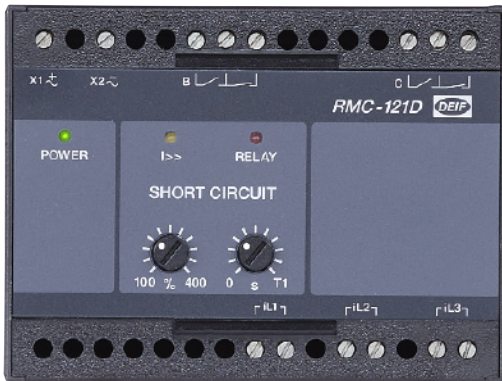
RMC-111D type approvals



www.deif.com

Short Circuit Current Relay, RMC-121D

Protect your generator against short circuit & over-current



The RMC-121D combined short circuit and over-current relay is applied for protection of generators against both over-currents and short circuit currents ($I >$ + $I >>$).

RMC-121D has two sets of contacts.

RMC-121D features

- ▶ Short circuit and over-current circuit relay ($I >$ + $I >>$)
- ▶ ANSI code 50 and 51
- ▶ 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

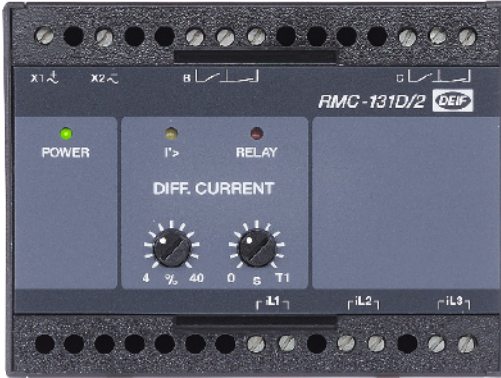
RMC-121D type approvals



www.deif.com

Differential Current Relay, RMC-131D

Protect your generator against short circuits & leakage currents



DEIF's differential current relay RMC-131D protects the generator against short circuits and leakage currents in the windings of the generator.

The relay compares the differential current of each of the three phases, providing an RMS measurement at sinusoidal currents. In order to obtain a short response time on a fault condition, the measurement is based on peak values.

The versatile units feature a number of adjustable parameters.

RMC-131D is part of DEIF's complete range of relays for protection and control of generators.

RMC-131D features

- ▶ Differential current relay
- ▶ ANSI code 87
- ▶ Measurement of 3-phase currents
- ▶ Non-stabilised measurement
- ▶ LED indication of fault condition
- ▶ Timer-controlled tripping
- ▶ LED indication for activated relay
- ▶ Extra change-over relay contact for signalling
- ▶ 35 mm DIN rail or base mounting

RMC-131D type approvals



www.deif.com

Double Over-current Relay, RMC-132D

Protect your generator against double over-currents



This double over-current relay is applied in cases where protection against over-currents at two levels is required.

The versatile unit features a number of adjustable parameters.

RMC-132D features

- ▶ Double over-current relay ($I > + I >$)
- ▶ ANSI code 50 and 51
- ▶ 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

RMC-132D type approvals



www.deif.com

Stator Earth Fault Relay, RMC-142D

Protect your operators against electric shocks due to earth faults



DEIF's RMC-142D stator earth fault relay protects genset operators against electric shock in case of earth faults in the generator's stator.

The relay also protects against loss of excitation in case of earth fault in the stator.

The RMC-142D is part of DEIF's complete range of relays for protection and control of generators featuring a number of adjustable parameters.

RMC-142D features

- ▶ Earth fault protection at two levels
- ▶ Built-in filter for 3rd harmonic
- ▶ LED indication of fault condition
- ▶ Timer-controlled tripping
- ▶ LED indication for activated relay
- ▶ 35 mm DIN rail or base mounting

RMC-142D type approvals



www.deif.com

Loss of Mains Relay, LMR-111D

Protect your generator against damages due to loss of mains failure



The Loss of Mains Relay Uni-line LMR-111D is for protection of the generator 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.

The Loss of Mains Relay Uni-line LMR-111D forms part of a complete DEIF series of relays for protection and control generators

LMR-111D 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

LMR-111D type approvals



Loss of Mains Relay, LMR-122D

Protect your generator against damages due to loss of mains failure



The Loss of Mains Relay Uni-line LMR-122D is for protection of the generator 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. 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.

The Loss of Mains Relay Uni-line LMR-122D forms part of a complete DEIF series of relays for protection and control generators.

LMR-122D features

- ▶ Detection of vector shift and ROCOF
- ▶ 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

LMR-122D type approvals



Overload Power Relay, RMP-111D

Protect your prime mover against overload



The RMP-111D is a protective overload power relay for generator and prime mover protection.

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

The versatile unit features a number of adjustable parameters.

RMP-111D 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

RMP-111D type approvals



Overload/Reverse Power Relay, RMP-112D

Protect your prime mover against overload & reverse power



The RMP-112D is a protective overload and reverse power relay for generator and prime mover protection.

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

The versatile unit features a number of adjustable parameters.

RMP-112D 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

RMP-112D type approvals



www.deif.com

Reverse Power Relay, RMP-121D

Protect your prime mover against reverse power



DEIF's RMP-121D is a protective reverse power relay for generator and prime mover protection.

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

The versatile unit features a number of adjustable parameters.

RMP-121D 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

RMP-121D type approvals



www.deif.com

Loss of Excitation Relay, RMQ-111D

Protect generators running in parallel against under-excitation



This Uni-line relay protects 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-111D 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-111D 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

RMQ-111D type approvals



Over-excitation Relay, RMQ-121D

Protect generators running in parallel against over-excitation



The RMQ-121D relay protects generators against over-excitation and will prevent it from generating too high currents in case of heavy inductive loads.

The RMQ-121D will thus protect the generator against damages caused by excessive heating of its windings, at the same time preventing transfer of reactive load to a faulty generator.

RMQ-121D features

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

RMQ-121D type approvals



Switchboard equipment

Intro

DEIF is a one-stop-shop for switchboard manufacturers across the globe who prefer to work with just one supplier, customising units to fit project specifications at lowest total cost of ownership, knowing that DEIF also delivers in record time. This gives our customers major logistical advantages. Customers receive “the entire package” from a supplier who understands the customer’s high expectations. This does not just make it easier for switchboard manufacturers, it also helps plant owners whenever they need replacement deliveries or technical support.

Switchboard builders choose DEIF because of our product lines’ acclaimed reliability, high quality standards and market-leading test procedures.

At our test centre in Skive, Denmark, DEIF performs measurements relevant for classification approvals and CE marking, audited by classification societies. Our products often exceed classification requirements as our own standards are extremely high. Why? Because it ensures hassle-free operation for our customers.

Because good logistics are crucial to our competitiveness, we are also able to customise with logos, scales and colours. DEIF’s customisation department enables us to provide customer-specific products fitted to your exact needs. This is the case whether you need an instrument with a reading from 0-280 V AC, a special scale with your logo or a pre-configured transducer.

To us, delivery performance is central. That is why we are able to dispatch a customised unit from day to day.

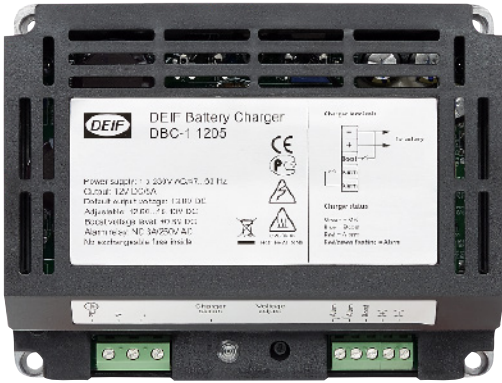
Switchboard equipment

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Battery Charger, DBC-1

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

DBC-1 type approval



www.deif.com

Power Supply, DCP2 (12 V, 24 V)

Highly efficient DC supply



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.

DCP2 features

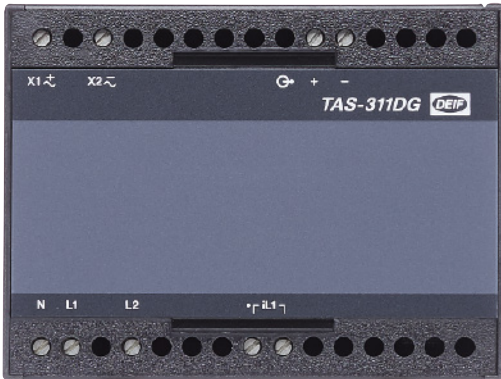
- ▶ Automatic and electronic protection features
- ▶ Automatic restart after fault conditions
- ▶ Automatic output power derating for high ambient temperatures
- ▶ Green LED indication for aux. power connected
- ▶ Current output up to 40 A
- ▶ Adjustable output voltage
- ▶ No moving parts – no maintenance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

DCP2 type approval



Selectable AC-Transducer, TAS-311DG

Measuring transducers for voltage, current, frequency & phase angle



TAS-311DG features

- ▶ Measures voltage, current, frequency and phase angle on AC networks
- ▶ Class 0.5 measurement
- ▶ Supply and measuring voltage up to 690 V
- ▶ Pre-configuration or easy PC tool configuration
- ▶ Configurable up to three output slopes

Powerful, fast and compact, the 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.

