MiR250 Space Requirements

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Software version: 2.x and 3.x

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Original instructions (English)

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1. About this document

This document describes how much free space MiR250 requires to execute common maneuvers with various MiR supported top modules. The values provided in this guide should be used for best practice.

Depending on the environment, setup, and configuration of the robot, the robot may be able to drive with less space than stated in this document. MiR guarantees that the robot can operate reliably if these space requirements are met and the operating conditions are as described in "Environment and setup conditions" on page 10. If the robot operates in a smaller area than described, you must test whether your robot can perform as intended when commissioning the robot.

Test the robot multiple times, keeping in mind that an adaptive mobile robot does not have perfect repeatability. The smaller the area the robot operates in, the higher the risk for the robot to occasionally fail the intended operation. A smaller operating area may also increase planning time and the frequency of errors and Protective stops.

If any space requirements are updated, they will be updated in the robot's specifications page available on MiR Support Portal before being updated in this guide. For the most up-to-date values, refer to the robot's specifications.

1.1 Version history

This table shows current and previous versions of this document.

Revision	Release date	Description
1.16	2024-03-22	Guide updated with newest specifications. Restructured table format. Restructured illustration format. Changed name from MiR250 Space Requirement Best Practices to MiR250 Space Requirements General improvements throughout the manual.

Revision	Release date	Description
1.15	2023-12-20	Restructured table format for Shelf carrier maneuvers to include MiR250 Shelf Carrier hardware version 2.0. Affects section: Shelf carrier maneuvers Added performance values for MiR250 Shelf Carrier hardware version 2.0. Affects section: Shelf carrier maneuvers Updated older images in the document.
1.14	2023-10-27	Passing another robot corrected.
1.13	2023-09-11	Default footprint corrected. General improvements throughout the manual.
1.12	2023-06-15	Guide updated with newest specifications. General improvements throughout the manual.
1.11	2022-11-25	Guide updated with newest specifications. Small corrections and improvements throughout the guide. General improvements throughout the manual.
1.10	2022-11-15	Guide updated with newest specifications. General improvements throughout the manual.
1.9	2022-07-20	Guide updated with newest specifications.

Revision	Release date	Description
1.8	2022-03-22	Added space requirements for U-turn and pivot for MiR250 and MiR250 Dynamic, and the requirement for two MiR250 Dynamic robots to pass each other.
1.7	2022-02-18	Updated all space requirements. Now includes compromised performance values and alternative setups.
1.6	2021-10-06	Updated space requirements and footprint for MiR250 Shelf Carrier.
1.5	2021-06-15	Added space requirements for MiR250 Hook.
1.4	2021-05-04	General improvements throughout the manual.
1.3	2021-02-15	Added 90° turn. Corrected footprints.
1.2	2020-11-20	Added new specifications: Shelf maneuvers, MiR250 Dynamic, and U-turn. Improved images for shelf space requirements.
1.1	2020-11-12	Removed incorrect values for space required around charging stations.
1.0	2020-10-28	First edition.

1.2 Where to find more information

For online courses to strengthen your understanding of MiR products, go to MiR Academy.

If you are looking for more documentation about all MiR products, go to MiR Support Portal where we have the following resources:

Documentation

- **Integrator Manuals** provide all the information you need to set up and prepare MiR robots for the commissioning process. It comes in print in the box with the robots. Integrator Manuals are available in multiple languages. These guides are for PCM (partly completed machinery) robots.
- **Quick starts** describe how you start operating MiR robots quickly. It comes in print in the box with the robots. Quick starts are available in multiple languages. These guides are for CE robots.
- **User guides** provide all the information you need to operate and maintain MiR products and how to set up and use top modules and accessories, such as charging stations, hooks, shelf lifts, and pallet lifts. User guides are available in multiple languages. These guides are for CE robots.
- **Risk assessment guide** describes how to conduct a risk assessment and provides some risk assessed use cases.
- **Commissioning guide** provides examples and guidelines to commission your robot successfully. The Commissioning guide is available in multiple languages.
- **Interface guides** contain descriptions of all the elements of the robot interface and MiR Fleet interface. Interface guides are available in multiple languages.
- **Best practice guides** provide helpful information you can use when commissioning or operating your robot.
- **REST API references** for MiR robots, MiR Hooks, and MiR Fleet. HTTP requests can be used to control robots, hooks, and MiR Fleet.
- **MiR Network and Wi-Fi guide** specifies the performance requirements of your network and how you must configure it for MiR robots and MiR Fleet to operate successfully.
- **Migration guides** describe how to upgrade your MiR system from one major software version to the next.
- **Cybersecurity guide** provides important information and instructions to increase the cybersecurity of your MiR product.
- **How-to guides** are short guides providing instruction for maintenance, replacement, commissioning, and other tasks related to MiR products.
- **Troubleshooting guides** can help you determine the cause of an issue you are experiencing with your MiR product and how to resolve it.

- **Release notes** of new products and hardware updates that describe what has been changed and why.
- **Service notes** notify of issues identified in MiR products and changes that are applied.
- **Spare parts and additional products** list all spare parts and accessories you can order for robots.
- **Warranty** describes the MiR standard warranty agreement.
- **Certificates and declarations** for MiR products that prove compliance with standards.
- **Technical guides** provide in-depth information about how MiR products work.

Models and drawings

- **Wiring diagrams** are graphic representations of how the components in MiR robots are wired.
- **CAD files** of the robots that are made to scale can be used to help determine the dimensions of the robot or for illustrative purposes.

