



Marine system solutions

Combined expertise for better performance,
profitability and environmental protection



Contents

Engineering for a better world ~~~~~	5
Marine system solutions ~~~~~	6
Application range ~~~~~	8
GEA Heat Exchangers ~~~~~	10
GEA Refrigeration Technologies ~~~~~	20
GEA Westfalia Separator Group ~~~~~	24





GEA Heat Exchangers (page 10 to 19)

GEA Heat Exchangers consolidates all the activities in the area of heat exchangers and comes with probably the largest portfolio in this field worldwide. GEA plate heat exchangers, shell and tube heat exchangers, air-cooled heat exchangers, air filter systems, wet cooling towers and dry cooling systems and synthetic fillings, as well as air treatment systems for numerous areas of application – the segment gives comprehensive coverage of the spectrum. Customers in the global markets for marine, power and energy, food and air-conditioning profit from the highest standard of efficiency, safety and sustainability.

GEA Refrigeration Technologies (page 20 to 23)

The segment GEA Refrigeration Technologies is a synonym for industrial refrigeration technology. Since the end of the 19th century, it has been GEA business to cool processes and products, and to control the temperature of goods in transport. You will find GEA Refrigeration Technologies in the food and beverage sector; in the petrochemical, chemical, and pharmaceutical industries; on fishing, cargo and passenger ships; in natural gas liquefaction; in infrastructure facilities and in ice factories. The passion for refrigeration is highly apparent in the daily work of the segment. As a result, the staff enthusiastically goes about its development and production projects – to include preventive and remedial maintenance of refrigeration systems.

GEA Mechanical Equipment (page 24 to 27)

Separators, decanters, ceramic membrane elements, valves, pumps, homogenizers – high-quality process engineering components from the segment GEA Mechanical Equipment ensure smooth processes and cost-optimized production flows in virtually all important industrial sectors worldwide. The wide range of products provides solutions for the most varied tasks and challenges in a whole range of branches around the globe. At the same time, GEA Mechanical Equipment helps to cut production costs and significantly and sustainably reduce the impact on the environment.



Engineering for a better world.

Together on an innovative course –
with companies of the GEA Group

The GEA Group is the umbrella under which global leaders in the field of marine engineering work closely together. Their combined expertise ensures that partners in the shipbuilding industry have a key edge in competing for more efficiency, profitability and environmental protection.

The shipbuilding industry is becoming increasingly important across the globe. The reasons for this are obvious: accounting for more than 95 per cent of global transport tonnage, the ship is by far the most efficient and economical means of transport and thus a central “module” within the global supply chain. At the same time, shipping companies, shipyards and suppliers are under considerable pressure to innovate: the constant growth of competition for production capacity and ever-stricter environment-protection laws call for new solutions that focus on maximum economic efficiency and sustainability with a view to improving the way resources are handled. So new technical solutions have to meet a large number of requirements. Sustainability in the economic and ecological sense is a self-evident necessity.

Being based in more than 50 countries, the GEA Group is able to fulfill these challenging requirements. This umbrella covers leading companies in the field of process engineering whose engineering excellence ideally supports the shipbuilding industry in the performance of its tasks.

Complete system solutions for the engine room

The companies of the GEA Group and their marine specialists can be approached individually or in different combinations, depending on requirements and needs. The use of several companies within one shipbuilding project ensures the greatest value added for customers: experience with joint projects and continuous know-how transfer results in valuable synergies. The combined expertise of these companies is the best foundation for developing complete system solutions for the modern engine room – without frictional losses and without interface problems.

26 – 27
24 – 25
22 – 23
20 – 21
18 – 19
16 – 17
14 – 15
12 – 13
10 – 11
08 – 09
06 – 07
04 – 05



Marine system solutions

These marine specialists bring more efficiency and sustainability on board

Whether fuel, lube oil, bilge water or ballast water treatment, fuel oil conditioning, engine cooling, seawater desalination or cooling and refrigeration is required, the companies of the GEA Group offer marine system solutions that make it possible to achieve strategic improvements in efficiency and cut costs while optimising product and process quality.

The GEA Group offers its customers in the shipping sector system solutions that are comprehensively and systematically designed for the special requirements on board. In an energy-efficient manner they ensure a high performance from the drive units while securing maximum availability of the systems. At the same time they support the aim of shipping companies to protect both crews and the environment as well as possible. All the rules laid down by the International Maritime Organization (IMO) to protect sensitive maritime ecosystems are more than complied with. The compact design of the systems and components fulfill the requirements of modern shipbuilding by virtue of their low weight and the extremely small space needed to accommodate them. All products from the GEA Group are designed for extreme conditions and operate reliably even in rough seas. The consistently applied plug-and-play principle simplifies installation, thereby contributing to shortening building times. In addition to this, the systems are low-maintenance and support the demand for an intelligent, supervision-free engine room.

This means that costs are reduced, efficiency increased and return on investment optimised. At the same time working conditions are significantly improved and operational safety further enhanced. As a result, the economic, social and ecological sustainability of investments in shipping is further reinforced.





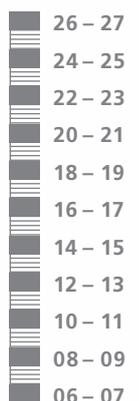
Protecting investments with life-cycle benefit

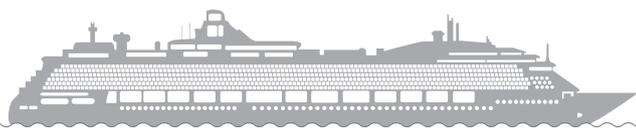
GEA marine system solutions are designed for the maximum benefit over the entire lifetime of the units. This life-cycle benefit is not only ensured by first-class product quality. A further bonus takes the form of customised service solutions that can be perfectly adapted to customers' needs. Here partners benefit not only from conventional services such as inspection, maintenance, original spare parts and repairs, but also from proactive risk-avoiding solutions, such as the on-line or off-line monitoring of systems.

By modernising units during operation, performing retrofit activities and upgrading in line with the latest state of the art, performance can also be continuously improved. Overall, this means maximum process efficiency and plant availability combined with absolute budget control. There is no better way to secure your investments and your processes.

