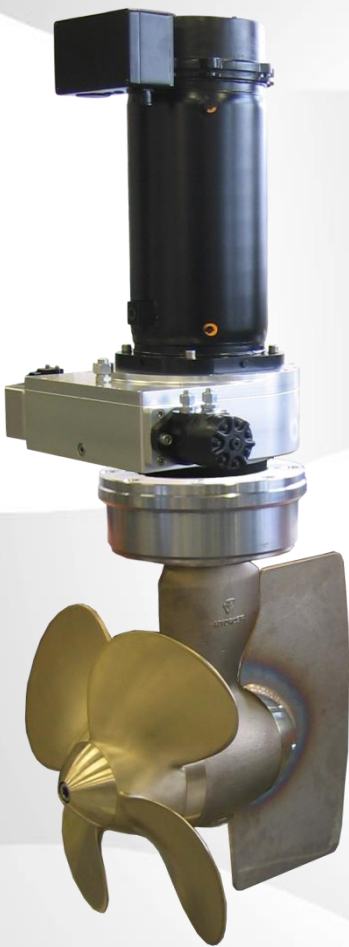


## Catalog Hybrid Marine



Hydrosta has been active on the hydraulics market for more than 25 years. In this time it has developed a complete line of products for nautical maritime applications.

The hydraulic thrusters and Hy-Props ask for a precise and metered control. In addition, Hydrosta has developed its own electronics from a Navio613 PWM module to complete navigation systems for Autopilot and Motor Control. With a combination of different Hydrosta systems, it is possible to give all control panels and screens a uniform look. From 2012 we are active with Hybrid systems based on PM electric motors from AMK.

## Steering installations

In addition to the standard range it is possible to build the steering systems to customers' specific requirements with CE certification or ILT classification. Possible options:

- Servo control (power-assisted steering)
- Joystick control
- Autopilot control
- Combined steering / electric steering
- Multiple steering positions

## Bow and stern thrusters

The counter-rotating Sider bow and stern thrusters are made of seawater-resistant material and have the following features:

- High thrust in two directions
- Thrusters are counter rotating
- Well-considered design with double water sealing and labyrinth to protect the seals against small fishing lines
- Maintenance free (lifetime grease lubrication)
- Especially compact design

Available both in fixed version and in Swing version. Available in hydraulic design, electrical performance (AC) or electrical output DC with permanent magnet liquid cooled motors.

## Propulsion installation

Navigating with a PM-Prop installation is a completely new sensation. Known from the low power segment and commercial, is now also available for medium capacity segment.

The PM-Prop is characterised by:

- Continuously adjustable and vibration-free drive
- Continuously variable optimal transmission
- Propeller speed adjustable from approx. 10 rpm to maximum trust.
- Steerable 2 x 90°
- Rotation direction of the propeller can be reversed immediately (emergency stop)
- Single-lever operation
- Turning circle is the length of the water line

This gives superior manoeuvrability and navigation properties. Available with permanent magnet electric motors, liquid-cooled, but also hydraulically available.

## Hydraulic system

All desired functions are processed into a compact, customized, hydraulic system. The system is largely composed of a tank, a pump and one or more valve blocks. The system can be assembled for various hydraulic functions such as:

- Hydraulic steering
- Mast lowering installation
- Spud leg
- Walkway
- Various sailing functions
- Capstan / anchor winches
- Cranes

## Electronic control

To have an excellent control of the vessel in combination with the available power of the engine and the hydraulic system, Hydrosta has developed various programmable control units. As central regulation units, this processor devices can coordinate many things, such as:

- Operation of main engine
- Operation of propulsion drive line
- Operation of steering installation
- Operation of bow/stern thrusters

Navigation devices and alarm functions can also be integrated in the system when combined with a Navio screen and particularly user friendly operation will be achieved.

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Version: 2014, print 31-10-2019



## General information

The PM-Prop is an electric steerable propulsion system.

### Technic

The unit is placed into a so called 'hat'. This hat must be welded into to hull. Due the use off unique rubber seals in the hat the mechanical rotating parts under water unit are completely isolated from the hull itself. This unique system avoids negative vibrations from (a) the propeller and (b) the noise from the gears, bearings and E-motor to be transported into the vessel as contact noises or vibration. During operation there are no moving parts inside the vessel and thus cannot harm people.

The propulsion motor is mounted with its shaft down straight on top of the propulsion set in the centre of the steering shaft.

The main propeller shaft is driven by the E-motor through a high efficient gear set in the tail of the gearbox unit.

The Electro (E)-motor is fixed on the housing and can not move during steering.

The steering gear is mounted underneath this E-motor, which can be driven by (a) a small hydraulic motor (as in the displayed model at the METS) or (b) by a conventional Electromotor. The shape from the casted tail drive is hydrodynamic for optimum efficiency. All materials in contact with the water are made from seawater resistible Aluminium-Bronze and Duplex Stainless Steel.

### E-motor

The employment of a standard industry norm, i.e. the Permanent Magnet (PM) motor, also ensures the chosen E-motor's reliability by virtue of its proven and accepted endurance tests. The great advantage of this type of motor is the light weight, compact design and the very fast response time in operation. This PM motor's basic power requirement is 750 Volt Direct current. Without loss of control, this power can be provided by a PM generator of the same kind.

### Maximized manoeuvrability

The "one in all" system (i.e. propeller and rudder is one unit) forces the propeller to be turned in the same direction as the rudder blade, 100% conversion of direction. Depending on the rotation direction of the propeller trust is available in the direction as requested.

For leisure crafts the steering angle is purposely limited to 2 x 90 degrees. For professional crafts Hydrosta offers endless 360 degree steering.



*PM-Prop, 75kW design*

This system results in a very precise drive-unit. Even with a single system the end user is in maximum control of his vessel.

The wheel effect of a reverse move is easily compensated by turning the rudder a few degrees to the opposite side.

