Electric propulsion systems

Manual

Propulsion systems

V1.1
01/04/2024

Contents

Attachments

1 General

1.1 Purpose of this User Guide

The purpose of this manual is to ensure the safe use of the Arka drive system for the application for which it is intended. The drive is hereinafter also referred to as the word motor or system.

The manual must always be available and must be kept within easy reach near the engine. Any person operating the engine should first read this manual. This also applies to transport, set-up and installation, as well as to (dis)assembly work.

In the case of professional use, local or national guidelines, standards and laws must also be observed.

Additional information not included in this manual is available from the manufacturer or supplier.

2 Safety

2.1 General

This user manual is an integral part of the product. You must ensure that this manual is always available with the engine and that the operator takes note of it.

The manual should be supplemented by instructions for use based on existing national regulations for the prevention of accidents and for the protection of the environment, including the information on monitoring and reporting obligations for compliance with details.

In addition to the operating instructions and accident prevention regulations in force in the country of use and at the place of application, the recognised technical rules for safety and professional work must also be observed.

2.2 Instructions for pictures and symbols

The engine is produced according to generally accepted rules and using the latest state of the art. In order to ensure sufficient safety, additional safety instructions are provided. If this is strictly followed, the system is handled in a sufficiently safe manner.

In several places, it is necessary to emphasise certain safety texts with warning symbols. Each of these has a specific meaning:

Indication!

Notes provide additional information for safe and efficient handling of the system.

Please note!

This warning symbol indicates a material risk of damage caused by improper action or failure to observe the required safety measures. Observe all warnings and measures that may prevent damage to the system or environment. Always trade very cautiously.

Danger!

This warning symbol indicates the risk of injury, which can occur in the event of improper handling or if the required safety precautions are not observed.

Heed all warnings and measures that may prevent injury to yourself or third parties. Always trade very cautiously.

2.3 Expertise of staff

Only qualified personnel are allowed to deal with the installation in any way. Powers for operation and for installation/maintenance must be strictly separated.

The definition of qualified personnel is used in this manual as follows: those who are fully familiar with the set-up, installation, commissioning, use, maintenance, decommissioning and dismantling of this system and who also have a general legal capacity regarding the work they perform.

The installation, commissioning, maintenance and dismantling of the engine may only be carried out by authorised and qualified electrical technicians.

In the case of trained electrical professionals, it must be assumed that the relevant regulations and the safety tips of the regulations laid down by the industrial accident insurance (e.g. BGV A2) are observed and complied with. This also applies to all rules for safe and professional work (e.g. DIN VDE 100 and IEC 664 or DIN VDE 0110).

The manufacturer and supplier expressly disclaim any form of liability for damages, operational disruption or any form of consequential damage caused by ignoring this manual.

2.3.1 Professional use

In addition, in the case of professional deployment:

- The operator must be familiar with the operating process and how to use the system through special instructions or training.
- Only designated qualified personnel may carry out work on the system.

2.4 Intended Use

The system is intended exclusively for powering ships. Make sure you are sufficiently informed in advance about the expected performance. For the intended use, the information on the place of installation (see paragraphs 2.5 and 5.2), the data on any type of plate and the technical data (see Annex) must be observed and complied with.

Risk of injury!

risk of serious injury and property damage in the event of:

- Improper use or incorrect operation.
- Unauthorized and unauthorized access to the system.
- Incorrect installation or improper maintenance and repair.

All instructions for use for which intended, residual risk, installation, use and maintenance must be followed at all times.

The engine may only be used with the applications specified in the manual and the technical description. In addition, only accessories or components recommended and approved by the manufacturer should be used.

All other or superior applications are considered improper use. The operator or user of the engine is fully liable for any damage resulting from this.

2.5 Safety instructions for set-up and installation

First, check that the delivery is complete. Please contact the supplier immediately if anything is missing.

The installation site must be protected from the weather and requires a dry place.

The ambient temperature should not be below 0°C or above 40°C. Heat build-up in the engine room, e.g. due to heat sources, or blocking of the ventilation slots, must be excluded.

The installation site must be adequately ventilated so that warm air can escape, and cold air can be supplied.

Excessive dust must not be generated in the installation area. Completely exclude the occurrence of conductive substances (soot, metals).

No fluids should enter the engine.

Avoid any unacceptable load. Especially during transport and maintenance, the risk of damage to parts must be avoided. Always avoid contact with and vibration of electronic components.

The motor contains electrostatically sensitive parts that can be damaged or interfered with in their operation if handled improper, prevent malfunction or mechanical damage to electrical components.

The fixed electrical installation (cable gauges, fuses, earthing) must be installed in accordance with the applicable regulations and by a certified installer.

For the electrical installation, the power data of the motor must be compared with the power data of the power connections. The motor must be protected against contact with incorrect voltages and polarity reversal.

Never place motor and regulator against each other to avoid unwanted heating.

