Berthing and Mooring

100 years of innovation. Reliability engineered to last.

SCAN FOR MORE INFO

Driving innovation through combined expertise

For over 120 years, Trelleborg Dordrecht (formerly Mampaey Offshore Industries) has been a trusted leader in advanced marine systems, specializing in innovative berthing, mooring, and towing solutions. Now, as part of the Trelleborg Group, we are building on that legacy to deliver even greater value, expertise and innovation to our customers worldwide. Trelleborg's global reach, advanced research and development capabilities, expanded engineering resources and global network enhances our ability to deliver seamless, reliable solutions tailored to your unique needs. Our expanded engineering resources, global network, and advanced research and development capabilities means a broader range of products, enhanced global support, and strengthened site service capabilities for every project.

As the global market leader in the design, engineering, manufacturing, and commissioning of marine systems, we pride ourselves on delivering solutions that ensure safety, reliability, and performance in the most challenging conditions. Our commitment to innovation has driven new standards in the towing, mooring, Ship-to-Shore, and Ship-to-Ship Safety Links industries, earning the trust of an ever-growing global customer base.

With our combined capabilities, you can count on expertise, innovation, and a commitment to delivering solutions that keep your operations safe and efficient.

With courtesy of Höegh LNG and ENGIE.

Contents

Berthing and Mooring

WE PROVIDE STATE-OF-THE ART TOWING, MOORING AND BERTHING AND INTEGRATED INFORMATION SYSTEMS TO ENHANCE THE SAFETY AND EFFICIENCY OF THE PORT, MARITIME AND OFFSHORE INDUSTRY.

Berthing and mooring

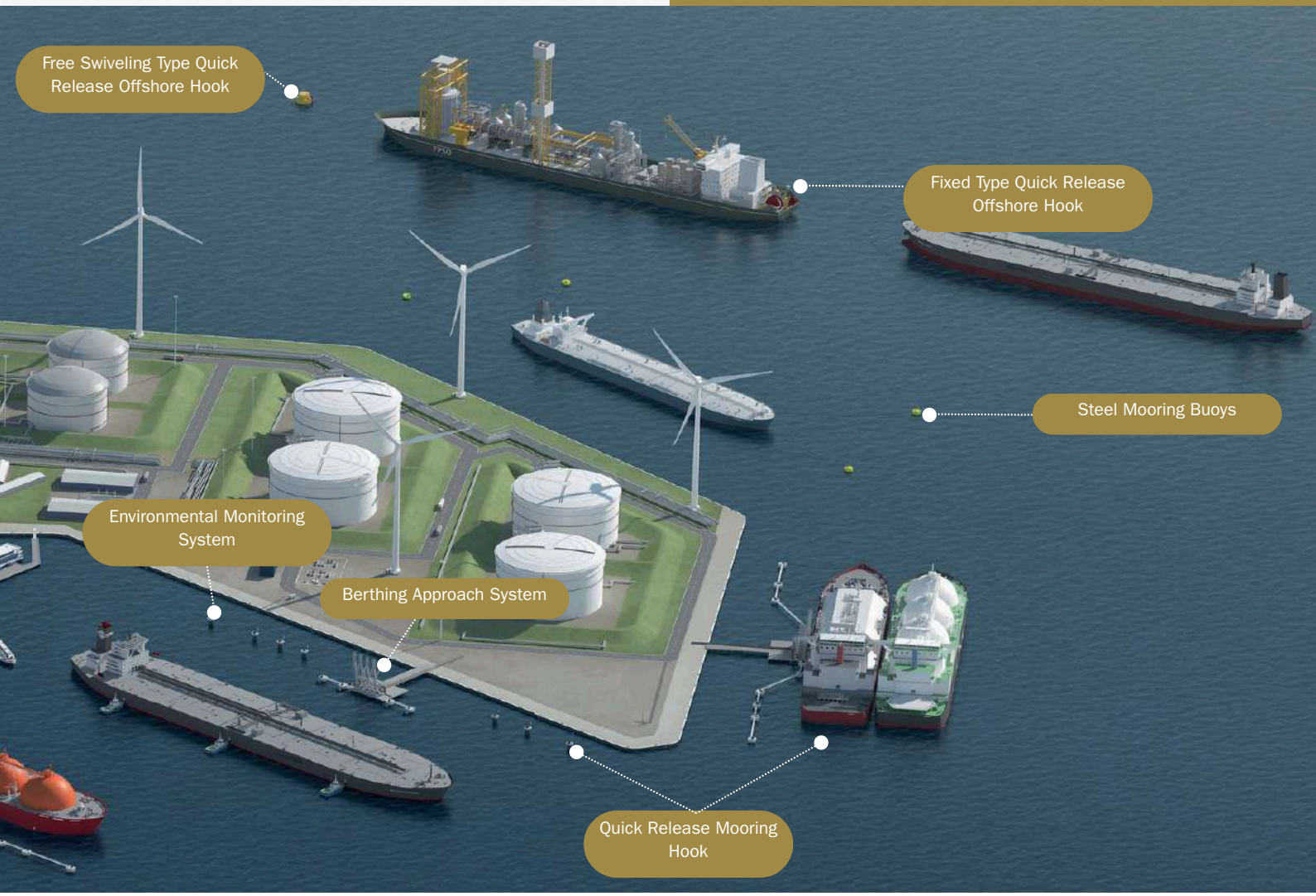
Our solutions are specialized for the safe mooring and berthing of vessels. We offer the most complete suite of products and services for any specific integrated berthing and mooring requirement.

We developed a special iMoor® system for safe mooring and berthing. iMoor is an integrated system of all mooring products which guarantees safety at the port and terminals or offshore worldwide. All our products can be integrated to the iMoor® jetty management systems through the use of a uniform iMoor interface.

