

TORGEEDO
STARNBERG.GERMANY

The Leader in Clean Outboards

CATALOGUE 2012



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Why we build the world's best electric outboards.

The answer lies in the details. Details that come from a combination of the newest technical developments from various fields, resulting in a unique outboard concept. That means careful selection of materials, many of which are high-tech. And finally, uncompromising optimization of performance, torque, efficiency, weight and convenience play a decisive role.

High-tech and convenience: you experience both every time you use a Torqeedo outboard. The on-board computer with GPS-based remaining range calculation and the all-round waterproofing (IP 67) of all components. Even more important: the high-tech features that you can't see. But you feel. When accelerating, in handling – always – when you're underway with your Torqeedo outboard.

Electronic Commutation

Normally, sliding contacts – so called brushes – are used to switch the polarity in electric motors and cause them to run.

Torqeedo motors are everything but normal. They create an alternating field contactlessly using electronic, digital switching. Integrated into the drive system, it switches the polarity through the coils 35,000 times per second.

Benefits of this method:

- the leading angle of the alternating field can be better matched to the load and speed, making it more efficient.
- there is no brush loss and
- the motors don't need servicing.

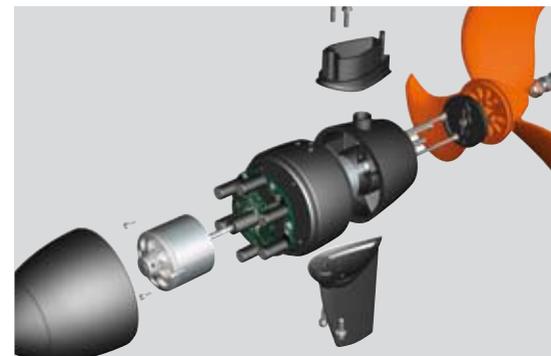
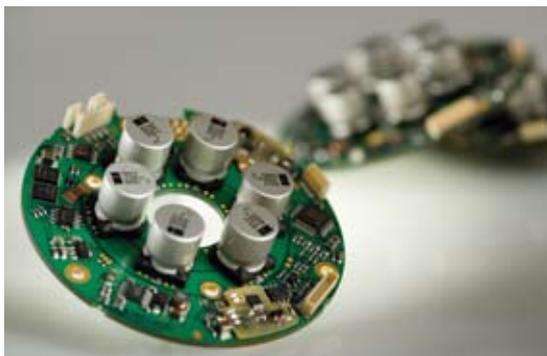
Outrunner Design

In conventional electric motors, the rotor is located inside and surrounded by the stator. The magnets are on the inside and the coils that generate the alternating field are on the outside. Consequently, the magnetic field where the torque is generated lies relatively far inside so that this classic design only produces low torque.

Torqeedo uses so-called outrunners in which the coils are arranged internally with the magnets mounted externally on a moving bell. With this design, the field that generates torque is moved outwards as far as possible producing much higher torque. Additionally, the area covered by the magnets is greater on the outside, which results in even more torque.

Rare-Earth Magnets

Instead of the usual hexaferrite magnets, Torqeedo uses rare-earth magnets. They're much more expensive, but provide six times the field strength, which means they deliver six times as much torque. The outstanding torque that Torqeedo motors deliver means they can drive propellers extremely efficiently.



Conventional Propeller Optimisation

Viewed conventionally, there are three main characteristics that define an efficient propeller:

1. large diameter
2. high pitch
3. low rotational speed

A large circumference results in a high mass flow rate of the propeller. High pitch has a positive effect through additional speed induced by the propeller. On the other hand, increased rotational speed of the propeller leads to increased loss of efficiency.

Because of their unusually high torque, Torqeedo motors are able to drive efficient propellers, i.e. they can turn larger propellers with higher pitch through the water comparably slower.