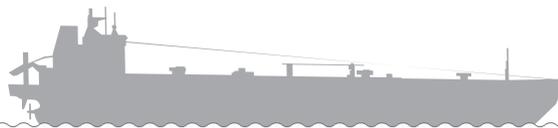
The benefits of GEA marine system solutions at a glance

- First-class product quality
- Safe in extreme conditions
- Compact design – low weight and small space requirements
- Reduction of interfaces
- Simple installation thanks to plug and play
- Maximum process efficiency and availability
- Sparing use of natural resources
- IMO-compliant
- Reliable protection of people and the environment
- Proactive service
- Optimal investment protection





Cruise ships



Oil and gas tankers



Application range

Successful shipping companies make use of GEA group expertise in the engine room



Central cooling of the main and auxiliary engines



Dedicated cooling of engines and auxiliary systems



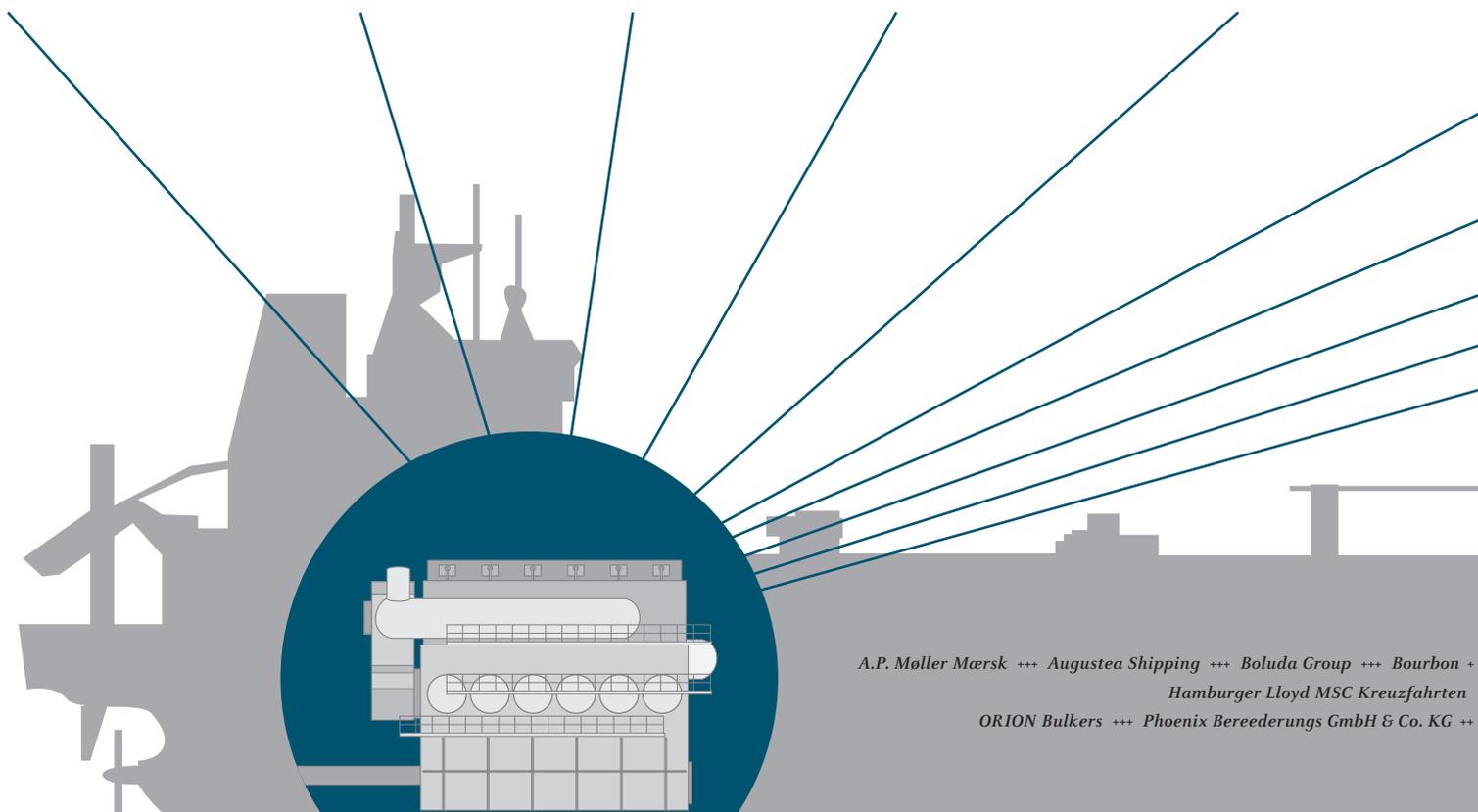
Efficient energy conversion



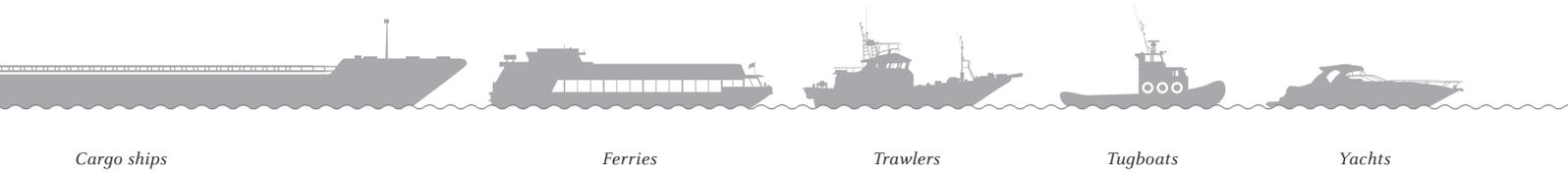
Reduction of NOx emissions



Climate control and air treatment



*A.P. Møller Mærsk +++ Augustea Shipping +++ Boluda Group +++ Bourbon +
Hamburger Lloyd MSC Kreuzfahrten
ORION Bulkers +++ Phoenix Bereederungs GmbH & Co. KG ++*



Cargo ships

Ferries

Trawlers

Tugboats

Yachts

Supertankers, cruise ships, trawlers, freighters and mega-yachts: all types of ships with systems, units and components from companies of the GEA Group are ideally equipped for the challenges of today and tomorrow.



