TRELLEBORG

DynaMoor

A DYNAMIC MOORING SOLUTION TO IMPROVE THROUGHPUT, EFFICIENCY AND SAFETY

Powered By SmartPort®

The Smarter Approach

Connect with
The Smarter Approach
By Trelleborg Marine and Infrastructure

- Visit: **TrelleborgMarineandInfrastructure**
- Connect: **trelleborg-marine-and-infrastructure**
- Discover: **TrelleborgMarineandInfrastructure**
- Converse: **@TrelleborgMI**
- Explore: **marineandinfrastructure**
- Discover: **TrelleborgMarineandInfrastructure**

The demanding nature of commercial ports and terminals means you need a partnership that provides much more than technically superior products and technologies. You need to work with a partner that combines best practice expertise gained through worldwide experience with a deep understanding of local requirements and regulations. At Trelleborg, we call this the Smarter Approach.

Our Smarter Approach combines global reach with feet-on-the-ground local presence, delivering solutions that continually enhance your operations. Smart technologies are at the forefront of improving operational efficiencies. Trelleborg's innovative SmartPort offering deploys the latest in marine technology applications to help ports and terminals optimize their operations.

Connect with a partner that combines smart solutions, proven product capability and industry expertise to maintain and enhance port and vessel performance. Take a Smarter Approach, with Trelleborg Marine and Infrastructure.

Docking and Mooring Systems

When installing or upgrading Docking and mooring Systems, you need to ensure you choose the right partner. Ensure your provider can deliver the solution for you, on time and on budget, wherever you are in the world.

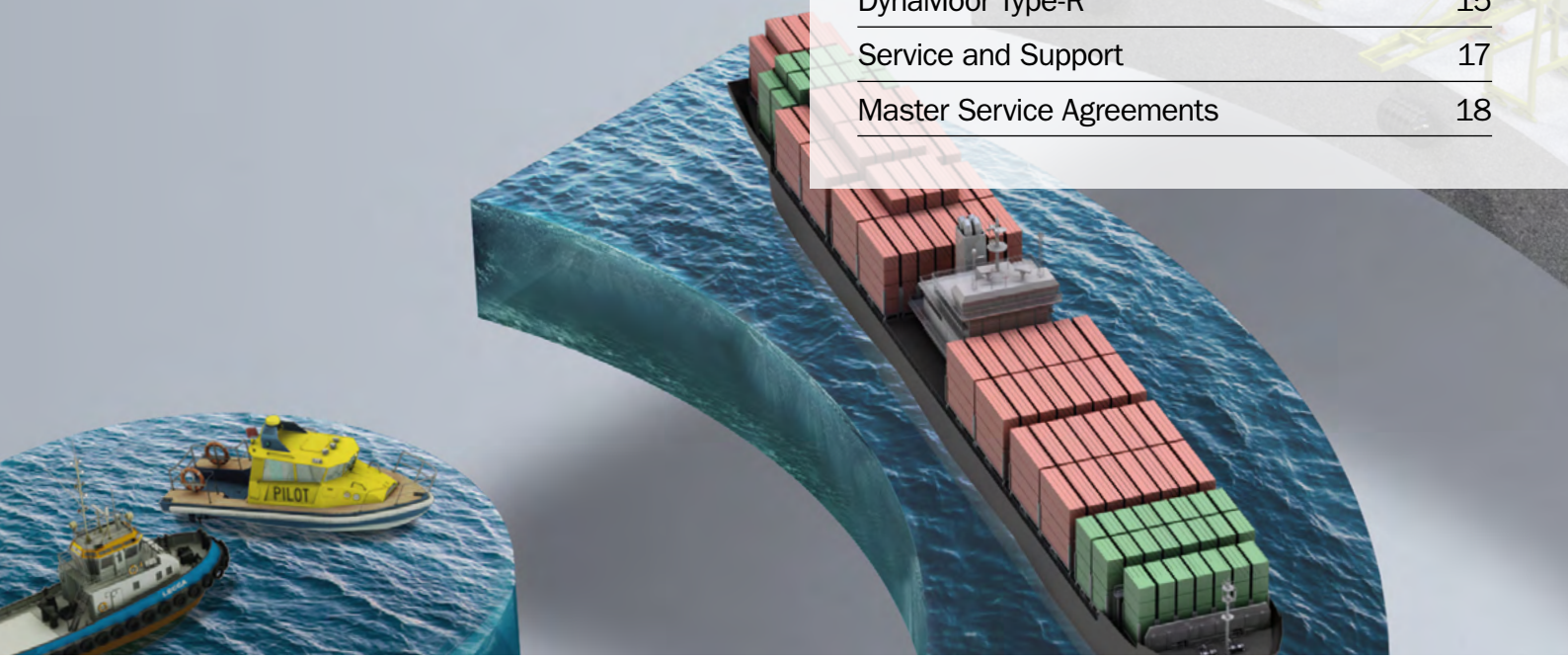
Ensure your solution is designed around the needs of you and your operations, with a dedicated team that has the experience to understand them.

