Hybrid and fully electric drive systems for ships
Hybrid and all electric drive systems for ships

Environmentally friendly and practical

Lowering costs, reducing emissions and fulfilling new guidelines: these are the advantages of all electric solutions or diesel-electric hybrid drives from Baumüller. Baumüller has been a specialist in electric drive and automation technology for decades and has been successfully installing its systems in numerous areas of mobile drive technology.

With its broad range of services, from motors, converters and control units to diagnostic software or battery management systems, Baumüller offers practical alternatives to traditional ship drives and paves the way for realistic solutions in the field of smart shipping.

Baumüller has the necessary technology and experience to equip inland waterway vessels, yachts, work ships, offshore vessels and ferries with electric drive technology or to adopt complete drive concepts.
Custom-fit and customer-specific: From electric motor to complete drive system

Baumüller offers exactly the service you need – from individual motors and components to the complete drive system with self-regulating energy and battery management. We support you with tailored solutions and fill the gap that you need to complete a job.

Baumüller is a partner to shipyards, system integrators and ship owners and is itself also a supplier of complete systems.

Partnership from specification to prototype to series production
We assist you in every phase along the way to an electrified future.

Our advantages

- **Experience:** Many successfully implemented projects
- **Future-oriented:** Efficient and high-performance hybrid and electrical drives
- **Expertise:** High-quality and reliable products in shipbuilding
- **Fast and customer-oriented decision paths:** Experience and advantages of a global, successful and innovative family company with tradition
- **Global service**
  - Production-ready design and development of prototypes all the way to pre-production to over 40 locations globally – all from a single source
Baumüller now supplies ferries, inland waterway vessels, yachts, etc. worldwide with its solutions and thus brings a wide range of experience to the outfitting or retrofitting of ships and offshore vessels.

Baumüller has specially adapted its products and certified them for shipbuilding. The DST2 high-torque motors, for example, are equipped with wing-mounts that make it much easier to integrate into the ship’s design. The DST2 marine motors are available with outputs from 3 to 875 kW and nominal speeds between 100 and 1500 min⁻¹.

The rudder propeller is powered e.g. by the powerful and dynamic three-phase current synchronous motors from the DS2 series with up to 300 kW.

In addition, recognized manufacturers such as Danfoss, Omron, STW and Eaton are used for project components.

In addition to components and systems, the Baumüller Group offers project planning expertise and service concepts with a global service network and is thus a long-term partner for the entire life cycle of ship drives.
Inverters

Controllers

Visualization & software

System optimization
Hybrid drive system for more efficiency

With a hybrid drive, the ship’s propellers are powered electrically by converter-fed synchronous motors which receive their energy from battery and diesel generators, e.g. LNG, diesel, fuel cells, etc. Numerous advantages make the combination of diesel and electric motors particularly attractive for shipping. Along with a significant reduction in fuel consumption in moving bodies of water, this system also reduces noise and vibrations by up to 28 percent.

Example of hybrid-electric system construction

Video and case study for the project are available here: www.baumueller.com
Maximum efficiency

An additional advantage is the improvement in overall efficiency through an output reduction feature on the diesel engine, ensuring travel within the optimal speed range. Ships that maneuver precisely on the open sea or have to remain within a set application location, for example, only require minimal output. In this case, speed is massively reduced with a pure diesel drive compared to the previous, faster moving journey. This means that the motor is not operating in its ideal efficiency range. By contrast, when an electric drive is used in these situations, the frequency converter controls the propeller speed directly via the synchronous motor, thus enabling it to run far more slowly. Because synchronous motors also achieve high effectiveness at low speeds, electric operation saves fuel.

DST2 — The powerful

The high-torque motors DST2 are certified by the Lloyd's Register and meet the specific requirements for shipping. The water-cooled direct drives are constructed with protection class IP 54, are not susceptible to dirt accumulation and run producing little noise. With their compact and robust construction, the motors take up minimal space in the engine room and are well suited for rough conditions on the water.

A powerful torque up to 60,000 NM improves the performance of the ship drive and positively affects the reverse thrust and bollard pull.

Parallel hybrid

Electric motor and combustion engine simultaneously affect the drive train. The torque of the individual drives is cumulative.
All-electric and emission-free: E-ships with battery-powered drive

Quiet and completely free of particulates: these are the key advantages of an all- or battery-electric e-motor for ships and boats. Here the motors are powered entirely without diesel motors with lithium-ion batteries.

Example of the structure of an all-electric system:

Video and case study for the project are available here: www.baumueller.com
The flexible e-drive system as a modular solution

System engineering and commissioning of prototypes
Implementation of the individual e-drive concept based on the system module from concept to series production

Control system
The control system is based on DNV-GL approved components and can be extended flexibly.
- Interfaces: CAN2.0B, Modbus, EtherCat

Drives for propulsion, thrusters, generators
- Electric motor with high performance
- Water-cooled
- from direct drive to PTI/PTO and Z-drive

Converters
- Mobile four-quadrant converter
- Water-cooled
- Nominal power 50–350 A
- Nominal voltage AC 400/500V; DC 750V
- Variable implementation as motor converter, AFE or M-Grid converter

Battery
- Use of different battery types depending on requirements of the load profile
- Nominal voltage 200–700V
- Interface with battery management systems of common battery manufacturers

DC/DC converter
- Mobile converter for connecting HV batteries to DC link
- Water-cooled
- Nominal power up to 400 A

Weltweiter Service
With our wide range of offerings in the areas of service, maintenance and retrofits, we ensure the reliability and productivity of your machine throughout the lifecycle of your system.
Over 80 ships and boats successfully electrified

We are the experts in the complete drive system: From control unit to battery management. Past implementations have included e.g. hybrid cargo ships for inland waterways and coastal applications, hybrid work ships, as well as hybrid and electrical ferries. Whether original equipment or a remotorization – our marine drives impress with their lower environmental impact, improved maneuverability and space-saving installation compared to classic diesel drives.
References:

**Hybrid: MS Nadorias**

Year of manufacture 2013 | Length 135 m | Width 11.45 m | Draft 3.78 m | Tonnage 4327 t | Engine Mitsubishi S1A2-MPTA 863 pk@1940 rpm | Hybrid baumüller DST2-400, 285 kW

**Hybrid: Ferry Farge**

Year of manufacture 2017 | Length 59 m | Width 14 m | Maximum speed: 14 km/h | capacity: 32–34 passenger cars, 6 semis, up to 249 people; 200 tons | Max. vehicle weight: 60 t

**Fully electric: Qi–Fu No.1**

Year of manufacture 2017 | Length 25 m | Width 6.5 m | Capacity: up to 150 persons; 46 bicycles | Motor 2 x 2 powerMELA® systems, each with 150

**Diesel–electric: Trischen**

Year of manufacture 2019 | Length 22 m | Width 7.5 m | Work ship | Diesel–electric drive system | 2 drive units DST2 2*225 kW

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