2.6 Safety instructions for use and operation

The engine may only be used in a technically flawless condition and only for its intended purpose, with awareness of safety and risks, and in compliance with this manual. In particular, faults with a safety hazard must be rectified immediately.

The permissible battery voltage data must be checked and observed before connecting the cable. The connection of cables and battery to the correct terminals must be ensured.

When sailing (if you are using an outboard motor), lay the cables in such a way that no one can trip over them and that the operation is not interrupted by pulled plugs. If the plugs are pulled off while sailing, there is a real risk of fire and explosion due to the formation of sparks.

In the event of changes to the motor or controller that could pose a safety hazard, the system must no longer be used, and the hazard must be eliminated immediately.

2.7 Safety instructions in case of malfunction and maintenance

Contact the supplier or manufacturer before opening the enclosure for servicing or repair.

Before starting maintenance or repair work, the system must be disconnected from the battery voltage. After switching off, wait at least five minutes before opening hoods and housings.

No modifications to installation or installation may take place without the permission of the manufacturer or supplier. This also applies to the installation and adjustment of safety devices. Care must be taken not to reduce distances, creep current and airways.

Replacement parts must meet the manufacturer's technical requirements. This is always the case when using original parts.

3 Product description

3.1 Product Description & Features

The system is intended exclusively for propulsion of ships. Depending on the preset program, functionalities can be made suitable for certain types of ships (ask your supplier).

The system contains an adjustable high-frequency power unit, with microprocessor-controlled electronics and a diagnostic light (LED). This diagnostic LED gives a flashing code in the event of a malfunction. The explanation of this is given in chapter 6.9, malfunctions and error messages. For the Arka 700 systems, you can find the explanation in chapter 6.8.

The control unit, main relay and fuses are built in a stable sheet steel housing. For connection, the box is equipped with a cable opening. If desired, the cables can be fitted with a plug.

The sound pressure level of an Arka system is less than 70 dB(A).

3.2 Serial number designation

Serial Number: 01 35 001

01— Year of Build 35— Power/ 100 001—Serial Number

For the exact details of the engine, please contact your supplier.

3.3 Description of accessories and functions (depending on system type)

3.3.1 Key switch

Depending on the system type, it is equipped with an ignition switch. This ignition switch always shows battery voltage, unless it is a high voltage (>80VDC) system, in which case this voltage is 24VDC.

3.3.2 Joystick

The system is equipped with a joystick with a potentiometer. These are sometimes equipped in combination with microswitches (see circuit diagram inside the housing).

3.3.3 Battery monitor

Included in the system is a battery monitor that displays voltage, current, ampere-hour and remaining sailing time. For further information, please refer to the manual of this monitor.

As an option, the standard version of the system can be expanded with an HMI display. For further information, see Chapter 6.1.1, Product Description.

3.4 Other risks

Warning of dangerous electrical voltage!

The drive is an electrical work equipment with sometimes voltage and currents that can be dangerous to humans. The system may therefore only be opened, repaired or dismantled by a qualified electrician. Always disconnect the mains plug from the socket and disconnect the battery before carrying out any work on the system.

Explosion!

Explosive gases can be generated when batteries are charged. The use of a charger is therefore only permitted in well-ventilated areas.

Never pull out the battery plug while charging. This can create sparks that can ignite the (bang) gas. Sealed batteries can also be blown off via a pressure relief valve.

Risk of tripping over charging cables!

Uncoiled charging cables pose a tripping hazard with the risk of injury and interruption of the charging process due to the plugs being pulled apart. There is a risk of sparks with a risk of fire and explosion.

When connecting shore power, lay the cables in such a way that no one can trip over them. After charging, store the cables neatly.

Please note!

When an incorrect battery is connected to the charger, damage to the system, battery and/or environment may occur. The battery can start to gas, boil over, and even explode!

Always check that the charger is set to the battery type to be charged. If in doubt, contact qualified specialists.

Please note!

When the battery is charged, corrosive acid fumes may be generated. These can cause a short circuit in electrical appliances (risk of fire) and corrode components! For this reason, do not place the charger in the battery compartment and ensure that there is sufficient distance between the charger and the battery, so that rising gases and vapours can merge unhindered into the freely ventilating ambient air.

3.5 Description of the protections

The Arka system is designed and built according to the recognized rules of technology. Therefore, during normal operation, there is no danger to the health of the operating personnel or others.

All live parts are housed in a housing/cover that can only be removed with the help of tools. All cables and plugs are adequately insulated or earthed. The enclosure complies with protection class IP 43 at least. All electrical or electronic components have the CE mark; All necessary isolation distances have been applied. All switching circuits are fused with primary and secondary fuses with certain amperage and action characteristics.

Please note!

parts must be earthed (especially in the case of metal ships).

4 Transport, maintenance and storage

The system is delivered packed in a box.

For transport, maintenance and storage, any instructions on the box must be followed.

Protect from the weather!  Fragile!  Above! 