Ensure your Docking and Mooring Systems feature technically superior products to maximize durability and reliability, whilst minimizing downtime and whole life costs.

Ensure your partner can offer you the maintenance and aftersales service you need.

Contents

DynaMoor



A Smarter Approach at every stage

A smarter approach to...

CONSULTATION

Consultation from the earliest project phase to ensure the optimum fender systems and marine technology solutions are specified, with full technical support from our global offices.

CONCEPT

Conceptual design in your local office – with full knowledge of local standards and regulations, delivered in your language – for optimized port and vessel solutions.

DESIGN

Concepts are taken to our Engineering Centers of Excellence in India where our team generates 3D CAD designs, application-engineering drawings, a bill of materials, finite engineering analyses and calculations for both our fender systems and marine technology solutions.

MANUFACTURE

Our entire product range is manufactured in-house, meaning we have full control over the design and quality of everything we produce. Our strategically located, state-of-the-art facilities ensure our global, industry leading manufacturing capability.

TESTING

Across our entire product range, stringent testing comes as standard at every step in our in-house manufacturing process. We ensure that lifecycle and performance of our entire product range meets your specifications, and more.

INSTALLATION

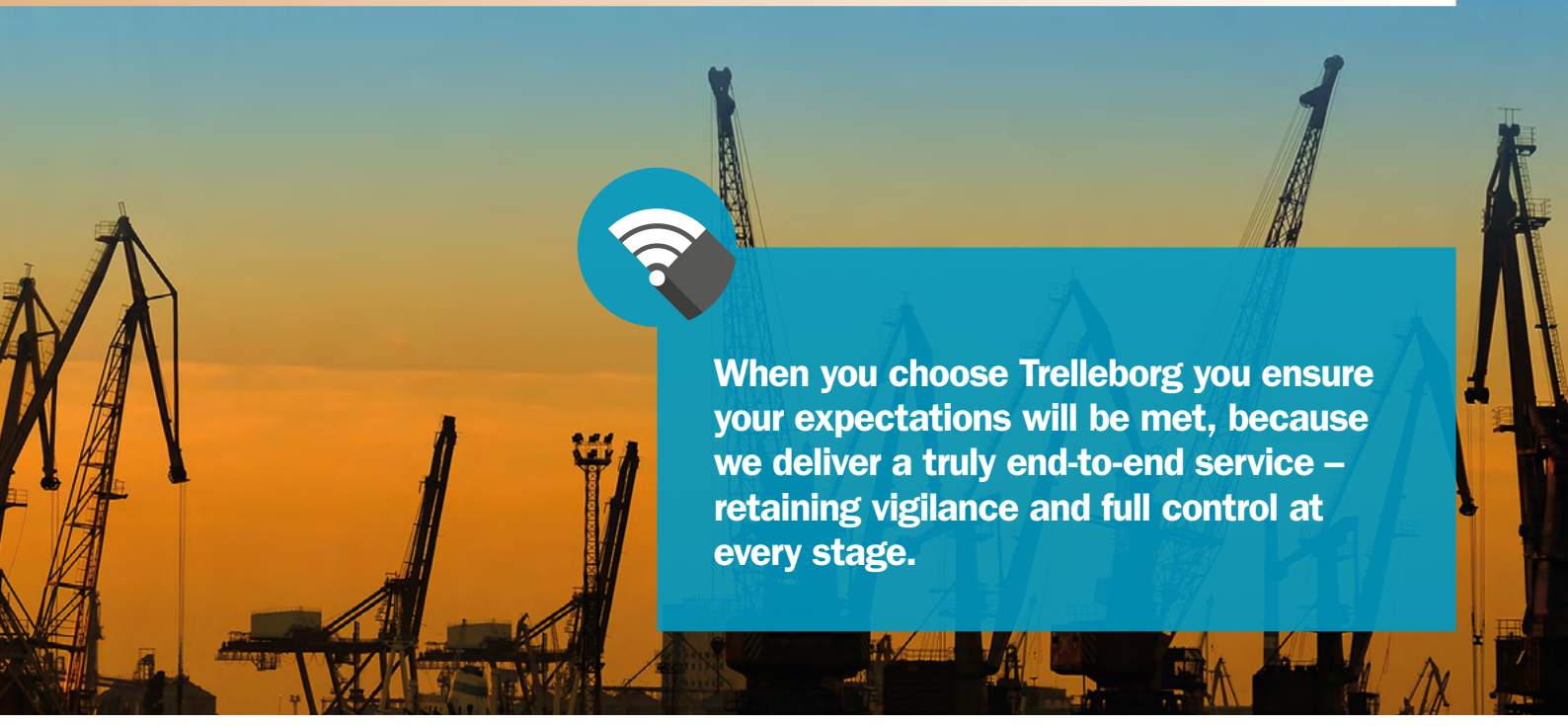
Dedicated project management, from solution design right the way through to on-site installation support. We design products and solutions that always consider ease of installation and future maintenance requirements.