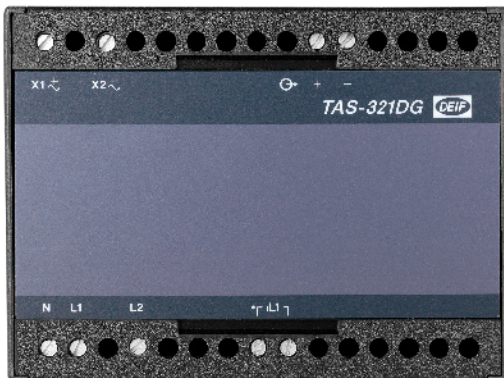
TAS transducers are micro-controller-based with one analogue output for measurement of power, voltage, current etc. on an AC network. Because these transducers have no mechanical parts like potentiometers, the calibration stability is excellent.

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.



Selectable AC-Transducer, TAS-321DG

Measuring transducers for bi-directional current



TAS-321DG features

- ▶ Measures bi-directional current on AC networks
- ▶ Class 0.5 measurement
- ▶ Supply and measuring voltage up to 690 V
- ▶ Pre-configuration or easy PC tool configuration
- ▶ Configurable up to three output slopes

Powerful, fast and compact, the 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.

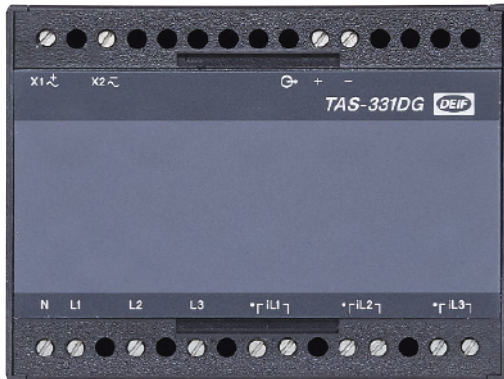
TAS transducers are micro-controller-based with one analogue output for measurement of power, voltage, current etc. on an AC network. Because these transducers have no mechanical parts like potentiometers, the calibration stability is excellent.

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.



Selectable AC-Transducer, TAS-331DG

Measuring transducers for power or reactive power



TAS-331DG features

- ▶ Measures power or reactive power on AC networks
- ▶ Class 0.5 measurement
- ▶ Supply and measuring voltage up to 690 V
- ▶ Pre-configuration or easy PC tool configuration
- ▶ Configurable up to three output slopes

Powerful, fast and compact, the 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.



AC Voltage Single Function Transducer, TAV-311DG

Measuring transducers for voltage



Powerful, fast and compact, the 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.

TAV transducers are compact, single function transducers for measurement of a sinusoidal AC current converted into a DC current or voltage signal proportional to the measured value on a single-phase network.

TAV-311DG features

- ▶ Measures voltage on AC networks
- ▶ Compact design, 55 × 75 mm
- ▶ Easily accessible terminals
- ▶ Easy identification of unit/function
- ▶ Accuracy class: 0.5
- ▶ 35 mm DIN rail or base mounting

TAV-311DG type approval



www.deif.com

AC Voltage Single Function Transducer, TAV-321DG

Measuring transducers for voltage



Powerful, fast and compact, the 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.

TAV transducers are compact, single function transducers for measurement of a sinusoidal AC current converted into a DC current or voltage signal proportional to the measured value on a single-phase network.

TAV-321DG features

- ▶ Measures current or voltage on AC networks
- ▶ No aux. supply required
- ▶ Compact design, 55 × 75 mm
- ▶ Easily accessible terminals
- ▶ Easy identification of unit/function
- ▶ Accuracy class: 0.5
- ▶ 35 mm DIN rail or base mounting

TAV-321DG type approval



AC Current Single Function Transducer, TAC-311DG

Measuring transducers for current



Powerful, fast and compact, the 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.

TAC transducers are compact, single function transducers for measurement of a sinusoidal AC current converted into a DC current or voltage signal proportional to the measured value on a single-phase network.

TAC-311DG features

- ▶ Measures current on AC networks
- ▶ Compact design, 55 × 75 mm
- ▶ Easily accessible terminals
- ▶ Easy identification of unit/function
- ▶ Accuracy class: 0.5
- ▶ 35 mm DIN rail or base mounting

TAC-311DG type approval



www.deif.com

AC Current Single Function Transducer, TAC-321DG

Measuring transducers for current



Powerful, fast and compact, the 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.

TAC transducers are compact, single function transducers for measurement of a sinusoidal AC current converted into a DC current or voltage signal proportional to the measured value on a single-phase network.

TAC-321DG features

- ▶ Measures current on AC networks
- ▶ No aux. supply required
- ▶ Compact design, 55 × 75 mm
- ▶ Easily accessible terminals
- ▶ Easy identification of unit/function
- ▶ Accuracy class: 0.5
- ▶ 35 mm DIN rail or base mounting

TAC-321DG type approval



Multi-transducer, MTR-3

Cost-effective measurement of more than 50 parameters



The size of a portable hard drive, the MTR-3 transducers are slight in size but each one offers equal performance of 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.

The range has a standard response time of less than 200 ms, with the MTR-3F offering ultra-fast response at just ≤ 50 ms. Modbus data refresh time is also just 50 ms with transfer data up to 115,200 bit/s. The accuracy class is 0.5 for analogue data and 0.3 for Modbus data. 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.

DEIF's MTR-3 is a cost-effective, compact and powerful solution for transducer applications. Developed for measuring single-phase and 3-phase network topologies, measurement data are available through RS-485 Modbus communication. Simply connect a USB 2.0 interface for fast and easy configuration of up to four analogue outputs.

MTR-3 features

- ▶ Suitable for all 1- and 3-phase network topologies
- ▶ Up to 1000 VL-L AC input
- ▶ Accuracy class: 0.5 or 0.3
- ▶ Up to 4 analogue outputs
- ▶ Fast response time, down to ≤ 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

Type	Analogue outputs	RS-485 Modbus	Response time
MTR-3-015	–	×	200 ms
MTR-3F-215	2	×	50 ms
MTR-3-315	3	×	200 ms
MTR-3-415	4	×	200 ms

MTR-3 type approval



www.deif.com

Multi-instrument, MIB

Measure & monitor your energy distribution network



DEIF's multi-instruments for measurements and monitoring of single-phase or 3-phase electric energy distribution networks cover readings of more than 50 parameters.

The instruments have four-quad energy measurement and built-in energy counting and come with free utility software for programming and data viewing.

MIB features

- ▶ 1- or 3-phase TRMS measurements
- ▶ Voltage inputs 690 L-L AC
- ▶ Accuracy: 0.5 or 1.0
- ▶ RS-485 Modbus communication (optional)
- ▶ Digital outputs for alarm and energy (optional)
- ▶ Supply voltage:
 - ▶ 100 to 300 V DC
 - ▶ 100 to 415 V AC 50/60 Hz

Type	Digital outputs	RS-485 Modbus
MIB 7000	–	–
MIB 7000C	–	×
MIB 7020	2	–

MIB type approval



www.deif.com

Multi-instrument, MIC

Measure, analyse & monitor your energy distribution network



DEIF's multi-instruments for measurements, analysis and monitoring of 3-phase electric energy distribution networks cover readings of more than 50 parameters.

The instruments have four-quadrant energy measurement and built-in energy counting and come with free utility software for programming and data viewing.

MIC features

- ▶ 3-phase TRMS measurements
- ▶ Voltage inputs 400 L-L AC
- ▶ Accuracy: 0.2 or 0.5
- ▶ RS-485 Modbus communication
- ▶ Digital input
- ▶ Relay and digital outputs (optional)
- ▶ Supply voltage:
 - ▶ 100 to 280 V DC
 - ▶ 85 to 264 V AC 50/60 Hz
 - ▶ 24 to 48 V DC (optional)

Type	Digital outputs	Digital inputs	Relay outputs
MIC 4002	–	2	–
MIC 4224	2	4	2

MIB type approval



Multi-instrument, MIC-2 MKII

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 free utility software it is a simple and fast job to configure and adapt the unit to fit most applications.