MARKETS/APPLICATIONS:

- Ports and Terminals
  (LNG, Oil, Iron Ore, Coal, Cruise, Ferry Terminals, etc.)
- Offshore Mooring
  (FPSO's, FLNG's CALM/DW/SPM Buoys, etc.)
- Bunkering
  (Oil Bunkering and LNG Bunkering Vessels and Jetties)
- LNG Carriers and FS(R)U's

IMOOR® SYSTEM FOR SAFER MOORING AND BERTHING



Quality control & customer service

PROJECT MANAGEMENT

From the moment you place a purchase order with us, our professional project management team will be your point of contact. This concerns the processes of engineering, development, calculations, manufacturing, assembly, certification, documentation, testing, delivery and commissioning.

We have a dedicated team of technical sales engineers, project managers and electrical and mechanical engineers who are all specialized in mooring equipment processes and technology to assist all projects with the accurate know-how from beginning to end.

CUSTOM SOLUTIONS

All products of Trelleborg Dordrecht can be custom designed. With our products we meet all your demands such as low temperatures, Coal and Iron Ore Applications and revamping and upgrading of existing jetties. For example:

- Materials behave differently at room temperatures (and higher) compared to subzero temperatures. We are able to install the Quick Release Mooring Hooks in conditions with temperatures below zero degree Celsius, even down to -50 °C (-58 °F).
- The accumulation of dust, coal and iron ore particles at bulk terminals can cause the quick release mechanism to fail. We have however designed Quick Release Hooks specifically to be installed and operated in coal and iron ore quays with protection covers for the internal mechanism.

ALL TESTS ARE PERFORMED IN CLOSE COOPERATION WITH OUR CUSTOMERS AND WITNESSED BY A THIRD PARTY SURVEYOR IF REQUESTED

TESTING & CERTIFICATION

Trelleborg Dordrecht provides tests before delivery of all products, assuring that the product complies with the applicable specifications and standards. All tests are performed in close cooperation with our customers and witnessed by a third party surveyor if requested.

- Hook Load Testing
- Factory Acceptance Test (FAT)
- Site Acceptance Test (SAT)
- Certified Production Process

Trelleborg Dordrecht is ISO 9001 and 14001 quality approved.

All our systems can be supplied suitable for hazardous area with explosion proof certificates according to the standards such as ATEX/ IEC Ex/ UL/CU TR, etc.

REVAMPING & UPGRADING

To ensure and increase safety on existing jetties, more iMoor integrated systems are being installed. Trelleborg Dordrecht designs special units for installation on existing anchor-bolts or units to reduce downtime and costs for the revamping and upgrading of the existing jetties.

Trelleborg Dordrecht can provide:

- Integral Capstans suitable for mounting onto existing Quick Release Mooring Hooks
- Freestanding Capstans, suitable to be installed onto existing anchor bolt configurations.
- Mooring Load Monitoring System installation for already installed Quick Release Mooring Hooks.
- Special adapted Quick Release Hooks for installation into existing assemblies.
- Quick Release Mooring Hook Units specially designed to fit onto existing anchor bolt configurations.

Quick Release Mooring Hooks

The Quick Release Mooring Hook can disconnect the tanker's mooring lines with minimal effort even under full load conditions in case of emergency. This will limit the damage to the jetty and the environment. The standard versions the Quick Release Mooring Hooks are able to safely handle workloads from 40 up to 180 metric tons and the units can be supplied as single, double, triple, quadruple, sextuple, back to back and V-shape configurations.

All Quick Release Mooring Hooks are individually tested at standard 150% of the Safe Working Load, are low on total costs of ownership and have a long-proven durability. All load tests are based upon accepted classification societies e.g. LR, BV, DNV, RINA, ABS, etc.

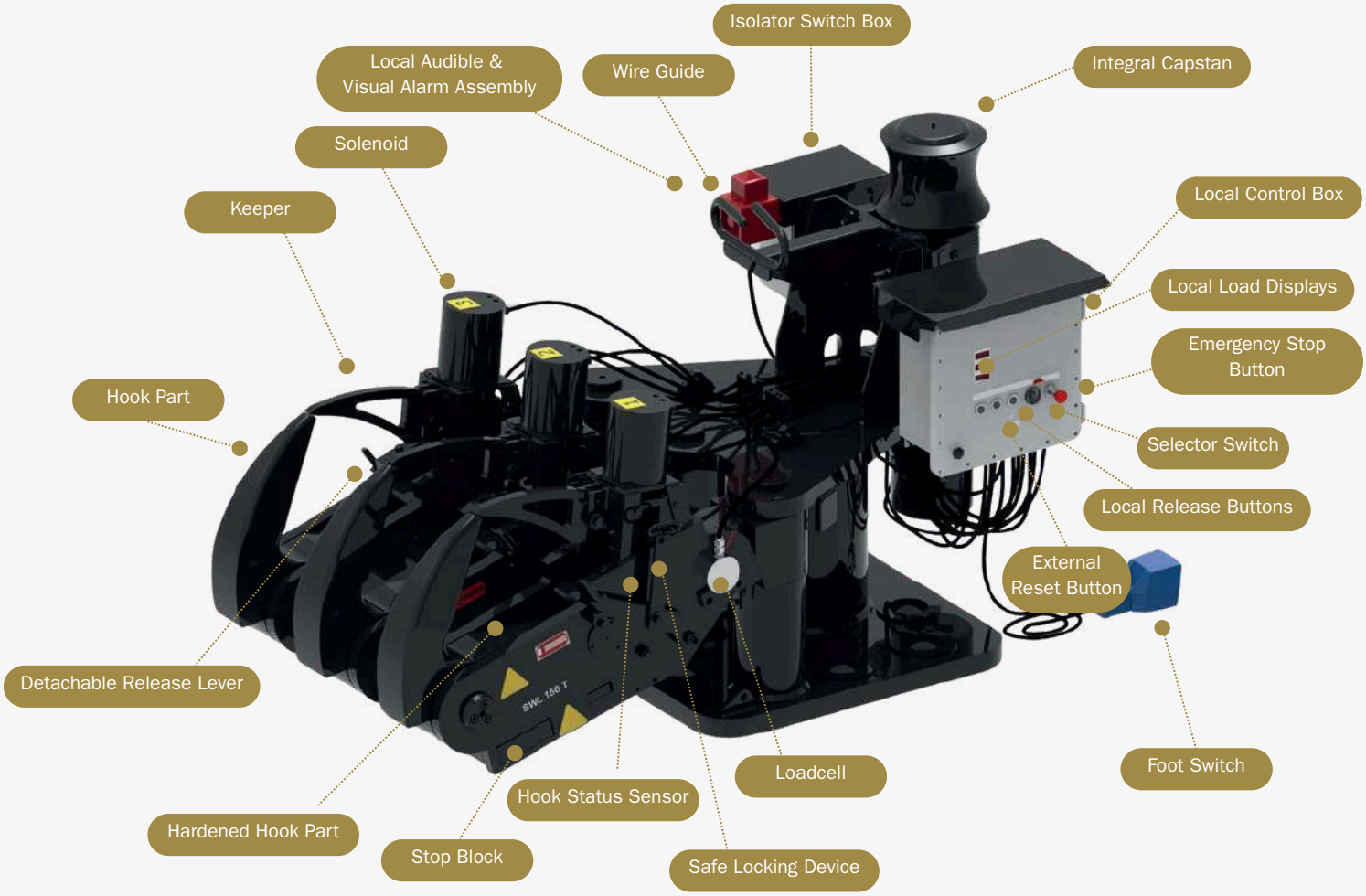
All units can be integrated with Integral Capstans, Remote Control System and Mooring Load Monitoring System.