SUPPORT

Local support on a truly global scale, with customer support teams all over the world. And this service doesn't stop after a product is installed. You have our full support throughout the entire lifetime of your project, including customized training programs, maintenance and onsite service and support.

THE FUTURE

Deploying the latest in smart technologies to enable fully automated, data-driven decision making that optimizes port and terminal efficiency. At Trelleborg, we're constantly evolving to provide the digital infrastructure our industry increasingly needs.



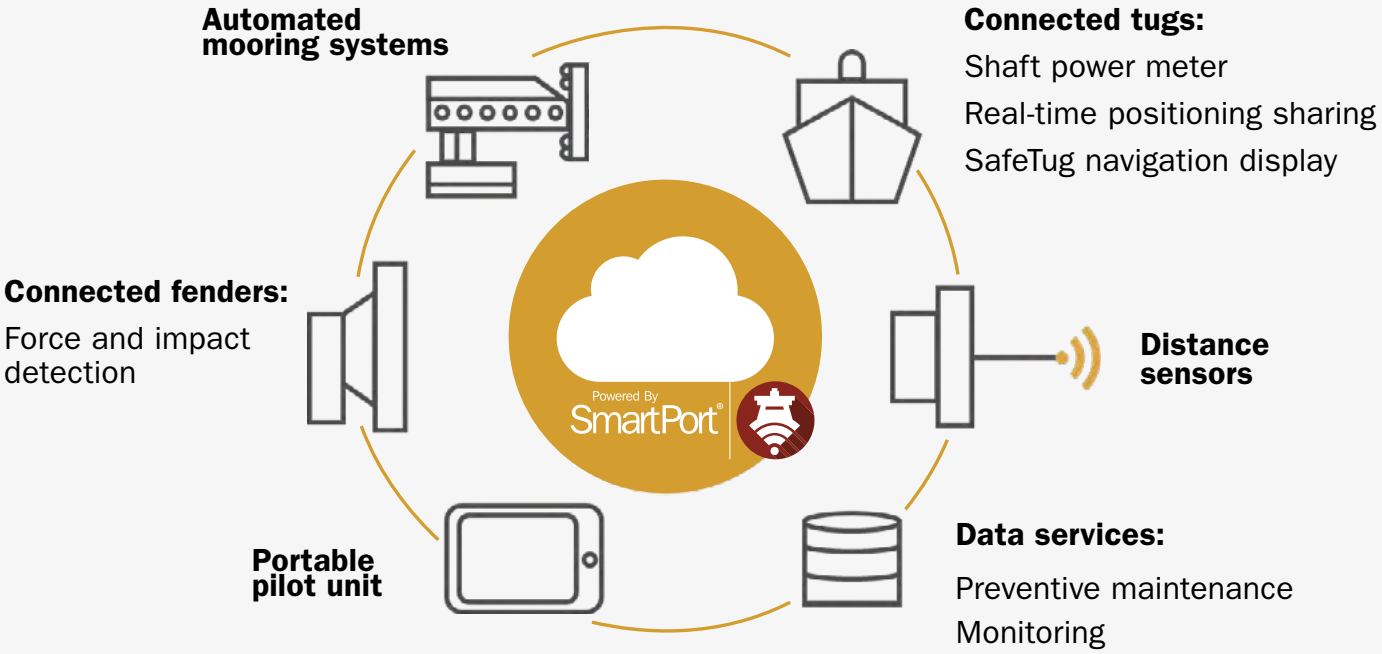
When you choose Trelleborg you ensure your expectations will be met, because we deliver a truly end-to-end service – retaining vigilance and full control at every stage.

SmartPort: Better Together

SmartPort is Trelleborg's answer to the need for a standardized way to collect and store data. It's a technology platform that connects port operations, allowing users to analyze asset performance effectively and apply data insights to improve day-to-day decision-making and long-term operational improvements.

