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1 About this manual

1.1 Overview

This Operating Guide contains all essential information about how to operate and safely handle a
MiR500 EU Pallet Lift mounted on a MiR500. The Operating Guide is intended for Mobile Industrial
Robots’ distributors as well as end users responsible for the daily operation of MiR500 EU Pallet Lift.

Note

MiR500 EU Pallet Lift is an accessory for MiR500 and is therefore only intended to be used when mounted on a
MiR500. Please read the User Guide for MiR500 and the Safety chapter thoroughly before reading this operating
guide for MiR500 EU Pallet Lift.

1.2 Document history

This table shows latest and previous versions of this document and their interrelation with product
software releases.

<table>
<thead>
<tr>
<th>Doc version</th>
<th>Release date</th>
<th>Description</th>
<th>SW rel</th>
<th>HW rel</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>2019-01-25</td>
<td>First edition</td>
<td>2.5.0</td>
<td>1.0</td>
</tr>
</tbody>
</table>

1.3 Where to find more information

At Mobile-industrial-robots.com, the following extra resources on MiR500 EU Pallet Lift are
available. To access the pages in the Distributor site, sign in with your distributor account at http://

- Distributor site > Manuals
  The section contains the following resources:
  - MiR Robot Interface 2.0 Reference Guide
    The reference that describes the elements of the MiR robot interface. Available in multiple
    languages.
  - MiR500 REST API reference.
    The REST API reference for the robot.
  - MiR500 Quick Start
    The short guide that lets you start operating the robot quickly. This document is in the box
    with the robot in the printed format. Available in multiple languages.
  - MiR500 Lift Operating guide
    The operating guide that describes how to set up and use MiR500 with MiR500 Lift.
  - MiR500 EU Pallet Lift Operating guide
    The operating guide that describes how to set up and use MiR500 with MiR500 EU Pallet Lift.
  - MiRCharge 500 Operating guide
    The operating guide that describes how to set up MiRCharge 500 and configure the MiR500
    robot for automatic battery charging at the charging station.
• Distributor site > Download
The section contains the following resources:
• EC Declarations of Conformity.
  Click Show Certificates to see the list of EC Declarations of Conformity.
• CAD drawings.
  Click Show CAD-files to see the list of available CAD drawings.
• Certificates.
  Click Show Certificates to see the list of certificates for the robot.
• Software upgrades.
• Product release notes.

• Distributor site > How to
This page contains how-to articles that describe how to perform specific tasks with the robot.

• Product pages
  • MiR500 product page
    This page contains specifications, pictures, and brochures
  • MiR500 EU Pallet Lift product page
    MiR500 EU Pallet Lift is found on the MiR500 product page under Addons. This page contains specifications, pictures, brochures and manuals for MiR500 EU Pallet Lift.
2 Product presentation

2.1 About MiR500 EU Pallet Lift

MiR500 EU Pallet Lift is a top module that can be mounted on a MiR500 robot and autonomously pick up and drop off heavy loads of up to 500 kg. The robot with a MiR500 EU Pallet Lift works internally within production facilities, warehouses, and a host of other industrial locations.

The user provides the destination of product delivery via a web-based user interface. MiR500 with a MiR500 EU Pallet Lift can be set up to run a fixed route, be called on demand or perform more complex operations (missions).

MiR500 EU Pallet Lift can be activated in various missions and ensures stable handling and transport of pallets to and from a MiR500 Pallet Rack.

2.1.1 How the lift works

When MiR500 with a MiR500 EU Pallet Lift docks to a pallet rack, the lift can either be elevated to pick up a pallet or lowered to place a pallet.

MiR500 EU Pallet Lift uses I/O modules and includes four inputs and four outputs. The tables below show the functionality of these. To use MiR500 EU Pallet Lift correctly, these internal I/O modules must be used.

To be able to use and see the menu options for the I/O modules and the Pallet Lift, they must be enabled first. See Enable MiR500 EU Pallet Lift feature on page 9 for more information.
For more information on how to set the input and output, see the chapter Usage on page 8
2.2 MiR500 Pallet Rack

MiR500 with a MiR500 EU Pallet Lift mounted on top can be used together with one or more MiR500 Pallet Racks.

MiR500 Pallet Rack is the delivery station for your EUR-pallets. MiR500 drives autonomously into the MiR500 Pallet Rack and delivers or picks up pallets safely with a payload of up to 500 kg.

To see all the Technical specifications of MiR500 EU Pallet Lift, go to our website.

If you want to know how to mount MiR500 EU Pallet Lift, go to our Distributor site.

To see how to mount a MiR500 Pallet Rack, see the mounting guide on our Distributor website.

