



SafePilot

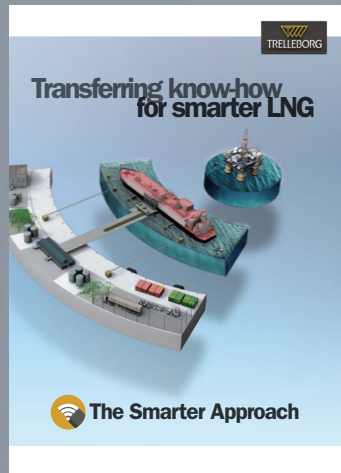
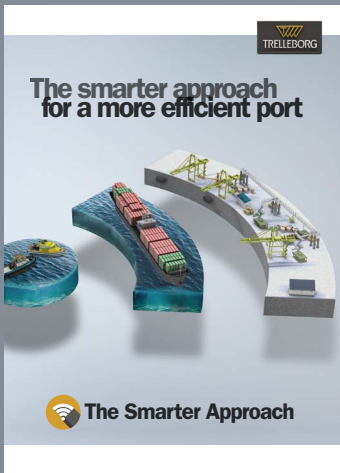


**SMARTER SOLUTIONS FOR ACCURATE,
SAFE AND EFFICIENT OPERATIONS IN
CHALLENGING NAVIGATION, OFFSHORE
AND PILOTAGE ENVIRONMENTS**

Powered By
SmartPort[®]



The Smarter Approach



Connect with The Smarter Approach

By Trelleborg Marine and Infrastructure

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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 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 Smarter Approach deploys the latest in marine technology to help ports and terminals optimize their operations, from port approach and berthing through to docking and mooring. Combining engineering expertise, end-to-end service and an integrated product portfolio to drive efficiencies, improve safety and support sustainability throughout the port environment.

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.

Next Generation Navigation and Piloting

Trelleborg is a world leader in the design and manufacture of advanced, highly accurate piloting and navigation solutions for offshore and pilotage applications. Our user-friendly, automated solutions take advantage of the latest smart technology to improve situational awareness during maneuvers and enhance the safety, efficiency and sustainability of port operations.

Today's ports, terminals and offshore operations are managing bigger vessels to ever tighter schedules and increasingly variable and difficult operating conditions. Trelleborg's range of smart, next generation piloting and navigation solutions capture and integrate data in real time, both on board and jetty-side, to improve communication, reduce delays and optimize vessel throughput.

