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Installatie instructies

Istruzioni per l'installazione

Installasjonsinstrukser

Einbauanleitung

Installationsinstruktioner

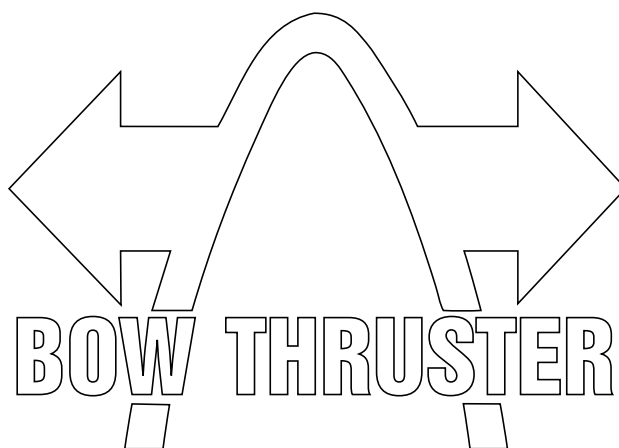
Asennusohje

Instructions d'installation

Monteringsinstruktioner

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Installation instructions

BOW PRO Series Thrusters

BOWA0301

30 kgf - ø 110 mm

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Raadpleeg de eigenaarshandleiding voor Bediening, Onderhoud, Storingen en Technische gegevens.'

Consult the owner's manual for Operation, Maintenance, Trouble shooting and Technical data.

1 Safety

Warning indications

The following warning indications are used in this manual in the context of safety:



DANGER

Indicates that great potential danger exists that can lead to serious injury or death.



WARNING

Indicates that a potential danger that can lead to injury exists.



CAUTION

Indicates that the usage procedures, actions etc. concerned can result in serious damage to property. Some CAUTION indications also advise that a potential danger exists that can lead to serious injury or death.



NOTE

Emphasises important procedures, circumstances etc.

Symbols



Indicates that the relevant procedure must be carried out.



Indicates that a particular action is forbidden.

Pass on the safety instructions to others using the bow thruster. General rules and laws concerning safety and accident prevention must always be observed.

2 Introduction

This manual give guidelines for installing a Vetus bow and/or stern thruster from the BOW PRO series, model 'BOWA0651', 'BOWA0762' and 'BOWA0902'

The quality of installation will determine how reliably the bow and/or stern thruster performs. Almost all faults can be traced back to errors or inaccuracies during installation. It is therefore imperative that the steps given in the installation instructions are followed in full during the installation process and checked afterward.

Alterations made to the bow thruster by the user will void any liability on the part of the manufacturer for any damages that may result.

The actual thrust generated by the bow and/or stern thruster will vary from vessel to vessel depending on the windage, the hull displacement, and the shape of the underwater section.

The nominal thrust quoted can only be achieved under normal conditions:

- During use ensure the correct battery voltage is available.
 - The installation is carried out in compliance with the recommendations given in this installation instruction, in particular with regard to:
 - Sufficiently large diameter of the battery cables so that voltage drop is reduced to a minimum.
 - The manner in which the tunnel has been connected to the hull.
 - Use of bars in the tunnel openings.
- These bars should only be used where this is strictly necessary (if sailing regularly in severely polluted water.)
- The bars must have been fitted correctly.



NOTE

The areas in which the electric motor(s) of the thruster(s) and batteries are positioned must be dry and well ventilated.



NOTE

Check for possible leaks immediately the boat is relaunched.

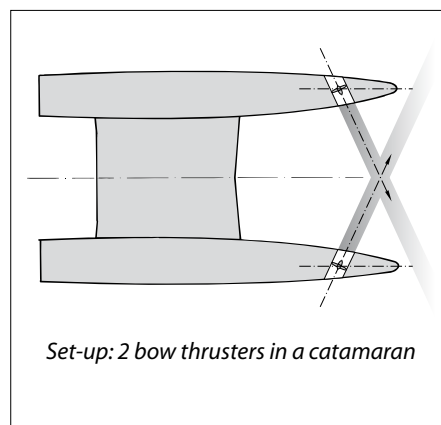
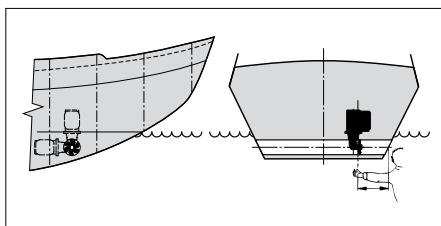
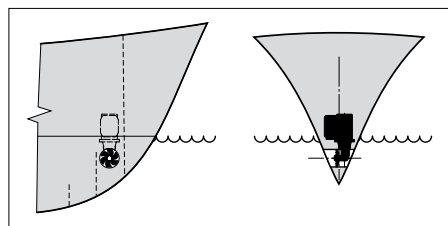


Make sure that the user of the vessel is supplied with the owner's manual.

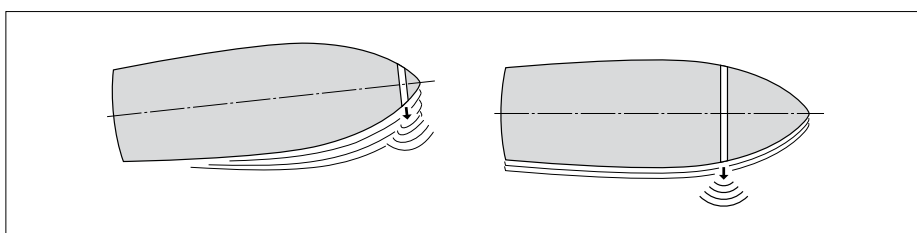
3 Installation recommendations

3.1 Positioning of the thruster tunnel

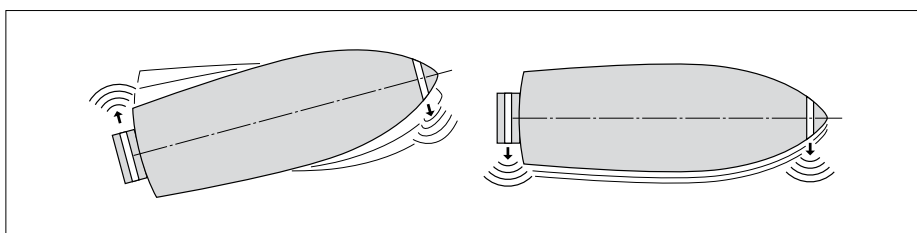
Several installation examples.



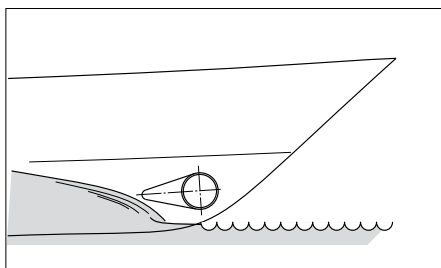
To achieve the optimum performance, position the thruster tunnel as far forward as possible.



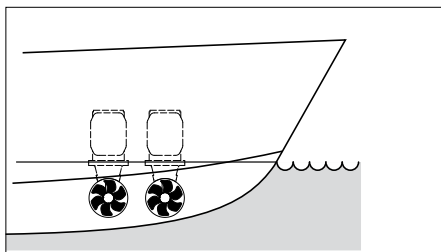
If, in addition to controlling the movement of the bow, the stern of the vessel is required to move sideways, then a second thruster may be installed at the stern.



For a planing boat the tunnel should, if possible, be so situated so that when the vessel is planing it is above the water level thus causing no resistance.



Installation of two bow thrusters in tandem (for larger boats). In this case, depending on weather conditions, one or both bow thrusters may be used.

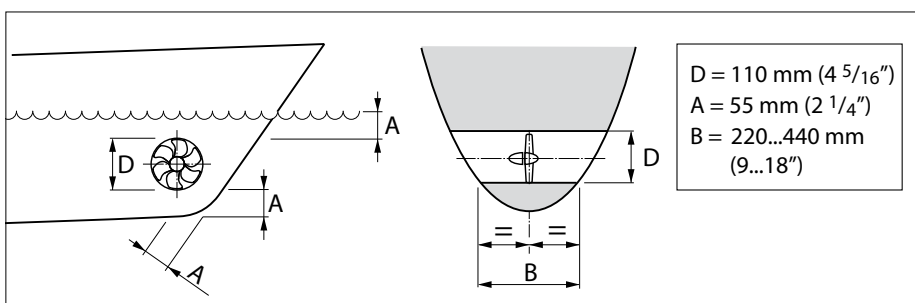


TIP:

We do not advise fitting 2 bow thrusters into one tunnel; this does not result in doubling the thrust!

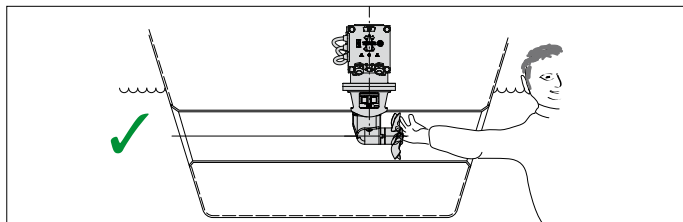
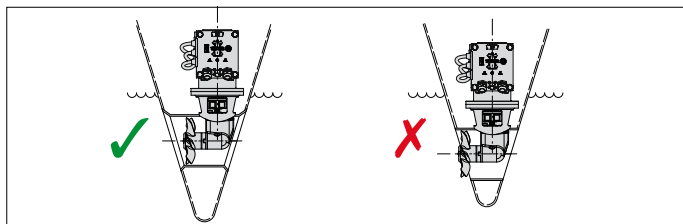
When choosing the location for the thrust tunnel, take the following into account for optimum performance:

- The distance A shown in the drawing must be at least $0.5 \times D$ (where D is the tunnel diameter).
- The length of the tunnel (distance B) should be between $2 \times D$ and $4 \times D$.

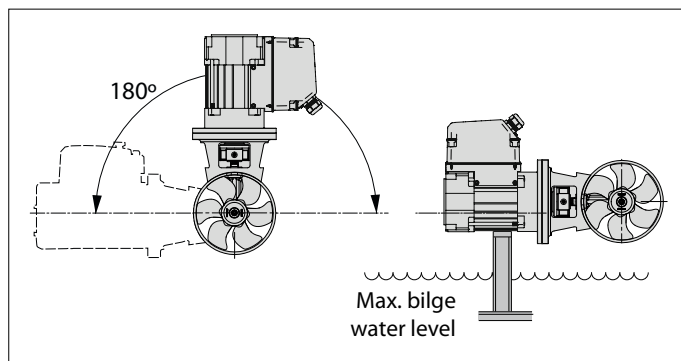


3.2 Positioning of the bow thruster in the thrust-tunnel

When determining the exact position of the bow thruster in the thrust tunnel, the tailpiece **MUST NOT** protrude from the tunnel end.



The propeller should preferably be situated on the centreline of the vessel, but it must always be accessible from the outside.



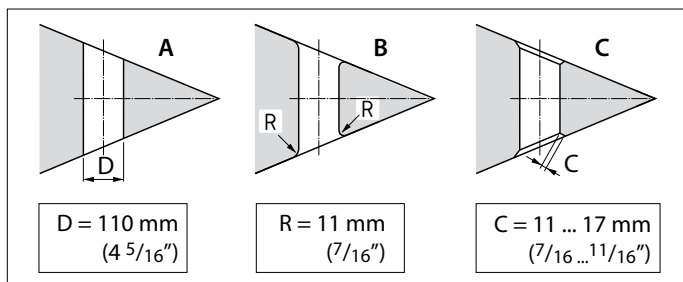
The electric motor can be installed in various positions.

