

AVENTICS Marine

Introduction to the Marine Product Segment

AVENTICSTM



Topics

About Emerson

About AVENTICS Marine

Overview product portfolio

Electronic Systems

Pneumatic Components and Systems

Projects

Services

Summary

About Emerson

Emerson At-A-Glance

(Continuing Operations)

COMPANY PROFILE

Emerson is a global leader in automation technology and software. We help customers in critical industries, like energy, chemical, power and renewables, life sciences and factory automation operate more sustainably while improving productivity, energy security and reliability.

BUSINESS SEGMENTS

SOFTWARE AND CONTROL

- AspenTech
- Control Systems & Software
- Measurement & Analytical

INTELLIGENT DEVICES

- Final Control
- Discrete Automation
- Safety & Productivity



CONSECUTIVE
YEARS OF
INCREASED
DIVIDENDS

MARKET PRESENCE

~70%

Sales tied to sustainability enabling technologies *

65%

Of 2022 electric vehicles produced using Emerson solutions

24 of Top 25

Life sciences companies use Emerson technology

60,000

Wind turbines controlled with Emerson systems

9 of Top 10

Semiconductor manufacturers use Emerson technology

\$13.8 BILLION

GLOBAL NET SALES FY 2022

FOUNDED

1890

NYSE:

EMR

HEADQUARTERS
ST. LOUIS, MO USA

WORLDWIDE



66,300 EMPLOYEES



130 MANUFACTURING LOCATIONS

2022 RECOGNITIONS

TOP 50 EMPLOYERS

Woman Engineer Magazine

WORLD'S BEST EMPLOYERS

Forbes Magazine

INDUSTRIAL IOT COMPANY OF THE YEAR

IoT Breakthrough

* See Appendix for definition.

Emerson Global Presence 2022

(Continuing Operations)

GLOBAL

\$13.8B
SALES*

66,300
EMPLOYEES

130
LOCATIONS**

UNITED STATES and CANADA

\$6.3 BILLION SALES*
17,200 EMPLOYEES
40 LOCATIONS**

LATIN AMERICA

\$0.7 BILLION SALES *
8,300 EMPLOYEES
10 LOCATIONS**

EUROPE

\$2.6 BILLION SALES*
18,100 EMPLOYEES
45 LOCATIONS**

ASIA

\$3.4 BILLION SALES*
21,000 EMPLOYEES
30 LOCATIONS**

MIDDLE EAST and AFRICA

\$0.8 BILLION SALES*
1,700 EMPLOYEES
5 LOCATIONS**

* Net of sales eliminations.

** Locations include manufacturing locations only.

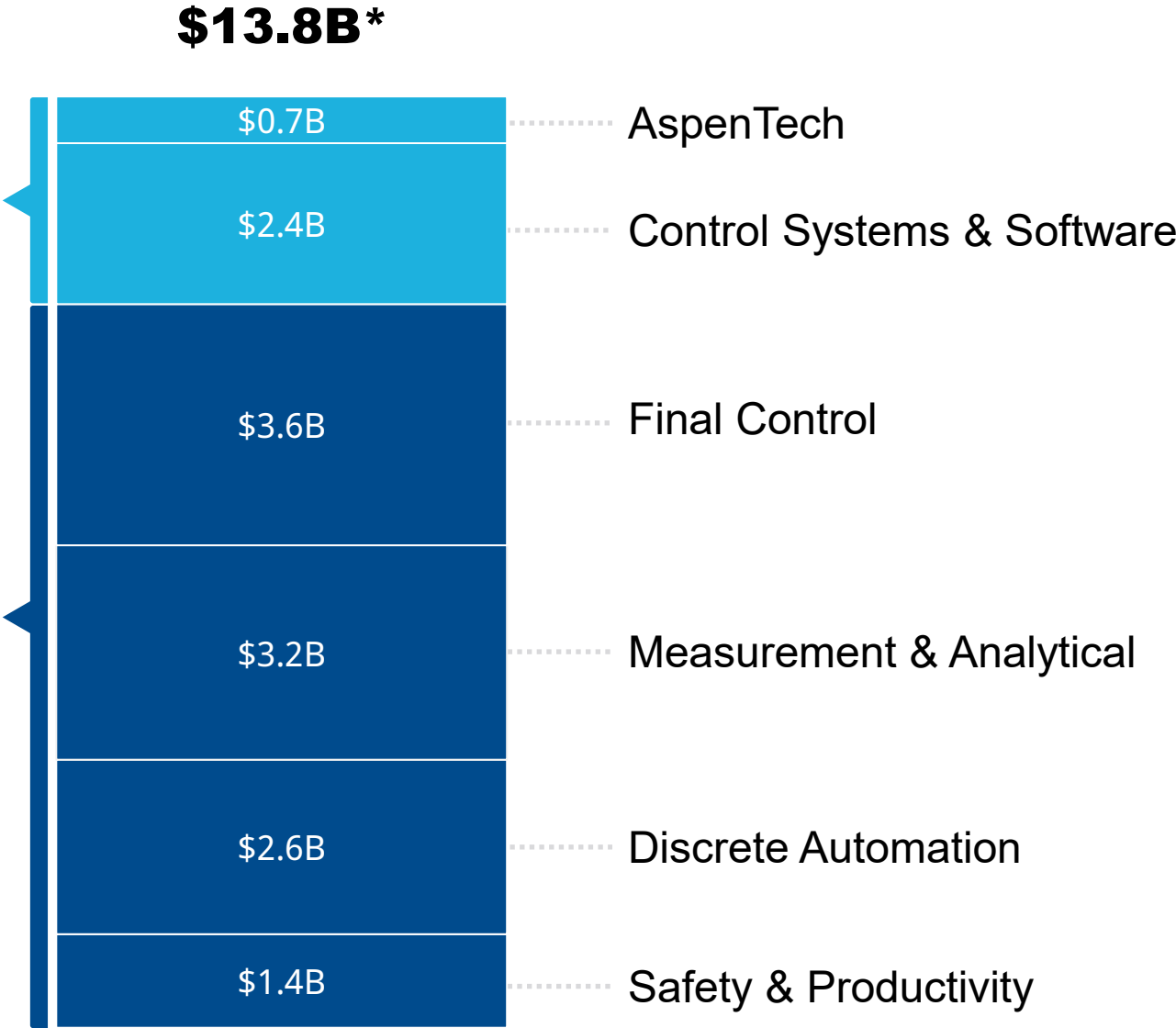
Financial Snapshot of Emerson's New Business Segments



Software
and Control



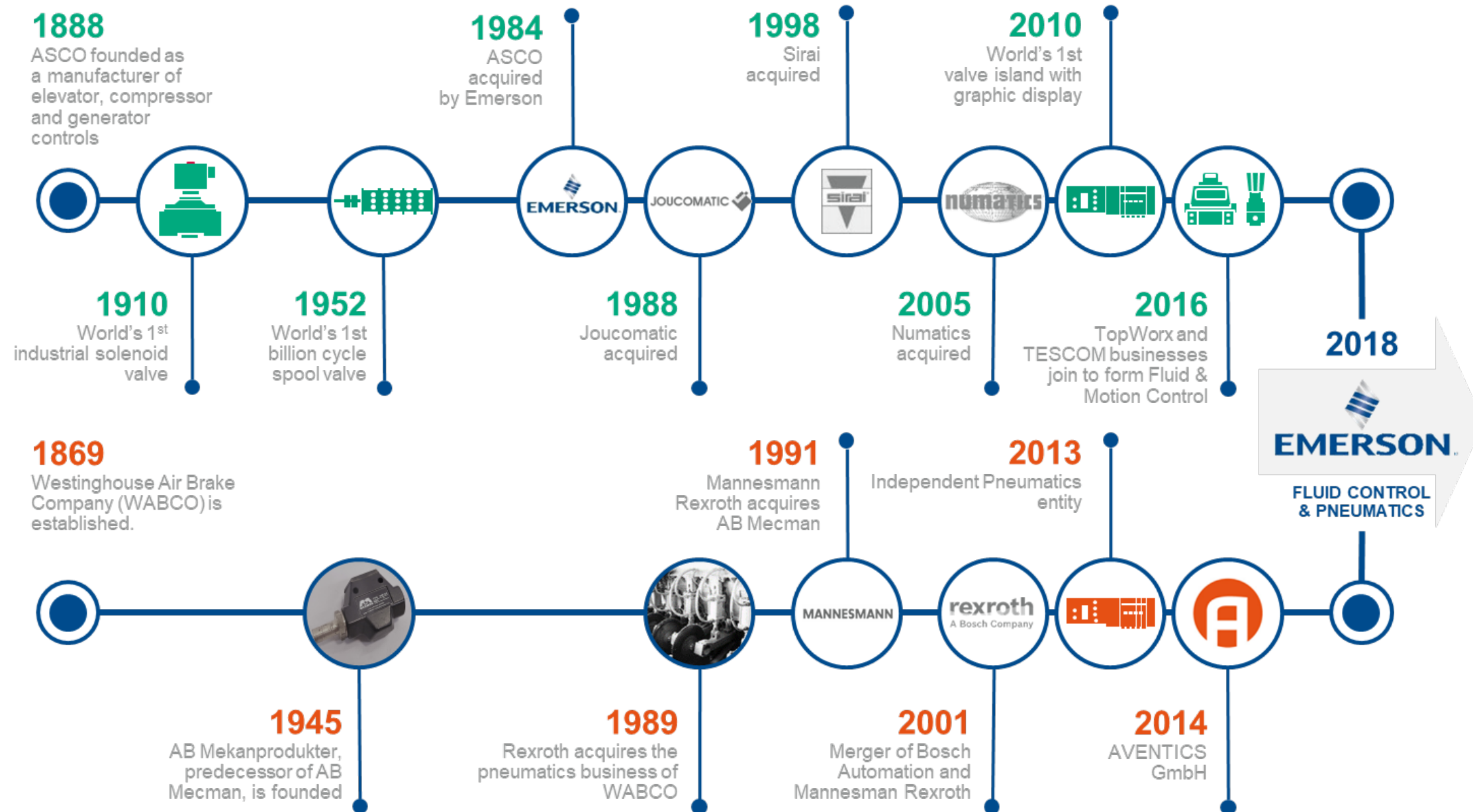
Intelligent
Devices



2022 REVENUE

Revenue data include intersegment sales.
*Net of intersegment sales eliminations.