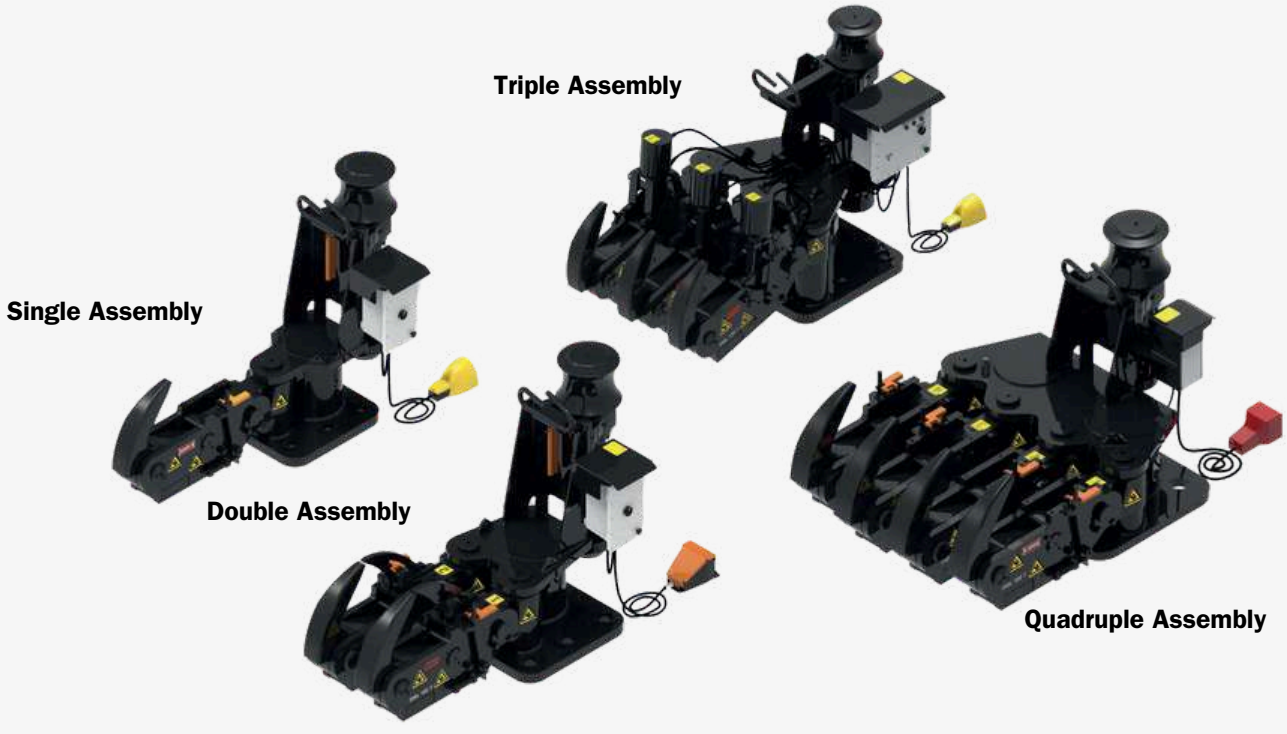
OPTIONS

- Dust protection covers
- Anti-rope slip devices (keepers)
- Special coatings
- Special low temperature executions
- Break-Off-Bolt Construction
- Solar Powered Units

SPECIAL CONFIGURATIONS

- Special Base-Plate for installation onto existing anchor-bolts.
- Special Adapted Hooks for installation into existing assemblies
- Quick Release Mooring Pulley


Isolator Switch Box
Local Audible & Visual Alarm Assembly
Wire Guide
Integral Capstan
Solenoid
Keeper
Local Control Box
Local Load Displays
Emergency Stop Button
Hook Part
Selector Switch
Local Release Buttons
External Reset Button
Detachable Release Lever
Foot Switch
Loadcell
Hook Status Sensor
Hardened Hook Part
Stop Block
Safe Locking Device