Resources

- **MiR Insights** is a tool you can use to analyze how well your robots or fleet are performing. MiR Insights runs continuously alongside MiR Fleet to give real-time data on several metrics. MiR Insights requires a paid license.
- **AprilTag** collection can be used instead of generating your own AprilTags.
- **Space calculator** determines the approximate amount of space your MiR robot will need to operate depending on the size of its footprint.
- **Community** is a forum of MiR users with a collection of questions, recommendations, webinars and other community driven material.
- **Marketing and brand portal** is a collection of our graphical elements where you can download color schemes, rendered images of the robots, and icons.

2. Environment and setup conditions

For the space requirements described in this document to apply to your robot, the following conditions must be met:

- The floor is level, dry, and clean.
- The robot is clean and well-maintained.
- There is no load on the robot unless specified.
- The robot is driving within the operating conditions described on the MiR website under the product specifications.
- There is enough traction between the robot and the floor to prevent the wheels from slipping.
- The walls and objects around the robot can be detected by the safety laser scanners. This means they must be opaque, matte, and taller than 210 mm from the ground.
- There is no light interference that can affect the robot sensors, such as direct sunlight.
- The robot is not connected to MiR Fleet, unless specified otherwise. When robots are part of MiR Fleet and Collision avoidance is enabled, the robots need more space for maneuvering when close to other robots.
- The robot's **Desired speed** is set to the default speed of 1.5 m/s. This is the speed the robot tries to drive at, not necessarily the speed the robot always drives at. During each maneuver, the speed may vary depending on the route the robot plans. For example, the robot automatically slows down at turns.

These space requirements were determined through tests with the robot under the conditions described above. If your robot is operating under other conditions, this may affect the robot's space requirements. It is very important to test each robot operation during commissioning to determine if there is sufficient space.

Although you can set a **Desired speed** to guide the robot, the robot may automatically adjust its speed depending on the route and map of the robot. The speed of the robot can affect the space requirements.

2.1 Robot settings

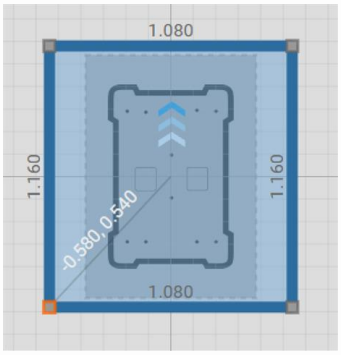
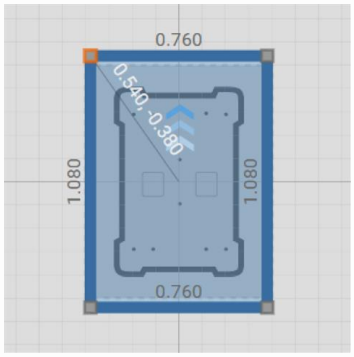
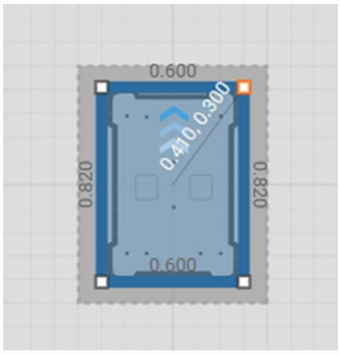
The space requirements are specified for the following robot setups:

- **Default**
  The robot is running with the default footprint—see Figure 2.1—and settings for MiR250. The robot's default footprint is slightly larger than the robot itself and the Protective fields are active. With these settings, the robot requires more space, but all of the safety and planning features work as intended.
- **Dynamic**
  The robot is MiR250 Dynamic, which is another version of MiR250 with modified settings that enable it to drive closer to objects. The main difference between MiR250 and MiR250 Dynamic is that the footprint on MiR250 Dynamic is smaller—see Figure 2.1—and the SICK configuration is modified to enable the robot to drive close to obstacles.
- **Minimum**
  The robot's footprint is reduced to the smallest possible size—see Figure 2.1— and the robot's Protective fields are muted. With these settings, the robot requires the least amount of space, but it compromises the safety of the robot.

  To be able to mute the Protective fields, you must first enable the feature under **Settings > Features**. You can then add Mute Protective fields actions to the robot's missions.

  NOTICE
  MiR does not recommend using the Minimum setup. When the footprint is reduced, the robot can plan routes that bring it too close to the edges of objects and make the robot initiate a Protective stop. Also, when the robot operates with muted Protective fields, you must mark the area as an operating hazard zone and inform personnel that the robot is operating with Compromised safety.

Figure 2.1 Dimensions of the default footprint, dynamic footprint, and minimum footprint

Default footprint	Dynamic footprint	Minimum footprint
		

2.2 Performance evaluation

There are often two values provided for the space requirements:

- A *good* performance value. These are the values we recommend following where the robot should be able to execute a maneuver smoothly, without stopping, and without requiring intervention from a user.
- A *compromised* performance value. The robot will in most cases execute the maneuver correctly but may experience issues such as:
  - Driving slowly
  - Entering Protective stop
  - Reversing
  - Spending time on replanning its path
  - Failing the mission completely and requiring intervention from a user
  - May fail a small percentage of times (less than 5%)

  If you choose to use a compromised value, we recommend implementing a **Try/Catch** action in any relevant missions, so you can define the robot's behavior, in case it fails the maneuver.