If the motor is installed horizontally, a support **MUST** be fitted.

The electric motor must be positioned in such a way that it is always well clear from the maximum bilge water level.

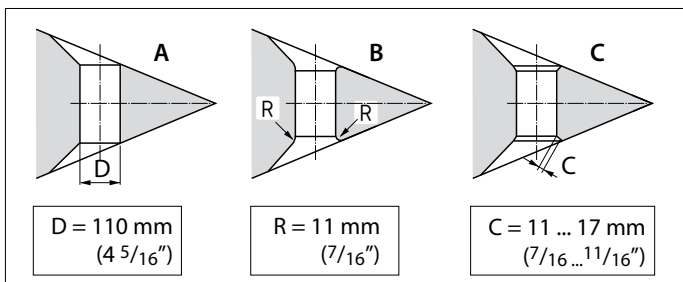
3.3 Connection of thrust tunnel to ship's hull

Direct connection of the tunnel to the hull, without a fairing, produces reasonable results.



- A** The connection to the hull can be abrupt.
- B** It is better to make the connection rounded with radius 'R' of about $0.1 \times D$.
- C** It is even better to use sloping sides 'C' with dimensions 0.1 to $0.15 \times D$.

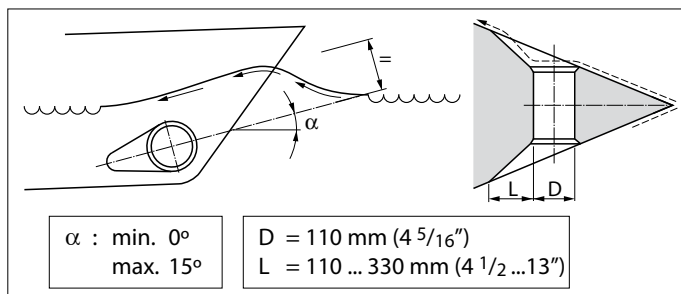
Connection of the thrust tunnel to the ship's hull with a fairing results in lower hull-resistance during normal sailing.



- A** The connection with a fairing can be abrupt.
- B** It is better to make the connection with a fairing rounded with radius 'R' of about $0.1 \times D$.
- C** The best connection is with a fairing using sloping side 'C' with dimensions 0.1 to $0.15 \times D$.

TIP:

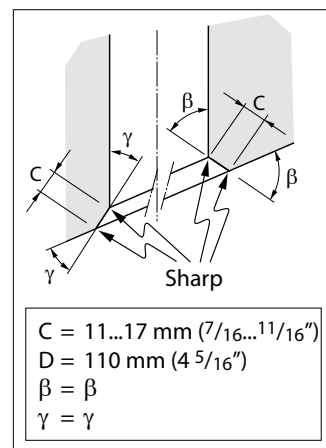
The manner, in which the thrust tunnel is connected to the hull, has a great influence on the actual performance of the bow thruster and to the drag the hull experiences when underway.



Length 'L' of the fairing should be between $1 \times D$ and $3 \times D$. This fairing should be embodied in the ship's hull in such a way that the centreline of the fairing will correspond with the anticipated shape of the bow-wave.

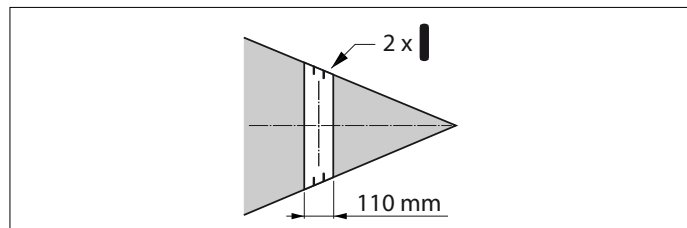
If the connection of the thrust tunnel and the boat's hull is to be made with a sloped side, it should be executed in accordance with the drawing.

Make the sloped side (C) with a length of 0.1 to $0.15 \times D$ and make sure that the angle between the tunnel and the sloped side will be identical to the angle between the sloped side and the ship's hull.

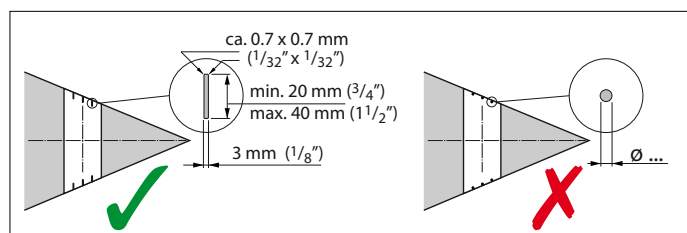


3.4 Grid bars in the tunnel openings

Although the thrust force will be adversely affected, grid bars may be placed into the tunnel openings, for protection of the thruster.

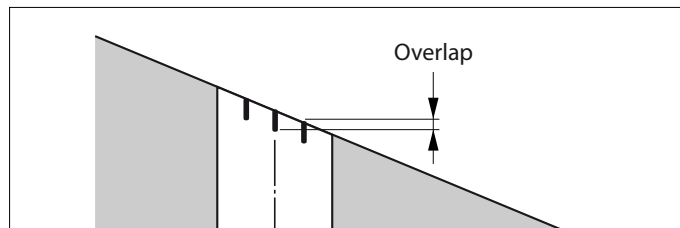


Do not fit more bars per opening than is indicated in the drawing.

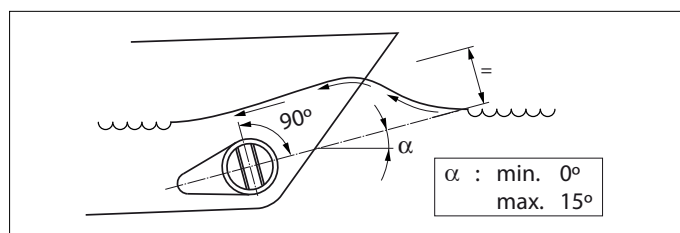


The bars must have a rectangular cross-section.
Do not fit round bars.

In order to limit the negative effect of this on the thrust and on hull resistance during normal operation as much as possible, the following must be taken into account:



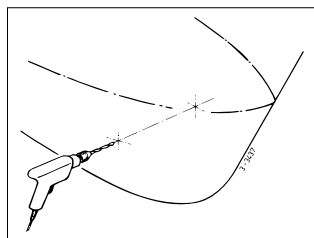
The bars must overlap a certain amount.



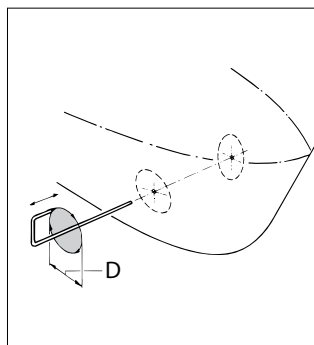
The bars must be installed so they are perpendicular to the expected waveform.

3.5 Installation of the thrust tunnel

Drill 2 holes in the hull, where the centreline of the thrust tunnel will be, in accordance with the diameter of the marking tool.

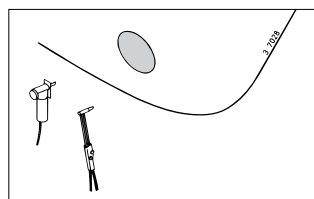


Pass the marking tool (home-made) through both pre-drilled holes and mark the outside diameter of the thrust-tunnel on the hull.

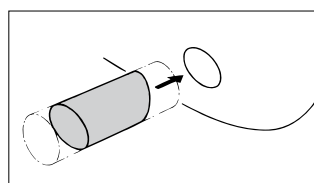


D [mm] (inches)		
Steel	GRP	Aluminium
121 (4 9/64")	120 (4 13/32")	120 (4 13/32")

Dependent on the vessel's construction material, cut out the holes by means of a jigsaw or an oxy-acetylene cutter.



Install the thrust-tunnel.



Polyester thrust tunnel:

Resin: The resin used for the polyester thrust tunnel is Isophthalic polyester resin (Norpol PI 2857).

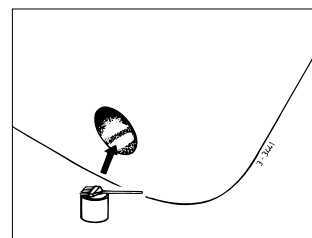
Pre-treatment: The outside of the tunnel must be roughened. Remove all of the top surface down to the glass-fibre. Use a grinding disc for this.

Important: After the tunnel been sawn to length, treat the end of the tube with resin. This will prevent water seeping in.

Laminating: Apply a coat of resin as the first coat. Lay on a glass-fibre mat and impregnate with resin. Repeat this procedure until you have built up a sufficient number of layers.

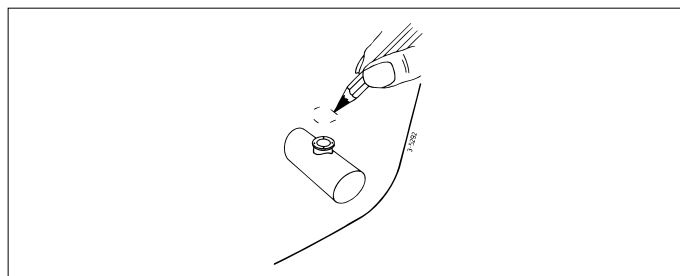
A polyester thrust tunnel should be finished as follows:

- Roughen the hardened resin/glass-fibre. Apply a top coat of resin.
- Treat the side of the tunnel which comes into contact with water with 'epoxy paint' or 2-component polyurethane paint.
- Then apply anti-fouling treatment if required.



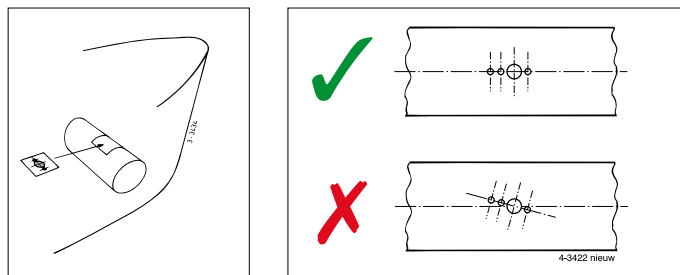
3.6 Drilling the holes in the thrust-tunnel

Mark the installation position of the bow thruster by means of the intermediate flange.



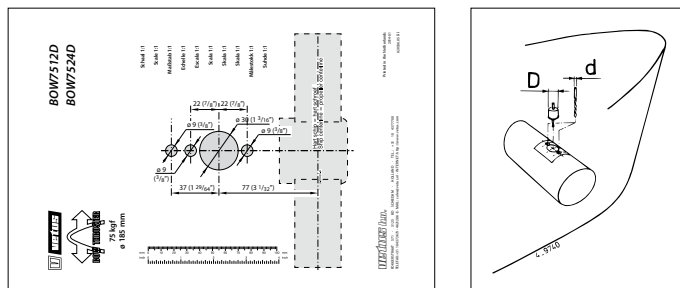
Use the drill pattern supplied, to determine the correct position of the holes to be drilled.

Important: The pattern of the holes must be positioned precisely on the centreline of the tunnel.