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
 - Relay
 - Analogue I/O
 - Digital I/O
- ▶ Free utility software with data logging
- ▶ Type approvals from all major classification societies

MIC-2 MKII type approvals



www.deif.com

Multi-instrument, MIC-2 MKII DIN

Access monitoring data remotely via the internet



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

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

A microprocessor-based measuring unit for most electrical quantities on 2-phase or 3-phase electric energy distribution networks, readings are transferred via Modbus or Profibus communication to your SCADA system.

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 free utility software it is a simple and fast job to configure and adapt the unit to fit most applications.

MIC-2 MKII DIN 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
 - Relay
 - Analogue I/O
 - Digital I/O
- ▶ Free utility software with data logging
- ▶ Type approvals from all major classification societies

MIC-2 MKII DIN type approvals



www.deif.com

Insulation Monitor, AAL-2

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 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

AAL-2 type approval



Selectable Insulation Monitor, SIM-Q

Insulation monitoring of your AC networks with self-test mode



The SIM-Q supervises 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.

SIM-Q features

- ▶ Insulation monitoring of AC networks of up to 690 V AC
- ▶ Ideal for applications with frequency converters
- ▶ Fault-finding and self-test mode
- ▶ The leakage capacitance is up to 500 μF

SIM-Q type approval



www.deif.com

Insulation Monitor, ADL-111Q96

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).

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

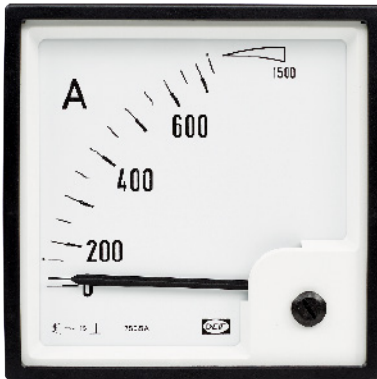
ADL-111Q96 type approval



www.deif.com

Quadratic Moving Iron Instrument, EQ

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)

EQ type approval



www.deif.com

Quadratic Moving Coil Instrument, DQ

Measure low power DC signals



The moving coil meters are applied to measure low power DC signals, for example 01 mA/4 to 20 mA/0 to 10 V DC etc.

DQ is available in four different sizes, in other words 48 mm, 72 mm, 96 mm and 144 mm.

DQ features

- ▶ Accuracy class: 1.5
- ▶ 90° or 240° pointer deflection
- ▶ IP52 protection (IP54 on request)
- ▶ Customised and exchangeable scale available for 90°
- ▶ Measuring range: 60 mV to 300 V, 1 mA to 40 A (except for Q48: 1 mA to 600 mA)

DQ type approval



www.deif.com

Quadratic Moving Coil Instrument, VDQ

Measure AC voltage & low power signals



The VDQ measures AC currents and AC voltages.

The quadratic VDQ is available in 4 different sizes, i.e. 72mm, 96mm and 144mm.

VDQ features

- ▶ 1.5 accuracy class
- ▶ 90° and 240° pointer deflection
- ▶ IP52 protection (IP54 on request)
- ▶ Approved by classification societies
- ▶ Measuring range: 25 to 300 V AC, 1 to 600mA
- ▶ Scale: Customised and exchangeable scale available for 90°

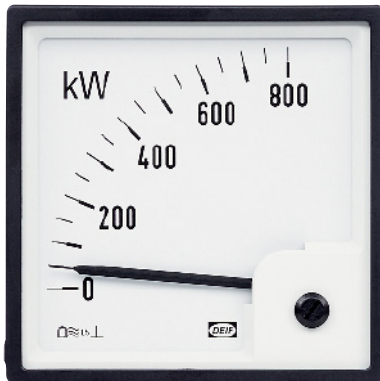
VDQ type approval



www.deif.com

Watt or Var Meter, WQ

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...110...127...220...230...240...380...400...415...440 V AC
- ▶ Measuring range: Frequency: 45...65 Hz
- ▶ Measuring current: direct or from C.T./1 A or /5 A
- ▶ Scale: customised and exchangeable scale available for 90°

WQ type approval



www.deif.com

Pointer Frequency Meter, FQ

Convert frequency to analogue readings



With high immunity to 3rd harmonics, DEIF Pointer frequency meter is suitable for all applications. The moving coil instrument features integrated electronics for converting frequency into analogue readings with accurate and linear readouts on an exchangeable scale

FQ features

- ▶ Accuracy class: 0.5
- ▶ 90° pointer deflection
- ▶ Available in sizes Q72 and Q96

FQ type approval



www.deif.com

Reed Frequency Meter, FTQ

Vibration-based read-out



Reed frequency meter, with one row of metal reeds vibrating at the applied frequency (resolution: $\frac{1}{4}$ Hz). Available with 13 or 21 reeds. Exchangeable scale.

The FTQ is available in Q72 mm and Q96 mm.

FTQ features

- ▶ 0.5 accuracy class
- ▶ IP52 protection (IP54 on request)
- ▶ Approved by classification societies
- ▶ Measuring voltage: 100...110...220...230...240...380...400...415...440 V AC $\pm 15\%$
- ▶ Scale/measuring range: 47...53 Hz, 45...55 Hz, 57...63 Hz, 55...65 Hz

FTQ type approval



www.deif.com

Power Factor Meter, PFQ

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

PFQ type approval



www.deif.com

Quadratic Voltmeter with Built-in Switch, EQ96-sw4

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



The EQ96-sw4 has been designed to save switchboard builders space and installation time and does not require installation of normal selector switch.

The instrument measures AC phase-to-phase voltages and is available in 96 mm size only.

EQ96-sw4 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

EQ96-sw4 type approval



Quadratic Voltmeter with Built-in Switch, EQ96-sw7

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



The EQ96-sw7 has been designed to save switchboard builders space and installation time and does not require installation of normal selector switch.

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

EQ96-sw7 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

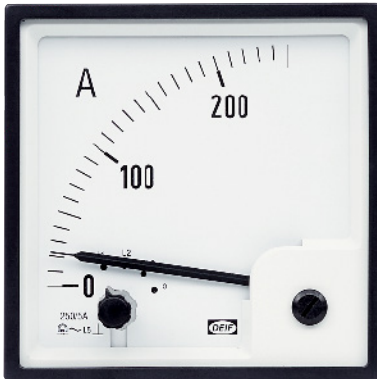
EQ96-sw7 type approval



www.deif.com

Ammeters with Built-in Switch, VDAQ96-sw

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



The VDAQ96-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.

VDAQ96-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)

VDAQ96-sw type approval



www.deif.com

Bimetallic Instrument, BQ

Monitor maximum current demand



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

Due to the inertia of the system, the instrument 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...6 A or 0...1.2 A
- ▶ DIN standard sizes: Q48, Q72, Q96
- ▶ Exchangeable scale

BQ type approval



www.deif.com

Combined Ammeter, BEQ

Measure & monitor current with maximum demand indication



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

The instrument 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...6 A or 0...1.2 A
- ▶ DIN standard sizes: Q72, Q96
- ▶ Exchangeable scale

BEQ type approval



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DIN Rail Instrument, D45

Moving coil instrument for DC measurements



The D45 moving iron instrument for DIN rail mounting (35 × 15 mm) is fitted for DC measurement.

The quadratic D45 is available in 45 mm size.

D45 features

- ▶ 1.5 accuracy class
- ▶ 90° pointer deflection
- ▶ IP52 protection
- ▶ Approved by classification societies
- ▶ Measuring range: 1 V...300 V (incl. 0...60 mV/5 mA), 1 mA...600 mA (incl. 4...20 mA)
- ▶ Standard ranges: 1 – 1.5 – 2.5 – 4 – 6 and multiples of 10 thereof
- ▶ Scale: Customised and exchangeable scale available for 90°

D45 type approval



www.deif.com

DIN Rail Instrument, E45

Moving coil instrument for AC measurements



The E45 moving coil instrument for DIN rail mounting (35 × 15 mm) is fitted for AC measurement.

The E45 is available in 45 mm size.

E45 features

- ▶ 1.5 accuracy class
- ▶ 90° pointer deflection
- ▶ IP52 protection
- ▶ Approved by classification societies
- ▶ Measuring range: 6 V...400 V, 100 mA...25 A
- ▶ Standard ranges: 1 – 1.5 – 2.5 – 4 – 5 – 6 and multiples of 10 thereof
- ▶ Scale: Customised and exchangeable scale available for 90°

E45 type approval



www.deif.com

DIN Rail Instrument, B45

Bimetallic instrument for AC measurements



DIN rail-mounted bimetallic instruments (maximum demand ammeters) are specifically suitable for thermic control of cables, transformers, etc. Due to the inertia of the system, the instrument is not affected by brief current pulses.