2.3 Not available values and not recommended values

For some maneuvers, you may find the entry *N/A* or *not recommended* instead of space requirement measurements. These are used to indicate the following:

- *N/A* stands for *Not available* in this guide. These are maneuvers where we have not yet determined the space requirements. They will be updated as soon as the maneuver has been tested thoroughly in the described scenario.
- *Not recommended* is often used to indicate scenarios where:
  - There were only cases where the robot could perform the maneuver with Compromised performance, and there was a small change the robot could not perform the maneuver at all.
  - Modifications in the map or modifications to the robot's safety system did not reduce the space requirements. We do not recommend applying the modification if it does not reduce the required space for the robot to operate.

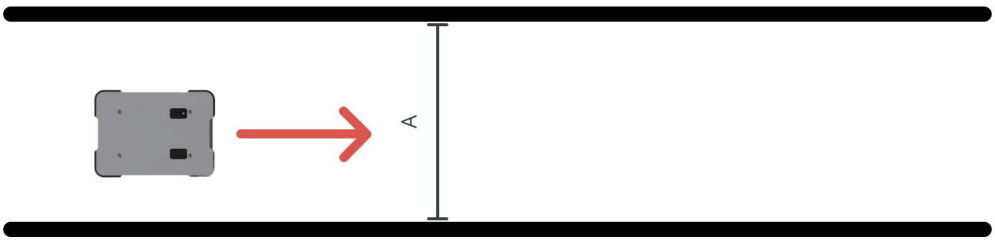
3. Robot maneuvers

The following sections describe the required space for robots to perform common navigation maneuvers.

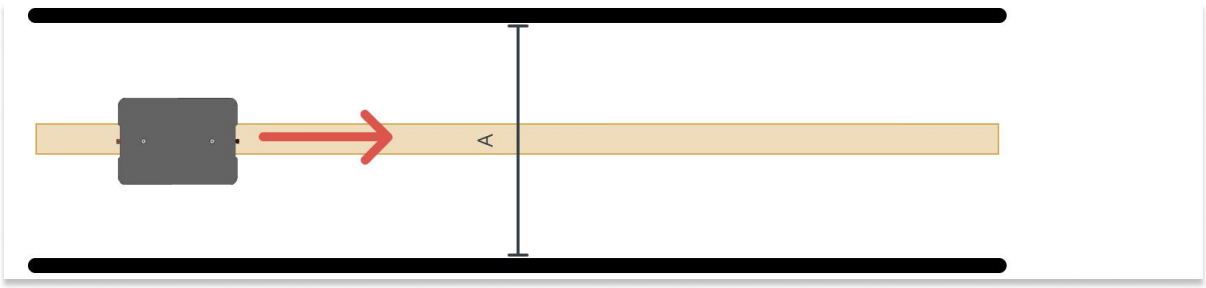
The maneuvers in the following sections illustrate the robot traveling down a corridor, but the dimensions are also applicable for other obstacles and structures the robot may maneuver between.

Driving straight

Robot performance	Description	With default robot setup	With dynamic robot setup
Good	Corridor width (A)	1.45 m	1.30 m
Compromised	Corridor width (A)	1.35 m	1.25 m

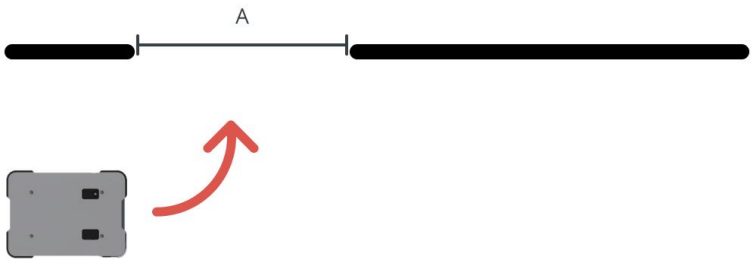


Software 2.x only: you can implement a Critical zone to reduce the minimum space requirement to 0.85 m while the robot is driving with the minimum footprint and muted Protective fields. This can be reduced to 0.80 m, but compromises performance.



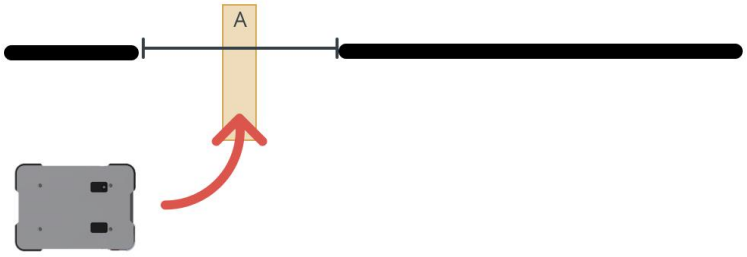
Driving through a doorway

Robot performance	Description	With default robot setup	With dynamic robot setup	With minimum footprint and muted Protective fields
Good	Doorway width (A)	1.40 m	1.00 m	0.80 m
Compromised	Doorway width (A)	1.25 m	0.95 m	0.80 m