Fluid Control & Pneumatics Business History



- A Respected Heritage of Fluid Control & Pneumatics Solutions



About AVENTICS Marine

Marine Functions Laatzen, Germany



Business Development

- Areas:
Europe, Middle East,
Africa
Americas
Asia Pacific
- Strategic Account Mgmt.
- Product and Sales
Initiatives
- Coordination of
Marketing Activities

Engineering

- Platform development
- Product customization
- Design of embedded and
computer based
software
- Classification Approvals
- Product Testing
- Project engineering and
consultancy

Sales

- Pricing
- Product Availability
Information
- System Deliveries
- Commercial support of
country units,
distributors, direct key
accounts
- Trade Compliance

Service

- Support of service
partners
- Remote Assistance
- On-Site Service
- Spare part identification
- Refit consultancy

Production Facility Laatzen, Germany



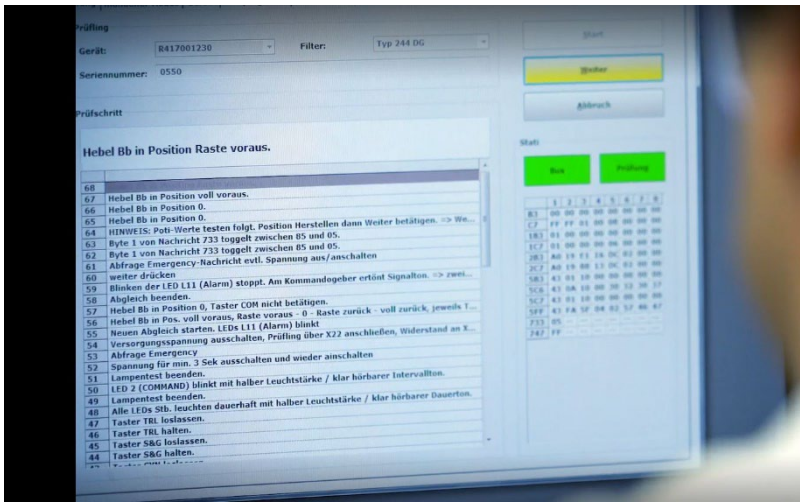
Assembly of Electronic Components



System Setup and Adjustment



Computerized Testing



Production Facility Eger, Hungary



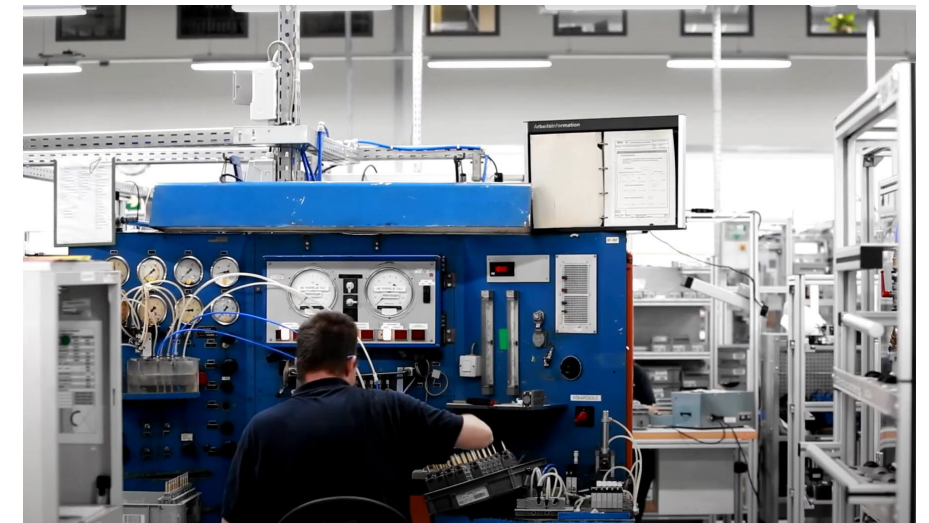
Manufacturing of valves and cylinders



R&D center for Pneumatic Actuators



Quality Testing Facilities



Marine Product Portfolio

Overview Electronic Ship Control Systems



Marex OS

Modular electronic propulsion control system with classification approval



Marex SCADA

Modular SCADA network solution for advanced ship management empowering enhanced diagnostics and analytics of subsystem data, as well as remote monitoring and predictive maintenance.



Marex 3D

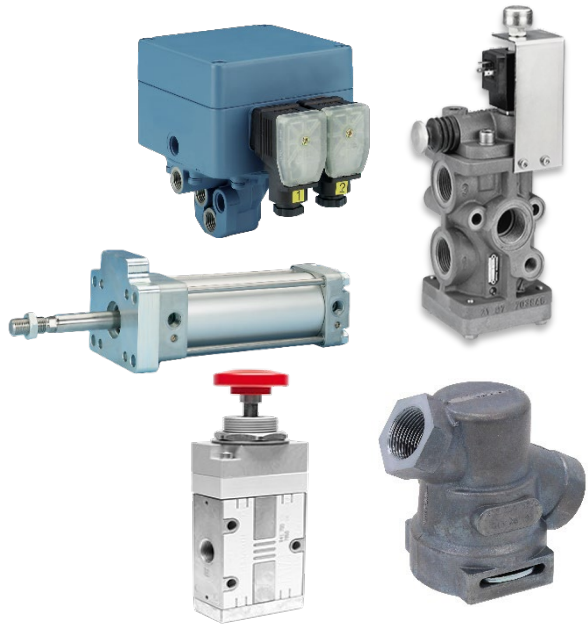
Intuitive joystick control system with optional DP features for easy docking maneuvers



Marex ECS

Compact, plug-and-play propulsion control system for small recreational vessels

Overview Pneumatic Components and Systems



Pneumatic Components

- Robust pneumatics for marine applications



Air Treatment Units

Ready-to-mount units designed for delivering the appropriate air quality for an application.



Valve Control System

Pneumatic or electro-pneumatic system for remote-controlling butterfly valves in fluid-carrying lines.



Tank Sounding System

Pneumatic or electro-pneumatic bubble-type tank level measuring system

Product Portfolio and Applications

Commercial



Medium-Small Cargo



Special purpose / work boat



Passenger transport

Recreational



Super yachts > 80 m (260 ft)



Luxury yachts
20 – 80 m (65 – 260 ft)



Motor yachts <20 m (65 ft)

Pneumatics	Components and spares					
	Air Treatment Unit					
	Valve Control System					
	Tank Sounding System					
Electronic Systems	Marex SCADA					
	Marex OS Propulsion Ctrl					
	Marex 3D Joystick					
	Dynamic Positioning DP					
	Marex ECS Propulsion Ctrl					



Electronic Systems

Marex OS Propulsion Control System



Features

- Modular system design
- Separate CAN bus networks port and starboard
- Analog and digital interface to external devices
- Various lever designs including follow-up option
- Customizable display
- Internal software for special functions
- Type-approval by major classification societies

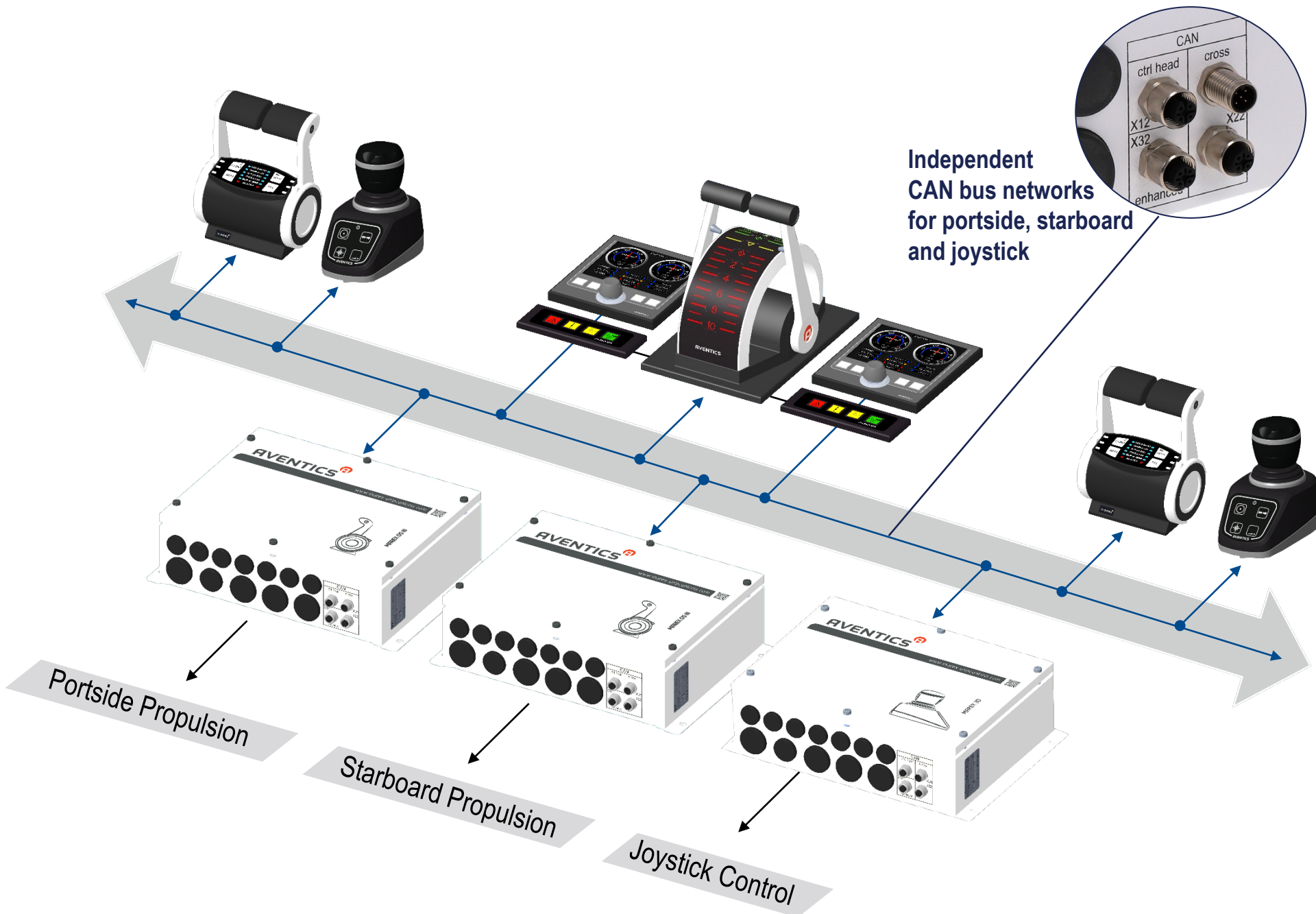
Benefits

- Class approved safety
- Adaptable to requirements
- Open interface to engine and gearbox
- Large number of function blocks
- Project consulting and support
- Worldwide Service network
- Support throughout the life of the vessel
- Product training
- FAT on request
- Joystick option with DP feature

Applications:

- Fixed pitch propellers
- Controllable pitch propellers
- Hybrid, diesel-electric and electric propulsions

Marex OS with Joystick Option



Integrated functions:

- Engine control
- Speed curves
- Engine stall protection
- Engine synchronization
- Gear operation, reversing maneuver curves
- Control of PTO and PTI, Trolling and Slip & Grip
- Shaft brake control
- Standard interface to DP, autopilot and VDR systems

Marex os Control Heads



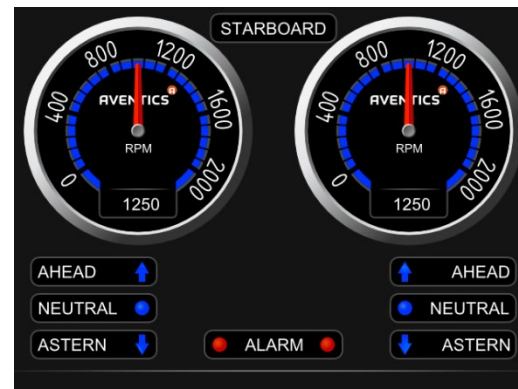
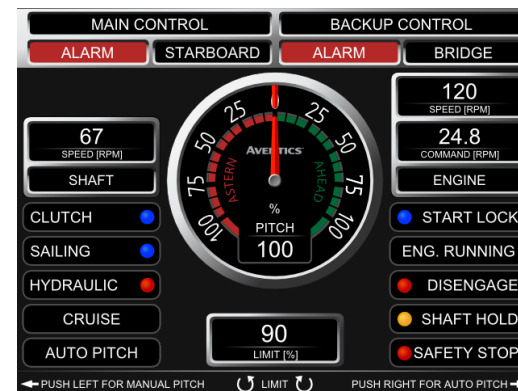
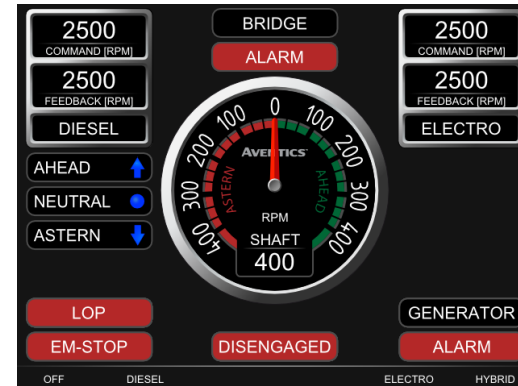
Type-approved by
ABS, DNV, LR, ...