When MiR500 with a MiR500 EU Pallet Lift docks to a MiR500 Pallet Rack, the robot mutes Personnel Detection Means and blinks yellow. Do not step in front of the robot and keep distance to the pallet rack.

Read Safety on page 5 for more information.

To see all the Technical specifications of MiR500 Pallet Rack, go to our website.
3 Usage

3.1 Introduction

Before taking your MiR500 EU Pallet Lift into use, it is necessary to mark up the floor in the area where MiR500 with a MiR500 EU Pallet Lift docks to a MiR500 EU Pallet Rack.

It takes four steps in the robot interface to be able to pick up and place pallets autonomously with MiR500 with a MiR500 EU Pallet Lift mounted on top. This chapter describes the necessary steps that will enable the robot to pick up and place pallets:

1. Enabling the pallet lift feature, see Enable MiR500 EU Pallet Lift feature on page 9.
2. Creating a pallet rack marker and entry position on the map on the location where MiR500 EU Pallet Rack is located, see Before creating missions to pick up and put down pallets, entry and pallet rack positions must be defined on the map first. on page 11.
3. Creating two simple missions that lowers the lift and raises the lift in order to carry out more complex missions, where MiR500 picks up and puts down pallets, see Lower Lift mission on page 13 and Raise Lift mission on page 16.
4. Creating two missions where MiR500 drives to the pallet rack, picks up a pallet and exits the rack and drives to another pallet rack, puts down the pallet and exits, see Pick Up Pallet mission on page 18 and Put Down Pallet mission on page 26.

After these steps are carried out, the robot is able to pick up and put down pallets autonomously.

3.2 Marking potentially hazardous floor area

When docking to MiR500 EU Pallet Rack, the robot mutes its personnel detection means temporarily. This includes turning off the protective fields around the scanner.

The muting starts when the robot reaches the entry position approximately 1 meter from the pallet rack marker. To indicate this to people nearby, MiR500 slows down and starts blinking yellow using the eight indicator lights on the corners of the robot.

To avoid potentially hazardous situations as a consequence of the muted personnel detection means, you must mark the physical area around MiR500 EU Pallet Rack with tape or similar.

The size of the marked area must be calculated based on the robot’s path going to the pallet rack and take into account that the robot may make a turn of up to 90° in front of the pallet rack.

The size of the marked area is calculated based on the robot’s path going to the pallet rack and takes into account that the robot may have to make a turn of up to 90° when docking to the pallet rack.

Figure 3.1 illustrates how to calculate where the floor marking should be:

- The red dotted line shows the area where the robot mutes the personnel detection means. This is the potentially hazardous zone.
- The yellow/black striped line indicates the area that should be marked with signal tape. The space between the red dotted zone line and the tape marking should be held free of objects to ensure a smooth entry to the pallet rack.
3.3 Enable MiR500 EU Pallet Lift feature

To access MiR500 EU Pallet Lift settings and mission pages, you must first enable them.

Go to **System > Settings > Features.**
Under Pallet lift, select True.

Under I/O modules, select True if this is not already set. MiR500 EU Pallet Lift communicates through I/O modules, so they have to be activated for the lift to work.
3.4 Setting entry and pallet rack positions

Before creating missions to pick up and put down pallets, entry and pallet rack positions must be defined on the map first.

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Turn the key to <strong>manual mode</strong> on the robot and manually drive MiR500 with a MiR500 EU Pallet Lift in front of a Pallet Rack, facing front.</td>
</tr>
<tr>
<td>2</td>
<td>Go to <strong>Setup &gt; Maps</strong> and select <strong>Edit</strong> to the active map.</td>
</tr>
<tr>
<td>3</td>
<td>In the menu, select <strong>Markers</strong>. Select <strong>Draw a new marker</strong>.</td>
</tr>
</tbody>
</table>
3.5 Creating simple missions with MiR500 EU Pallet Lift

Setting up missions for picking up and placing pallets with MiR500 EU Pallet Lift consists of the following steps:

- Create Lower Lift and Raise Lift missions to use in other missions
- Create Pick Up Pallet and Put Down Pallet missions

If you have more than one pallet rack, repeat the previous steps to mark all your pallet racks on the map.
The task at hand is to pick up a pallet at Pallet Rack A and place the pallet at Pallet Rack B.
Start by making two simple missions: for example **Lower Lift** and **Raise Lift**.
These two missions can later be used in the two main missions: for example **Pick Up Pallet** and **Put Down Pallet**.

### 3.5.1 Lower Lift mission

In the **Lower Lift** mission, MiR500 will lower the lift on the robot to prepare to pick up a pallet.

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Go to <strong>Setup &gt; Missions</strong> and select <strong>Create mission</strong>.</td>
</tr>
<tr>
<td><img src="image.png" alt="Create mission" /></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Give the mission a name, for example <strong>Lower Lift</strong>. Select the group and site it should belong to.</td>
</tr>
<tr>
<td>3</td>
<td>In the Actions menu, select <strong>I/O module &gt; Set output</strong>.</td>
</tr>
<tr>
<td><img src="image.png" alt="Set output" /></td>
<td></td>
</tr>
<tr>
<td>Step</td>
<td>Action</td>
</tr>
<tr>
<td>------</td>
<td>--------</td>
</tr>
<tr>
<td>4</td>
<td>Under <strong>Module</strong>, select MiR500 internal IOs. Under <strong>Output</strong>, type in 3. Under <strong>Operation</strong>, select Off. This ensures that any raising movement is stopped.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Set output" /></td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Logic &gt; Wait" /> Set the time for 1 second. Select Validate and close.</td>
</tr>
</tbody>
</table>
6 Go to I/O module > Set output.

7 Under Module, select MiR500 internal IOs. Under Output, type in 2. Under Operation, select On. This is to ensure that the lowering action is performed. Select Validate and close.
3.5.2 Raise Lift mission

In the **Raise Lift** mission, MiR500 will raise the lift to prepare to pick up a pallet from a pallet rack.

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Go to <strong>Setup &gt; Missions</strong> and select <strong>Create mission</strong>.</td>
</tr>
<tr>
<td>2</td>
<td>Give the mission a name, for example <strong>Raise Lift</strong>. Select the group and site it should belong to.</td>
</tr>
<tr>
<td>3</td>
<td>Select <strong>I/O module &gt; Set output</strong>.</td>
</tr>
</tbody>
</table>
4. **Step 4**  
Under **Module**, select MiR500 internal IOs. Under **Output**, type in 2. Under **Operation**, select off. This is to ensure that the lift is in a fully lowered state.

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Under <strong>Module</strong>, select MiR500 internal IOs. Under <strong>Output</strong>, type in 2. Under <strong>Operation</strong>, select off. This is to ensure that the lift is in a fully lowered state.</td>
</tr>
</tbody>
</table>

5. **Step 5**  
Go to **Logic > Wait**. Set the time for 1 second. Select **Validate and close**.

6. **Step 6**  
Go to **I/O module > Set output**.
### 3.5.3 Pick Up Pallet mission

The two simple missions **Lower Lift** and **Raise Lift** are now ready to use in missions to pick up and put down pallets.

**Step 7**

Under **Module**, select MiR500 internal IOs. Under **Output**, type in 3. Under **Operation**, select On. This is to ensure that the lift is raised.

**Step 8**

Remember to save the mission. The mission should look similar to this:
In the **Pick Up Pallet** mission, MiR500 will dock into a pallet rack, pick up a pallet and undock from the pallet rack.

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Go to Setup &gt; Missions. Select Create mission.</td>
</tr>
<tr>
<td>2</td>
<td>Give the mission a name, for example <strong>Pick Up Pallet</strong>. Select the group and site it should belong to. Select Create mission.</td>
</tr>
<tr>
<td>3</td>
<td>Select <strong>Move &gt; Docking</strong> in the actions menu.</td>
</tr>
<tr>
<td>4</td>
<td>To edit the docking action, select the gearwheel icon.</td>
</tr>
</tbody>
</table>
Select the Pallet Rack marker and then **Validate and close**.

This step is optional.

**Go to Move > Check position status.**
Step 7  This step is optional.

Under **Position**, select the pallet rack marker. Under **Option**, select Occupied. Set the time for 10 seconds. Select **Validate and close**.

**Check position status** is an action that can be set up to tell the robot what to do, if a position is occupied, fx if a pallet is placed on a pallet rack and the robot can not deliver a pallet.
8 Go to **Missions**, then find and select the **Lower Lift** mission that was made earlier.

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Go to <strong>Missions</strong>, then find and select the <strong>Lower Lift</strong> mission that was made earlier.</td>
</tr>
</tbody>
</table>

9 Go to **Move > Docking**.

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Go to <strong>Move &gt; Docking</strong>.</td>
</tr>
</tbody>
</table>
## Usage

### Step 10: Select the Pallet rack marker. Select **Validate and close.**

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Select the Pallet rack marker. Select <strong>Validate and close.</strong></td>
</tr>
</tbody>
</table>

![Docking](image)

- **Validate and close**
- **Undo and close**
- **Remove action**

### Step 11: Go to Missions, then find and select the **Raise Lift** mission that was made earlier.

<table>
<thead>
<tr>
<th>Missions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main mission</td>
</tr>
<tr>
<td>Pick up cart head</td>
</tr>
<tr>
<td>Pickup</td>
</tr>
<tr>
<td>Pickup</td>
</tr>
<tr>
<td>Place</td>
</tr>
<tr>
<td>Raise Lift mission</td>
</tr>
<tr>
<td>TestWiseLan</td>
</tr>
</tbody>
</table>

---

MiR500 EU Pallet Lift Operating Guide, 01/2019 v.1.0
12. Select **Move > Relative move** in the actions menu.

13. To edit the Relative move action, select the gearwheel icon.

14. Under **X**, type in **2.0** (minimum) and then **Validate and close**.
15 Go to Missions and find the Lower Lift mission that was made earlier.

MiR500 drives to the entry position in front of the MiR500 EU Pallet Rack and checks if there is a pallet (check position status is optional). If there is a pallet, MiR500 lowers the lift, docks to the pallet rack, lifts off the pallet, exits the pallet rack and lowers the lift again.
3.5.4 Test the mission

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Go to Setup &gt; Missions.</td>
</tr>
</tbody>
</table>

![Image of Setup > Missions screen]

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Select the Queue mission icon next to the Pick Up Pallet mission. The mission is now added to the mission queue.</td>
</tr>
</tbody>
</table>

![Image of selecting Queue mission]

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Select the Play button to start the mission.</td>
</tr>
</tbody>
</table>

![Image of Play button]

WARNING!

When MiR500 with a MiR500 EU Pallet Lift docks to a pallet rack, the robot mutes Personnel Detection Means and blinks yellow. Do not step in front of the robot and keep distance to the pallet rack.

Read Safety on page 5 for more information.

3.5.5 Put Down Pallet mission

In the Put Down Pallet mission, MiR500 will dock into a pallet rack, put down a pallet and undock from the pallet rack.

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Go to Setup &gt; Missions. Select Create mission.</td>
</tr>
</tbody>
</table>

![Image of Create mission screen]
<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Give the mission a name, for example <strong>Put Down Pallet</strong>. Select the group and site it should belong to. Select <strong>Create mission</strong>.</td>
</tr>
<tr>
<td><img src="image" alt="Create mission" /></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Select <strong>Move &gt; Docking</strong> in the actions menu.</td>
</tr>
<tr>
<td><img src="image" alt="Actions menu" /></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>To edit the docking action, select the gearwheel icon.</td>
</tr>
<tr>
<td><img src="image" alt="Gearwheel icon" /></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Select the Pallet Rack marker and then <strong>Validate and close</strong>.</td>
</tr>
<tr>
<td><img src="image" alt="Docking options" /></td>
<td></td>
</tr>
</tbody>
</table>
6 This step is optional.

Go to **Move > Check position status**.
7 This step is optional.

Under **Position**, select the pallet rack marker. Under **Option**, select Occupied. Set the time for 10 seconds. Select **Validate and close**.

**Check position status** is an action that can be set up to tell the robot what to do, if a position is occupied, fx if a pallet is placed on a pallet rack and the robot can not deliver a pallet.

8 Select **I/O module > Set output**.
<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Under <strong>Module</strong>, select MiR500 internal IOs. Under <strong>Output</strong>, set I/O port to 3. Under <strong>Operation</strong>, select <strong>Off</strong>. Select <strong>Validate and close</strong>.</td>
</tr>
</tbody>
</table>

![Set output](image)

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Select <strong>I/O module &gt; Set output</strong>.</td>
</tr>
</tbody>
</table>

![I/O module](image)
11 Under **Module**, select MiR500 internal IOs. Under **Output**, set I/O port to 2. Under **Operation**, select **On**. Select **Validate and close**.

12 Select **Move > Relative move** in the actions menu.

13 To edit the Relative move action, select the gearwheel icon.
14 Under **X**, type in **2.0** (minimum) and then **Validate and close**.
Remember to save the mission. The mission should look similar to this:

MiR500 drives to the entry position in front of the MiR500 EU Pallet Rack and checks if there is a pallet (check position status is optional). If there is no pallet and the pallet rack is free, MiR500 raises the lift, docks to the pallet rack, puts down the pallet, exits the pallet rack and lowers the lift again.

3.5.6 Test the mission

1. Go to Setup > Missions.
2. Select the Queue mission icon next to the Put Down Pallet mission. The mission is now added to the mission queue.
3 Select the **Play** button to start the mission.

When MiR500 with a MiR500 EU Pallet Lift docks to a pallet rack, the robot mutes Personnel Detection Means and blinks yellow. Do not step in front of the robot and keep distance to the pallet rack.

Read Safety on page 5 for more information.

If you experience that MiR500 with a MiR500 EU Pallet Lift mounted on top picks up or delivers loads imprecisely on a MiR500 EU Pallet Rack, try adjusting the offset of the pallet rack marker. Select the pallet rack marker on your map, select Edit and adjust the coordinates (by approximately up to 1 cm). You might have to try out a few different combinations to make it precise.