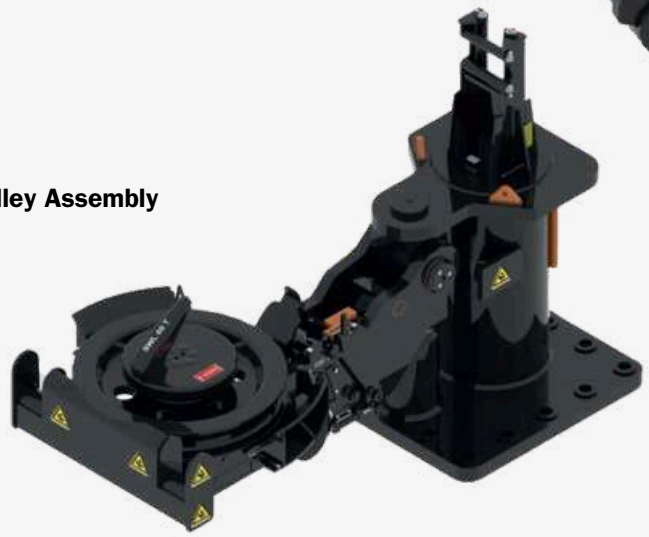

Triple Assembly
Single Assembly
Double Assembly
Quadruple Assembly

SPECIAL CONSTRUCTIONS

Back to Back Assembly

Sextuple Assembly

Pulley Assembly



TECHNICAL DESIGN DATA

SPECIFICATION	DETAILS
Safe Working Load per hook	400 kN up to 1800 kN
Release Load per hook	400 kN up to 1800 kN
Test Load per hook	150% (standard)
Safe Working Load per unit	Depending on the amount of hooks on the unit
Area Classification	Non-Hazardous and Hazardous areas
Holding Down Bolts	For new concrete, existing concrete and steel decks
Manual Release	Standard
Integral Capstan	Optional
Electric Remote Control System	Optional
Hydraulic Remote Control System	Optional
Mooring Load Monitoring System	Optional

Quick Release Offshore Hooks

Our designed Quick Release Offshore Hooks are designed for safe tandem mooring of shuttle tankers to FSO's, FPSO's, FLNG's and SPM/CALM/DW Buoys. We supply two different types; Fixed Type and Free Swivelling Type Quick Release Offshore Hooks.

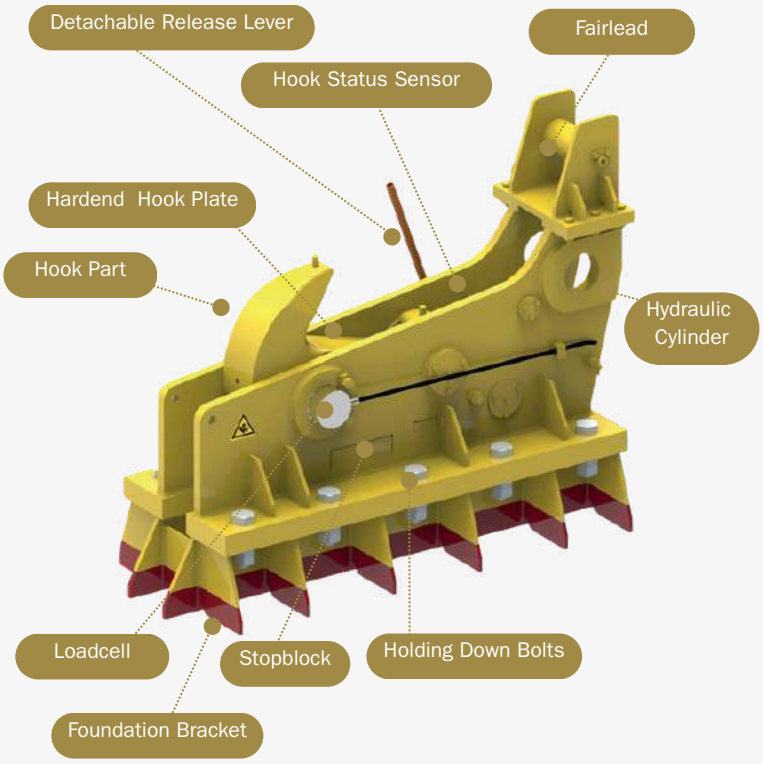
All units can be executed with Hydraulic Remote Control System and Mooring Load Monitoring System.

All hooks can be supplied with approval and certification based upon classification societies e.g. LR, BV, DNV GL, ABS, etc.

