EN

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# Installation Guide

# ARIES R50

Outboard System v1.2


MOLABO

# FOREWORD

This document describes the required mechanical installation steps and their execution for a MOLABO ARIES R50 system. This includes the handling and installation of the components, as well as the routing of cables. Unless otherwise specified or agreed, these tasks are the responsibility of the boat builder in charge.

Before installing the ARIES R50 system, take some time to plan the individual steps.

This manual describes the basic handling of the components for installation, the exact position in the boat and the mounting. Where and how you mount your system is influenced by the design, the construction of the boat and the special technical design of the ARIES R50 system and is therefore largely determined by the boat builder. The specifications in these instructions, e.g. for safety distances or accessibility, must be observed.

Before installing the ARIES R50 system, ensure that all legal requirements for the use and construction of the boat are met.

If the boat is a commercial vessel, additional warning signs may need to be posted or other systems installed that are not addressed in this manual.

If you want to make structural changes to your boat, contact the boat manufacturer in advance. Do not make any modifications without the manufacturer's consent.

The boat builder or person installing the system is responsible for compliance with regional/national regulations that must be followed to install and operate the ARIES R50 system.

Your MOLABO Team

# TABLE OF CONTENT

# 1 INTRODUCTION

## 1.1 EXPLANATION OF SYMBOLS

The following symbols, warnings or mandatory signs can be found on the system components of the ARIES R50.

Attention fire hazard

Do not enter

Attention danger of crushing

Attention hot surface

Attention electrical voltage

Attention danger

Follow manual

Do not open

## 1.2 STRUCTURE OF THE SAFETY INSTRUCTIONS

Safety instructions are reproduced in this manual with standardized representation and symbols. Observe the respective notes. Depending on the probability of occurrence and the severity of the consequence, the explained hazard classes are used.

**⚠ DANGER!**

**Immediate hazard with high risk.**
Death or serious bodily injury can result if the risk is not avoided.

**⚠ WARNING!**

**Possible hazard with medium risk.**
Death or serious bodily injury can result if the risk is not avoided.

**⚠ CAUTION!**

**Hazard with low risk.**
Minor or moderate bodily injury or property damage may result if the risk is not avoided.

NOTE

**Note, which must be observed without fail.**
User tips and other particularly useful information.

## 1.3 ABOUT THIS INSTALLATION GUIDE

**Instructions for action**

Steps to be performed are shown as a numbered list. The sequence of steps must be followed.

**Example:**

**1st** action step

**2nd** action step

Results of an action instruction are presented as follows:

➔ Result 1
➔ Result 2

**Enumerations**

Enumerations without a mandatory order are shown as a list with bullet points.

**Example:**

- Item 1
- Item 2

## 1.4 IDENTIFICATION LABEL

An identification label is attached to each MOLABO component of the system according to the Machinery Directive 2006/42/EC. The boat builder should record the identification label and the serial number before installing the respective component.

The following figure shows an example of an identification label:

# 2 TECHNICAL DATA

| | |
|---|---|
| **Nominal mechanical power** | 50 kW |
| **Supply voltage** | 48 V (44 V - 54 V full operation) |
| **Max. voltage** | 58 V |
| **Logic supply voltage** | 14 V |
| **Motor weight without cable** | L: 125 kg<br>XL: 131 kg |
| **Splines** | 13 tooth (4 ½“) Evinrude/Johnson/Selva 40-140 HP |
| **Torque on propeller shaft** | 270 Nm |
| **Speed propeller shaft @ 50 kW** | 1.767 - 2640 rpm |
| **Trim- / Tilt system** | Hydraulic |
| **Communication** | CAN |
| **Max. trim angle** | -4° - 12° |
| **Max. tilt angle** | 12° - 65° |
| **Max. steering angle** | +-28° |
| **Water cooling** | Dual-circuit cooling,<br>Input heat exchanger: 12 l/min, max. 35° C |
| **External cooling circuit** | Electrical pump |
| **Max. system efficiency** | 95,6 % (Motor: 97 %, Controller: 98 %) |

# 3 SECURITY

## 3.1 WORK AND PRODUCT SAFETY

For the installation of the ARIES R50, the local safety and accident prevention regulations must also be observed.
Changes to parts can result in danger to life and limb, lead to malfunctions.

## 3.2 INTENDED USE

**The ARIES R50 system must be installed and operated in conjunction with the following components:**

- Mastervolt battery bank 36 kWh, 48 kWh or 60 kWh
- Charger AC 3 kW or 9 kW
- MOLA*Connect*
- MOLA*Link*
- System display
- Throttle side-mount / top-mount
- 12 V battery 100 Ah

**Intended use also includes:**

- The mounting of the ARIES R50 system at the mounting points provided for this purpose and compliance with the prescribed torques.
- The observance of all instructions in this manual.
- Adherence to the care and service intervals.
- The exclusive use of original parts of the components, in particular the use of the original throttle and the original display
- The exclusive use of original spare parts.
- The use of the cables specified in the wiring diagram.
- Compliance with national regulations for 230 V installation of the chargers and shore power system including galvanic isolation (e.g. Zinc-Saver).
- The drive may only be used by instructed persons with a sufficient driving license for the water.

## 3.3 FORESEEABLE MISAPPLICATION

A different approach than the one described in chapter 3.2 "Intended use" is considered to be improper use. The operator bears sole responsibility for any damage resulting from improper use and the manufacturer accepts no liability whatsoever.

**Among other things, is considered not intended:**

- The operation of the propeller even for a short time out of the water.
- An underwater deployment of the ARIES R50 system.
- the manipulation of safety devices such as the emergency stop switch
- Operation in waters to which chemicals (e.g. chlorine, active oxygen, etc.) are added.
- The use of the ARIES R50 system outside of watercraft.

## 3.4 GENERAL SAFETY INSTRUCTIONS

**⚠ DANGER!**

Fire and burn hazard due to overheating or hot surfaces of the components! Fire and hot surfaces can lead to serious physical injury, or death.

- Do not store flammable objects or liquids in the area of the batteries and MOLA*Connect*.
- Keep fire away from the components.
- Do not cover any components.
- Ensure good ventilation.

**⚠ WARNING!**

Mechanical hazard due to rotating components!
Serious bodily injury or death can result.

- Rotating parts must be covered so that they cannot be touched.

**⚠ CAUTION!**

Damage may be caused to the battery by stepping on it.

- Do not open the battery casing.
- When moving the battery, ensure that it is not damaged. Batteries with damaged cases must not be installed.

**⚠ CAUTION!**

Danger of crushing during installation work.
Minor or moderate injuries can be the result.

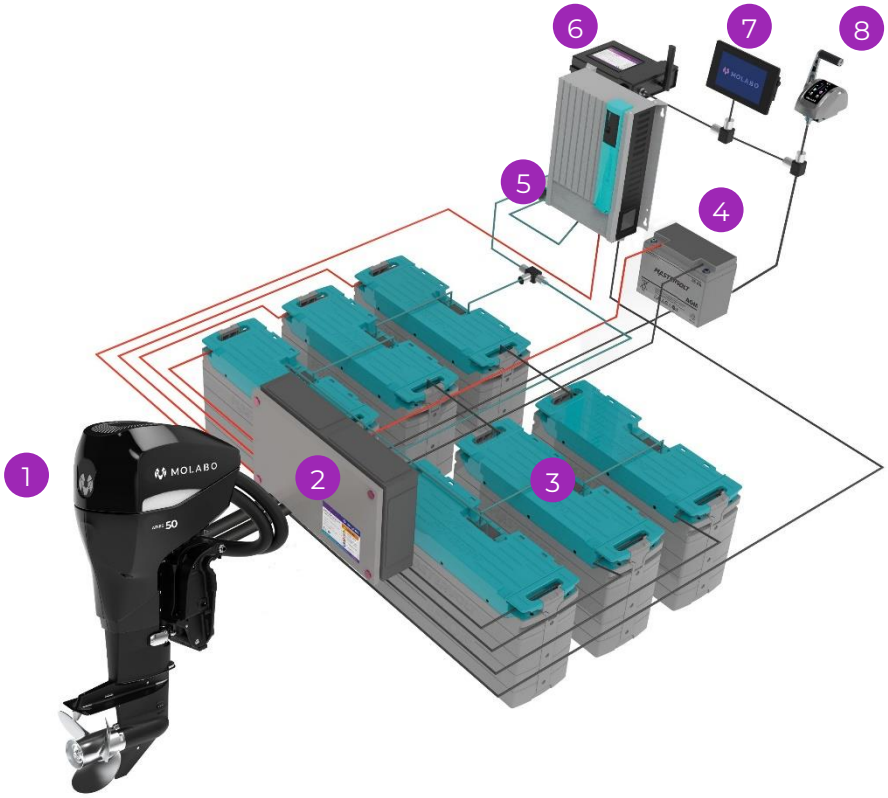
- Lift heavy components only with suitable means (crane, fork lift, etc.).
- When moving the components, ensure that they cannot fall.
- Components with damaged housings must not be installed.

## NOTE

If you are not familiar with the installation, work on the system must be carried out by a qualified specialist. During work in the battery room, the contact breakers close to the batteries of the individual battery strings must be opened.

- All devices must be disconnected from the power supply.
- To be secured against restarting.
- Determine zero voltage.
- Adjacent live parts are to be covered or cordoned off.

# 4 SYSTEM OVERVIEW




1. ARIES R50
2. MOLA*Connect*
3. 48 V battery bank
4. 12 V system battery
5. 48 V charger
6. MOLA*Link*
7. System display
8. Throttle

# 5 INSTALLATION

This chapter covers the installation of the MOLABO ARIES R50 inboard system. Each subchapter begins with a list of the scope of delivery. Then the installation is explained. At the end of each subchapter there is a checklist for checking the correct installation.

Attached is the complete installation checklist. Please print it out and fill it in during the installation. After completion of the installation, the checklist must be sent to service@molabo.com In case of service requests, this can be used to prove correct execution and optimize service support.

**Electrical connection boxes**

Electrical connection boxes must always be fastened in such a way that the cable entry is from below. Electrical connection boxes must be mounted in such a way that they are or can be made easily accessible for maintenance.

**Cable installation**

Cables of different systems and wiring systems, especially those belonging to the ARIES R50 system and those not belonging to its scope, must be laid separately.

Cables must be routed a minimum of 25 mm above the bilge area. Cables and conductors of AC and DC networks must always be routed separately.

Power cables must be routed separately from data cables. The use of separators for joint routing on cable ladders is permissible. A distance of at least 10 cm must be maintained from electronic components. Single conductors without double insulation must always be protected by routing in the empty conduit and separated from other conductors and sheathed cables.

If single conductors are used, they must be laid with the smallest possible spacing by taking suitable measures.

Cables of different system categories are to be routed with a distance of at least 10 cm between each other. Generally, cables must be routed over their entire length in empty conduits, ducts or on cable ladders. If there is sufficient space, cables of different systems can be routed independently of each other on conductors or in ducts by means of separators. Individual cables can also be routed freely with a fixation every 450 mm.

If metal pipes or ducts are used for laying, the spatial separation of 10 cm between the categories is not required. The pipes or ducts shall each be connected to the common ship's earth at one point.

If cables are installed in areas where there is thermal or mechanical danger from other installations (e.g. exhaust duct or rotating shaft), a distance of at least 25 cm must be maintained from these parts.

## 5.1 LOCKABLE BATTERY ROOM

The MOLA*Connect* box, the Mastervolt battery system incl. chargers must be housed in a separate room. This is closed with tools so that the skipper has no access to electrically conductive parts.