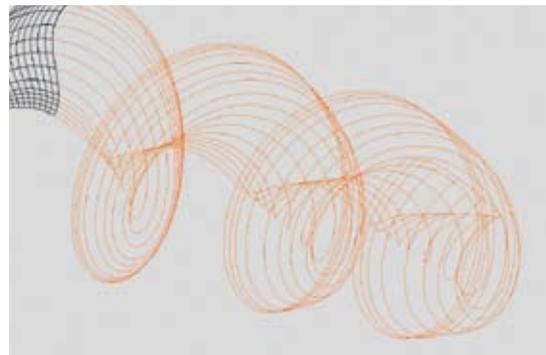


Multidimensional Propeller Optimisation

The construction of most propellers used in out-board motors today is based on results from a series of tests carried out between the 1940's and 1960's. The results are still seen in general design principles today and are used as a rule of thumb.

For several years now, the most modern commercial ships have been fitted with propellers designed according to a multidimensional optimisation calculation. In this process, a vortex grid calculation is used to optimise all segments of the propeller over many thousands of iteration steps.

This is also how Torqeedo propellers are made.



Lithium Battery Technology

Lithium-based battery systems are by far the most powerful sources of energy currently available. They are characterised by their high specific energy density, i.e. they can store more energy per kilogramme of battery weight. In addition, they can withstand high current, which enables them to deliver their capacity even under high currents. Both of these properties are very significant for applications in boat drives. For Torqeedo boat motors we only use lithium batteries.



Small lexicon of power ratings – what boat motors can really do



The various boat manufacturers work with different performance ratings for their products which makes comparison difficult. The most meaningful performance indicator of a drive system is **propulsive power**, which indicates the performance actually delivered by the boat's motor, taking all losses into account including propeller losses. This method has been in use for almost 100 years in commercial shipbuilding. Nevertheless, in recreational boating, less informative indicators are used.

To provide you with as much transparency as possible, Torqeedo provides all relevant performance ratings. Not only propulsive power, which we feel is the most appropriate, but also input power and static thrust data.

Petrol outboards

Performance rating:
shaft power [HP or watts]

When manufacturers of petrol outboards talk about horsepower, they mean shaft power measured at the propeller shaft. Shaft power, however, doesn't take propeller losses into account. Depending on propeller loss, over 60% or, on the other hand, only 20% of the shaft power is available to drive the boat. It would be nice to know more precisely.

Conventional electric outboards

Performance rating:
input power [HP or watts]

Input power indicates the energy consumption of a motor. But it doesn't indicate how much of the energy consumed is lost through inefficiency and how much is actually available to drive the boat. This amount – or overall efficiency – differs considerably and varies between 18% and 56% (Torqeedo). Therefore, the input power alone says very little about an outboard.

Trolling motors

Performance rating:
static thrust [lbs or lbf]

Static thrust indicates the ability of a motor to move a boat from standing still to a very very slow speed. It does not indicate its ability to move a boat at normal speed. As a performance indicator it is therefore inadequate.

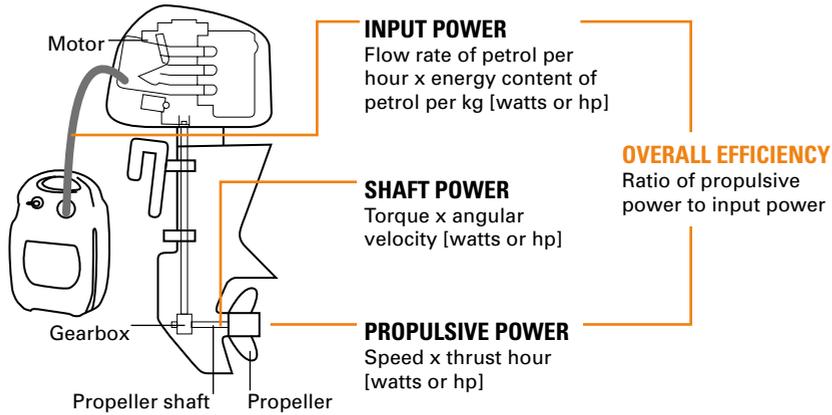
Torqeedo electric outboards

Performance rating:
propulsive power [HP or watts]