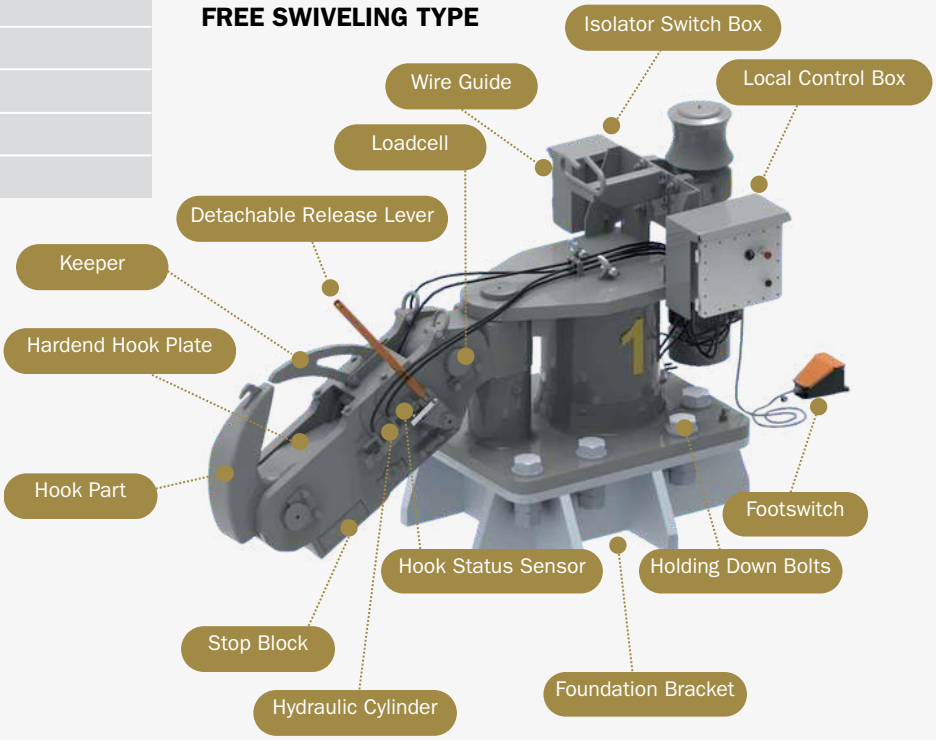
TECHNICAL DESIGN DATA

SPECIFICATION	DETAILS
Safe Working Load per hook	1500 kN up to 6000 kN
Release Load per hook	1500 kN up to 6000 kN
Test Load per hook	125% (standard)
Area Classification	Non-Hazardous and Hazardous areas
Installation	Counter Plate or Foundation Bracket
Fairlead	Optional
Manual Release	Standard
Integral Capstan	Optional
Electric Remote Control System	Optional
Hydraulic Remote Control System	Optional
Mooring Load Monitoring System	Optional

FIXED TYPE



FREE SWIVELING TYPE



Steel Mooring Buoys

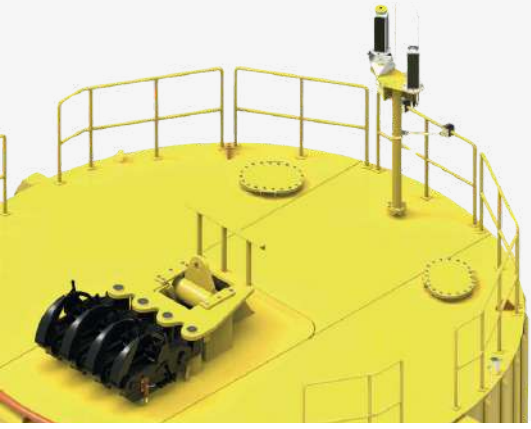
The Steel Mooring Buoy is specially designed for safe mooring of vessels in the most economical way. Built from robust, high-quality steel and fitted with Quick Release Buoys Hooks, the Steel Mooring Buoys offer a sturdy mooring solution for vessels undergoing waiting- or charging/discharging procedures.

The mooring stability is furthermore reinforced by the direct connection of the anchor chain to the mooring hook unit, the Steel Mooring Buoy offers a durable operation, even in extreme corrosive environments. The Steel Mooring Buoys are equipped with Quick Release Buoy Hooks for safe operation in all sea conditions.

Trelleborg buoys are typically used for Multi-Buoy-Mooring (MBM) operation, following OCIMF guidelines.

TECHNICAL DESIGN DATA STEEL MOORING BUOYS

SPECIFICATION	DETAILS
Standard Buoy Sizes	Approx. 5,000 mm Approx 6,500 mm diameter
Standard Features	Antislip surface treatment Hand Rail Man Holes Bollards Step Ladder Fenders Radar Reflector Navigation Beacon Anodes
Quick Release Buoy Hooks	Single Hook Unit to Quadruple Hook Unit 40 to 150 Tons SWL each hook
Wireless Remote Control System	Optional
Wireless Mooring Load Monitoring System	Optional



NON-RECLINING

Chain connection for a direct connection of the anchor chain to the mooring unit offers safety and stability.

BUOY DESIGNS

The Mooring Buoys are available in different sizes according to special requirements and conditions.

QUICK RELEASE BUOY HOOKS

Safe operation of the mooring buoys in all sea conditions is assured by Quick Release Buoy Hooks which can release mooring lines under full load.

REMOTE CONTROL & MOORING LOAD MONITORING

Quick Release Buoy Hooks can be provided with Remote Control System and Mooring Load Monitoring System which operate with Solar Panels for independent power supply and wireless communication to shore or portable devices.

Quick Release Buoy Hooks

Trelleborg Dordrecht supplies customized version of the Quick Release Mooring Hooks for use on Mooring Buoys. These are integrated on our Steel Mooring Buoys and can also be supplied for other Mooring Buoys.

The Quick Release Buoy Hooks can be operated manually from a line handling vessel.

Undesired opening of the hook is prevented by a special locking device.

By applying special coatings, bushings, grease and use of stainless steel internal hook parts the Quick Release Buoy Hooks offer a durable operation, even in extreme corrosive environments.

REMOTE CONTROL SYSTEM

The Quick Release Buoys Hook can optionally be operated hydraulically. This allows the hooks to be released from a distance by use of a wireless shore or portable remote device. Hooks can be individually or simultaneously released in case of an emergency. An indication if the hook is open or closed will also be displayed.

MOORING LOAD MONITORING SYSTEM

For safe and economic mooring operations, we provide the Mooring Load Monitoring System. Mooring line loads are measured by load cell installed in each hook. Mooring Loads and Alarms are displayed on a wireless shore or portable remote device.

TECHNICAL DESIGN DATA QUICK RELEASE BUOY HOOK

SPECIFICATION	DETAILS
Safe Working Load per hook	400 kN up to 1500 kN
Release Load per hook	400 kN up to 1500 kN
Test Load per hook	150% (standard)
Safe Working Load per unit	Safe Working Load per hook multiplied by the number of hooks on the unit
Assembly	Single Hook Unit to Quadruple Hook Unit
Manual Release	Standard
Remote Control System	Optional
Mooring Load Monitoring	Optional

Mooring Load Monitoring System

With the Mooring Load Monitoring System (MLMS) a close and constant watch on the forces on the mooring lines is kept. You can take immediate action in possible slack or overload situations.