## 5.2 DRIVE

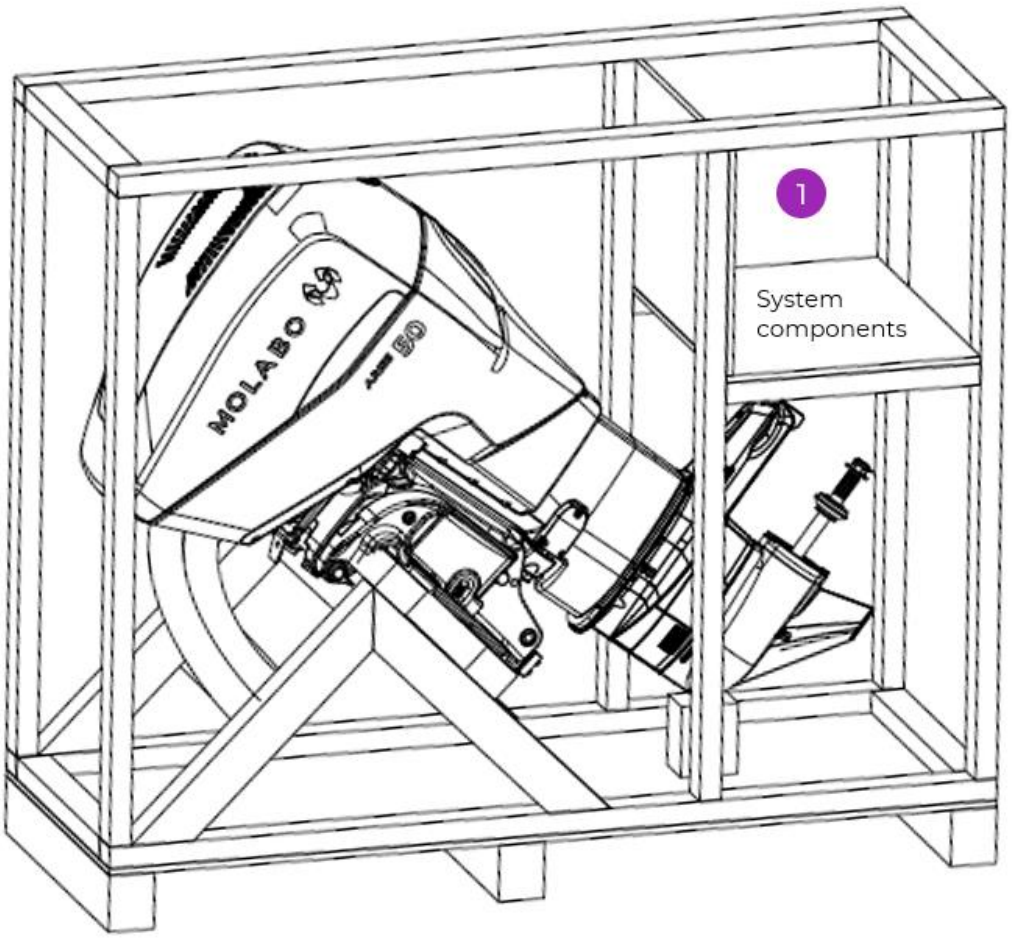
### 5.2.1 Scope of delivery

- ARIES R50 system with all components

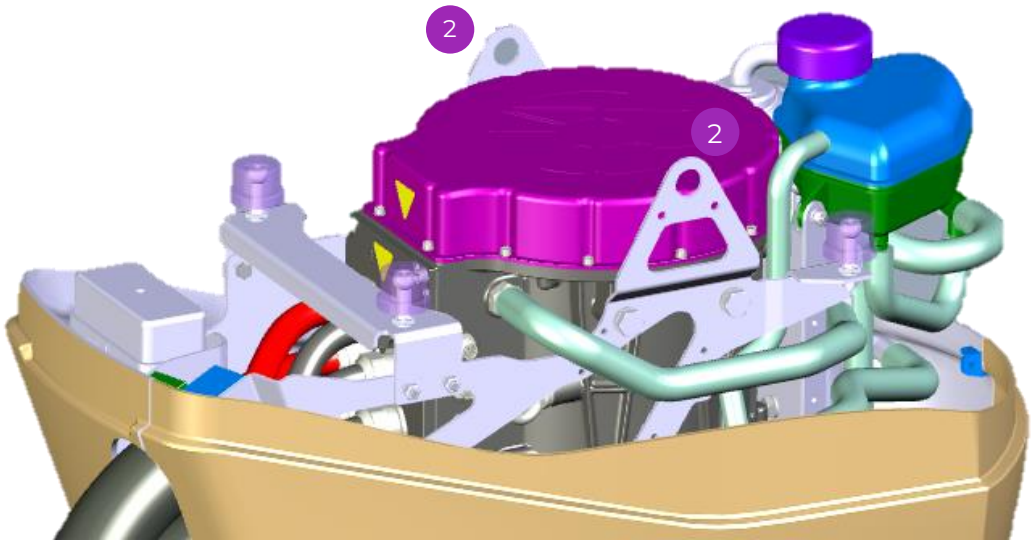
### 5.2.2 Unpacking and lifting the drive

First open the screwed lid of the wooden packaging. In addition to the ARIES R50 motor, the packaging contains all system components accessible from above. Remove the MOLAConnect, MOLALink, system display, control lever, propeller attachments, installation and operating instructions and the service check book from the compartment 1

Only then remove the screwed side walls of the transport box. Remove any existing padding.



Lift the top cover of the outboard motor upwards. There are 2 lifting points underneath 2 .


Remove the two M12 bolts with nuts and washers from the transom bracket. The ARIES R50 outboard motor can now be lifted.

Check the hoist and lifting points are secure so that the motor cannot fall.

1. Use two hooks and attach them to the lifting points 2 provided.
2. Check that the hoist and the lifting points are secure so that the motor cannot fall.
3. Carefully lift the ARIES R50 outboard motor to the intended position on the boat using a crane, which may only be operated by trained, authorized personnel. Pay attention to the cables.

### 5.2.3 Installation of the drive in the boat

**⚠ CAUTION!**

Material damage due to unstable boat stern.
Property damage can be the result.

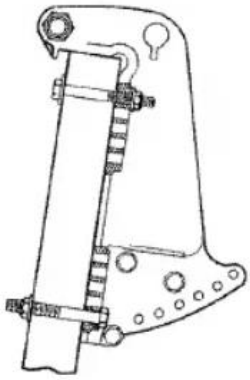
- Make sure that the boat stern sufficiently stable to absorb the forces due to bolting and operation.

**⚠ WARNING!**

If the outboard motor is not fastened correctly, it can lift off the stern of the boat, which can lead to property damage, serious injury or death.

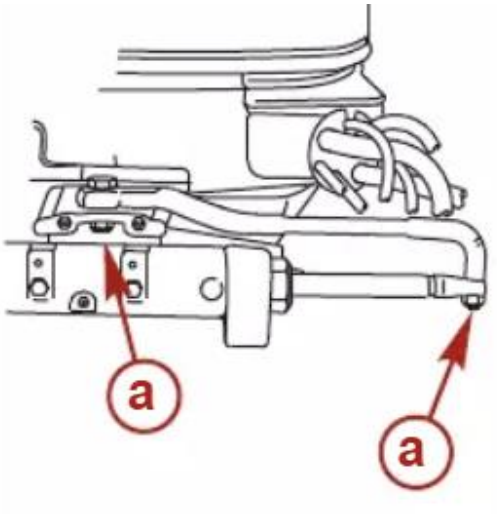
- The outboard motor must be installed correctly with the required fastening elements before it is put into operation.

1. Align the motor centrally on the stern.
2. Check the position of the anti-ventilation plate. This must be 0 to -25 mm below the lowest hull edge. The optimum mounting height of the outboard motor depends on the boat/motor combination and the application. Test runs at different heights can help to determine the optimum mounting height.
3. Mark the mounting position and drill mounting holes according to the marking
4. The outboard must be secured to the transom using the four M12 x 90 mounting bolts, washers and M12 locknuts supplied. Install two bolts through the top set of holes and two bolts through the bottom set of holes. Seal the screw holes with a suitable sealant (e.g. Sikaflex). The tightening torque of the screws is 60 Nm.



5. Check that the motor is securely seated.

6. The steering linkage, which connects the steering push rod to the engine, must be secured with self-locking nuts (a). These self-locking nuts must never be replaced by conventional nuts (non-self-locking), as otherwise they will loosen, which can cause the connecting rod to come loose. Follow the installation instructions of the steering system manufacturer.




7. Guide the motor cables through suitable openings in the stern of the boat. The diameter of the ducts must be at least 60 mm and be suitable for permanent use. Sealing against splash water is recommended.

**⚠ CAUTION!**

Damage to the power cable possible!
Material damage may result.

- Make sure that the power cables are not damaged by sharp edges.
- The steering angle must not be restricted by the power cables.
- The tilt angle must not be obstructed by the power cables.
- The minimum radius of 30 cm must be observed when laying cables.
- A strain relief must be provided in the boat

8. A 12 V supply to the outboard motor is required for the water pumps and tilt/trim hydraulics.
Connect the 12 V power cables (red and black, 6 mm²) coming from the engine to the 12 V system battery. Use a 75 A fuse (maximum 20 cm away) and a battery switch (so close as possible) on the positive terminal of the battery.

### 5.2.4 Installation checkliste for outboard, steering, 12 V supply

- Anti-ventilation plate 0 to -25mm below the lowest hull edge?
- Screws used to fasten the motor with sealing compound?
- Steering fixed with self-locking nuts?
- All screws tightened to the specified torques?
- Power cables laid with minimum bending radius?
- Strain relief fitted for power cables?
- Power cables do not restrict the steering and tilt angles?
- 75 A fuse for the 12 V battery supply installed at a maximum distance of 20 cm?
- Battery main switch installed as close as possible to the 12 V battery?

## 5.3 INSTALLATION OF THE MASTERVOLT BATTERY SYSTEM

**⚠ CAUTION!**

Danger of short circuit!

Do not insert any fuses into the designated holders during the entire installation of the battery system. This takes place during commissioning in chapter 6.1.

**NOTE**

Follow the applicable standards and regulations.

**NOTE**

The batteries must be installed in a battery room. Access must be closed with tools and marked with an "electric shock" warning label.

**NOTE**

The batteries must not be used in wet areas / outdoor areas, either install batteries in dry environments or provide additional protection device with IPx5.

**NOTE**

Specifications and instructions for mechanical installation can be found in the Mastervolt installation manual.

**NOTE**

Follow only these instructions to connect. More information about the battery can be found in the Mastervolt manual.

*https://www.mastervolt.de/produkte/li-ion/mli-ultra-24-6000/*

### 5.3.1 Scope of delivery

The Mastervolt battery system is supplied by Navico Group and includes the following parts:

| Article | 36 kWh | 48 kWh | 60 kWh |
|---|---|---|---|
| **MLI Ultra 24/6000** | 6 | 8 | 10 |
| **Mass Charger 48/50** | 1 / 3 | 1 / 3 | 1 / 3 |
| **Solenoid ML 500A 24 V, mounted on MLI Ultra 24/6000** | 3 | 4 | 5 |
| **Fuse holder, fuse class T, mounted on MLI Ultra 24/6000** | 500 A | 350 A | 300 A |
| **MasterBus CAN Open Interface** | 1 | 1 | 1 / 2 |
| **MasterBus USB Interface** | 1 | 1 | 1 |
| **MasterBus Power Insert and DC Master 12/12 3 A** | 1 | 1 | 1 |
| **MasterBus cable set** | 1 | 1 | 1 |

Please check if the delivery is complete.

### 5.3.2 Structure of the battery system

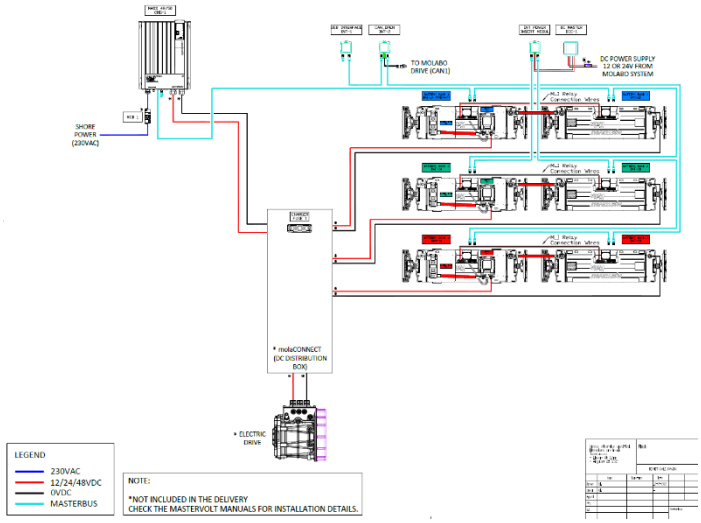



**Diagram Download**

The battery wiring diagram for all available battery sizes can be found at the link:

*https://molabo.com/wp-content/uploads/circuit%20diagram_ARIES_50_system.pdf*

The entire installation includes the construction and wiring of the battery strings, the construction and wiring of the chargers, and the construction of the internal battery communication bus (MasterBus).

### 5.3.3 Structure of a battery string

The battery system consists of several battery strings connected together in parallel. Each battery string has a nominal voltage of 48 V and consists of two Mastervolt MLI Ultra 24/6000 battery modules connected in series. Each string contains a safety relay and a fuse.

The battery string is connected to the MOLA*Connect* box with cables. The cable cross-section must be at least 95 mm². The battery cables are not included in the scope of delivery.

The cable length of a string is composed of the power cable of the positive pole, the of power cable of the negative pole and the connection cable of the two modules.

**NOTE**

The cable length of the strands must be chosen as short as possible. The cable length per strand must not exceed 6 m in total.

