New energy for marine applications

Into the future with electrified drive systems



Bosch Engineering

BOSCH

The trend towards electrification

Bosch Engineering offers electric drive systems for a wide range of marine applications, covering both planing and displacement craft. This provides shipbuilders, system integrators, and naval architects with a quick and simple means of electrifying their boat drives.

Driven by upcoming global environmental regulations and growing demand for quieter, eco-friendly propulsion, the maritime industry is shifting. Bosch Engineering actively shapes this transformation by providing manufacturers with electric drive components and system solutions tailored to their exact requirements.

Electric drive for marine applications (EDM): the plug-and-play complete solution

The integration of an electric inboard motor into recreational boats or commercial vessels involves considerable engineering effort and requires a high level of understanding of the overall system. With the complete system, the electric drive for marine applications (EDM), Bosch Engineering now supports the quick and straightforward high-voltage electrification of boats and small ships. Bosch Engineering supports EDM customers from the initial installation concept to the commissioning of the drive.

The system sets new standards in terms of performance, efficiency, and sustainability.

Inboard motor EDM160



Continuous power[1]	120 kW / 160 hp
Peak power[1]	140 kW / 190 hp
Output speed at 120 kW (i=4.6)	≥ 1,300 rpm
Output speed at 120 kW (i=6.0)	≥ 1,000 rpm
Output speed without gearbox at 120 kW	≥ 6,000 rpm
Total weight (dry)	Approx. 195 kg
Size (W x H x D)	65 cm x 75 cm x 92 cm
Cooling type	Open seawater circulation
Total efficiency	up to 94%
Compatible HV battery	Customized, according to application
Drivetrain configuration	Single
Application	Inboard, direct drive

[1] $T_{Coolant}$ 45 °C; power / torque at 400 V_{DC} continuous, peak ≙ 10 sec.

Benefits at a glance

Everything from a single source[2]: fully integrated plug-and-play solution for reliable operation and convincing performance.

Sophisticated drive system design: result of decades of experience and innovation in the field of drive technologies.

Straightforward replacement of internal-combustion engines: engineered for seamless integration and straightforward switch to zero-emission propulsion.

Light and powerful: optimized for high efficiency and performance combined with low weight for maximum range.

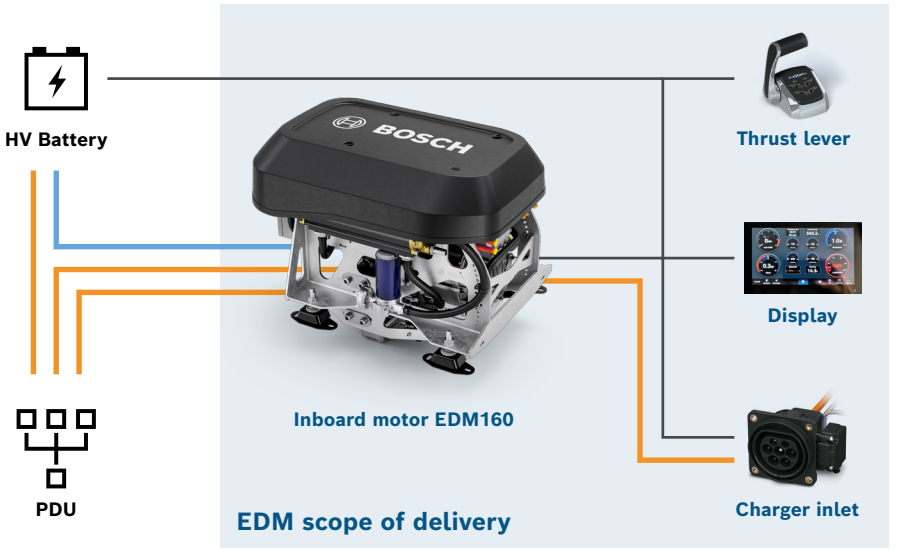
Compact dimensions and design: space-saving and flexible integration into diverse ship architectures.

State-of-the-art control software: for precision maneuvering, optimum energy efficiency, and high operational reliability.