The quadratic B45 is available in 45 mm size.

B45 features

- ▶ 3.0 accuracy class
- ▶ 90° pointer deflection
- ▶ IP52 protection
- ▶ Scale: always 120 % of the current transformer
- ▶ Measuring range: 0...6 A (nominal -/5 A)
- ▶ DIN standard sizes: Q45
- ▶ Exchangeable scale

B45 type approval



Running Hours Counter, HC 36/24

Monitor operating time, warranty periods & maintenance intervals



DEIF's compact HC 36/24 Running Hours Counter has 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 unit can also be applied to central heating boilers, electrical furnaces, power drives and marine applications.

HC 36/24 features

- ▶ Compact design (36 × 24 mm)
- ▶ Synchronous motor (AC version)
- ▶ Step motor (DC version)
- ▶ 7 digits read-out (whole figures white, decimals red/black)
- ▶ For flush mounting

HC 36/24 type approval



Running Hours Counter, HC 48

Monitor operating time, warranty periods & maintenance intervals



DEIF's HC 48 Running Hours Counter has 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.

HC 48 features

- ▶ For AC or DC measuring voltage
- ▶ Synchronous motor (AC version)
- ▶ Step motor (DC version)
- ▶ Standard IP40. Special version IP65
- ▶ In DIN size case, 48 × 48 mm, aluminium clamp mounting
- ▶ Adapter frames: 55 × 55 mm, 72 × 72 mm

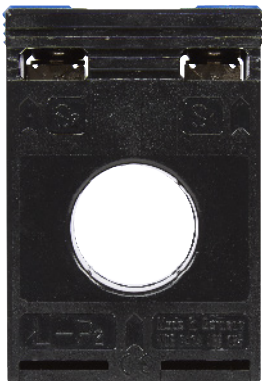
HC 48 type approval



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Measuring Transformer, ASR

Measuring transformer for round cables



Part of DEIF's current transformer range, the ASR 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 numerous 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.

ASR features

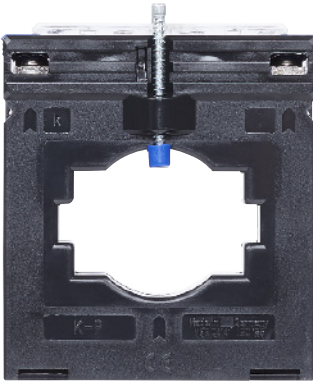
- ▶ Designed for round cables
- ▶ Primary current: 40 to 600 A
- ▶ Secondary current: 5 or 1 A
- ▶ Burden: 1.0 to 10 VA
- ▶ Accuracy class:/protection class: 0.5 or 1.0

ASR type approval



Measuring Transformer, ASK

Measuring transformer for cables & busbar



Part of DEIF's current transformer range, the ASK 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.

ASK features

- ▶ Designed for cables and busbar
- ▶ Primary current: 40 to 7,500 A
- ▶ Secondary current: 5 or 1 A
- ▶ Burden: 1.0 to 30 VA
- ▶ Accuracy class:/protection class: 0.5 or 1.0

ASK type approval



Protection Transformer, SASR

Protection transformer for round cables



SASR features

- ▶ Primary current: 100 to 300 A
- ▶ Secondary current: 5 or 1 A
- ▶ Accuracy class/protection class: 5P5 – 5P10

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

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

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



Protection Transformer, SASK

Protection transformer for cables & busbar



SASK features

- ▶ Primary current: 50 to 1,600 A
- ▶ Secondary current: 5 or 1 A
- ▶ Accuracy class/protection class: 5P4 – 5P5 – 5P10 – 10P5 – 10P10

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.



Split Core Transformer, KBU

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

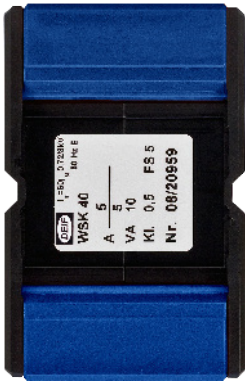
- ▶ Primary current: 250 to 5,000 A
- ▶ Secondary current: 5 or 1 A
- ▶ Burden: 1.25 to 30 VA
- ▶ Accuracy class: 0.5 or 1.0

KBU type approval



Primary Winding Transformer, WSK

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

WSK type approval



Summation Transformer, KSU

Summation transformer with up to 3 inputs



Part of DEIF's current transformer range, the KSU summation transformers summarise the secondary currents of any number of 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.

KSU features

- ▶ Number of inputs: 2 or 3
- ▶ Primary current: 1 or 5 A
- ▶ Secondary current: 5 or 1 A
- ▶ Burden: 5 to 15 VA
- ▶ Accuracy class/protection class: 0.5 or 1.0

KSU type approval



www.deif.com

Summation Transformer, SUSK

Summation transformer with 3 to 8 inputs



Part of DEIF's current transformer range, the SUSK summation transformers summarise the secondary currents of any number of 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.

SUSK features

- ▶ Number of inputs: 3 to 8
- ▶ Primary current: 1 or 5 A
- ▶ Secondary current: 5 or 1 A
- ▶ Burden: 5 to 30 VA
- ▶ Accuracy class/protection class: 0.5 or 1.0

SUSK type approval



www.deif.com

Shunt Resistors

Measure DC current



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

Shunt Resistors features

- ▶ Dimensions to DIN 43703
- ▶ Class 0.5
- ▶ Extensive programme
- ▶ Standard versions in stock



www.deif.com

Plant design, commissioning & monitoring

Intro

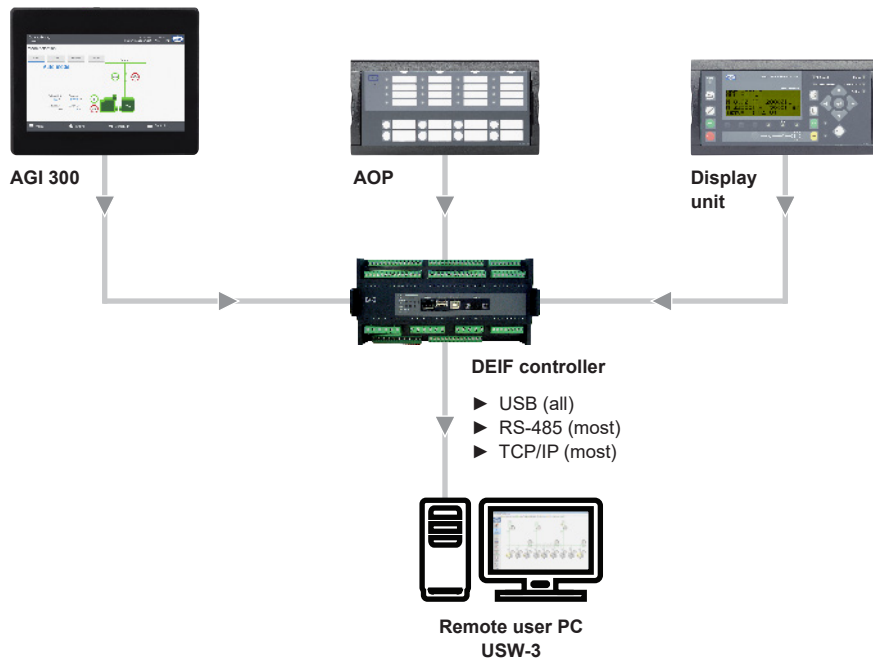
From Design to Operation

Knowing all installations present unique challenges, DEIF has developed a series of flexible and scalable tools and solutions to facilitate design and commissioning and extending the possibilities for user-customisation of DEIF genset controllers.

The initial design and preliminary plant configuration is supported by a unique PC software tool that enables the user to perform a Patent-pending Emulation of the power plant. With this flexible solution, users can perform a range of tests saving time for the final commissioning, including for instance desktop testing of protection mechanism for an entire power plant.

DEIF's Human Machine Interfaces (HMI), including an Additional Operator Panel (AOP) and Advanced Graphical Interfaces (AGI), allow system designers and project engineers to configure project-dependent features, including on-site, during commissioning and for later supervision.

The below drawing indicates possible HMI interfaces in conjunction with DEIF genset controllers.