**NOTE**

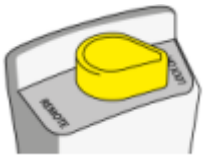
The cable lengths of all strings must be identical and must not differ by more than +/- 5 cm. Failure to observe this may result in unequal discharge and load on the batteries.

**NOTE**

The cable cross-section must not be less than 95 mm².

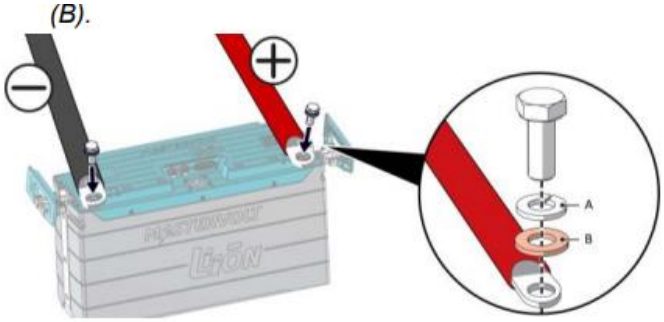
**Battery module MLI Ultra 24/6000:**

1. Set the lever of the safety relay to "LOCK OFF".

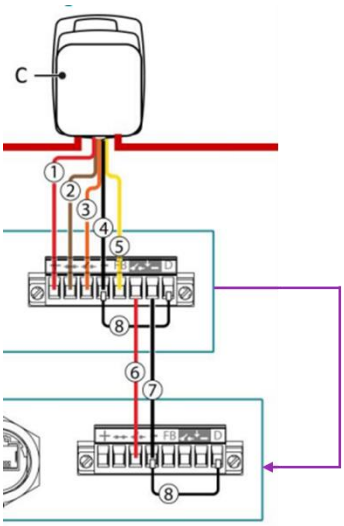


2. Lift the side handles to expose the battery terminals. The use of a safety relay is a mandatory part of the battery installation. The remote battery switch and a suitable fuse are mounted on the positive battery in the string at a time. Nevertheless, check the tightening torque of the terminal screw, it must be 15,5 Nm. Always use an additional washer and a spring washer for the battery connection. The washer must always be placed on the cable lug.

Sample:

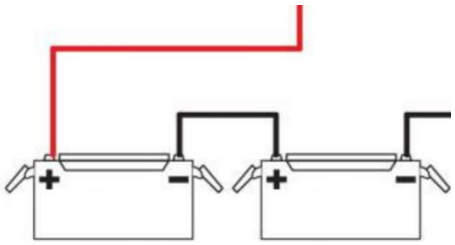


3. Connect both batteries using the pre-assembled two-core cables and the green connectors according to the wiring diagram.




C = Safety relay

4. Connect one battery in series with the first battery to obtain 48 V.



### 5.3.4 Charger structure

The battery system can be installed with one or with three chargers.

On the input side, the chargers are connected to a 230 V / 400 V shore power connection in accordance with the applicable standards.

**NOTE**

Follow the valid standards and regulations!

**NOTE**

Specifications and instructions for mechanical installation can be found in the Mastervolt installation manual.

https://www.mastervolt.de/produkte/mass-48v/mass-48-50-230v/

**NOTE**

The shore connection must be made according to EN ISO 13297, the installation of a galvanic isolator is recommended.

**NOTE**

The cable cross-section between *MOLAConnect* and the charger must be at least 25 mm² up to a cable length of 3 m, and at least 35 mm² for longer cables.

**WARNING!**

The AC connection may only be carried out by a specialist and must comply with the applicable standards for a shore connection.

### 5.3.5 Structure of the internal battery communication bus

All components of the Mastervolt battery system must be connected to the internal battery communication bus MasterBus. Two RJ45 sockets are provided on each component for this purpose.

The communication bus thus forms a string. The still open RJ45 sockets on the two components at the ends of the string must be terminated with the RJ45 terminators supplied.

The order of the components in the bus is not relevant. However, it is important that the power insert module, which feeds the bus, is placed in the middle and not at one end of the string.

### 5.3.6 Installation checklist battery system

Battery

- Is the cross-section of each battery cable suitable for the current (at least 95 mm² is required)?
- Is the cable length of each battery string the same as the other strings (+/- 5 cm) and less than 6 m in total?
- Tightening torque for screws M8 on the battery pole 15,5 Nm
- Tightening torque for M10 screw on safety relay 15,5 Nm
- Tightening torque for M10 nut on fuse holder 35 Nm
- Does each battery string have a T-fuse and safety relay?
- Is the polarity of the DC cables permanently color-coded and correctly connected?
- Are all cable lugs insulated with heat shrink tubing?
- Are the data cables laid without kinks (min. bending radius of 50 mm)?
- Is the MasterBus terminated at both ends?

Charger

- At least 0.5 m³ ambient air for each charger
- Is there sufficient distance of at least 50 mm around the charger?
- The charger is not mounted near other heat sources
- The charger is fixed with four screws suitable for the installation surface?
- Cable feed only from below?
- Distance between charger and shore power distribution max. 3 m
- Cable cross section 25 mm² or 35 mm²
- Is the polarity of the DC cables permanently color-coded and correctly connected?
- No AC cable extensions used

Shore power connection

- Galvanic isolation (e.g. zinc saver) installed
- Residual current circuit breaker (RCD) installed
- All phases with circuit breaker
- No AC cable extensions used
- Installation by a qualified electrician

## *5.4* INSTALLATION MOLA*CONNECT V2.1*

### 5.4.1 Scope of delivery

- MOLA*Connect v2.1*
- Special nuts M10
- Special nuts M8
- Cube fuses 75 A
- Insulating nut for fuses

### *5.4.2* Assembly of *MOLAConnect*

**NOTE**

Mount MOLA*Connect* on a bulkhead at least 10 mm above the highest possible bilge water level, taking heel angle and trim into account. The cable feed is only permitted coming from below. Pay attention to the minimum bend radius of the respective cables.

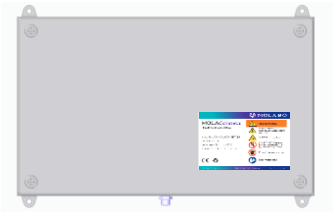
**NOTE**

The MOLA*Connect* must not be used in wet areas / outdoor areas, either install MOLA*Connect* in dry environments or provide additional protective equipment with IPx5.

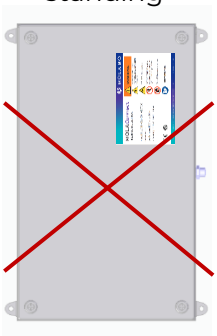
**NOTE**

*MOLAConnect* may only be installed horizontally.

**Allowed:**
horizontal



**Not allowed:**
standing



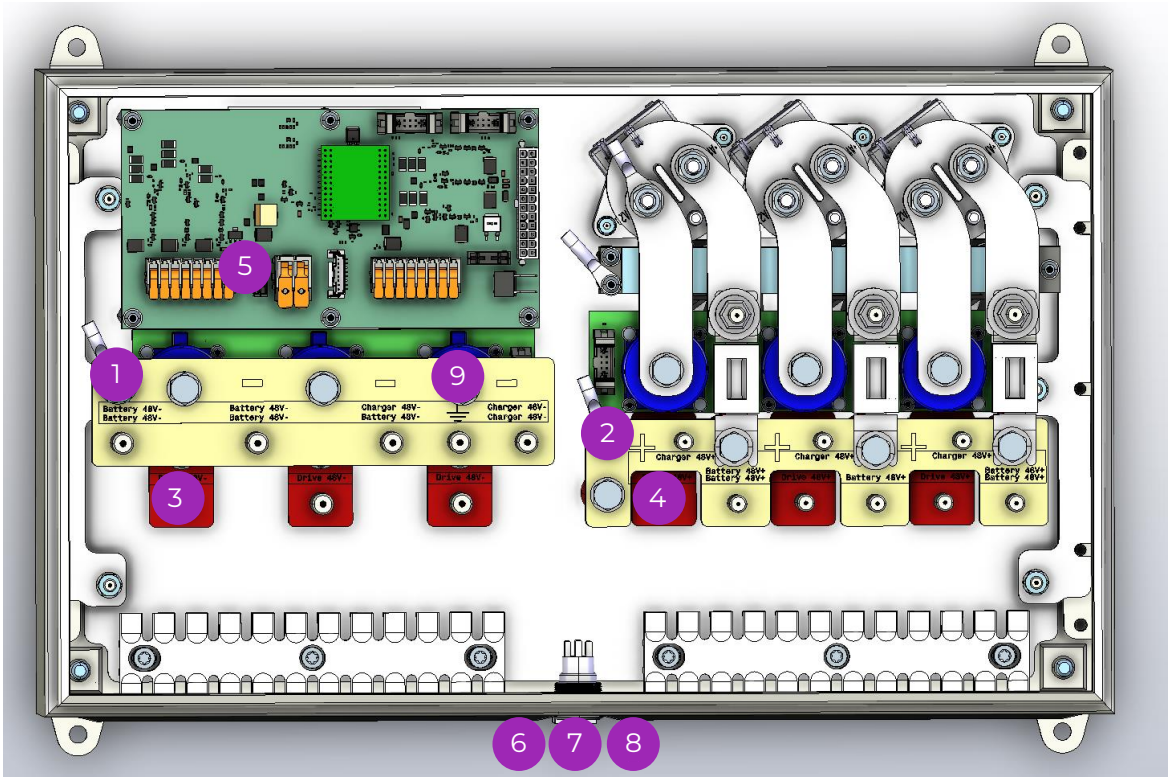
**Not allowed:**
lying

Ensure at least 5cm free space around MOLA*Connect to ensure* sufficient air supply and circulation.

Drilling pattern in the appendix

### 5.4.3 Connection of MOLA*Connect*

Overview connections and switches

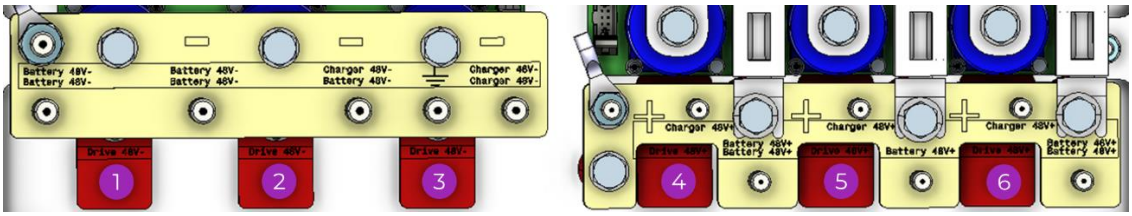



1. Terminal block battery -
2. Terminal strip battery +
3. Terminal block motor –
4. Terminal block motor +
5. Connection of external components and sources
6. 12 V emergency start switch
7. Data socket Multi IO 8-pin M12
8. Data socket CAN 5-pin M12
9. Ground connection

**Connection of the power cables motor (48 V)**

> **NOTE**
>
> Do NOT use washers or snap rings! To secure the nuts against self-loosening, only Nord Lock wedge lock washers or a high viscosity threadlocker are permitted (Loctite 290).

> **NOTE**
>
> The power cables on the motor side must not be extended under any circumstances.



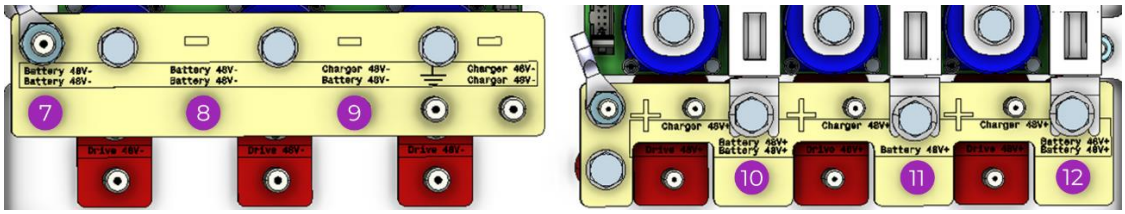

Screw the black marked cable lugs (-) to the 10 mm stud bolts 1, 2 and 3 with a tightening torque of 35 Nm.

The cable lugs (+) marked in red are fastened to the stud bolts 4, 5 and 6 with a tightening torque of 15 Nm.

**Connection of the 48 V supply, 3 battery strings**

> NOTE
>
> Only use Klauke 706F10 tubular cable lugs.
> These must be crimped in the specified manner!

Screw the black marked tube cable lugs (-) to the M10 stud bolts 7, 8 and 9 with a tightening torque of 35 Nm.