High-quality volume-production components: tried-and-tested quality and robustness of our large-volume production in the passenger car and commercial vehicle sector.

[2] Excl. battery

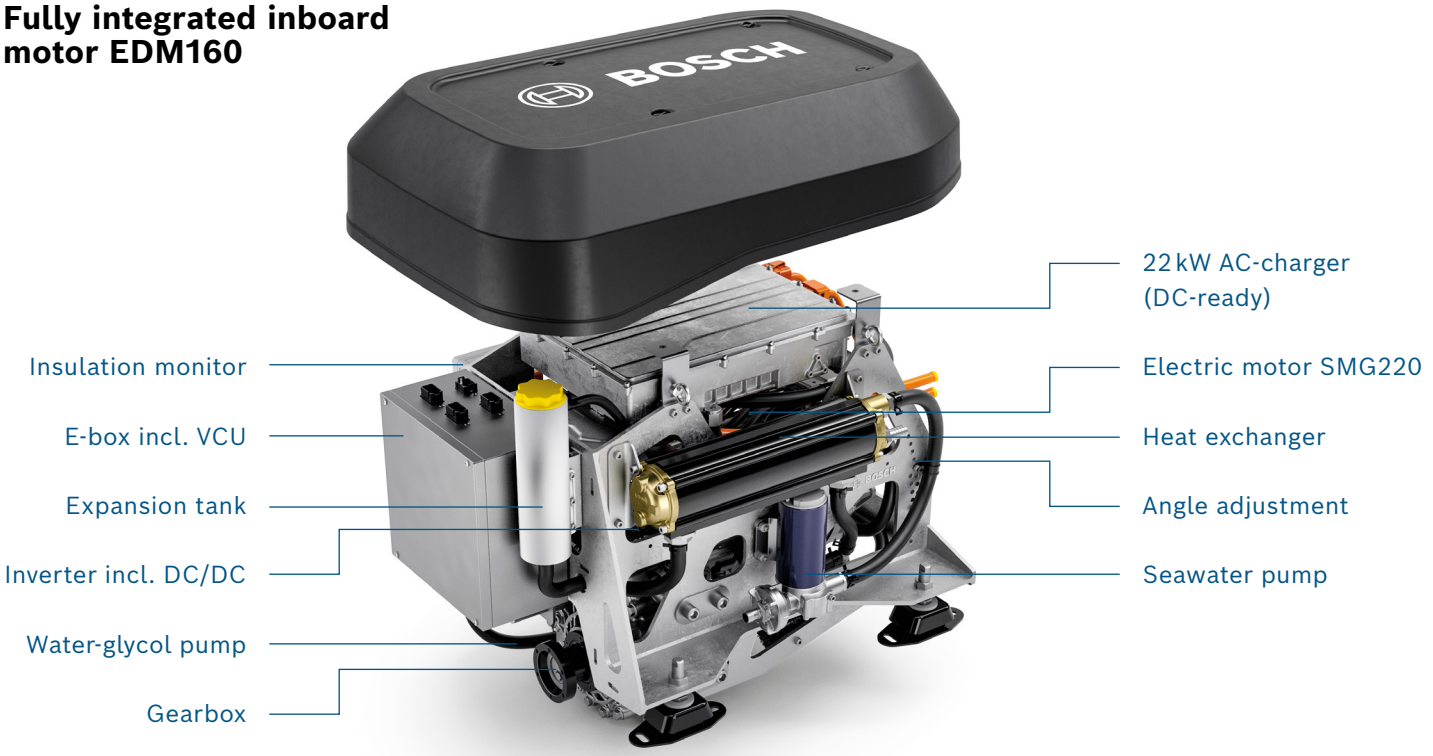
The system setup



The EDM is compatible with various batteries on the market, which makes it particularly flexible for meeting the individual requirements of different applications.