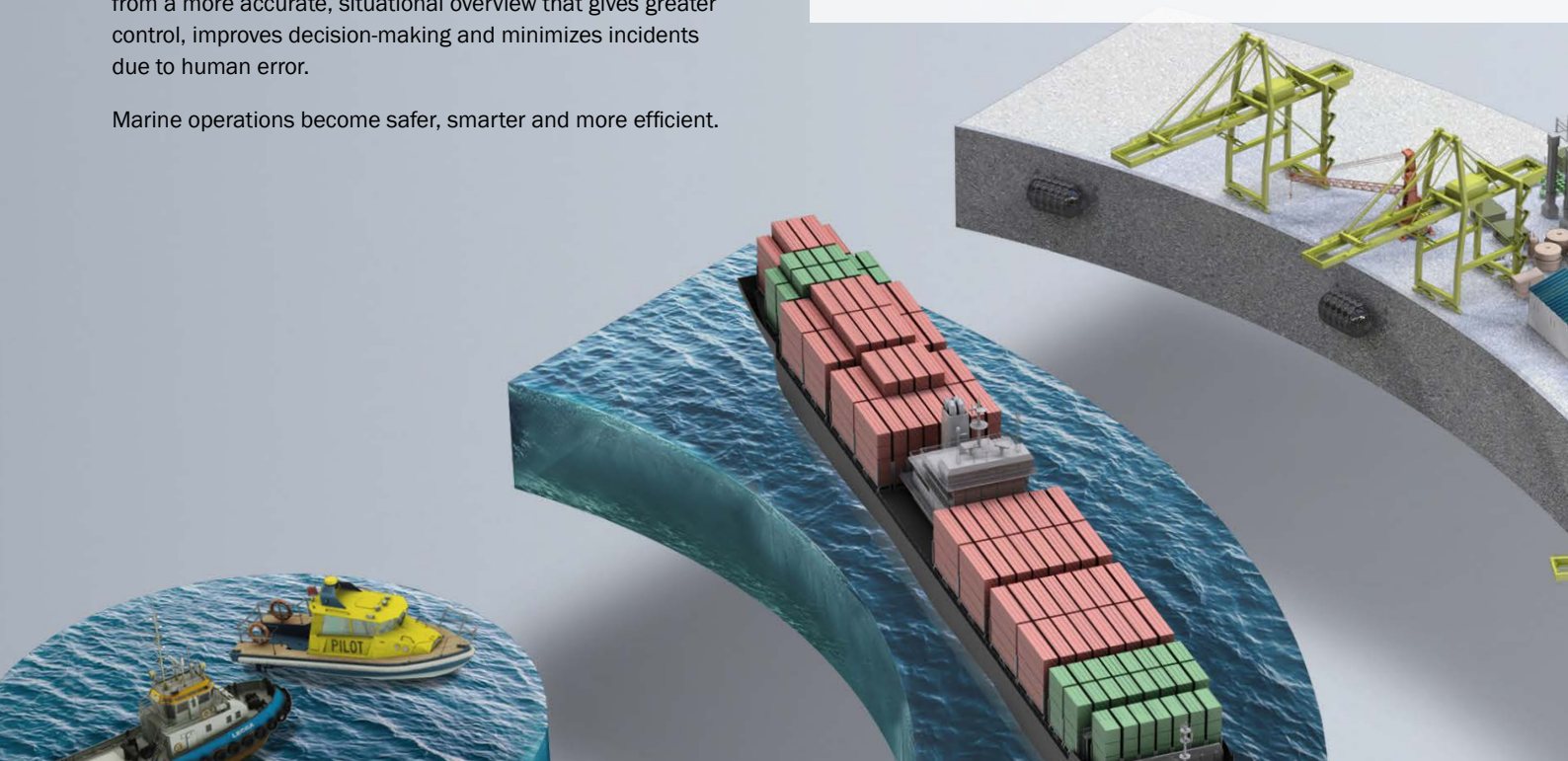
Multiple information sources are used to continuously capture navigational data to within 1cm accuracy, which is then relayed and filtered in real time using advanced smart technology and piloting software. Pilots and navigators benefit from a more accurate, situational overview that gives greater control, improves decision-making and minimizes incidents due to human error.

Marine operations become safer, smarter and more efficient.

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SmartPort: Better Together

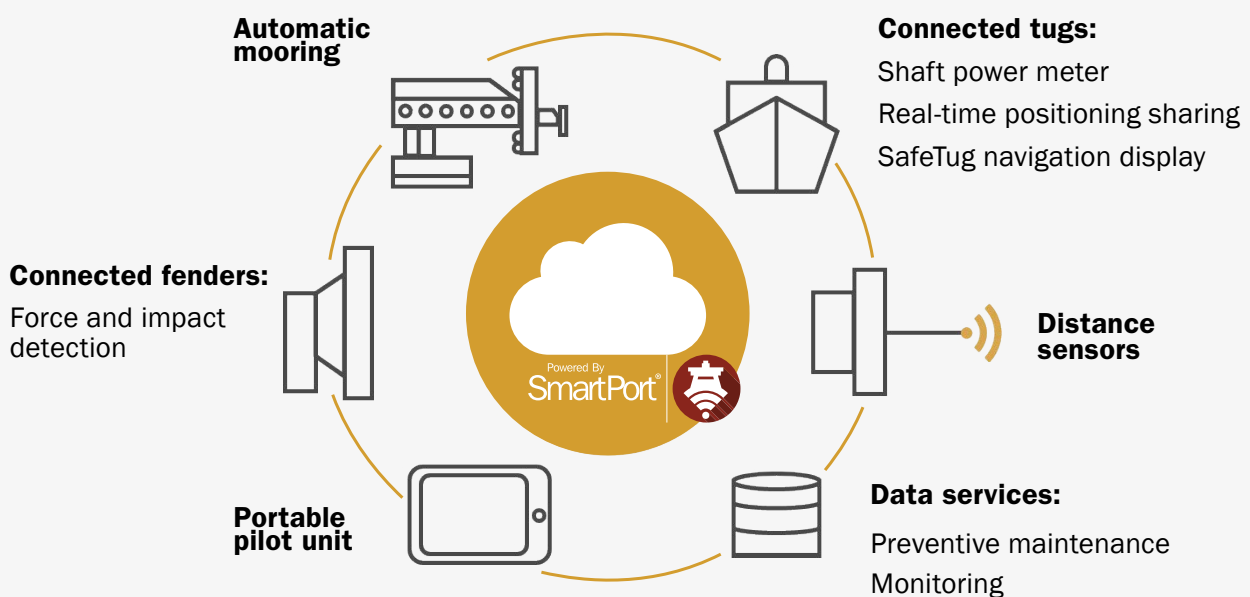
SmartPort is Trelleborg's answer to the need for a standardized way to collect and store data. It's a technology platform that connects port operations, allowing users to analyze asset performance effectively and apply data insights to improve day-to-day decision-making and long-term operational improvements.

