



ELECTRIC PROPULSION

E-LINE & E-POD



**A LONG DAY ON THE WATER WITH PEACE OF MIND,
NOW AND IN THE FUTURE**



VETUS Electric propulsion

The pioneer of electric propulsion is back! VETUS introduces a completely new electric propulsion package twenty years after introducing the EP2200. With our improved all in one solution, VETUS honours the title "Creator of Boat Systems". The newly introduced system group "Electric Propulsion" creates a total package, consisting of different modules.

Control the boat like you're used to, with only the sound of the water

During the development of the systems, the sailing experience of the electric motor is designed in such a way that it is as close as possible to that of sailing with an internal combustion engine - but of course without the emissions and noise! On this page several of the unique benefits of the VETUS Electric Propulsion system are described.

Active Electric Braking

The E-LINE motor and E-POD system accelerate more powerful and faster than a diesel engine. In addition, gearbox and clutch are not required for the electric propulsion system. This means that when reversing the propeller, the complete high speed electric motor has to immediately come to a full stop and then rotate in the opposite direction. To enable a quick reverse power manoeuvre like with a clutch, VETUS has developed Active Electric Braking for the E-LINE and E-POD e-drive systems. The high torque of the electric motor is used to change the direction of rotation quickly and actively. With Active Electric Braking, it is possible to stop the boat within one boat length if necessary. Full control, a familiar way of sailing, with the advantages of the electric motor with high starting torque.

Battery Protection function

The Battery Protection function of the VETUS electric propulsion motor also ensures that the battery pack is not unnecessarily damaged, and the service life cycle of the batteries is guarded for the present and future boating seasons. Draining a battery pack below the specified minimal voltage will damage the batteries and reduce the life span. To prevent this the Motor Controller of the VETUS e-drives actively monitors the battery pack state of charge by verifying voltage and current draw.

Boosted Battery Charge function

Another unique feature of the VETUS e-drive motors is the patented Boosted Battery Charge function. Using the Boosted Battery Charge function a 24 volt charger can be used to charge up the required 48 volt battery pack for propulsion. This is an economic advantage as the 24 volt battery charger is more common. Plus this allows the boat builder an easy way to provide a low voltage 24 V electric board network.

How long can you sail then? A full day with ease!



A long day on the water with peace of mind, now and in the future

Thanks to the cleverly applied liquid cooling, you get the maximum power from the motor and the maximum range from the batteries. A full day on the water without any limitations. With the monitoring panels, the energy levels are easy to gauge and with the right battery pack you can sail all day long.

VETUS' view of electric boating is compact, complete, very efficient, plug & play and suitable for both new and existing vessels. The VETUS electric propulsion system functions with our V-CAN bus system and meets emission requirements. Noiseless, infinitely adjustable and equipped with comprehensive protection against overload: the ideal companion for a comfortable trip!