Plant design, commissioning & monitoring index

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System Solutions

Integrated systems

Sustainable Power Management

DEIF Land Power's power management products are integrated solutions which include logic functions such as blackout start, load-dependent start/stop, heavy consumer control, load shedding, priority control and plant operational modes. These system solutions operate without additional equipment such as external PLCs.

Retrofit

Updating your old control systems with DEIF technology will not only optimise the operation of your gensets and make them more robust. You will also benefit from reduced maintenance, fuel costs and CO₂ emissions. But above all, it will make your power supply safer and more reliable.

Project solutions

DEIF specialises in integrated control solutions that are simple, user-friendly and cost-efficient alternatives to standard controllers and completely eliminate the need for external modules. Our solutions can also include project-specific HMI solutions.

Our dedicated expert teams for turnkey solutions deliver project management from A to Z to minimise your risk and maximise performance. We also offer training, simulator and FAT facilities, site tests and commissioning. DEIF assumes responsibility for the functionality of the application, delivering pre-configured and tested parameter files, project-specific documentation, etc.

Project Phases



Emulation Solution

Safe & simple system testing without connecting to real gensets



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

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

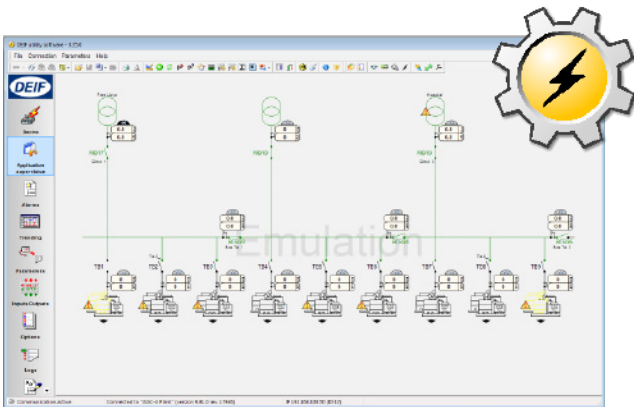
With the Emulation Solution, all you need to do to perform a complete test of your Power Management Systems is to turn on your controller and connect communications. The Emulation Solution's focus on exact reproduction of system behaviour improves your planning, approvals and training. It is all done 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.



www.deif.com

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 personnel 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

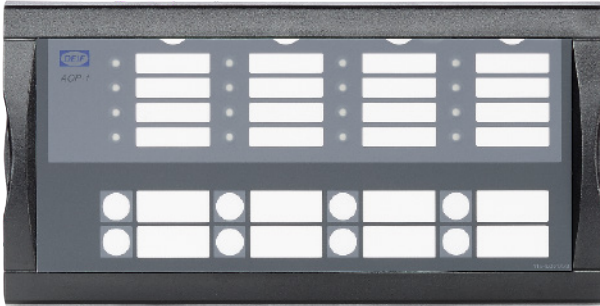
USW-3: general

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



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



Advanced Graphical Interface, AGI 300

Touch screen monitoring & control of your system



AGI features

- ▶ State-of-the-art HMI
- ▶ Unique design tool
- ▶ Control and monitor your system
- ▶ Data-logging and alarm handling
- ▶ Designed for harsh environments

The AGI 300 has been designed as an intuitive and user-friendly HMI for visualisation and active control for multiple applications and is available in 4.3", 7" and 15" sizes with a quality screen readable even in direct sunlight and at sharp angles, making it a safe and ideal choice for bridge installations.

Featuring touch screen system control and monitoring functionalities which eliminate the need for other instruments and save you both space and wiring, the AGI 300 connects both to all DEIF Multi-line controllers and other brand controllers via standard communication protocols.

Data-sharing ability via Ethernet connections effectively enable the DEIF HMI to be used as a small SCADA system. Built-in Ethernet port switch functionality lets you connect the panels to small control systems without incurring extra costs for external switches. Connect to multiple serial devices with the multi-standard serial port or use the USB host to provide access for external storage devices.

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.
- ▶ Energy Monitoring System (EMS): track your energy consumption to optimise and implement the 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.

Remote Maintenance Box, RMB

Safely service substations without power supply interruptions



RMB features

- ▶ Safe interruption of transformer substations
- ▶ Handles load jumps during synchronisation
- ▶ Voltage remains stable during load jumps, with max 2 % deviation
- ▶ Static synchronisation using phase, frequency and voltage control

DEIF's new Remote Maintenance Box (RMB) is a remote management tool for safe maintenance at transformer substations or other electrical installations and operation in scenarios that require the interface/operator panel to be located close to the connection points.

Intuitive to use with a step-by-step sequencer, it enables you to service your substation without interrupting the power supply to your customers and limits exposure to risks.

Operation is extremely simple and service very easy with both visual and audible indication guides alerting you the moment the generator is in phase with the mains, making it safe to reconnect the fuses.

Remote Gateway

Monitor your rental installations & equipment in the field



DEIF's Remote Gateway is a remote monitoring solution for rental installations and equipment in the field, particularly suited for rental operations facilitating and improving remote service while cutting costs.

Powered by small communication units that provide connectivity through online and global data servers, the solution is platform-independent and requires no IT expertise and no programming. Ready-to-use plug and play templates for the HMI part of the Remote Gateway solutions ensure perfect and flawless integration with dedicated DEIF Power Management solutions and are available for free as downloads from www.deif.com.

Designed especially for industrial applications, Remote Gateway solutions are available with both GSM/GPRS mobile access and Ethernet communication and provide:

- ▶ Remote access to DEIF controllers with DEIF's Utility Software (USW-3)
- ▶ Free graphical dashboard providing gateway data through a cloud
- ▶ Historical data logging and graphical trend graphs
- ▶ Automatically generated and scheduled reports sent directly to your inbox
- ▶ Access via a desktop PC, laptop, PDA or cell phone
- ▶ Scalable system by means of multiple gateways

The versatile and dynamic solutions do not require static IP or VPN and have no firewall issues.

Remote Gateway features

- ▶ Visualised solution overview via dashboard
- ▶ Worldwide map overview and GPS tracking
- ▶ Alarm management (email, SMS, RRS)
- ▶ Reports (weekly/monthly, etc.)
- ▶ RS-485 Modbus serial interface
- ▶ Digital input, relay output and analogue I/O
- ▶ Geofencing and route tracking for mobile applications
- ▶ Benefits of cloud technology

Remote Gateway: simple to use

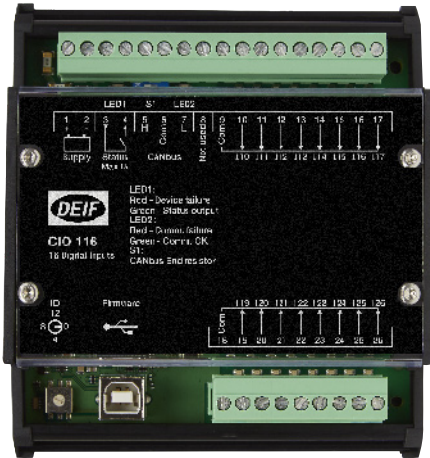
- ▶ No IT expertise required
- ▶ No firewall issues
- ▶ No VPN required
- ▶ No static IP needed
- ▶ No programming



www.deif.com

CAN bus-based I/O Module, CIO 116

Add 16 digital inputs to your genset controller



CIO 116 features

- ▶ 16 digital inputs
- ▶ Positive or negative common for 2x8 inputs
- ▶ CAN bus interface
- ▶ LED indication of status and input state
- ▶ 12/24 V DC supply

The CIO 116 is an external I/O module for DEIF's Multi-line series for those requiring a number of digital inputs exceeding the capacity of a range of DEIF genset controllers.

The CIO module requires a host controller to send and receive information.

Currently, the CIO 116 is compatible with DEIF's AGC Plant Management and AGC 200 controllers.

More controllers will be added over time – please refer to www.deif.com for an updated list.



www.deif.com

CAN bus-based I/O Module, CIO 208

Add 8 relay outputs to your genset controller



CIO 208 features

- ▶ 8 relay outputs
- ▶ 240 V AC or 30 V DC relay contacts
- ▶ 8 A relay rating
- ▶ CAN bus interface
- ▶ LED indication of status and input state
- ▶ 12/24 V DC supply

The CIO 208 is an external I/O module for DEIF's Multi-line series for those requiring a number of relay outputs exceeding the capacity of a range of DEIF genset controllers.

The CIO module requires a host controller to send and receive information.

Currently, the CIO 208 is compatible with DEIF's AGC Plant Management and AGC 200 controllers.