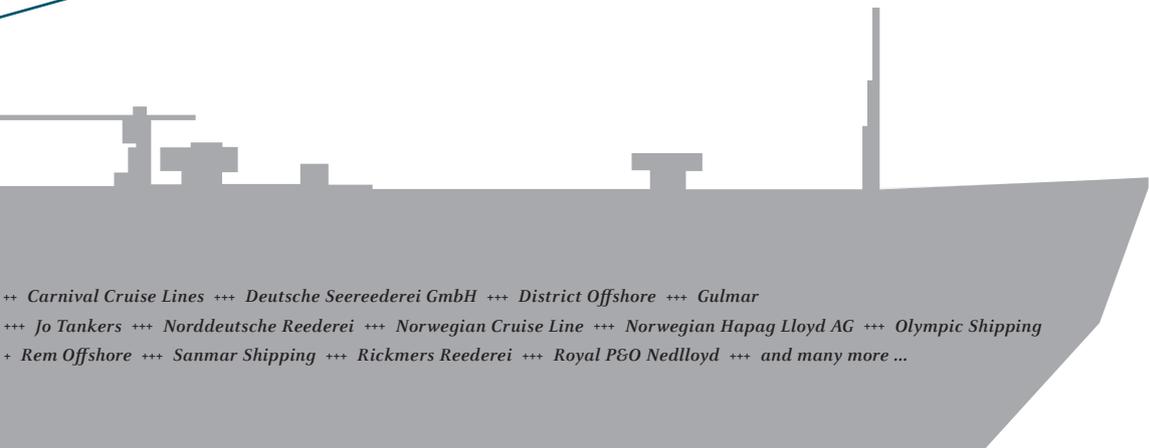
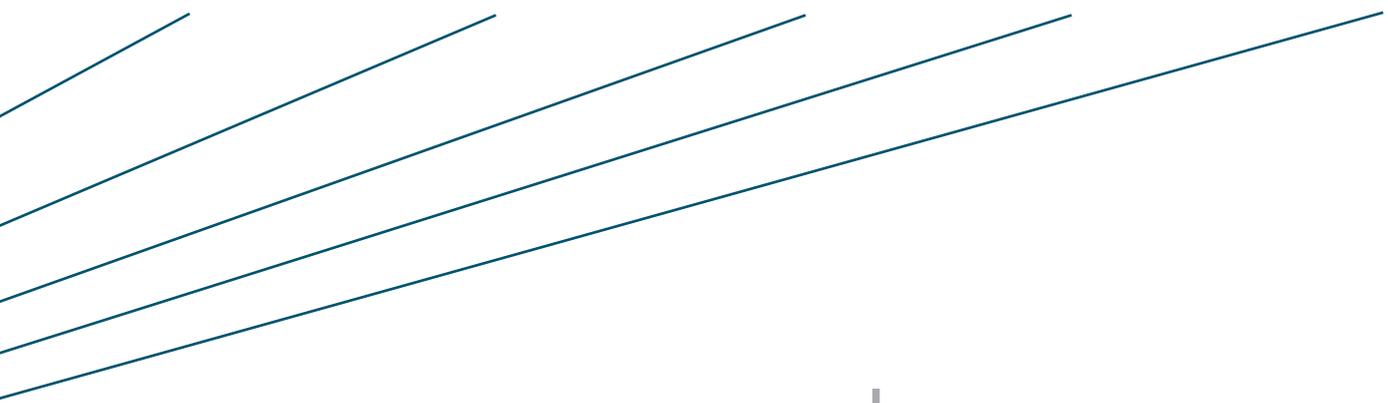
Refrigeration technology for gas storage in ship tanks

Compact piston compressors for refrigeration and air-conditioning

Sea water desalination

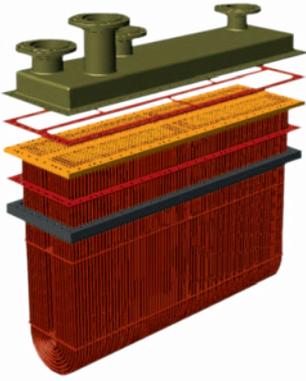
Clarification and purification of fuel and lube oil

Ballast water treatment



++ Carnival Cruise Lines ++ Deutsche Seereederei GmbH ++ District Offshore ++ Gulmar
 +++ Jo Tankers ++ Norddeutsche Reederei ++ Norwegian Cruise Line ++ Norwegian Hapag Lloyd AG ++ Olympic Shipping
 + Rem Offshore ++ Sanmar Shipping ++ Rickmers Reederei ++ Royal P&O Nedlloyd ++ and many more ...

- 26 – 27
- 24 – 25
- 22 – 23
- 20 – 21
- 18 – 19
- 16 – 17
- 14 – 15
- 12 – 13
- 10 – 11
- 08 – 09



Box cooler (K-type)



Plate Fin Oilcooler (PF-type)

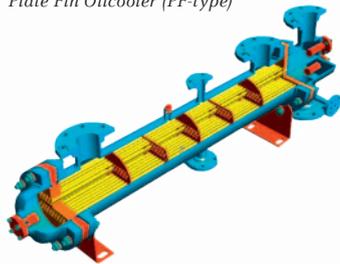


Plate Fin Oilcooler (N-type)



Oil and water heater (V-type)



Plate Fin Oilcooler bundle for lube oil applications (PF-OEM-type)

GEA Heat Exchangers

Efficient heat exchange for a wide range of applications

On the high seas, for example on an ocean freighter or a drilling rig, there are innumerable areas where the efficiency of heat exchangers is of paramount economic importance. Over the past 90 years, GEA Bloksma has made a name for itself around the world in the field of oil, water and air cooling and has maintained its technological leadership.

The application areas of heat transfer are manifold: diesel engines, hydraulic systems, lube oil systems, separators, propulsion systems, turbines, transformers and much more. So research and development play a major role. In order to be able to ensure a constant high quality for the entire area of heat-transfer technology, GEA Bloksma uses the latest development and design equipment. Long-standing and stable relations with customers and partners are one factor in quality assurance.

The GEA Bloksma Box Cooler is a product that combines various advantages used in vessels ranging from the fishing boats and cargo vessels to the dredger and workboats. One advantage is much lower power consumption thanks to thermo syphon principle in the sea chest in stationary mode or and making use of flow characteristics when the ship is in sailing mode. This is how the GEA Bloksma Box Cooler saves up to 15,000 litres of fuel a year. Another advantage is that the system is not susceptible to galvanic corrosion and impurities. In particular, biological impurities are prevented by an Impressed Current Anti Fouling (ICAF) system.