Load information is displayed in real time and load alarms are presented against configurable load alarm settings. Mooring line patterns and load alarm settings can be saved to the ship database for future mooring procedures.

MOORING LINE PATTERNS AND LOAD ALARM SETTINGS CAN BE SAVED TO THE SHIP DATABASE

MONITORING

This information is accessible from the jetty computer and from different portable devices such as pagers, PDA's, laptops, tablets and mobile phones. The Mooring Load Monitoring data can be transmitted wireless or over the Ship to Shore Communication Link to the display device on the LNG Carrier. Trelleborg Dordrecht supplies Mooring Load Monitoring software for portable devices or MLM display device installed on an LNG Carrier.

CALIBRATION SERVICES

All Load Cells are calibrated during the load test on a calibrated test-bench. All calibration certificates are witnessed by classification societies (e.g. LR, BV, DNV, RINA, ABS, etc.).

Remote Control Systems

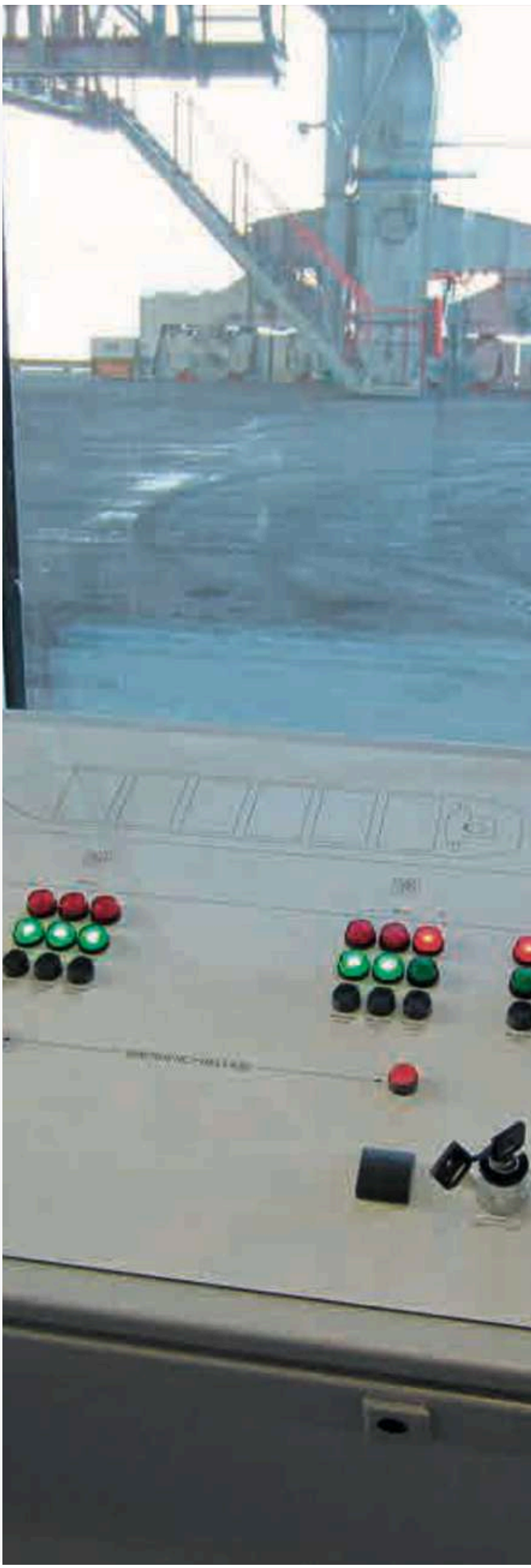
In case of an emergency you can release the hooks from a distance by remote control. With the Remote Control System(RCS) the hooks can be released individually or simultaneously. With a sensor mounted inside the hook open or closed hook status is measured and transmitted to the Remote Control Panel or iMoor® application software.

We offer two remote control systems:

- Electric Remote Control System: The release mechanism of the mooring hook will be operated by an electric solenoid.

- Hydraulic Remote Control System: The release mechanism of the hook is operated by a hydraulic cylinder. Hydraulic pressure is provided by a hydraulic power pack fitted at each mooring unit.

Both systems are operated by means of a Remote Control Panel. There are several in and outdoor configurations including pushbutton panels, virtual panels on screen and explosion proof panels.



Capstans

Trelleborg Dordrecht designs and manufactures the capstans for safe and economic handling of mooring lines. The capstans can greatly reduce the handling time needed for mooring. They prevent heavy lifting of mooring lines. In the standard versions, the capstans are available from 1 ton up to 3 tons nominal pull. Capstans are often integrated on the hook units. If so required we can also supply the capstans as separate freestanding units or as add-on units.