Features	Type 230	Type 244 (4 buttons)	Type 244 (2 buttons)
Engines per control head	Single, twin	Single, twin, triple	Single, twin
Application	FPP, CPP	FPP, CPP	FPP
Lever length	One length	Standard and short lever option	Standard and short lever option
Illumination	Backlit scale	Status indicators	Backlit keypad, status indicators
Special features	Lever follow-up Twin version with separate electronics for port/starboard	Integrated keypad for CPP, FPP	Integrated keypad for FPP Indication of gear feedback
Operation	One-hand control of RPM and Gear/Pitch + configurable module	One-hand control of RPM and Gear/Pitch, integrated keypad	One-hand control of RPM and Gear, integrated keypad
Dimming	Adjustable via button	Brightness sensor and manual adjustment	Brightness sensor and manual adjustment
Finish	High-quality chrome or black	High-quality chrome or black	High-quality chrome or black
Protection class	IP 66	IP 66	IP 66+ (roll-over tested)
Mounting orientation	Forward and reverse	Forward	Forward and reverse

Marex OS Display Type 230



- Display of propulsion data
- Back-up system option
- Engine telegraph option



Screen layout examples

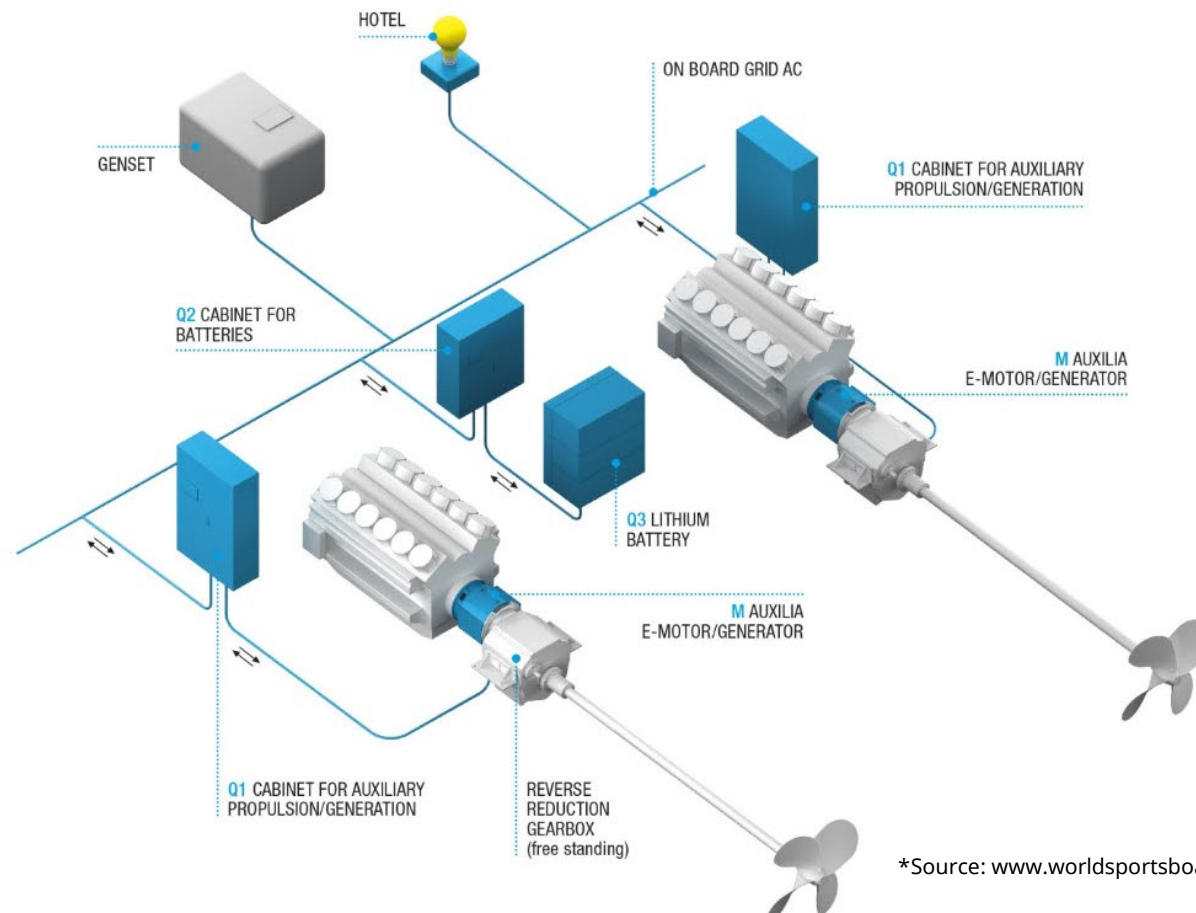
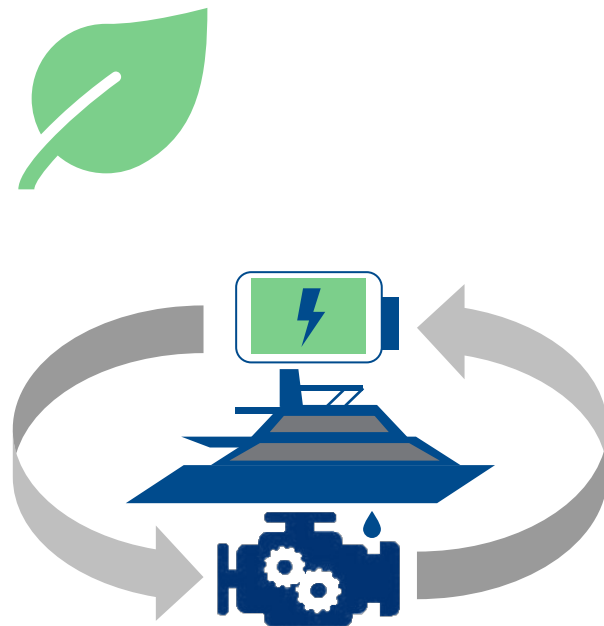
Multifunctional User Interface

- 5.7" multicolor display
- Connections for two galvanically isolated CAN bus lines
- Customizable visualization of propulsion data
- Up to 10 screen pages
- 4 keys with LED indicators
- Jog dial for value adjustments
- USB service port
- Protection class IP 66
- For in- and outdoor stations

Marex OS Control of Hybrid Applications



Example of a marine hybrid propulsion



Advantages of diesel-electric drives

- The diesel engines can be operated at precisely the speed range that provides optimum efficiency. This is more resource-efficient and environmental-friendly.
- In addition to the environmental aspect, electric ship operation allows more agile maneuvering than diesel operation, which is particularly advantageous for special ships, vessels with DP systems or pilot boats.

*Source: www.worldsportsboats.com

Marex OS Hybrid Application



Challenges

- **Complexity:**
With two sources to power the ship, the propulsion control becomes more complex.
- **Realization of hybrid modes:**
Every vessel – pilot boat or sailing yacht - requires the implementation of different driving modes, e. g. diesel / electric / boost / eco.
- **Smooth Transition:**
The propulsion control must ensure that switching between modes works smoothly and diesel engines and electric drives are used efficiently in every mode.

Advantages

- **Project consultancy:**
Our experienced experts support from the start of the project to commissioning.
- **One solution:**
All components in the hybrid propulsion can be implemented and controlled by one system – Marex OS.
- **Flexible hard- and software**
A selection of modules is available to realize the individual solution. Configurable operating modules enable user-friendly adaptation to the application.



Marex 3D Joystick System

With Dynamic Positioning Option



Intuitive, one-hand maneuvering



Features

- Intelligent vector control for engines and thrusters
- Suitable for Marex OS and Marex ECS
- Up to 6 joystick stations
- Two joystick variants
- 3D and Thruster Modes
- Optional heading hold, position hold and virtual anchor modes
 - Integrated indication of GPS signal strength
 - Acoustic and visual warnings

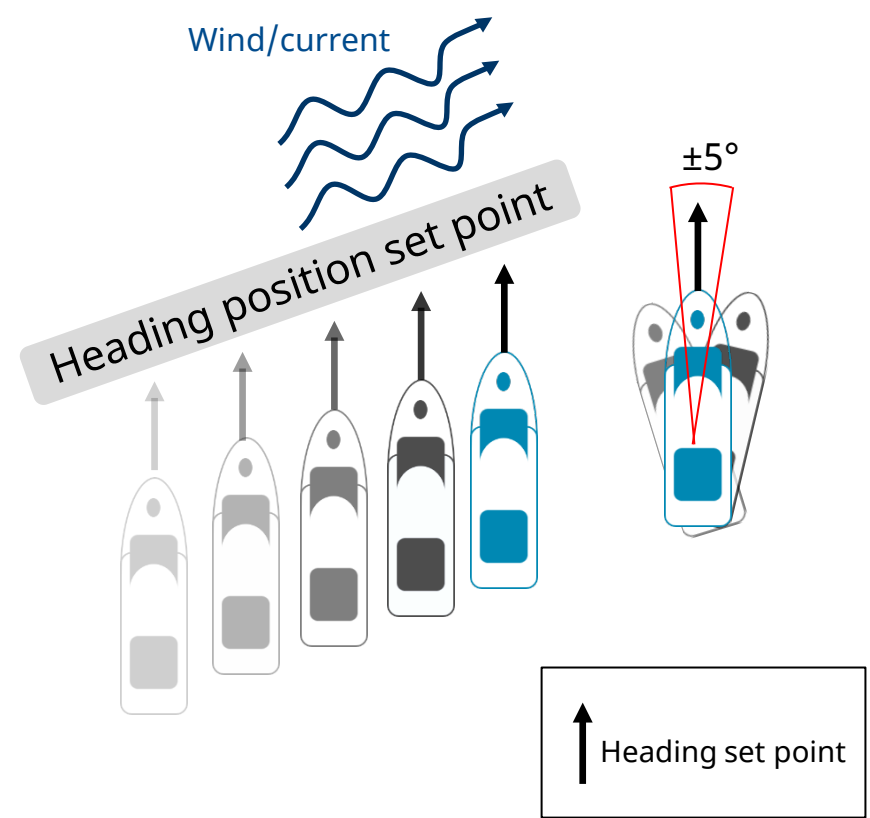
Benefits

- Intuitive, easy maneuvering: Ship follows joystick movement
- Mode for thruster control
- Integrated keypad with LED indicators
- Easy refit with Marex OS systems
- No need for thruster control panel
- Safety features for use of DP modes
- Flexible installation sites
- Start-up and fine-adjustment via remote assistance