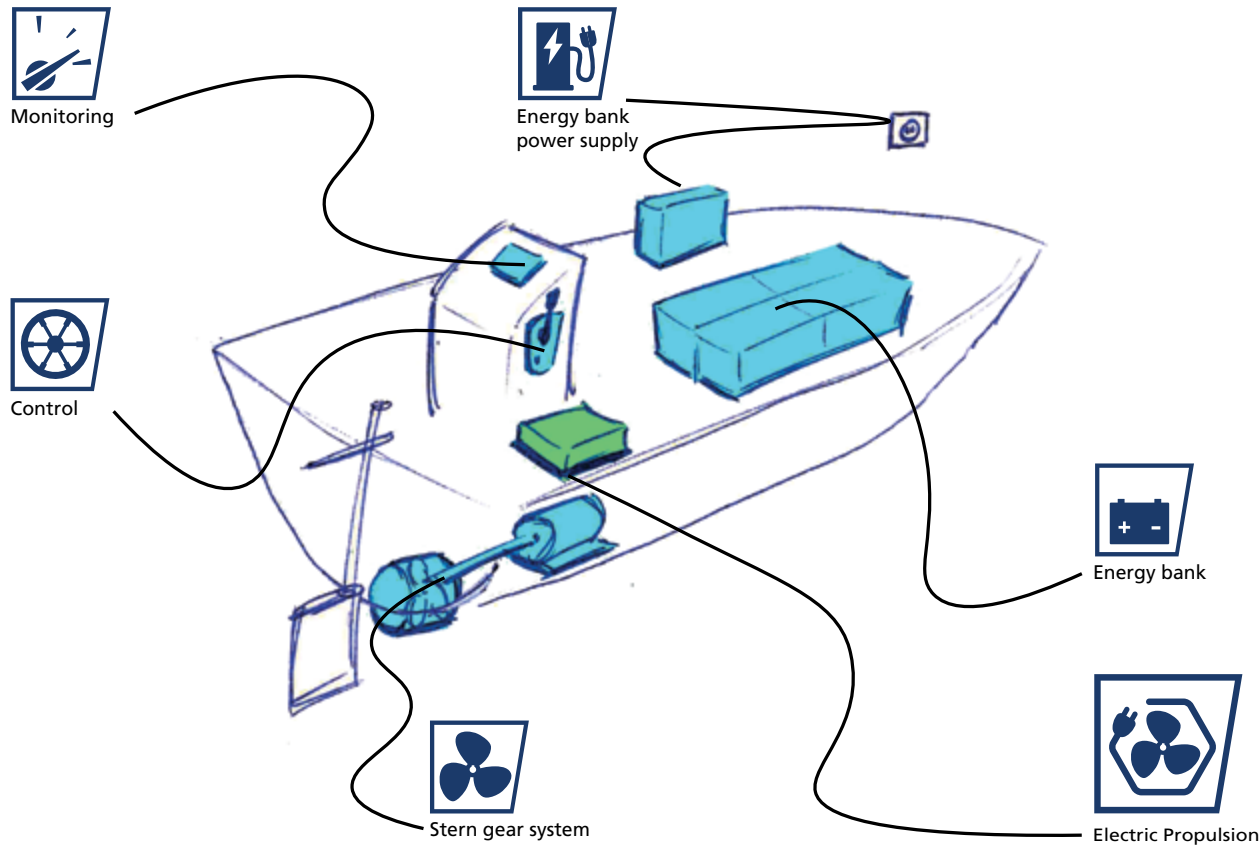
Creators of Electric Propulsion Systems

The Electric Boating system consists of five modules. Within each of the five modules, multiple choices and combinations are possible. This makes it possible to select the best total package for each type of boat.

- The system blocks are:
- 1. Propulsion
 - 2. Control
 - 3. Monitoring
 - 4. Energy storage
 - 5. Energy supply

For the E-LINE inboard motor VETUS offers the complete stern gear system. Selecting the right propeller to match the boat and desired speed is essential.

Contact your local VETUS dealer for propeller calculations.





Module: Propulsion

The heart of the system is the motor. Connected via the modular digital CAN-bus communication system V-CAN. Quiet, reliable and low-maintenance sailing.

VETUS offers the E-LINE in-line propeller shaft solutions and the innovative compact E-POD solution. Below an indication which type of electric VETUS motor system suits which size boat. Please note that this is a rough guideline. The motor selection depends on multiple parameters such as hull shape, please feel free to contact your dealer for detailed advice.

Model	Indicative comparable combustion engine	Indication for suitable boat length
E-LINE rental *	3.6 - 8.8 kW (5-12 hp)	4-7 metre
E-LINE 050	8 kW (11 hp)	up to 7 metre or 3 ton
E-LINE 075	11.7 (16 hp)	up to 9 metre or 5 ton
E-LINE 100	16 kW (22 hp)	up to 11 metre or 7 ton
E-POD	14.7 kW (20 hp)	up to 11 metre or 7 ton

*For more information, please contact your local dealer.

E-LINE motor range is designed to be compact and fit the existing propulsion foundation and propeller shaft installation. The supplied Swap & Go mounting brackets with motor mounts can easily be adjusted in height and set to angle the shaft to 0° or 8°. This makes the re-powering and connecting to an existing propeller shaft easy. The included motor mounts are specially developed for electric propulsion motors.

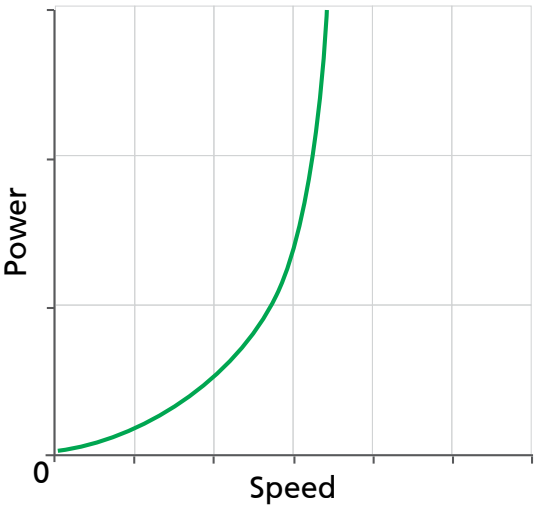
The E-POD combines the motor, suspension, cooling, gearbox, clutch, propeller shaft, propeller, all into one complete system. This space saving solution makes the engine box and propeller shaft through the boat redundant. Opening up the floor space. This makes a completely new boat design possible.

Both the E-LINE and the E-POD motors have been developed for an optimal boating experience with the control as a combustion engine - but without the emission and noise. The E-LINE and E-POD let you enjoy nature at its best.

The hull speed, also known as limit speed, is the maximum speed at which a boat can sail. When a displacement boat reaches the hull speed, the speed no longer increases, regardless of the increase in propulsion power. This can be explained by the bow wave. A boat cannot overtake its own bow wave. By adding more power at maximum hull speed, the bow wave becomes larger, more energy is used, more water is displaced, but no increase in speed is gained.

Below is a table with the different speeds per boat length and corresponding consumption power as reference only. Knowing that every boat is different, this calculation is based on a theoretical standard displacement vessel and propeller. The battery pack used for the calculation is an 440 Ah, 48V VETUS AGM deep cycle pack. This 440 Ah pack has about 14,8 kWh nett. usable energy and can be charged overnight with a light 6A shore connection. In many countries, the shore connections go up to 16A, in which case charging can take place 2.5 times faster.