FEATURES

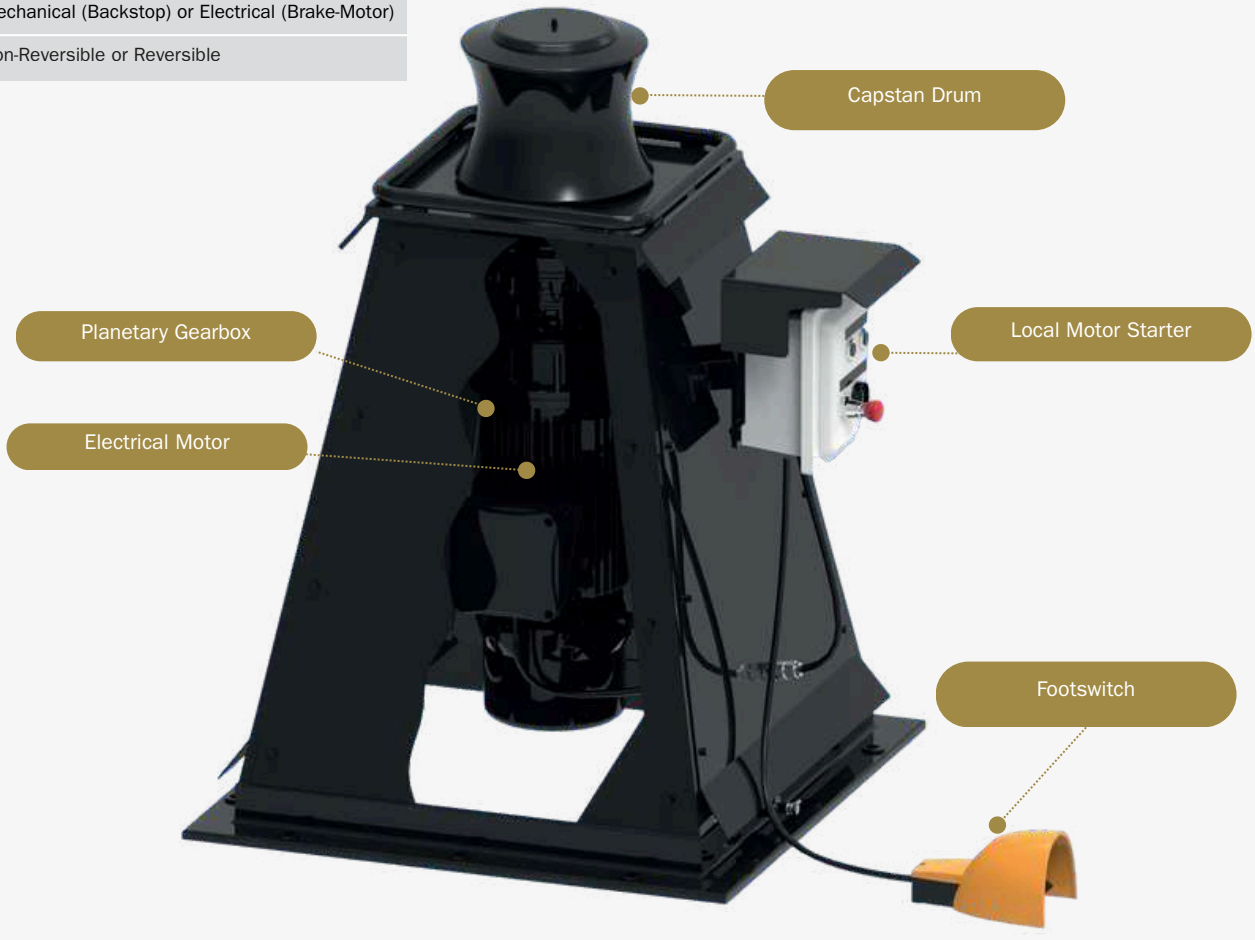
- Suitable for non-hazardous or standard areas
- 3-Phase squirrel cage induction motor with direct vertically mounted planetary gear.
- Foot switch and/or push button operation
- Local (non-)reversible type motor starter
- Optionally equipped with mechanical or electrical braking device
- The capstans can be customized upon request

TECHNICAL DESIGN DATA FREESTANDING OR INTEGRAL CAPSTANS

SPECIFICATION	DETAILS
Running Pull	10 kN to 30 kN
Starting Pull	20 kN to 60 kN
Line Speed	10 m/min to 30 m/min
Motor Capacity	3,0 kW up to 15 kW
Area Classification	Non-Hazardous and Hazardous areas
Braking device	Mechanical (Backstop) or Electrical (Brake-Motor)
Motor starter	Non-Reversible or Reversible

SPECIAL EXECUTION

- Horizontal Motor
- Dual Speed capstans available



Autonomous Solar Panels

To improve the energy supply we provide special Autonomous Solar Panel Systems. This green and sustainable stand-alone system provides electricity to the capstans, navigation light, working light.

A special designed mobile application provides the crew on site of information about the battery status, the level of charge of the Solar Panel System. The energy provided from the solar panels is stored in battery packs and can be used 24/7.

The provided energy can also be used for the wireless Mooring Load Monitoring System integrated in the Quick Release Mooring Hooks. With this wireless solution, the crew at the office can monitor the mooring loads on the hooks.

THE SOLAR PANEL SYSTEM CONSISTS OF:

- Solar Panel Frame
- Solar Modules
- Distribution Panel
- Battery Box
- Logging & Remote Monitoring

Berthing Approach System

The Berthing Approach System (BAS) aggregates the vital approach data with Laser Sensors and visualizes this with Large LED Display and Traffic Lights to the pilots and marine personnel to make the best decisions for a safe berthing process.

During the berthing process, the Large LED Display can be used to display berthing and mooring information such as approaching distance, speed and angle. After the vessel is moored and in contact with the fenders the system monitors the fender deflection & drift-off. Safety is assured by iMoor® 's adjustable alarm settings for the ship's speed and angle.

LARGE LED DISPLAY

Part of the Berthing Approach System is the Large LED Display. This provides data of interest for berthing services to pilots and ship crew. The LED powered digits are clearly visible beyond 300 meters during all weather conditions, day and night. They are maintenance free. It displays the following data:

- Distance for bow and stern
- Speed of Approach
- Speed Alarms
- Berthing Angle
- Angle Alarm
- Drift-Off (after vessel is moored)
- Certified for Hazardous areas

The traffic lights are integrated in the LED digits and provide speed & angle alarms.

Environmental Monitoring System

The Environmental Monitoring System (EMS) measures and records meteorological & oceanographical data from various sensors. With Environmental Monitoring System data you can predict ship behaviour which creates a safer berthing operation. Pilots and marine personnel can use the actual data and trends to make proper decisions.