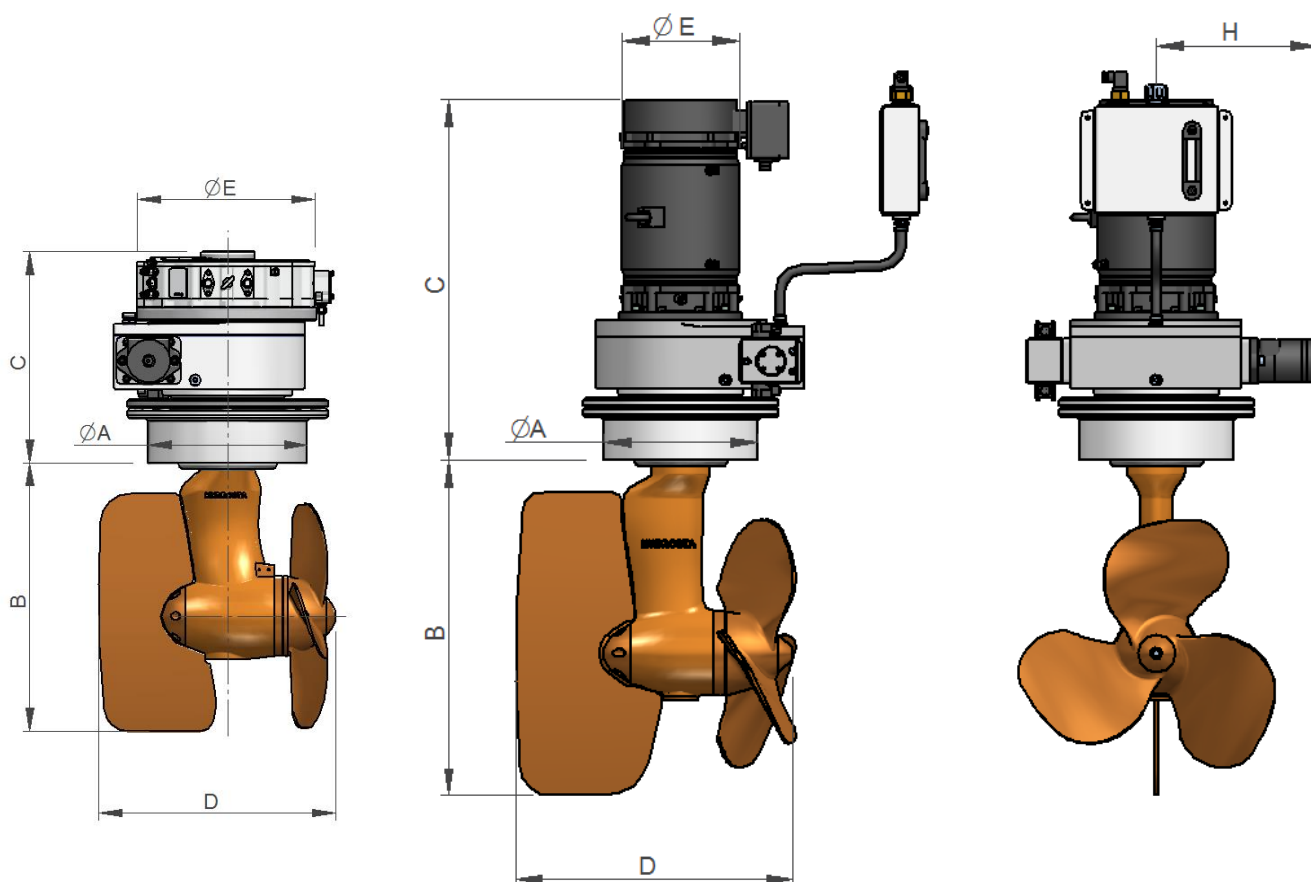
### Control

Hydrosta's exclusive Navio product line (e.g. follow-up steering and drive control) complements the units operation and control.



*PM-Prop, 130kW design*

## General dimensions:



Dimensions	Compact 26/35kW		26 / 35 kW		55 / 75 kW		130 / 150kW		200/250kW	
A mm	324		324		324		385		460	
B mm	547		547		707		751		996	
C mm	430		750		750		910		645	
D mm	480		480		585		726		927	
E mm	370		247		247		247		552	
F inch	18"		18"		23"		26" - 28"		32"	
G mm	275		275		275		272		272	
H mm	340		340		340		335		343	
Specifications	26kW	35kW	26kW	35kW	55kW	75 kW	130kW	150kW	200kW	250kW
Voltage E-motor	200 DC	400 DC	750 DC	750 DC	750 DC	750DC	750 DC	750 DC	750 DC	750 DC
Propeller output kW	20	35	26	35	55	75	130	150	175	225
Weight kg *	280	290	275	285	296	320	650	650	1100	1300

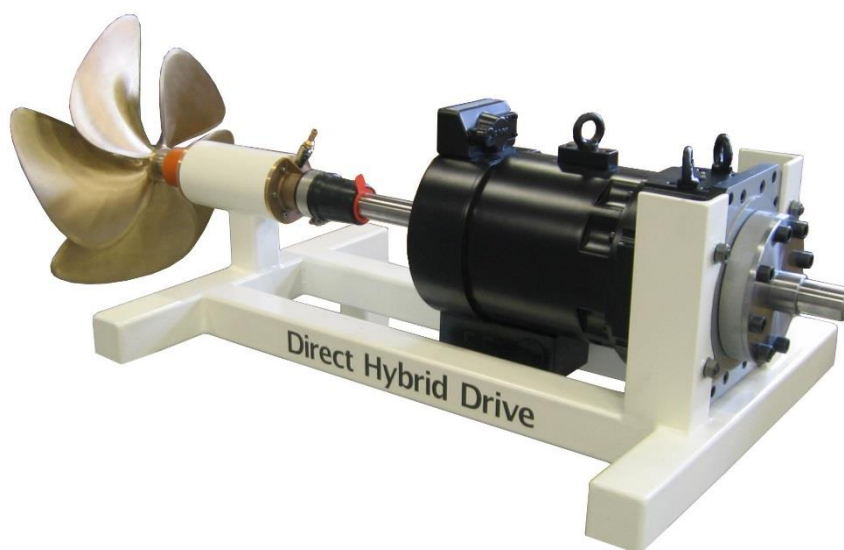
\* Weight depends on chosen motor (standard or compact).

## Hollow shaft motors for Direct Hybrid Drive:

Our PM drive motor set is a compact drive motor that can be mounted directly in line with the screw shaft (without reduction gear box). Screw shaft must be fitted with its own thrust bearing and a flexible coupling must be used for connection to the PM motor.

### Characteristics:

- motor is of the Permanent Magnet (PM) type
- maximum drive torque motor 600 Nm continuously
- choice of 6 models in the range 4.5 - 45 kW normal duty or 11 - 63 kW in heavy duty
- motors are performed in O - convection cooling or W - liquid cooling



### Power range:

SKT hollow shaft Motor		Cooling	Ø shaft	Rated data				Maximum data			Mechanical data		
			Ø [mm]	M <sub>n</sub> [Nm]	P <sub>n</sub> [kW]	I <sub>n</sub> [A]	N <sub>n</sub> [rpm]	M <sub>max</sub> [Nm]	I <sub>max</sub> [A]	N <sub>max</sub> [rpm]	J [Kgcm <sup>2</sup> ]	L [mm]	m [kg]
Normal duty	SKT10-54-20-xxO-1400	O	65	42	4.5	10,5	1000	194	67	2000	425	316	48
	SKT10-95-20-xxO-1400	O	65	73	6.1	19	800	360	105	3000	494	436	67
	SKT10-100-20-xxW-3000	W	65	66	11	38	1500	160	132	3000	425	316	48
	SKT10-145-20-xxW-2000	W	65	120	18	50	1500	310	200	2500	569	436	65
	SKT13-200-20-xxW-2600	W	105	240	45	103	1800	640	330	3300	1.822	520	160
Heavy duty	SKT10-100-20-xxW-3000	W	65	66	11	38	1500	160	132	3000	458	357	55
	SKT10-145-20-xxW-2000	W	65	120	18	50	1500	310	200	2500	610	477	71
	SKT13-200-20-xxW-2600	W	105	240	45	103	1800	640	330	3300	2.399	600	191
	SKT13-650-20-xxW-1200	W	105	600	63	130	1000	1.280	330	1500	3.366	780	240



## Motors for Parallel Hybrid Drive:

This unit consists of:

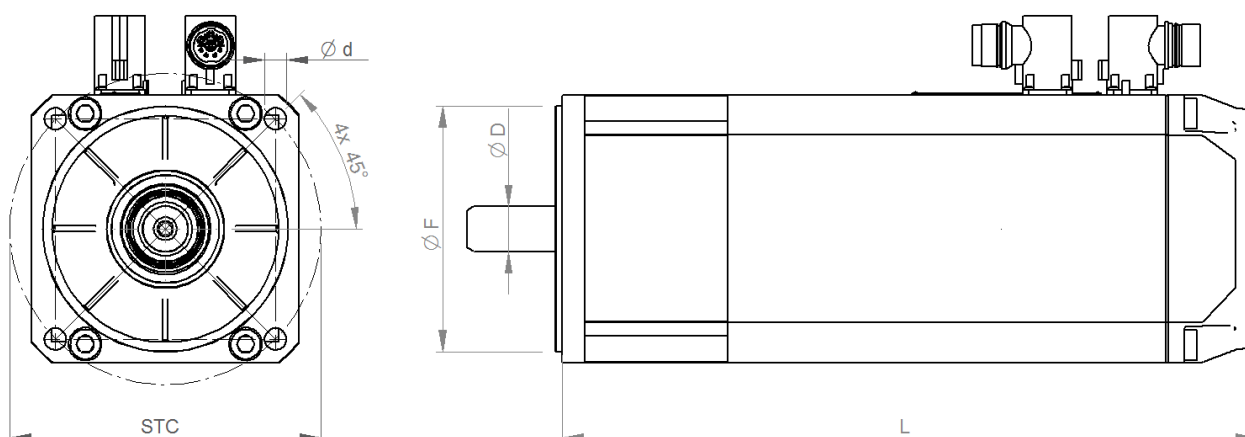
- an AMK electric motor
- reduction gear box on own mounting foot
- electric clutch
- freewheel toothed belt pulley with bearings