5 Set-up, installation and commissioning

5.1 Delivery of components Inboard system

The delivery consists of at least the following parts:

- Cabinet with controller with preset program.
- Motor with shaft coupling - battery/motor cables and charging cable.
- This user manual (downloadable from the Arka site).
- A diagram (located in the closet door).
- A delivery note.

Depending on the customer order, the scope of delivery or its execution may vary. Additional technical data can be found in the supplied delivery note (as well as on the order confirmation).

Before commissioning, always check the connections and tighten them if necessary.

5.2 Supply of components Outboard system

The delivery consists of at least the following parts:

- Motor with propeller.
- This user manual (downloadable from the Arka site).
- A diagram (this is in the engine).
- A delivery note.

Depending on the customer order, the scope of delivery or its execution may vary. Additional technical data can be found in the supplied delivery note (and on the order confirmation).

 ***Before commissioning, always check the connections and tighten them if necessary.***

5.3 Requirements for the operating environment of the system

The system should only be installed in a well-ventilated room with a maximum ambient temperature of 40°C. The arrangement should be chosen in such a way that ventilation openings are not covered, and cooling air can flow through unhindered. Do not place the system in the immediate vicinity of heat sources such as open flames. Smoking is prohibited in the battery compartment.

5.4 Installation

Warning of dangerous electrical voltage and short circuit!

The system is an electrical work equipment with voltage and currents that can be dangerous to humans. The system may therefore only be operated by an instructed and trained worker. The system must therefore only be installed, opened, repaired or dismantled by a qualified electrician.

• Make sure the fuses are in accordance with the following table:

According to DIN table on conductor cross-section, maximum permissible current and maximum fuse value.

Diameter (mm 2)	Max. Current	Max. Fuse
0.75	15	10
1	19	10
1.5	24	20
2.5	32	25
4	42	35
6	54	50
10	73	63
16	98	80
25	129	100
35	158	125
50	198	160
70	245	200
95	292	250
120	344	315

Lower fuse values may be applied.

Check the diagram for the correct installation value or replacement value!

5.5 Inboard systems

During assembly

- Always make sure that the engine is properly and in the right place in the boat before sailing or trailering.
- Always attach the motor without the battery connected to the system The motor must not be able to run unexpectedly.
- Make sure the propeller shaft and motor are properly adjusted.
- A flexible coupling or CV joint with thrust bearing must be fitted between the engine and the propeller shaft (check with your supplier).
- Make sure that the propeller shaft, propeller and motor can always rotate freely and unhindered by obstacles.

While cruising

- Keep your sight on the point where you want to go, and make sure to stay away from shallow water, rocks, and debris floating in the water.
- Always stop the motor and disconnect it from the power before removing any debris from the propeller.
- Do not operate the engine if the cabling shows signs of heating or damage.
- Become familiar with the area where you will be sailing.
- If you are going to work on the motor, always disconnect the battery.

5.6 Outboard systems

During assembly

- Always make sure that the engine is properly and in the right place behind or under the boat before sailing or trailering.
- Always attach the motor without the battery being connected to the motor. The engine must not be able to run unexpectedly.
- Make sure you have the right height and angle adjustment before you start sailing.
- Make sure that the propeller can always rotate freely and unhindered by obstacles.

While cruising

- Keep your sight on the point where you want to go, and be sure to stay away from shallow water, rocks, and debris floating in the water.
- Always stop the motor and disconnect it from the battery before removing any debris from the propeller.
- Do not operate the system if the cabling shows signs of heating or damage.
- Become familiar with the area where you will be sailing.
- If you are going to work on the motor or propeller, always disconnect the battery.

5.7 Setup and installation of charging system

For the setup and installation of the charging system, please observe the following:

Warning of dangerous electrical voltage!

Please note! Risk of fire and explosion!

Improper installation or the wrong type of charger can cause a fire or explosion.

Connect the charging plug to the battery in the correct terminal direction.

Choose the correct type of charging plug and consider the instructions provided by the supplier. Pay particular attention to the permissible amperage of the charging plug.

Carry out the assembly according to the professional electrotechnical standards and the data of the charger supplier. Observe the installation instructions from the charger's user manual.

Please note!

Connecting an unauthorised battery to the battery charger may cause material damage to the battery and the charger. As a result, damage to the system may occur.

As an operator or as a responsible service personnel, exclude any possibility of mix-up by the system operator when the vessel's batteries are connected!

- Note the corresponding battery type on the front of the housing according to the installed charging plug and a preset charging program!

- Also note a subsequent change to the charging program on the front of the case. Also make a note if the actual rated amperage (I) is set to a lower value than stated on the rating plate.

5.8 Battery Setup and Installation

When setting up and installing the battery, please observe the following:

Warning of dangerous electrical voltage!

Please note! Risk of fire and explosion!

Improper installation or the wrong type of battery can cause a fire or explosion.

Connect the battery to the system with the correct terminal direction.

Choose the correct type of battery plug and consider the manufacturer's instructions. Pay particular attention to the permissible amperage of the battery plug!