The Environmental Monitoring System generally consists of the following sensors:

WEATHER STATION

The Weather Station can measure following data:

- Wind Speed & Direction
- Humidity
- Barometric Pressure
- Air Temperature
- Precipitation

We offer standard a compact and lightweight multi sensor configurable weather transmitter which measure all above parameters and requires minimal maintenance. Upon request all other type of weather sensors can be integrated to our system. Sensors for meaning other data such as solar radiation, cloud height, etc. are available as well.

CURRENT SENSOR

The Current Sensor is a submerged sensor which measures the following data:

- Current Speed & Direction
- Water Temperature

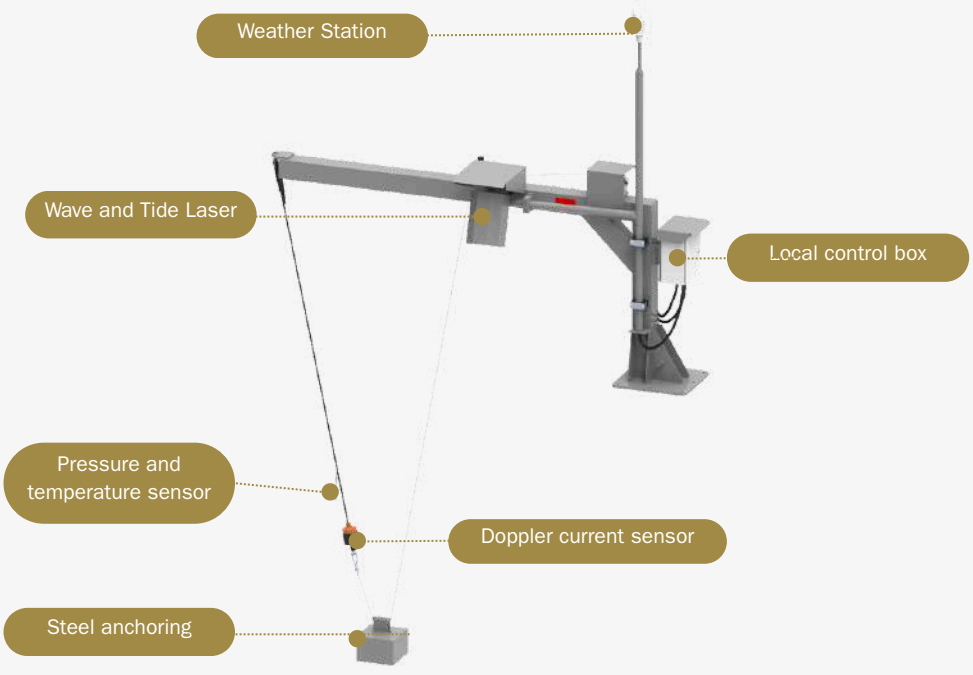
We offer standard a Doppler Current Sensor with true vector averaging sensor. The sensor is rugged, reliable and insensitive to fouling it is ideal for use on buoys, quays and jetties. Upon request all other type of current sensor, such as profilers can be integrated to our system.

WAVE & TIDE SENSORS

The Wave and Tide Sensors measure following data:

- Wave Heights
- Wave Periods
- Tide Level

We offer standard a submerged Pressure Sensor Wave & Tide Sensor or Non-Contact Type Wave & Tide Sensor. Upon request all other type of wave & tide sensor, such as profilers can be integrated to our system.



Central Monitoring System

The Central Monitoring System (CMS) enables your personnel to receive up to date information from the various iMoor modules about the berthing and mooring process. This provides histogram trends for vessels and has ship's data stored centrally. Specific data bases includes:

- Mooring configurations
- High load alarms
- Rope tension limits
- Trend logs
- Event & alarm archives and configurable
- Emergency release information

We can visualize typical iMoor applications like Mooring Load Monitoring, Remote Hook Release & Hook Status and Berthing Approach data. We also provide meteorological & oceanographic info as well as AIS or CCTV images. We can distribute the data locally or globally and can be monitored via LAN, WLAN, UHF or the internet. The iMoor® system processes the relevant information from the various sensors and visualizes it by the Jetty Computer.

FEATURES

Customized software: The iMoor Software Package is SCADA based. We can easily customize this package to your requirements and interface it to other systems.

MONITORING DEVICES

Personnel receives up to date information about the about Berthing, Mooring Load Monitoring and Environmental Monitoring data with devices such as hand-held pagers, PDA's, tablets, mobile phones, laptops and Carry Onboard Computer. The Ship to Shore Link facilitates the Mooring Load Monitoring data transfer and software application especially for LNG carriers.

DISCLAIMER

Trelleborg AB has made every effort to ensure that the technical specifications and product descriptions in this brochure are correct.

The responsibility or liability for errors and omissions cannot be accepted for any reason whatsoever. Customers are advised to request a detailed specification and certified drawing prior to construction and manufacture. In the interests of improving the quality and performance of our products and systems, we reserve the right to make specification changes without prior notice. All dimensions, material properties and performance values quoted are subject to normal production and testing tolerances.
This brochure supersedes the information provided in all previous editions. If in doubt, please check with Trelleborg Marine and Infrastructure.

BC-B&M-V1-EN,2025

At Trelleborg, sustainability isn’t an afterthought - it’s the foundation upon which we build our success and the promise we make to every customer and our environment. Through advanced solutions, we actively support the maritime industry’s transition to a low-carbon future - reducing emissions, improving efficiency, and creating lasting value for our customers.

SCAN FOR MORE INFO

TRELLEBORG

Trelleborg is a world leader in engineered polymer solutions that seal, damp, and protect critical applications in demanding environments. Its innovative solutions accelerate performance for customers in a sustainable way.

Trelleborg Marine and Infrastructure is a leading provider of premium solutions for critical marine, port, and built infrastructure applications. Its innovative polymer and smart technology solutions enhance operational efficiency, safety, and sustainability.

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