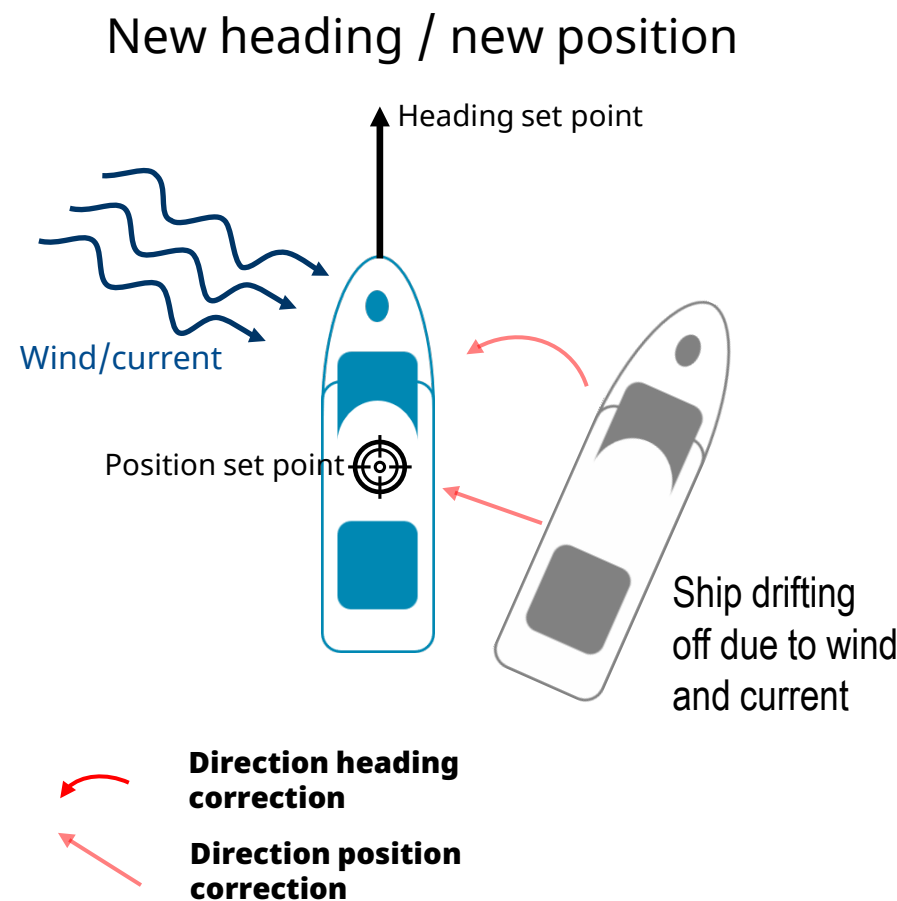
Joystick Dynamic Position modes



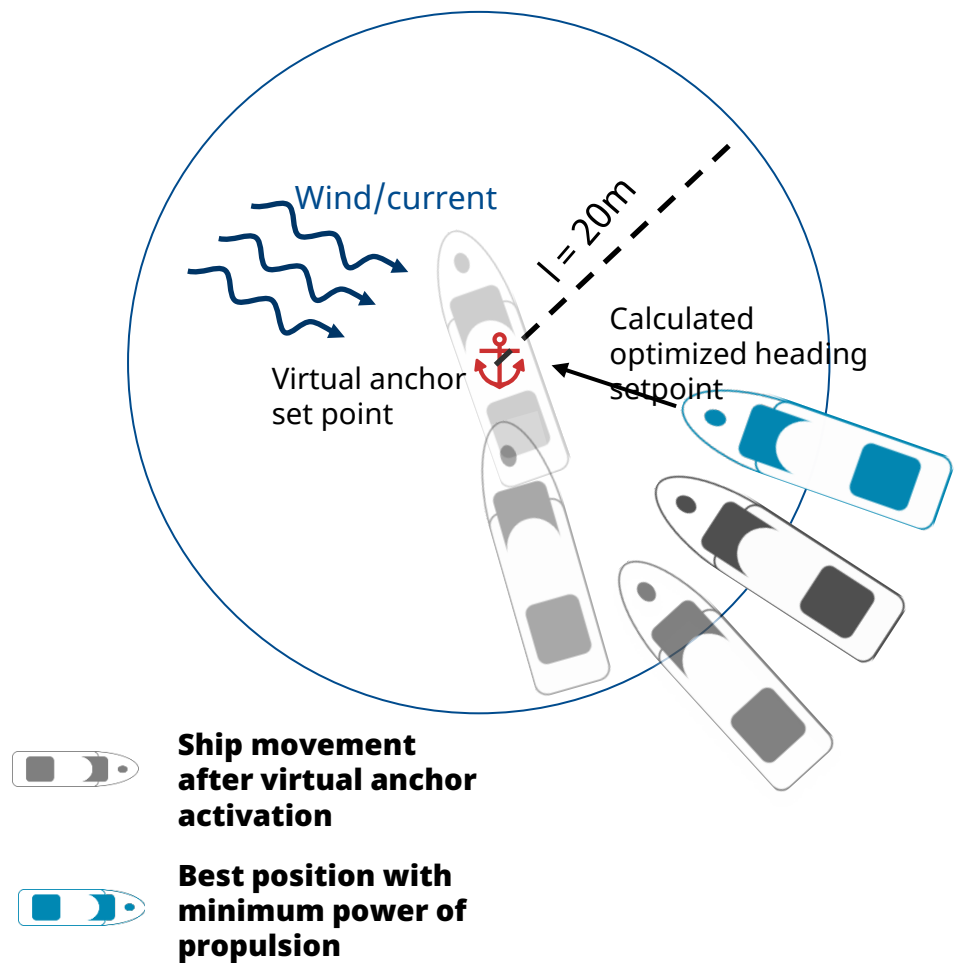
1. Heading Mode



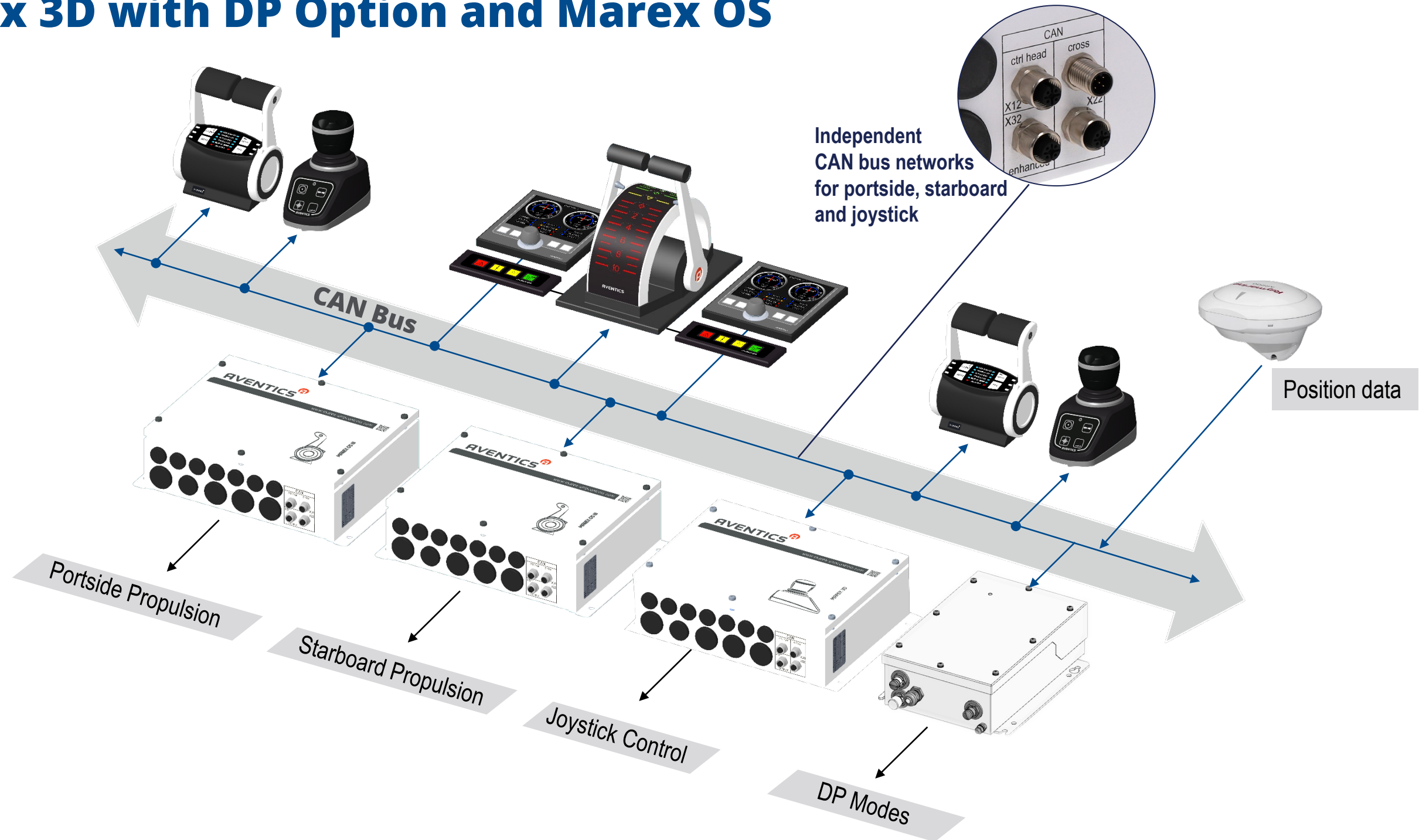
2. 3D Hold (Hold position)



3. Virtual Anchor



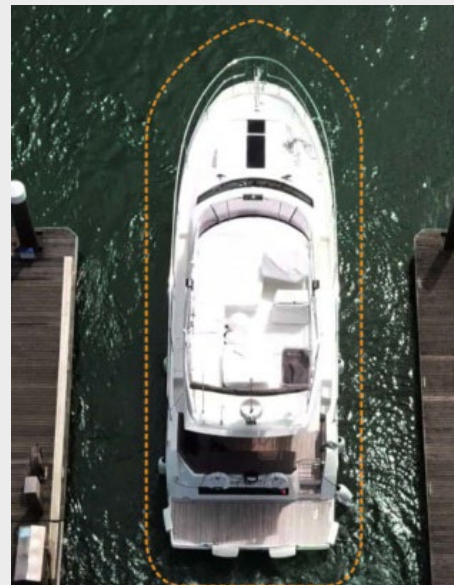
Marex 3D with DP Option and Marex OS



AVENTICS Marex 3D and Raymarine DockSense™

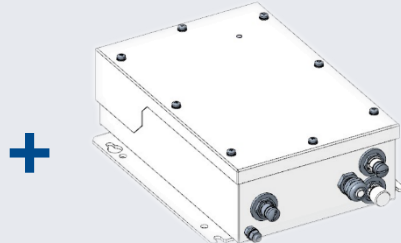


**Creating a new user experience
combining easy maneuvering and
assisted docking**



- DockSense™ Control creates a virtual bumper zone around the ship.
- When the ship is at risk of colliding with an object, DockSense™ overrides the captain's throttle and steering commands to prevent contact.
- Marex 3D perfectly complements the system, providing very precise vessel control at slow speeds.
- At present, Marex 3D is the only joystick control compatible with DockSense™.