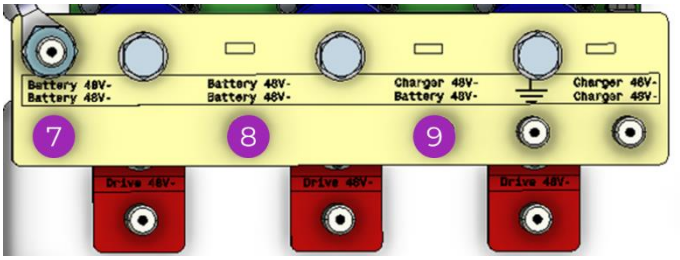


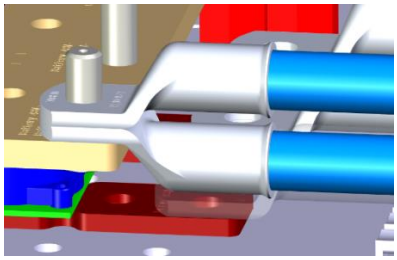

> NOTE
>
> Only use Klauke 706F8 tubular cable lugs.
> These must be crimped in the specified manner!

The tubular cable lugs (+) marked in red are fastened to the M8 stud bolts 10, 11 and 12 with a tightening torque of 15 Nm.

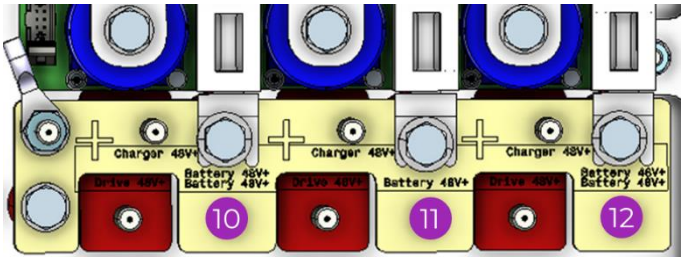
**Connection of the 48 V supply, 4 battery strings**

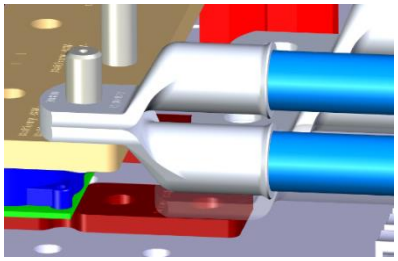
> **NOTE**
>
> Only use Klauke 706F10 tubular cable lugs.
> These must be crimped in the specified manner!



Screw the tubular cable lugs (-) marked in black to the M10 stud bolts 7, 8 and 9 with a tightening torque of 35 Nm. 2 cable lugs are mounted on top of each other on the stud bolt 8!

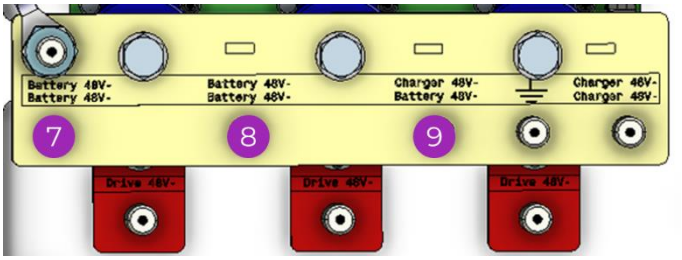


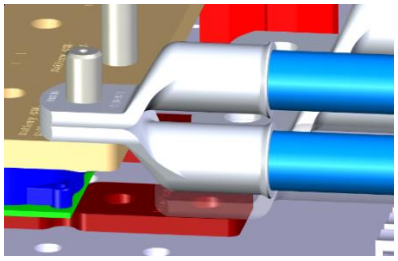



The tubular cable lugs (+) marked in red are fastened to the M8 stud bolts 10, 11 and 12 with a tightening torque of 15 Nm. 2 cable lugs are mounted on top of each other on the stud bolt 11!

**Connection of the 48 V supply, 5 battery strings**

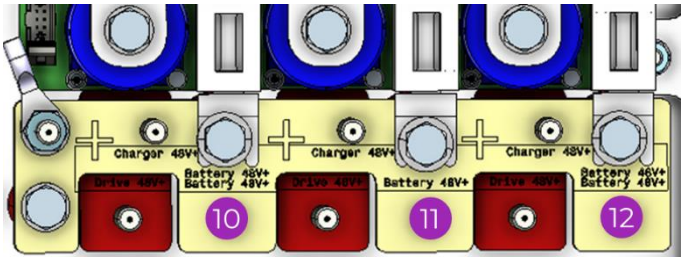
> **NOTE**
>
> Only use Klauke 706F10 tubular cable lugs
> These must be crimped in the specified manner!

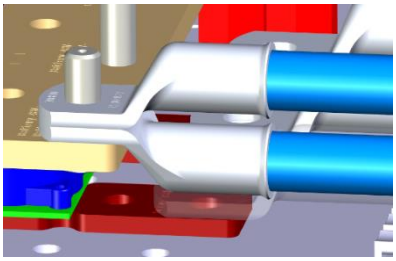


Screw the tubular cable lugs (-) marked in black to the M10 stud bolts 7, 8 and 9 with a tightening torque of 35 Nm. 2 cable lugs are mounted on top of each other on stud bolts 8 and 9.

> **NOTE**
>
> Only use Klauke 706F8 tubular cable lugs.
> These must be crimped in the specified manner!



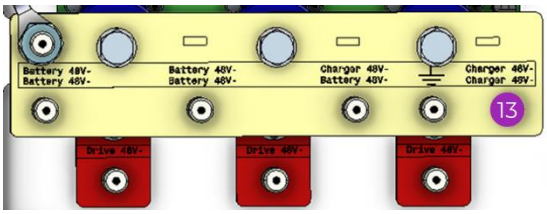



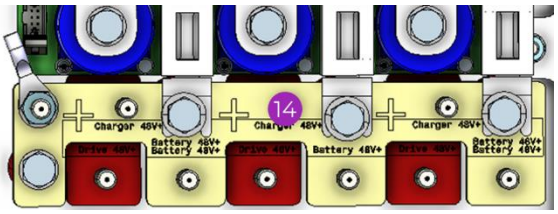
The tubular cable lugs (+) marked in red are fastened to the M8 stud bolts 10, 11 and 12 with a tightening torque of 15 Nm. 2 cable lugs are mounted on top of each other on stud bolts 10 and 11.

**Connection of one charger**

> **NOTE**
>
> Do NOT use washers or snap rings!
> To secure the nuts against self-loosening, only Nord-Lock wedge lock washers or a high-viscosity threadlocker are permitted (Loctite 290).

> **NOTE**
>
> Only use Klauke 704F10 or 705F10 tubular cable lugs.
> These must be crimped in the specified manner!



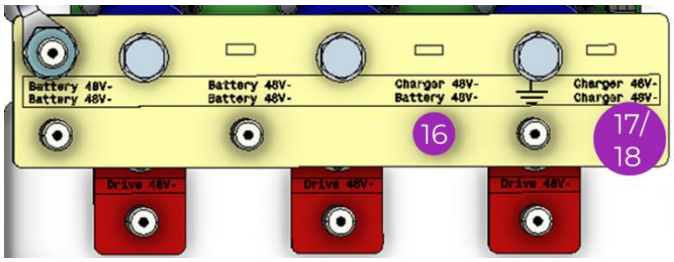

Screw the black marked cable lug (-) to the M10 stud bolt 13 with a tightening torque of 35 Nm.

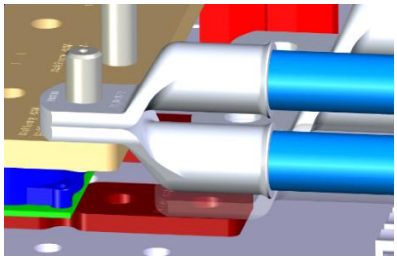
The red marked M10 cable lug (+) of the charger is fastened to the M8 stud bolt 14 on the 75 A cube fuse with a plastic nut. The tightening torque is 12 Nm.

**Connection of 3 chargers**

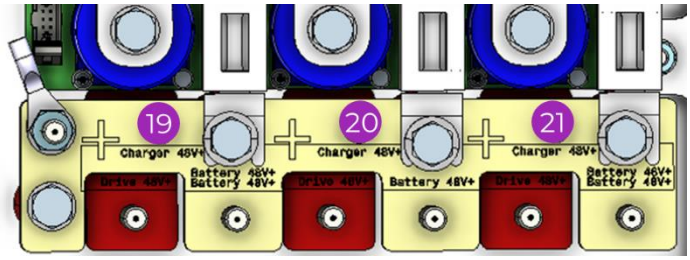
> **NOTE**
>
> Do NOT use washers or snap rings! To secure the nuts against self-loosening, only Nord Lock wedge lock washers or a high-viscosity thread-locker are permitted (Loctite 290).

> **NOTE**
>
> Only use Klauke 704F10 or 705F10 tubular cable lugs.
> These must be crimped in the specified manner!



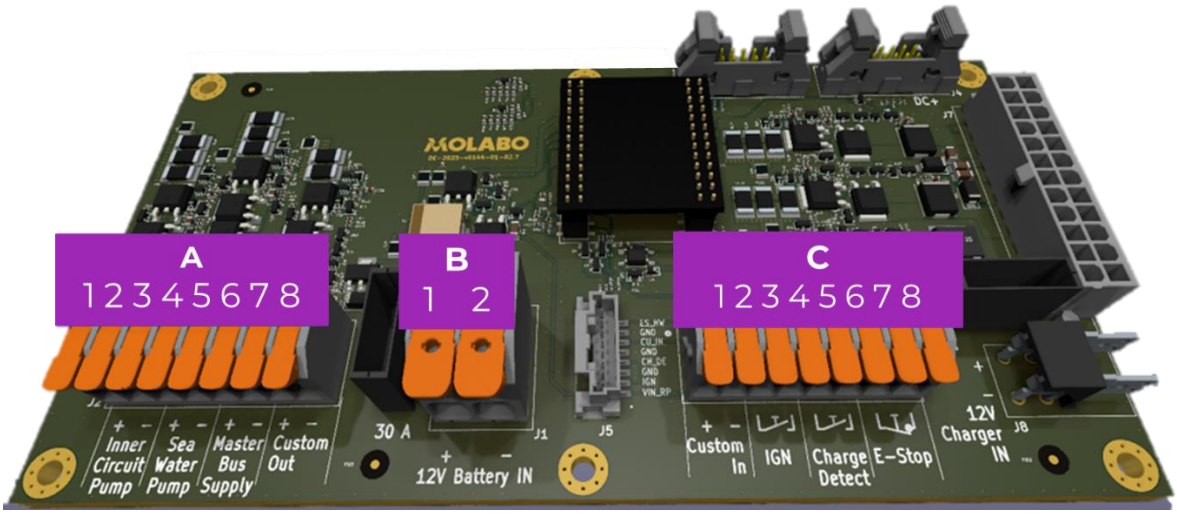



Screw the black marked cable lug (-) to the M10 stud bolt 16 and 17/18 with a tightening torque of 35 Nm. The cable lug is attached to both stud bolts one above the other.




The red marked M10 cable lugs (+) of the chargers are fastened to the M8 stud bolts 19, 20 and 21 on a 75 A cube fuse each with an M8 plastic nut. The tightening torque is 12 Nm.

**Connection of 12 V voltage source to MOLA*Connect***




Terminal block (B)

1. Connection 12 V positive (+)

2. Connection 12 V negative (-)

Use a cable cross-section of at least 4 mm² (AWG 11) and a maximum cable length of 3 meters per pole to the 12 V battery. The supply line must be protected by a 25 A fuse on the battery side.

**NOTE**

The charger integrated in MOLA*Connect* charges the 12 V battery during operation. Do not connect any other consumer to this voltage source to avoid problems caused by interference with the drive or with safety equipment (lights, radio, etc.).

**NOTE**

We recommend the use of a 12 V AGM battery with at least 100 Ah.

**Connection key switch***

Connect a key switch (NO contact) with a cable cross-section of 1.5 mm² to connection terminals 3 and 4 on terminal block (C). The key switch has no special polarity.

**Optional available*

**Connection emergency stop switch***

> **NOTE**
>
> At least one emergency stop switch must be installed. The emergency stop switch is connected to the emergency stop input of the boat kit so that in the event of a malfunction, damage to equipment or danger to persons is averted or minimized.

Connect a kill switch (NC contact) with a cable cross-section of 1.5 mm² to terminals 7 and 8 on the terminal block (C). The kill switch has no special polarity.

**Optional available*

**Power supply to the Mastervolt Power Supply**

Connect a two-pole line to terminals 5 (+) and 6 (-) on terminal block (A) to supply the Mastervolt power supply unit with a cross-section of 1.5 mm².