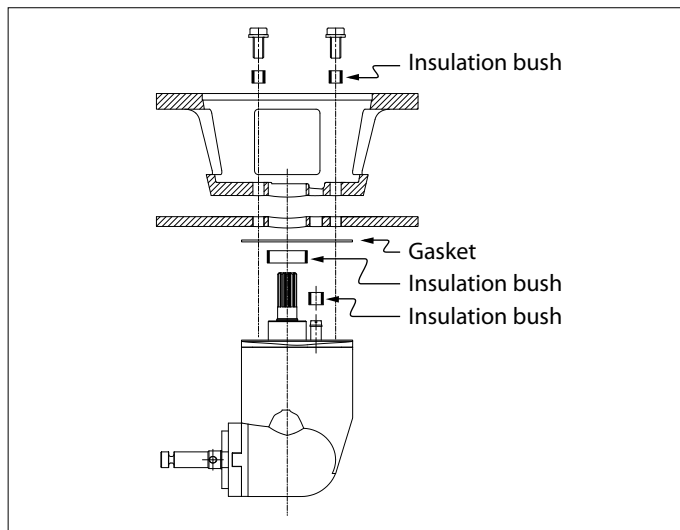
Consult the template for the dimensions of the holes to be drilled.

Drill the holes through the thrust tunnel and take care that the holes are free of burrs.



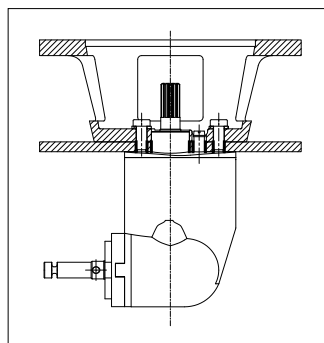
3.7 Protection of the bow thruster against corrosion

To prevent corrosion problems, do not use copper based anti-fouling. Cathodic protection is a 'must' for the protection of all metal parts under water and the bow thruster is supplied with a zinc anode for this purpose.



Corrosion of a steel or aluminium thrust tunnel can be reduced by ensuring that the tail piece is completely insulated from the thrust-tunnel.

NOTE: The gaskets supplied are already electrically insulated. However the bolts and the shaft need to be fitted with insulation material, for example nylon bushes.



4 Installation

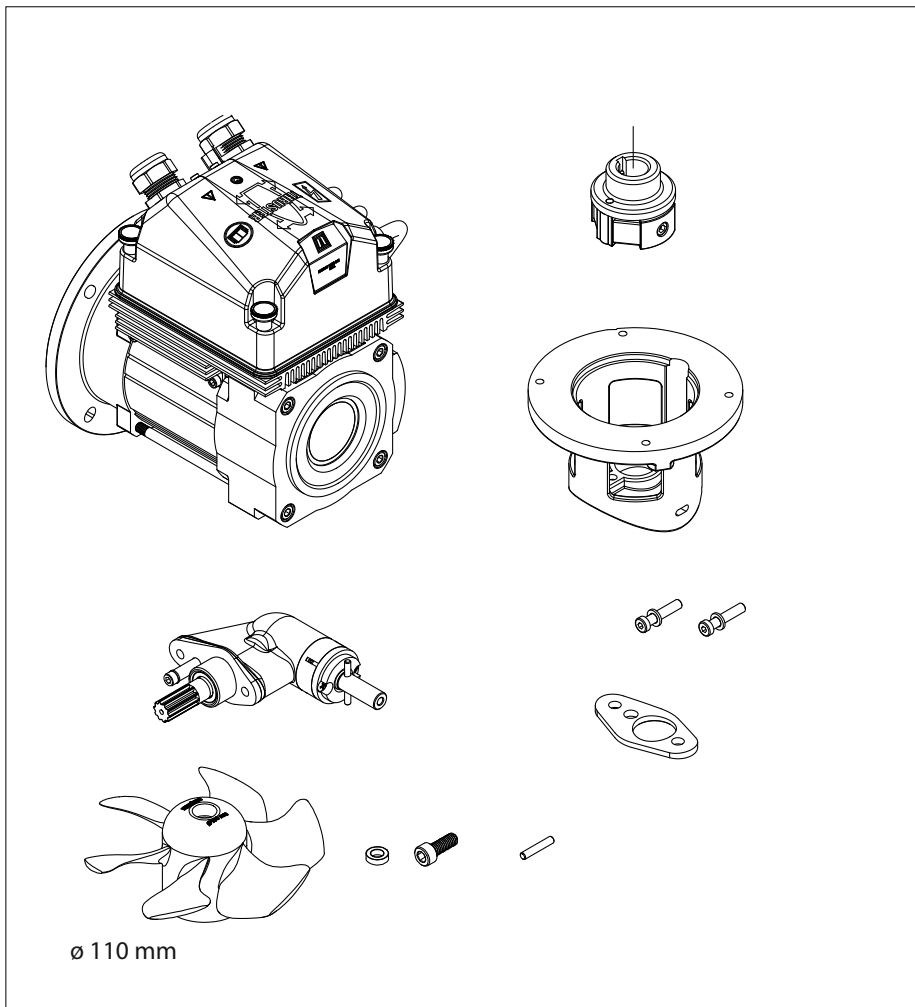
4.1 Introduction

NOTE

The areas in which the electric motor(s) of the bow thruster(s) and the batteries are positioned must be dry and well ventilated.

For overall dimensions see drawing, page 142.

The bow thruster is supplied in parts as shown.

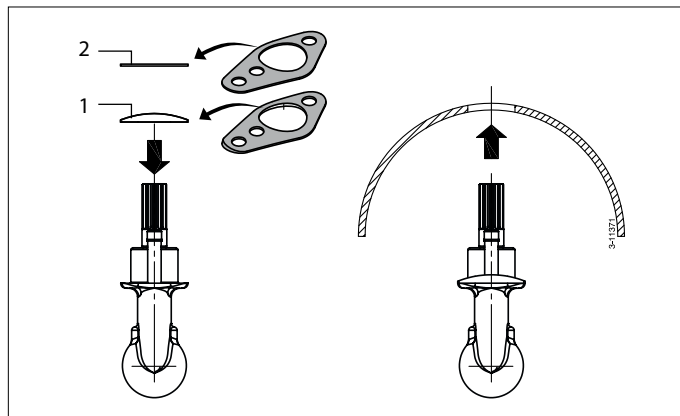


4.2 Installation tailpiece and intermediate flange

- Ensure that the plastic shim plate (1) has been positioned on the tail piece.
- Place one packing (2) between the tail piece and the tunnel.
- Apply a sealant (e.g. polyurethane*) or silicone) between the tail piece and packing, and between the packing and the tunnel wall.
- Place the tail piece in the hole in the tunnel.

Any extra packings used should be ones capable of justifying the tail piece.

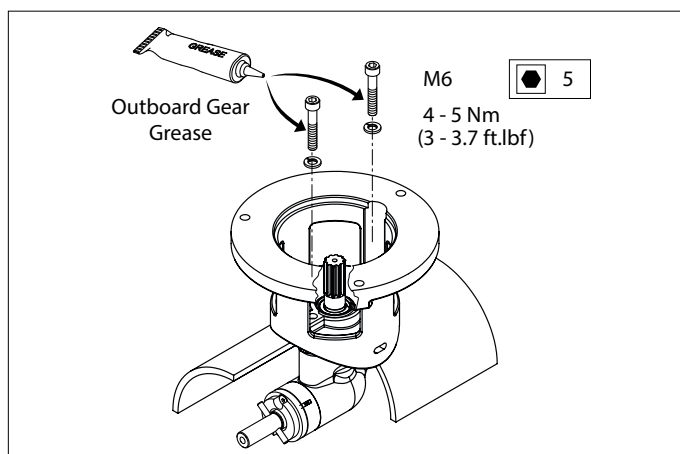
*) e.g. Sikaflex®-292.



- Grease the hole of the intermediate flange and position this flange.
- Grease the threads of the bolts with 'outboard gear grease' before inserting and tightening them.

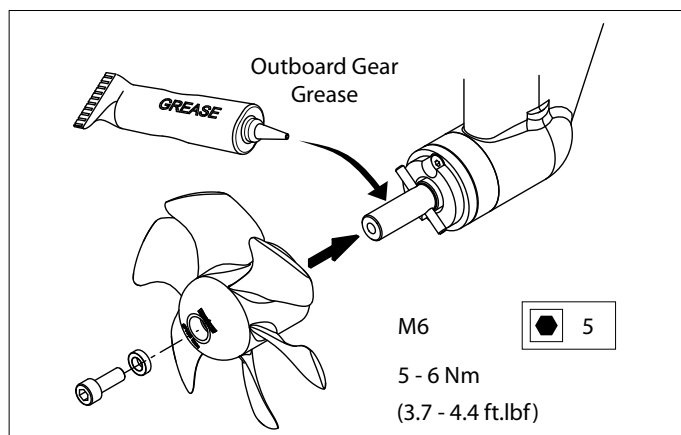
NOTE

Check for any leaks immediately the vessel returns to the water.

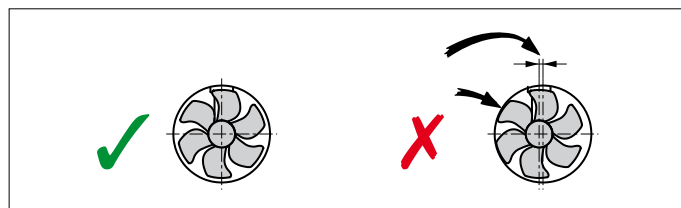


4.3 Final assembly

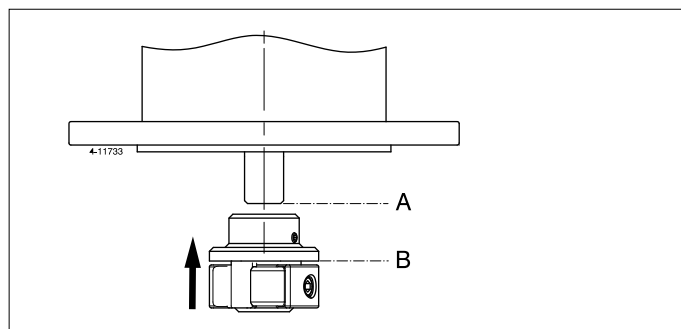
- Grease the propeller shaft with 'outboard gear grease' and install the propeller.



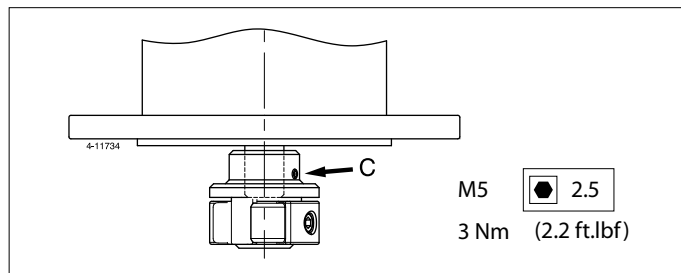
The propeller should run a minimum of 1.5 mm (1/16") free of the thrust tube wall, around the complete circumference.



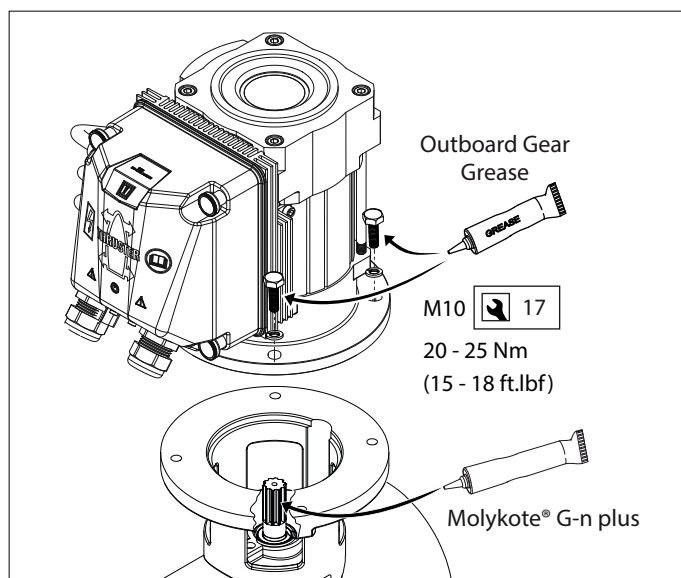
- Slide the flexible coupling onto the output spindle of the electric motor as far as necessary to allow the end of the output spindle (A) and the underside of the flange (B) to become aligned.