Marex 3D Joystick System – Operating Modes

Minimum propulsion configuration	Engines	Transmission	Thruster	Joystick modes	Display	Description	Use cases	Required Components
	Diesel, twin setup	Standard reversing gear	Electric on/off	3D mode		Joint control of engines and thruster/s Joystick returns to neutral position when released.	Slow-speed maneuvering (e.g. docking)	
				Thruster mode		Separate thruster control	Conventional docking or other maneuvers which require independent control of thrusters.	
				Heading Hold		Ship's heading is kept while the yacht is floating.	Game fishing, enjoying the view to coastline or sunset	
		Trolling	Hydr. Proportional	3D Hold		Ship's heading and position are kept.	Waiting at water gates, fuel stations, port entries etc.	
				Virtual Anchor		Ship floats around a defined set point, the bow pointing to the set point.	Keep position with optimized fuel consumption and low noise	



Marex ECS Propulsion Control System



The EASY CONTROL SYSTEM

For small vessels with fixed pitch propellers



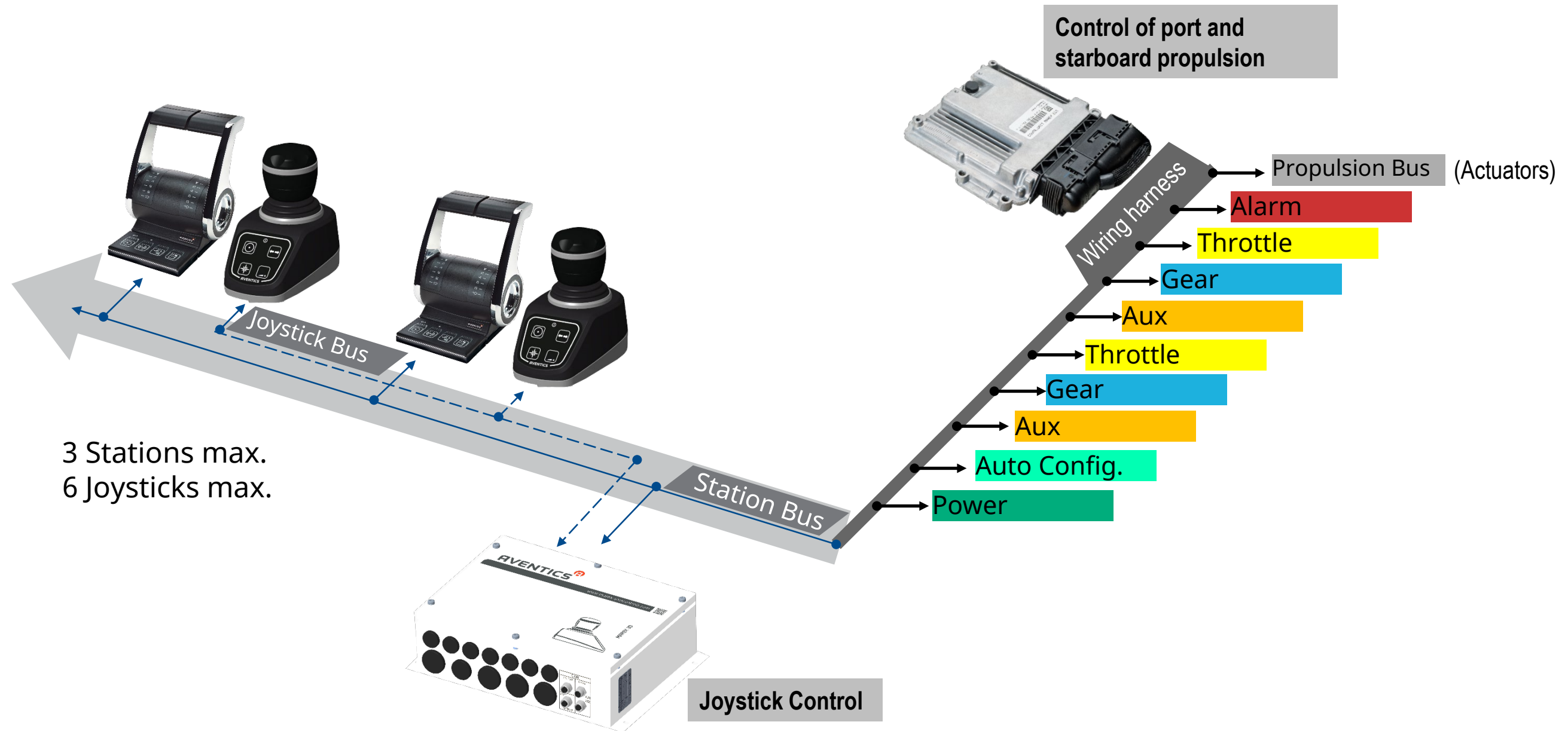
Features

- “Plug & Play” system setup
- Single or twin applications
- Chrome or black lever design
- Integrated keypad
- Up to 4 control stations (3 with joystick option)
- Compatible with YachtController™ wireless stations
- Joystick option
- Color-coded wiring harness

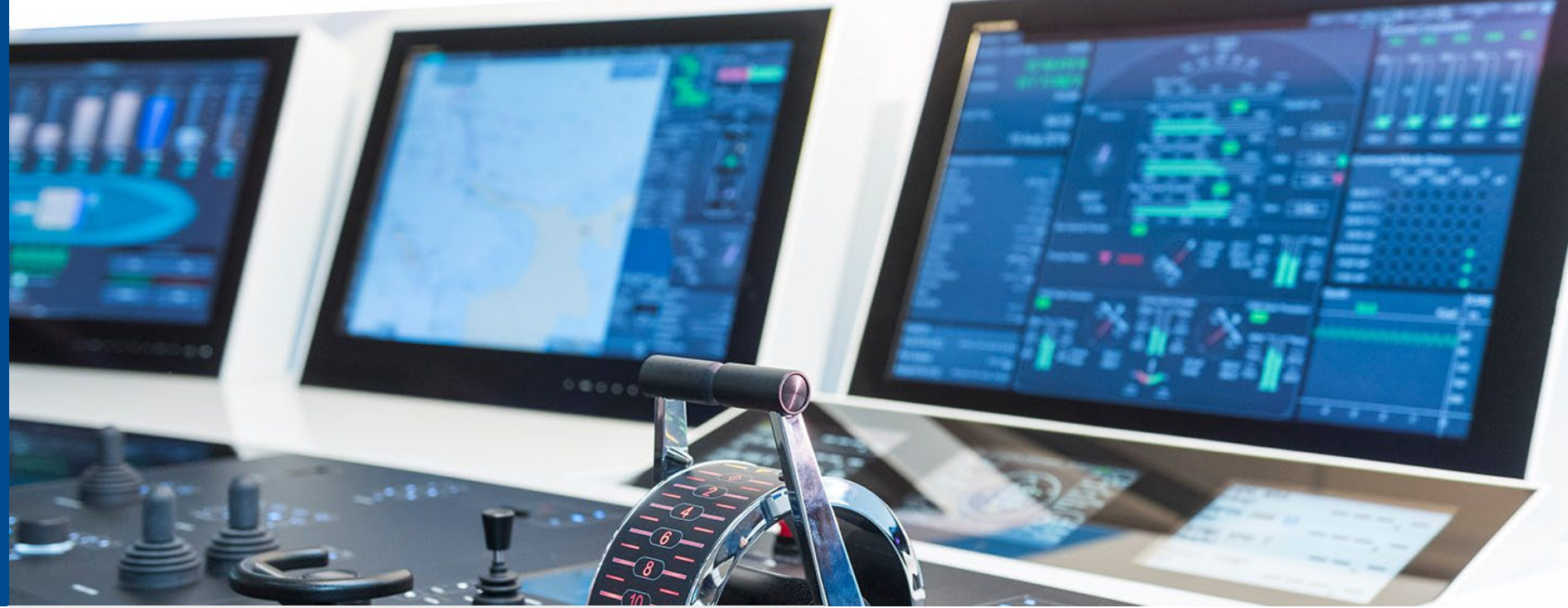
Benefits

- Focused on the essential without compromising on quality, look and feel.
- Easy to install
- Easy commissioning due to automatic configuration
- Wireless fine-adjustment
- Language independent buttons

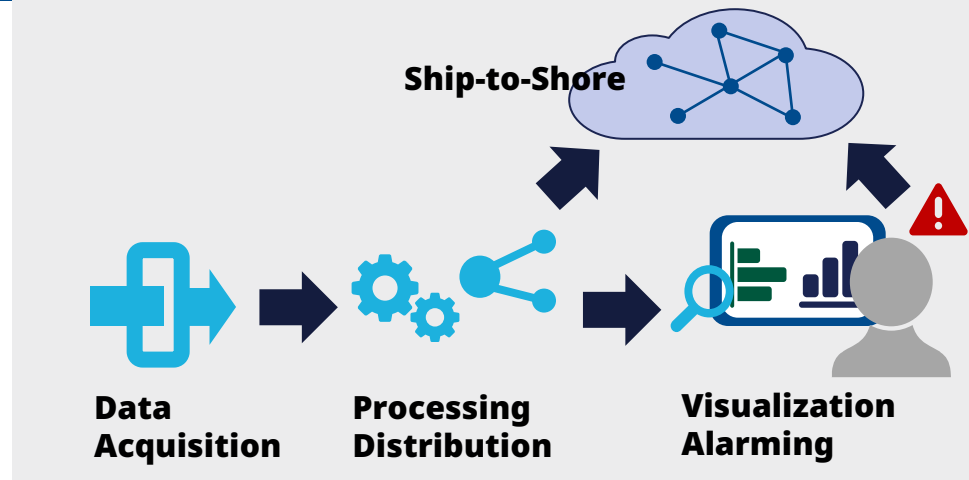
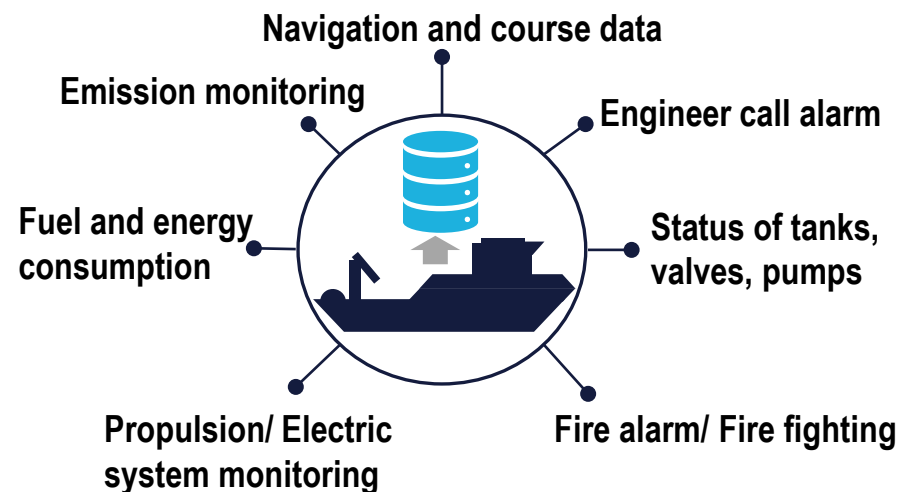
Marex ECS Twin Engines with Joystick Option



Marex SCADA Alarm and Monitoring Control



Economical and sustainable ship management through **digitization and **visualization** of data and **network connectivity****



Ready for Maritime 4.0:

- System monitoring and alarming
- Enhanced visualization
- Data acquisition and digitization
- Historic database
- Analysis Reporting

Enable safe and energy-efficient vessel operation

- Detect critical conditions without delay
- Enable fast crew response
- Ensure compliance with environmental rules
- Provide data e.g. for predictive maintenance
- Enable economic ship management through remote monitoring

Marex SCADA

Ruggedized Components for Marine Use



Features

Benefits

- Various display sizes from 7 to 24"
- Sunlight-readable option
- Customizable screen designs
- Compact and advanced user interfaces (Quick Panels or Panel PC)
- Strong shock and vibration resistance
- Optional cloud interface
- Movicon.NExT™ software
- Lean system option for small applications
- Fast processing and display
- Excellent graphics
- International character library
- Customizable system
- Certified software
- User and access right management
- Package solution with Marex OS propulsion control
- Local servicing from any laptop
- Remote commissioning