Battery cooling
High-voltage cabling
Low-voltage cabling

Fully integrated inboard motor EDM160



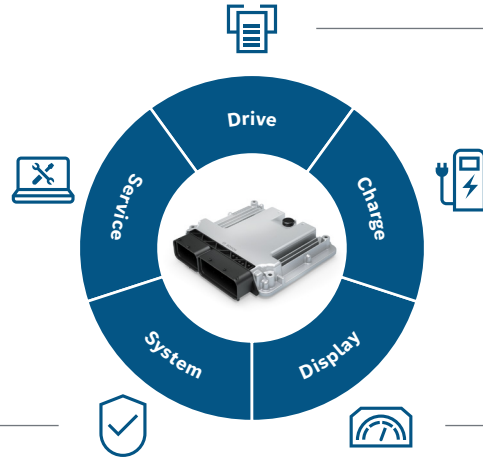
Adjustable shaft coupling for flexible mounting

The shaft coupling angle adjusts by +/- 8 degrees fore or aft, ensuring perfect alignment with the propeller shaft. Additionally this maximizes mounting flexibility, allowing the inboard motor to be rotated and installed in either orientation to suit restricted engine spaces onboard.



-8° 0° +8°

Comprehensive software features



- Cruise and maneuvering mode
- Drive characteristics configurable by the customer

- AC and DC charging with 22 kW / >100 kW
- Charging in dry condition
- Charging in sleep mode

- Support of NMEA displays
- Provision of cockpit and state values

- Self-protecting system
- Automatic state coordination
- Supports safety according to ISO 25197

- PC-based service tool
- Guided troubleshooting
- Secure access protection

Electric drive system platform (EDSP): flexible integration with platform approach

With the electric drive system platform (EDSP), Bosch Engineering offers boat manufacturers a high-quality, predefined solution for electric drives in marine applications.

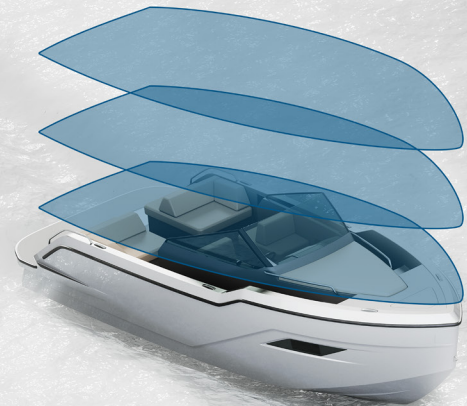
This includes Bosch‘s own drive components, such as electric motors, inverters, and gearboxes, as well as solutions for all other relevant components, including high-voltage batteries, chargers, and cable harnesses. Along with the EDSP, users also receive a description of all the essential information required for integration into the boat. This includes a system manual, component specification, ECU software, as well as a commissioning package.

The EDSP system guideline and software make it easier for users to create a high-voltage drive system that not only meets the requirements of the European Recreational Craft Directive but also represents the latest state of the art with regard to functional safety and cybersecurity.

Software platform
Selection of comprehensive software features, covering drive, charge, display, system and service.

System platform
The predefined toolkit for the electric drive enables seamless interplay between the various elements.

Components
Proven automotive high-volume drive components from Bosch combined with selected third-party components.



Benefits at a glance

Predefined solution: less in-depth expertise required on the part of the customer.

Sophisticated and flexible drive design: based on decades of experience and innovation in the field of drive technologies.

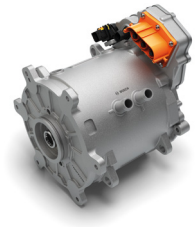
Easier and faster projects: significant reduction in the time to market.

Greatly reduced project costs: easier, faster, and more cost-effective integration into a wide range of marine applications.

High flexibility: selection of third-party components such as battery packs, thrust levers, and displays.