Power range:

DT/DT Liquid cooled electromotor	data				Maximum data			Mechanical data						
	Mn [Nm]	Pn [kW]	In [A]	Nn [rpm]	Mmax [Nm]	I <sub>max</sub> [A]	Nmax [rpm]	J [kg·m <sup>2</sup> ]	L [mm]	Ø D [mm]	Ø F [mm]	STC [mm]	4xØ d [mm]	m [kg]
DT7-55-20-xxW-5200	38	14.0	38	3500	110	132	5000	57	288	32k6	130j6	165	11.5	21
DT7-72-20-xxW-5000	52	18.0	43	3000	160	200	5000	85	348					25
DT10-100-20-xxW-3000	66	11.0	38	1500	160	132	3000	175	292	38k6	180j6	215	14	43
DT10-145-20-xxW-2000	120	18.0	50	1500	310	200	2500	330	412					64
DT10-200-20-xxW-2500	153	24.1	55	1500	430	200	3500	480	532					83
DP13-250-12-xxW-2000	310	52.5	100	1600	630	280	4500	810	414	48k6	230j6	265	14	88
DP13-300-12-xxW-2000	410	69.4	138	1600	780	330	4500	1224	474					112
DP13-600-12-xxW-2000	610	102.5	230	1600	1110	500	4500	1820	594					160

For dimensions: see table



## SIDER bow- and stern thrusters

The Hydrosta bow thruster range is made out of high-quality materials. The range includes hydraulically driven bow thrusters and bow thrusters equipped with an electric motor. You can choose between a PM motor or a standard 400VAC motor. The electrically driven Sider can be delivered in the following power ranges: 5, 11, 20, 35, 45, 60, 75, and 90 kW. The range of PM motors contains a 8, 11, 18, 26, 33, 45, 60, 75, 90 en 110kW motor.

### Design

The Sider is characterised by compactness and robustness, due to the hydrodynamic shape of the tailpiece and propellers the water resistance is minimised and increased the efficiency.

Because of the counter-rotating propeller concept the thrust is increased in relation to the specific diameter of the tunnel.

The hydraulic bow thrusters are suitable for continuous operation. The electric bow thrusters have a limited duty cycle which depends upon several factors. Normal duty cycle is about 10 min each hour. However, this depends on the variations of the thrusters. Ask for detailed information.



### Technical

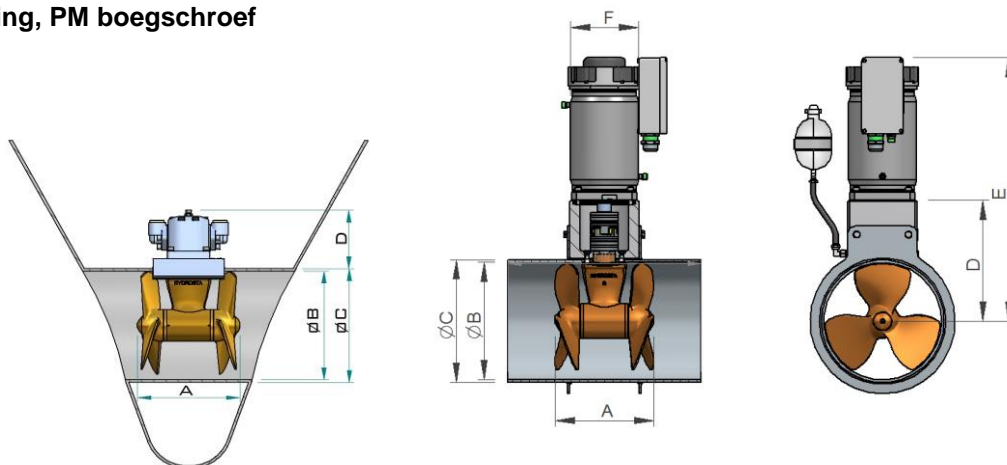
By using a special grease as lubrication for the bearings and drives the Sider thrusters are maintenance free. The bigger power thrusters are also available with oil bath lubrication on request. A labyrinth construction between the propeller and the housing is protecting the double sealing against small fishing lines, etc. The thruster installation is secured by two bolts. The tailpiece centres itself in the tunnel. All gearboxes from the 18kW up are fitted with a torque limiter, the tunnel is fitted with sketch plates for the weight of the electric motor

### Materials

The Siders are made out of excellent materials that is resistant to the harsh environment of seawater. The housing and the propellers are made of "zinc-free" aluminium bronze\*.

The Sider thrusters are also available in seawater-resistant aluminium. The aluminium versions must be coated before to use under water. In this variant the propellers are made of stainless steel or aluminium bronze.

### Maatvoering, PM boegschroef



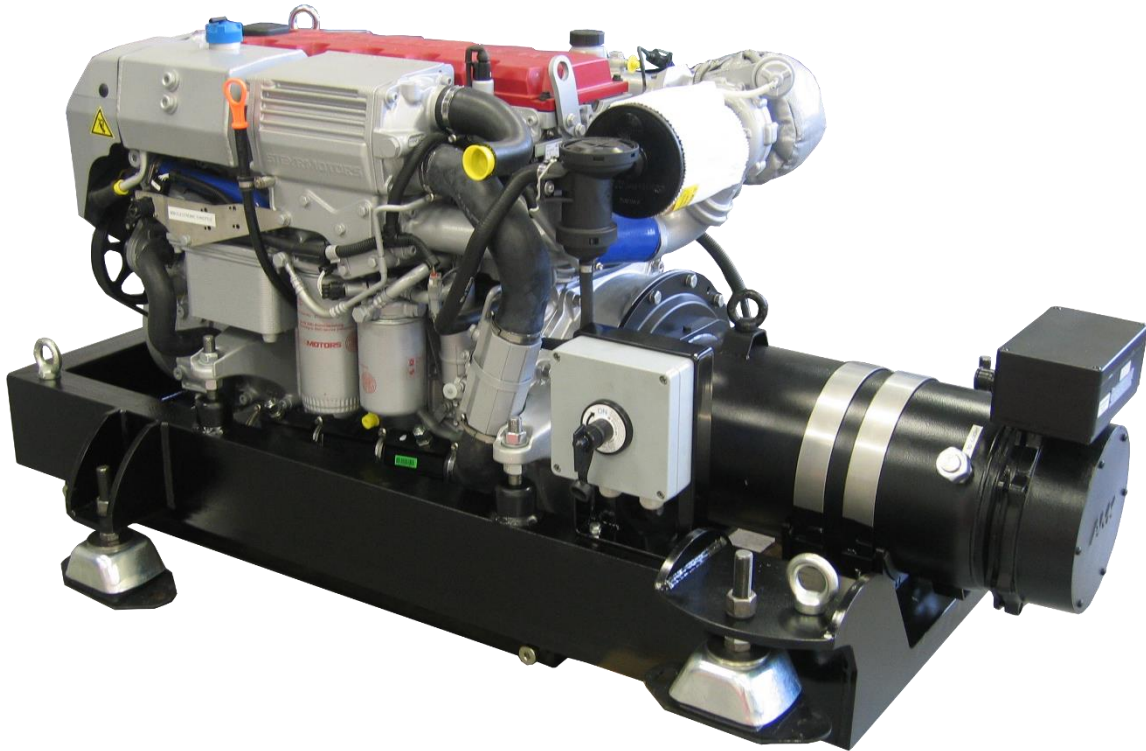
For the electric Siders reserve free space for mounting the drive motor for assembling. For the bigger Siders the bell housing piece must be supported to the hull.