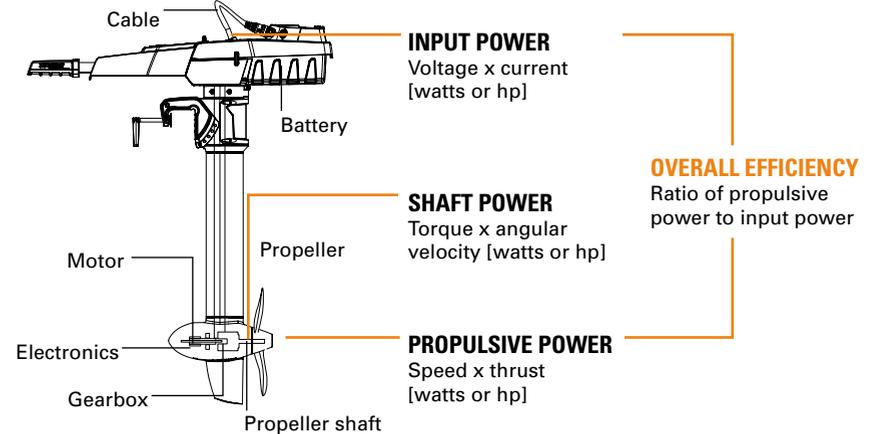
Just like the manufacturers of large ships, at Torqeedo, we always state the propulsive power of our outboards, i.e. the power actually delivered that drives the boat, taking into account all losses, including propeller losses. Using propulsive power, all outboards can be compared with each other. Sadly, you'll search in vain for the figures for propulsive power in other manufacturers catalogues.

OUTBOARD PERFORMANCE INDICATORS – WHERE THEY ARE MEASURED

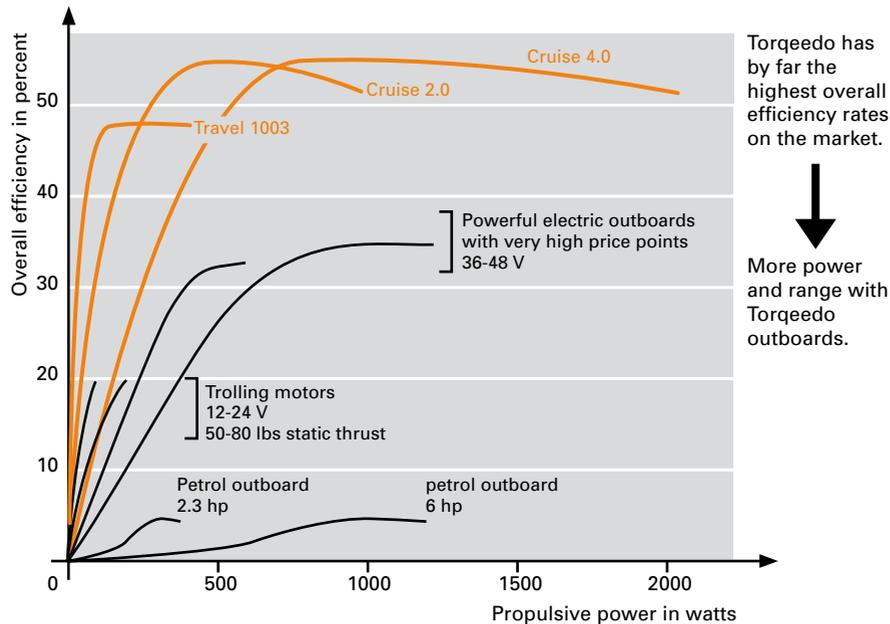
Petrol Outboards



Electric Outboards



PROPULSIVE POWER AND OVERALL EFFICIENCY RATES OF VARIOUS OUTBOARDS



When dealing with electric outboards, another performance indicator that needs to be considered is the **overall efficiency**. It describes the proportion of propulsive power compared to input power. For electric outboards, overall efficiency is one of the key performance indicators; because batteries only have a small fraction of the energy density compared to petrol, the battery capacity is almost always the limiting factor for power and range of an electric motor.

Higher overall efficiencies result in more power and range. Overall efficiencies of electric outboards and trolling motors range between 18 and 56% and differ from each other considerably by a factor of around 3.

For petrol outboards, the overall efficiency is not such a relevant indicator because, due to the high energy density of petrol, lower efficiencies can be simply compensated for with higher petrol consumption. The overall efficiencies of small petrol outboards are therefore particularly poor at around 5-10%, i.e. 90-95% of the petrol in the tank is lost and only about 5-10% arrive to propel the boat.