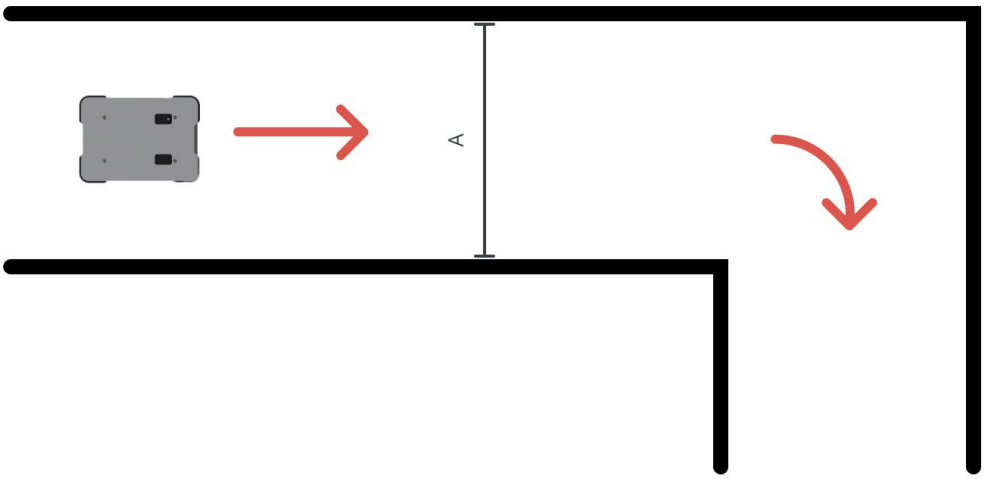
Software 2.x only: you can implement a Critical zone to reduce the minimum space requirement to the dimensions given in the table below:

Robot performance	Description	With default robot setup	With dynamic robot setup	With minimum footprint and muted Protective fields
Good	Doorway width (A)	1.30 m	0.95 m	N/A
Compromised	Doorway width (A)	1.20 m	0.90 m	0.75 m



Taking a turn around an obstacle or wall

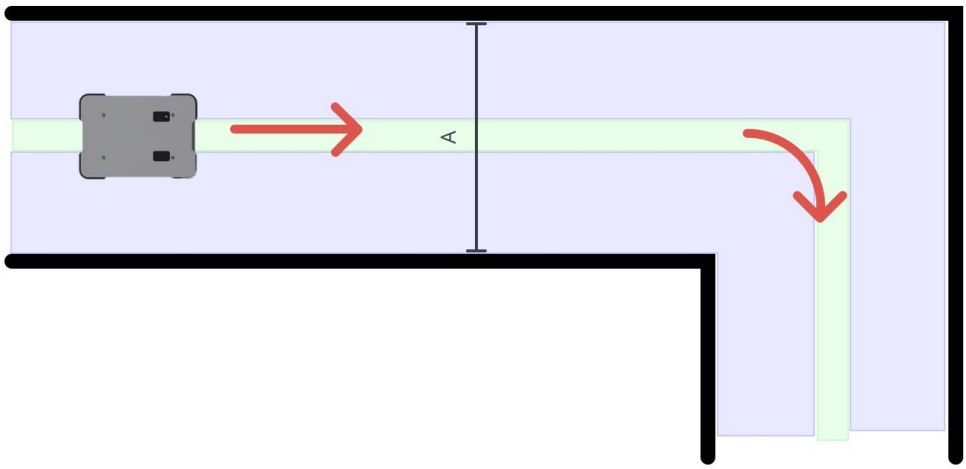
Robot performance	Description	With default robot setup	With dynamic robot setup	With minimum footprint and muted Protective fields
Good	Corridor width before and after turn (A)	1.50 m	1.35 m	1.0 m before and after turn
Compromised	Corridor width before and after turn (A)	1.45 m	1.25 m	1.0 m before and after turn



You can implement a Preferred zone along the center of the corridor and Unpreferred zones on both sides to reduce the minimum space requirement to the values in Table 1.4.

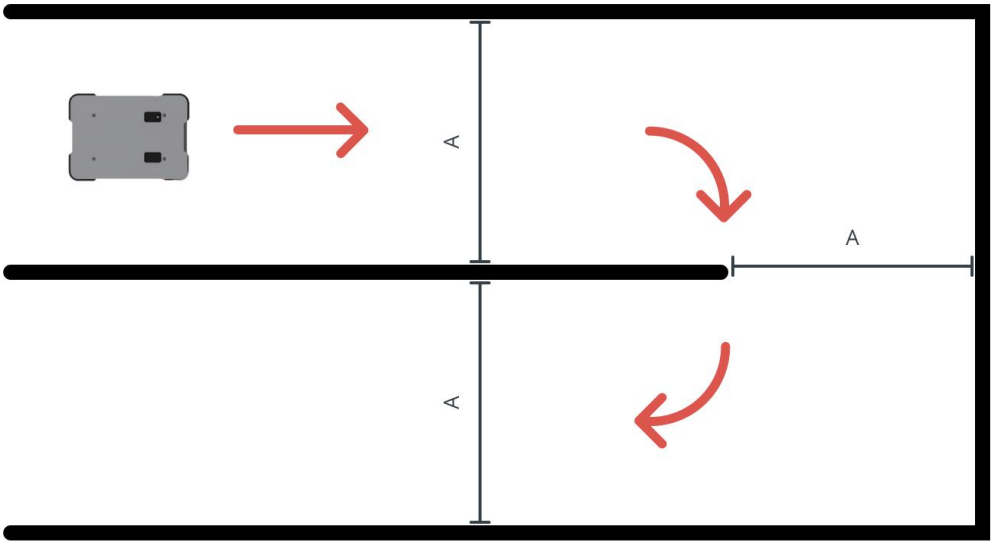
If your robot is running with the minimum footprint and muted Protective fields, adding zones will not reduce the amount of space required.