Dimensions	8 kW	11 kW	18 kW	26 kW	33kW	45 kW	60 kW	75 kW	90 kW	110 kW
A mm	262		285		360		465		530	
B mm	257		342		439		540		636	
C mm	273		358		457		559		660	
D mm	173		350							
E mm	535		765							
F mm	Ø 142		Ø200							
Weight kg	40		145		209					



## PM-motor as generator

All available PM motors can also be used as generator. A diesel generator engine or a propulsion engine can drive the generator motor and the generator can supply energy for either the drive or the batteries by an inverter.



Steyr SE196E35 engine –  
DP1360012EOW15 AMK generator

Hydrosta takes care of the construction of the generator motor and the diesel engine of your choice.

## PM-steering: the most efficient hybrid steering system

Following the success of the PM Prop, Hydrosta developed PM Steering, the ultimate solution for optimally manoeuvring electric or hybrid ships. PM Steering was built and developed entirely in-house. No variable, axial plunger pump is available on the market, so Hydrosta developed it itself, which is how the unique character of the system was created.

The heart of the system is the PM (Permanent Magnet) motor, which powers the main engine in combination with the mechanically variable plunger pump and has piston rings to obtain the best results, particularly when moving slowly and for minimum energy consumption. The PM motor and the regulator together, ensure proportional control of the steering system. The steering direction is determined by the turning direction of the electric engine and the steering speed by the engine speed (rotations a minute). With a double set-up, the whole satisfies the applicable regulations for certification as, e.g. ILT.

### Advantages

- compact dimensions
- suitable for various power supplies
- in combination with the PM-Prop feed from the same bus voltage
- extra quiet, due to application of the variable multi-plunger pump
- electricity consumption without steering is zero
- very sustainable

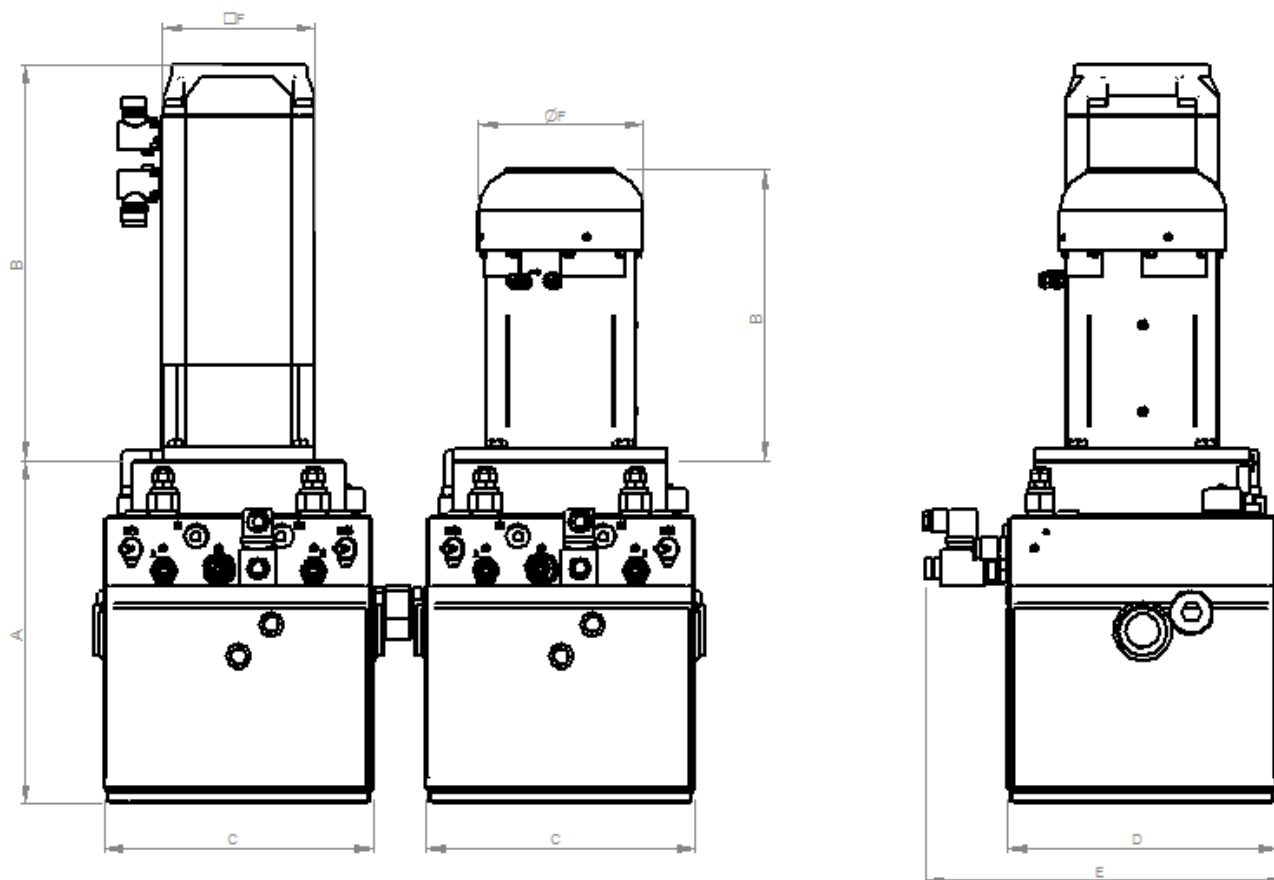
### Options

- Navio travel-dependent steering
- Navio autopilot
- single set-up to be combined with hand pump
- duo-set-up to be combined with electronic steering wheel with feedback

This system is also suitable for, e.g. (mega) sailing yachts in combination with a mechanical steering system and for normal ships, partially due to compact dimensions.

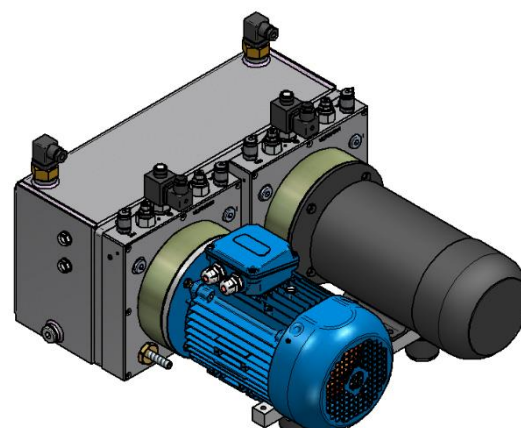


## PM-Steering: dimensions



Dimensions	24VDC	24VDC	750VDC	400VAC
Type motor	A140PWLW	A159M	DP07	IEC100B14
Power	1500W	2600W	2000-4000W	2200-3000W
A mm	320			
B mm	275	350	350	315
C mm	251			
D mm	251			
E mm	340			
F mm	Ø 160	Ø 160	□142	Ø 200

With custom reservoir, horizontal mounting is also possible.  
We think about you when it comes to compact solutions!  
The weight of a double unit is 107kg.



## Steering wheel with or without hand pump

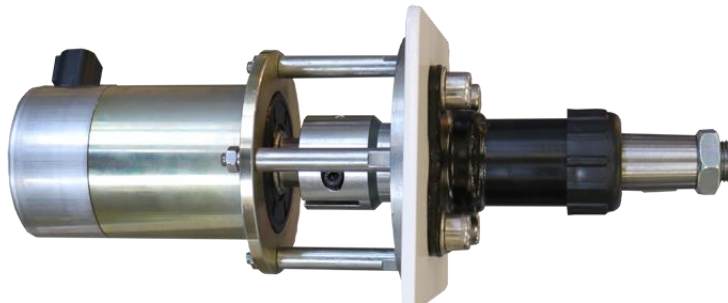
Our PM-prop is to your choice equipped with a PM electric motor or hydro motor for steering. Power steering can be made from the Hybrid Steering units, electric control is located under the Navio chapter. To steer with a conventional steering wheel, Eaton orbitrols can be used, as we have applied to Hydrosta for decades.