SmartPort connectivity

Our navigation and piloting 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 longer-term.
- SmartPort is built on an open API structure to enable collaboration with third-party systems and third-party assets.



SafePilot Solutions

Trelleborg's portfolio of SafePilot solutions includes various portable navigation systems that provide port operators, pilots and captains with important, real-time navigation information, giving pilots greater control, safety and accuracy during port approach and maneuvers.

Built in collaboration with marine pilots worldwide, all SafePilot solutions employ highly intuitive, easy-to-use touchscreen technology, offering pilots the most modern and professional tool for pilotage operations.



Powered By
SmartPort®



SafePilot Pro

SafePilot Pro combines professional piloting software with portable pilot units (PPUs) to deliver situational awareness of a vessel to within 1cm accuracy.

Integrating multiple information sources – including vessel movement data, charts, weather forecasts, automatic identification system (AIS) and tug positions – the intelligent filtering system ensures pilots are presented with only the relevant details to avoid misinformation and to improve response and decision-making time. This enables safer, more efficient and more sustainable piloting and navigation operations within the port environment.

Customizable and easily integrated

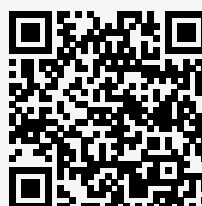
SafePilot software includes navigation data, planning function, route, arrival times, recordings, chart handling, predictions and history, in a user-friendly format direct to iPad or Apple Watch.

Extensive PPU range, from pilot plug repeater and independent rate of turn, through to independent heading and second source positioning depending on requirements.



THE BENEFITS OF SAFEPILOT PRO

- Highly accurate, real-time data for safer pilotage
- Enhanced situational awareness during port approach
- More effective decision-making – intelligent filtering shows only relevant data
- Improved communication between captain, pilot, tug and port personnel
- Reduced incidents and downtime due to automated data capture and exchange
- Safer navigation in a greater range of meteorological conditions



**Download the
SafePilot app**

THE FEATURES OF SAFEPILOT PRO

Pro Navigation

SafePilot Pro's navigational features include advanced route planning and monitoring, multilayer vector charts, cloud-shared chart annotations, an automatic vessel database, automatic recording, replay, distance of targets, safety contours and prediction of vessel movement. SafePilot Pro is cloud-connected to display overlays of data such as weather information, air draft, other vessels and bathymetric data.

Master Pilot Exchange

Built-in digital Master Pilot Exchange module, with automatic document sharing, digital signature and piloting schedule integration.

Vessel Alignment and Approach

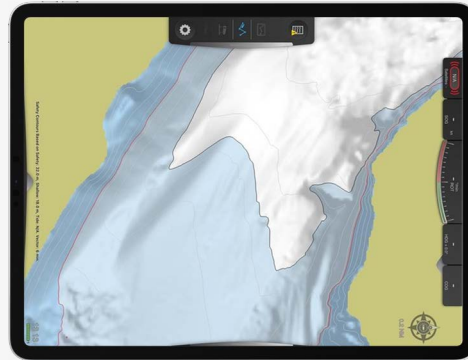
Enhanced features, including distance to fender lines, full-screen docking display, transverse speed and berthing angle, turning basin-specific display and Apple Watch integration for monitoring closing distances while on the bridge wing.

Lock

SafePilot Pro's bespoke lock module provides alignment guidance for lock approach and departure, as well as distances toward lock gates (front and rear), and the status of the lock gates (open/closed) through sensors integrated via the cloud. Distances to lock walls from vessel (front and rear) are also provided.

River

Dedicated river module for narrow channel navigation featuring quick jump between multiple locations of interest, automatic meeting point calculations, real-time ETAs, cross track distances and the option to decide on optimal meeting point with calculated speed recommendations.