ULTRALIGHT 403



up to
9.8 km/h



1 HP
equivalent



7.3 kg



waterproof
IP 67



on-board computer
with GPS

U light up my life.

A motor on a kayak? Awesome! Because it's not just any motor, it's the Ultralight 403 and weighs just 7 kg including battery and throttle. So it doesn't restrict performance when paddling, but pushes when it's needed: against the current, against the wind and against tired arms. Plus, it's perfect for hands-free fishing and trolling – the right amount of power to get you where you need to be. Quietly! And when it drives, it drives properly. There's not only more power in this lightweight than you'd think at first sight, it demonstrates real endurance, taking you up to a full 42 km on a single charge at an average speed of 4 km/h (boat dependent). Which can be done simply and precisely because the throttle display shows the precise

speed over the ground – just one of four values that the integrated on-board computer always has ready. In addition, battery charge status and remaining range are available at any time with conditions such as current and tides taken into account. If the range isn't sufficient for you, just take the solar panel on board and charge easily en route, even you're underway.

With the included mounting ball, the Ultralight fits almost every kayak. All components – motor, battery and throttle – are completely waterproof to IP 67. So whether you're on inland water or the sea, the Ultralight 403 is the ideal companion for every trip into the blue.

***"I've never used an electric engine before and I'm keen to try one out.
Off we go and the Torqeedo is great ...!"***

Watercraft Magazine (UK)



ULTRALIGHT 403 –

key features:

- Total weight 7.3 kg including battery
- Maximum speed 9-10 km/h (boat dependent), faster than any trolling motor
- Range at lower speed 42 km (boat dependent)
- Completely waterproof (IP 67)
- Precise GPS-based calculation of remaining range
- Solar rechargeable – including during the voyage



ULTRALIGHT 403 with integrated battery (29.6 V / 11 Ah)

Fishing kayak (Hobie Mirage Revolution), 4.1 m, 26.3 kg

	Speed in km/h	Range in km	Running time in hours
Slow speed	4.2	35.2	8:20
Half power	6.0	25.0	4:10
Full power	9.3	7.4	0:48

ULTRALIGHT 403 with integrated battery (29.6 V / 11 Ah)

Touring kayak (Prijon Prilite T470), 4.7 m, 23 kg

	Speed in km/h	Range in km	Running time in hours
Slow speed	4.2	42.0	10:00
Half power	6.2	26.0	4:10
Full power	9.8	7.8	0:48

Mounting:

4 mounting options are available.

1. For use with Hobie kayaks: we recommend the Hobie "eVolve" available through Hobie dealers.
2. For use with Grabner kayaks: please use Grabner mounting kits.
3. For use with Prijon kayaks, please use the Prijon rudder mount.
4. All others: by using the mounting ball provided, the Ultralight 403 can be easily mounted on almost any kayak.

Steering:

the Ultralight 403 can be attached to the kayak's steering system/rudder.

Safety:

The motor shuts off when the magnetkey is removed from the remote throttle control. The motor only runs when the magnetkey is placed in position on the throttle and stops immediately when the pin is removed. For safety reasons, the magnetkey should be attached to your wrist or life vest. If the kayak capsizes, the motor shuts off automatically to avoid possible injury.

Battery charging:

When fully discharged, the charge time with the charger supplied is approx. 12 hours.

Solar charging:

A 45 W solar panel is available as an accessory.

Lithium battery life expectancy:

The life of a lithium battery is barely affected by charging cycles. It has no memory effect. Therefore, the battery can be fully recharged after every trip, regardless of the charge status shown on the display. Generally, a loss of capacity of 4% per year can be expected. Ageing is accelerated if the battery is exposed to high temperatures for long periods while fully charged.

Our recommendation: the battery can be used in very hot conditions but should be stored in a cool place away from the sun when not in use. 8 years after date of production, your battery needs to be inspected by a service center.

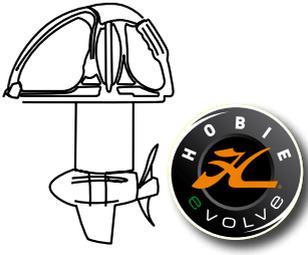
Specifications integrated battery:

The integrated battery has a capacity of 320 Wh, i.e. 11 Ah at 29.6 V.