Electric motor

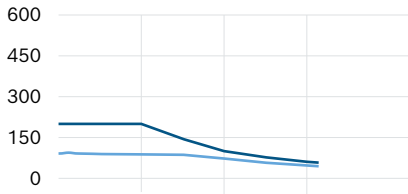
Seperate motor-generator (SMG) for off-highway (OHW)



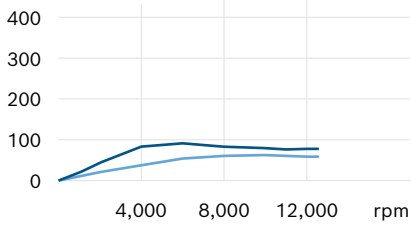
SMG180-OHW

Voltage range	<425 V_{DC}
Power peak[1]	90 kW / 120 hp
Power continuous[1]	60 kW / 80 hp
Torque peak[1]	200 Nm
Torque continuous[1]	95 Nm
Efficiency$_{peak}$[3]	94 %
Coolant flowrate	8 l/min
Weight	30 kg
Dimensions	~Ø 260 × 270 mm
Max. speed	12,000 rpm

Torque (400 V) [Nm]



Power (400 V) [kW]

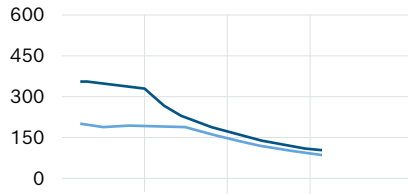




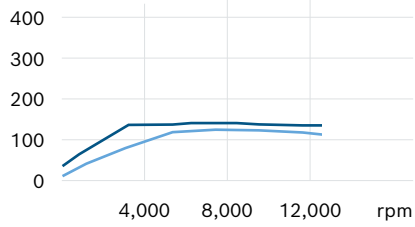
SMG220-OHW

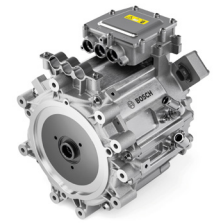
Voltage range	<425 V_{DC}
Power peak[1]	140 kW / 190 hp
Power continuous[1]	120 kW / 160 hp
Torque peak[1]	350 Nm
Torque continuous[1]	200 Nm
Efficiency$_{peak}$[3]	96 %
Coolant flowrate	8 l/min
Weight	63 kg
Dimensions	~Ø 286 × 337 mm
Max speed	15,000 rpm

Torque (400 V) [Nm]



Power (400 V) [kW]

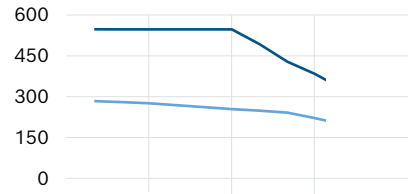




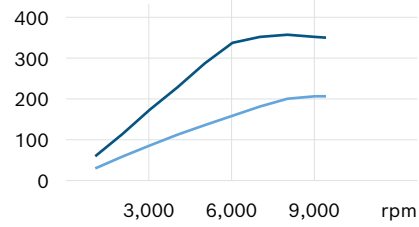
SMG230-OHW

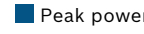
Voltage range	<850 V_{DC}
Power peak[2]	360 kW / 490 hp
Power continuous[2]	200 kW / 270 hp
Torque peak[2]	550 Nm
Torque continuous[2]	280 Nm
Efficiency$_{peak}$[3]	97 %
Coolant flowrate	10 l/min
Weight	60 kg
Dimensions	~Ø 345 × 283 mm
Max speed	12,000 rpm

Torque (800 V) [Nm]



Power (800 V) [kW]



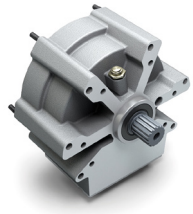


[1] $T_{Coolant}$ 45 °C; power/torque at 400 V_{DC} continuous, peak ≙ 10 sec.

[2] $T_{Coolant}$ 40 °C; power/torque at 800 V_{DC} continuous, peak ≙ 30 sec.