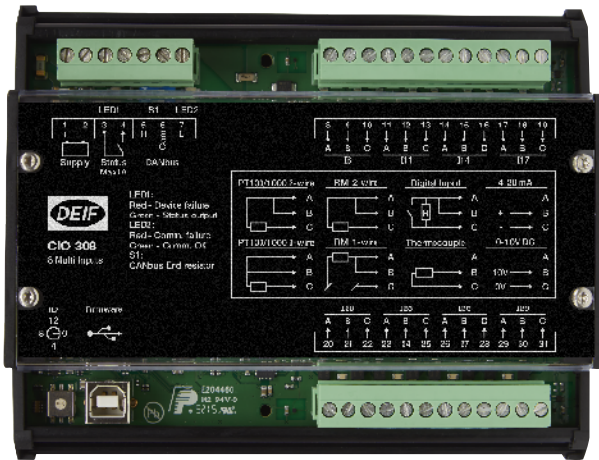
More controllers will be added over time – please refer to www.deif.com for an updated list.



www.deif.com

CAN bus-based I/O Module, CIO 308

Add 8 multi-functional inputs to your genset controller



CIO 308 features

- ▶ 8 multi-functional inputs
- ▶ Wire break detection
- ▶ CAN bus interface
- ▶ LED indication of status and input state
- ▶ 12/24 V DC supply

The CIO 308 is an external I/O module for DEIF's Multi-line series for those requiring a number of inputs exceeding the capacity of a range of DEIF genset controllers.

The CIO 308 has 8 multi-functional inputs selectable as:

- ▶ Digital input
- ▶ 0(4)-20mA
- ▶ 0-10 V
- ▶ RMI
- ▶ Pt100
- ▶ Pt1000
- ▶ Thermocouple type B, E, J, K, N, R, S or T.

The CIO module requires a host controller to send and receive information.

Currently, the CIO 308 is compatible with DEIF's AGC Plant Management and AGC 200 controllers.

More controllers will be added over time – please refer to www.deif.com for an updated list.



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

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Spare parts & replacement policies

Passive status & last time buy

To accommodate our partners' product planning strategies and enable smooth switch-overs to new product lines, DEIF follows an established End-of-Life Policy (EOL). 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.

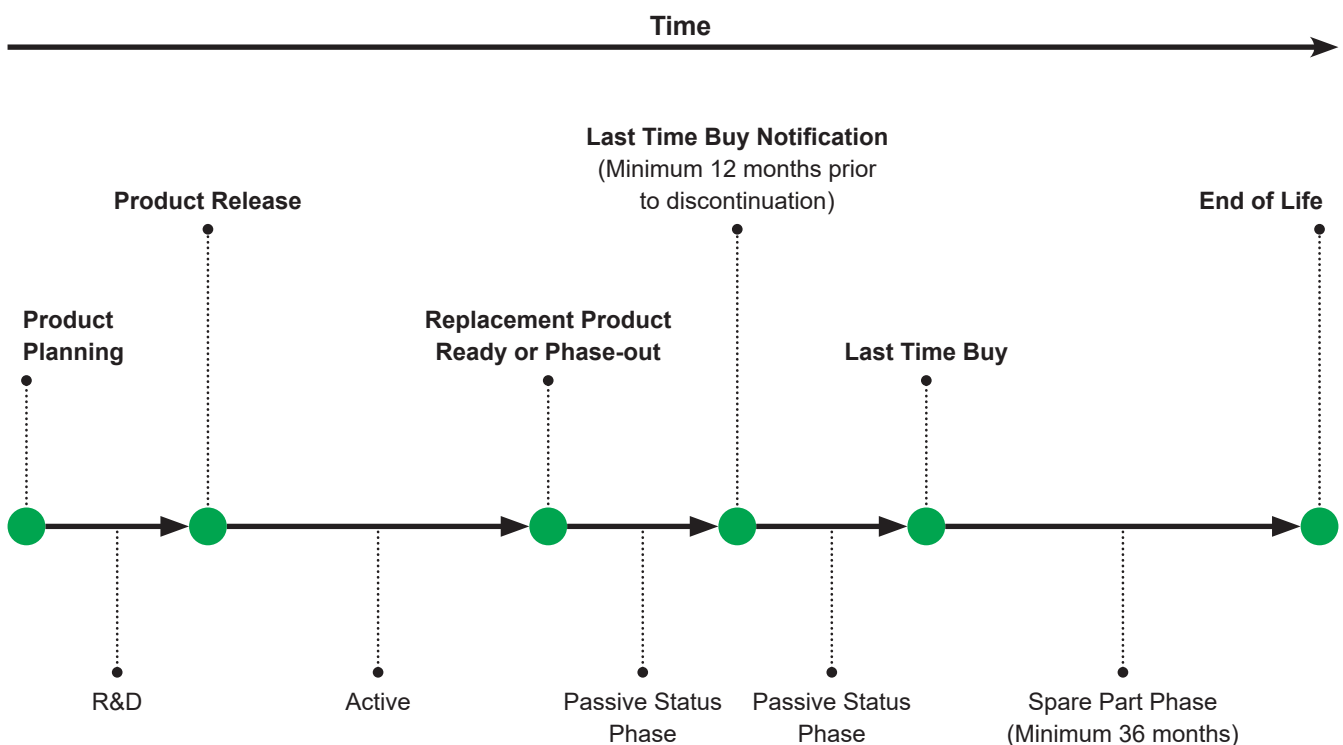
Last Time Buy notification (LTB)

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 Last Time Buy* and Last Shipment Date**. New orders will be "Non-Cancellable/Non-Returnable (NCNR)". In connection with Last Time Buy notifications, we advise customers of compatible replacement products.

*Last Time Buy = Final order date.

**Final Shipment Date = Final delivery date.

Product life cycle



Spare parts & replacement policies

Spare part policy

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.

Spare parts & replacement policies

Replacements

Product type	Old product	Replacement product
Power Management		
Generator Controller	BGC	AGC 200
Engine Controller	EC-1	CGC 400
Generator Controller	GC-1	CGC 400
Automatic Genset Controller	AGC-2	AGC-4
Automatic Genset Controller	AGC-3	AGC-4
Integrated Systemes	DM-4 Hydro	DM 400 Hydro
Integrated Systemes	DM-4 Gas	DM 400 Gas
Integrated Systemes	DM-4 Bio	DM 400 Bio
Parallel Operation		
Load Sharing Units	DGC-1TB	LSU-112DG and LSU-113DG
Load Sharing Units	DGC-1TF	LSU-112DG and LSU-113DG
Generator Paralleling Controller	GPC-2	GPC-3
Synchronisation		
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		
Multi-Differential Relay	MDR-1	MDR-2
Generator Protection Unit	MGP-1	GPU-3
Protection Relay	Gepimax	GPU-3
Short Circuit Protection	Curimax	RMC-111D, RMC-112D or GPU-3

Spare parts & replacement policies

Replacements

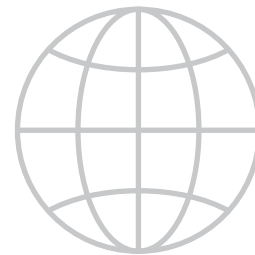
Product Type	Old Product	Replacement Product
Switchboard Equipment		
Electronic Potentiometers	EPQ96	EPQ96-2
Insulation Monitoring	DIM-Q	SIM-Q
Running Hours Counter	HCQ48	HC 48
Multi Transducer	MTR-1	MTR-3
Multi Transducer	MTR-2	MTR-3
Watt Transducer	TAP-210DG	TAS-331DG
Watt Transducer	TAQ-210DG	TAS-331DG
Dual Output Power Transducer	TAX-312DG-1	TAS-331DG
Mains Frequency Transducers	TMF-210DG	TAS-311DG
Multi-Instrument	MIQ96	MIC-2 MKII
Multi-Instrument	MIQ96-2	MIC-2 MKII
Multi-Instrument	MIQ96-3	MIC-2 MKII
Plant Design, Commissioning and Monitoring		
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

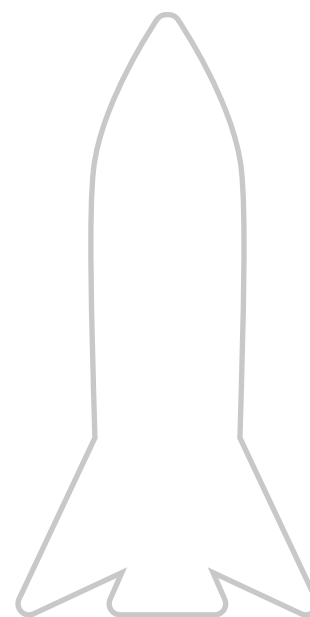


MISSION

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

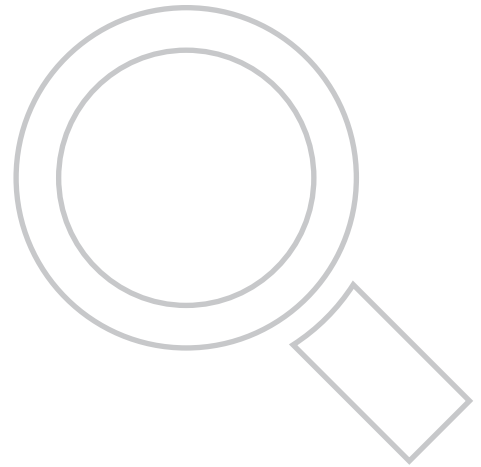


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FIND NEW OPPORTUNITIES

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.