High-performing monitors and software Movicon.NExT™



Flexible network switches



Ruggedized industrial PCs

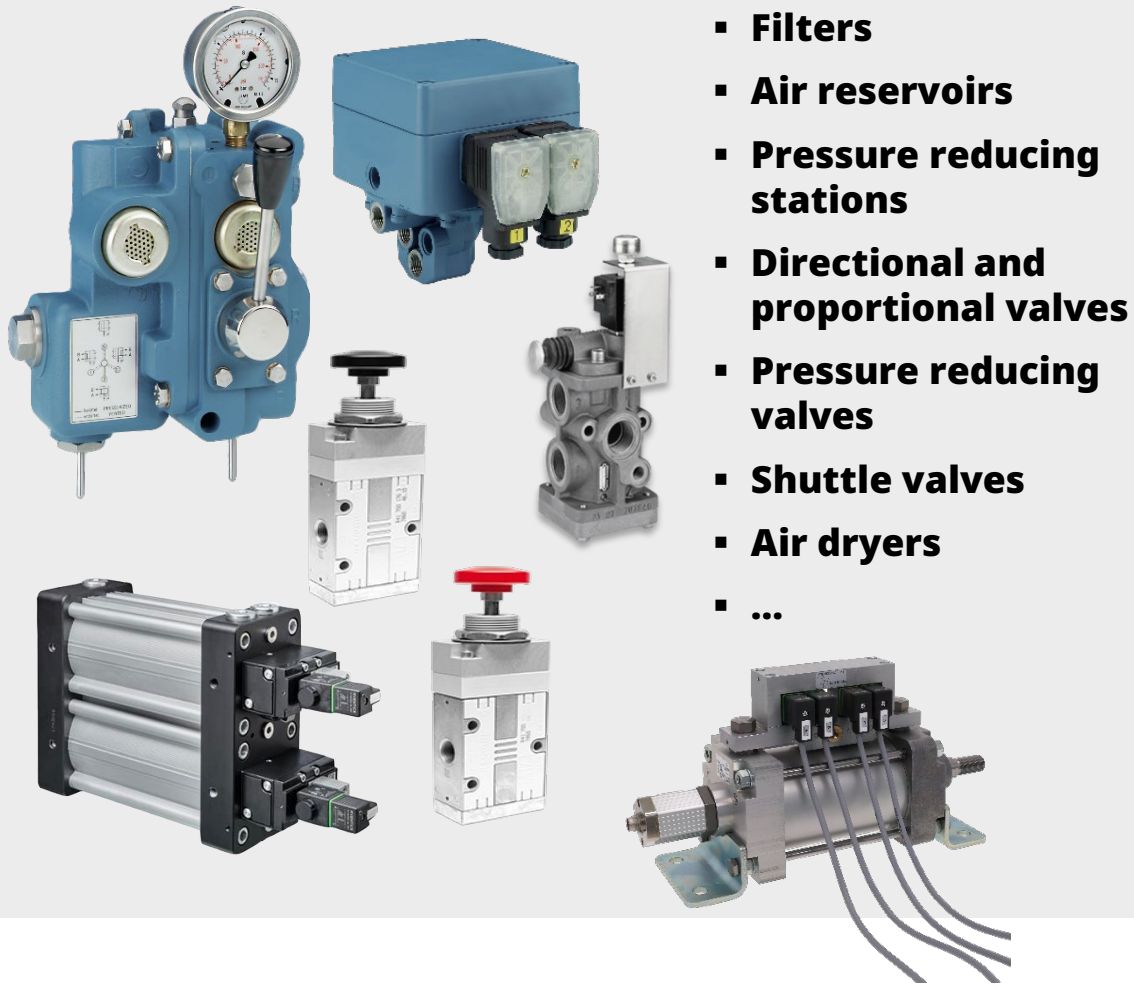


High channel density, high performing I/O modules



Pneumatic components and systems

Pneumatic Components



- **Filters**
- **Air reservoirs**
- **Pressure reducing stations**
- **Directional and proportional valves**
- **Pressure reducing valves**
- **Shuttle valves**
- **Air dryers**
- ...

Features

- Metal housing
- Durable, resistant air filters
- 30-bar-devices
- Low wear air dryer
- Spare parts and repair kits
- Class approved components available

Benefits

- Designed for marine applications
- Long service life
- Robust and low in maintenance
- Longterm availability of spare parts
- Easy maintenance
- High-performing air dryer



RDD Air dryer



New technology with high-performing Roll-up Desiccant



Reliable dry air supply for safe, smooth and low maintenance pneumatic control circuits

Features

- Maintenance interval > 8 years or 25,000 h service hours
- Patented, immobile desiccant
- Protection class IP 65
- Dew point suppression >40°C
- Sizes/Flow rates:
215, 1000, 2370 NI/min
- Working pressure 4 - 12 bar
- Optional heater
- Temperature range: -40 to +70°C

Benefits

- High moisture uptake
- Consumption for purge <15%
- Low in maintenance
- Stable and consistent performance
- Adsorbion material insensitive to vibration
- Long service life
- Flexible installation orientation
- **Cost and energy saving**



Air Treatment Units



Features

- Modular, ready-to-install units for pressure reducing, air filtering and drying
- Robust design
- Scope from basic to excellent air quality
- Optional double design for uninterrupted air supply and availability at second air outlet
- Optional high-performance RDD air dryer

Benefits

- Optimal preparation of compressed air for every control application
- Long and flawless service life of the pneumatic system
- Continuous air supply due to redundancy
- Option of outstanding air quality for demanding applications
- Easy to integrate and service
- Low in maintenance



Product Examples



Air Treatment Units

Scope of Supply

- Units for air qualities from 7:8:4 to 2:2:2 (ISO standard ISO 8573 - 2010)
- Flow rates from 200 to 6750 NI/min
- Single or redundant versions

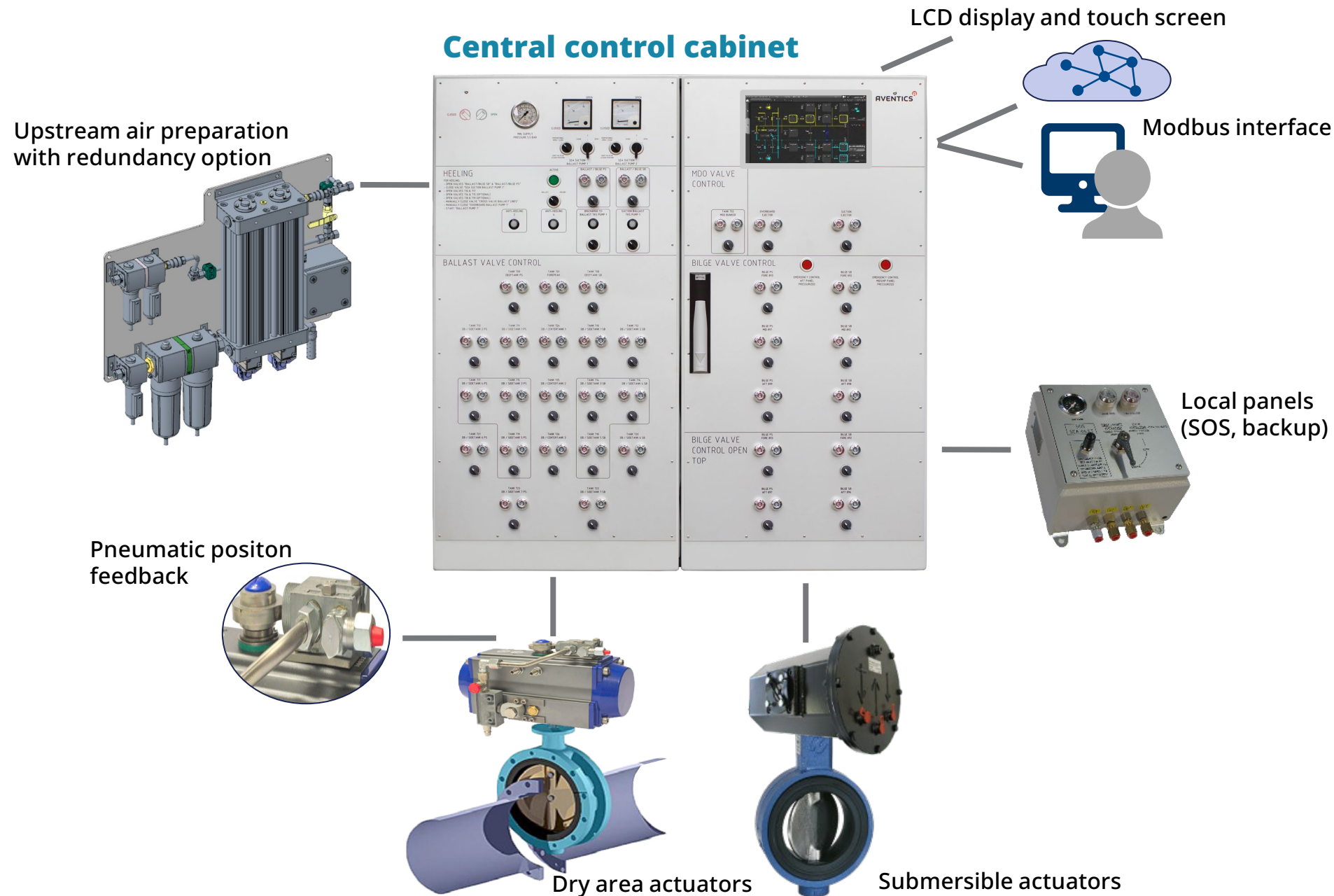
		Flow rates (NI/min)					
Air Quality	ISO Standard	200	1000	1400	2400	4200	6750
Basic	7:8:4			x			x
Standard	5:8:4			x	x	x	
High	3:7:3			x	x		
Excellent	2:2:2	x	x		x		



Marex Valve Control System Overview

Highlights

- ✓ Fully pneumatic, highly reliable actuator control and feedback
- ✓ Single, double acting and proportional control
- ✓ Submersible actuators
- ✓ Optional electronic interface and data communication



Marex VCS Valve Control System

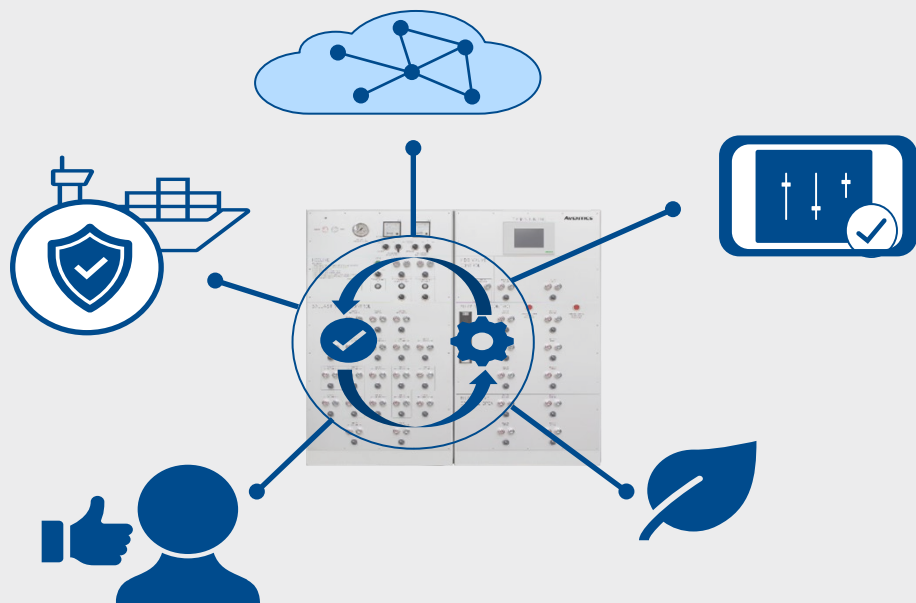


Features

- Fully pneumatic, highly reliable valve control and feedback
- Optional electronic interface and data communication
- Single, double-acting and proportional valve actuation
- Actuators for dry and submerged installation
- Modular setup
- Class approval on request