Robot performance	Description	With default robot setup	With dynamic robot setup
Good	Corridor width before and after turn (A)	1.45 m	1.25 m
Compromised	Corridor width before and after turn (A)	1.40 m	1.20 m



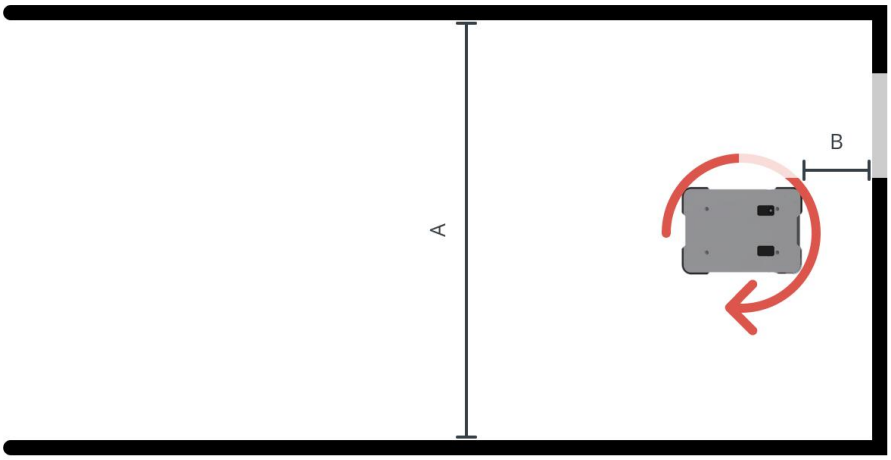
Taking a U-turn around an obstacle or wall

Robot performance	Description	With default robot setup	With dynamic robot setup	With minimum footprint and muted Protective fields
Good	Corridor width (A)	1.60 m	1.55 m	1.15 m
Compromised	Corridor width (A)	1.50 m	1.50 m	N/A



Pivoting

Robot performance	Description	With default robot setup	With dynamic robot setup	With minimum footprint and muted Protective fields
Good	Corridor width (A)	1.80 m	1.55 m	1.20 m
Good	Distance between robot and end wall (B)	0.45 m	0.35 m	N/A
Compromised	Corridor width (A)	1.75 m	1.45 m	1.15 m
Compromised	Distance between robot and end wall (B)	Not recommended	0.25 m	N/A

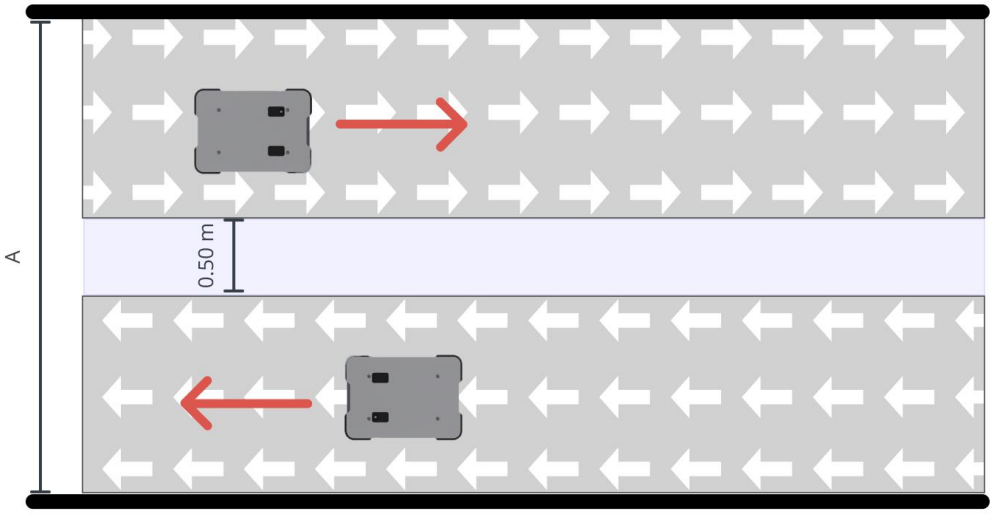


Passing another robot

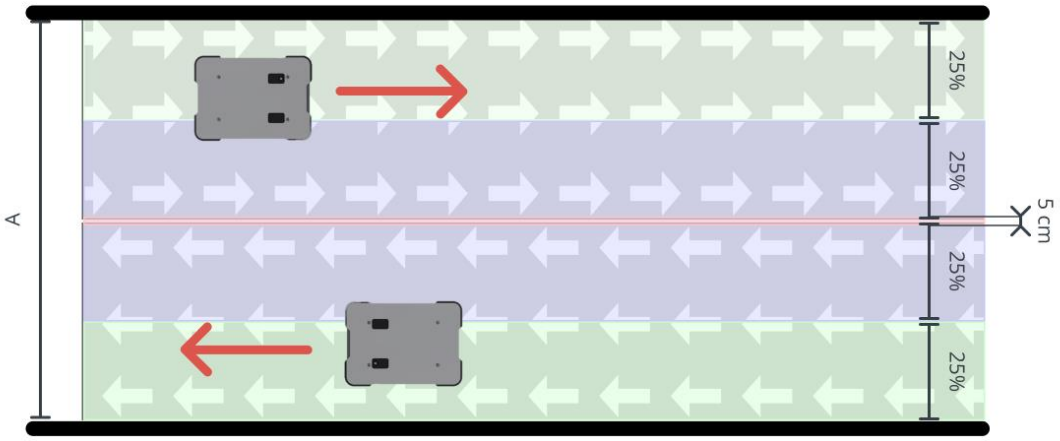
If you have any aisles that are wide enough to let two robots pass each other, we recommend managing these aisles with two Directional zones. This prevents robots from blocking each other in the aisle.

We recommend two possible setups:

- A simple setup where you have two Directional zones, one in each direction, and an Unpreferred zone between them in the middle.