SmartPort connectivity

Our docking and mooring solutions integrate with the SmartPort technology platform to better connect your marine assets and optimize performance across the port environment. All port and pilot functions, data and schedules are linked together via the SmartPort cloud, enabling full transparency, information sharing and live access to all relevant information with a touch of a finger at the right time to the right staff – and in real time.



Why Choose SmartPort?

- SmartPort uses the latest smart technology to manage intelligent data collection, transfer and storage to optimize assets across the port environment.
- SmartPort products collect and transmit data in real time, distributing it to the right people at the right time – on board the vessel, in the control room or on the jetty – to improve day-to-day operations.
- SmartPort allows the performance of assets to be analyzed quickly and effectively to identify incremental efficiency gains over the short and long-term.
- SmartPort is built on an open API structure to enable collaboration with third-party systems and third-party assets.

Powered By SmartPort®

A Smarter Approach to Docking and Mooring

The marine industry is in a time of transition and change. We must constantly adapt and innovate to ensure efficient, safe solutions in an increasingly demanding environment.

Our docking and mooring systems play a critical role in optimizing the efficiency of both the berth and the overall port facility. Process refinement is key. That's why, at Trelleborg, we have reconsidered our approach, introducing a new concept we call lean mooring.

The lean mooring philosophy aims to transform berthing strategies and deliver superior efficiency in operations.

A lean mooring approach enables greater control of the operational window, optimizes berth utilization, lowers resource and space requirements and demands less time and infrastructure investment to increase berthing capacity.

A Dynamic Solution

Dynamic mooring is an important part of the solution to the key challenges faced by port and terminal owners and operators today.

Vessels are becoming larger.

Not only does the greater mass of the vessel being moored increase peak loads on mooring lines, but weather and wind have an increased effect on the larger vertical surface areas presented by today's large tankers, cargo vessels and cruise liners. Larger vessels also mean more powerful oscillations to berthed vessels as they pass by, creating alternating mooring line tension and increasing the risk of snapping lines.

Environments and operations are becoming more demanding.

The rise of the LNG sector, in particular, has seen more work taking place offshore. Climate change and greater commercial demands on ports also necessitate that unloading and transfers take place in less than ideal conditions.

Adverse weather conditions including long period waves cause unsafe loading and unloading environments. More berths are being built in exposed locations, and the cost of building breakwaters is prohibitive. And even in good conditions, changes in draft or tide mean that lines need constant tending – making accidents caused by human-error an ever-present possibility.

Safety is paramount.

The more human involvement in the docking and mooring process, the more potential there is for human error. The greater the number of lines and fixtures like bollards and pulleys, the greater the potential for accidents on the wharf.

Dynamic mooring helps you solve the most important challenges.

Dynamic mooring keeps constant tension in mooring lines to dampen vessel motion, simplifies the mooring and release processes, reduces wharf furniture and the risk of snapback, as well as monitoring loads in real time.

Introducing DynaMoor

The next generation of mooring systems, DynaMoor, combines Trelleborg's class leading Quick Release Hooks with an innovative dynamic tensioning system.

DynaMoor provides control of loads on the ship's mooring lines leading to safer, more secure mooring.

DynaMoor dampens vessel motion, which increases the range of environmental conditions in which cargo can be transferred, improving throughput. The risk of parted lines and excessive vessel excursion is significantly reduced, protecting people, assets and increasing uptime.

DynaMoor further enhances safety by minimizing 'snap back' zones, and also reduces the overall amount of wharf furniture, simplifying day-to-day operations. The system speeds up the berthing process and minimizes workload and manual line handling, improving overall efficiency.

Complying with international engineering standards and exceeding numerous industry guidelines, production of DynaMoor is carried out by qualified technicians, using components supplied by Trelleborg-owned factories and approved supply chain partners.