Under Keel Clearance

SafePilot Pro's Adaptive Under Keel Clearance (AUKC) feature allows for real-time, highly accurate measurement of the water under the keel for use in draft-restricted waterways – based on hi-res bathymetric data and 6-axis measurement of the ship's movement. It also features a visual display of go/no-go areas with possible integration of third-party UKC planning tools.

Anti-jamming/Spoofing

SafePilot Pro features a class-leading anti-jamming/spoofing system that immediately alerts the user should there be any concern on external data quality or compromise.

Care Pack

Peace-of-mind hardware and software support that is available all day, every day through our 24/7 open hotline. Managed by our dedicated European support team. Annual servicing and calibration of units is also available.

MetOcean Data

Live meteorological and ocean data can be added to the system – including tide, current, wave, wind, visibility and cloud cover.

Integration

SafePilot Pro can be integrated with third party systems via the cloud, allowing two-way data exchange with existing port systems which include ship schedule, weather sensors, chart management and notes to mariners.

SafePilot Offshore

SafePilot Offshore is a bespoke designed solution for improving the safety and efficiency of all critical offshore operations.

With SafePilot Offshore, operators have 360° visibility of offshore operations such as loading and unloading, single and multiple buoy mooring, dual berth transfer and FPSO drift monitoring – all with real-time updates. With the ability to record all data, owners can analyze how to improve safety during operations, increase decision-making and monitor their assets efficiently.

SafePilot Offshore allows operators to analyze the approach, drift, alignment and distance between the assets during the critical berthing, ship-to-ship transfer, and buoy loading and unloading so they can alter positioning where needed to ensure optimal operations.

THE BENEFITS OF SAFEPILOT OFFSHORE

- 360° visibility of critical offshore operations including ship-to-ship transfers
- Real-time updates and analysis on FPSO location, ship alignment, and loading and unloading operations
- Excursion monitoring
- Drift monitoring
- Alarm module provides notification in real time during the operation
- Recording of operations (reusable for training and analyzing operations)



**Download the
SafePilot app**

THE FEATURES OF SAFEPILOT OFFSHORE

Pro Navigation

SafePilot Offshore's navigational features include advanced route planning and monitoring, multilayer vector charts, shared chart annotations, an automatic vessel database, automatic recording, replay, distance of targets, safety contours and prediction of vessel movement. SafePilot Offshore is connected to the SafePilot system through a dedicated UHF link, enabling the communication of data such as weather information, product data, vessel position and movement, and ESD signals.

Single Point Mooring

The SafePilot Offshore Single Point Mooring feature displays alarm and speed zones along with closing distances and heading off the buoy. Further hawser tension monitoring and emergency release functions are available.

Ship-to-Ship Operation

SafePilot Offshore has a dedicated display for Ship-to-Ship operations. The system features precise transverse distance and speed information fore and aft between vessels, heave, roll and pitch monitoring between vessels and manifold alignment with closing distance.

Tandem Operation

The tandem module features a dedicated display for monitoring minimum distance between the vessels, angle between the vessels, speed zones and alarm zones to make sure the vessels do not get too close or move into danger areas.

Excursion Monitoring

SafePilot Offshore features very accurate excursion monitoring of the turret, drift and heading alignment.

MetOcean Data

Live meteorological and ocean data can be added to the system – including tide, current, wave, wind, visibility and cloud cover.



Control Room System

SafePilot Offshore's planning and overview system, SafePilot Shore Viewer, gives real-time updates on the ongoing operations through the dedicated bird's-eye view display including sea charts. Recording and replay of all operational data is also possible from this tool and all data points can be monitored.

Integration

SafePilot Offshore can be integrated with product data, an emergency shutdown, gyro and weather and ocean sensors through a two-way link to the SafePilot's central control system.