Note that the available boating time exponentially increases when the speed is reduced below hull speed or limit speed. A full day continuously on the move is possible. How long can you sail? A full day with ease!



Hull speed or limit speed of a typical water displacement vessel. By adding more power at maximum hull speed, the bow wave becomes larger, more energy is used, more water is displaced, but no increase in speed is gained.

Boat length (waterline)	4 metre (13 feet)	6 metre (19 feet)	8 metre (26 feet)	10 metre (33 feet)	12 metre (39 feet)
Calm paced in km/h (knots)	6 (3,3)	6 (3,3)	6 (3,3)	6 (3,3)	6 (3,3)
Consumed input power in kW	1	0,7	0,8	1	1,1
Boating time calm paced with 440 Ah @ 48 V battery pack	15 h 30 m	20 h 45 m	17 h 30 m	14 h 15 m	13 h
Cruising speed in km/u (knots)	7,2 (3,8)	8,8 (4,7)	10,2 (5,5)	11,4 (6,1)	12,5 (6,7)
Consumed input power in kW	1,5	2,1	3,9	6,7	9,6
Boating time cruising speed with 440 Ah @ 48 V battery pack	10 h 15 m	7 h 15 m	3 h 45 m	2 h 15 m	1 h 30 m
Hull speed / Limit speed in km/u (knots)	9 (4,9)	11 (5,9)	12,8 (6,9)	14,3 (7,7)	15,7 (8,4)
Consumed input power in kW	3,1	4,1	7,7	13,4	18,9
Boating time limit speed with 440 Ah @ 48 V battery pack	4 h 45 m	3 h 30 m	1 h 45 m	1 h 15 m	45 m

Indication only. Values strongly depended on hull shape, boat length, weight, propeller pitch/diameter and other parameters.





E-Line

050

5,6 kW input power
1200 RPM - 36 Nm output

7,3 kW input peak power
1350 RPM - 43 Nm output



ELINE050



MPE1KB



MPE1MB

TECHNICAL SPECIFICATIONS

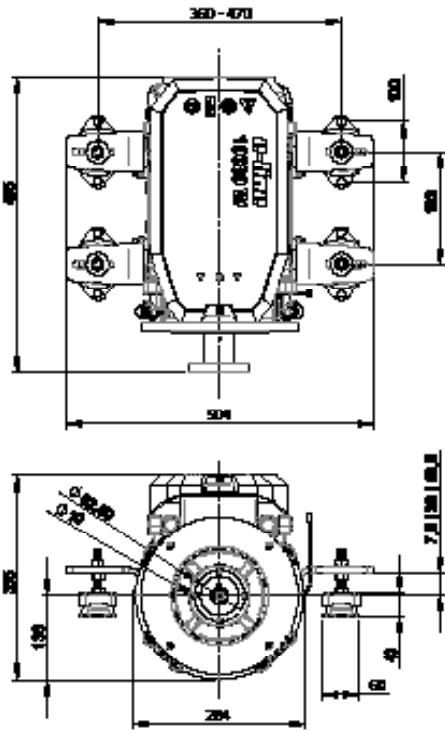
Motor controller and motor in one. Compact design, very efficient, plug & play and including Swap & Go engine brackets and mounts specially developed for electric inboard motors.

Maximum motor power and long distances on one battery charge due to efficient motor management and liquid cooling. A full day on the water without any limitations. The supplied Swap & Go mounting brackets with motor mounts can easily be adjusted during the installation in height and set to angle the shaft to 0° or 8°. This makes the re-powering and connecting to an existing propeller shaft easy. The included motor mounts are specially developed for electric propulsion motors.

Supplied as standard with

- MPE1KB key switch - all-in-one solution; V-CAN power supply, external 12V power supply and anti-theft
- MPE1MB monitoring panel - V-CAN monitoring, battery indication, motor alarms and motor status
- Fresh surface water cooling package
Also available with closed circulation keel cooling system
- Swap & Go motor brackets and motor mounts type EMX65
- Integrated thrust bearing
- Mounting flange 4" suitable for COMFL, BULFL01

E-LINE model	050
Motortype	Brushless induction motor
CAN bus	V-CAN
Nominal input voltage	48 V
Maximum input current draw	155 A
Maximum output power	6,0 kW (cf. 11 pk)
Indicative energy consumption*	1 kWh @ 6 km/u (3,5 knt)*
Suitable for indicative boat length	up to 7 metre or 3 ton*
Maximum shaft rpm in NORMAL mode	1200 rpm
Maximum shaft rpm in ECO mode	1000 rpm
Maximum shaft rpm in POWER mode	1350 rpm
Maximum torque	45 Nm
Transmission ratio	1:1 direct electric drive
Coupling (optional)	Combiflex 1225 / 1230 Bullflex 0120 / 0125
IP-rating motor	IP65 with gore-tex membrane and IP43 cover
Cooling system	Air and liquid cooled +
Liquid cooling system connections	12,7 mm (1/2") (intake and outlet)
Control and warning lights and audible indication on MPE1MB panel (standard)	Propulsion active, POWER mode, temperature, battery level indication, high current draw, low voltage, limiting alarm
Electric circuit protection	Fuse 200 Amps
Dry weight	68 kg
Equipped with	Active Electronic Braking (2500 rpm brake) Battery Protection function Boosted Battery Charge function



*Indication only. Values strongly depended on hull shape, boat length, weight, propeller pitch/diameter and other parameters.