### *5.4.4* Installation checklist MOLA*Connect*

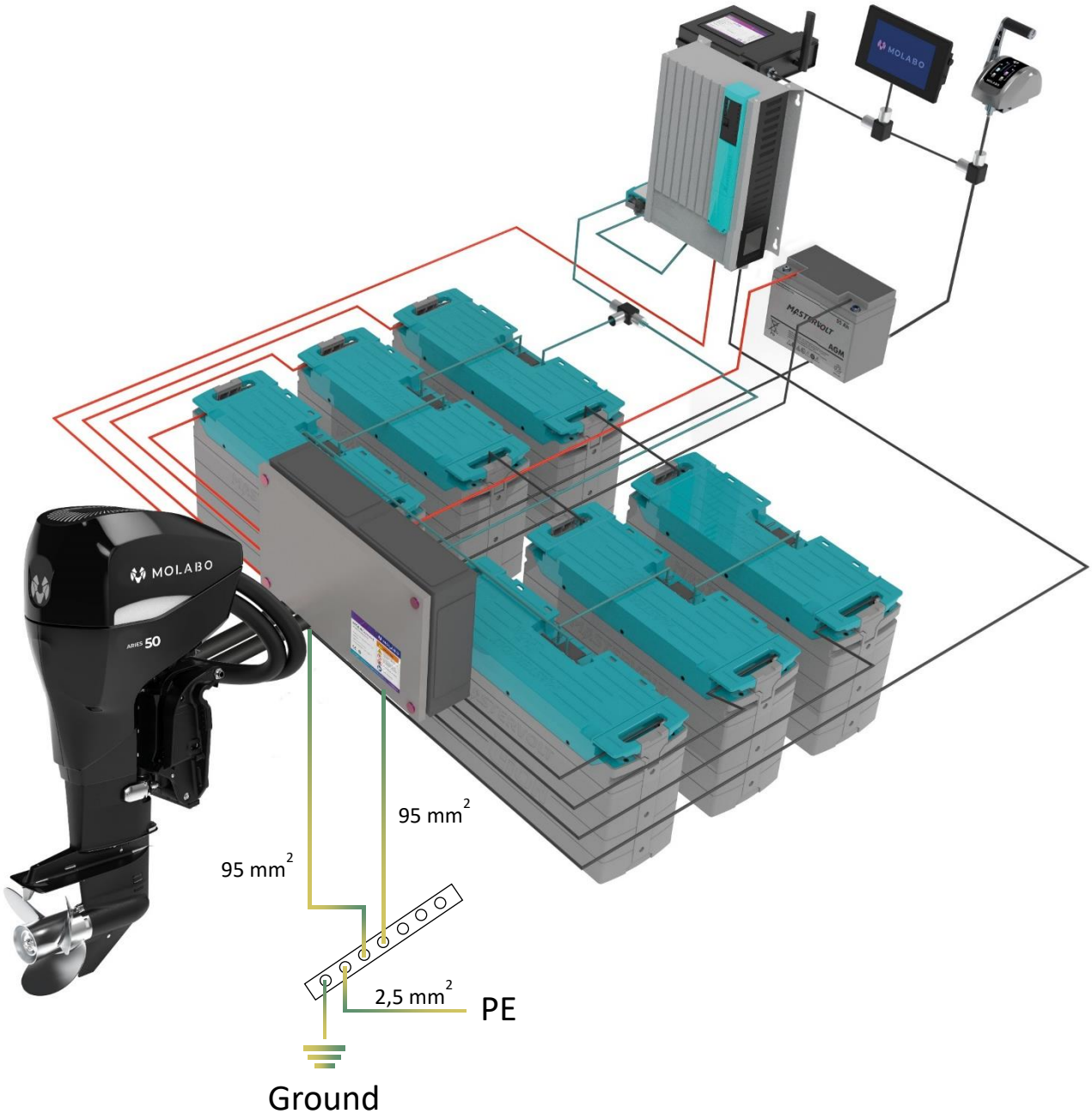
Inside the MOLA*Connect* box

- All cables fed from below
- MOLA*Connect* not exposed to intense or prolonged heat or constant water
- MOLA*Connect* always accessible, cover screws and housing cover removable at all time
- MOLA*Connect* is fastened with four screws suitable for the mounting surface
- Tightening torque of M8 nuts for battery and motor connection (positive) 15 Nm
- Tightening torque of the M10 nuts for the battery and motor connection (negative) 35 Nm
- Tightening torque of the M8 nuts for connecting the charger (negative) 35 Nm
- Tightening torque of M8 nuts for charger connection (positive) 12 Nm

12 V battery

- 12V battery as close as possible to MOLA*Connect*
- 12 V Main switch as close as possible to battery
- 25 A fuse to supply the MOLA*Connect* (maximum 20 cm away from battery)
- Maximum 3 m distance between 12 V battery and MOLA*Connect*
- 12 V cable with 4 mm² (AWG 11)

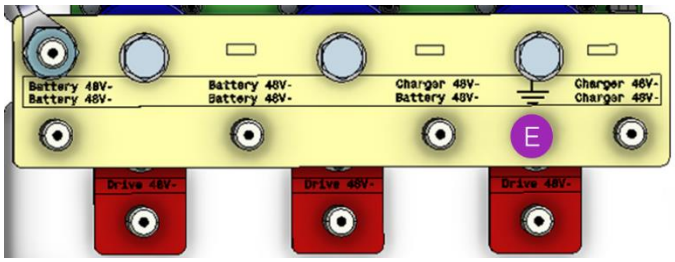
## 5.5 GROUNDING OF THE DRIVE SYSTEM



### Connection of grounding to MOLA*Connect*

**NOTE**

Only use Klauke 706F10 tubular cable lugs.
These must be crimped in the specified manner!




Screw a grounding cable 95 mm² (yellow/green) with a tubular cable lug 10 mm to the stud bolt (E) with a tightening torque of 35 Nm. Connect the grounding cable to the grounding rail mounted on the ship's side.

### Connection of the grounding on the motor ARIES R50

Screw the 10 mm tubular cable lug of the 95 mm² earthing cable on the motor side (marked yellow/green) to a fastening screw on the earthing rail mounted on the ship's side.

**NOTE**

The grounding bar must be connected to the boat grounding point with at least 95 mm².

**NOTE**

The installation of a galvanic insulator in PE is recommended according to EN ISO 13297 at the shore connection.

## 5.6 INSTALLING THE PERIPHERAL COMPONENTS

### 5.6.1 Scope of delivery

- Throttle for side- or top-mount
- System display
- MOLA*Link* with 3 antennas

### 5.6.2 Installation of the throttle

Attach the throttle to the operator's platform using the installation template. To do this, follow the enclosed instructions for the throttle.

Drilling template in the appendix.

**NOTE**

The travel lever must be connected to the data bus using the T-cable marked yellow.

### 5.6.3 Installation and connection system display

Attach the system display to the operator's platform using the installation drawing. Use the threaded holes provided on the display housing for this purpose.

**NOTE**

A mounting bracket is not included with the system display and must be manufactured by the user. Alternatively, the display can also be glued in place with suitable adhesives and sealants (e.g. Sikaflex or similar).

**NOTE**

**5" display only:** Make sure that the USB-A port on the side is accessible for software updates. The connection can also be made accessible from another location using a USB extension cable.

**7" display only:** Make sure that the USB-A port on the back is accessible for software updates. The connection can also be made accessible from another location using a USB extension cable.

**NOTE**

The connection to the data bus may only be made with the supplied T-cable with display connector.

### *5.6.4* Installation and connection MOLA*Link*

1. Mount MOLA*Link in* a protected place in the boat. A drilling diagram can be found in the appendix.

2. Connect a 0.3 m T-cable to the 5-pin data socket on MOLA*Link*.

3. Attach the supplied 3 antennas to the connectors.

MOLA*Link* turns on and off automatically with the system.

> **NOTE**
>
> Mount MOLA*Link* on a bulkhead above the waterline and observe the minimum bend radius of all cables.

> **NOTE**
>
> When installed in an aluminium or steel hull, they should use passive external antennas to ensure good reception.

> **NOTE**
>
> The passive GPS antenna can only be attached to the centre port.

### 5.6.5 Installation checklist peripheral components

- Key switch and kill switch near steering wheel?
- System display, throttle and kill switch are suitably mounted?
- Mounting according to the manufacturer's installation instructions?
- All 3 antennas on MOLA*Link* mounted?

## 5.7 STRUCTURE OF THE MOLABO COMMUNICATION BUS

All system components communicate via CAN bus.

The 5-pin data cable coming from the ARIES R50 cable loom is connected to the backbone coming from MOLAConnect. A 5-pin data cable with a watertight connection is used for this purpose. System-relevant signals are exchanged between the outboard motor and MOLAConnect via the eight-pin multi-IO connection.

> **NOTE**
>
> In the MOLABus, the cable length of 0.3 meters between the backbone and the individual components must **not be** exceeded. T-cables must not be extended! Non-observance can lead to malfunctions.

### 5.7.1 Scope of delivery

The following data cables are included in the scope of delivery of the ARIES R50:

- 3 x 5-pin T-cable 0.3 m
- 1 x 5-pin 1 m
- 3 x 5-pin 2 m
- 1 x 5-pin 3 m
- 1 x T-cable for display 0.3 m
- 1 x T-cable for travel lever 0.3 m (marked yellow)
- 2 x Terminator male

### 5.7.2 Structure of the data bus

The MOLA*Bus* network uses a backbone. All components are connected via T-cables. The T-cables must not be extended. However, the lengths of the backbone connection cables (shown in red in Figure 1) may vary and be extended.

The total length of the backbone is approved and tested for a maximum length of 30 m. Both backbones must be terminated with a terminating resistor.

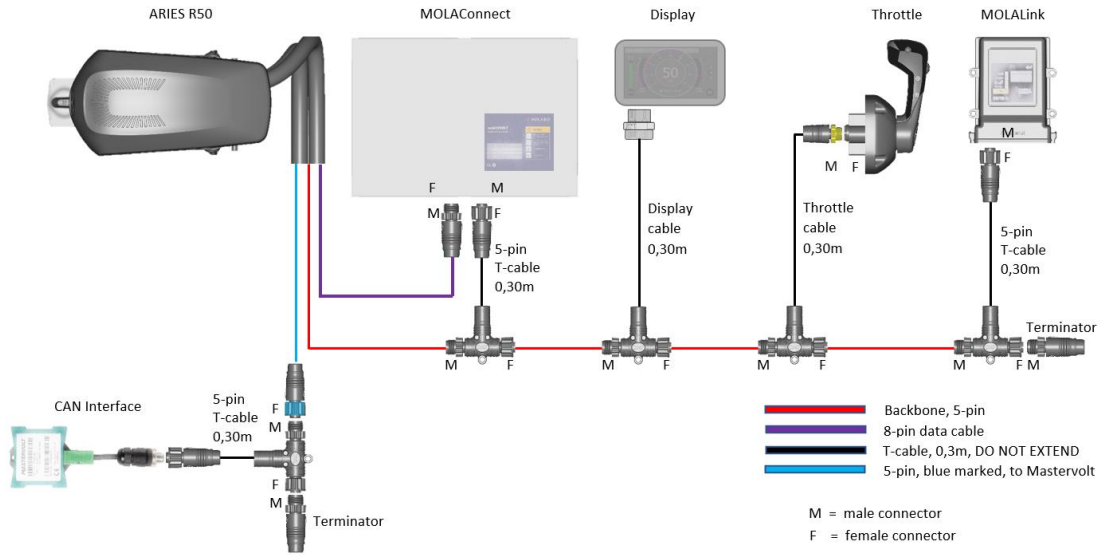



*Figure 1: Structure of the* MOLABus

The Mastervolt battery system is integrated into the MOLABus via a gateway to the MasterBus and is connected to the blue 5-pin connector of the motor connection cable. For the 48 kWh or 60 kWh battery variants with 3x 3 kW chargers, the installation of 2 CAN interfaces is mandatory. The additional CAN interface is integrated into the MOLABus with a T-cable in the same way as the first interface.

Installation-checklist MOLA*Bus*

- The cables are laid 25 mm above the bilge water area?
- Power and data cables are separated and laid with a distance of 10 cm?
- The cables are fixed every 450 mm?
- The MOLA*Bus* has a terminating resistor?
- The master bus has a terminating resistor?

**NOTE**

After the installation of the system is complete, commissioning can take place. Make an appointment with service@molabo.com for commissioning via remote connection.

# 6 COMMISSIONING

MOLABO Service will remotely perform the inspection of the battery system and the drive system, provide remote support for troubleshooting if necessary, and update and adjust the configuration if necessary.