- Tighten the lock-screw (C) to the specified torque.



- Grease the input shaft with an installation compound, such as 'Molykote® G-n plus'.
- Grease the threads of the fastenings bolts with 'outboard gear grease' and install the electric motor to the intermediate flange.
- For a first check, turn the propeller by hand - it should turn easily, while connected to the output spindle of the electric motor.



5 Electrical installation

5.1 Choice of battery

The total battery capacity must be sufficient for the size of the bow thruster; see the table.

See page 151 for the applicable battery capacity.

The minimum battery capacity is specified in the table; with a larger battery capacity, the bow thruster will perform even better!

We recommend Vetus maintenance free marine batteries; these can be supplied in the following sizes: 55 Ah, 70 Ah, 90 Ah, 108 Ah, 120 Ah, 143 Ah, 165 Ah, 200 Ah and 225 Ah.

We also recommend that each bow thruster is powered by its own separate battery or batteries. This allows the battery bank to be placed as close as possible to the bow thruster; the main power cables can then be short thus preventing voltage losses caused by long cables.

Always use batteries whose type and capacity are compatible for their use.

5.2 Main power cables (battery cables)

The minimum diameter must be sufficient for the bow thruster's current draw in use and the voltage drop must not be more than 10% of the voltage supplied, consult the table on page 151.

The minimum wire cross-section is given in the table; the bow thruster will perform even better with a larger cross-section!

5.3 Main switch

see page 29

The main switch must be fitted to the 'positive cable'.

The Vetus battery switch type BATSW250 is a suitable switch, which is also available in a 2-pole version, Vetus part number BATSW250T.

5.4 Fuses

Main power fuse 1, see page 29

In addition to the main switch and main relay, a fuse must be fitted to the 'positive' cable as close to the battery as possible.

The fuse will protect the bow thruster from overloading and provide short circuit protection for the on-board power system.

See page 151 for the size of the fuse to be used.



NOTE



Be sure to only use 'sealed' batteries if the batteries are located in the same compartment as the bow thruster.

Vetus 'SMF' and 'AGM' maintenance-free batteries are ideal for this application.

Batteries that are not 'sealed' may produce small amounts of explosive gas during the charging cycle.



NOTE

The maximum operating time and the thrust, as specified by the technical details in your bow thruster installation and operating manual, are based on the recommended battery capacities and battery connection cables.



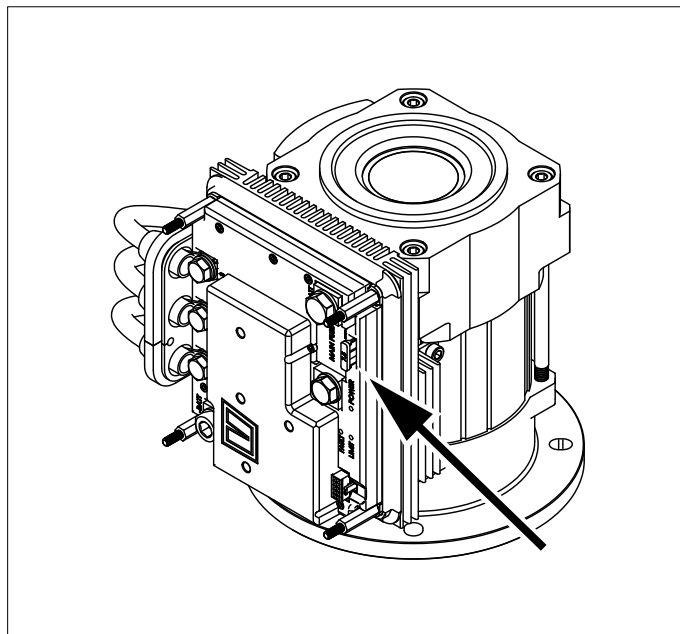
Main power fuse 2

In the connection unit, there is a main power fuse on the controller. This fuse must be in place at all times.



NOTE

When replacing the fuse, the replacement must be of the same rating.



5.5 Connecting main power cables

Make sure that no other electrical parts come loose when connecting the electric cables.

Check all electrical connections after 14 days. Electrical parts (such as bolts and nuts) may come loose as a result of fluctuations in temperature.

- Take off the cover.
- Feed the battery cables through the input glands in the cover.
- Apply cable terminals to the battery cables and connect the cables to the motor controller.



NOTE

The tightening torque of bolts in the motor regulator is a maximum of 16 Nm.

The drawing shows how the cables must be laid in order for the cover to be replaced again.



NOTE

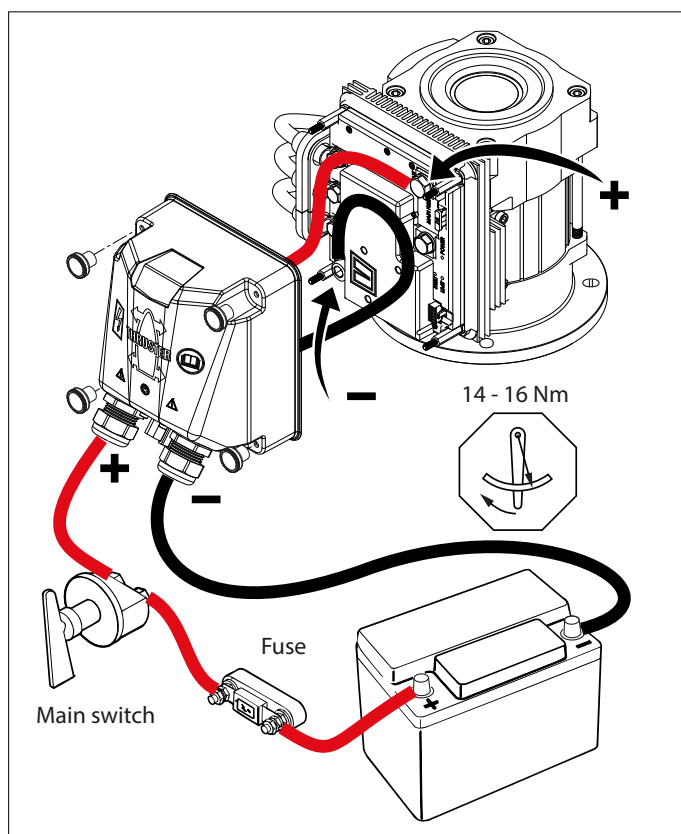
See Chapter 6 Configuring the system before replacing the cover again

- Reinstall the cover and tighten the glands.



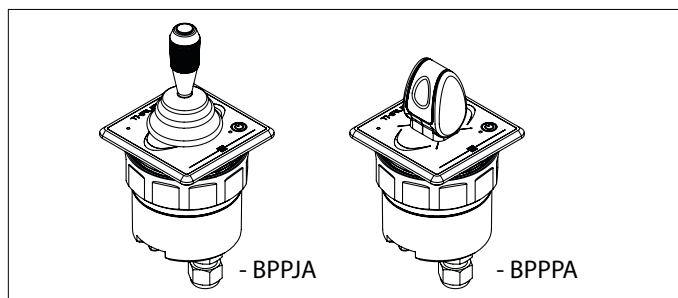
NOTE

Make sure that the voltage stated on the motor type plate is identical to the boat's power supply voltage.



5.6 Connecting control voltage cables

- Mount the control panel at the helm position. There must be 150 mm of free space behind the panel.



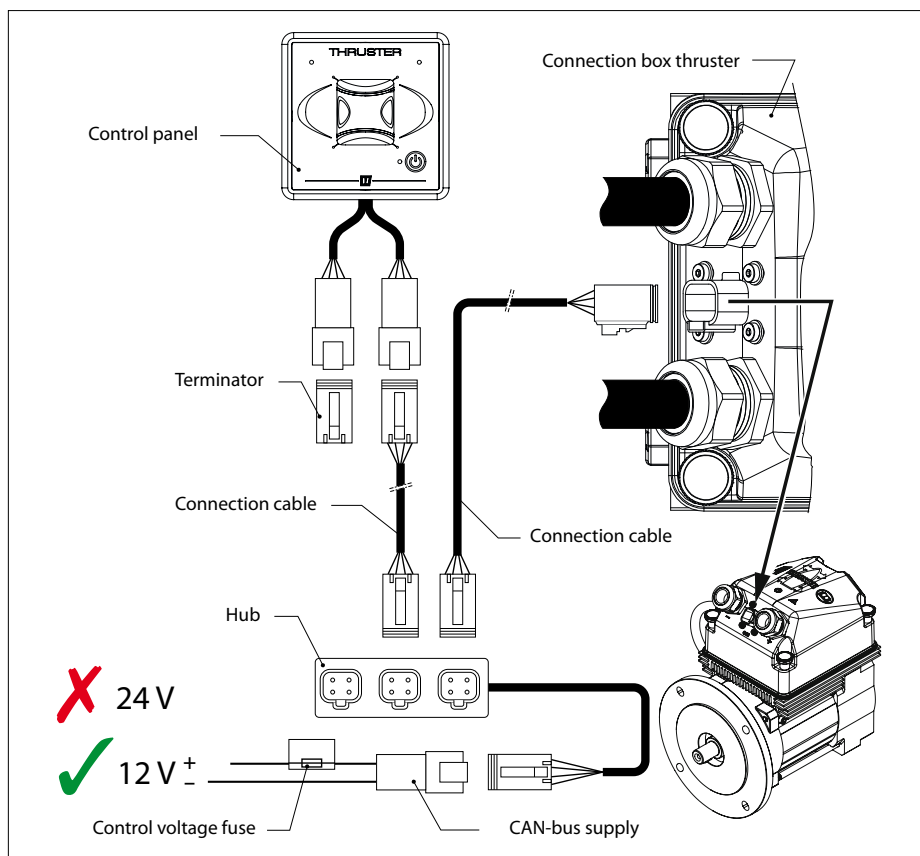
- Connect the panel as shown in the diagram.

See diagrams on page 144 if several panels have to be connected.

- Connect the motor's control voltage cable to the connection box.
- Connect the hub to a 12-Volt power supply.

NOTE

The hub should also be connected to 12 Volts in the case of a 24-Volt bow thruster.



6 Configuration of the installation

Both the panels and the bow thruster / stern must be configured correctly.

6.1 Configuring the bow and / or stern thruster

Bow thruster

If only one (1) bow thruster is installed configuration is not necessary.

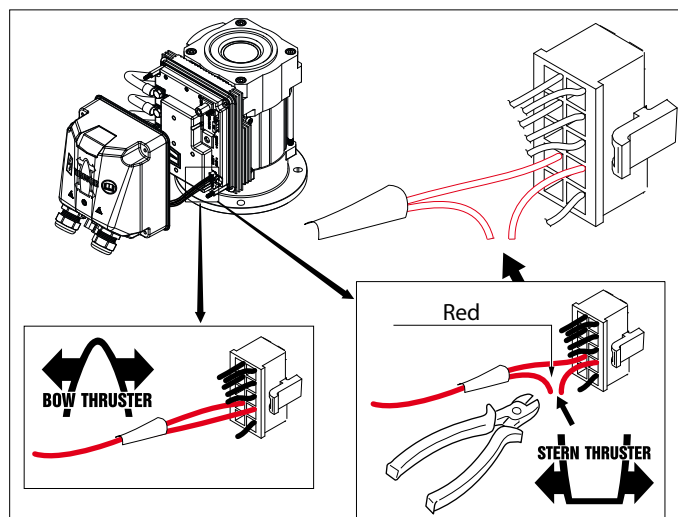
Stern thruster

If only one (1) stern thruster is installed configuration is not necessary, but consider the stern thruster panels as bow thruster panels when configuring.