E-Line

075

8,4 kW input power
1400 RPM - 48 Nm output

10,2 kW input peak power
1500 RPM - 55 Nm output



ELINE075



MPE1KB



MPE1MB

TECHNICAL SPECIFICATIONS

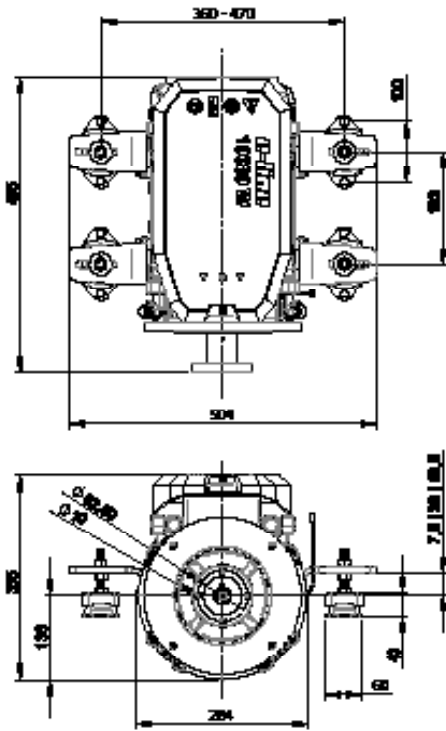
Motor controller and motor in one. Compact design, very efficient, plug & play and including Swap & Go engine brackets and mounts specially developed for electric inboard motors.

Maximum motor power and long distances on one battery charge due to efficient motor management and liquid cooling. A full day on the water without any limitations. The supplied Swap & Go mounting brackets with motor mounts can easily be adjusted during the installation in height and set to angle the shaft to 0° or 8°. This makes the re-powering and connecting to an existing propeller shaft easy. The included motor mounts are specially developed for electric propulsion motors.

Supplied as standard with

- MPE1KB key switch - all-in-one solution; V-CAN power supply, external 12V power supply and anti-theft
- MPE1MB monitoring panel - V-CAN monitoring, battery indication, motor alarms and motor status
- Fresh surface water cooling package
Also available with closed circulation keel cooling system
- Swap & Go motor brackets and motor mounts type EMX65
- Integrated thrust bearing
- Mounting flange 4" suitable for COMFL, BULFL model 1, 2 and 4

E-LINE model	075
Motortype	Brushless induction motor
CAN bus	V-CAN
Nominal input voltage	48 V
Maximum input current draw	220 A
Maximum output power	8,5 kW (cf. 16 pk)
Indicative energy consumption*	1 kWh @ 6 km/u (3,5 knt)*
Suitable for indicative boat length	up to 9 metre or 5 ton*
Maximum shaft rpm in NORMAL mode	1400 rpm
Maximum shaft rpm in ECO mode	1100 rpm
Maximum shaft rpm in POWER mode	1500 rpm
Maximum torque	60 Nm
Transmission ratio	1:1 direct electric drive
Coupling (optional)	Combiflex 1225 / 1230 Bullflex 0120 / 0125
IP-rating motor	IP65 with gore-tex membrane and IP43 cover
Cooling system	Air and liquid cooled ++
Liquid cooling system connections	12,7 mm (1/2") (intake and outlet)
Control and warning lights and audible indication on MPE1MB panel (standard)	Propulsion active, POWER mode, temperature, battery level indication, high current draw, low voltage, limiting alarm
Electric circuit protection	Fuse 250 Amps
Dry weight	69 kg
Equipped with	Active Electronic Braking (2500 rpm brake) Battery Protection function Boosted Battery Charge function



*Indication only. Values strongly depended on hull shape, boat length, weight, propeller pitch/diameter and other parameters.



E-Line

100

11,3 kW input power
1500 RPM - 61 Nm output

13,3 kW input peak power
1600 RPM - 67 Nm output



ELINE100



MPE1KB



MPE1MB

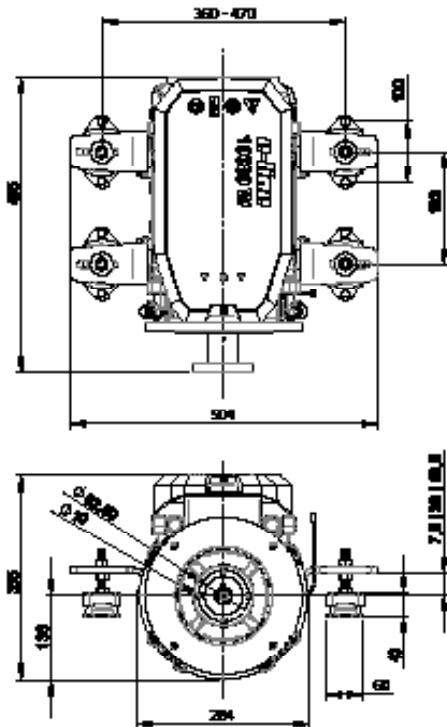
TECHNICAL SPECIFICATIONS

Motor controller and motor in one. Compact design, very efficient, plug & play and including Swap & Go engine brackets and mounts specially developed for electric inboard motors.