Benefits

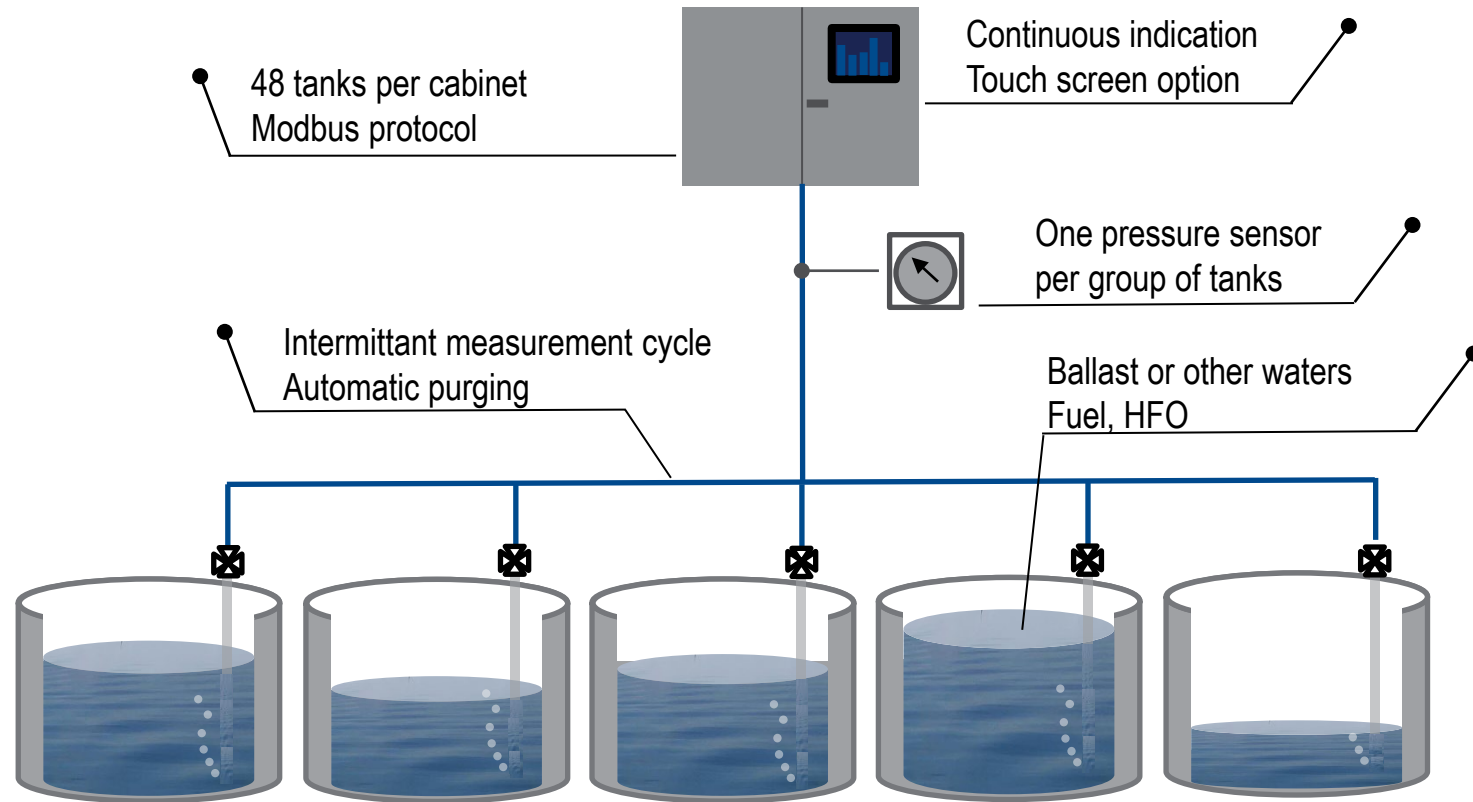
- Cost-efficient in purchase, installation and operation
- Customizable with many options
- Clean medium
- Serviceable by crew members
- Reliable operation also of submerged valves
- Manual emergency operation



Marex Tank Sounding System

Bubble Type Electropneumatic System

(Click in presentation mode to start animation)



Marex TSS Tank Sounding System

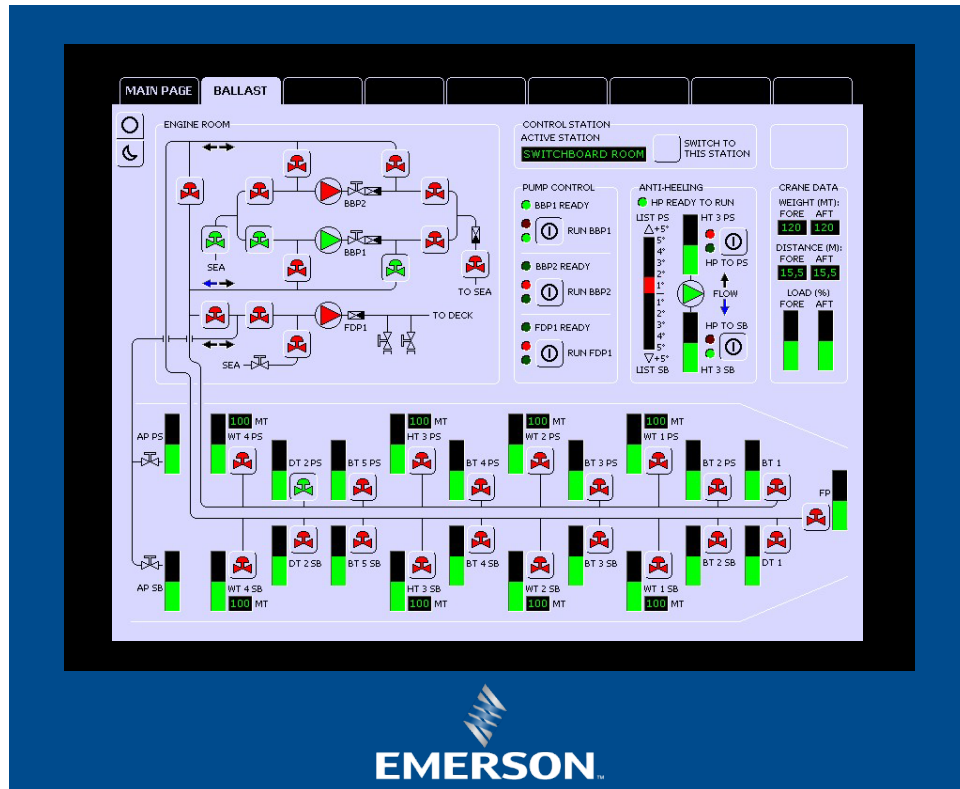


Features

- Modular solution with many options
- Compact system for small applications
- Temperature range from 0 – 50°C
- Reliable, low maintenance principle
- Optional Modbus interface
- Alarm output
- Optional tank volume measurement

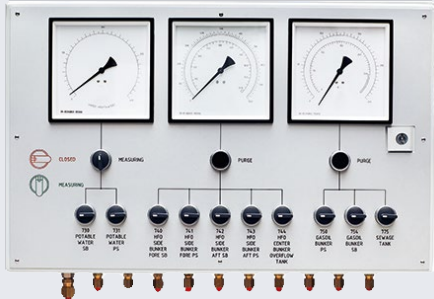
Benefits

- Low purchase and operating costs
- Environmental-friendly medium
- No equipment in the tank except for tube
- High accuracy, measurement unaffected by ship movement
- Self-cleaning system, no clogging
- Serviceable by crew members



EMERSON

Marex TSS Variants

Type	Full pneumatic	Electro-pneumatic	Electro-pneumatic
			
Control type	Manual	Manual	Automated
Operation via	Buttons	LCD display and buttons	Touch screen
Tanks	10	8	48 (per cabinet)
Modbus interface	n. a.	n. a.	✓
Alarm output	n. a.	✓ (option)	✓
Tank volume measurement	n. a.	n. a.	✓
Intermediate measurement	n. a.	✓	✓
Continuous indication	n. a.	✓	✓



Projects

Marex 3D Joystick System Upgrade of Viking Motoryacht, USA

Before:



After:



Marex OS + Rudder Control

New Build Vanquish 80 Motoryacht, Italy



- Twin engine application with reversing gear and trolling
- Top System™ Surface Drive including trim and steering gear



AVENTICS scope:

- Marex OS with implemented Rudder Control Unit
- Marex 3D joystick system with DP features



Marex OS Hybrid Application

New Build Superyacht Oceanco Y721, Netherlands



- Sailing Vessel
- Twin hybrid propulsion
- CPP application
- MTU engines
- Reintjes gearboxes
- Electric motors



AVENTICS scope:

- Marex OS ship control system
- Control of diesel engines, gearboxes, electric motors in all cruising modes
- Selection of modes via push buttons
- Bridge and wing stations equipped with control head type 230
- Lever follow-up feature
- Special feature ,automated lever adjustment':
When changing the cruising mode, the control head lever automatically moves to the position which corresponds to the settings of the new mode. This ensures smooth transition between the diesel and electric modes.

Marex OS Hybrid Application

Passenger Ferries on Lake Geneva, Switzerland



- Passenger Transport Vessel
- Twin hybrid propulsion
- 2 Ships designed by Shiptec
- Warsilä engines
- BlueDriveEco by Siemens



AVENTICS scope:

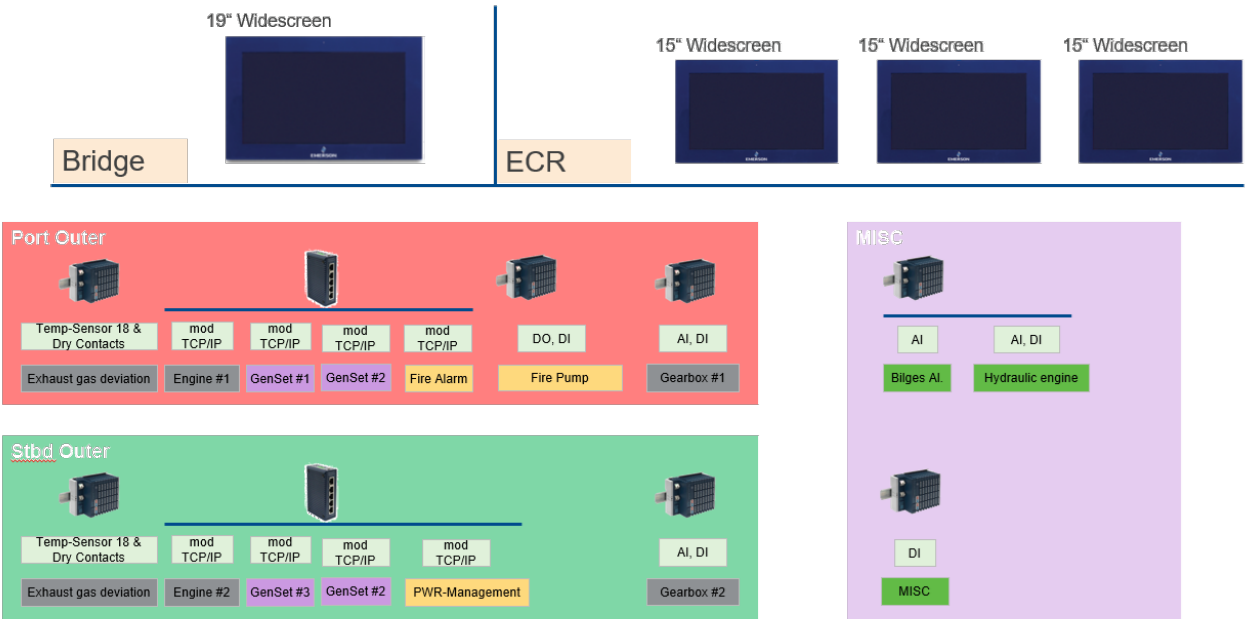
- Marex OS ship control system, Navis DP0 dynamic positioning system
- Control of diesel engines, gearboxes, electric drives in all cruising modes
- Propulsion is designed for peakshaving during high energy demands and fully electric powering near the shore.
- New transport capacities reduce CO² footprint of commuters between France and Switzerland by shifting traffic from road to public transport.