Carry out the assembly according to the professional electrotechnical standards and the data of the battery supplier. Observe the installation instructions from the battery user manual.

Always insert the main fuses only after checking all connections!

Please note!

The battery compartment is only intended for setting up a battery.

Make sure the battery compartment is adequately ventilated.

Do not insert fuses and/or other breakers into the battery compartment.

Connecting an unauthorized battery to the battery charger or the system may cause material damage to the battery, the battery charger and the system!

As an operator or as a responsible service personnel, exclude any possibility of mix-up by the vessel driver when the vessel's batteries are connected!

5.9 Commissioning and performance test

After installation and setup, the system is ready. However, a functional test must first be carried out before you can release the system for use. To do this, proceed as described in chapter 6 "Operation".

In the case of a system with a nominal voltage of lake than 50 Volt DC, an insulation meter is supplied as standard.

Carry out an insulation test before commissioning! (Press the test button for 3 sec.)

If the system is equipped with an insulation meter, you will find the manual for this in the installation cabinet.

6 Service

The system is an electrical work equipment with voltage and currents that can be dangerous to humans. The system may therefore only be operated by instructed persons who have read this manual.

Operating the system usually consists of the following steps:

- Check that the ship is in the right condition to start sailing.
- Check that the battery is charged.
- Then disconnect the mains plug from the shore power.
- Operate the system by means of the ignition switch or by connecting the plug.
- Try the system before detaching the lines.

Before operating the system for the first time, these paragraphs should be read carefully.

6.1 Description of the Battery Display Unit (BDI)

Most Arka systems are equipped with a battery monitor. This monitor allows the user to assess the state of charge of the installed battery.

The monitor displays the following values:

- Spanning (V)
- Current (A)
- Capacity consumed (Ah.)
- Remaining sailing time in hours and minutes
- Percentage state of charge (%)

Please read the corresponding manual before use and operation. You can download this manual on www.arka.nl or ask your supplier.

6.1.1 Clearview monitor (option)

When an HMI monitor is included in the system, it is possible to read the following values in addition to the above data:

- Speed
- Couple
- Direction of rotation
- Rudder position
- Temperature of the engine
- Temperature of the controller
- Operating hours

For all possibilities, some will appear on the splash screen and others in child screens. For further details about the possibilities of these options, please refer to your supplier.

6.2 Connecting the battery charger to the mains.

Warning of dangerous electrical voltage!

Make sure that the values of the supply voltage correspond to the data from the system.

If the charger is equipped with mains plug, plug it into the wall socket. The device is now ready for operation.

The mains connection with a charging plug is described below. Keep in mind that charging starts automatically as soon as the battery is plugged in.

Connect the charger as follows:

- Lay out the charging cables in such a way that no one can trip over them or interrupt the charge.
- Plug the plug into the corresponding shore power plug. After this, the charging process will automatically begin.

6.3 Loading process

When the battery is charged, corrosive acid fumes may be generated. These can cause a short circuit in electrical appliances (risk of fire) and damage components. This is one of the reasons why the battery should not be placed underneath or at a sufficient distance from the charger, so that rising gases and vapours can merge unhindered into the freely ventilating ambient air.

Explosion!

When an incorrect battery is connected to the charger, damage to the charger, battery and environment may occur. The battery can start to gas, boil over, and even explode!

6.4 Automatic start of charging process

A charging process starts automatically when:

- The charger is connected to the mains power supply.
- The battery voltage is at least 5 Volts DC for single-phase devices (mains connection 230 V AC) and at least 24 Volts DC for three-phase devices (mains connection 3x400 V AC).
- The stop/start button is not pressed.

6.5 Interrupting the charging process.

A charging process must run without interruption. However, it may be necessary to interrupt charging for some reason. However, pay close attention to:

Explosion!

If a battery charge is interrupted, there is a risk of injury and property damage. When disconnecting the plugs, sparks may occur, which can cause the blast gas created during the charge to explode. Therefore, always use the on/off button first if a charge needs to be interrupted. Only then can you disconnect the mains plug from the mains if necessary.

Indication!

, a charging process should not be terminated prematurely. Premature shutdown will result in inadequate charging of the battery. As a result, the available capacity of the battery is reduced.

6.6 Automatic end of the charging process

The charging process is automatically terminated upon completion of the charging program, i.e. when the battery is fully charged. Then the charging status light lights up green and the LED charging ends. The battery can then be used freely.

In addition, the battery monitor will show 100% state of charge in this case.

6.7 Disabling the system.

By disabling the ignition switch or disconnecting the battery plug, the system will shut down.

6.8 Error and warning indication Arka 700 systems

The diagnostic LED is located on the control and provides immediate information about a fault situation. The diagnostic LED does not light up when there are no faults and also not when the control, main fuse or relay control is defective. If the LED flashes, an error has been detected. You can tell by the number of blinks what that error means:

Use the table below to identify the error by the number of times the LED flashes.
The blinking pattern will be recognizable as follows (3 x excel – off – 3 x shine etc.). Possible recovery procedures are listed in the right-hand column.