## 6.1 COMMISSIONING OF THE BATTERY SYSTEM

- Download the tool "MasterAdjust" from Mastervolt and install it on a computer with WIFI-connection:
  *https://www.mastervolt.com/products/miscellaneous3/masteradjust-software/*

- Connect the MasterBus USB adapter to a laptop and start the MasterAdjust software.
- Now all Mastervolt devices on the bus are displayed. Figure 2 shows an example view of the devices of a 36-kWh-battery system with a charger. For a 48 kWh-system, 8 battery modules (BAT R.S0x.P0x) must be visible, and for a 60 kWh-system, 10 battery modules must be visible. For a system with three chargers, three CHG R.0x devices must be visible.

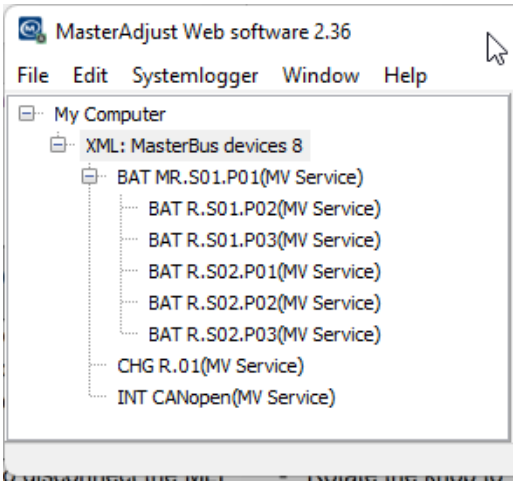



*Figure 2: MasterBus devices for a 36 kWh battery system with one charger*

The safety functions of the system, the behavior during charge stop events and battery safety events must be tested.

Please contact MOLABO Service to assist you with this test remotely: *service@molabo.com*

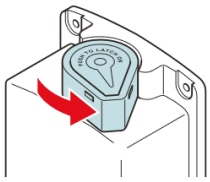
After checking the safety functions and approval by MOLABO service, make sure that all safety relays are switched off (LOCK-OFF). Now a fuse for each battery string can be inserted into the fuse holder provided.

| Checkpoint | Datum | Name |
|---|---|---|
| Safety function test, supported by MOLABO Service. | | |

## 6.2 COMMISSIONING THE DRIVE SYSTEM

The first step is to start up the control system of the system and check the correct communication of all control units.

For this purpose, all battery strings must be switched off and the safety relay of each string must be set to "LOCK OFF":

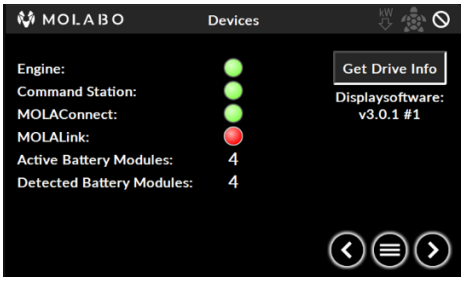


Now the 12 V battery can be connected and the MOLABO system can be supplied with 12 V. Now proceed as follows:

- Switch on key switch

The system boots, the display and the drive lever come on. After a short time, the drive goes into the "PRECHARGE" state and attempts to pre-charge the DC link via the 48 V battery. Since this is deactivated, the display changes to ERROR.


- Switch to the DEVICES screen

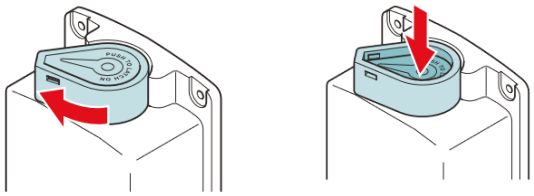



- Check whether all components are green

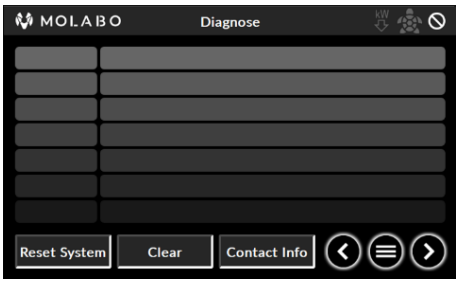
If the behaviour of the system differs from the description, there is an error. Please contact our service: *service@molabo.com*

Otherwise, the 48 V battery can be connected (the drive system is still in the "ERROR" state).

- Switch the safety relays of all battery strings to the "REMOTE ON" position one after the other.

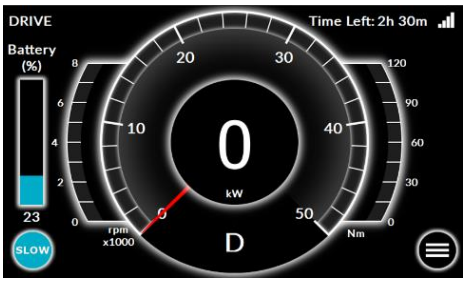


- Activate the "SLOW" key by pressing longer on the throttle. This limits the torque to be applied for the upcoming tests.
- Switch to the DIAGNOSE display.




- Press the key “Reset System”

The error is reset, the drive now pre-charges the DC link again. After a few seconds, the main relais can be heard switching on. The drive is now in the "READY" state and ready for the first rotation.




**⚠ WARNING!**

Make sure that the drive shaft, the propeller shaft and the propeller are free of obstacles.

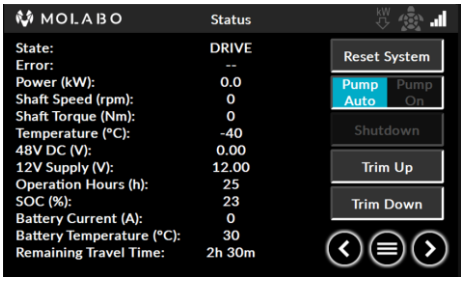
- Actuate the shift lock on the travel lever and carefully and slowly push the throttle forward.
- From the first engagement, the state changes to "DRIVE".

If the lever is now moved further forward, the propeller shaft will now start to rotate. The correct direction of rotation of the propeller can now be checked here. If this is incorrect, it can be adjusted by the configuration. Please contact service@molabo.com for more information.

## 6.3 FUNCTION TEST

### Function test in the shipyard

- Check the level of coolant in the expansion tank and fill up with BASF G40 mixed with water (40:60, down to -27 °C ) if necessary.
- Switch on ARIES R50 with the key switch and wait until the display has booted.
- Switch on the circulation pump via the system display with "PUMO ON" and let it run for a few minutes for venting. The water pump for the outer circuit runs dry, but this is allowed.




- Fill up coolant if necessary.
- Switch off circulation pump with "PIMP AUTO" on display.
- Actuate the shift lock on the throttle lever (only for side-mount) and carefully and slowly push the travel lever forward.
- From the first engagement, the state changes to "DRIVE".
- Turn the motor on briefly. Without water resistance, the motor will rev up very quickly!
- Emergency stop test: trigger emergency stop switch at very low speed. The drive must stop.
- Then move the throttle to the neutral position and reset the error in the display (Reset System).
- If the lever is moved forward again after actuating the switching lock now, the propeller shaft starts to rotate. The correct direction of rotation of the propeller can now be checked here.
- If the direction of rotation is incorrect, it can be adjusted by the configuration. To do this, contact service@molabo.com
- Run through 3 operating cycles: Switch on the ARIES R50, turn it on, move the travel lever to the neutral position and then switch it off again.
- Now install a suitable propeller, following capture 11.

### Performance test in water

- Switch on ARIES R50 with the key switch and wait until the display has booted.
- Actuate the shift lock on the travel lever (only for side-mount) and carefully and slowly push the throttle forward.
- From the first engagement, the state changes to "DRIVE", the propeller rotates when the lever is moved further forward.
- DC cabling: check all contact points of the MOLA*Connect* with a thermal imaging camera (after 10 minutes at nominal power). The temperature must **not** exceed 100° C.
- Connect shore power. The charger must switch on and charge with 1 x 50 A or 3 x 50 A. The status in the display changes to "CHARGE", a drive command is inhibited.

# 7 MAINTENANCE PLAN

| Maintenance interval | Component | Activity to be performed |
|---|---|---|
| **Before each trip** | Water hoses, coolant pump | Visual inspection for leakage |
| | Water filter | Visual inspection for contamination |
| | Kill switch | Function test |
| **During operation** | | Check cooling water temperatures on display |
| **After each ride** | Hoses, water filter | Visual inspection for dirt and leakage |
| **Annual** | Cable sheaths and lugs | Check tightening torque of nuts, visual inspection for discoloration, cracks, damage |
| | Water filter | Clean |
| | Greasing transom mount | Regrease with Quicksilver Marine Grease 2-4-C |
| | Coolant | Checking the glycol content,<br>Set point -27° C |
| | Sacrificial anodes transom mount and underwater part | Visual check and replacement if necessary |
| **Every 400 hours of operation or after 3 years (whichever comes first)** | Gearbox | Oil change with Quicksilver High Performance Gear oil |
| **Every 400 hours of operation or after 5 years (whichever comes first)** | Coolant | Change |

# 8 DISASSEMBLY, STORAGE AND DISPOSAL

## 8.1 DISASSEMBLY

**Procedure:**

1. Perform disassembly in reverse order to assembly.
2. Drain the coolant from the cooling system and dispose of it properly.

## 8.2 STORAGE

Clean the product thoroughly before storing it. It is recommended that you provide the product with a suitable cover to protect it from external contamination. Furthermore, observe the following points:

- The storage surface must be level and stable.
- The motor must be stored in a dry and clean environment and should be protected from direct sunlight.
- Storage temperatures must be between -40° C and +85° C.
- The cooling medium should be removed for storage, especially if there is a risk of frost.

## 8.3 DISPOSAL

Dispose of the product properly or have it disposed of by a specialist company. In doing so, observe all regulations of the national legislation applicable in your country.

Be sure to separate metal and electrical waste.

Dispose of the coolant properly at a local disposal company.

# 9 INSTALLATION CHECKLIST

## 9.1 DECLARATION

The company commissioned and entrusted with the installation of the ARIES system and its acting persons (e.g. boat builder, shipyard, etc.) guarantee the proper installation of the ARIES system in accordance with the ARIES installation instructions, as well as their supplements. The responsible company and its acting persons shall indemnify MOLABO in this context against any liability and claims of third parties to the extent permitted by law.

_____ _____

Place/ Date Company stamp and signature

## 9.2 PROJECT SPECIFICATION

| Specification | Details | |
|---|---|---|
| Place / Date | | |
| Project name | | |
| Name of the boat (if specified) | | |
| Boat builder / OEM | | |
| Boat model / type | | |
| End customer with address | | |
| Length overall | | m |
| Waterline length | | m |
| Width overall | | m |
| Wide waterline | | m |
| Weight - ship without ARIES R50 | | kg |
| Weight - ship with ARIES R50 | | kg |

## 9.3 SYSTEM SERIAL NUMBERS

| | Details |
|---|---|
| ARIES R50 | |
| MOLA*Connect* | |
| MOLA*Link* | |
| System display | |
| Throttle | |

## 9.4 INSTALLATION IN GENERAL

- Checking the installation steps performed (according to the corresponding chapters in the installation manual).
- Check off the cases to demonstrate completion of the required steps:

| Checkpoint | Date | Name |
|---|---|---|
| The cables are inserted into MOLA*Connect* from below to prevent water penetration | | |
| MOLA*Connect* and MOLA*Link* are easily accessible or can be made easily accessible in case of maintenance | | |
| The cables are laid 25 mm above the bilge water area | | |
| Power and data cables laid separately and with a distance of 10 cm | | |
| The cables are fixed every 450 mm | | |

## 9.5 MOTOR INSTALLATION

### 9.5.1 ARIES R50

| Checkpoint | Date | Name |
|---|---|---|
| Anti-ventilation plate 0 to -25mm below the lowest transom edge? | | |
| Screws for motor mounting inserted with sealing compound? | | |
| Steering fixed with self-locking nuts? | | |
| Have all screws been tightened to the specified tightening torques? | | |
| Power cables laid with minimum bending radius? | | |
| Power cables do not restrict the steering and tilt angles? | | |
| 75 A fuse installed for the 12 V supply to the outboard motor (max. 20 cm away)? | | |

### 9.5.2 Cables

| Checkpoint | Date | Name |
|---|---|---|
| Cable length between MOLA*Connect* and the battery strings must be the same in each case | | |
| Lay cables as straight and short as possible | | |

| | | |
|---|---|---|
| Power and data cables laid separately and at a distance | | |
| The cables are fixed every 450 mm | | |
| Minimum bending radius of the cables observed | | |