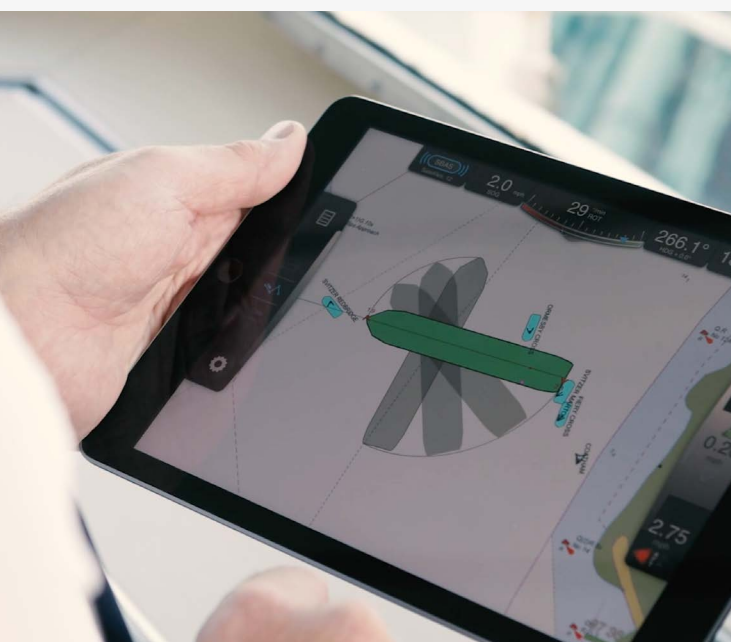
SafePilot Offshore is also easily integrated with Trelleborg's Ship-Shore Link, Laser Docking Aid Systems and mooring monitoring systems for full operational and situational awareness.

Adding Trelleborg's SafeTug system to the tugs involved in the operation completes the operational overview by sharing the tugs' movements, line tension and RPM in real time.

SafeCaptain

SafeCaptain is a high-accuracy navigation tool for marine captains. Its software runs on an iPad and displays official sea charts with dedicated overlays to allow for precise vessel navigation. The system combines an interface box that is independent of the ship and an app that provides a portable display for the captain and/or the helmsman.

This enables the user to accurately monitor the vessel's movements in constrained waterways. The system consists of a high-accuracy global navigation satellite system (GNSS) and an advanced motion sensor that measures the ship's movement in three dimensions. SafeCaptain also computes the vessel's position and heading based on the two GNSS antennas, and will even work under a blackout.

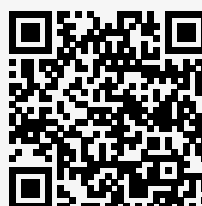


THE BENEFITS OF SAFECAPTAIN

- Accurate heading, position, speed and course
- Roll, pitch and heave
- Data availability on a portable display across the bridge, showing accurate movement of the vessel from a bird's-eye view
- Real-time AIS data for better situational awareness
- Better communication for enhanced port efficiency
- Increased uptime and throughput of port facilities
- Intelligent filtering, prediction and past tracks

EASY-TO-USE APP

- Docking mode for precise maneuvering
- High-density bathymetric electronic navigation charts (if available)
- Distance measuring capability to avoid other ships and objects



**Download the
SafePilot app**

THE FEATURES OF SAFECAPTAIN

Pro Navigation

SafeCaptain's navigational features include advanced route planning and monitoring, multilayer vector charts, cloud-shared chart annotations, an automatic vessel database, automatic recording, replay, distance of targets, safety contours and prediction of vessel movement. SafeCaptain is cloud-connected to display overlays of data such as weather information, air draft, other vessels and bathymetric data.

Master Pilot Exchange

Built-in digital Master Pilot Exchange module, with automatic document sharing, digital signature and piloting schedule integration.

Vessel Alignment and Approach

Enhanced features, including distance to fender lines, full-screen docking display, transverse speed and berthing angle, turning basin-specific display and Apple Watch integration for monitoring closing distances while on the bridge wing.


Lock

Bespoke lock module provides alignment guidance for lock approach and departure, as well as distances toward lock gates (front and rear), and the status of the lock gates (open/closed) through sensors integrated via the cloud. Distances to lock walls from vessel (front and rear) are also provided.


River

Dedicated river module for narrow channel navigation featuring quick jump between multiple locations of interest, automatic meeting point calculations, real-time ETAs, cross track distances and the option to decide on optimal meeting point with calculated speed recommendations.


Under-keel Clearance

SafeCaptain's Adaptive Under  Clearance (AUKC) feature allows for real-time, highly accurate measurement of the water under the keel for use in draft-restricted waterways – based on hi-res bathymetric data and 6-axis measurement of the ship's movement. It also features a visual display of go/no-go areas with possible integration of third-party UKC planning tools.



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
MetOcean Data

Live meteorological and  ocean data can be added to the system – including  tide, current, wave, wind, visibility and cloud cover.