The Benefits of DynaMoor

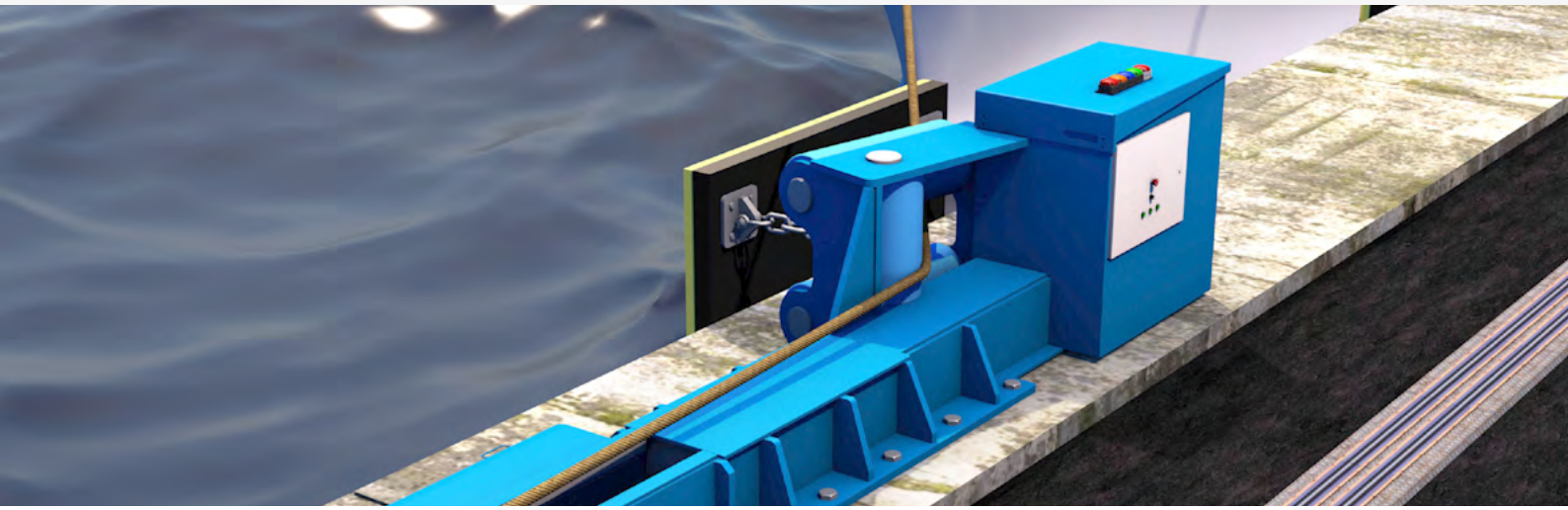
DynaMoor is a versatile mooring solution which can be used with the ship's mooring lines and winches. It can form part of a complete jetty solution integrated with Trelleborg's Quick Release Hooks, AutoMoor, Smart Bollards, or be deployed as a separate system. DynaMoor units can suit a wide range of mooring configurations and can come with an optional capstan fitted.

EFFICIENCY

- Dampens vessel motions allowing operations in a wider range of conditions.
- Integrated fairlead simplifies the mooring arrangement and eliminates bollards.
- Allows real time monitoring of mooring line tension and integrates with SmartPort.
- Keeps mooring crews out of the danger zone by automatically adjusting mooring line tensions.

SAFETY

- Avoids the need for complex pulley systems to route mooring lines to the vessel.
- Local or remote release allows safe release of mooring lines up to the full Safe Working Load (SWL).
- Added safety interlocks prevent inadvertent or unauthorized release.
- Controls tension of mooring due to tidal or vessel loading draft changes, eliminating reliance on mooring crews.



Why use DynaMoor?

DynaMoor is an intelligent dynamic mooring solution that enables more efficient berthing and release operations and Dynamically controls tensions in mooring lines, damping vessel movements to facilitate product transfer operations.

- Improves throughput by allowing product transfer in a greater range of conditions.
- Different operating modes offer more efficient use of equipment, they help manage energy consumption and equipment fatigue.
- Less reliant on shipping crew tending to mooring lines throughout the product transfer cycle, reducing human error resulting in parting lines.
- Enhances safety with the ability to release mooring lines remotely in an emergency.
- Moors vessels more securely with balanced loads and dynamic tension.
- Improves efficiency by speeding up the berthing process, minimizing workload.
- Contributes to a better connected more customer-friendly port with SmartPort connectivity.

DynaMoor at a glance

Trelleborg's DynaMoor is a safe, cost-effective, dynamic mooring solution that provides dynamic tension control of mooring lines and dampens vessel motions. DynaMoor increases port and terminal throughput by allowing operations to continue in a wider range of conditions, while improving safety and reducing operational costs.

Reducing Total Cost of Ownership

DYNAMOOR REDUCES CAPITAL AND OPERATIONAL COSTS BY

- Improving berthing efficiency.
- Reducing labor.
- Enhancing safety.
- Shortening mooring line setup time.

DYNAMOOR ENHANCES MARITIME SAFETY BY

- Reducing human error as fewer personnel are required throughout the product transfer window.
- Requiring fewer lines, no pulleys and bollards in turn reducing snapback zones.
- Applying active tensioning to maintain vessel position, minimize oscillating vessel motions, and the risk of parted lines.

DYNAMOOR TYPE-L OR TYPE-R?