[3] Motor and inverter

Gearbox



EDT180

1 speed planetary gear box

Ratio	3.086; 4.318
Torque peak (out)	615 Nm
Power peak	90 kW
Speed max (in)	12,800 rpm
Efficiency	up to 98 %
Cooling	Water glycol mixture
Oil pump	Internal active oil cooling/lubrication
Weight	15 kg
Dimensions	259 × 140 × 263 mm
Compatible motor	SMG180



eGFZ9125

1 speed spur gear box

Ratio	4.6 (optional available: 4; 5; 6)
Torque peak (out)	3,800 Nm
Power peak	140 kW
Speed max (in)	16,000 rpm
Efficiency	up to 98 %
Cooling	Water glycol mixture
Oil pump	Integrated (CAN controlled)
Weight	49 kg
Dimensions	329 × 457 × 336 mm
Compatible motor	SMG220

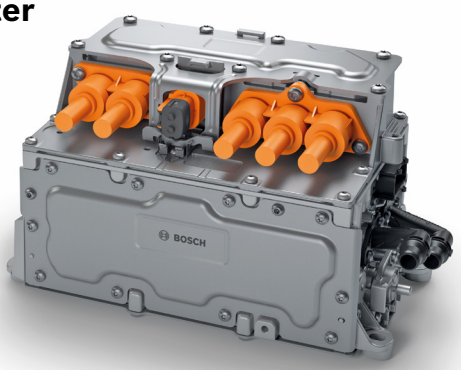


eGFV9120

1 speed planetary gear box

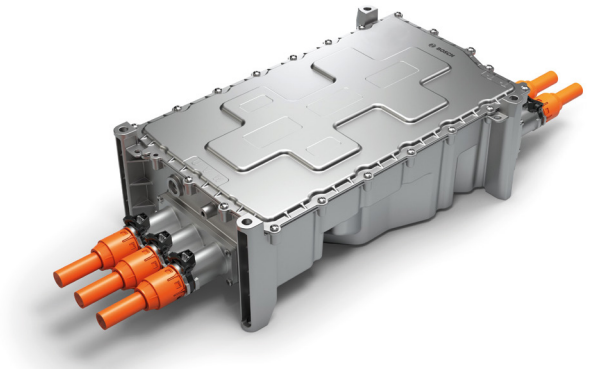
Ratio	3.77; 4.34
Torque peak (out)	2,100 Nm
Power peak	360 kW
Speed max (in)	12,000 rpm
Efficiency	tbc.
Cooling	Water glycol mixture
Oil pump	Splash lubrication
Weight	~26 kg (tbc)
Dimensions	Ø 335 × 220 mm
Compatible motor	SMG230

Inverter



INVCON3.3

Typ. power	140 kW
Voltage range	205 – 425 V_{DC}
Supply voltage	12 V
Current peak	480 A_{rms}
Current continuous	250 A_{rms}
DCDC power (12 V)	2.8 kW
Water cooled	8 l/min, 65 °C
Protection	IP6K6K, IP6K9K
Software	Control software with config. interface (UDS, BODAS Service) and CAN 2.0 A (500 kbit/s); trq- & n-control
Weight	10 kg
Dimensions	352 × 192 × 194 mm
Compatible motor	SMG180, SMG220



Inverter Gen4

Typ. power	360 kW
Voltage range	400 – 845 V_{DC}
Supply voltage	12/24 V
Current peak	550 A_{rms}
Current continuous	307 A_{rms}
DCDC power (12 V)	–
Water cooled	10 l/min, 65 °C
Protection	IP6K6K, IP6K9K
Software	Control software with config. interface (UDS, BODAS Service) and J1939; trq-, n- and U-control
Weight	17 kg
Dimensions	533 × 343 × 160 mm
Compatible motor	SMG230

For the electrification of marine applications, Bosch Engineering offers three different solution approaches:

Plug-and-Play complete solution: The new electric drive for marine applications (EDM), featuring an electric inboard motor and further system components from a single source.

Pre-defined modular solution: The Electric Drive System Platform (EDSP), where various drive components can be flexibly and modularly combined.

Individual drive components: Robust drive components, proven through technology transfer from automotive large-scale production, for independent integration.



Bosch Engineering GmbH
Robert-Bosch-Allee 1
74232 Abstatt
Germany
Phone +49 7062 911-02

Find more information on our website!

www.bosch-engineering.com