Bow thruster + Stern thruster

The default configuration is for use as a bow thruster. Only the configuration of the stern thruster must be adapted.

Configure a stern thruster by cutting the red cable as shown in the drawing.



6.2 Configuring the panels

If several panels are installed configuration is required.

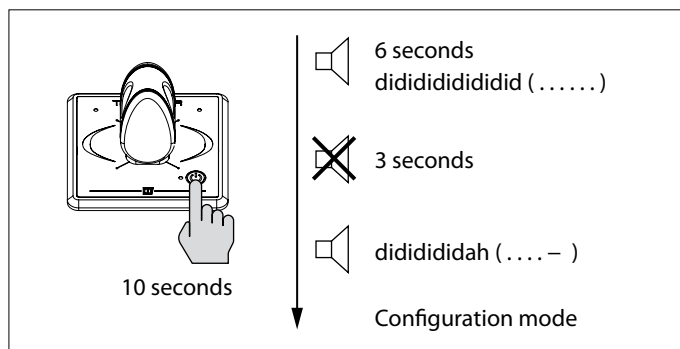
The illustrated operations must be performed on EACH panel installed.

6.3 Place the panel in configuration mode

N.B. The panel must be in the OFF position (if the panel is NOT in the OFF position, first press the On / Off button once to switch the panel to the OFF position).

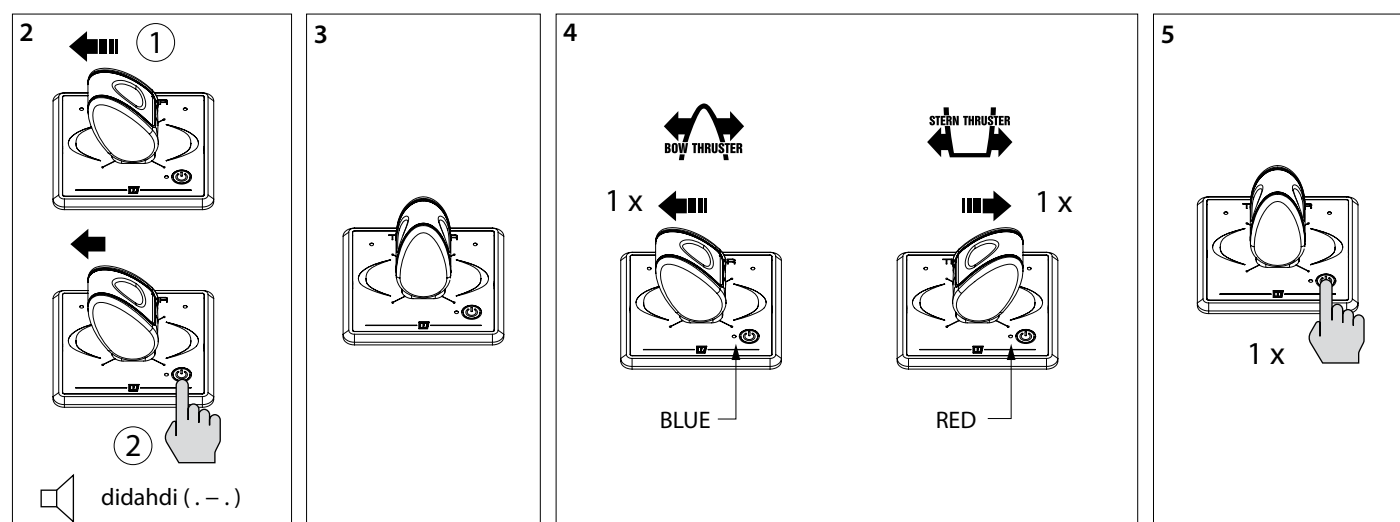
- Press and hold the On / Off button for 10 seconds.

During the first 6 seconds, the buzzer will continuously signal a dididididi (. . .). Keep pressing the On / Off button. After 10 seconds the buzzer sounds the signal dididididah (. . . -). Now the panel is in configuration mode.



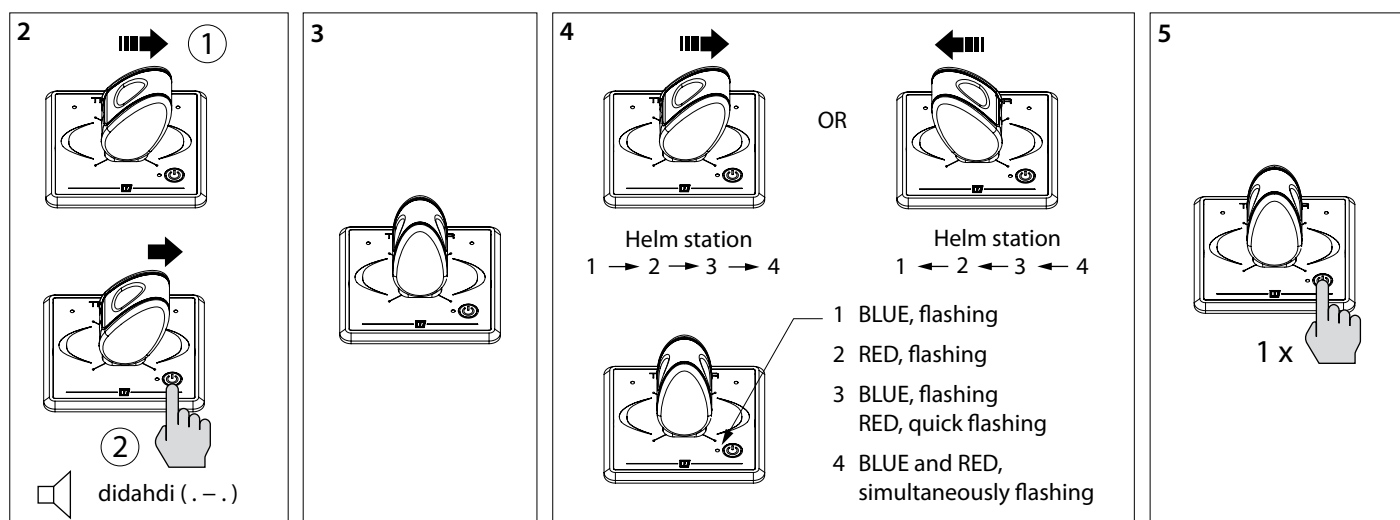
6.4 Configuring a panel for operating a bow thruster or a stern thruster

- Place the panel in configuration mode, see 6.3.



6.5 Configuring a panel for the steering position where the panel is placed

- Place the panel in configuration mode, see 6.3.



NOTE

With a bow and stern thruster panel, together at the same helm station, the helm station number entered must be the same.

7 Test run

Consult the instructions in the owner's manual in '3 Operation' to engage and operate the bow thruster.

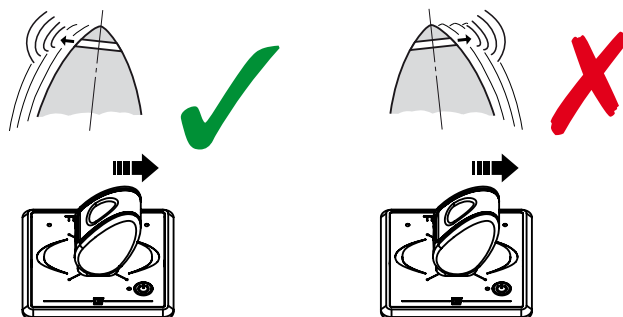


WARNING

Do not test the bow thruster when the boat is out of the water unless you are convinced that everyone is at a safe distance from the propeller tunnel.

If, during the test run, it appears that the movement of the boat is contrary to the direction in which the joystick is moved, reconfigure as follows.

The illustrated operations must be performed on EACH panel installed.



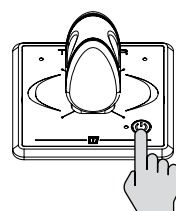
7.1 Changing the thrust direction

1 Place the panel in configuration mode.

N.B. The panel must be in the OFF position (if the panel is NOT in the OFF position, first press the On / Off button once to switch the panel to the OFF position).

- Press and hold the On / Off button for 10 seconds.

During the first 6 seconds, the buzzer will continuously signal a dididididi (. . . .). Keep pressing the On / Off button. After 10 seconds the buzzer sounds the signal dididididah (. . . -). Now the panel is in configuration mode.



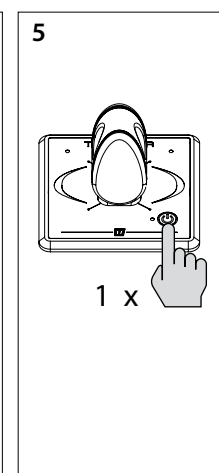
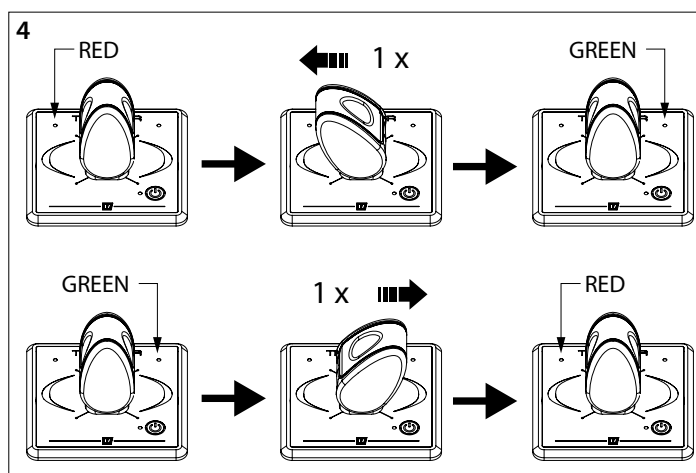
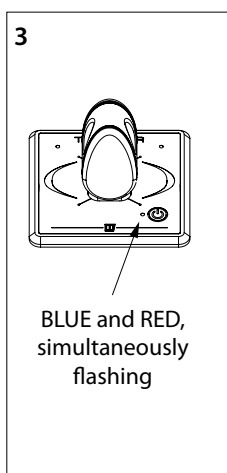
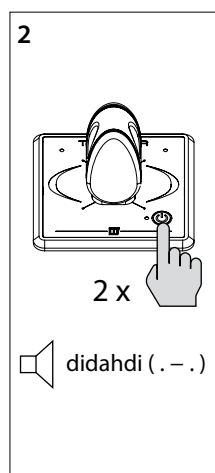
10 seconds

6 seconds
dididididididid (.....)

 3 seconds

dididididah (. . . . -)

Configuration mode



The settings of the thrust direction have been changed and will remain as set even when the voltage supply has been switched off.