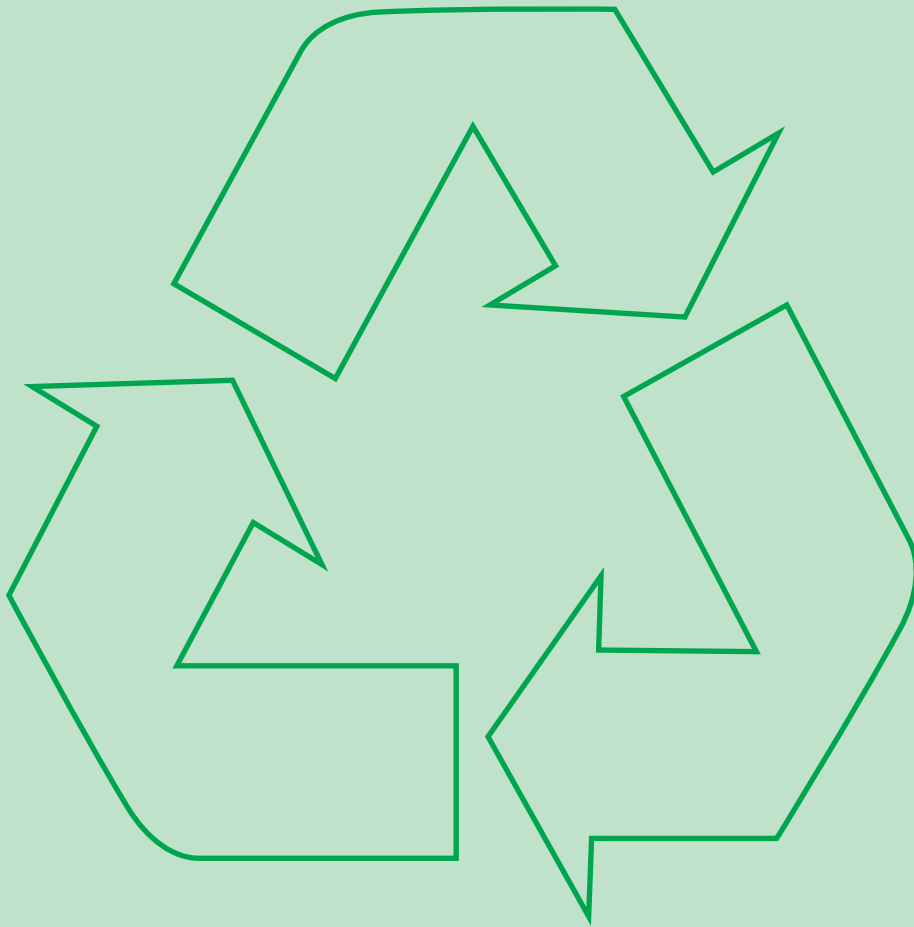




LAND POWER MARINE & OFFSHORE WIND POWER

POWERED BY



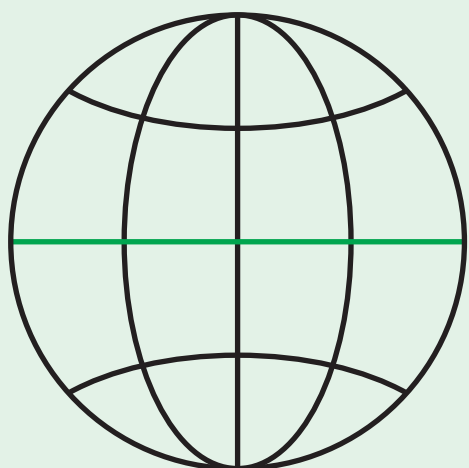


GREEN AMBITION

Environmentally improved

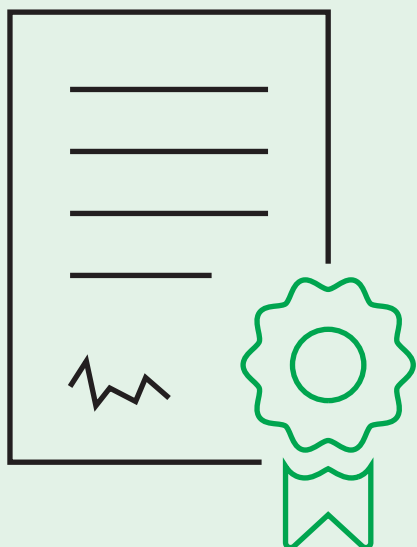
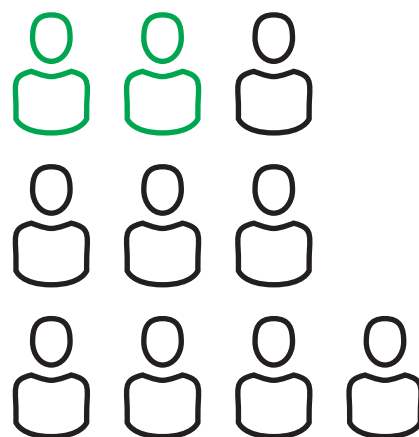
DEIF's intelligent power management solutions and cleantech products meet growing needs for reliable power while supporting the world's environmental transition.

- ▶ 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

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; and
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; and
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; and
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





MARINE & OFFSHORE

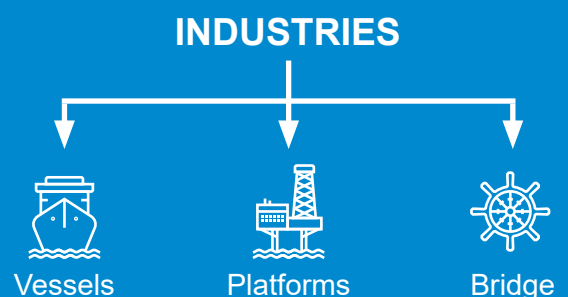
DEIF HAS A LONG AND RICH HISTORY OF PROVIDING CLASS APPROVED, RELIABLE BRIDGE INSTRUMENTATION, SWITCHBOARD EQUIPMENT AND POWER CONTROL.

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**.

THE WORLD'S PREFERRED SUPPLIER*

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

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**.



EUROPE'S LARGEST ONSHORE WIND PARK*



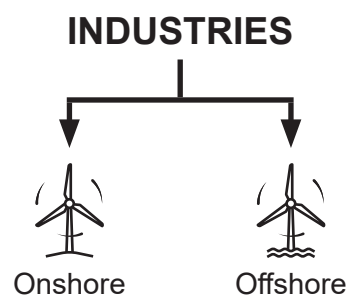
* See www.deifwindpower.com

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 ACH



1933
Erling Foss, founder



1943
Production



1956
Exhibition



1933
DEIF founded



1930s
B-225 Ammeter



1950s
VTR-1



1960s
Electrometer 34



IEVEMENT



1975
DEIF's HQ



1987
Toke Foss



2009
DEIF's HQ

1980s
Delomatic



1990s
Uniline



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.

Contact information

DEIF offices

Brazil

DEIF do Brasil Comercio de Controles e Equipamentos Ltda.



Av. Brasil, 2287, Jardim Chapadão,
CEP: 13070-178 Campinas, SP, Brazil

Contact information

Tel.: +55 19 3579 4681
E-mail: deif@deif.com.br
www.deif.com.br

Germany

DEIF GmbH



Lilienthalstr. 47,
D-64625 Bensheim, Germany

Contact information

Tel.: +49 (0) 6251/1756-0
E-mail: germany@deif.com
www.deif.de

China

DEIF Electrical (Shanghai) Co., Ltd.



Room 206, No.8 Building, Shanghai Zhangjiang
Semiconductor Industry Park, No.3000 Long
Dong Road, Pudong Area, 201203 Shanghai, China

Contact information

Tel.: +86 21 68796200
E-mail: sales@deifchina.com
www.deif.cn

India

DEIF India Pvt. Ltd.