- An extended setup where you add Preferred and Forbidden zones to the simple setup. These help robots to drive closer to the walls, thus reducing the amount of space required.



The values in this section are also applicable for robots connected to MiR Fleet where Collision avoidance is enabled.

To ensure that two robots can pass each other in a corridor smoothly and without stopping, the corridor must have one of the zone setups described above and be at least as wide as the dimensions given in either of the tables.

Minimum space required for two robots to pass each other with the simple zone setup:

Robot performance	Description	With default robot setup	With dynamic robot setup	With minimum footprint and muted Protective fields
Good	Corridor width (A)	3.00 m	2.45 m	2.10 m
Compromised	Corridor width (A)	2.90 m	2.40 m	1.70 m

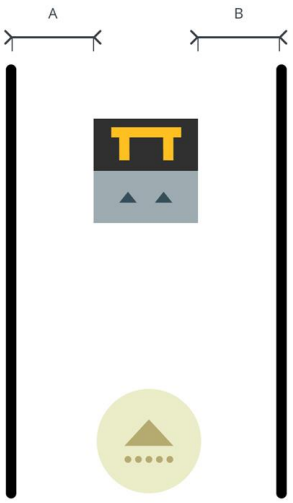
Minimum space required for two robots to pass each other with the extended zone setup:

Robot performance	Description	With default robot setup	With dynamic robot setup	With minimum footprint and muted Protective fields
Good	Corridor width (A)	2.80 m	2.30 m	1.70 m
Compromised	Corridor width (A)	2.70 m	2.10 m	1.50 m

Minimum space to adjacent wall for a Bar-marker

Where the walls are long enough to cover the entry position. With docking offset x = -0.55 m, y = 0.2 m, yaw = 0°.

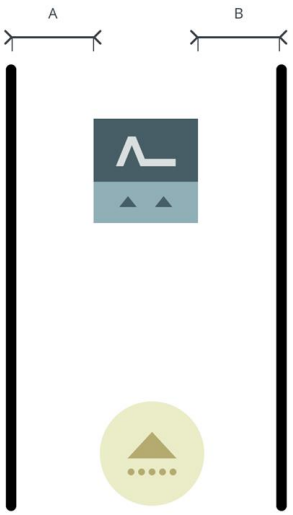
Robot performance	Description	With default robot setup
Good	To the left of marker (A)	450 mm
Good	To the right of marker (B)	450 mm



Minimum space to adjacent wall for a VL-marker

Where the walls are long enough to cover the entry position. With docking offset x = -0.55 m, y = 0.1 m, yaw = 0°.

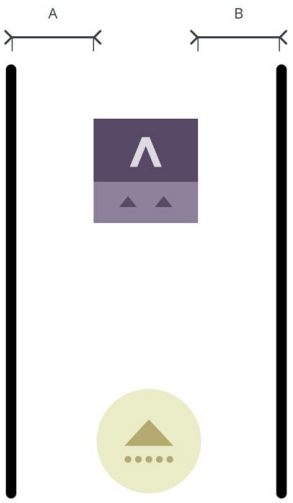
Robot performance	Description	With default robot setup
Good	To the left of marker (A)	500 mm
Good	To the right of marker (B)	450 mm



Minimum space to adjacent wall for a V-marker

Where the walls are long enough to cover the entry position. With docking offset x = -0.55 m, y = 0.2 m, yaw = 0°.

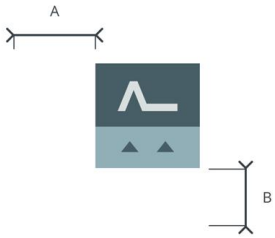
Robot performance	Description	With default robot setup
Good	To the left of marker (A)	700 mm
Good	To the right of marker (B)	650 mm



Minimum space around VI-markers

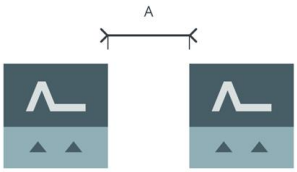
With docking offset x = -0.55 m, y = 0.1 m, yaw = 0°

Robot performance	Description	With default robot setup
Good	To the sides of the marker (A)	150 mm
Good	In front of the marker (B)	2 400 mm



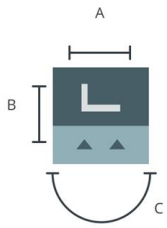
Minimum distance between VL-markers

Robot performance	Description	With default robot setup
Good	With fast docking (A)	40 mm
Good	With slow docking (A)	30 mm



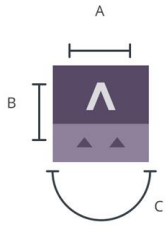
Positioning accuracy docking to L-marker (in controlled conditions)

Robot performance	Description	With default robot setup
Good	X-axis (A)	± 6 mm
Good	Y-axis (B)	± 3 mm
Good	Yaw (C)	± 1°



Positioning accuracy docking to V-marker (in controlled conditions)

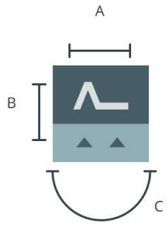
Robot performance	Description	With default robot setup
Good	X-axis (A)	± 9 mm
Good	Y-axis (B)	± 17 mm
Good	Yaw (C)	± 3°



Positioning accuracy docking to VL-marker (in controlled conditions)

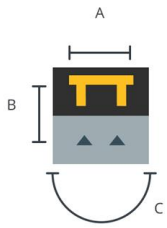
Robot performance	Description	With default robot setup
Good	X-axis (A)	± 3 mm