LED flashes	Mistake	Remediation action
0 x blink	System is Ok / Faulty	If it doesn't work check fuses
1 x Flashing	Wrong starting order	Restart
2 x blink	Battery voltage too low	Checking/Charging Batteries
3 flashes	Microprocessor fault	Check wiring/connection
4 flashes	Open motor connection	Check Motor Cables/Carbon Brushes
5 flashes	Faulty control or closure B-	Check B- on engine/control
6 flashes	Potentiometer defective or out of range at start-up	Check that potentiometer is neutral
7 flashes	Temperature too high	Allow the unit to cool down
8 flashes	The engine is already running when the ignition is switched on	Contact dealer
9 flashes	Software Corruption	Contact dealer

In Appendix 7 you can see where the diagnostic LED is mounted. (pg. 25)

6.9 Error and warning indication system (other models)

In the event of a fault in the system, the engine controller will take the following actions:

1 The engine controller protects the operator and the vessel.
2 The motor controller sends an alarm via the CAN bus to the callibrator (or if fitted, the display).
3 The motor controller will flash the LED in a pattern depending on the type of fault and its severity.
4 The motor controller logs the error to be read out later.

Error identification

Here's how to spot the error:

- Check the number of times the LED flashes using the table on the next page to assess what the error is. This gives a possible solution for recovery.
- Connect a calibrator to the CAN bus and check the error.
- Fix the error using the configuration software.

Use the table below to identify the error by the number of times the LED flashes.
The blinking pattern will be recognizable as follows (3 x excel – off – 3 x shine etc.). Possible recovery procedures are listed in the right-hand column.

LED Flashes	Mistake	Seriousness	Condition	Remediation action
0 (off)	Internal hardware fault	RTB	Hardware circuit damaged	Contact Arka
0 (off)	Failsafe hardware fault	RTB	Hardware failsafe not working	Contact Arka
1	Out of configuration range	United States	One or more settings are out of maximum value	Contact dealer
1	Corrupted configuration data	United States	Configuration setting is gone	Contact dealer
2	Boot sequence error	DI	Direction active at startup	Set the joystick to neutral
2	Two Directions Chosen	OF	Both the forward and reverse signal are given at the same time	Check the joystick
3	Power stage error (internal and external)	VS	Short circuit over an output stage (M1 to 3)	Contact dealer
3	Closure on the Power Sockets	VS	Short circuit with battery on (M1 to 3)	Contact dealer
4	Line contactor welded	S	Line contactor was connected during startup	Contact dealer
4	Line contactor does not close	S	Line contactor does not close after startup	Check wiring
5	Open motor circuit	S	No power build-up in motor possible	Check the wiring
6	Joystick wiring loose	VS	Loose joystick cabling detected	Check wiring
6	Joystick out of range	VS	Joystick gives wrong start-up value	Check wiring and adjustment
7	Excessive voltage on system	S	Battery voltage above set maximum	Check battery
7	Battery voltage that is too low	OF	Battery voltage below set minimum	Check battery and cabling
8	Controller te warm	I	Controller reduces output power	Allow the controller to cool down
8	The 25-day-to-3	I	Reduces output power	Allow the engine to cool down
10	Preoperational	I	Controller is in programming mode	Contact dealer
10	RPDO error		Can bus error	Check can bus wiring
11	Encoder error	VS	No encoder detected	Check wiring
11	Over current	United States	Motor current too high (no rotation)	Check cabling and mechanical load
12	COM error	S	Irreparable communication with display	Contact dealer
13	Internal software fault	RTB	Software run time fault	Contact Arka
Other	Error detected	RTB	System needs to be reprogrammed	Contact Arka

RTB = Return to Base (ARKA) - VS = Very Severe - S = Severe - DI = Drive Inhibit (unable to function.) - I = Inhibit (impaired function)

In Appendix 7 you can see where the diagnostic LED is mounted. (pg. 25)

7 Maintenance

Warning of dangerous electrical voltage!

The system is an electrical work equipment with voltage and currents that can be dangerous to humans. The system may therefore only be opened, repaired or dismantled by a qualified electrician

.

Always disconnect the mains plug from the mains socket and disconnect the battery before carrying out any work on the system.

7.1 Cleaning, Inspection and Maintenance

The system is virtually maintenance-free and, when used correctly, ensures trouble-free operation. We advise you to have the system serviced once every 5 years or at least after 1500 operating hours by Arka or a dealer. For systems that are used professionally, maintenance once a year is advisable.

- Regularly remove dust and dirt deposits from the outside of the system with a dry cloth.
- Never use a pressure washer or similar cleaning method.

Check at least once a month that:

- The plug and cabling are undamaged.
- The housing is not damaged.
- The insulation of the cabling is undamaged.
- The charging plug is undamaged.
- All screw connections are tightened.
- All cable and plug connections are tight.