Safety

The built-in  battery will kick in and keep the system operational during black outs. This means that the bridge team will have access to AIS data and its own ship's movement data – even if the ship has no power.

Integration

SafeCaptain can be  integrated with Trelleborg's SmartPort technology for better management and integration of marine assets.

SafeTug

Bringing large vessels into port is an important and complex process that requires ship captains, pilots, tug skippers and port operators to precisely coordinate their efforts – working as a cohesive unit. Situational awareness is mission critical here. Port operators require highly accurate navigational information in real time to monitor a range of possible operating scenarios.

SafeTug is a revolutionary software solution that creates a more effective pilotage experience. It increases operational visibility for all parties to make port approach, berthing and departure easier, safer and more efficient.

The solution uses smart interfaces to continuously capture and transmit dynamic data to tugboat skippers via an iPad-based display, to give them accurate, real-time information on the movement of the ship they are maneuvering. This includes the vessel's speed and direction, rate of turn, trajectory, RPM/pull force via load sensing on the tug bollard, heading, and course over the ground. This enables optimized decision-making and fully controlled, safe maneuvers. The software also shows the position of other tugboats using the system to further enhance safety.

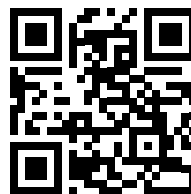
With SafeTug, ports have greater control of fleet management through real-time visibility of location to manage operations more effectively. The 360° digital display also enables ports to record and replay operations, analyzing and evaluating effectiveness and identifying areas for improvement to optimize port operations over time.

SafeTug drastically reduces administrative burdens on port operators, with digital paperwork that requires a simple sign-off method before being handed over to the next stage of the operation automatically. Through digital planning, ports can better organize the times at which tugs are released and to which pilots.

Improving the range and accuracy of navigational measurements alongside intelligent filtering, so only data relevant to the current operational phase is provided, enables tugboat skippers to make faster, more accurate and more confident decisions.

THE BENEFITS OF SAFETUG

- 360° visibility and improved situational awareness
- Real-time data exchange for more accurate decision making
- Safer vessel maneuvers and reduced incidents
- Better communication for enhanced port efficiency
- Increased uptime and throughput of port facilities
- Intelligent filtering, prediction and past tracks



SafeTug Experience

Scan the QR code to visit the Trelleborg SafeTug experience webpage

safepilot360experience.com

THE FEATURES OF SAFETUG

Pro Navigation

SafeTug provides a complete navigational tool including advanced route planning and monitoring, multilayer vector charts, shared chart annotations, automatic vessel database, automatic recording, replay, distance of targets, safety contours and prediction of vessel movement.

Data Sharing

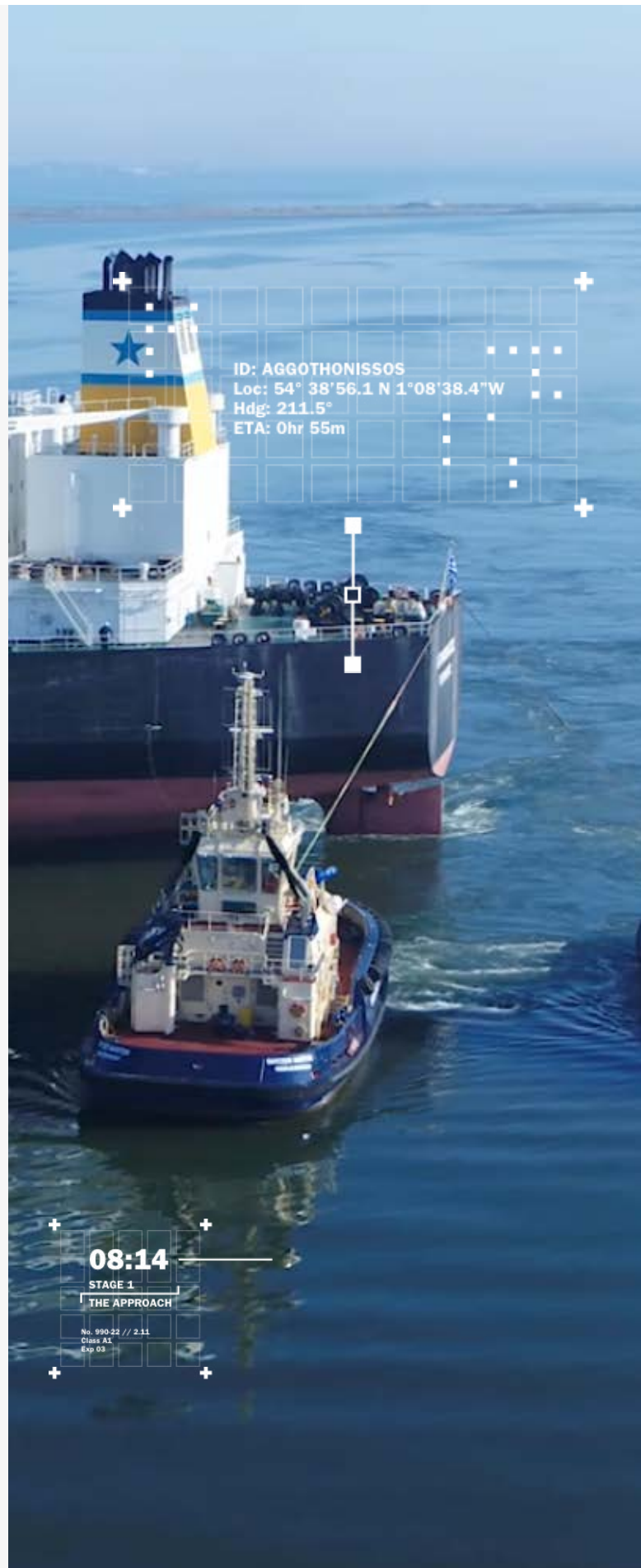
SafeTug's operational data such as location, line tension and RPM is shared on a 360° digital display. Highly accurate data from the piloted vessel, including closing distances and predictions of vessel locations, is sent to SafeTug to provide a complete operational bird's-eye view.