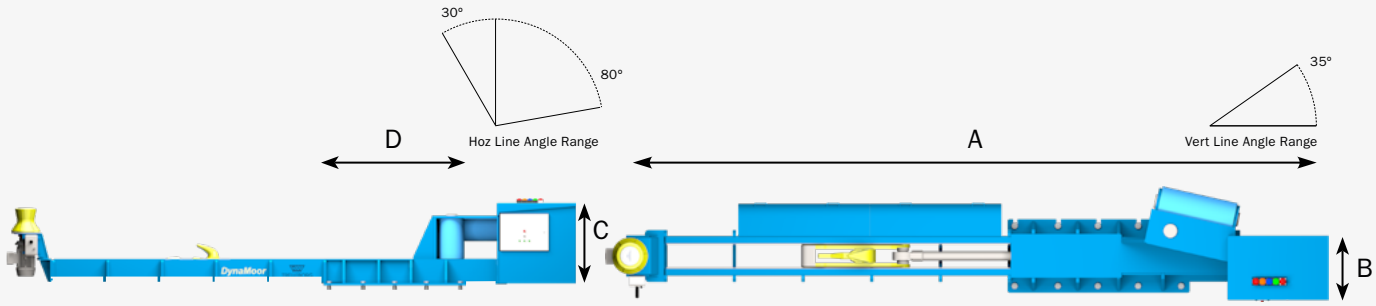
QUICK COMPARISON		
	DYNAMOOR TYPE-L 3m	DYNAMOOR TYPE-R 4m
Footprint (mm x mm)	8900 x 1300	3000 x 1900
Shipping mass (kg)	6500	12000
Maximum damping load	60T	60T
Safe Working Load (T)	150 In fully compressed position	100 In fully compressed position
Fairlead	Integrated	Integrated

DynaMoor is available in linear or rotary configurations. The rotary DynaMoor Type-R has the advantage of a smaller footprint to suit compact spaces such as mooring dolphins.

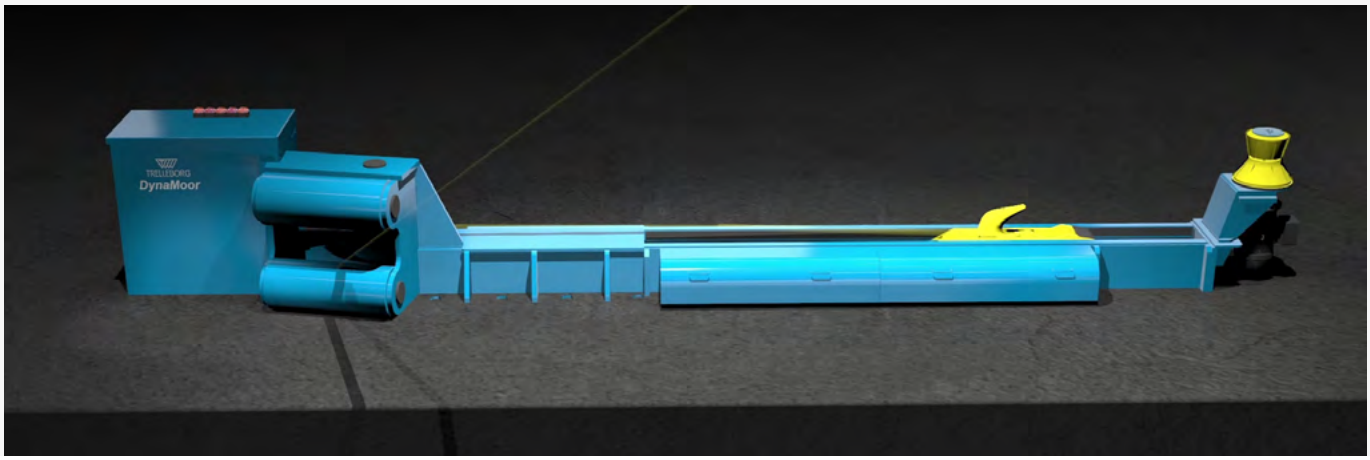
DynaMoor Type-L

Details and Specifications

MODEL	A	B	C	D	ANCHOR BOLT SIZE (mm)	ANCHOR BOLT (QTY)	SHIPPING MASS (KG)
DM60L	8900	1300	1400	2900	M56 x 1000	10	6500



1	**GENERAL SPECIFICATIONS**	
1.1	Maximum damping load	60T
1.2	Line Stroke	3m*
1.3	Safe Working Load	150T in fully compressed position
1.4	Line angles	Vertical - 0° to 35° Horizontal - -30° to 80°
1.5	Key Standard Features	Quick Release Hook (QRH)
		Integrated Roller Fairlead
		Main Structure
		Integrated or Separate Hydraulic Power Unit (HPU)
		Integrated Accumulators
1.6	Optional Features	DynaMoor Control System
		Electric Capstan 1.5T - 3T line pull
2	**DYNAMOOR CONTROLS**	
2.1	Control Systems	Local Push Button Panel Optional Systems: Tablet with User Interface Integrated Central Monitoring System