### *9.5.3* MOLA*Connect*

| Checkpoint | Date | Name |
|---|---|---|
| Cable feed from below | | |
| Do not expose MOLA*Connect to* intense or prolonged heat or constant water | | |
| MOLA*Connect* always accessible, cover screws and housing cover removable at any time | | |
| MOLA*Connect* fastened with four screws suitable for the mounting surface | | |
| Tightening torque for M8 nuts for battery and motor connection (positive) 15 Nm | | |
| Tightening torque of M10 nuts for battery and motor connection (negative) 35 Nm | | |
| Tightening torque of M8 nuts for charger connection (negative) 35 Nm | | |
| Tightening torque of the M8 nuts for connecting the charger (positive) 12 Nm | | |

### 9.5.4 Mastervolt MLI 24/6000

| Checkpoint | Date | Name |
|---|---|---|
| Tightening torque of M8 screws for all battery terminals 15,5 Nm | | |
| Torque adjustment M10 nuts for all relay contacts 15,5 Nm | | |
| Tightening torque of the M10 nuts for all fuse holder contacts 35 Nm | | |
| Is the cross-section of each battery cable sufficient (at least 95 $mm^2$ is required)? | | |
| Is the cable length of each battery string the same as the other strings (+/- 5 cm) and less than 6 m in total? | | |
| Does each battery string have a T-fuse and safety relay? | | |
| Are both batteries of a string connected via daisy chain? | | |
| Is the polarity of the DC cables permanently color-coded and correctly connected? | | |
| Are all cable lugs insulated with heat shrink tubing? | | |
| Are the data cables laid without kinks (min. bending radius of 50 mm)? | | |
| Is the MasterBus terminated at both ends? | | |

### 9.5.5 12 V battery

| Checkpoint | Date | Name |
|---|---|---|
| 12 V AGM battery with at least 100 Ah installed | | |
| 12 V 25 A block fuse near the positive contact | | |
| 12 V battery as close as possible to MOLA*Connect* | | |
| 12 V main switch as close as possible to the battery | | |
| 12 V cable with 4 $mm^2$ and max. 3 m length | | |

### 9.5.6 Shore power connection

| Checkpoint | Date | Name |
|---|---|---|
| Galvanic isolation (e.g. zinc saver) installed | | |
| RCD installed | | |
| All phases with circuit breaker | | |
| No AC extension cables used | | |
| Installation performed by a qualified electrician | | |

### 9.5.7 Charger

| Checkpoint | Date | Name |
|---|---|---|
| At least 0.5 $m^3$ ambient air for each charger | | |
| Installation at a distance of at least 50 mm from the top, 50 mm from the side | | |
| Not placed near other heat sources | | |
| Fastening the charger with four screws suitable for the installation surface and tight fit | | |
| Cable glands installed downwards | | |
| Distance between charger and shore power distribution max. 3 m | | |
| Cable cross section 25 $mm^2$ or 35 $mm^2$ | | |
| No AC extension cables used | | |

### 9.5.8 Peripherals

| Checkpoint | Date | Name |
|---|---|---|
| Key switch and emergency stop switch are mounted near the steering wheel | | |
| CAN-bus of control lever and display connected as described in the corresponding figure | | |

### 9.5.9 Throttle, system display, MOLA*Link*

| Checkpoint | Date | Name |
|---|---|---|
| Mounting according to the manufacturer's installation instructions | | |
| MOLA*Link* mounted in location with good reception | | |

### 9.5.10 Performance Data

Please enter the performance data of your boat in the tables below.

**Boat Characteristics**

| | |
|---|---|
| Boat type | |
| Length | |
| Beam | |
| Hull weight (without system) | |
| Boat weight as tested | |

**Propulsion System**

| | |
|---|---|
| Motor type | |
| Prop (no. blades, diameter x pitch) | |
| Battery capacity | |
| Battery brand | |

**Test Conditions**

| | |
|---|---|
| Test date | |
| Number of people on board | |
| Wind velocity | |
| Test location | |

**Performance Details**

| Motor torque (Nm) | Power (kW) | Rotor Speed (rpm) | Boat speed (km/h) |
|---|---|---|---|
| 10 | | | |
| 20 | | | |
| 30 | | | |
| 40 | | | |
| 50 | | | |
| 60 | | | |
| 70 | | | |
| 80 | | | |
| 90 | | | |
| 100 | | | |
| 110 | | | |

## 9.6 ACCEPTANCE SIGNATURE

| Checkpoint | Date | Name |
|---|---|---|
| Safety function test supported by MOLABO service performed | | |

| Checkpoint | Date | Name |
|---|---|---|
| All controls were performed for all components | | |

If you have any questions, please contact MOLABO Service by e-mail or phone: service@molabo.com or +49 (0) 89/179 251 079

**NOTE**

**To preserve warranty and guarantee claims, the completed checklist must be sent by mail to service@molabo.com.**

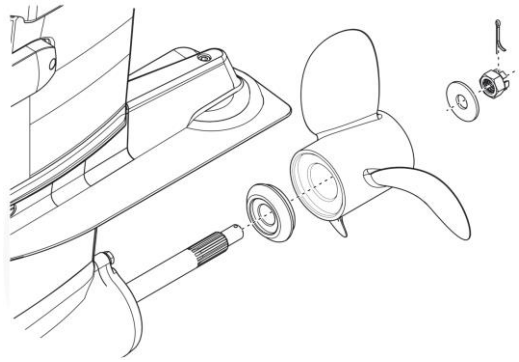
# 10 SCOPE OF DELIVERY ARIES R50 OUTBOARD

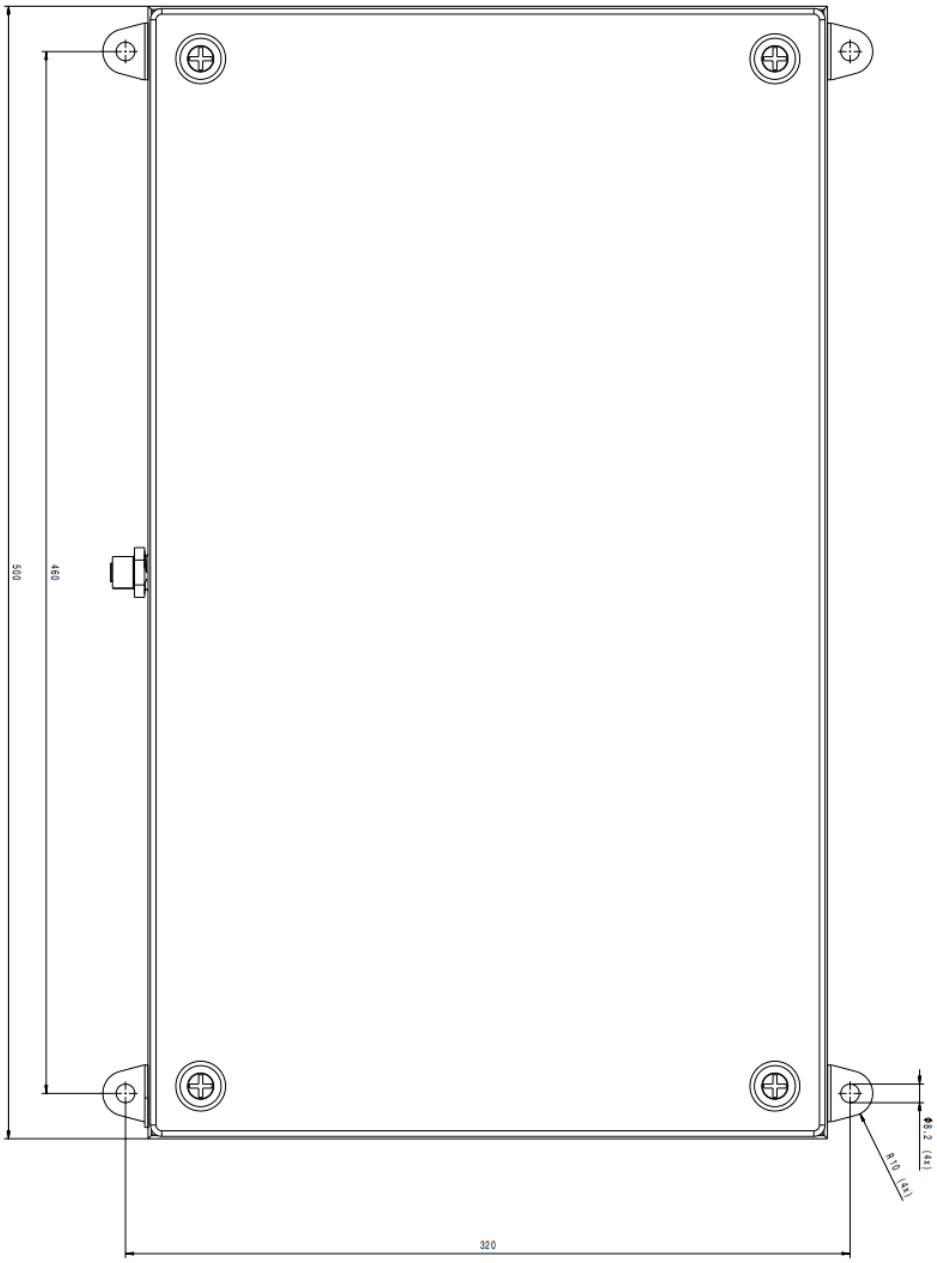
The scope of delivery of the ARIES R50 inboard is described in chapter 0 in the subchapters on the respective subsystems. The following is a list of the parts that are **not** included in the scope of delivery but are necessary for successful operation:

| Component | Specification |
|---|---|
| DC-cable between battery and MOLAConnect | 6 x (min. 95 mm², max. 120 mm²), each 1 - 5 m |
| DC-cable between charger and MOLAConnect | 2 x or 6 x 35 mm², 3 - 4 m |
| Key switch | Single-pole, single-stage NO contact, min. 1 A |
| Kill switch | Single pole NC contact, min. 1 A |
| 12 V battery | AGM, min. 60 Ah |
| 12 V fuse holder and fuse 25-A and 75-A | At least 2 positions |
| Shore power installation | |
| Propeller | 13 Splines, Johnson-, Evinrude-, OMC-Standard 40-140 HP, 4 1/4“ gear housing<br>Recommendation:<br>Solas Rubex 3: Pitch 9“ – 19“<br>Solas Rubex 4: Pitch 13“ – 19“<br>Solas New Saturn 3: Pitch 13“ – 21“<br>Hubkit: Michigan Wheel XHS206 |

# 11 APPENDIX

**Propeller assembly**

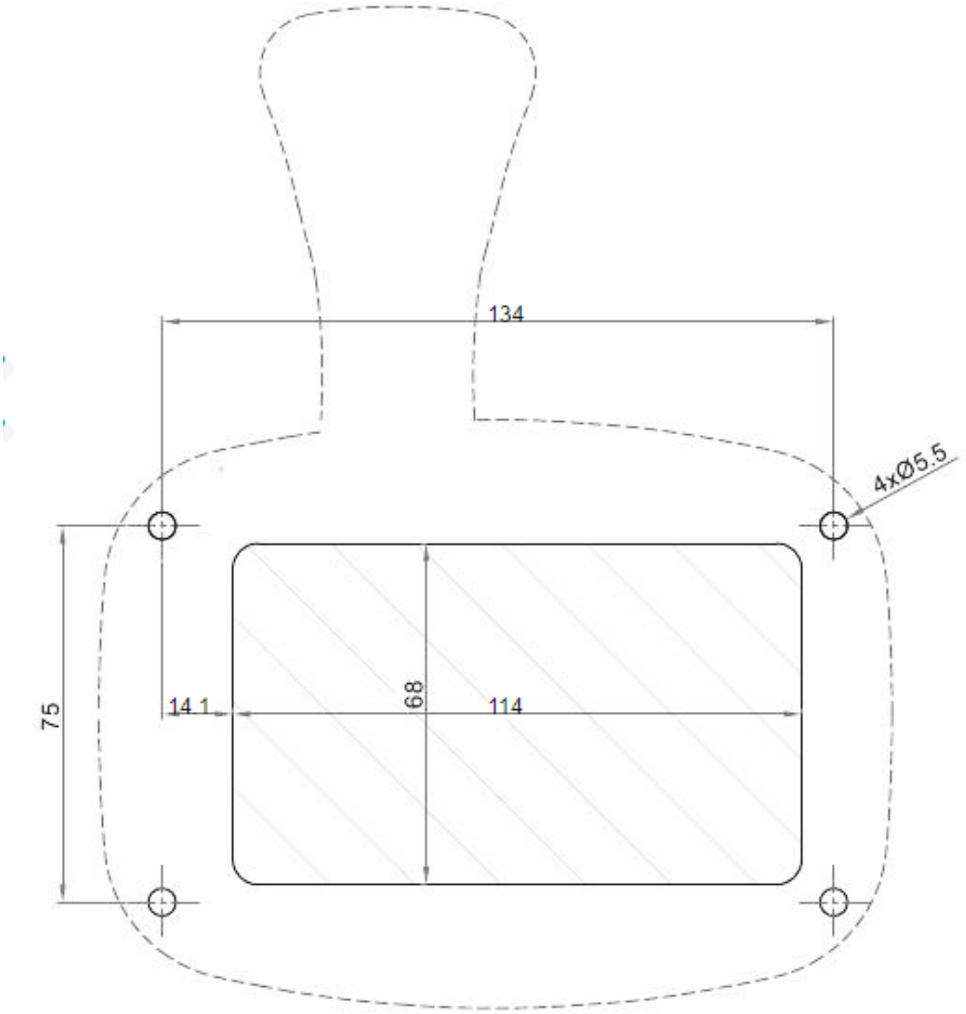



500
469
320
Ø8.2 (4x)
R10 (4x)