A further specialist area is liquid-based oil and air cooling. The plate fin technology used here offers a maximum of operating safety combined with an extremely compact design – the GEA Plate Fin (PF) Oilcooler is only 30 percent the size of a conventional cooler and offers the reliable benefits of a cylindrical, tubular heat exchanger. The four standard series and standardised connections simplify installation.

Thermal transfer technology for heating, especially for heavy heating oil, lube oil, thermal oil, steam or water, is also one of the areas of use for GEA Bloksma Heaters. The latest information gained from heat-transfer research went into the design of the heaters. For instance, the V-type heaters work up to a temperature of 300 degrees Celsius and can withstand over-pressure of 32 bar. This robust design means that GEA Bloksma Heaters are suitable for applications where strong pulsations occur.



Box coolers fitted in engine room



Box coolers for offshore workboats

GEA Bloksma
Draaibrugweg 15
1332 AB Almere
The Netherlands

Phone +31 36 549-23 00
Fax +31 36 549-23 90
bloksma.info@gea.com

Products and Service at a glance

- Compact Coolers:
Robust design and exceptionally compact by plate fin technology
- Plate Fin Oilcoolers:
Exceptionally compact and robust design
- Oil and water heaters:
Various materials possible, from ingot steel through stainless steel down to cunifer
- Customized heat exchangers:
A practical addition to the GEA standard series, especially for capacitors (steam turbines) and other demanding applications
- Comprehensive service portfolio and prompt delivery of spare parts



█	26 – 27
█	24 – 25
█	22 – 23
█	20 – 21
█	18 – 19
█	16 – 17
█	14 – 15
█	12 – 13
█	10 – 11



GEA Heat Exchangers

Condensers and cooling systems for steam turbines

Steam turbines are used in innumerable applications both on land and at sea. The conversion of kinetic energy into rotational energy by means of such a turbine calls for the use of efficient condenser and cooling systems. For maritime applications, GEA Ibérica has been the market leader in this technology sector for a long time. Ongoing development work always makes use of the results of the latest scientific research.

The entire range of GEA products has been designed according to the principles of longevity, cost efficiency and environmental compatibility. Based on these same principles the first air-cooled condenser, which was made by GEA Ibérica, has been running reliably for over seventy years.

While steam turbines are no longer used these days for propulsion – in an oil tanker, for example – they are still of great importance in energy conversion. The efficiency of the integrated condensers, and particularly the materials used, plays an important role here.

On the high seas, water is available in unlimited quantities for use as a cooling medium; however, the corrosive properties of sea water can shorten both the service life and the maintenance intervals of the various cooling systems significantly.

GEA Ibérica has special expertise in selecting the right materials. Titanium, copper-nickel alloys or other special materials: Decades of experience enable GEA to combine the right technologies with the right materials.



GEA Ibérica
Barrio de San Juan 28
48140 Igorre – Vizcaya
Spain

Phone +34 94 631-5000
Fax +34 94 631-5129
geaiberica.igorre@gea.com

Products at a glance

- Vacuum steam condensers
- Air-cooled condensers
- Surface condensers
- Parallel condenser systems (dry/wet)

Wide range of replacement parts and components:

- Exhaust ducts (between steam turbine and condenser)
- Vacuum pumps
- Condenser pumps
- Interconnecting piping
- Various other accessories



Vacuum steam condenser view, showing inlet/outlet water boxes, flash box, hotwell, etc.



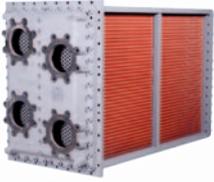
Vacuum steam condenser view, equipped with divided water boxes, hotwell, etc.



■	26 – 27
■	24 – 25
■	22 – 23
■	20 – 21
■	18 – 19
■	16 – 17
■	14 – 15
■	12 – 13

GEA Heat Exchangers

Reliable cooling for diesel engines and electric motors



Charge air cooler



Charge air cooler



Exhaust gas recirculation cooler



Closed circuit cooler



Acoustic capsule cooler for engine room

The discharge of heat from power or drive systems is an elementary factor in the operating safety and long service life of these systems. GEA Maschinenkühltechnik has been the market leader in the field of thermotechnical components for many years.

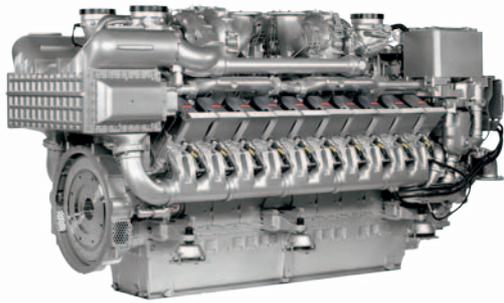
Today some 90 percent of global goods traffic is handled by sea. The requirements to be met in terms of the cargo capacity and engine power of ocean freighters are increasing apace. Also the cruise industry is growing more and more. Dependable cooling systems are indispensable for trouble-free operation.

For several decades GEA Maschinenkühltechnik has been developing charge air coolers for diesel and gas engines and supplying the world market with key products and reliable services for cooling technology. Here research and production are closely coordinated with engine manufacturers and plant engineers. The aim is to increase efficiency with maximum operating safety and to reduce emission levels.

The exhaust gas recirculation cooler from GEA Maschinenkühltechnik represents the latest development in the field of emission reduction. It complements conventional exhaust gas recirculation and reduces NO_x levels inside the engine – even at temperatures of up to 700 degrees Celsius. Recirculation upstream and downstream of the turbocharger is possible. In the near future emission guidelines will become a significant factor in mechanical engineering. At the latest as of 2016, all design engineers will have to observe new rules that further limit admissible NO_x levels.

GEA is also responsible for the development and manufacturing of closed circuit coolers which are used for drive systems, mains supply of generators and charging generators as well as for air conditioning on ships and submarines. Especially for the use on ships, different requirements concerning installation size and the choice of material have to be fulfilled. Furthermore sea water is used for cooling in many cases so that the material needs to be particularly robust.





MTU engine with GEA charge air cooler

GEA Maschinenkühltechnik
Südstrasse 48
44625 Herne
Germany

Phone +49 2325 468-801
Fax +49 2325 468-803
gmt.info@gea.com

Products and Services at a glance

- Charge air coolers:
For stationary and mobile onshore and offshore applications from 200 kW
- Exhaust gas recirculation coolers:
Effectively reduce NOx levels inside the engine unit
- Closed circuit coolers:
Cool the air in the closed circuit using seawater and circulates it via a ventilator system
- Recirculation coolers:
For cooling large electric motors and medium-size generators
- Certified inspections
- Assembly and repair, also on site
- Emergency repairs service
- Preventive examination and damage analysis such as video endoscopy, leak tests, analysis of cooling water, etc.