Limited warranty: 2 years

Technical data and ordering information: Pages 30/31

For Hobie Kajaks



Ask your Hobie dealer for the Hobie eVolve kayak motor.

For Grabner Kajaks



Ask your Grabner dealer for the Ultralight 403 and its mounting kit.

For Prijon Kajaks



Ask your Prijon dealer for the Ultralight 403 and its mounting kit.

Accessories



Spare battery Ultralight (320 Wh)



Charger for spare battery Travel and Ultralight



Solar panel 45 W



Motor cable extension Travel and Ultralight



Throttle cable extension Travel, Ultralight and Cruise, 1.5 m/5 m



Spare propeller v10/p350



TRAVEL 503/1003

TRAVEL 503



up to
4 knots



1.5 HP
equivalent



12.7 kg (S)/
13.3 kg (L)



waterproof
IP 67



on-board computer
with GPS

TRAVEL 1003

up to
5 knots

3 HP
equivalent

13.4 kg (S)/
14.0 kg (L)

waterproof
IP 67

on-board computer
with GPS

Take the long way home.

Imagine that you could easily and cleanly break your outboard down into three parts for simple transport and storage. And in just a few easy steps, put it back together again. Imagine that you could accelerate with such control that your enjoyment on the water begins in the harbour when casting off. Imagine that you could change from travelling ahead to astern with just a twist of the hand. And that during normal passage, you could converse at normal volume. You can! With the Travel. In terms of performance and efficiency, it provides everything a petrol outboard offers. But it's much more convenient, quieter and environmentally friendlier. The Travel 1003 drives tenders, dinghies and daysailers up to 1.5 tons effortlessly for up to 10 hours. The tiller display with its integrated GPS receiver constantly provides a precise overview of how fast you're travelling and the remaining range. So that you always know

that you'll get to where you want. If you've drained the lithium battery, recharge it via the mains or the 12V on-board system. To do so, you don't have to dismount the entire motor; it's enough to unplug the battery, which, at around 4 kg really isn't heavy, and carry it to the power source.

You can also increase your range while you're on the water. With the solar charger that ensures the battery charge increases. No wonder that the Travel, which was awarded "Best Choice Winner" along side a range of other distinctions and awards, has also been chosen as "Green Product of the Year 2011" A wonderful outboard – and we're not the only ones who think so:

"... the powerful thrust produced by the Torqeedo Travel 1003 makes one thing clear: electric outboards are here to stay"
Practical Sailor (USA)

"A class of its own in speed and thrust...!"

Yachtrevue (Austria)



TRAVEL 503/1003 –

key features:

- can do everything that a 1.5/ 3 HP petrol outboard can, plus it's environmentally friendlier, quieter, lighter and more convenient
- completely waterproof (IP 67)
- On-board computer with GPS-based calculation of remaining range
- solar rechargeable – including during the voyage
- can be easily dismantled for transport and space-saving storage
- a clean affair: no matter how or where you store your Travel, there's no risk that anything will leak out or smell

Throttle display – provides information about:

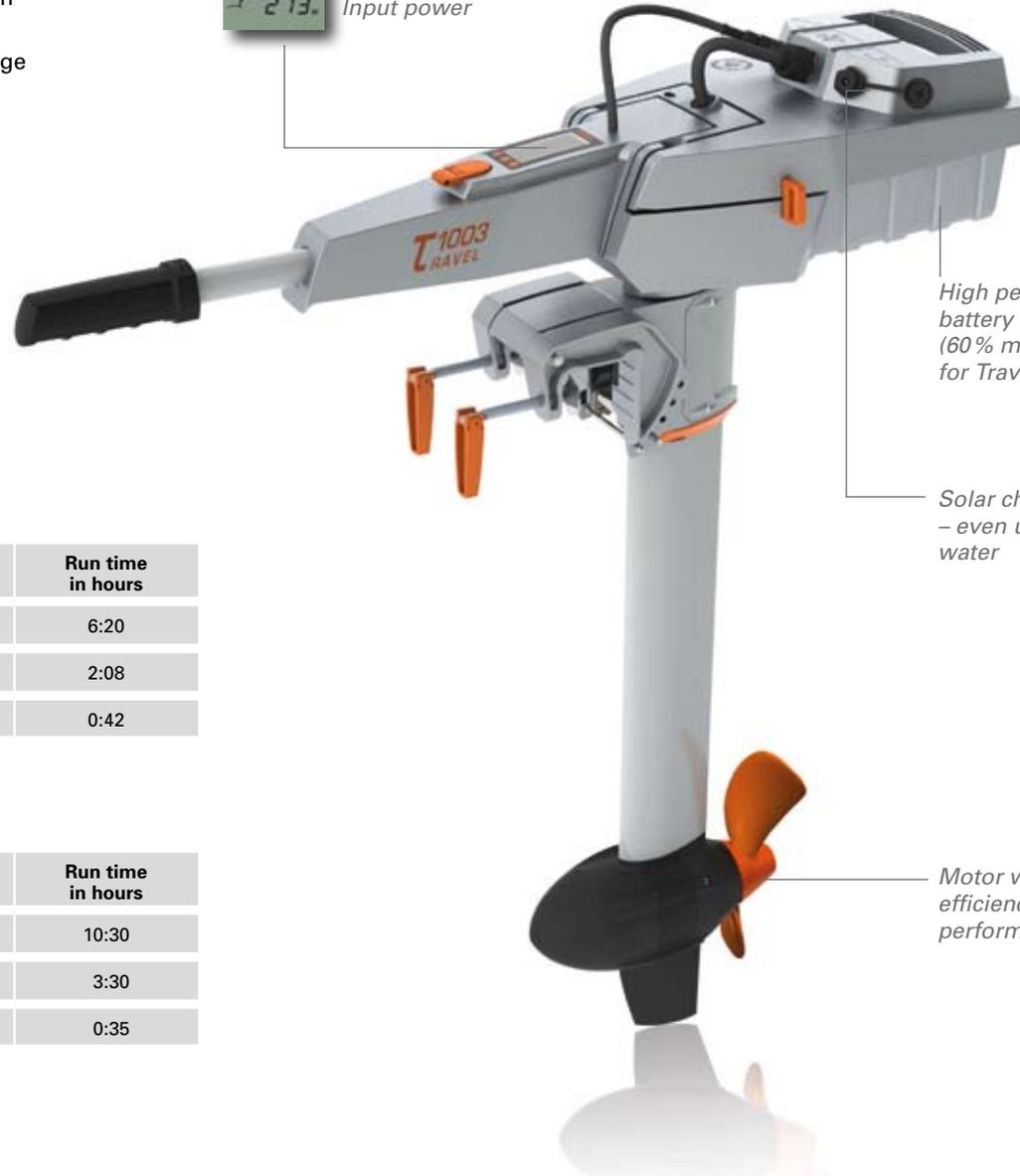
85	Battery charge status
113	Remaining range
45	Speed over the ground
273	Input power

Audible alarm countdown: as soon as the remaining battery charge reaches 30%, 20% and 10% a warning signal is given

High performance lithium battery with integrated GPS (60% more battery capacity for Travel 1003)

Solar charging possible – even underway on the water

Motor with highest efficiency for superior performance and range



TRAVEL 503 with integrated battery (29.6 V / 11 Ah)

Inflatables, dinghies, yachts up to 750 kg

	Speed in knots	Range in nm	Run time in hours
Slow speed	1.5 - 2.0	9.6 - 12.8	6:20
Half throttle	2.5 - 3.0	5.3 - 6.4	2:08
Full throttle	3.6 - 4.0	2.6 - 2.8	0:42

TRAVEL 1003 with integrated battery (29.6 V / 18 Ah)

Inflatables, dinghies, daysailers up to 1.5 tons

	Speed in knots	Range in nm	Run time in hours
Slow speed	1.5 - 2.0	15.0 - 20.0	10:30
Half throttle	2.5 - 3.0	8.5 - 10.5	3:30
Full throttle	4.5 - 5.0	2.5 - 2.8	0:35