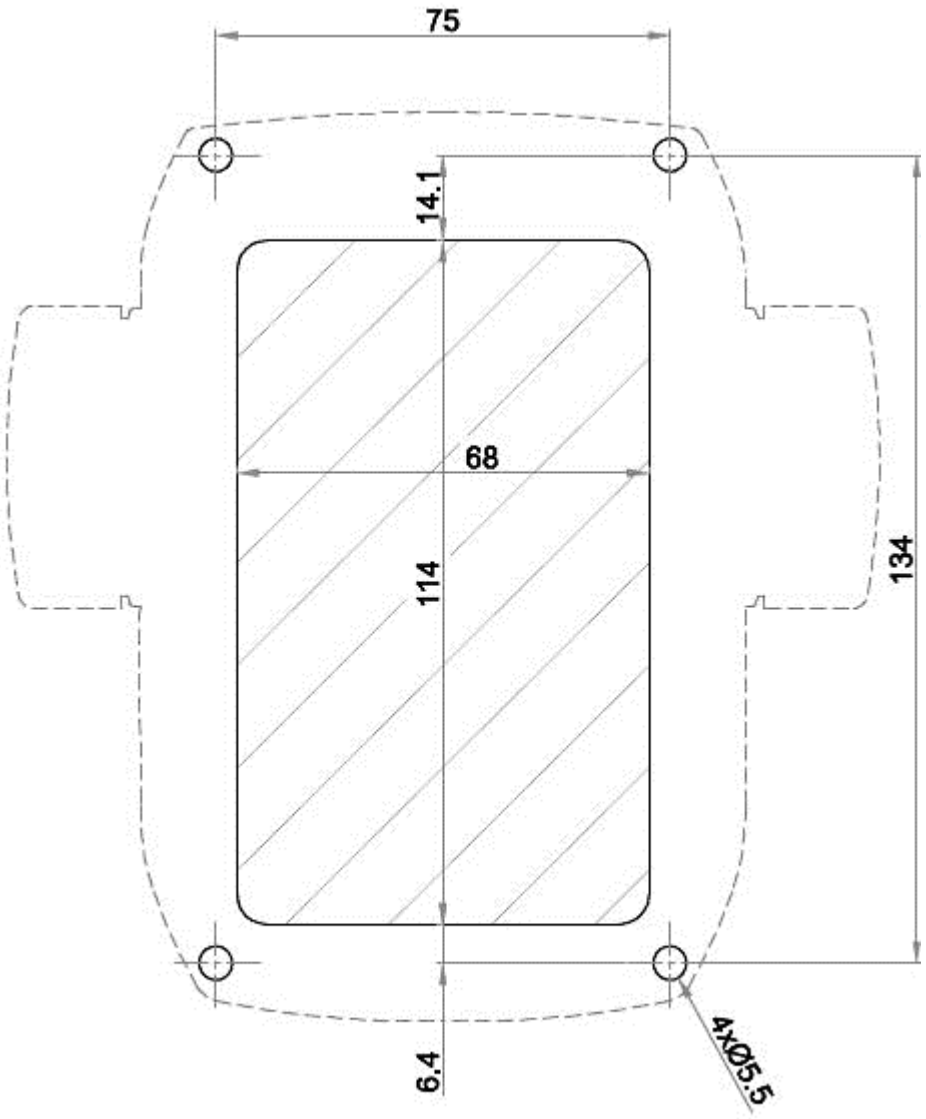
**Throttle**

**Mounting location console right or control console left.**

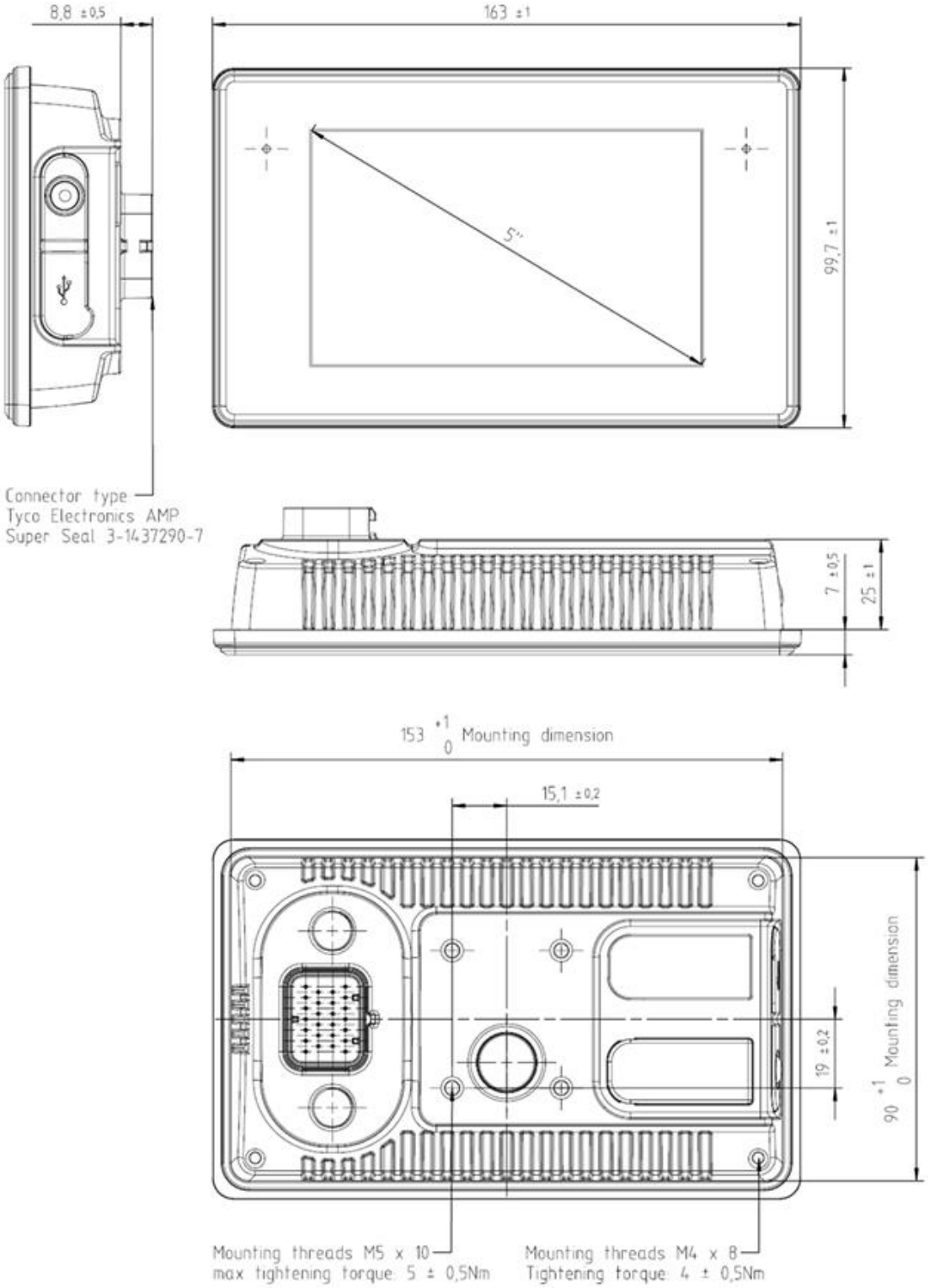
The template must be used mirrored for the installation location on the left side of the platform or on the right side of the control console.



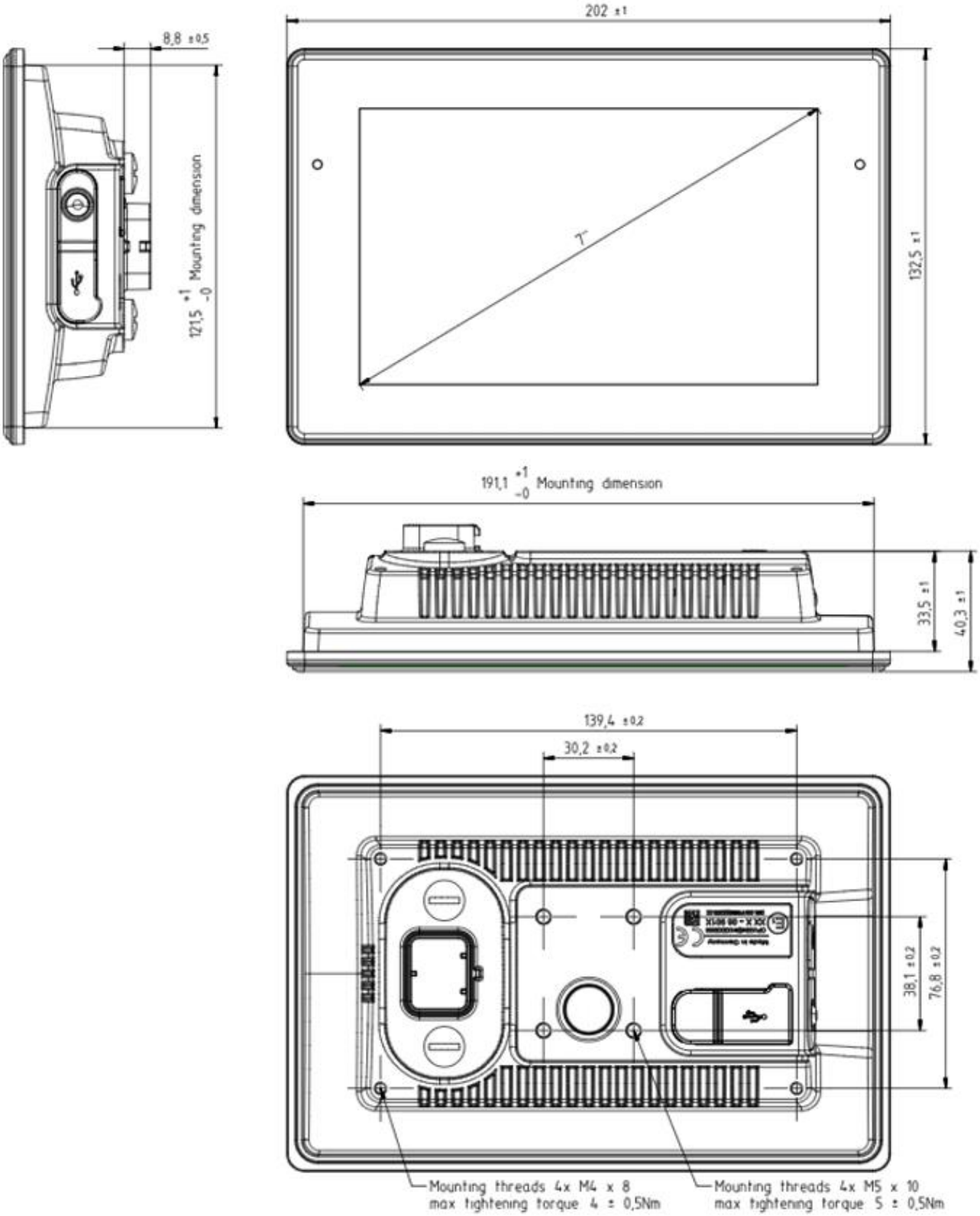
## Drilling template top-mount



## System display 5”



**System display 7”**



# CUSTOMER SURVEY FEEDBACK

Your opinion is of utmost importance to us at MOLABO. We always strive to optimize our products and services and tailor them to your needs.

To support us in this continuous improvement process, we invite you to participate in our short survey. Please scan the QR code below with your smartphone to access the survey. It only takes a few minutes and your answers will be kept strictly confidential.

Thank you in advance for your time and valuable feedback.

Your MOLABO team

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