AEM engine with GEA closed circuit cooler



█	26 – 27
█	24 – 25
█	22 – 23
█	20 – 21
█	18 – 19
█	16 – 17
█	14 – 15



GEA Heat Exchangers

Plate systems for cost-efficient heat exchange

Heat exchange in the onshore and offshore sector has to meet many criteria: low weight and small space requirements, to mention just two. Above all, one factor always has priority here: maximum reliability. Plate heat exchangers from GEA PHE Systems are reliable and operate safely even under the toughest conditions.



Gasketed plate heat exchanger for marine application

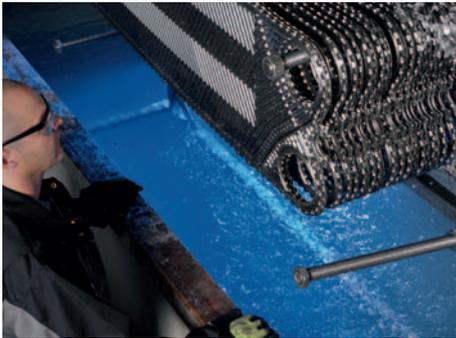
All plate heat exchangers of GEA PHE Systems have been ocean-tested and doing their work in different maritime and offshore areas of application for many years. It is not just that the development of cooling and heating technology is a decades-old tradition at GEA PHE Systems – the company also cooperates closely with leading engine builders. This resulted in complete systems that meet the highest standards in terms of cost efficiency and operational safety. Product series optimally tailored for use meet the increasingly stricter requirements at sea. Their variable lengths and profiles mean that the plate heat exchangers are adapted to conditions and not vice versa. And all products of GEA PHE Systems easily pass the acceptance tests of international classification societies.



Fully welded plate heat exchanger: easy to open and quick to clean

Higher performance, more applications and even less investment: the new versatile NT/HT series fulfills the requirements of the industry and sets economical standards for future plate heat exchangers. The innovative OptiWave plate design transfers a maximum of heat – while taking up less space. Modern installation and sealing technology ensures that the plate package is perfectly positioned. The non-adhesive and easy-to-change EcoLoc gaskets enable short downtimes, thus reducing maintenance costs. Of course these gaskets are optionally also available as adhesive versions. The GEA Bloc, a fully welded plate heater, offers an advanced technical solution for offshore applications where high pressure rating and temperature levels are standard. A large number of plate types and corrosion-resistant materials provide a solution for every application. Gaskets are installed without adhesives using the well proven Locln system.





Servicing a plate pack



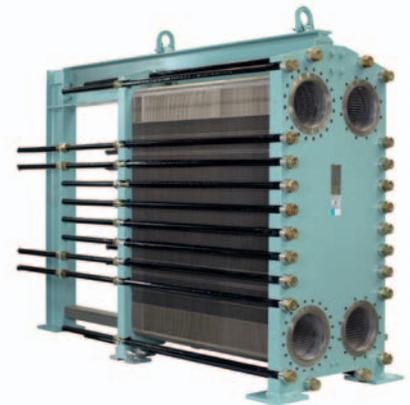
Shipowners and shipyards all over the world rely on GEA PHE Systems

GEA PHE Systems
 Karl-Schiller-Strasse 1-3
 31157 Sarstedt
 Germany

Phone +49 5066 601-416
 Fax +49 5066 601-134
info.phe-systems.germany@gea.com

Products at a glance

- NT series:
 Maximum corrosion protection thanks to broad choice of material (e.g. Titanium) combined with a small investment volume and maximum heat transfer
- LWC:
 Double NT technology for critical media like those applied in LNG regasification processes
- EcoWeld plate heat exchangers:
 Fully welded and reliable operation between minus 200 degrees Celsius and plus 950 degrees Celsius at an operating pressure of up to 100 bar
- EcoBraze – brazed plate heat exchangers:
 The design of the plates creates an extremely turbulent flow, effective heat transfer at low volume flows
- Effective central cooling of the main and auxiliary engines
- Cooling of gearbox, compressor and other lube oils
- Pre-heating of heavy fuel oils and lube oils
- Pre-heating of sea water to create fresh water
- Heat exchange to air-condition the passenger and freight areas
- Fuel oil cooling
- Regasification of LNG



LWC 350: plate heat exchanger for the LNG regasification process



█	26 – 27
█	24 – 25
█	22 – 23
█	20 – 21
█	18 – 19
█	16 – 17



GEA Heat Exchangers

Intelligent air treatment with
air handling units

If you need air heating, cooling, filtering, cleaning, humidifying, or dehumidifying, GEA Happel is your reliable and powerful partner, with customized air conditioning for the greatest possible reduction of energy consumption over the entire service life of your equipment.



GEA AHU CAIRplus SX



GEA Close Control GEA Ultra-DENCO®



GEA Fan Coil MPower-Geko



From comprehensive documentation
and on-site assistance up to after-sales
support

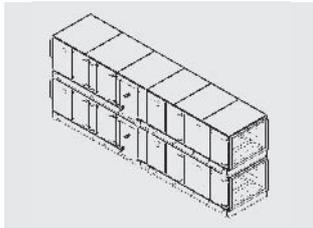
With increasing system responsibilities, our competence center for air treatment solutions covers the entire process chain of air treatment: from the intake of outside air to the transfer of treated air into rooms. The scope of activity comprises concept creation, technical design, and engineering of the air handling unit. We make use of our world-wide expertise to develop an optimal air treatment system 100 percent matched to your requirements. This pays off in euros and cents, comfort and work efficiency.

Our compact units are suitable for all areas of applications in the marine as well as in the oil & gas industry, taking into account the highly corrosive atmospheres and the constant movement of the equipment. In each ocean and sea, all types of ships are ideally equipped for very constraining climates around the world.