New is the hand steer pump with release valve. With the freewheel valve not energized it is a plunger hand pump, the freewheel is activated. An electric control signal activates the control valves on the powerpack to ensure the final movement of the steering of the PM-prop.



The version without hand pump is called the Navio210.

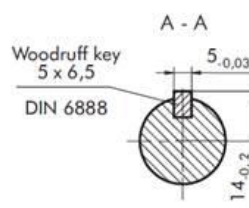
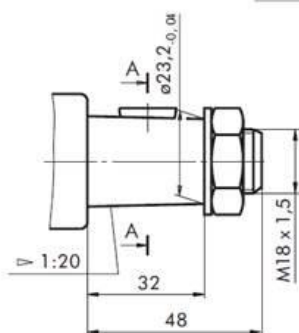
This control unit has an encoder for the electric control signal, also a "motor" that simulates resistance in the steering wheel. When the end stop is approaching, resistance is increased, resulting in more resistance, and heavier turning of the steering wheel.



Both shapes require a steering wheel adapter, which fits the steering wheel of your choice. Due to the length of the steering wheel, it is possible to cover up the technique very nicely and offset the steering wheel at the correct distance. Several options in design are available, including angle adjustable. Steering wheel shaft dimensions:

### SHAFT EXTENSIONS

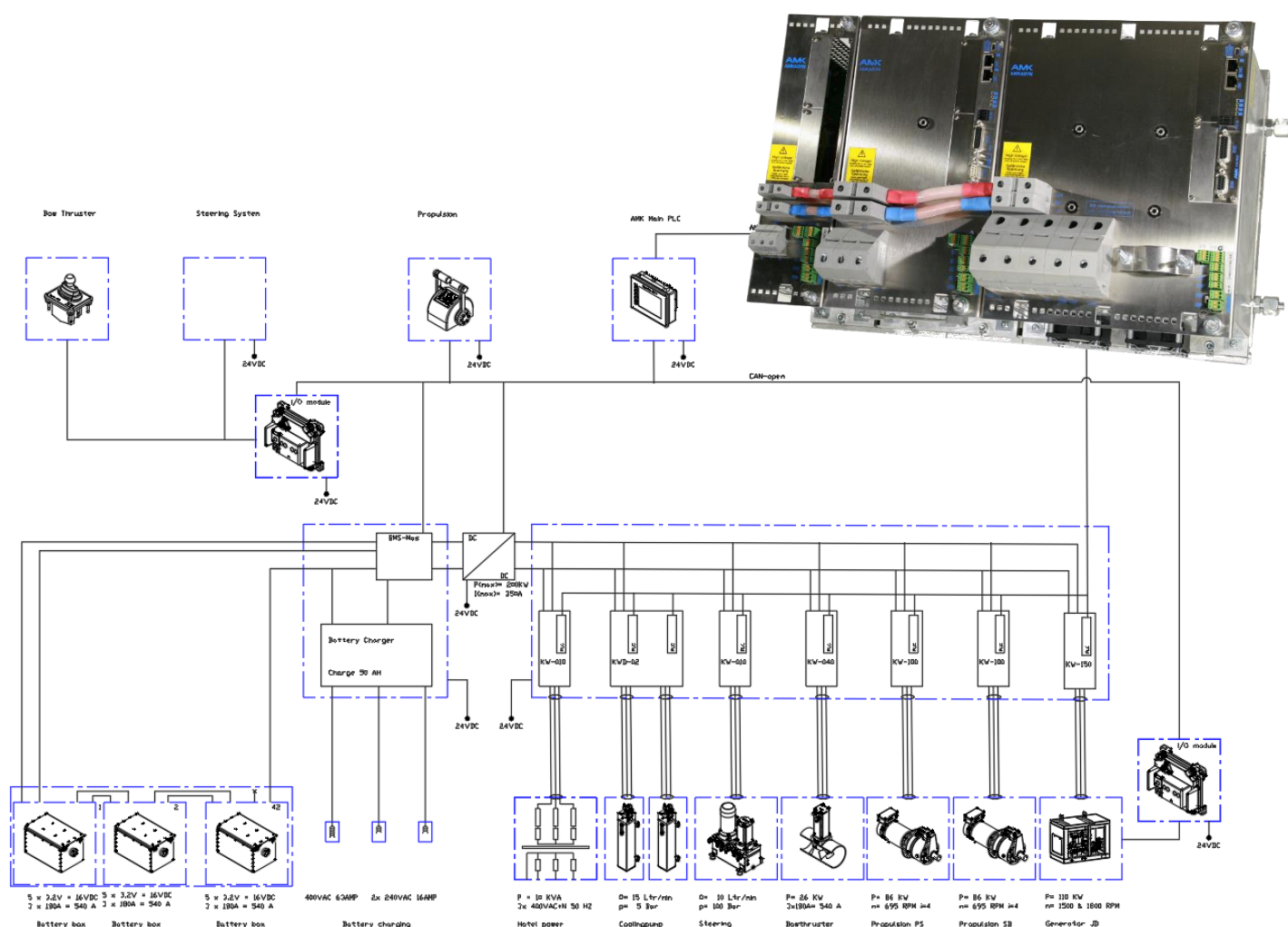
TYPE 1



The heart of the on-board installation is the control box with its inverters. All sources (batteries, generators, possibly shore power or solar panels) are routed to the users at the correct voltage and power (PM-prop, PM parallel drive motor or direct drive motor, Hybrid steering, PM hydraulic powerpack). AMK KW inverters are available in various sizes and can be modularly built up on a mounting plate. This so-called coldplate has cooling channels and is connected to the cooling circuit. Even though the efficiency of these inverters is high, cooling is still necessary.

Choice of AMK inverters:

Type		KW 2	KW 3	KW 5	KW 8	KW 10	KW 20	KW 40	KW 60	KW 100	KW 150	KW 200
Input voltage	VDC	540 – 650										
Switch off barrier	VDC	850										
Input current	A	3.8	5.6	9.3	15	18.5	37	74	112	187	280	370
Rated output voltage	VAC	3 * 350 for sinusoidal currents										
Output frequency	Hz	0 – 800										
Rated output power	kVA	2	3	5	8	10	20	40	60	100	150	200
Maximum output power	kVA	4	6	10	16	20	40	80	120	165	300	340
Rated output current	A	3.3	5	8.2	13.2	16.5	33	66	99	165	247	330
Max. output current	A	6.6	10	16.5	26.4	33	66	132	198	247	495	561
Efficiency	%	➤ 98										
Cooling system		Type cold plate										
Protective function		Motor overcurrent, short circuit, ground fault, over temperature module and motor, I2T monitoring										
Switching frequency	kHz	8 (4)										
Weight	kg	3	3	3	3	4.2	4.2	8	8	16	20	25
Module width	Mm	55	55	55	55	85	85	170	170	255	425	425



Let Hydrosta advise you for a suitable controlbox for your system!