602, Town Centre II, Andheri – Kurla Road,
Sakinaka, Andheri (East), Mumbai 400 059 MH,
India

Contact information

Tel.: (+91) 22 4245 2000
E-mail: india@deif.in
www.deif.com

Denmark

DEIF A/S (Headquarters)



Frisenborgvej 33, 7800 Skive
Denmark

Contact information

Tel.: +45 9614 9614
E-mail: info@deif.com
www.deif.dk

Korea, Republic of

DEIF Korea co., Ltd



Postal code : 46721
Address : 7-103, 203, 303. 76, Yutongdanji 1-ro,
Gangseo-gu, Busan, Korea

Contact information

Tel.: (+82) 51-558-1380
E-mail: inquiry@deif.co.kr
www.deif.co.kr

France

DEIF MEDiterranea



WTC 4 – Entrée N, 1300 Route des Crêtes
CS 50007 Valbonne, 06901 Sophia Antipolis Cedex.
France

Contact information

Tel.: +33 (0)4 92 38 05 06
E-mail: mediterranea@deif.com
www.deif.fr

Mexico

Danish Power & Marine, S.A. de C.V.



Circonvallación Pte. No. 219, Cd. Satélite,
Naucalpan 53100, Mexico City, Edo. de México; México

Contact information

Tel.: +52 1 55 6126 3716
E-mail: cmn@deif.com
www.deif.es

Contact information

DEIF offices

Norway

DEIF Norge AS

Døvlevei 41, N-3170 Sem
Norway



Contact information

Tel.: +47 3338 1600
E-mail: norge@deif.com
www.deif.no

United Arab Emirates

DEIF Middle East FZE

Office No. LB02013, JAFZA 2, Near Gate No. 3
P.O. Box No. 263194, Jebel Ali Free Zone, Dubai



Contact information

Tel.: + +971 4 8808908
E-mail: deifmiddleeastfze@deif.com
www.deif.com

Singapore

DEIF Asia Pacific Pte Ltd

31, Bukit Batok Crescent #01-16, The Splendour
658070 Singapore, Singapore



Contact information

Tel.: +65-69335300
E-mail: inquiry@deif.com
www.deif.com

United Kingdom

DEIF (UK) Limited

8 Acorn Business Park, Heaton Lane, Stockport
SK4 1AS Cheshire, United Kingdom



Contact information

Tel.: +44 (0) 161 429 4940
E-mail: uk@deif.com
www.deif.co.uk

Spain

DEIF Iberia S.L. (Liaison Office)

Av. Pintor Xavier Soler 24 Local 3
03015 Alicante, Spain



Contact information

Tel.: +34 965 24 23 95
E-mail: jv@deif.es
www.deif.es

USA

DEIF, Inc.

3855 Precision Drive, #180
Loveland, CO 80538, United States



Contact information

Tel.: (970) 530-2261
E-mail: us@deif.com
www.deif.com

Turkey

DEIF Turkey Enerji ve Kontrol Sistemleri Limited Şirketi

Gaziosmanpaşa Mah. İran Cad. Karum İş
Merkezi No: 21 Bağimsız Bölüm: 440 Çankaya/Ankara,
Turkey



Contact information

Tel.: +90 312 426 13 72
E-mail: info@deif.com.tr
www.deif.com.tr

**For a complete and updated list of
DEIF offices and global distributors,
please visit www.deif.com**

Contact information

DEIF distributors

Argentina

PEBSA S.A

Martin Rodriguez 545, Capital Federal, Argentina



Contact information

Mr. Jorge Cirelli (ventas@pebsacontrol.com.ar)
Tel.: +54 11 3968 3639, www.pebsacontrol.com.ar

Australia

Rave Group International Pty. Ltd.

Trading as Rave Industrial, 14/31 Acanthus Street, Darra, Queensland, 4076, Australia



Contact information

Mr. Adrian Clark
Tel.: +61 01 3139 8080, www.raveindustrial.com.au

Austria

HAINZL INDUSTRIESYSTEME GmbH

Industriezeile 56, 4021 Linz, Austria



Contact information

Mr. Heribert Zeller (h.zeller@hainzl.at)
Tel.: +43 (0)732 7892-359, www.hainzl.at

Bangladesh

PG Controls Limited

House No. 469, 1st floor, Apt. A-1, New DOHS, Mohakhali, Dhaka-1206, Bangladesh



Contact information

Mr. Azhar Othman (sales@pgcontrolsbd.com)
Tel.: +88 02 9882276, www.sdme.be

Belgium

SDM-Engineering BVBA

Terhulpense Steenweg 362, B-3090 Overijse, Belgium



Contact information

Mr. Bavo De Man (info@sdme.be)
Tel.: +32 2 688 33 89, www.sdme.be

Canada

Exell Power Services LTD.

#206-19049-54th Avenue, Surrey, British Columbia, Canada V3S 4R1, Canada



Contact information

Mr. Ron Klimmer
Tel.: 604-514-9472, www.exellpower.com

Colombia

Protección, Automatización y Control, Ltda (PAC)

Calle 145 #16 A-32, Bogotá D.C, Colombia



Contact information

Mr. Julian Rueda Molina (j.rueda@paclda.com.co)
Tel.: +57 (1) 475 3358

Italy

STAER S.r.l. Tecniche di Misura e Automazione

Via Sibilla Aleramo 4, 20090 Segrate (MI), Italy



Contact information

Mr. Mario Fantini (info@staermisure.it)
Tel.: +39 02 26 95 20 67, www.staermisure.it

Malaysia

TriSystems Engineering Sdn Bhd

No. 6, Jalan Tiang U8/91, Taman Perindustrian Bukit Jelutong, Selangor Darul Ehsan, 40150 Shah Alam, Malaysia



Contact information

Mr. Syed R. B. S. Hamid (ridhwan@trisys.com.my)
Tel.: +60 3 7848 3278, www.trisys.com.my

Netherlands

Caldic Techniek BV

Schuttevaerweg 60, 3044 BB Rotterdam, Netherlands



Contact information

Mr. Akash Raktoc (energie@caldic-techniek.nl)
Tel.: +31 (0) 10 4156622, www.caldic-techniek.nl

Contact information

DEIF distributors

New Zealand

Carrel-Electrade Ltd.

661 Great South Road, Penrose, Auckland 1061,
New Zealand



Contact information

Mr. Kevin Beeby (kevin@electrade.co.nz)
Tel.: +64 9 525 1753, www.carrel-electrade.co.nz

Peru

GRETEK S.R.L. (Grupo Técnico Kilowatt S.R.L.)

Jr. Iquique 058, Breña, Lima 5, Peru



Contact information

Mr. David Galbani (ventas1@gretekperu.com)
Tel.: +51 1 332 3271, www.gretek.com.pe

Russian Federation

DVK-electro

ul. Shvetcova 12/2, St-Petersburg, 198095 St.
Petersburg, Russian Federation



Contact information

Mr. Vladimir Chentsov (sales@dvk-electro.ru)
Tel.: +7 (812) 318 30 69, www.dvk-electro.ru

Saudi Arabia, Kingdom of

Al Mashariq Trading & Contracting Co.

Energy Projects and Services Div., 1 Street, Al
Ulaya, Khobar 31952, Kingdom of Saudi Arabia



Contact information

Mr. Nader E. Masoud (deif.sales@almashariq.com)
Tel.: +966 13 8878017, www.almashariq.com

Sri Lanka

U I Technical Services (Pvt.) Ltd

187, Ward Place, Colombo 07, Sri Lanka



Contact information

Mr. Lishan Pathirana (info@uitsgroup.com)
Tel.: +94 11 2688537

United Arab Emirates

KDU World Wide Technical Services (FZC)

Warehouse Q3-016, SAIF Zone, Sharjah, United
Arab Emirates



Contact information

Mr. Hardy George (sales@kduworld.com)
Tel.: +971 6 5575480, www.kduworld.com

Viet Nam

Sea Power Co., Ltd

38 Tran Quang Dieu Street, Ward 14, District 3,
Ho Chi Minh City, Viet Nam



Contact information

Mr. Ho Hai Duong
Tel.: +84 (0)8 351 551 38/351 551 39, www.seapower.vn

Viet Nam

Thanh My Electric Engineering Co., Ltd

915/66 Lê Văn Lương, Tân Kiểng, Quận 7, Hồ
Chí Minh, Viet Nam



Contact information

Mr. Luu Cong Thanh (thanhmy-electric@viettel.vn)
Tel.: +84 8382 31832

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DEIF A/S

Frisenborgvej 33, 7800 Skive, Denmark

Tel. +45 9614 9614

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