Robot performance	Description	With default robot setup
Good	Y-axis (B)	± 3 mm
Good	Yaw (C)	± 0.5°



Positioning accuracy docking to Bar-marker (in controlled conditions)

Robot performance	Description	With default robot setup
Good	X-axis (A)	± 18 mm
Good	Y-axis (B)	± 4 mm
Good	Yaw (C)	± 1.5°



4. Hook maneuvers

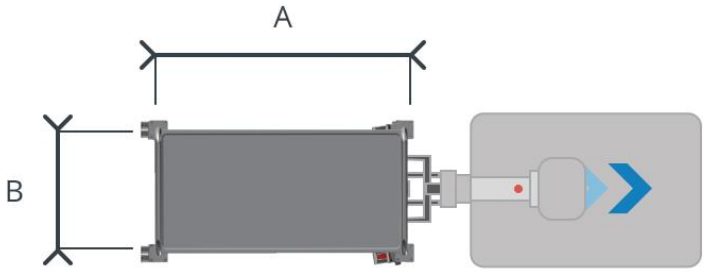
The following sections describe the space requirements for the robot when a MiR Hook 250 is mounted to it and the robot is pulling a cart that is supported by MiR.

For the dimensions of MiR supported carts, see *MiR250 Hook Integrator Manual*. You can find this guide on MiR Support Portal.

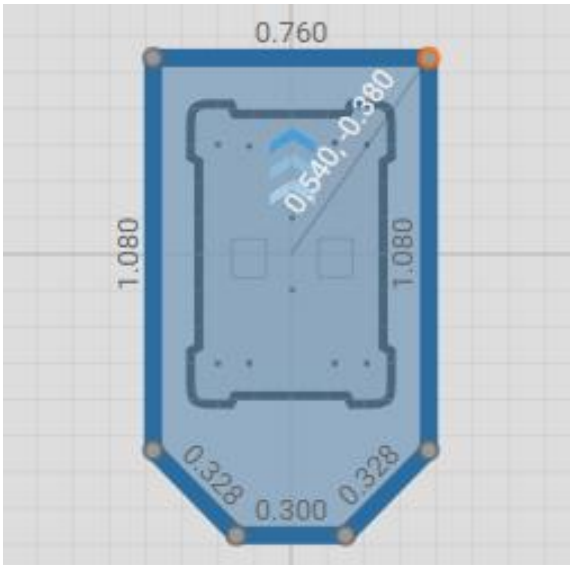
Once a cart is attached to MiR Hook 250, the robot does not reverse when driving to another position. As a result, its dynamic obstacle avoidance capabilities are somewhat restricted compared to when a cart is not attached. The commissioner and operator need to keep this in mind when choosing where to run MiR Hook 250.

The values in the following sections were determined using the following cart types and footprint:

- A cart with the dimensions 1.28 m (A) × 0.80 m (B), rigid wheels in the back, and a full payload.
- The Minimum space required for the robot to travel through a doorway and the Minimum space required for the robot to travel down a straight corridor were determined using a 1.15 m (A) × 0.70 (B) cart, rigid wheels in the back, and a full payload.



- The default footprint for MiR250 Hook.



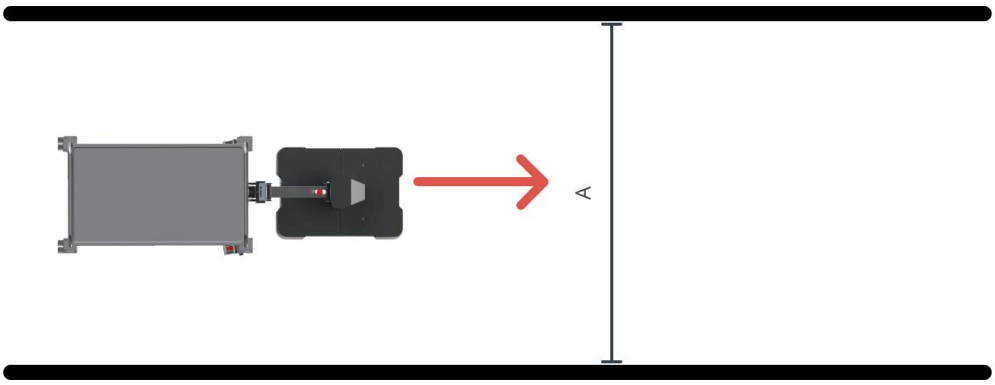
If your robot tows carts with other characteristics than those described, the space requirements in this section may not apply directly for your application.

NOTICE
The values in this guide are for general guidance only. The dimensions of the cart, position of the caster wheels, and the load on the cart greatly impact the maneuverability of the robot when towing the cart. Therefore, testing with the actual equipment in the operating environment is strongly recommended to determine the actual space required.

4.1 Driving straight

Using a 1.15 m × 0.70 m cart.

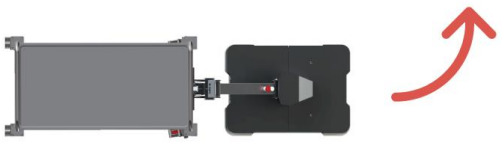
Robot performance	Description	With default robot setup
Good	Corridor width (A)	2.25 m
Compromised	Corridor width (A)	2.15 m



4.2 Driving through a doorway

Using a 1.15 m × 0.70 m cart.