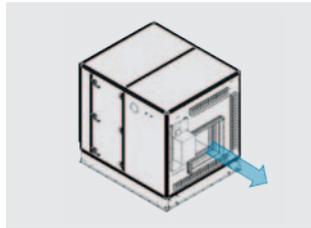
GEA CAIRplus air handling units: unlimited possibilities

Continuous supply of fresh air is one key to staff vitality and good performance. But room climate is influenced by many factors, and requirements for air state differ widely depending on the type of room and its particular use. GEA CAIRplus air handling units satisfy these tasks and ensure that a defined state of the air is provided and maintained. The GEA CAIRplus range (CAIR stands for “customized air”) is configurable as modules, which opens up almost unlimited possibilities. Whether as indoor or outdoor equipments, vertical or horizontal installation, double-deck, or single or side-by-side units – practically every installation variant is available.

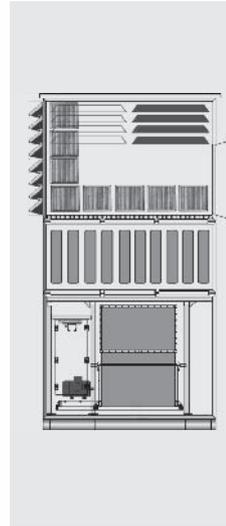




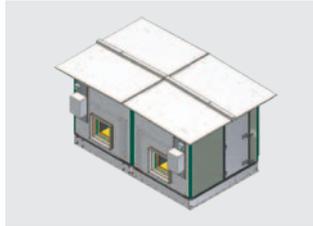
Indoor AHU: Double-deck



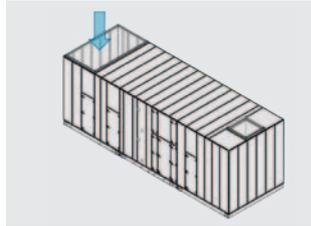
Air outlet on end wall



Vertical air routing



Outdoor AHU: Side-by-side



Air inlet on the top

GEA Happel France
61 avenue de l'Europe
59223 Roncq
France

Phone +33 3 20 68 90 20
Fax +33 3 20 94 57 37
sales-france@gea.com

Products and service at a glance:

Certificates

- Material Inspection Certificates
- Conformity Certificates
- Hazardous Area Certificates (ATEX)

Technical documents

- Equipment data sheets
- General arrangement drawings
- Equipment lists
- Wiring diagrams
- Design calculation notes
- Spare parts lists

Test reports

- Weight Certificates
- Dimensional Control Reports
- Coil-Pressure Test Reports
- Fan Functional Test Reports
- Air-Leakage Test Reports
- Electrical Continuity Test Reports

Procedures

- Handling, transportation, storage
- Installation, assembly
- Operation
- Maintenance

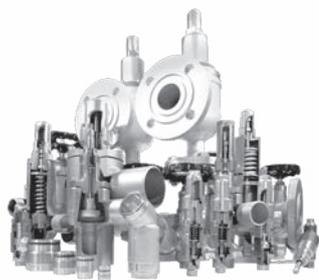


- 26 – 27
- 24 – 25
- 22 – 23
- 20 – 21
- 18 – 19



GEA Refrigeration Technologies

In touch with cooling and compact transport



Valves and fittings



Chillers



Freezers



Ice machines

GEA Refrigeration Technologies makes every effort to ensure that passengers are comfortable and the cargo arrives in good condition. Beyond that we are specialists in delivering refrigeration technology for compact transport of energy: for example, for cost-efficient transport of liquefied natural gas.

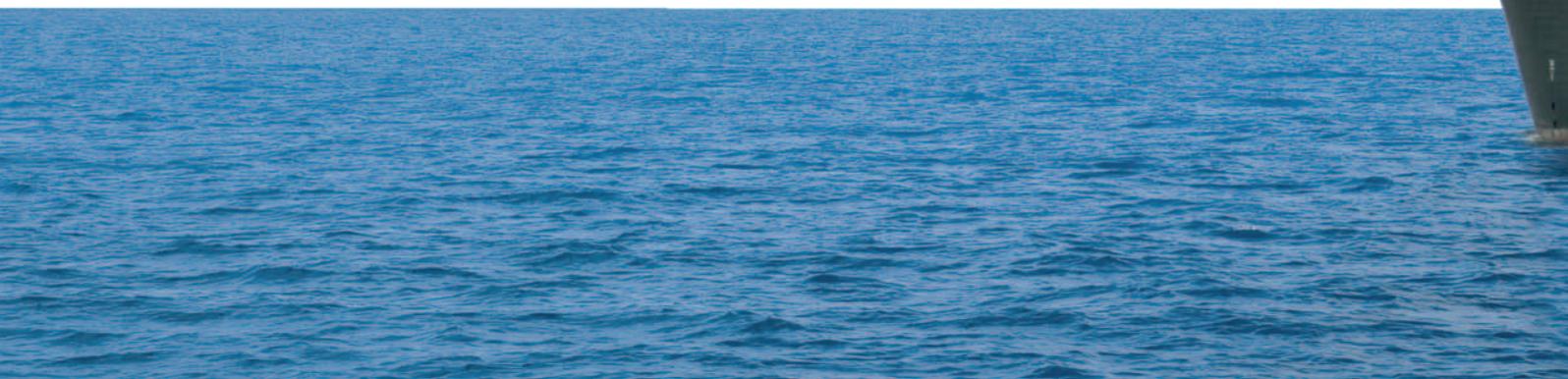
The cooling of processes and products are the specialties of GEA Refrigeration Technologies. Merchant-marine business also handsomely profit from this experience, and the fishing industry is a prime example. Units and systems of GEA Refrigeration Technologies are widely used on board of large and small fishing and seafood factory ships, for example to immediately freeze fish on the high seas. We are specialized in turnkey projects and deliver tailor-made solutions for new and existing vessels – from planning to implementation.

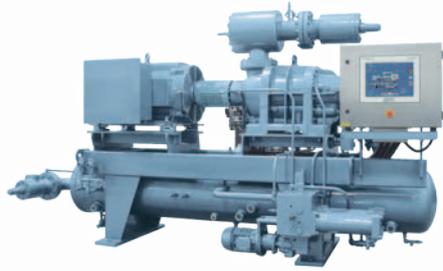
Compact, advanced, and energy-efficient systems cool or freeze the ready cargo, or help in pre-cooling and intermediate store. Small fishing trawlers and cutters need cooling beds of ice for their fresh catches, so that they can land fish with the same high quality as their larger competitors.

Juice-carrier ships require effective cooling systems to ensure the preservation of vitamins during the transport. Reliable and space-saving cooling during ocean transport is essential for cost-effective processing of juice or concentrate on site, where the fruit is actually harvested.