If defects are detected, the system must be decommissioned immediately. All defects must be rectified immediately by the responsible professional staff.

If it is unavoidable that the housing will have to be opened for repair, consult with the supplier.

7.2 Changes to the system

No modifications to the system or wiring should be made on your own without written permission from the manufacturer. A request for this can be made by e-mail (info@arka.nl).

Modifications may only be carried out by professional personnel, supplier or the manufacturer.

7.3 Components

If you need spare parts, you can contact the manufacturer or your supplier with the data on the system.

7.4 paint

The engine has a primer epoxy coating from the factory, if you want to paint it over, sanding and degreasing is a must. Note: use a type of varnish or paint that is compatible with the applied coating. Prevent the paint you have applied from accumulating in the fastening agents.

8 Removal

If the system is permanently shut down at any time, the laws and regulations on waste disposal in force at that time must be observed.

Make sure you are well informed about this by an environmental coordinator or the competent authorities.

Please note!

Electronics products are classified as environmentally hazardous waste due to the various plastic, metal and heavy metal parts. Therefore, they must be disposed of separately from household and industrial waste.

Therefore, have the disposal arranged by an environmental coordinator or other expert.

The packaging of a system must be disposed of separately. Paper, cardboard and plastics must be recycled.

Appendix 1 Glossary

Below are some abbreviations with their meanings, which occur in the jargon.

- An Ampere
-AC Alternating current
- Ah Amps per hour
- BGV Berufs Genossenschaftliche Vorschrift (rules laid down by industrial accident insurance)
- C° Degrees Celsius
- ca. approximately
-CE Conformity European, the European quality mark, indicates that all European standards have been met
-DIN Deutsche Industry Norm (German Industry Standard)
-EMF Electromagnetic compatibility
-ESD Electrostatic Discharge
- EEG European Economic Union
-Guess Cells with positive grid plates and multiple separators (DIN abbreviation for cell construction of lead-acid batteries)
- GiV Closed cells with positive grid plates (DIN abbreviation for cell construction of lead-acid batteries)
-Gl Total cable and cable protection (operating class of low-voltage fuses according to EN 602691 VDE 0636)
- h hourly-Hz Hertz
-IEC International Electrotechnical Commission
- IP Ingress Protection (Protection classification according to IEC 60529)
- m meter-mm millimetre
- (E)PzS Cells with positive armour plates for vehicles (DIN abbreviation)
- PzV Closed cells with positive armour plates for vehicles(DIN abbreviation)
- V Volt
- V/C Volts per cell (voltage of a battery cell)
-VDE Association of Electrical, Electronic and Information Technologies
- LWL Waterline Length
- BWL Waterline Width
- BDI Battery Discharge Indicator
- I Current
- U Voltage
- P Ability
-Fr Froude number
-Enc Encoder
- R Resistance
- S Duty cycle
-HD Heavy Duty
- EMC Electro Magnetic Compatibility
- DC Direct current
- PM Permanent magnets

Appendix 2 Declaration of Conformity

Declaration of Conformity

Arka Electric propulsion systems - Beulakerweg 169B - 8355 AG - Giethoorn

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Declares that the following products:

Arka outboard 1000, 2000, 3500, 5000, 7500, Aquatro & Infinion
Ark POD 1000, 2000, 3500, 5000, 7500, Aquatro, Infinion, Treton & Arton
Arka inboard 5 KW, 7,5 KW, 13 KW, 18,5 KW

Comply with the following standards:

Machinery Directive	2006/42/EG
EMC Directive	2004/108/EG
Low Voltage Directive	2006/95/EG
ROHS Guideline	2002/95/EG
NEN-IEC	60092-501
NEN-IEC	60092-504
ANSI-IEC	UL 583

Arka would like to draw your attention to the fact that the products are intended to be assembled. Based on the above directives, the products may only be put into operation after they have been brought into compliance with the provisions of the machine, low voltage and EMC directives.

Giethoorn 05-02-2024 J.J.R. Arendshorst

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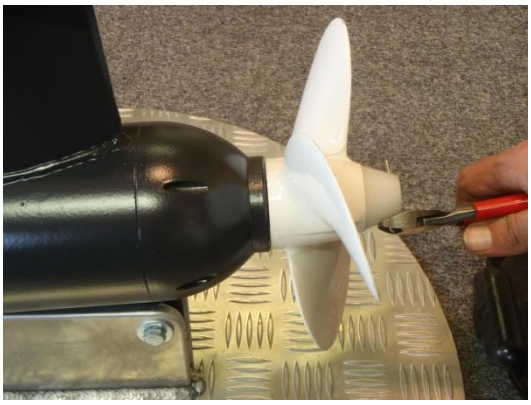
VAT: NL-8030.12.780.B01
CoC: 050.54247

Appendix 3 Removing the propeller for inspection:

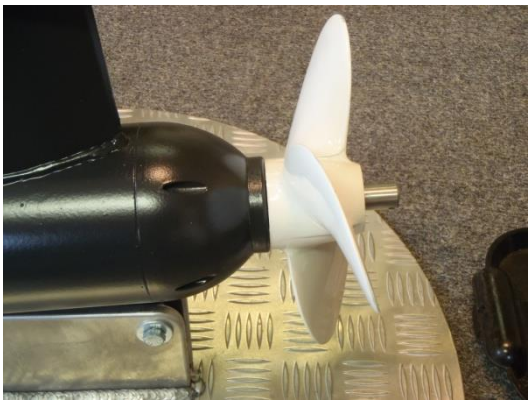
Outboard

Please note! Risk of injury.