Marex SCADA Application

Refit Navy Vessel „KD Ledang“, Malaysia

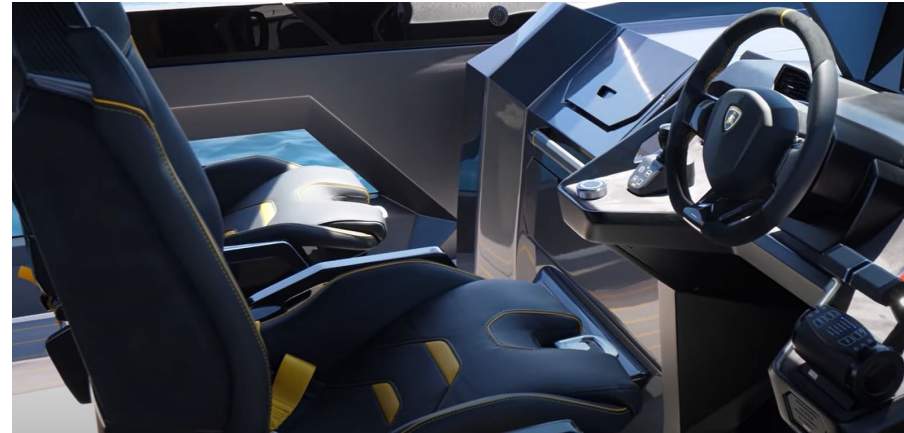


- AVENTICS scope:
Alarm and Monitoring Control
including
- Panel PCs and Movicon software
 - PLC controllers
 - Network switches
 - I/O Interface modules



- Integrated subsystems:
- Exhaust gas
 - Engines
 - Generators
 - Fire Alarms
 - Fire Pumps
 - Gearboxes
 - Bilges
 - Hydraulics

Product Customization Marex OS Technomar for Lamborghini, Italy



Challenge:

Develop a design for the controls that

- Picks up on Lamborghini lines and shapes
- Stands for sportiness and performance of the Lamborghini brand.

Solution:

- Command lever in edgy design typical of Lamborghini
- Handles in hexagonal honeycomb shape
- Matt black surfaces



Our Services

Marine Services

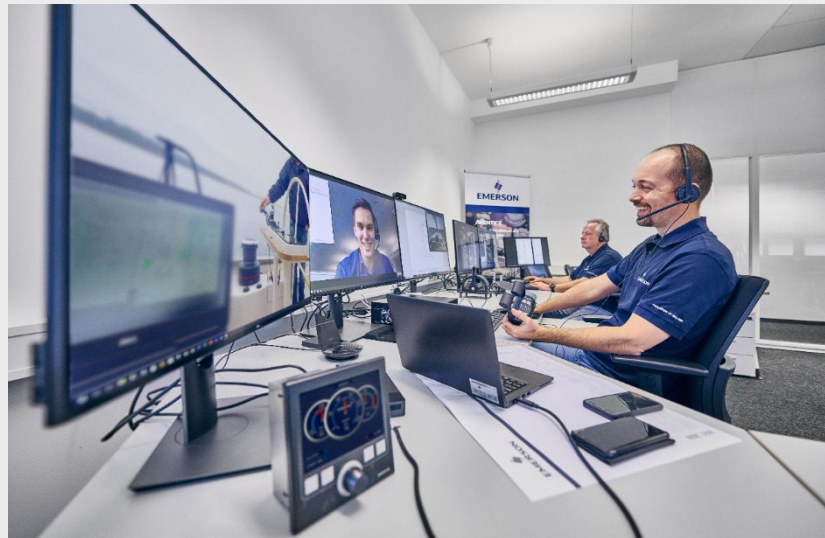
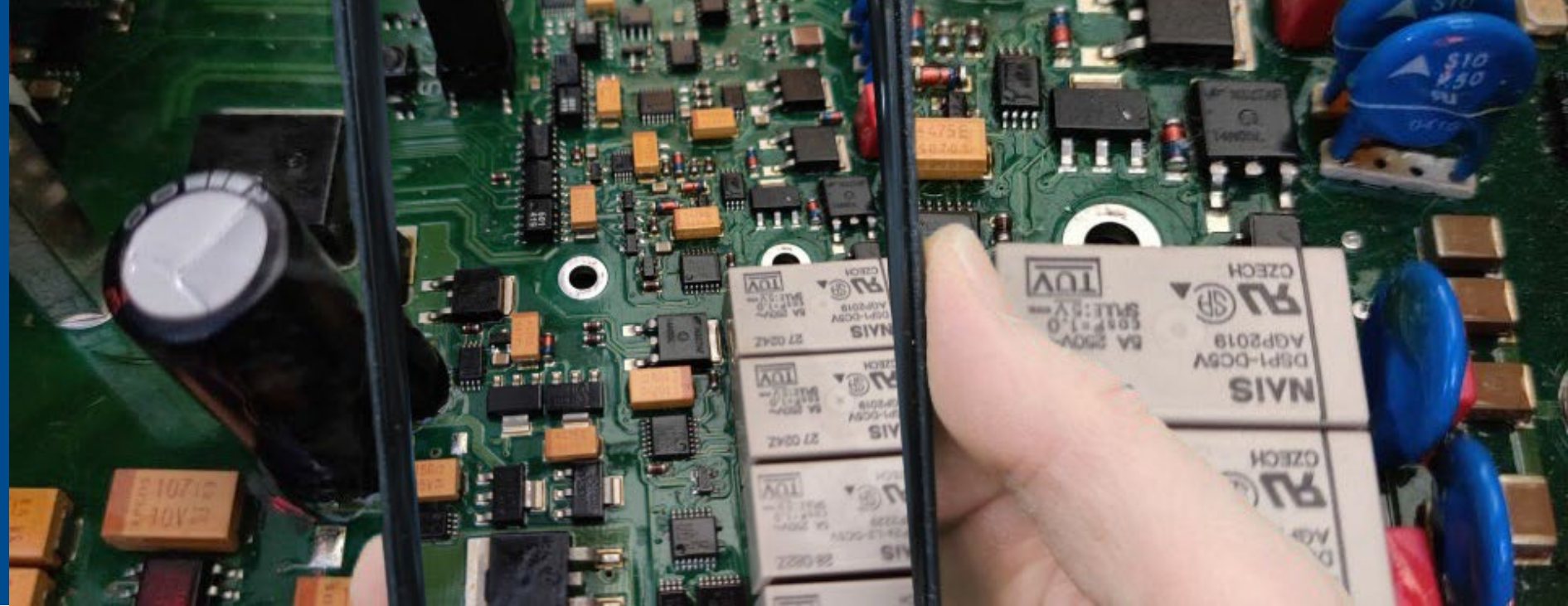


Our offer

- On-site and remote services
- Project support and consultancy
- Spare part expertise and supply
- Identification of follow-up devices
- Extensive project data base
- Commissioning
- Troubleshooting
- Maintenance
- Fine-adjustment for energy-efficient operation



Remote Assistance



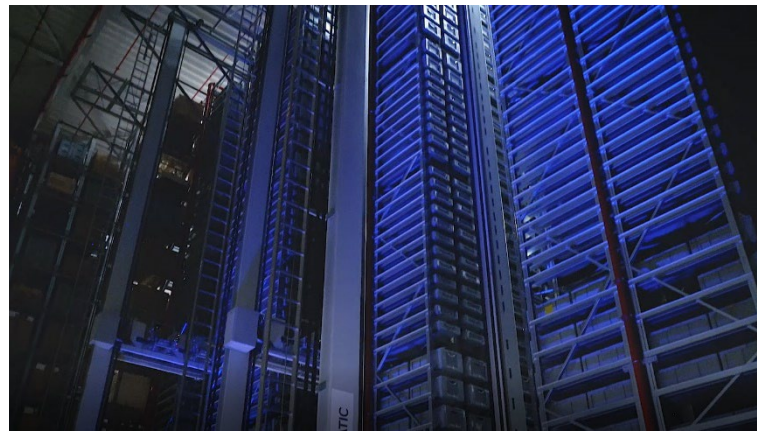
- Online support for solving technical issues, guiding through commissioning and troubleshooting
- Performed by means of internet connection, standard laptop and mobile phone
- Software tools and adapters provided by Emerson



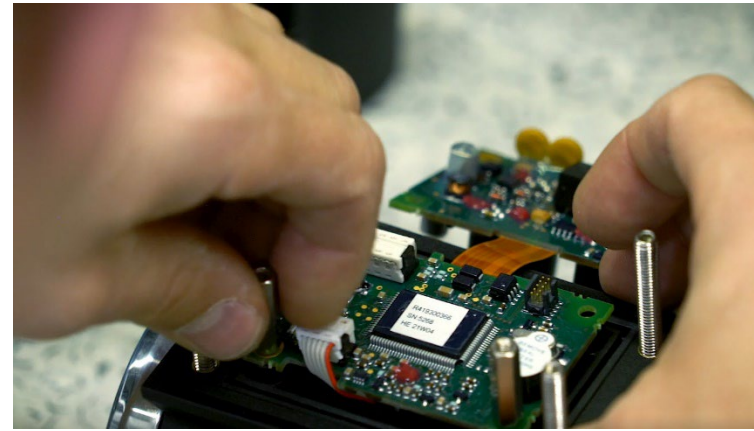
WEBEX
Adobe Connect
Teams



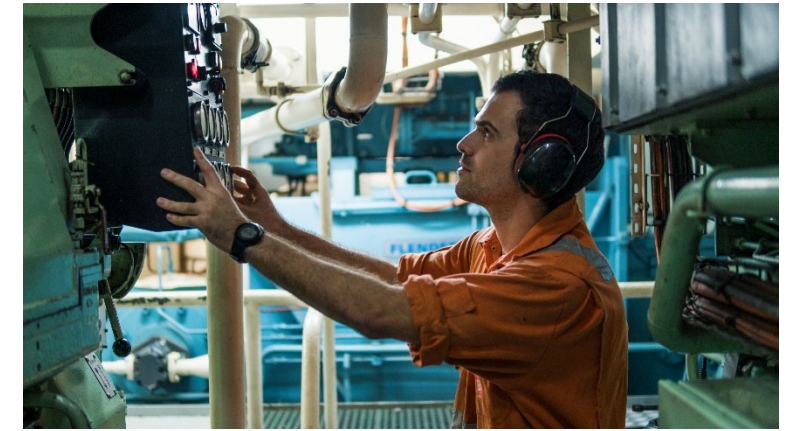
Spare Parts and Repair



- Automated distribution warehouse providing fast, worldwide shipping capacity
- Local stocks available at service workshops and partners



- Product repair service and testing facilities
- Original manufacturer warranty renewal
- Offer of remanufactured components



- Pneumare: Service and maintenance program for pneumatics at slow-revolving 2-stroke-diesel engines

Product Training



New Skills Training

Professional knowledge transfer to service partners and customers

- Professional training by skilled product experts
- Comprehensive range of courses for existing products and new features
- Customized courses on request
- Web-based, on-demand courses
- Scheduled courses face-to-face or remotely
- State-of-the-art in-house studio for distance learning
- Professional training software
- Access to document library with product news and service-related information
- [Online portal](https://emerson.swissteach.academy/sui/) for course program and registration
<https://emerson.swissteach.academy/sui/>

Sales and Service Network



Summary

Summary



- + Established products approved by major classification societies
- + Certified production sites performing strict quality controls
- + Decades of experience
- + Extensive engineering competence in pneumatics, mechanics and electronics, including software development und product customization
- + Strong partnerships with major OEMs (MAN, MTU, Caterpillar, HHI, STX, ...)
- + Worldwide Marex service network, expanded by Emerson's service organization
- + Service and support through the lifespan of the vessel, Remote Assistance option



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