8 Hoofdafmetingen

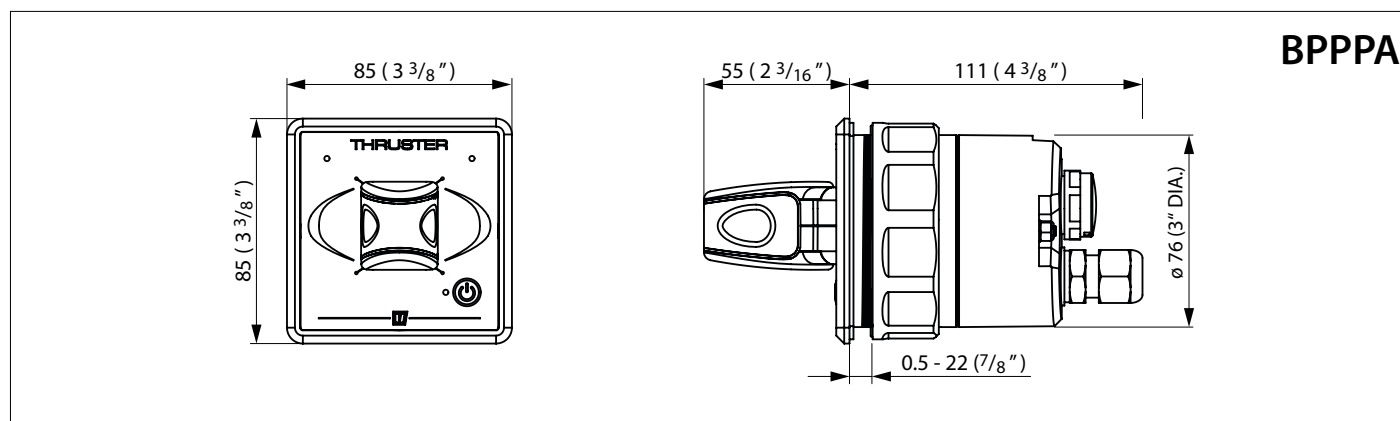
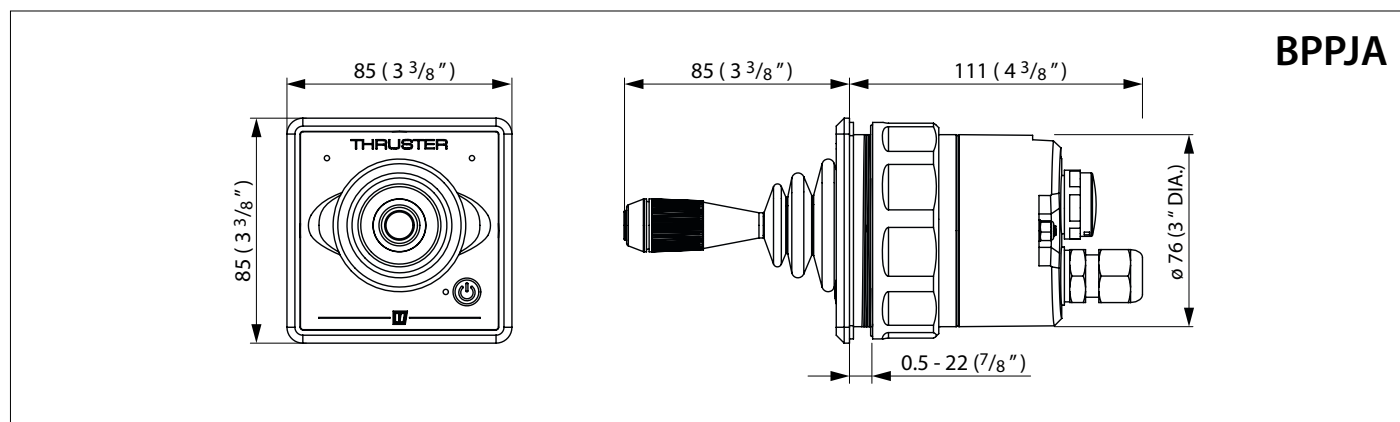
Principal dimensions

Hauptabmessungen

Dimensions principales

Dimensiones principales

Dimensioni principali



Mål

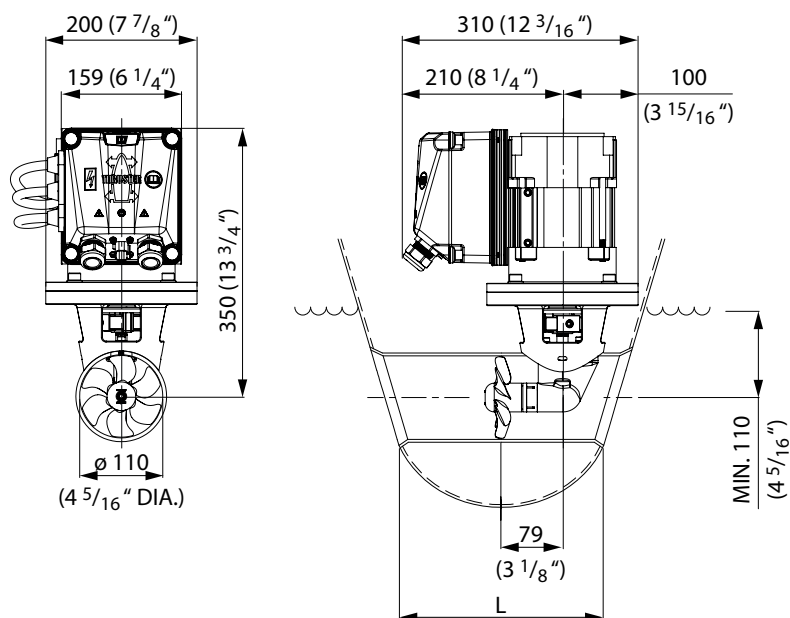
Huvudmått

Viktigste mål

Päämitat

Główne wymiary

BOWA0301



1 : 10

9 Aansluitschema's

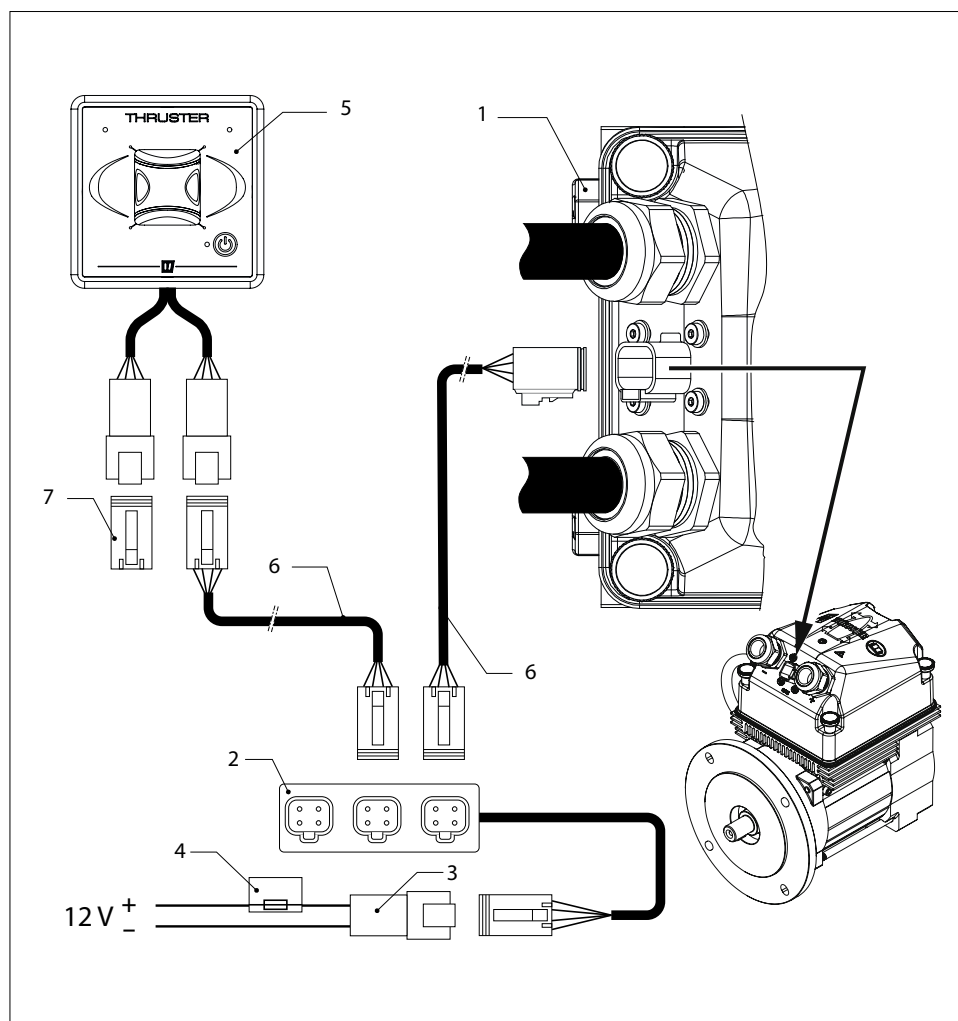
Wiring diagrams

Schaltplan

Diagramas de cableado

Diagrammes de câblage

Schemi Elettrici



Eén boegschroef (of hekschroef),
Eén stuurstand

One (1) thruster (bow or stern),
One (1) helm station

Ein (1) Strahlruder (Bug oder Heck),
Eine (1) Helmstation

Un (1) propulseur (proue ou étrave),
Un (1) poste de barre

Un (1) propulsor (proa o popa),
Una (1) estación de timón

Un (1) propulsore (prua o poppa),
Una (1) plancia di comando

En (1) propel (bov- eller hækepropel)
Én (1) rorstation

En (1) propeller (för eller akter)
En (1) manöver station

Én (1) propell (baugen eller hekk)
En (1) rorkanaler

Yksi (1) potkuri (keula- tai perä-)
Yksi (1) ruoriasema

Jeden (1) pędnik dziobowy (lub
pędnik rufowy), Jedna (1) sterówka

1 Aansluitkast boegschroef (of hekschroef)	Connection box thruster (or stern thruster)	Anschlussbox Strahlruder (Bug oder Heck)
2 Hub	Hub	Hub
3 CAN-bus voeding	CAN-bus supply	CAN-Bus-Versorgung
4 Stuurstroomzekering	Control voltage fuse	Sicherung der Steuerspannung
5 Bedieningspaneel	Control panel	Schalttafel
6 Aansluitkabel	Connection cable	Verbindungskabel
7 Terminator	Terminator	Abschluss

1 Boîtier de connexion du propulseur (proue ou étrave)	Caja de conexión propulsor de proa (o popa)	Scatola di connessione del propulsore (o propulsore di poppa)
2 Moyeu	Concentrador (Hub)	Mozzo
3 Alimentation CAN-Bus	Suministro de bus CAN	CAN-bus di alimentazione
4 Fusible régulateur de tension	Fusible de voltaje de control	Fusibile della tensione di comando
5 Panneau de contrôle	Panel de control	Pannello di controllo
6 Câble de raccordement	Cable de conexión	Cavo di connessione
7 Termineur	Terminador	Terminatore