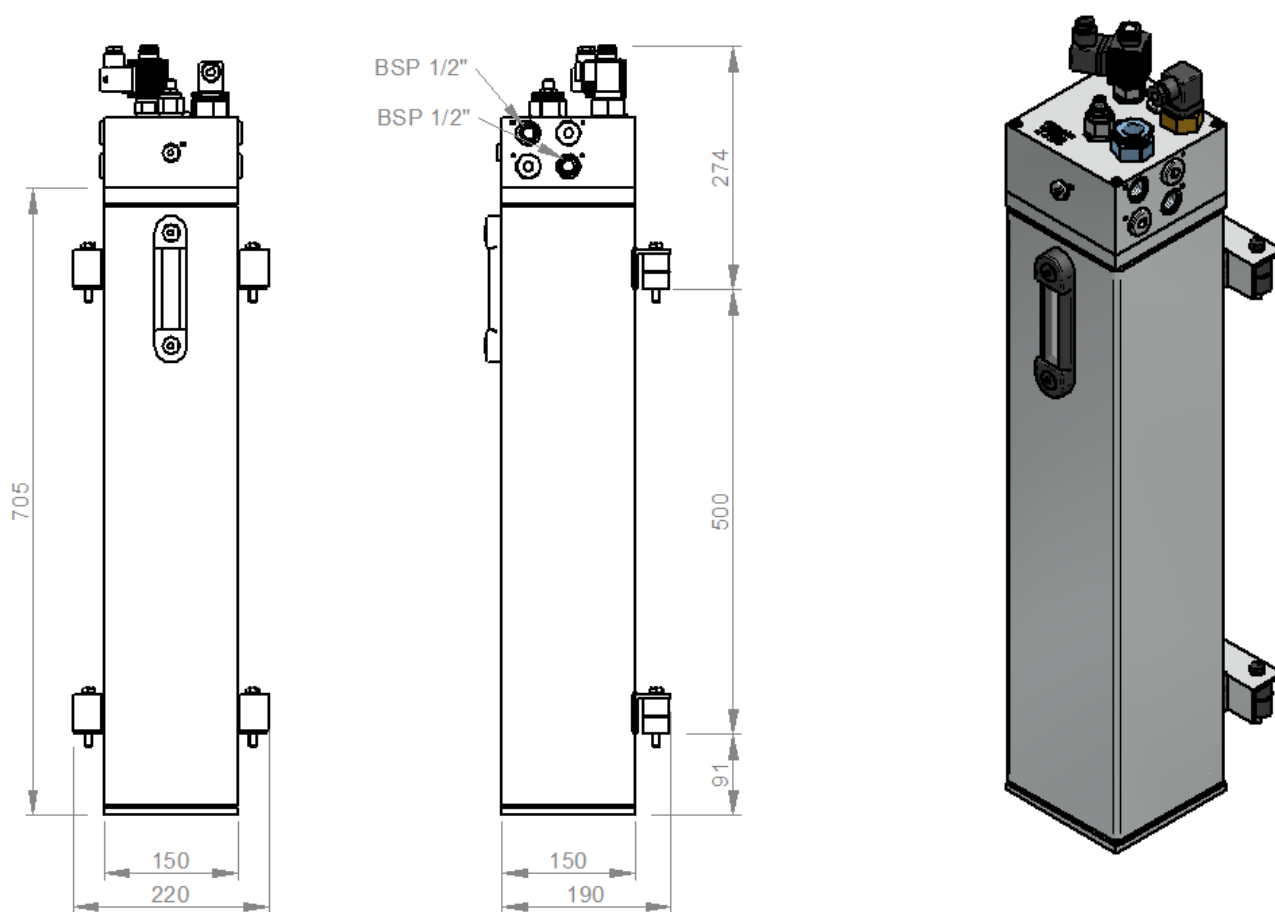
## Powerpack cooling circuit

The high power of the applied AMK electric motors, generators, controllers, all that rotates has resistance and loss. However small the losses are, this produces heat.

The electric motors have integrated cooling channels for liquid cooling, the controls are mounted on a so-called "coldplate".

The Hydrosta compact powerpack provides cooling water circulation. Cooling water is passed through all the components to cool, after which the heated cooling water is cooled back with outboard water (by a heat exchanger or a cooler). Depending on the size of the system, 1 or more compact powerpacks are applied.

Dimensions:



Data		
Type motor	750W max.	400VAC
Power	50L/min max.	750W max.
Flow water	2x Gas 3/4" BSPP	50L/min max.
Connections	Alu 51St	2x Gas 3/4" BSPP
Housing material	28.7kg	Alu 51St
Weight (dry)	25.4kg	28.7kg



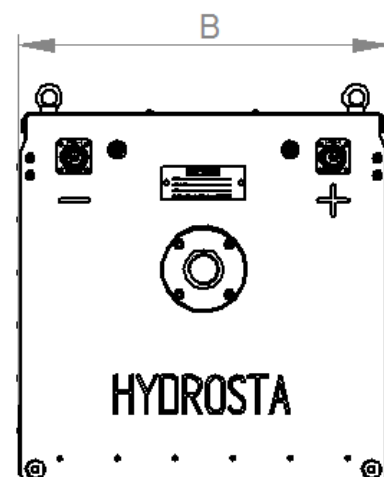
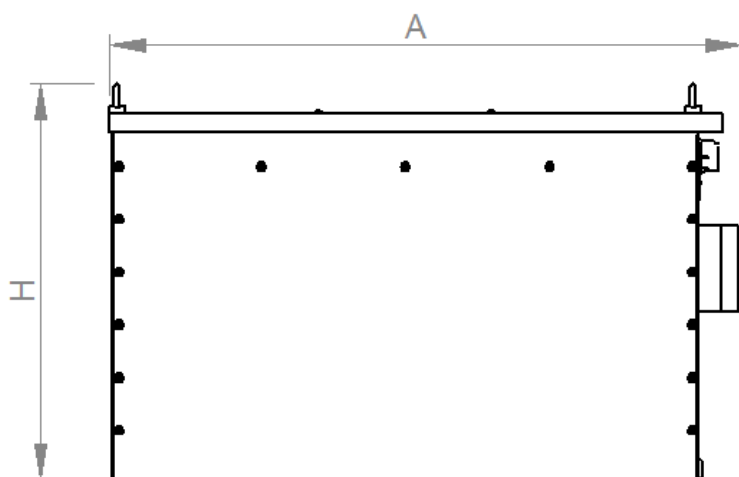
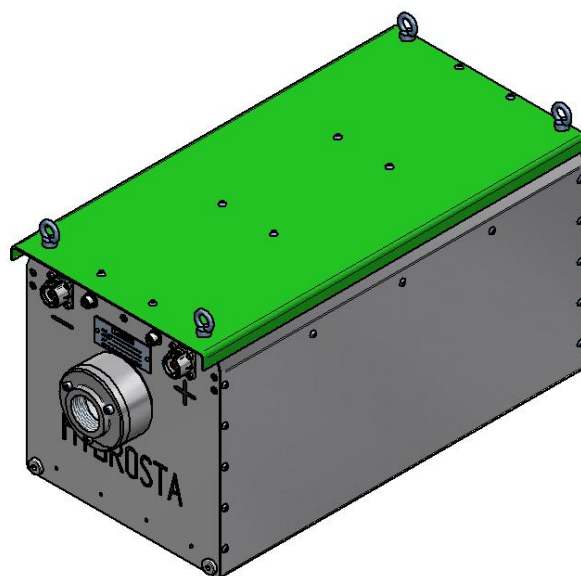
## Battery pack Lithium-Ion

Hydrosta can also supply you with the batteries.

For this, we use the 3.2V lithium ion cells type LiFePo4 (Lithium-ferro-phosphate) in a aluminium housing. These cells are clustered to reach the desired voltage and capacity. The casing and charging technique for connecting all cells is handled by Hydrosta.

For all batteries:

- approved for UN38.3 / MSDS, RoHS, CE, TUV, UL with high safety
- over 3500 cycles under the designed conditions
- integrated safety valve for safeguarding safety
- ceramic membrane technology for safeguarding safety
- battery housing material is flame retardant
- voltage 51.4VDC per unit, optional 48VDC
- standard ammount: 13 units



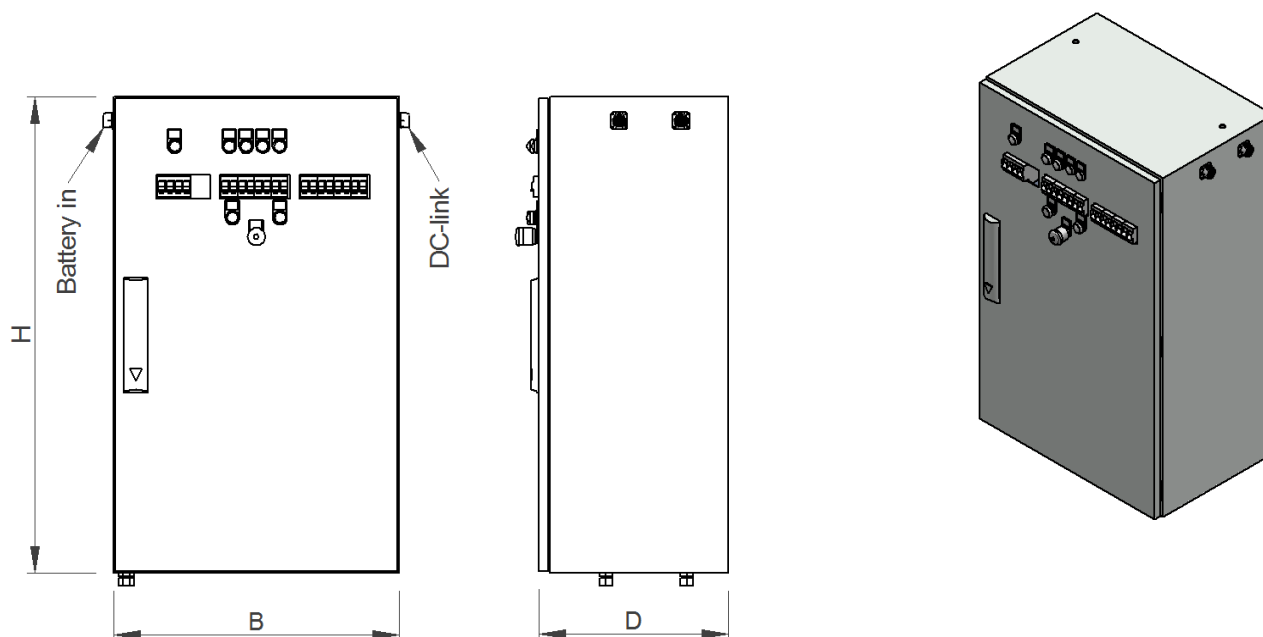
Dimensions	100Ah	180Ah	200Ah
A [mm]	620	660	
B [mm]	310	390	
H [mm]	350	420	
P [kW]	5.1	9.2	10.2
Weight [kg]	69	98	119

## Battery charger

Matching our Lithium batteries we have developed our own modular battery charger. In parallel, the main BMS for the batteries is integrated because these two always work closely together. Because each ship has its own wishes, we can deliver these in various capacities and modular construction and can be implemented in a left or right version.

Battery charger and BMS in combination with a DC / DC interface communicate via a CAN bus with the central control system. The central monitoring system can display the current load and status, but also set the boundary conditions as charging characteristic and maximum charging current of the shore.

For the main power supply, a choice can be made for shore power connection 3 phases 400VAC or 240VAC or a combination of both. Depending on which shore power connection is used, the charger switches automatically and blocks the other connection. The charger is also equipped with a galvanic separator for protection of the ship with the shore power.



Afmetingen:

Dimension	10kW	20 kW	40kW
B [mm]	600	600	600
H [mm]	600	800	1000
D [mm]	350	400	400
Weight [kg]	56	90	135

## General information

With the Navio control systems you can steer and navigate your ship comfortably and reliably.

Any kind of configuration is possible.

- automatic pilot (sea-pilot)
- gyro (river pilot)
- servo follow-up steering
- connection to way-point (NMEA0183 or NMEA2000)
- choice of steering lever

NAVIO 155 steering follow-up unit

To be used for:

- gyro or
- servo mode steering



**NAVIO 155 steering follow-up**



Navio 202 autopilot comes complete with:

- selection buttons for servo, gyro or automatic control.
- Course setting.
- Rudder-position indicator by LEDs
- Display of actual heading, set course or rudder angle displayed on LCD screen.

**Navio 202 autopilot**



**Navio 202 autopilot**

## Navio 260 throttle lever

Hydrosta has developed a line of throttle levers. These levers, the Navio 260 and Navio 262, are robust and elegant and CAN-bus controlled. The Navio 260 is a single throttle and the Navio 262 is a double throttle.



*Navio 260*



*Navio 262*

Throttle lever with a travel of 2 x 90 degrees



*Entirely a smooth layout*



*Also available in grey look*

## Overview

Whether you want an automatic pilot, stabilizers or a motor management system, you can complete your ship's control system with the new Navio range. All Navio products can be connected together via the Can-bus system. Connectors are used for this, which simplifies the installation. The entire Navio line is watertight. The various dashboard components all have a consistent design. All buttons and displays illuminate blue in the dark.



### Navio 120

The Navio 120 is a dashboard panel for the installation of the S14 joystick. Equipped with integral 'hold' button. Ideal for proportional bow thruster operation.



### Navio 122

The Navio 122 is the double version of the Navio 120. Ideal for proportional bow- and stern thruster operation.



### Navio 150

The control knob from the Navio 150 series is a route-dependent control knob especially developed for manoeuvring with a rudder. A scale of 2x35 degrees is engraved onto this knob. The knob is made of massive grey anodised aluminium. Upon request we can also anodise this in black.



### Navio 151

This control knob was specially developed for manoeuvring with a Hy-Prop. The scale is thus 2x90 degrees. The knob is massive black anodised aluminium. This is also available in grey upon request.



### Navio 155

This control knob has the same specifications as the Navio 151 except that it is equipped with a lever. Also available in grey anodised version.



### Navio 156

Steer handle with stripes scale op 2x 90grd. Steering knob equipped with lever. Foot diameter 71mm. Aluminium black anodized.



### Navio 165

Just like the knobs of the 150 series, the Navio 165 is a control knob. The difference is in the size. The control knob is larger and the square aluminium baseplate is equipped with a striped scale of 2x90°.



#### Navio 202

The Navio 202 is a complete control lever with various functions and visualisation options. The Navio 202 is only used in combination with an autopilot and gyro pilot. These control modes can be selected with the keys. The rudder position is displayed by LEDs. Compass course, depth, speed, etc. can be shown on the LC display.



#### Navio206

The NAVIO 206 is almost identical to the NAVIO304, however, it is possible to drive these two motors and control both the bow and sternthruster. Steering wheel and starboard are electronically separated so that if one engine fails, the other one can still be operated. Because the LCD screen is omitted, this performance is a lot more compact than the NAVIO304.



#### Navio 260

For the control of a combustion engine and electric coupling we use the Navio 260 throttle lever. When this is combined with a hydraulically driven coupling it is possible to navigate in trolling mode. The Can-bus provides the communication, a four-wire connection is therefore sufficient. The position of the throttle lever is determined by non-contact measurement, which means that the probability of mechanical defects is low.



#### Navio 262

Identical to the Navio 260, but with double lever for the control of 2 diesel engines.



#### Navio 301

Measured values such as depth, speed, course, etc. can be graphically displayed on this screen. Furthermore, autopilot, engine management functions, etc. can be operated by 6 buttons. The screen is 5.7" and monochrome. The buttons and LCD illuminate blue.



#### Navio 304

The Navio 304 is a remote control. The screen is based upon the Navio 301. Equipped with a steering knob, like the one on the Navio 202, and throttle lever. Also equipped with S14 joystick for the control of the bow thruster.



#### Navio 310

A 10" screen based upon computer technology. Both Windows-based and Linux-based software packages can be installed. The Navio 310 can communicate directly with all other Navio products. A special Linux-based software package can, for example, display your engine data. All functions can be operated with 8 buttons.



#### Navio 315

This is the big brother of the Navio 310. This screen is 15" and has 12 function buttons on the edge. Here, too, the buttons illuminate blue so that they can be seen in the dark.





**Navio 613**  
Digital PWM amplifier RS232/CAN 10-30V



**Navio 750**  
Multi controlbox



**Navio 816**  
Electronic compass via Can-bus. This compass also has the option of transmitting GPS data. This compass makes it possible to navigate on autopilot. The autopilot is generally an open-water pilot. A river pilot uses the Navio 820 or a gyro sensor.