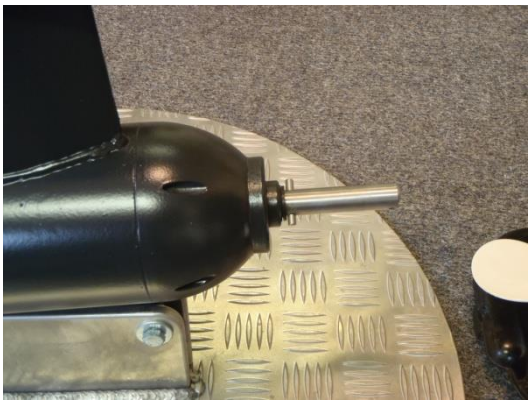
Always disconnect the battery before performing any work.



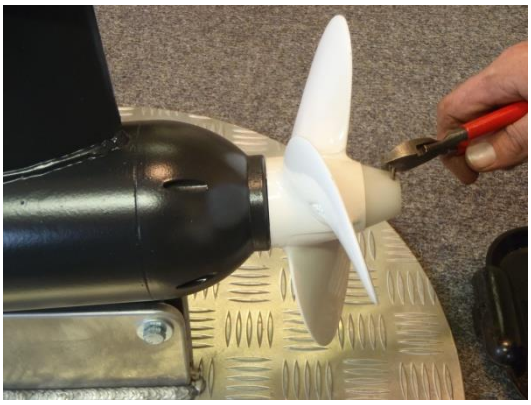
1 - Remove the cotter pin.



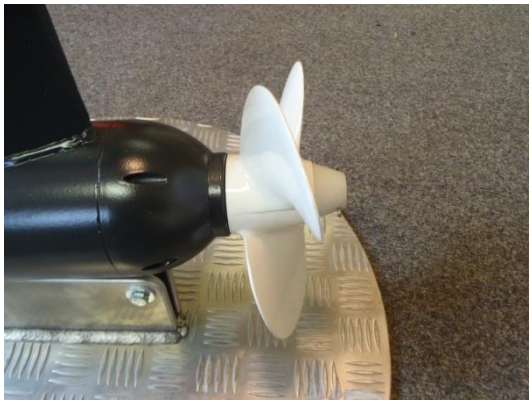
2 - Remove the cone cap.



3 - Slide the propeller off the shaft.



4 - After inspection, replace everything and bend the splitpin.



5 - Carefully flatten the cotter pin.

6 – Done.

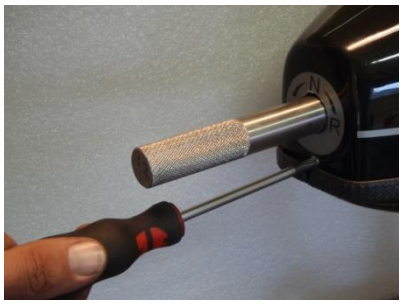
Appendix 4 Removing the bonnet for inspection and diagnosis LED.

Outboard

Please note! Short-circuit hazard.

Always disconnect the battery before performing any work.

1 - Remove the handle.



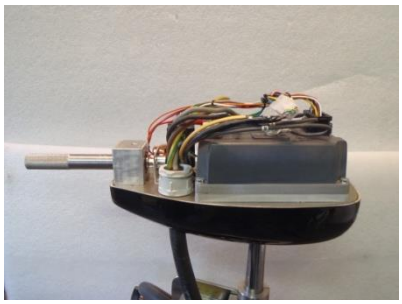
2 - Remove the screw.

3 - Remove the screws.

4 - Remove the rubber.

5 - Lift the hood at the back.

6 - Slide the hood forward.



7 - Check the LED.

8 - Insert the screws and rubber.

9 - Tighten the screws.