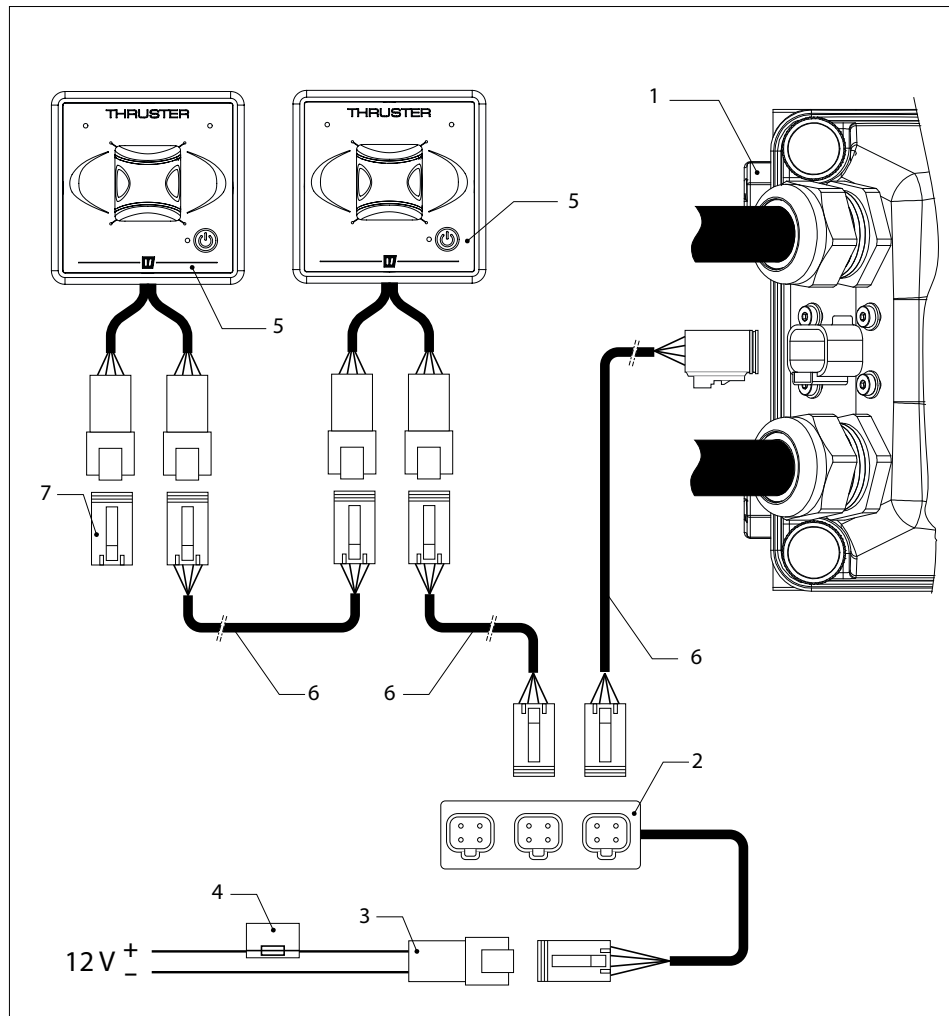
Strømskemaer

Kopplingsscheman

Koblingsskjemaer

Kytkentäkaaviot

Schemat okablowania



Eén boegschroef (of hekschroef),
Twee stuurstanden

One (1) thruster (bow or stern),
Two (2) helm stations

Ein (1) Strahlruder (Bug oder Heck),
Zwei (2) Helmstationen

Un (1) propulseur (proue ou étrave),
Deux (2) postes de barre

Un (1) propulsor (proa o popa),
Dos (2) estaciones de timón

Un (1) propulsore (prua o poppa),
Due (2) plance di comando

En (1) propel (bov- eller
hækpropel) To (2) rorstationer

En (1) propeller (för eller akter)
Två (2) manöverstationer

Én (1) propell (baugen eller hekk)
To (2) rorkanaler

Yksi (1) potkuri (keula- tai perä-)
Kaksi (2) ruoriasemaa

Jeden (1) pędnik dziobowy (lub
pędnik rufowy), Dwie (2) sterówki

1	Propellens klemkasse (eller hækpropel)	Anslutningsbox propeller (eller akterpropeller)	Tilkoblingsboks for propell (eller hekkthruster)
2	Nav	Hubb	Hub
3	CAN-busforsyning	CAN-bus tilførsel	CAN-bus tilførsel
4	Styrespændingssikring	Kontroll spänning säkring	Sikringskontroll for spenning
5	Betjeningspanel	Kontrollpanel	Kontrollpanel
6	Tilslutningskabel	Anslutningskabel	Tilkoblingskabel
7	Impedansmodstand	Terminator	Terminator

1	Potkurin (tai peräpotkurin) liitäntärasia	Skrzynka przyłączeniowa pędnika dziobowego (lub pędnik rufowy)
2	Keskitin	Koncentrator
3	CAN-väylän syöttö	Zasilanie magistrali CAN
4	Ohjausjännitteen sulake	Bezpiecznik sterowania
5	Ohjauspaneeli	Panel sterowania
6	Kytkentäkaapeli	Kabel przyłączeniowy
7	Terminaattori	Terminator

Eén boegschroef EN één hekschroef, Eén stuurstand

Thrusters (bow AND stern), One (1) helm station

Ein Bugstrahlruder UND ein Heckstrahlruder,
Eine (1) Helmstation

Une hélice d'étrave ET une hélice de poupe,
Un (1) poste de barre

Un propulsor de proa Y un propulsor de popa,
Una (1) estación de timón

Un'elica di prua E un'elica di poppa,
Una (1) plancia di comando

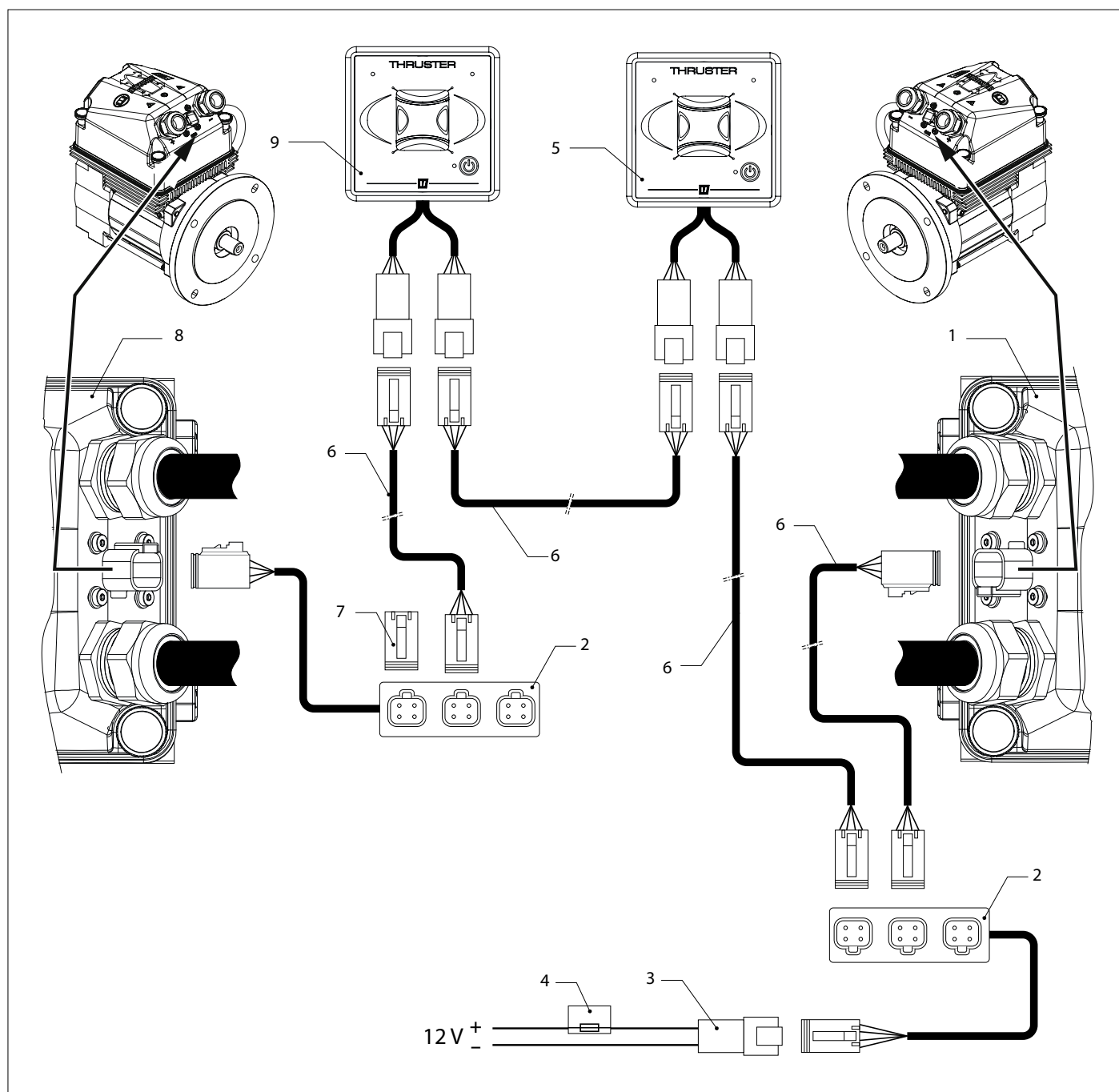
En bovpropel OG en hækpropel,
Én (1) rorstation

En bogpropeller OCH en akterpropeller,
En (1) manöverstation

Én baugpropell OG én hekkthruster,
En (1) rorkanaler

Keulapotkuri JA peräpotkuri,
Yksi (1) ruoriasema

Jeden pędnik dziobowy ORAZ jeden pędnik rufowy,
Jedna (1) sterówka



1	Aansluitkast boegschroef	Connection box bow thruster	Verbindingsbox von Bugstrahlruder
2	Hub	Hub	Hub
3	CAN-bus voeding	CAN-bus supply	CAN-Bus-Versorgung
4	Stuurstroomzekering	Control voltage fuse	Steuerstrom Sicherung
5	Bedieningspaneel boegschroef	Control panel bow thruster	Bedienfeld von Bugstrahlruder
6	Aansluitkabel	Connection cable	Verbindungskabel
7	Terminator	Terminator	Abschluss
8	Aansluitkast hekschroef	Connection box stern thruster	Verbindingsbox Heckstrahlruder
9	Bedieningspaneel hekschroef	Control panel stern thruster	Bedienfeld von Heckstrahlruder

1	Boîtier de connexion du propulseur à étrave	Caja de conexión propulsor de proa	Scatola di connessione del propulsore di prua
2	Moyeu	Concentrador (Hub)	Scafo
3	Alimentation CAN-bus	Alimentación del CAN-bus	Alimentazione CAN-bus
4	Fusible régulateur de tension	Fusible de tensión de control	Fusibile della tensione di comando
5	Panneau de commandes du propulseur d'étrave	Panel de control propulsor de proa	Pannello di controllo del propulsore di prua
6	Câble de raccordement	Cable de conexión	Cavo di collegamento
7	Terminateur	Terminador	Terminatore
8	Boîtier de connexion du propulseur de proue	Caja de conexión propulsor de popa	Scatola di connessione del propulsore di poppa
9	Panneau de commandes du propulseur de proue	Panel de control propulsor de popa	Pannello di controllo del propulsore di poppa

1	Bovpropellens klemkasse	Kopplingsbox bogpropeller	Koblingsboks for baugpropell
2	Nav	Hubb	Hub
3	CAN-busforsyning	CAN-bus tilførsel	CAN-bus tilførsel
4	Styrespændingssikring	Kontroll spänning säkring	Sikringskontroll for spenning
5	Betjeningspanel til bovpropel	Kontrollpanel bogpropeller	Kontrollpanel for baugpropell
6	Tilslutningskabel	Anslutningskabel	Tilkoblingskabel
7	Impedansmodstand	Terminator	Terminator
8	Hækpropellens klemkasse	Kopplingsbox akterpropeller	Koblingsboks for hekkthruster
9	Betjeningspanel til hækpropel	Kontrollpanel akterpropeller	Kontrollpanel for hekkthruster

1	Keulapotkurin liitäntärasia	Skrzynka przyłączeniowa pędnika dziobowego
2	Keskitin	Koncentrator
3	CAN-väylän syöttö	Zasilanie magistrali CAN
4	Ohjausjännitteen sulake	Bezpiecznik sterowania
5	Keulapotkurin ohjauspaneeli	Panel sterowania pędnik dziobowy
6	Kytentäkaapeli	Kabel przyłączeniowy
7	Terminaattori	Terminator
8	Peräpotkurin liitäntärasia	Skrzynka przyłączeniowa pędnik rufowy
9	Peräpotkurin ohjauspaneeli	Panel sterowania pędnik rufowy

Eén boegschroef EN één hekschroef.