MetOcean Data

Live meteorological and ocean data can be added to the system – including tide, current, wave, wind, visibility and cloud cover.



Download the
SafeTug app



SafeCrane

SafeCrane helps ports to improve vessel throughput by making crane deployment safer, more accurate and more efficient.

The systems use jetty-side, crane-borne GPS to alert the crane operator to the proximity and predicted path of the approaching vessel in real time, in unison with the accurate positioning of the vessels with SafePilot software. This allows the port to deploy the crane to where it is most needed to optimize transfer operations, and also to be alerted if adjustments need to be made to the alignment between the vessel and crane to prevent crane collisions.

SafeCrane offers complete 360° visibility, with the ability to monitor crane operations from anywhere in the port. This allows ports to monitor operations from start to finish from any position, while drastically improving operational safety, accuracy and overall efficiencies.

THE BENEFITS OF SAFECRANE

- Real-time crane positioning for more efficient deployment
- Prevention of crane collisions with GPS positioning to within 1cm accuracy
- Easily-integrated, standalone, retrofitted unit

THE FEATURES OF SAFECRANE

Alerts

SafeCrane features a crane operator alert that indicates the predicted swept path.

Cloud Connectivity

Data from the cloud can be sent to third-party monitoring systems.



After-sales Services and Warranty

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.