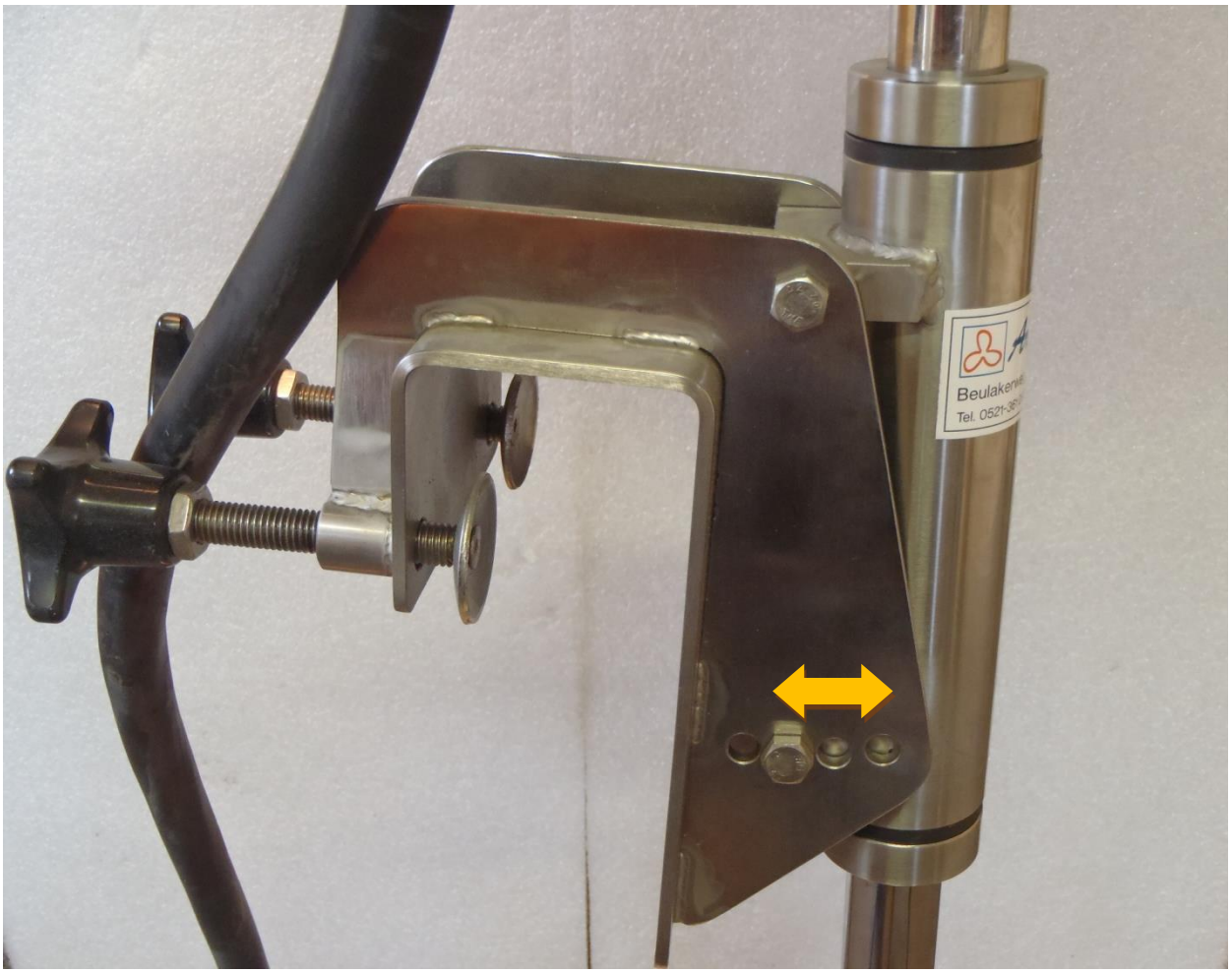
Diagnostic LED (see 6.9 for explanation)

Appendix 5 Bracket Angle Adjustment

Outboard

Please note!

Sometimes, use can create space on the mirror, causing the twist handles to attach the motor to the mirror to become loose. Therefore, check regularly, preferably before each use, whether they need to be tightened.



Adjust the bracket to the correct position in relation to the mirror. It is recommended that the engine is mounted perpendicularly when the ship is loaded normally.

Choose which of the four settings fits best.

Procedure:

- Remove the bolt from the adjustment hole.
- Find the correct adjustment and replace the bolt, tighten the bolt and nut securely.
- If necessary, also check the upper tipping point and tighten this bolt and nut securely.

Appendix 6 Serial Number Insert

Outboard

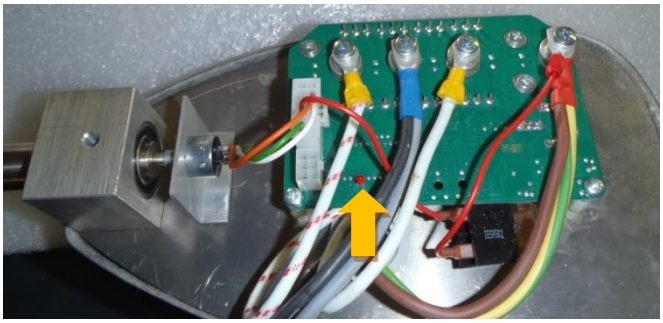
Inboard and POD system (control box)

Place serial number (on controller housing)

(Terminal box (if fitted))

Appendix 7 Location Diagnosis LED

Outboard 700



POD 700

Location diagnostic LED (inboard & POD systems)

Notes: