

Quick Start (en)

Date: 07/2021

Revision: v.2.1



MiR 500


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1. Version history

This table shows current and previous versions of this document.

| MiR500 | | | |
|---|--------------|--|---------|
|  | | | |
| Revision | Release date | Description | HW |
| 2.1 | 2021-07-05 | General improvements throughout the document. | 1.1 |
| 2.0 | 2020-12-01 | Major update and new structure with new sections: Version history, Warning label, IT security, Mounting the nameplate, and Charging the robot. | 1.1 |
| 1.0-1.3 | 2020-06-18 | First editions. | 1.0-1.1 |

2. Safety

Read the information in this section before powering up and operating MiR500.

Pay particular attention to the safety instructions and warnings.



NOTICE

Mobile Industrial Robots disclaims any and all liability if MiR500 or its accessories are damaged, changed, or modified in any way. Mobile Industrial Robots cannot be held responsible for any damages caused to MiR500, accessories, or any other equipment due to programming errors or malfunctioning of MiR500.

2.1 Safety message types

This document uses the following safety message types.



WARNING

Indicates a potentially hazardous situation that could result in death or serious injury. Carefully read the message that follows to prevent death or serious injury.



CAUTION

Indicates a potentially hazardous situation that could result in minor or moderate injury. Alerts against unsafe practices. Carefully read the message that follows to prevent minor or moderate injury.



NOTICE

Indicates important information, including situations that can result in damage to equipment or property.

2.2 General safety precautions

This section contains general safety precautions.



WARNING

If the robot is not running the correct software and is therefore not functioning properly, the robot may collide with personnel or equipment causing injury or damage.

- Ensure that the robot is always running the correct software.



WARNING

When the robot is in an operating hazard zone, there is a risk of injury to any personnel within the zone.

- Ensure that all personnel are instructed to stay clear of operating hazard zones when the robot is in the zone.



WARNING

The robot may drive over the feet of personnel, causing injury.

- All personnel must be informed of the side Protective fields of the robot and be instructed to wear safety shoes near an operating robot.



WARNING

The robot may drive into a ladder, scaffold, or similar equipment that has a person standing on it. Personnel risk fall injuries and equipment may be damaged.

- Don't place ladders, scaffolds, or similar equipment in the robot's work environment.

**WARNING**

The robot may drive down staircases or holes in the floor and cause serious injury to personnel and damage to the robot and to equipment.

- Mark descending staircases and holes as Forbidden zones on maps.
- Keep the maps up to date.
- Inform personnel that the robot cannot detect descending staircases and holes in the floor in time to stop.

**WARNING**

Contact with live electrical parts can cause electric shock.

- Do not touch any internal components of the robot while it is powered.

**WARNING**

Using a charging device different from the one supplied by the manufacturer can cause a fire and thereby burn injuries to nearby personnel and damage to the robot and equipment.

- Only use an original MiR charger.

**WARNING**

Attempting to charge batteries outside the robot can lead to burns.

- Never charge the batteries outside the robot.

**WARNING**

Lithium battery packs may get hot, explode, or ignite and cause serious injury if they are misused electrically or mechanically.

Observe the following precautions when handling and using lithium-ion batteries:

- Do not short-circuit, recharge, or connect with false polarity.
- Do not expose to temperatures beyond the specified temperature range or incinerate the battery.
- Do not crush, puncture, or disassemble the battery. The battery contains safety and protection devices, which, if damaged, may cause the battery to generate heat, explode, or ignite.
- Do not allow the battery to get wet.
- In the event the battery leaks and the fluid gets into one's eye, do not rub the eye. Rinse well with water, and immediately seek medical care. If left untreated, the battery fluid could cause damage to the eye.
- In case of fire, use water to put out the fire. There is no need for special extinguishing media. An ambient fire can be fought with class D extinguishing media.
- Do not touch damaged batteries with bare hands. Only personnel using suitable Personal Protection Equipment (PPE) and tools should handle damaged batteries.
- Isolate the battery and keep clear if the following conditions are observed:
 - The battery exhibits abnormally high temperatures.
 - The battery emits abnormal odors.
 - The battery changes colors.
 - The battery case is deformed or otherwise differs from the normal electrical or mechanical condition.
- Modifications or manipulations of the battery may lead to considerable safety risks and are therefore prohibited.
- Do not use the battery for anything other than MiR500.

**WARNING**

Load falling or robot overturning if the load on the robot is not positioned or fastened correctly can cause fall injuries to nearby personnel or damage to equipment.

- Ensure that the load is positioned according to the specifications and is fastened correctly—see the user guide of your robot for safe payload distribution.

**CAUTION**

Robot malfunctions can cause an electrical fire, causing damage and injury to equipment and personnel.

- Personnel operating near the robot must be informed on how to use an ABC fire extinguisher to put out an electrical fire should the robot malfunction and catch on fire.

**CAUTION**

Risk of trapping or injury to personnel if robots malfunction or if personnel enter operating hazard zones.

- Personnel operating near the robot must be informed on how to engage the robot's Emergency stop function in emergency situations.

2.3 Intended use

MiR500 is intended to be commissioned and used in indoor industrial environments where access for the public is restricted. For details about the environmental conditions in which MiR500 should operate, see specifications for MiR500 on the MiR website.

MiR500 is intended to be commissioned according to the guidelines in your robot's user guide. This is a prerequisite for safe usage of MiR500.

MiR500 is equipped with safety-related features that are purposely designed for collaborative operation where the robot operates without a safety enclosure or together with people.

MiR500 is intended to be used with top modules supported by Mobile Industrial Robots or custom modules that:

- Do not have any moving parts.
- Do not extend the physical dimensions of the robot.
- Operate within the environmental conditions required for MiR500.
- Are within the weight distribution requirements—see your robot's user guide.

If used with custom modules, all obligations of a manufacturer apply to the individual who performs the modifications in accordance with the machinery directive.

MiR500 is designed for and all risks are considered when used with one of the following types of top modules:

- MiR Pallet Lift 500 used with MiR Pallet Rack
- MiR EU Pallet Lift 500 used with MiR EU Pallet Rack.
- MiR Shelf Lift to transport MiR supported shelves.

MiR500 can be used as a partly complete machine as defined in the EU machinery directive with top modules that do not meet the above limitations. Those who design, manufacture, or commission a system that does not meet the limitations of use of MiR500 carry the obligations of a manufacturer and shall ensure a safe design according to EN ISO 12100. Guidelines outlined in this manual are not sufficient.

The following list gives examples of custom modules that are foreseeable misuse of MiR500:

- Top modules (including the payload) that increase the physical dimensions of MiR500
- Conveyers (powered and non-powered)
- Industrial robot arms
- Devices that tow carts
- Customized load transfer stations

**NOTICE**

A safe machine does not guarantee a safe system. Follow the commissioning guidelines in your robot's user guide to ensure a safe system.

2.4 Users

MiR500 is only intended to be used by personnel that have received training in their required tasks.

There are three types of intended users for MiR500: commissioners, operators, and direct users.

Commissioners

Commissioners have thorough knowledge of all aspects of commissioning, safety, use, and maintenance of MiR500 and have the following main tasks:

- Commissioning of the product. This includes creating maps and restricting the user interface for other users and making brake tests with a full payload.
- Conducting the risk assessment.
- Determining the payload limit, weight distribution, safe fastening methods, safe loading and unloading of loads on MiR500, and ergonomic loading and unloading methods if relevant.
- Ensuring the safety of nearby personnel when the robot is accelerating, braking, and maneuvering.
- Marking operating hazard zones.

Operators

Operators have thorough knowledge of MiR500 and of the safety precautions presented in this user guide. Operators have the following main tasks:

- Servicing and maintaining MiR500.
- Creating and changing missions and map features in the robot interface.

Direct users

Direct users are familiar with the safety precautions in this quick start and have the following main tasks:

- Assigning missions to MiR500.
- Fastening loads to MiR500 securely.
- Loading and unloading from a paused robot.

All other persons in the vicinity of MiR500 are considered indirect users and must know how to act when they are close to the robot. For example, they must be aware that visibly marked operating hazard zones must be respected.

2.5 Foreseeable misuse

Any use of MiR500 deviating from the intended use is deemed as misuse. This includes, but is not limited to:

- Using the robot to transport people
- Using the robot on steep surface grades, such as ramps
- Making changes to the SICK configuration
- Driving the robot on cross slopes
- Exceeding the total payload
- Positioning or fastening loads incorrectly according to the specifications
- Using Emergency stop buttons for anything other than emergency stops
- Using the robot in medical and life critical applications
- Operating the robot outside the permissible operating parameters and environmental specifications
- Using the robot in potentially explosive environments
- Using the robot outdoors
- Using the robot in hygiene zones

2.6 Residual risks

Mobile Industrial Robots has identified the following potential hazards that commissioners must inform personnel about and take all precautions to avoid when working with MiR500:

- You risk being run over, drawn in, trapped, or struck if you stand in the path of the robot or walk towards the robot or its intended path while it is in motion.
- You risk being run over, drawn in, trapped, or struck if you stand in the path of the robot or walk towards it while it is driving in reverse. The robot only drives in reverse when undocking from a marker, such as a charging station or load transfer station.
- You risk being crushed or trapped if you touch the robot while it is in motion.

- You risk being crushed or trapped if the robot places a load outside a designated drop-off area due to faulty localization.
- You risk losing control of the robot if it is accessed by unauthorized users. Consider increasing the IT security of your product—see [IT security on page 25](#).

**NOTICE**

Other significant hazards may be present in a specific robot installation and must be identified during commissioning.

2.7 Warning label

MiR500 is supplied with a warning label that specifies that it is strictly prohibited to ride on the robot.

The label must be placed on the robot or top module so that it is clearly visible.



Figure 2.1. The warning label must be placed on the robot or top module.

3. Light indicators and speakers

The robot uses two types of light indicators to let people in the environment know what the robot is currently doing or planning to do.

- **Status lights**

LED light bands on all four sides of the robot uses colors and light motion patterns to signal the current status of the robot.

- **Signal lights**

The signal lights at the front and back of the robot show if the robot is about to turn a corner or go backward. Front lights are white and rear lights are red. Right and left turns are indicated by blinking.



Figure 3.1. Indicator lights on MiR500.

| Table 3.1. Identification of indicator lights in <i>Figure 3.1</i> | | | |
|---|---------------|------|---------------|
| Pos. | Description | Pos. | Description |
| 1 | Signal lights | 2 | Status lights |

3.1 Status lights

The LED light bands running all the way around the robot indicate the robot's current operational state. Colors may also be used as part of missions, but as standard, status lights indicate the statuses described in **Table 3.2**.

| Table 3.2. Status light colors | |
|--|---|
| Red | Emergency stop |
| Green | Ready for job |
| Cyan | Drives to destination |
| Purple | Goal/Path blocked |
| White | Planning/Calculating |
| Yellow | Mission paused |
| Yellow wavering | Startup signal before PC is active |
| Yellow fade | Shutting down robot |
| Yellow blinking | Relative move, ignoring obstacles |
| Purple - yellow | General error, for example hardware, localization |
| Blue | Manual drive |
| Blue wavering | Mapping |
| Contracting white | Charging at charging station |
| White wavering | Prompt user / Waiting for user's response |
| Cyan wavering (robots connected to MiR Fleet only) | Waiting for MiR Fleet resource or for another MiR robot to move |



When the robot's battery reaches a critically low level of power (0-1%), the ends of the status lights flash red.



When the robot is charging in a charging station, the status lights on the side of the robot indicate the robot's battery percentage.

3.2 Signal lights

Signal lights are used to indicate the robot's immediate motion plans by signaling forwards-backwards-braking and left-right turns.

The signal lights work similarly to lights used on cars; white at the front, red at the back, and indicating a left or right turn by blinking.

When the robot drives with muted Protective fields, for example, when docking to a charging station, all signal lights blink yellow.

3.3 Speakers

In **Setup > Sounds**, you can upload new sounds to the robot or edit the volume and length of the default sounds.

Sounds are used in missions and can be used as alerts: "Please step aside" or to attract peoples attention, for example, when the robot has arrived at a position.

When the robot drives with muted Protective fields it emits a warning sound. In **System > Settings > Safety system**, you can choose which sound the robot makes and the volume of the sound.



CAUTION

Changing the safety system can cause the robot to not comply with safety standards.

- Do not disable the sound in the safety system.

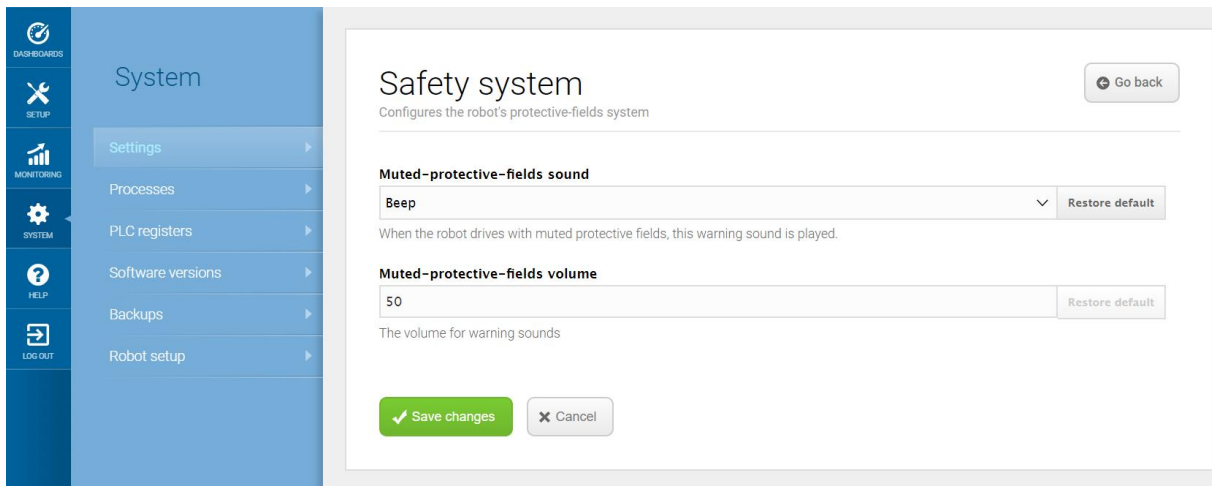


Figure 3.2. In the Safety system settings, you can modify the sounds the robot plays when the robot mutes its Protective fields.



CAUTION

It is the responsibility of the commissioner to ensure that the warning sounds are audible in the robot's work environment.

4. Control panel

MiR500 has a control panel in the rear-left corner of the robot.

4.1 The control panel buttons

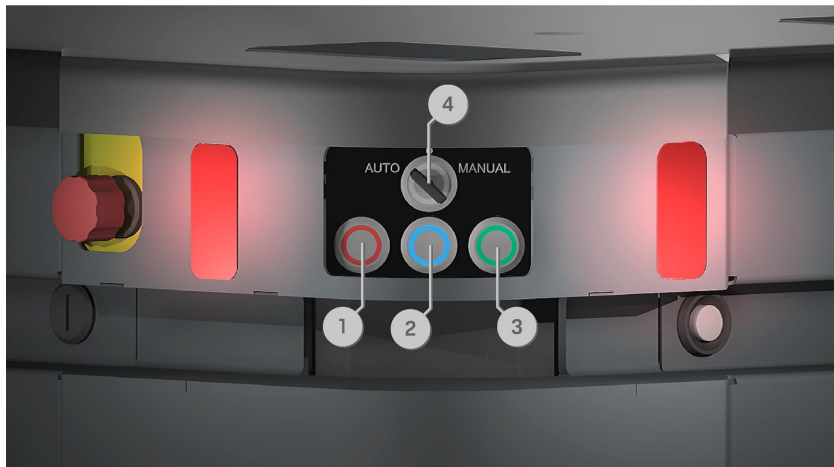


Figure 4.1. The MiR500 control panel.

| Table 4.1. Identification of items on the control panel in <i>Figure 4.1</i> | | | |
|---|--------------------|------|--------------------|
| Pos. | Description | Pos. | Description |
| 1 | Manual stop button | 2 | Resume button |
| 3 | Power button | 4 | Operating mode key |

Manual stop

Pressing this button stops the robot. After pressing this button, you must press the Resume button to let the robot continue operating.

Color indication:

- Red: It is possible to engage the Manual stop.

Resume

Pressing this button:

- Clears the Emergency or Protective stop state.
- Lets the robot continue operating after the Manual stop button was pressed or after the operating mode changes.
- Lets the robot start operating after powering up.

Color indication:

- Blinking blue: The robot is waiting for a user action (clear the Protective stop state, acknowledge the change of operating mode).

Power

Pressing this button for three seconds turns the robot on or shuts it off.

Color indication:

- Blue: The robot is off.
- Blinking green: The robot is starting up.
- Green: Normal operation.
- Blinking red: The battery level is too low to start without additional charging, or the robot is shutting down.

4.2 The Operating mode key

The Operating mode key lets you switch between operating modes.

- **Left position: Autonomous mode**
Puts the robot in Autonomous mode.
- **Middle position: Locked**
Locks the robot. The robot blocks the wheels; you cannot start a mission or drive the robot manually.
- **Right position: Manual mode**
Puts the robot in Manual mode.



Remove the Operating mode key during normal operation. The vibrations from the robot's driving may shake the key and plug, and can cause an unwanted Protective stop.

5. Accessing the internal parts

Most internal parts of MiR500 are accessed through maintenance hatches that open to different compartments.



CAUTION

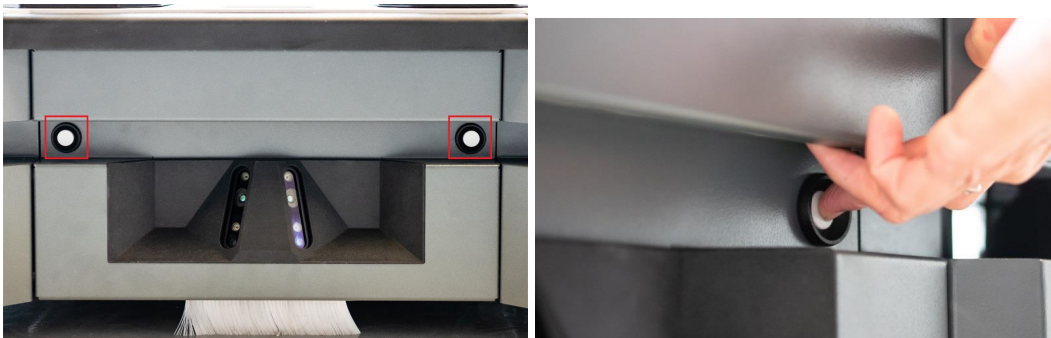
Opening or removing hatches from the robot exposes parts connected to the power supply, risking damage to the robot from a short circuit and burns.

- Before removing any covers, turn off the robot, and disconnect the battery—see your robot's user guide for instructions on disconnecting the battery.

5.1 Front compartment

To open the front compartment, follow these steps:

1. Push the two white buttons at the same time and pull the hatch.



2. Turn the two levers 180°.



3. Pull out the compartment drawer while holding underneath it and lifting slightly.



5.2 Rear compartment

To open the rear compartment, push the two white buttons at the same time and pull the hatch.



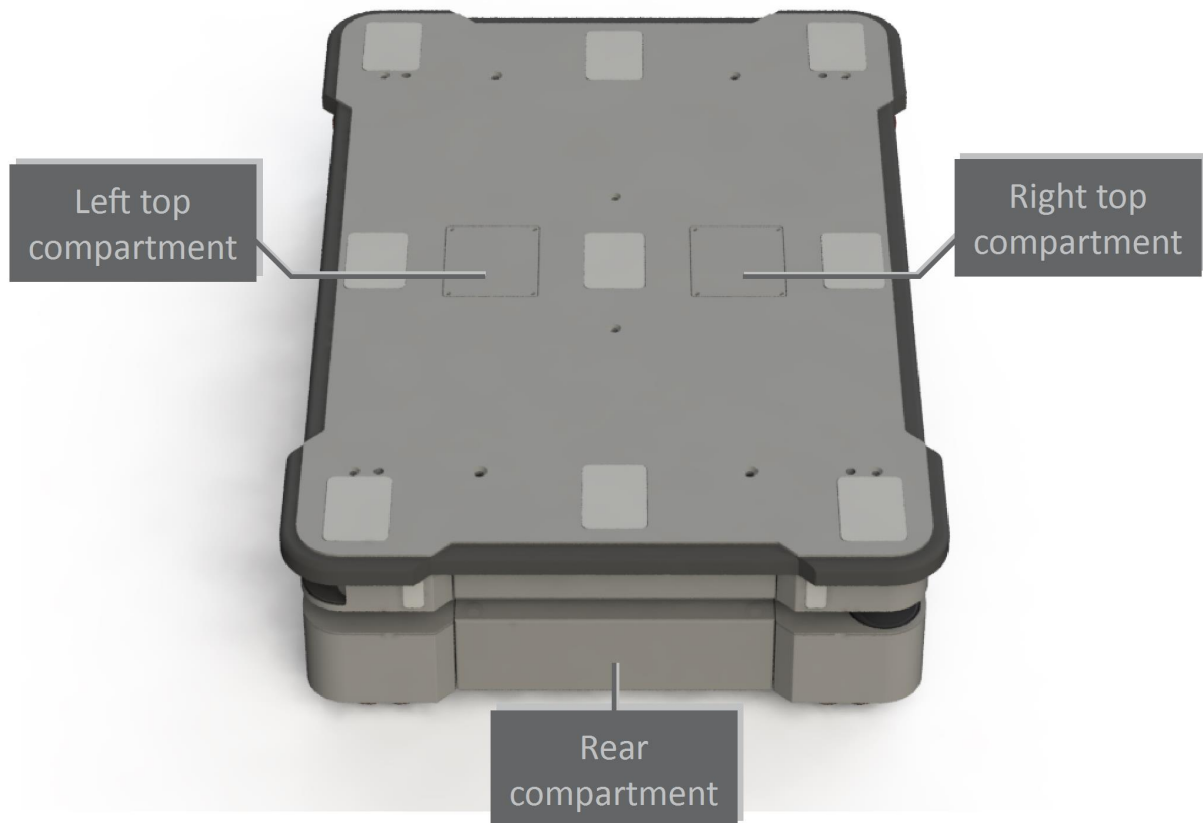
5.3 Side compartments

To open a side hatch, turn the two screws 90° with a flat-head screwdriver, and pull open the hatch.



5.4 Top compartments

To open a top compartment, remove the four screws and lift off the top cover.



6. IT security

IT security is a set of precautions you can take to prevent unauthorized personnel from accessing MiR500. This section describes the main IT-security related risks and how to minimize them when commissioning MiR500.

MiR500 communicates all data over the network that it is connected to. It is the responsibility of the commissioner to ensure that it is connected to a secure network. MiR recommends conducting an IT-security risk assessment before commissioning the robot.



Contact your distributor for a list of FAQs about IT security and the guide *How to set up MiR products to improve the IT security*.

6.1 Managing users and passwords

Managing your users and passwords is the main way you can control access to MiR500.

There are three default users with predefined passwords for you to start using. These are described in the *MiR Robot Reference Guide* along with instructions to create new users, user groups, and passwords. MiR advises you to:

- Change the default password for all predefined users if you choose to continue to use them. Make sure to choose a strong password since MiR500 does not enforce any password rules nor expire the password.
- Create new user groups if more levels of access are necessary.
- Create dedicated user accounts under the relevant user group for each person accessing MiR500, and ensure that the users change the password on their first sign-in. It is not recommended to have several users share the same account.
- Only enable users with a minimum level of access to use a pin code to sign in. Users with a higher level of access are recommended to use a strong password to sign in instead.

6.2 Software security patches

To improve the security of MiR500, MiR supplies security patches to the operating system in new MiR software update files. When you install a security patch, it takes approximately 10-15 minutes longer to update a MiR product.



Security patches are included from software version 2.8.3 and higher.

Understanding MiR software versions

MiR uses the **Major.Minor.Patch.Hot fix** format to version software. For example, 2.8.1.1 means that the software is based on the second major release, the eighth minor release of the major version, the first patch release of the minor version, and, in this example, a single hot fix is included too.

- **Major releases** include the most significant changes that affect the entire robot software.
- **Minor releases** often include new features and smaller changes that only affect parts of the software.
- **Patch releases** focus on fixing small issues in the software and introducing quality improvements.
- **Hot fix releases** are only created when a patch release has introduced a critical issue that needs to be fixed immediately.

Security patch policy

MiR applies the following policy when supplying security patches:

- New security patches are distributed per every minor release.
- All patch releases under a minor release include the previous security patches also. In other words, if you chose not to install the first software version in a minor release, such as version 2.9.0, the security patches will still be installed when you update to 2.9.1 or higher.

7. Getting started

This section describes how to get started with MiR500.



NOTICE

Read [Safety on page 5](#) before powering up MiR500.



In some images in this section, the robot is shown with a MiR EU Pallet Lift 500 top module.

7.1 In the box

This section describes the contents of the MiR500 box.



Figure 7.1. The box containing the robot and accessories.

The box contains:

- The MiR500 robot
- A MiR500 document folder containing a USB flash drive and the following printed documents:
 - *MiR500 Quick Start*
 - *The CE Declaration of Conformity for your robot*
 - *Getting the robot online*
 - *Passwords*
 - The unique nameplate for your robot
- The USB flash drive in the document folder has the following content:
 - *MiR500 User Guide*
 - *MiR500 Quick Start*
 - *MiR Network and WiFi Guide*
 - *MiR Robot Reference Guide*
 - *MiR Robot REST API Reference*
 - *Getting the robot online*
 - *CE Declaration of Conformity*

7.2 Unpacking MiR500

This section describes how to unpack the robot.



Keep the original packaging for future transportation of MiR500.

To unpack the robot, follow these steps:

1. Place the box with the robot so that there is at least three meters of free space at the front or the back of the box. This is necessary as the robot drives out of the box on a ramp.

2. Remove the screws that attach the walls of the box to the box lid and the base of the box.



3. Remove the lid from the box.

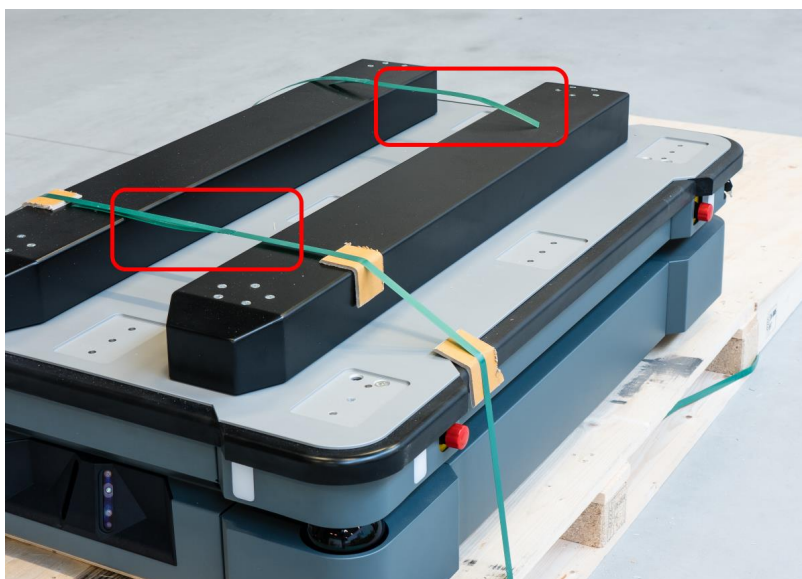


4. Take the folder with the printed documents and the USB flash drive out of the box.

5. Remove the walls of the box and the protective foam blocks.



6. Cut the protective straps.



7. Remove the wooden lath beneath the lid.



8. Place the lid of the box so that you can use it as a ramp. Align the lid so that it is flush with the base of the box.



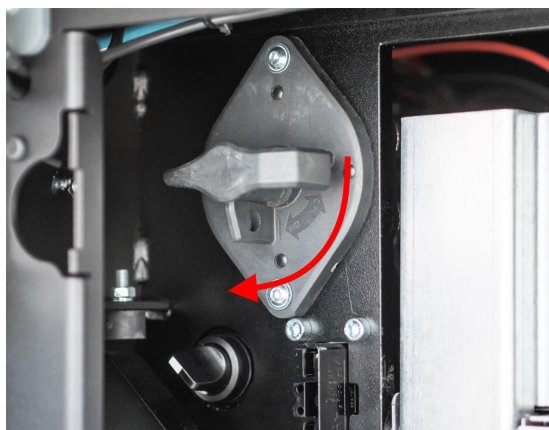
9. Remove the wheel stop board from the pallet to let the robot drive on the ramp.



7.3 Connecting the battery

To connect the battery to the robot, you need to open the rear compartment—see [Accessing the internal parts on page 21](#).

Once you have accessed the rear compartment, turn the Battery disconnect switch to the On position.



The battery is now connected, and you can close the rear maintenance hatch.

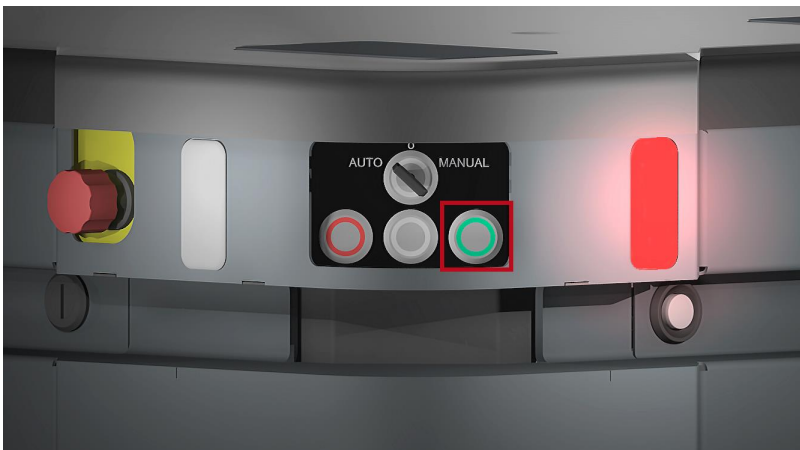
7.4 Powering up the robot

To power up the robot, follow these steps:

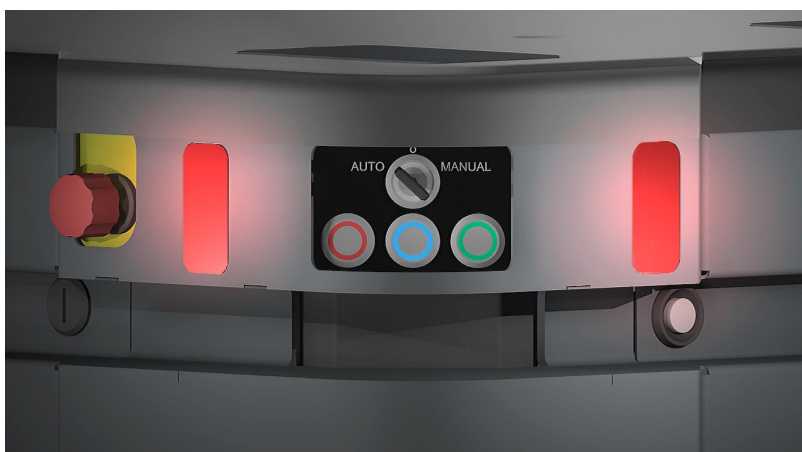
1. Ensure that all four Emergency stop buttons are in the released state. Turn an Emergency stop button clockwise to release it.



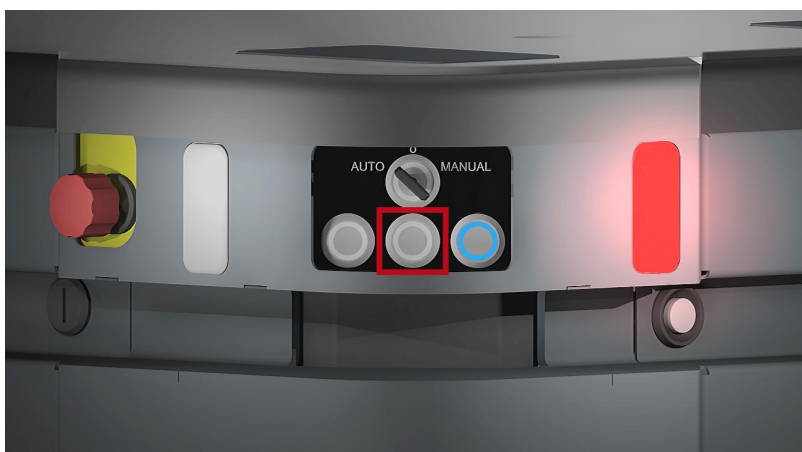
2. Press the Power button for five seconds.



The robot turns on the red signal lights and starts the software initialization process. When the initialization process ends, the robot goes into Protective stop.



3. Press the Resume button to clear the Protective stop. The robot is now ready for operation.



7.5 Connecting to the robot interface

When the robot is turned on, it enables the connection to its WiFi access point. The name of the access point appears in the list of available connections on your PC, tablet, or phone.



NOTICE

The original username and password for the robot's web interface are in the document *Getting the robot online*.

The unique password for the WiFi access point is in the *Passwords* document.

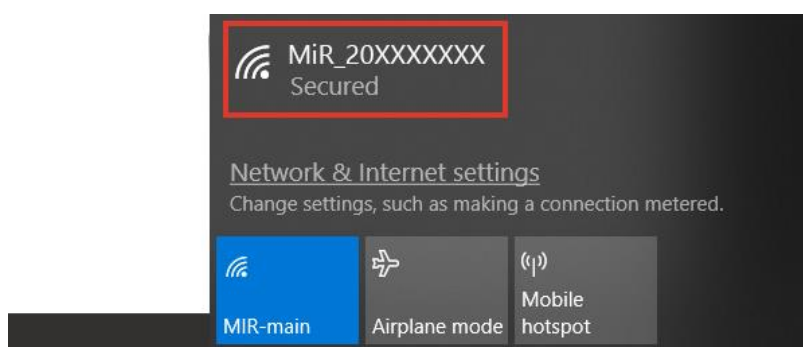
Both documents are in the box with the product.

To connect to the robot interface, follow these steps:

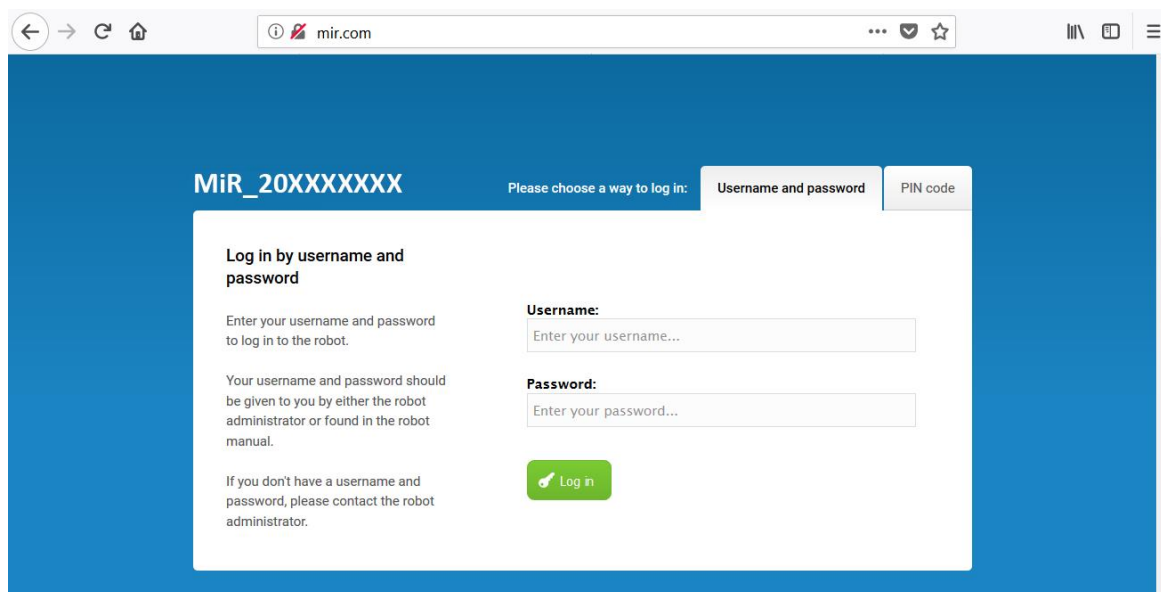
1. Using your PC, tablet, or phone, connect to the WiFi access point of the robot using the unique password for the WiFi access point. The access point name has the following format: **MiR_20XXXXXXX**.



The access point name is derived from the robot application's model serial number.



2. In a browser, go to the address **mir.com** and sign in.



3. Switch to Manual mode, and drive the robot down the ramp—see [Driving the robot in Manual mode on the next page](#).



Always make sure your robot is running the latest recommended software. This also applies to newly supplied robots, as there may have been important software updates during the storage time and shipment of the robot. Contact your distributor for the latest recommended update file.

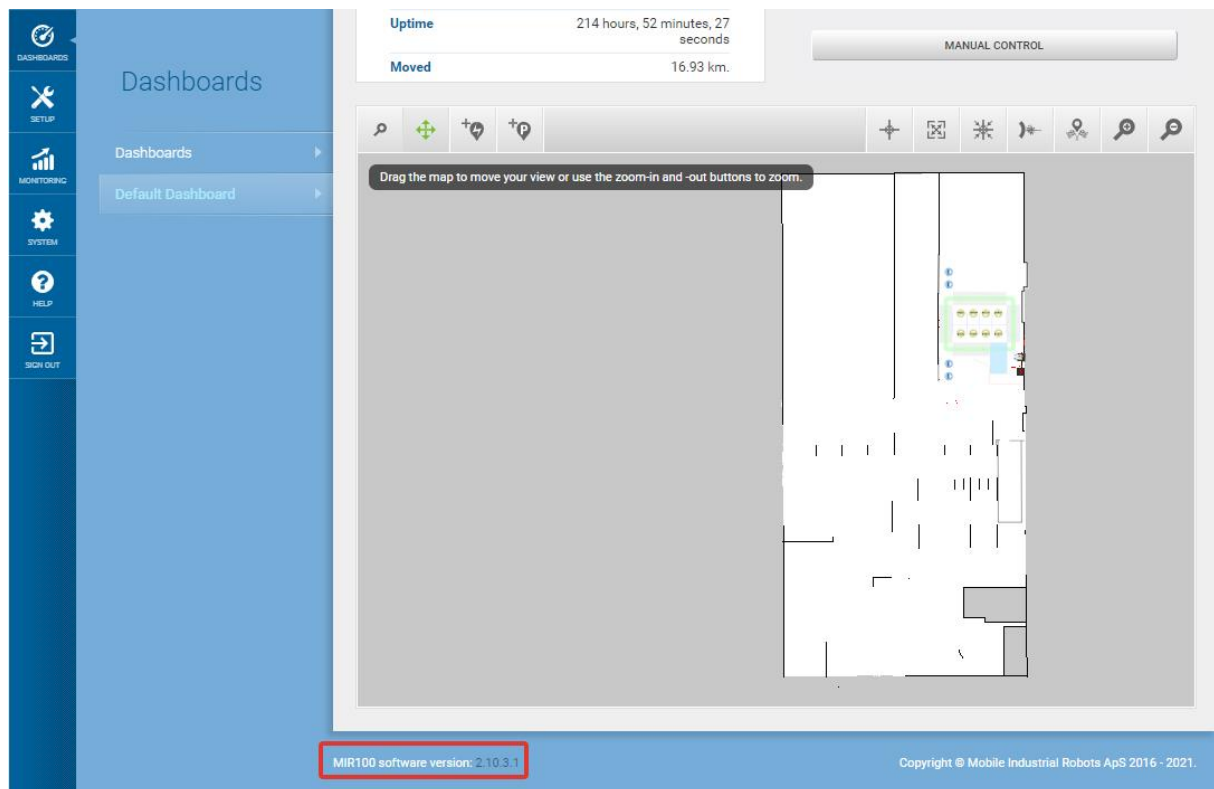


Figure 7.2. You can see the software version your robot is running in the bottom left corner of the robot interface.

7.6 Driving the robot in Manual mode



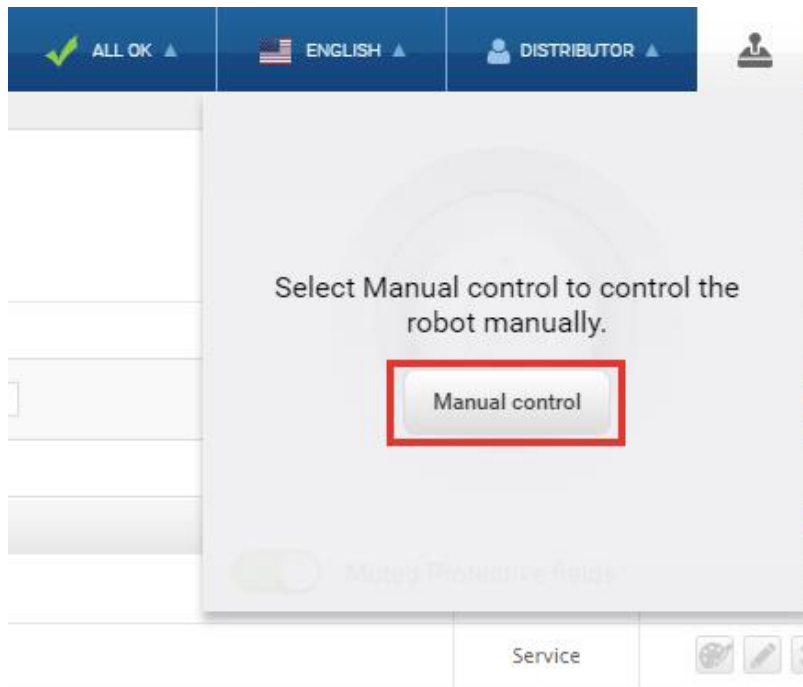
CAUTION

When driving the robot in Manual mode, it is possible to mute the Protective fields and drive the robot into Forbidden zones and Unpreferred zones on the map. This means that the robot will only stop when it is very close to an obstacle and will not respond to zones on the map. This can result in injury to personnel or damage to equipment if the robot is not driven carefully.

- Drive carefully to avoid collisions with any personnel or objects when driving the robot in Manual mode.
- Avoid driving the robot manually without a clear visual of the robot.

To drive the robot in Manual mode, follow these steps:

1. On the robot, turn the Operating mode key to Manual mode (turn it to the right).
2. In the robot interface, select the joystick icon.
3. Select **Manual control**. The Resume button on the robot starts blinking.



4. On the robot, press the Resume button. The status lights turn blue, indicating that the robot is in Manual mode.



The robot is shown with an EU pallet lift.



5. Drive the robot off the ramp using the joystick.



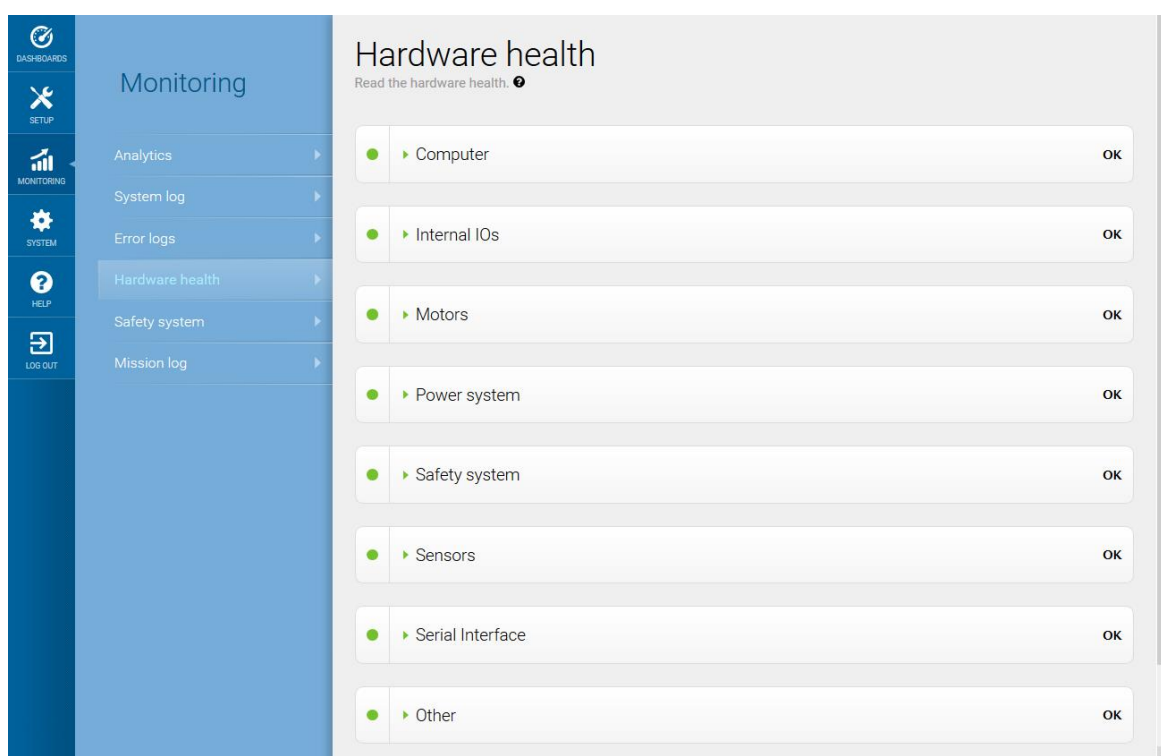
Place your foot in front of the ramp while the robot drives on it to keep the ramp from slipping.



7.7 Checking the hardware status

To check that all hardware components work as intended, follow these steps:

1. Sign in to the robot interface—see [Connecting to the robot interface on page 35](#).
2. Go to **Monitoring > Hardware health**.
3. Check that all elements on the page have the **OK** status and that they have green dots on the left.



For more information, see Hardware health in *MiR Robot Reference Guide* on the MiR website.

7.8 Mounting the nameplate

Before using MiR500, you must mount its unique nameplate to it. The nameplate contains information specific to your MiR application.

**NOTICE**

The nameplate must be mounted as described in the following steps. If mounted incorrectly, the CE mark is invalid.

To mount the nameplate correctly, follow these steps:

1. Locate the right side hatch.
2. Clean the area marked in the image below with a degreasing agent.



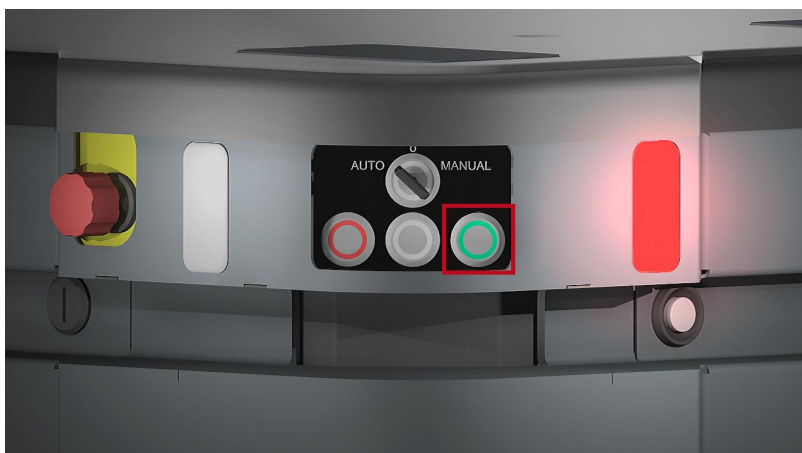
3. Mount the nameplate on the cleaned area.



7.9 Shutting down the robot

To shut down MiR500, follow these steps:

1. Ensure that the robot is not moving or executing an action.
2. Press the Power button for three seconds.



3. The robot starts the shutdown process. The status lights waver yellow, and the Power button blinks red.
4. When the robot finishes the shutdown process, the status and the signal lights go off, and the Power button turns blue.

When you shut down the robot for transportation, service, or repair, the battery must be disconnected—see your robot's user guide for instructions on disconnecting the battery.

7.10 Charging the robot

This section describes how to charge MiR500 using a MiR cable charger.

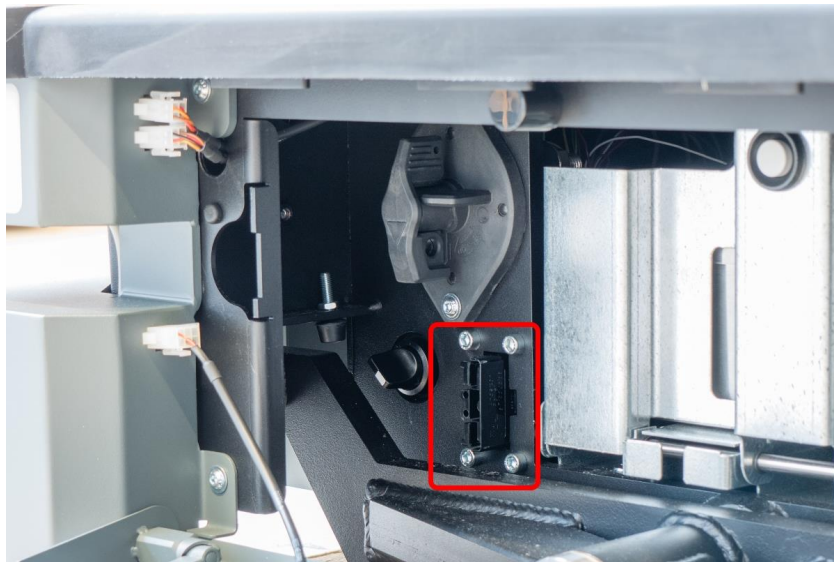


A MiR cable charger is not part of the MiR500 standard delivery. Contact your distributor for more information.



The robot is delivered 40-60% charged.

The rear compartment holds the robot's battery. To access the rear compartment, see [Accessing the internal parts on page 21](#).



Use only an original MiR cable charger.

For information about the charging time, see specifications on the MiR website.