**Navio 820**  
A gyro sensor measures the angle turn per time unit of the ship. By adjusting the rudder against the angle turn, we can minimise the turn. This means that the ship can be steered dead straight down a river without any intervention.



**Navio 850**  
For the measurement of depth, speed and water temperature we use a NMEA2000 sensor from Airmar. The advantage of NMEA2000 is that this can be connected directly to our bus system. The data can then be simply displayed in one of our displays.



**Navio 871**  
The rudder position is measured by the Navio 871. This is a robust device with a reliable bearing. The housing is made of anodised aluminium.



**Navio 920**  
For the control of the fuel motor we use a rotating servo motor. This actuator can be supplied for both a 12 and 24 Volt system. The Navio 920 can be fitted to almost any combustion engine. The full stroke can be travelled within ¼ second. This means that you feel the acceleration immediately, even when accelerating electronically. The Navio 920 can also be used to drive lightweight rudder installations.



**Eaton HFX-controller**  
The high-performance HFX12m control unit is designed for electronic control of all system functions on and off-highway mobile equipment. This control unit features a powerful processor, configurable CAN channels and a flexible I/O system to meet the needs of a variety of demanding applications.

## General information

There are a lot of options with Navio control systems. We have listed a few common installations.

### Autopilot 1:

The operation of this autopilot is fully integrated into the control lever(s).

#### Requirements:

- 1x Navio 202 steering lever (several steering positions possible);
- 1x Navio 816 compass;
- 1x Navio 820 gyro sensor;
- 1x Navio 871 rudder-position indicator.
- 1x Navio 750 control.

#### Several options are possible:

- bow- and stern thruster operation;
- engine management;
- stabilizers



### Autopilot 2:

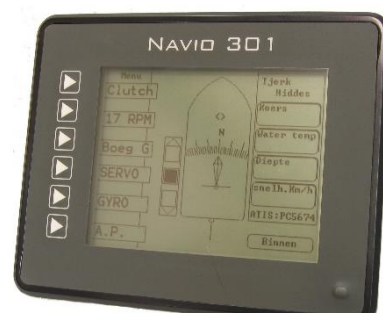
Operation of the autopilot is also possible from the Navio 301 display. With the Navio 301 we can grand various wishes.

#### Requirements:

- 1x Navio 150 (several steering positions possible);
- 1x Navio 301 (several possibilities);
- 1x Navio 816 compass;
- 1x Navio 820 gyro sensor;
- 1x Navio 871 rudder-position indicator;
- 1x Navio 750 control.

#### Several options are possible:

- bow- and stern thruster operation;
- engine management;
- stabilizers.



## Overview

The acceleration method depends upon the type of engine. Electronic acceleration is often possible for modern combustion engines. This can be achieved by voltage/amperage or Can-bus signal. If electronic acceleration is not available, we use the Navio920.

The coupling must also be electronic. Ask about the options if not present.

If the coupling permits, navigation in trolling mode is possible.

### Requirements:

- 1x Navio 260 throttle lever;
- 1x Navio 920 servo motor;
- 1x Navio 754 control.

We will be happy to discuss special requirements with you.



## Stabilizers:

Hydrosta stabilizers are normally supplied with a Navio301 display. The sensitivity and adjustment can be controlled on this display.

### Requirements:

- 1x Navio 301 display;
- 1x Navio 820 gyro sensor;
- 1x Navio 830 inclino sensor
- 1x Navio 750 control.



## Remote control:

Your entire ship can be controlled using the remote control depicted. With the Navio 202 you can operate the various steering modes (servo, gyro and AP) and with the knobs you can operate the coupling. Bow and stern thrusters operation is possible. With the attractive and subtle throttle lever you have the engine power at your command.

The remote control is not wireless (we don't recommend this for safety reasons). The cable has just four wires (power supply, Can-bus) and is therefore flexible.

With this remote control you can control the ship both from the bow and from the stern.

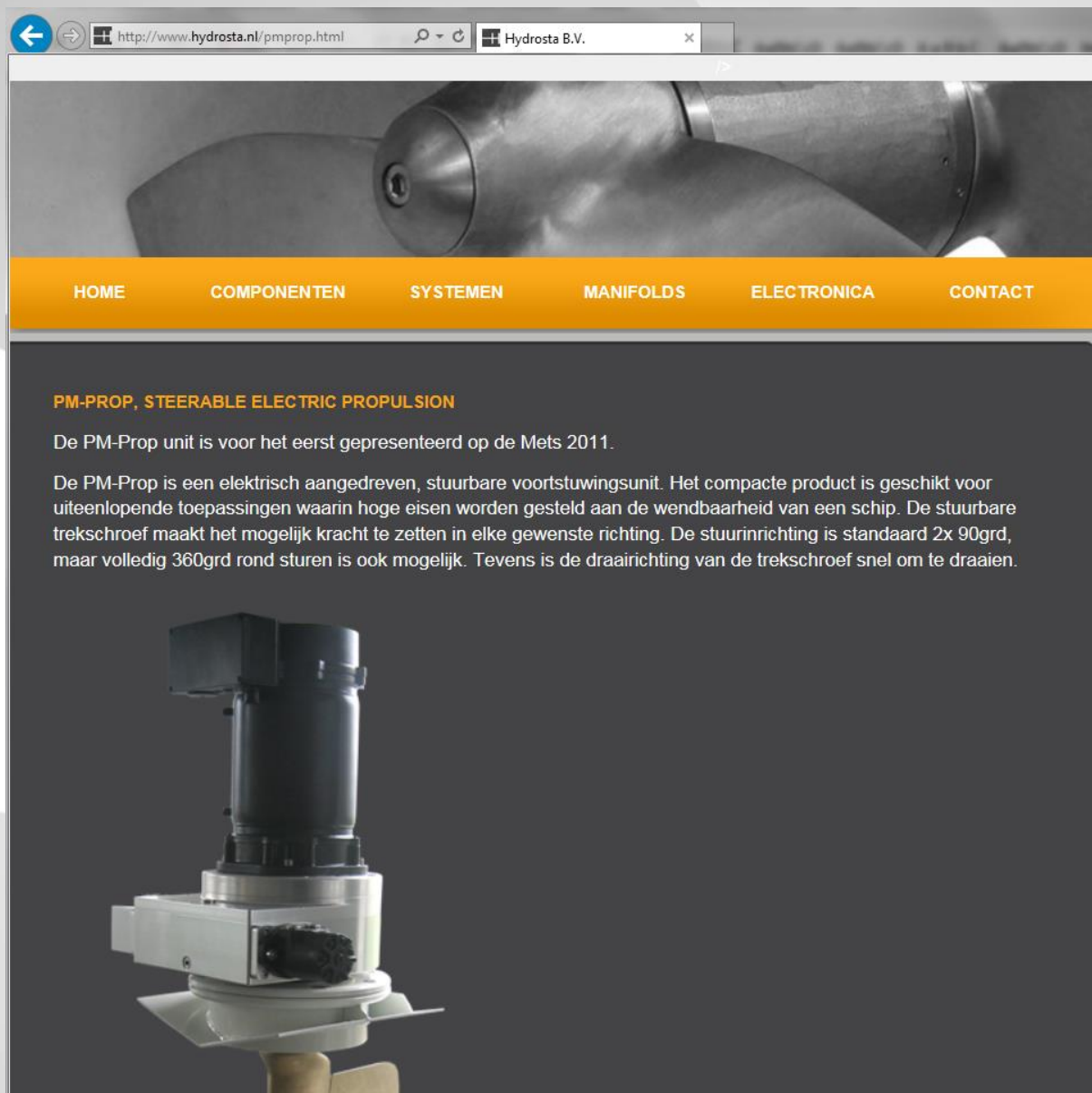


Navio206



Navio304

Also visit our website for current information, as well as download drawings here.



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