Compactness is also in demand for an entirely different application: natural gas. GEA systems reduce space requirements by liquefying gas down to below -160°C , and our cryotechnology enables great economy in the transport of energy media. Such liquefying shrinks the space needed for such gas to around 1/600 th of the requirements for uncompressed gas.

But last, and not least, people themselves are importantly involved. Cruises are becoming increasingly popular. During such cruises, the quality of time spent on board is at least as important as sightseeing on land.





Packages and skids



Piston and screw compressors

GEA Refrigeration Technologies GmbH
 Dorstener Strasse 484
 44809 Bochum
 Germany

Phone +49 234 980-0
 Fax +49 234 980-2802
 refrigeration@gea.com

GEA Refrigeration Technologies ensures a comfortable air-conditioning and the freshness of food storage even under extreme conditions of equatorial regions. What counts is the greatest possible benefit under cost-efficient conditions, with a maximum of environmental and climate protection.

For more information as well as worldwide customer contacts please go to GEA Refrigeration Technologies at www.gea.com.

Products at a glance

- Tailor-made solutions
- Turnkey projects
- Valves and fittings: Particular applications with regard to maximum permissible pressures
- Freezers: For fish that has been unprocessed, filleted, or portioned and otherwise prepared for the convenience of consumers
- Ice machines: More than 40 models delivering various ice qualities, including slurry ice and flake ice
- Ice towers: Extensive portfolio of solutions for fishing harbors and supermarkets
- Packages and skids: Ready to be hooked up and plugged in
- Piston and screw compressors: Covering all normally encountered requirements placed on the supply of refrigeration
- Chillers: Ensuring just the required climate
- Control systems: For individual units or complete systems to assure maximum benefits



Compact piston compressors



Ice towers



■	26 – 27
■	24 – 25
■	22 – 23
■	20 – 21

Customer proximity with top priority

GEA Refrigeration Technologies is not only just in the planning phase at customers side: The company also takes care of project engineering, implementation, commissioning, and maintenance of refrigeration equipment.



Control systems

Ships are usually one of a kind. As a result, refrigeration on board cannot be implemented with standard solutions. Systems by GEA Refrigeration Technologies are thought out on an individual basis to engineer a solution, that is optimally matched to all needs with respect to investment, functionality, space requirements, a minimum of maintenance, and long life cycles. And, on top of everything, these solutions are energy efficient, to ensure thrifty application of valuable resources.

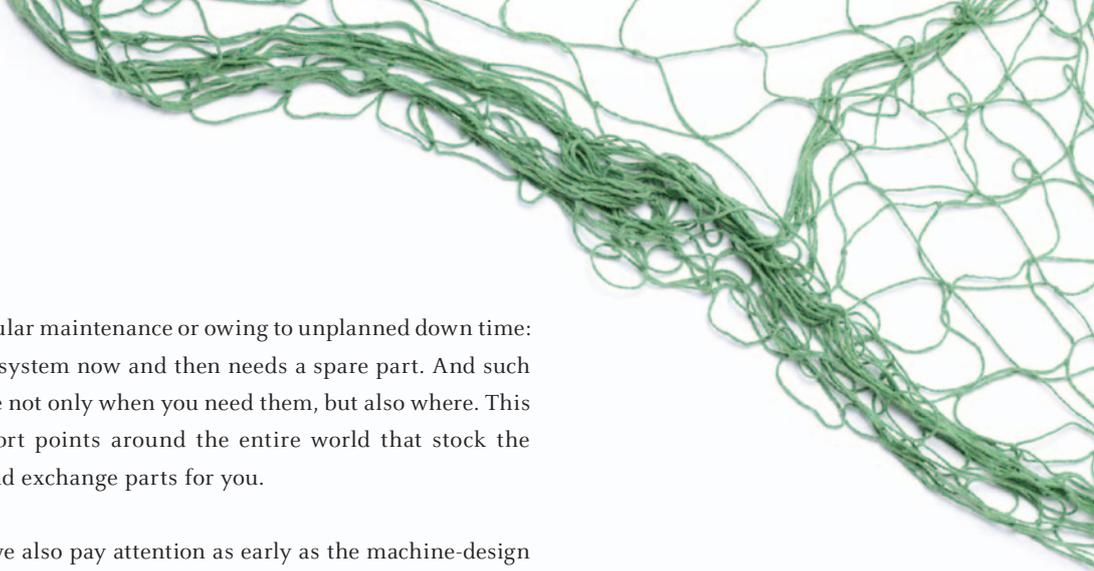
Beyond that GEA Refrigeration Technologies delivers measurement, control, and instrumentation technology in addition to the hardware. Interface problems simply do not exist. The GEA Refrigeration Technologies team will support the setup of systems, as well as assembly and commissioning of customers equipment.

Service and spare parts

Weeks out at sea and then only a few days in port – routine for you. Preventive and restorative maintenance cannot therefore be concretely scheduled at prescribed intervals. Instead, it must be oriented to your work plans. No problem. We are there if and when you need us. Also when you need help on open sea.

Simply call the GEA Refrigeration Service Hotline at: +31 73 6203 111. One central number for all our customers worldwide.





Whether as part of regular maintenance or owing to unplanned down time: even the longest-lived system now and then needs a spare part. And such parts must be available not only when you need them, but also where. This is why we have support points around the entire world that stock the normal wear, spare, and exchange parts for you.

To simplify logistics, we also pay attention as early as the machine-design phase that the same wear parts will be used in as many different modules as possible – which acts against unnecessary proliferation of part types. For us, this means simpler warehousing operations at the service support points – and for you this enhances the chances of spontaneous availability and fast assignment of our service team. A win-win situation that saves both of us time and money.

GEA Refrigeration Technologies works toward the following:

- Comprehensive consulting and responsible project support
- Great investment security
- Future-proof solutions
- A maximum of equipment operating time
- Long equipment life cycles
- Low energy consumption
- Minimal operating expense
- Highly competent service
- Fast spare parts delivery
- Climate- and environmentally-friendly technologies



We are ready to help you: we provide strong support in matters of financing, implementation of facilities, initial startup and maintenance.