Maximum motor power and long distances on one battery charge due to efficient motor management and liquid cooling. A full day on the water without any limitations. The supplied Swap & Go mounting brackets with motor mounts can easily be adjusted during the installation in height and set to angle the shaft to 0° or 8°. This makes the re-powering and connecting to an existing propeller shaft easy. The included motor mounts are specially developed for electric propulsion motors.

- Supplied as standard with
- MPE1KB key switch - all-in-one solution; V-CAN power supply, external 12V power supply and anti-theft
 - MPE1MB monitoring panel - V-CAN monitoring, battery indication, motor alarms and motor status
 - Fresh surface water cooling package
Also available with closed circulation keel cooling system
 - Swap & Go motor brackets and motor mounts type EMX65
 - Integrated thrust bearing
 - Mounting flange 4" suitable for COMFL, BULFL model 1, 2 and 4

E-LINE model	100
Motortype	Brushless induction motor
CAN bus	V-CAN
Nominal input voltage	48 V
Maximum input current draw	295 A
Maximum output power	11,2 kW (cf. 22 pk)
Indicative energy consumption*	1 kWh @ 6 km/u (3,5 knt)*
Suitable for indicative boat length	up to 12 metre or 8 ton*
Maximum shaft rpm in NORMAL mode	1500 rpm
Maximum shaft rpm in ECO mode	1200 rpm
Maximum shaft rpm in POWER mode	1600 rpm
Maximum torque	70 Nm
Transmission ratio	1:1 direct electric drive
Coupling (optional)	Combiflex 1225 / 1230 Bullflex 0120 / 0125
IP-rating motor	IP65 with gore-tex membrane and IP43 cover
Cooling system	Air and liquid cooled +++
Liquid cooling system connections	12,7 mm (1/2") (intake and outlet)
Control and warning lights and audible indication on MPE1MB panel (standard)	Propulsion active, POWER mode, temperature, battery level indication, high current draw, low voltage, limiting alarm
Electric circuit protection	Fuse 300 Amps
Dry weight	71 kg
Equipped with	Active Electronic Braking (2500 rpm brake)Battery Protection function Boosted Battery Charge function



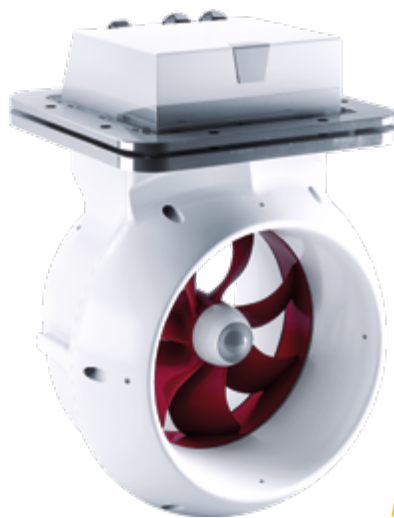
*Indication only. Values strongly depended on hull shape, boat length, weight, propeller pitch/diameter and other parameters.

E-POD

100

9,1 kW input power
1100 RPM - 79 Nm output

11,3 kW input peak power
1280 RPM - 84 Nm output



EPOD100



MPE1KB



MPE1MB

TECHNICAL SPECIFICATIONS

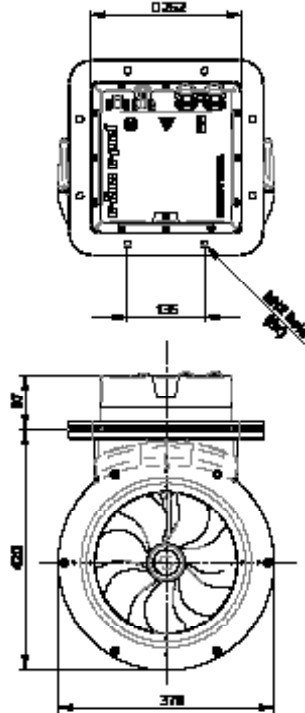
The E-POD combines the motor, suspension, cooling, gearbox, clutch, propeller shaft, propeller, all into one complete system. This space saving solution makes the engine box and propeller shaft through the boat redundant. Opening up the floor space. This makes a completely new boat design possibly.

Another unique feature is that with the E-POD, there are no rotating or vibrating parts inside the boat. Even better, there is no shaft or shaft bearings. The propeller submerged in the water outside the boat is powered directly. This propeller is the rotor of the energy efficient permanent magnet brushless induction motor drive. To reduce propulsion sounds even more, the propeller is designed to minimize cavitation however keep maximum propulsion power.

Maximum motor power and long distances on one battery charge due to efficient motor management and direct 360° liquid cooling. A full day on the water without any limitations.