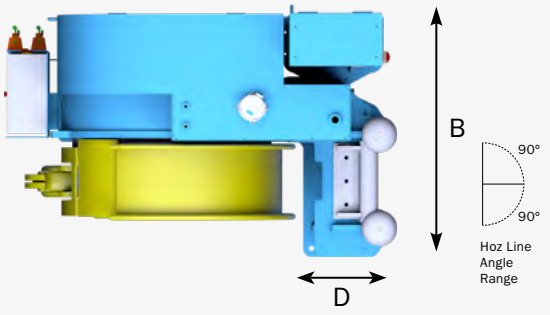
* For other lengths please contact our engineers

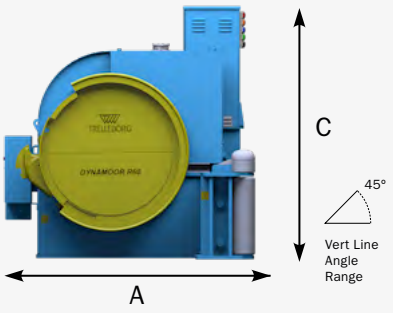
3	**QRH GENERAL SPECIFICATIONS**	
3.1	Hook Construction	Frame (side plates): Carbon Steel ASTM A572 Grade 50 equivalent to AS 3678 Grade 350 Hook body, main pivot block, primary release block: cross shaft are high strength alloy steel to ASTM A148, equivalent to AS 2074.
3.2	Spark Prevention	The hook assembly is fitted with three elastomeric impact blocks for energy absorption. Material: polypropylene.
3.3	QRH Line Sizes (Ø mm)	Max Ø 110mm
4	**UTILITIES AND CLASSIFICATION**	
4.1	Classification	Non-Hazardous Areas – IP66 Hazardous Areas - Suitable for ICEX Zone 1 IIB T4 Operating Temperature range: -20°C to +55°C
4.2	Electrical	Supply Voltage – 3 phase, 380 to 415 @ 50Hz, 440 to 480 60Hz
4.3	Incoming Connections	Power Entry with Power Communications Entry with Communications if remote control selected
5	**STRUCTURAL FRAME**	
5.1	Fabricated frame and fairlead	Low Alloy Steel Grade Q345D to GB/T1591-2008 equivalent to ASTM A572 Grade 50.
5.2	Extended Temperature Range	For temperatures below -20°C and above +55°C, please consult our engineers.
6	**QUALITY & TESTING**	
6.1	NDT	ASTM E1444-05
6.2	Welding	AWS D1.1. or AS 1554
6.3	Testing	All hooks individually load tested using NATA (National Association of Testing Authorities [Australian]) calibrated testing equipment. Each QRH standard Proof Load = 125%. Each QRH is individually load tested to Proof Load and manually released at the rated Standard Working Load (SWL).
7	**SURFACE TREATMENT**	
7.1	Surface Treatment	Surface Preparation – Class 2.5 Blast* 1st Coat : 60-80 µm DFT epoxy zinc-rich primer 2nd Coat : 160-280 µm DFT two-part epoxy, containing MIO 3rd Coat : nominal 60-80 µm re-coatable two-part polyurethane. Colour : Sky Blue / Golden Yellow highlights. Other colours available on request. * AS1627.4 , USA, National Association Corrosion Engineers, NACE or Society for Protective Coatings, SSPC-SP10 Sweden, Sa 2-1/2)

DynaMoor Type-R

Details and Specifications

MODEL	A	B	C	D	ANCHOR BOLT SIZE (mm)	ANCHOR BOLT (QTY)	SHIPPING MASS (KG)
DM60R	3000	1900	2800	1000	M42 x 1000	14	12000





1	GENERAL SPECIFICATIONS	
1.1	Maximum Damping Load	60T
1.2	Line Stroke	4m
1.3	Safe Working Load	100T in fully compressed position
1.4	Line angles	Vertical – 0° to 45° Horizontal – -90° to 90°
1.5	Key Standard Features	Quick Release Hook (QRH)
		Integrated Roller Fairlead
		Main Structure
		Integrated Hydraulic Power Unit (HPU)
		Integrated Accumulators
2	DYNAMOOR CONTROLS	
2.1	Control Systems	Local Push Button Panel Optional Systems: Tablet with User Interface Integrated Central Monitoring System
2.2	Incoming Connections	Cable Entry – 25mm