Sludge treatment



GEA Westfalia Separator *BilgeMaster*



GEA Westfalia Separator *EnergyMaster*

GEA Westfalia Separator Group

High performance equipment for maritime applications

The treatment of water, grease, oil and fuel on the high seas is subject to strict economic, technical and ecological rules and regulations. GEA Westfalia Separator Group has developed a wide-ranging portfolio of cutting-edge systems to protect the marine ecosystem while safeguarding the investments of ship owners and operators. These highly efficient, future-proof systems are in line with IMO standards and remove potential hindrances so the operations of our clients and partners run smoothly and reliably. We call this concept GEA Westfalia Separator **seaprotectsolutions**.

The treatment of lube oils and fuels, sludge containing oil, bilgewater and ballast water at the highest level of purity and safety is one of the central requirements in the shipping sector. Other requirements are the operational safety of the ship's drive units, which has to be ensured by means of fuel treatment as well as water treatment, and obtaining fresh water from sea water. In addition the sludge treatment plant from GEA Westfalia Separator Group is capable of reducing the volume of sludge disposal by up to 90 percent. The recovered fuel oil can be reused. The recovered lube oil can be used for boiler fuel.

GEA Westfalia Separator **seaprotectsolutions**:

- GEA Westfalia Separator manual and self-cleaning separators:
Treatment and conditioning of lube, fuel and hydraulic oil and treatment of sludges containing oil and water
- GEA Westfalia Separator **BilgeMaster** and **SafetyMaster**:
Treatment of bilgewater and documentation of all process data
- GEA Westfalia Separator **EnergyMaster**:
Easy cost saving for lube oil treatment systems
- GEA Westfalia Separator **ViscoBoosterUnit**:
Ensuring the temperature, pressure and viscosity for continuous and safe operation of drive units (fuel oil conditioning)
- GEA Westfalia Separator **SeaWaterDistiller**:
Generation of fresh water on board by single-stage evaporation technology – equipped with GEA PHE Systems plate packs
- GEA Westfalia Separator **BallastMaster ultraV**:
Mechanical ballast water treatment without the use and generation of chemicals



GEA Westfalia Separator manual and self-cleaning separators

The main benefits of the systems are the high separating efficiency, continuous unmanned operation combined with pronounced service friendliness and, of course, the significantly reduced disposal costs associated with the method.

All systems can be customized to meet the local circumstances and outdated systems can be replaced by easy-to-install retrofit units in order to meet the new safety, purity and environmental standards. This makes it possible to expand capacity, automate processes and reduce service and maintenance costs.

GEA Westfalia Separator Group
Werner-Habig-Strasse 1
59302 Oelde
Germany

Phone +49 2522 77-0
Fax +49 2522 77-1778
ws.info@gea.com



GEA Westfalia Separator ViscoBoosterUnit



GEA Westfalia Separator SeaWaterDistiller





GEA Westfalia Separator BallastMaster ultraV – just add water

The IMO convention requires that new and currently operated ships must have ballast water management systems, with the law coming into full effect in 2016. These new guidelines may lead some ship owners and operators into uncharted territory. It's important to have a ballast water management system that is easy to use, complies with the terms of the convention and can be used for many years to come. GEA Westfalia Separator **BallastMaster ultraV** provides you with an all-round, worry-free system which meets current and future IMO standards for ballast water treatment.



*GEA Westfalia Separator
BallastMaster ultraV*

Just add water

With the GEA Westfalia Separator **BallastMaster ultraV**, it is very simple to ensure that there is only water in your ballast tanks – with no harmful organisms such as plankton, bacteria or viruses. Everything beneath the waves is under control, so you don't have to worry about it. Water goes in – easy.



*Energy-efficient low pressure UV-C
disinfection technology*

UV-C-based treatment system without the use and generation of chemicals

The GEA Westfalia Separator **BallastMaster ultraV** is a highly efficient mechanical and physical system for treating ballast water, including water with a high concentration of organisms and sedimentary particles. The two-stage system combines mechanical pre-filtration with subsequent disinfecting of the ballast water by UV-C. In this process, no chemicals are used and no hazardous by-products are created. It uses a low pressure UV section, which is energy-efficient and requires no cooling.



serv&care – proactive service for optimum reliability on board

The proactive, risk-free services of serv&care optimize operating reliability and permanent availability of the drive systems. Safety first: this is precisely what the service concept serv&care stands for. Shipowners not only benefit from traditional services such as inspection, maintenance, original spare parts and repair work provided by the original manufacturer; they also benefit from proactive solutions which avoid risk, e.g. online and offline monitoring with GEA Westfalia Separator wewatch®. These preventive services are the best pre-condition for a smooth operation. Enhanced process efficiency also follows from maximum operating reliability and machine availability. Accompanying modernization or upgrading to state-of-the-art technology also offer the option of boosting performance as required.



Original Manufacturer Service Worldwide

Training provided on site or in the modern training centre of GEA Westfalia Separator Group ensures that the plant operator's employees receive training in the proper handling of the high-tech installations. This provides additional safety.

Authorized workshops worldwide

And if problems occasionally occur or if a spare part is required at short notice, the specialists are able to attend to the ships quickly. This is ensured by a global network with more than 50 sales and service companies. Authorized workshops are able to service every location in the world at short notice.

serv&care accordingly makes for maximum operating reliability, machine availability, process efficiency and budget security. And these benefits are provided throughout the entire life cycle of the entire installation.

Service from the original manufacturer:

- Service engineers quickly on site
- Extensive service network
- Risk avoidance through service provided by the original manufacturer
- Proactive solutions
- Upgrading to boost performance
- Crew training



We live our values.

Excellence • Passion • Integrity • Responsibility • GEA-versity

GEA Group is a global engineering company with multi-billion euro sales and operations in more than 50 countries. Founded in 1881, the company is one of the largest providers of innovative equipment and process technology. GEA Group is listed in the STOXX® Europe 600 Index.

GEA Heat Exchangers GmbH

Dorstener Strasse 484, 44809 Bochum, Germany
Phone: +49 (0) 234 980-0, Fax: +49 (0) 234 980-2752
heatexchangers@gea.com, www.gea.com

GEA Refrigeration Technologies GmbH

Dorstener Strasse 484, 44809 Bochum, Germany
Phone: +49 (0) 234 980-0, Fax: +49 (0) 234 980-2802
refrigeration@gea.com, www.gea.com

GEA Westfalia Separator Group GmbH

Werner-Habig-Strasse 1, 59302 Oelde, Germany
Phone: +49 (0) 2522 77-0, Fax: +49 (0) 2522 77-2488
ws.info@gea.com, www.gea.com