- Supplied as standard with
- MPE1KB key switch - all-in-one solution; V-CAN power supply, external 12V power supply and anti-theft
 - MPE1MB monitoring panel - V-CAN monitoring, battery indication, motor alarms and motor status
 - All-in-one system solution. Integrated cooling system, thrust bearing, shaft system and propeller

E-POD model	100
Motortype	PMAC Permanent Magnet brushless induction motor
CAN bus	V-CAN
Nominal input voltage	48 V
Maximum input current draw	255 A
Maximum output power	10,2 kW (cf. 20 pk)
Indicative energy consumption*	0,9 kWh @ 6 km/u (3,5 knt)*
Suitable for indicative boat length	up to 12 metre or 8 ton*
Maximum shaft rpm in NORMAL mode	1100 rpm with ø 250 mm (9,84") propeller
Maximum shaft rpm in ECO mode	750 rpm with ø 250 mm (9,84") propeller
Maximum shaft rpm in POWER mode	1280 rpm with ø 250 mm (9,84") propeller
Maximum torque	84 Nm
Transmission ratio	1:1 direct electric drive
Coupling and shaft system	All-in-one system including propeller
IP-rating motor	IP69 sealed motor and IP67 top cover
Cooling system	Direct 360° cooling; submerged in water
Control and warning lights and audible indication on MPE1MB panel (standard)	Propulsion active, POWER mode, temperature, battery level indication, high current draw, low voltage, limiting alarm
Electric circuit protection	Fuse 300 Amps
Dry weight	61 kg
Equipped with	Active Electronic Braking (2500 rpm brake)Battery Protection function Boosted Battery Charge function



*Indication only. Values strongly depended on hull shape, boat length, weight, propeller pitch/diameter and other parameters.



Cooling system for E-Line inline motor

Fresh surface water cooling package with EIP12 pump.

Also available with closed circulation keel cooling system. Using the ELINEKC keel cooler the coolant VOC (VETUS Organic Coolant) medium transports heat away from the motor and controller.



EIP12

Module: Control

The VETUS e-drives (E-LINE and E-POD) work with V-CAN as do the VETUS proportional thrusters (BOW PRO). This in-house designed data traffic solution ensures less cables through your boat, robust reliable control and simple expandability.

Key switch for e-drives

MPE1KB key switch - all-in-one solution; V-CAN power supply, 12V cooling pump power supply and anti-theft. Engaging the V-CAN line and 12V cooling pump by the turn of the key.

Specifications

- Compact design and high quality materials
- Stylish designed aluminium bezel (85 x 85 mm)
- Quick installation in Ø 75 mm cut-out hole
- Can be installed in double frame (XTASF2P 167,5 x 85 mm)
- Waterproof IP65 when mounted
- V-CAN CANBUS protocol certified
- Input wires 12V
- Reverse polarity protection for V-CAN output
- Switched output V-CAN connector 12 V, fuse protected 5 A max.
- Switched output 12 V, fuse protected 30 A max.
- LED indication when engaged

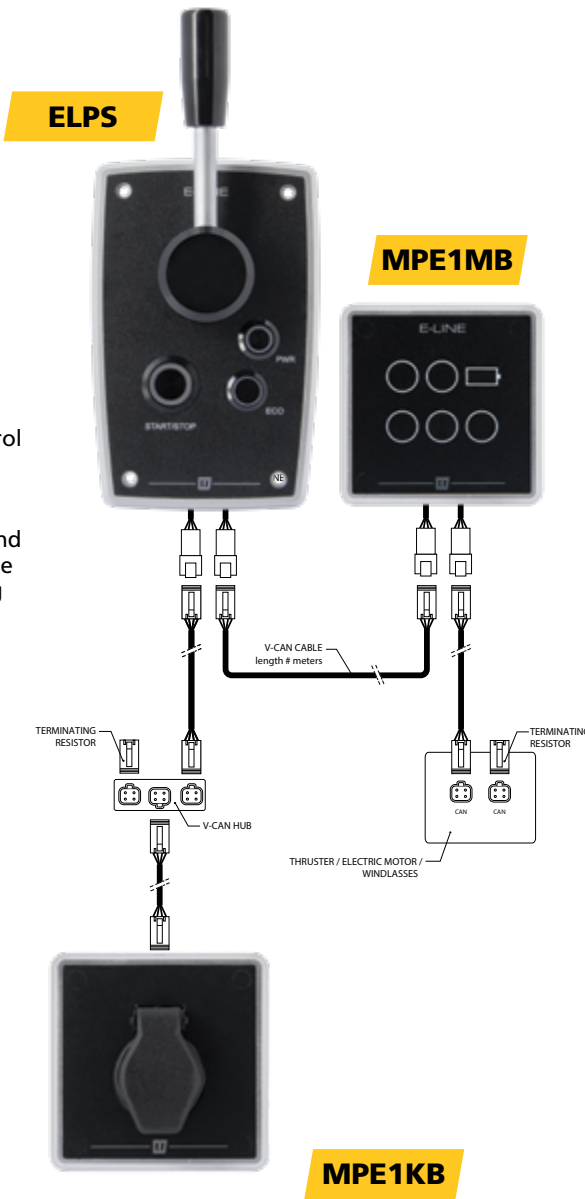
Control lever for e-drives

The E-LINE and E-POD are controlled by the ELPS side mounted V-CAN control lever. The panel has a neutral safety switch as standard, which prevents the motor from being started when the propulsion thrust is engaged.

This control lever enables three propulsion control modes; NORMAL, ECO and POWER mode. By pressing the ECO mode the maximum output power of the e-drive is limited. When in ECO the POWER mode is not available. Switching off the ECO mode, the e-drive is in NORMAL mode. Pressing the POWER button unleashes the electric peak power kick for those fast manoeuvres.