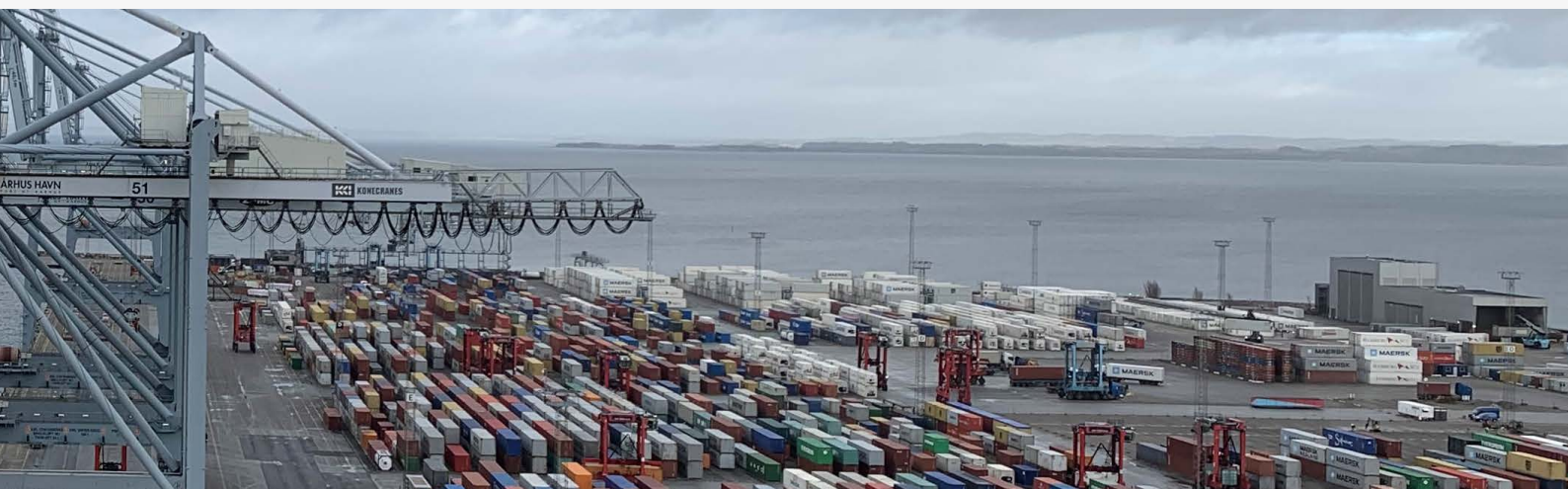
Maintenance and Repair Services

Trelleborg's global maintenance and repair services are designed to comply with the maintenance requirements outlined in ISO 28460, and are available 24/7 – all-year round.

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

PARTNER WITH US TO ACCESS SERVICES SUCH AS:

- A certified pilot training program
- 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)



SafePilot Hardware

SafePilot CAT ROT

SafePilot CAT ROT is a small and compact pilot unit primarily designed to connect to a ship's AIS pilot plug and transmit data via Wi-Fi to the pilot's tablet/notebook.

The solution is designed to overcome the shortcomings of the AIS pilot plug data format by generating an accurate real-time rate of turn and providing the missing decimal readings to the heading data via an integrated rate sensor, intelligent processing and advanced Kalman filter integrated into the unit.



SafePilot CAT I

SafePilot CAT I is a standalone, high-accuracy GPS receiver with the capability of GPS/GLONASS and available SBAS systems such as EGNOS, WAAS, MSAS, and GAGAN provides 1cm/sec (RMS) speed accuracy.

The solution is an add-on option to CAT ROT for use in operations that demand more accurate positioning than what is provided by the ship's own positioning through the AIS pilot plug. The use of CAT I further improves the accuracy of the speed measurements of the vessel.



SafePilot CAT XT

SafePilot CAT XT combines the ROT of CAT ROT with the DGPS precision of CAT I in one unit. The unit is intended for use in sets of two interchangeable units, of which one is connected to the AIS pilot plug and the other is placed on the bridge wing as DGPS receiver.

When connected to the AIS pilot plug, the unit allows for charging of the internal battery and the DGPS function is disconnected, making the unit work purely as a ROT sensor. When the unit on the bridge wing is running low on battery, the two units are swapped for charging. This makes the CAT XT ideal for use on long transit pilotage operations.

SafePilot CAT PRO

SafePilot CAT PRO is a completely independent portable pilot unit designed to overcome the limitations of AIS and Wi-Fi range. With an extended battery life and wireless charging, this lightweight solution can be configured in four different operational modes.

Providing ultra-stable position tracking by utilising Multi GNSS L1/L2, CAT PRO delivers situational awareness on vessel maneuvers to within 1 cm accuracy.

The solution is scalable making it suit all types of vessel maneuvers with interchangeable units providing greater flexibility.



SafePilot CAT MAX

SafePilot CAT MAX is developed for applications requiring the highest positioning accuracy, such as piloting in confined waters, offshore operations and more.

The solution consists of heading and positioning units, which can communicate with each other and the pilot's display via Wi-Fi. The PPU's boast an integrated 6-axis gyro/motion sensor, offering precise and independent rate of turn, roll and pitch. This, coupled with the capability to charge wirelessly, makes SafePilot CAT MAX the ideal solution.





Trelleborg has been pioneering the development of intelligent navigation and piloting systems since the year 2000. Our long-term vision of upholding the complexity of dedicated piloting software, while simplifying the user interface, has now been brought to life in our innovative range of SafePilot solutions.

But it does not stop there. SafePilot solutions are continuously being developed and tested in close cooperation with a group of active pilots working worldwide.

LEARN MORE



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.

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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/MARINE-AND-INFRASTRUCTURE



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