Twee stuurstanden. Het schema kan worden uitgebreid tot maximaal vier (4) stuurstanden.

Thrusters (bow AND stern).

Two (2) helm stations. The diagram can be extended to up to four (4) helm stations.

Ein Bugstrahlruder UND ein Heckstrahlruder.

Zwei (2) Helmstationen. Das Diagramm kann auf bis zu vier (4) Helmstationen erweitert werden.

Une hélice d'étrave ET une hélice de poupe.

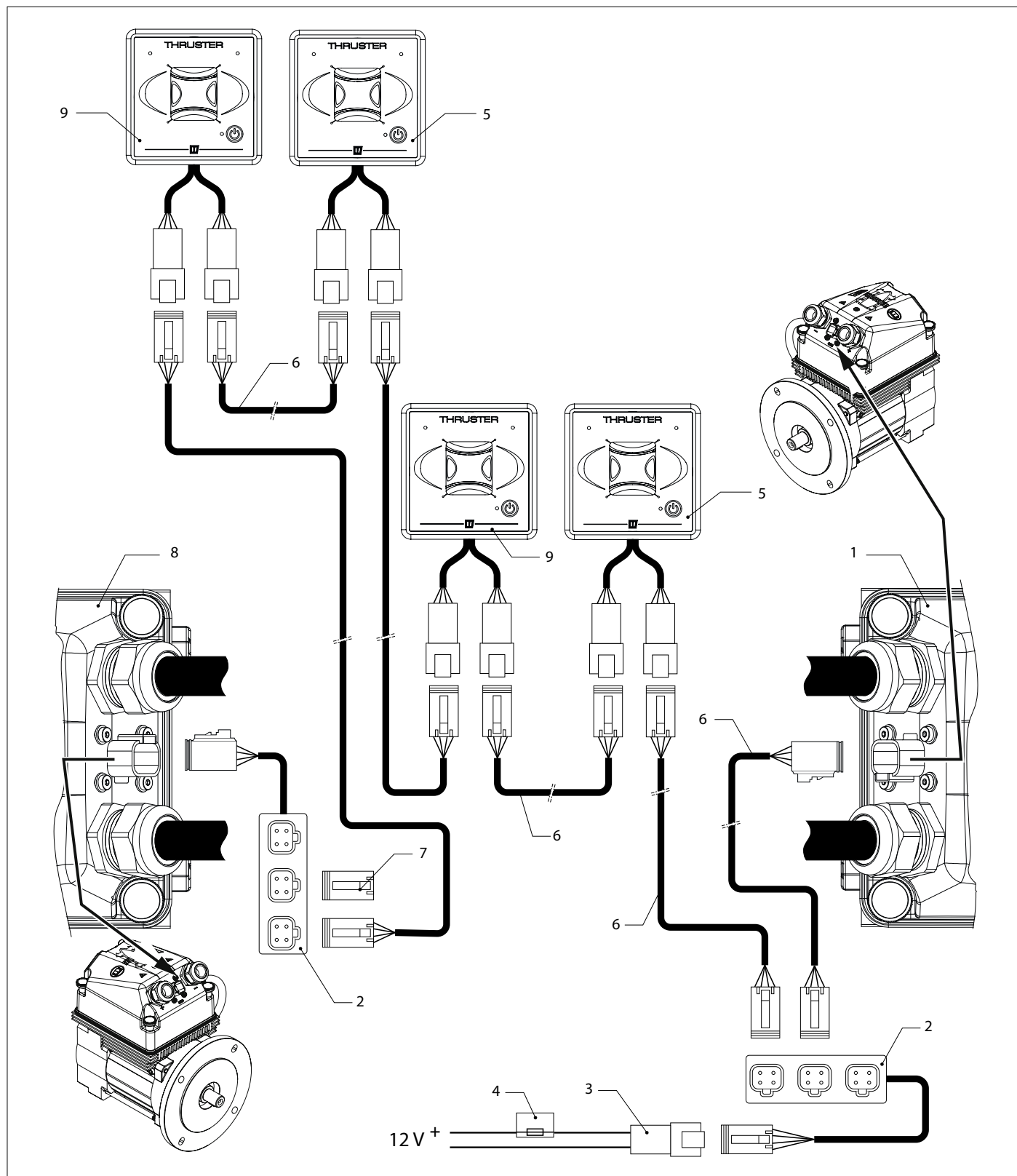
Deux (2) postes de barre. Le diagramme ci-dessus peut être étendu à quatre (4) postes de barre.

Un propulsor de proa Y un propulsor de popa.

Dos (2) estaciones de timón. El diagrama anterior puede ampliarse hasta cuatro (4) estaciones de de timón.

Un'elica di prua E un'elica di poppa. Due (2) plance di

comando. Lo schema di cui sopra può essere esteso a un massimo di quattro (4) plance di comando.



En bovpropel OG en hækepropel.

To (2) rorstationer. Diagrammet ovenfor kan udvides til maks. fire (4) rorstationer.

En bogpropeller OCH en akterpropeller.

Två (2) manöverstationer. Diagrammet ovan kan utökas med upp till fyra (4) manöverplatser.

Én baugpropell OG én hekkthruster.

To (2) rorkanaler. Skjemaet ovenfor kan utvides til opptil fire (4) rorkanaler.

Keulapotkuri JA peräpotkuri.

Kaksi (2) ruoriasemaa. Yllä oleva kaavio voidaan laajentaa enintään neljään (4) ruoriasemaan.

Jeden pędnik dziobowy ORAZ jeden pędnik rufowy, dwie sterówki. Schemat może zostać rozszerzony do maksymalnie czterech (4) sterówek.

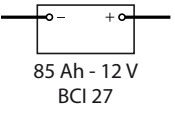
1	Aansluitkast boegschroef	Connection box bow thruster	Verbindungsbox von Bugstrahlruder	Boîtier de connexion du propulseur à étrave
2	Hub	Hub	Hub	Moyeu
3	CAN-bus voeding	CAN-bus supply	CAN-Bus-Versorgung	Alimentation CAN-bus
4	Stuurstroomzekering	Control voltage fuse	Steuerstrom Sicherung	Fusible régulateur de tension
5	Bedieningspaneel boegschroef	Control panel bow thruster	Bedienfeld von Bugstrahlruder	Panneau de commandes du propulseur d'étrave
6	Aansluitkabel	Connection cable	Verbindungskabel	Câble de raccordement
7	Terminator	Terminator	Abschluss	Terminateur
8	Aansluitkast hekschroef	Connection box stern thruster	Verbindungsbox Heckstrahlruder	Boîtier de connexion du propulseur de proue
9	Bedieningspaneel hekschroef	Control panel stern thruster	Bedienfeld von Heckstrahlruder	Panneau de commandes du propulseur de proue

1	Caja de conexión propulsor de proa	Scatola di connessione del propulsore di prua	Bovpropellens klemkasse	Kopplingsbox bogpropeller
2	Concentrador (Hub)	Scafo	Nav	Hubb
3	Alimentación del CAN-bus	Alimentazione CAN-bus	CAN-busforsyning	CAN-bus tillförsel
4	Fusible de tensión de control	Fusibile della tensione di comando	Styrespændingssikring	Kontroll spänning säkring
5	Panel de control propulsor de proa	Pannello di controllo del propulsore di prua	Betjeningspanel til bovpropel	Kontrollpanel bogpropeller
6	Cable de conexión	Cavo di collegamento	Tilslutningskabel	Anslutningskabel
7	Terminador	Terminatore	Impedansmodstand	Terminator
8	Caja de conexión propulsor de popa	Scatola di connessione del propulsore di poppa	Hækpropellens klemkasse	Kopplingsbox akterpropeller
9	Panel de control propulsor de popa	Pannello di controllo del propulsore di poppa	Betjeningspanel til hækepropel	Kontrollpanel akterpropeller

1	Koblingsboks for baugpropell	Keulapotkurin liitäntärasia	Skrzynka przyłączeniowa pędnika dziobowego
2	Hub	Keskitin	Koncentrator
3	CAN-bus tilførsel	CAN-väylän syöttö	Zasilanie magistrali CAN
4	Sikringskontroll for spenning	Ohjauksen jännitteen sulake	Bezpiecznik sterowania
5	Kontrollpanel for baugpropell	Keulapotkurin ohjauspaneeli	Panel sterowania pędnik dziobowy
6	Tilkoblingskabel	Kytentäkaapeli	Kabel przyłączeniowy
7	Terminator	Terminaattori	Terminator
8	Koblingsboks for hekkthruster	Peräpotkurin liitäntärasia	Skrzynka przyłączeniowa pędnik rufowy
9	Kontrollpanel for hekkthruster	Peräpotkurin ohjauspaneeli	Panel sterowania pędnik rufowy

10 Accucapaciteit, accukabels
Battery capacity, battery cables
Akkukapazität, Akkukabel
Capacité de la batterie, câbles de batterie
Capacidad de las baterías, cables de baterías

Capacità della batteria e cavi della batteria
Batteriets kapacitet, batterikabler
Batterikapacitet, batterikablar
Batterikapasitet, batterikabler
Akkukapasiteetti, akkukaapelit
Pojemność akumulatora, kable akumulatora

Boegschroef	Toe te passen accu('s)	Totale lengte plus- en min-kabel	Draaddoor-snede	Zekering	
	Minimaal			'traag'	Vetus art. code
Bow thruster	Battery capacity required	Total length of plus- and minus cable	Cable cross-section	Fuse	
	Minimum			'slow blow'	Vetus art. code
Bugschraube	Zu verwendende Akkus	Gesamtlänge Plus- und Minuskabel	Draht-durchschnitt	Sicherung	
	Minimum			'träge'	Artikelnummer
Hélice d'étrave	Batterie(s) à utiliser	Longueur totale des câbles plus et moins	Diamètre du câble	Fusible	
	Minimum			'lent'	code d'art. Vetus
Hélice de proa	Batería(s) a aplicar	Largo total cable positivo y negativo	Diámetro de hilo	Fusible	
	Mínimo			'lento'	Código de art. Vetus
Elica	Batteria(e) da usare	Lunghezza totale cavo positivo e negativo	Diametro cavi	Fusibile	
	Minimo			'a tempo'	Vetus codigo art.
Bovpropel	Batterikapacitet	Total længde af positiv og negativ batterikabel tilsammen	Tråddiameter	Sikring	
	Min.			'træg'	Vetus artikelnr
Bogpropeller	Lämpligt batteri	Total längd kabel till plus- och minuspol	Kabelns dimension	Säkring	
	Min.			'trög'	Vetus artikelnr
Baugpropell	Nødvendig batterikapacitet	Total lengde pluss- og minus-kabel	Ledningtsverrsnitt	Sikring	
	Min.			'treg'	Vetus art. kode
Keulapotkuri	Vaadittava akkukapasiteetti	'Miinus'- ja 'plus'-kaapeleiden kokonaispituudet	Kaapelikoko	Sulake	
	Minimi			hidas	Vetus koodi
Pędnik dziobowy	Wymagana pojemność akumulatora	Całkowita długość kabla dodatniego i ujemnego	Przekrój kabla	Bezpiecznik	
	Minimalna			'zwłoczny'	Nr kat. Vetus
BOWA0301 30 kgf - 12 V		0 - 12 m	35 mm ²	200 A	ZE200
		0 - 38 ft	AWG 2		



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