Specifications

- Start/Stop Command button with LED status indication
- ECO mode latching button for increased range
- POWER (PWR) mode button to unleash full electric power
- LED and audible indication on e-drive status
- Safe and easy proportional control of your vessel
- High quality materials
- Stylish designed aluminium bezel (154 x 100 mm)
- Waterproof IP65 when mounted
- V-CAN CANBUS protocol certified
- Twin connector for multiple stations



Module: Monitoring

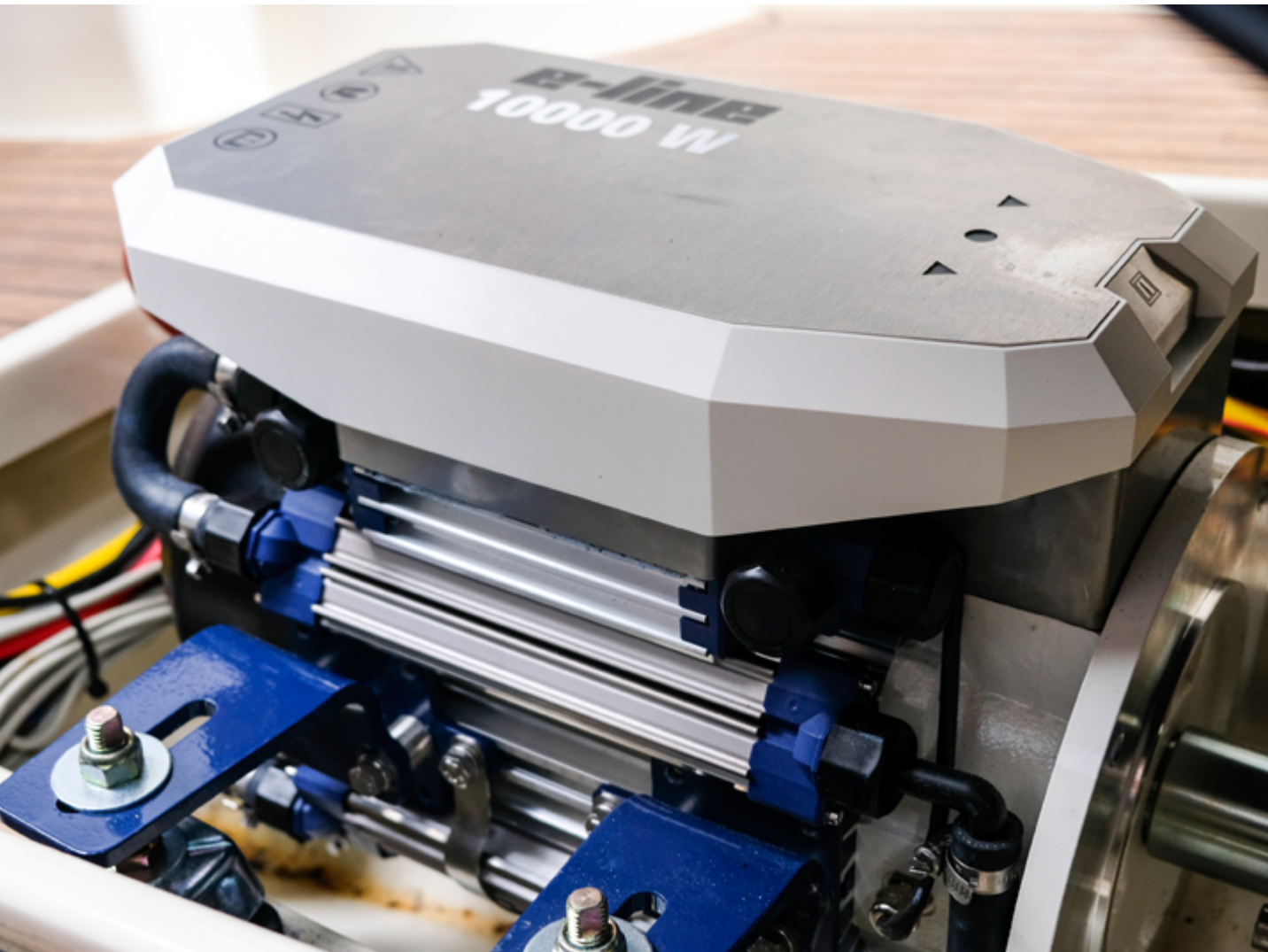
To monitor the e-drive status, warning and alarms there are multiple options. To see the most important instances at a glance the MPE1MB V-CAN monitoring panel can be used. To see the rich digital information available on the digital CANbus line, the NMEA2000 connected solution can be selected. By using the CANV2N CANverter messages on the V-CAN line are translated towards NMEA2000 and can be displayed on NMEA2000 devices.

Monitoring panel for e-drives

MPE1MB monitoring panel - important instances insight; the electric monitoring dashboard instrument. Clear LED light indication of V-CAN electric propulsion activities.