3	**QRH GENERAL SPECIFICATIONS**	
3.1	Hook Construction	Frame (side plates): Carbon Steel ASTM A572 Grade 50 equivalent to AS 3678 Grade 350 Hook body, main pivot block, primary release block: cross shaft are high strength alloy steel to ASTM A148, equivalent to AS 2074.
3.2	Spark Prevention	The hook assembly is fitted with three elastomeric impact blocks for energy absorption. Material: polypropylene.
3.3	QRH Line Sizes (Ø mm)	Max Ø 110mm
4	**UTILITIES AND CLASSIFICATION**	
4.1	Classification	Non-Hazardous Areas – IP66 Hazardous Areas – IP66, Suitable for IECEX Zone 1 IIB T4 Operating Temperature range: -20°C to 55°C
4.2	Electrical	Supply Voltage – 3 phase, 380 to 415 @ 50Hz, 440 to 480 60Hz
4.3	Incoming Connections	Power Entry with Power Communications Entry with Communications if remote control selected
5	**STRUCTURAL FRAME**	
5.1	Fabricated frame and fairlead	Low Alloy Steel Grade Q345D to GB/T1591-2008 equivalent to ASTM A572 Grade 50.
5.2	Extended Temperature Range	For temperatures below -20°C and above +55°C, please consult our engineers.
6	**QUALITY & TESTING**	
6.1	NDT	ASTM E1444-05
6.2	Welding	AWS D1.1. or AS 1554
6.3	Testing	All hooks individually load tested using NATA (National Association of Testing Authorities [Australian]) calibrated testing equipment. Each QRH standard Proof Load = 125%. Each QRH is individually load tested to Proof Load and manually released at the rated Standard Working Load (SWL).
7	**SURFACE TREATMENT**	
7.1	Surface Treatment	Surface Preparation – Class 2.5 Blast* 1st Coat : 60-80 µm DFT epoxy zinc-rich primer 2nd Coat : 160-280 µm DFT two-part epoxy, containing MIO 3rd Coat : nominal 60-80 µm re-coatable two-part polyurethane. Colour : Sky Blue / Golden Yellow highlights. Other colours available on request. * AS1627.4 , USA, National Association Corrosion Engineers, NACE or Society for Protective Coatings, SSPC-SP10 Sweden, Sa 2-1/2)

Service and Support

Trelleborg provides dedicated support throughout the full length of a project and beyond. Our support combines commercial and technical knowledge, which are both put into practice through site services and maintenance, helping you to reduce downtime, improve productivity and reduce costs over a lifetime.

Training and Maintenance Program Services

Trelleborg's reliable personnel will train your team to provide enhanced on-site support and knowledge, so you can improve operational efficiencies and reduce overall costs.

Maintenance and Repair Services

Trelleborg's global maintenance and repair services are designed to comply with the maintenance requirements outlined in numerous international port industry guidelines, and are available 24/7 – all-year round.

Our worldwide after-sales structure consists of a range of customized service and support activities.

INDUSTRY-LEADING SERVICE AND SUPPORT OPTIONS FROM YOUR MOORING SOLUTIONS PARTNER

- Remote and on-site training classes
- In-house technical staff with knowledge of hardware and software
- A remote factory acceptance test
- 24/7/365 emergency hotline
- On-site commissioning
- Yearly equipment checkup
- Dedicated workshops
- Spare parts (where necessary)

MASTER SERVICE AGREEMENTS

Leading companies recognize that it's the total cost of ownership which really matters in the purchase of capital equipment.

Without doubt regular preventative maintenance reduces downtime, improves productivity and manages risk.

A Tailored Service Program gives you inside access to Trelleborg's product experts and allows you to leverage our experience and product knowledge for your benefit. A Trelleborg Aftersales representative will work with you to tailor a service solution including some or all of the following:

- Programmed maintenance and inspection.
- Callout service with defined response times.
- Refresher training.
- Audit of spare parts holdings.
- Remote technical support and diagnostics.
- Comprehensive reporting and recommendations.
- Wear & tear spares kits.
- Operational spares kits.

Whether you need us onsite every year or every month, we can work with you to help you get the best out of your Trelleborg equipment.

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_DM_DM_v2_EN_2021

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.

WWW.TRELLEBORG.COM/MARINEANDINFRASTRUCTURE

facebook: TrelleborgMarineandInfrastructure
twitter: @TrelleborgMI
youtube.com/user/TrelleborgMarine
flickr.com/people/marineandinfrastructure
linkedin.com/company/trelleborg-marine-and-infrastructure
Thesmarterapproachblog.trelleborg.com

Trelleborg Marine and Infrastructure
Email: marine_infra@trelleborg.com