Specifications

- Compact design and high quality materials
- Stylish designed aluminium bezel (85 x 85 mm)
- Quick installation in Ø 75 mm cut-out hole
- Can be installed in double frame (XTASF2P 167,5 x 85 mm)
- Waterproof IP65 when mounted
- Control and warning lights; Propulsion active, POWER mode, temperature, limiting power alarm, battery level indication (4 levels), high current draw, low voltage, charging active indication
- V-CAN CANBUS protocol certified
- Twin connectors for multiple stations



Electric propulsion

Module: Energy storage

To get the boat moving energy is needed. For Electric Propulsion instead of a tank, filters, hoses, etc a battery bank with nominal voltage 48 volts is required. For electric propulsion VETUS offers AGM deep cycle and lithium batteries (on request only).

- To calculate the required battery pack for your boat the following data is important:
- Desired usage and vessel specifications, such as boat length and average boating speed
This data is to be used to calculate the average required consumption input power in kW per hour. For a combustion engine this would be the fuel consumption ratio of the boat.
Note that the designed hull speed, design cruising speed of the boat and actual usage are important values here.
A calculation of a standard water displacement boat of 6 metre (1,1 ton) shows the following indicative data:
 - Energy consumption 0,7 kW @ paced of 6 km/h (3,3 knts)
 - Energy consumption 2,1 kW @ paced of 8,8 km/h (4,7 knts)
 - Energy consumption 4,1 kW @ paced of 11 km/h (5,9 knts)Slightly reducing average speeds exponentially increases available boating range due to water displacement hull design.
 - Type of battery. For example AGM deep cycle, lithium
An VETUS AGM deep cycle can be discharged up to 70%.

Example
440 Ah @ 48 V is a battery pack of 8x AGM 220Ah 12V and gives a total battery pack of (440 Ah x 48 V x 70%) 14,8 kWh nett. usable energy capacity. With an energy consumption of 2,1 kW, this would give a total continuous sailing time of (14,8 / 2,1 =) over 7 hours.

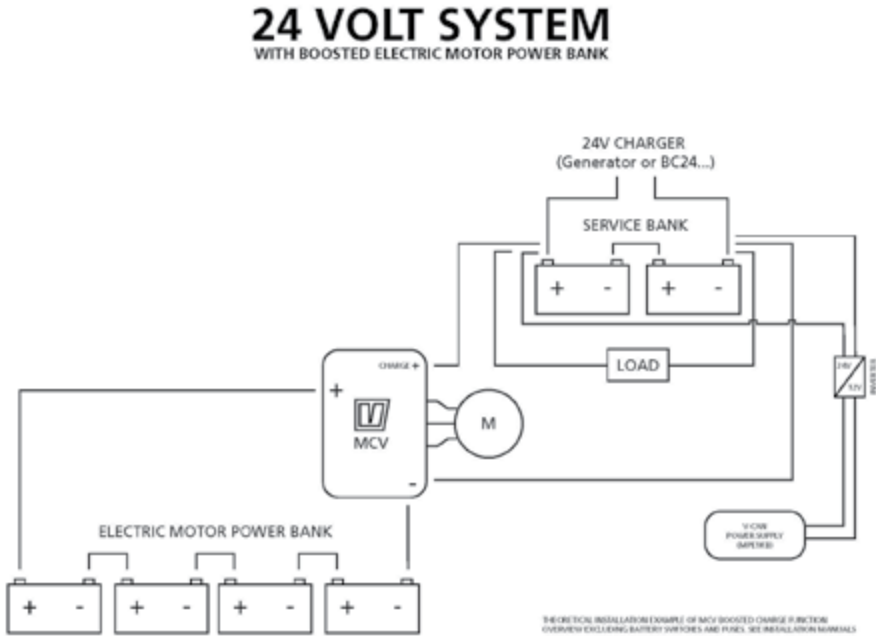
Battery pack	Motor type	Calm paced	Average paced	Fast paced	Intense paced
220 Ah @ 48 V (AGM battery pack)	E-LINE 050	14 h 45 m	7 h 15 m	3 h	1 h 30 m
	E-LINE 075	10 h	5 h	2 h	1 h 15 m
	E-LINE 100	7 h 15 m	3 h 30 m	1 h 30 m	45 m
	E-POD	9 h 15 m	4 h 30 m	1 h 45 m	1 h
440 Ah @ 48 V (AGM battery pack)	E-LINE 050	29 h 30 m	14 h 45 m	6 h	3 h 15 m
	E-LINE 075	19 h 45 m	10 h	4 h	2 h 15 m
	E-LINE 100	14 h 45 m	7 h 15 m	3 h	1 h 30 m
	E-POD	18 h 30 m	9 h 15 m	3 h 30 m	2 h 15 m

Module: Energy supply

What filling up the tank is for combustion engine systems, charging the batteries is for an electric propulsion system. Difference is there is no jerrycan or petrol filler nozzle. There are in fact multiple ways to charge a battery pack. Think about shore power, generator set, solar panels, wind generator, etc.

All VETUS e-drive motors are equipped with the Motor Controller VETUS (MCV) with boosted charge function. Using the Boosted Battery Charge function a 24 volt charger can be used to charge up the required 48 volt battery pack for propulsion.

This is an economic advantage as the 24 volt battery charger is readily available. Plus this allows the boat builder an easy way to provide a 24 volt electric board network.





ELECTRIC PROPULSION