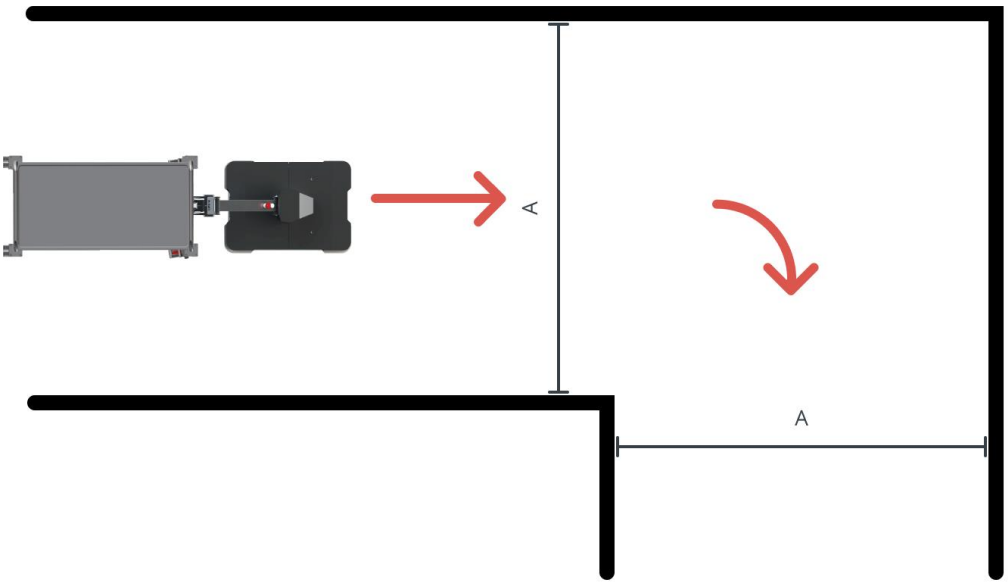
Robot performance	Description	With default robot setup
Good	Doorway width (A)	1.70 m
Compromised	Doorway width (A)	1.65 m



4.3 Taking a turn around an obstacle or corner

Using a 1.28 m × 0.80 m cart.

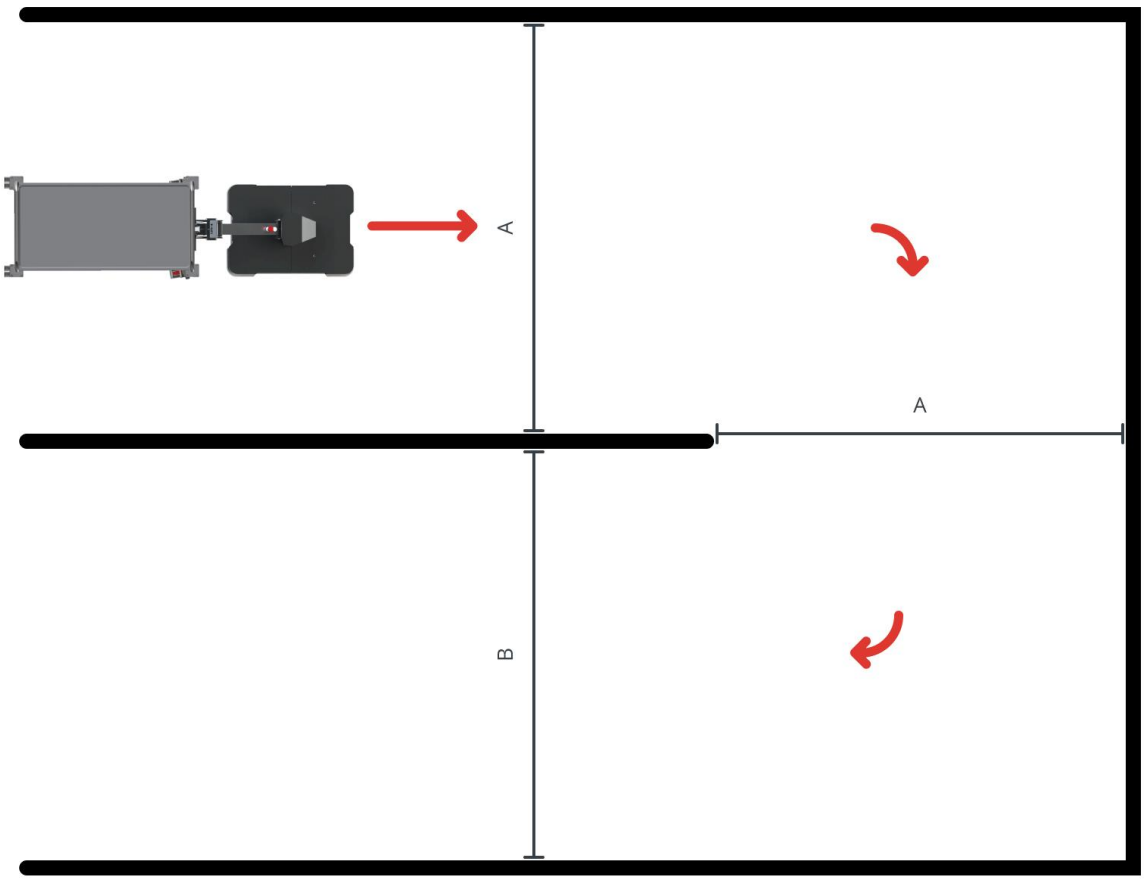
Robot performance	Description	With default robot setup
Good	Corridor width before and after turn (A)	2.45 m



4.4 Taking a U-turn around an obstacle or wall

Using a 1.28 m × 0.80 m cart.

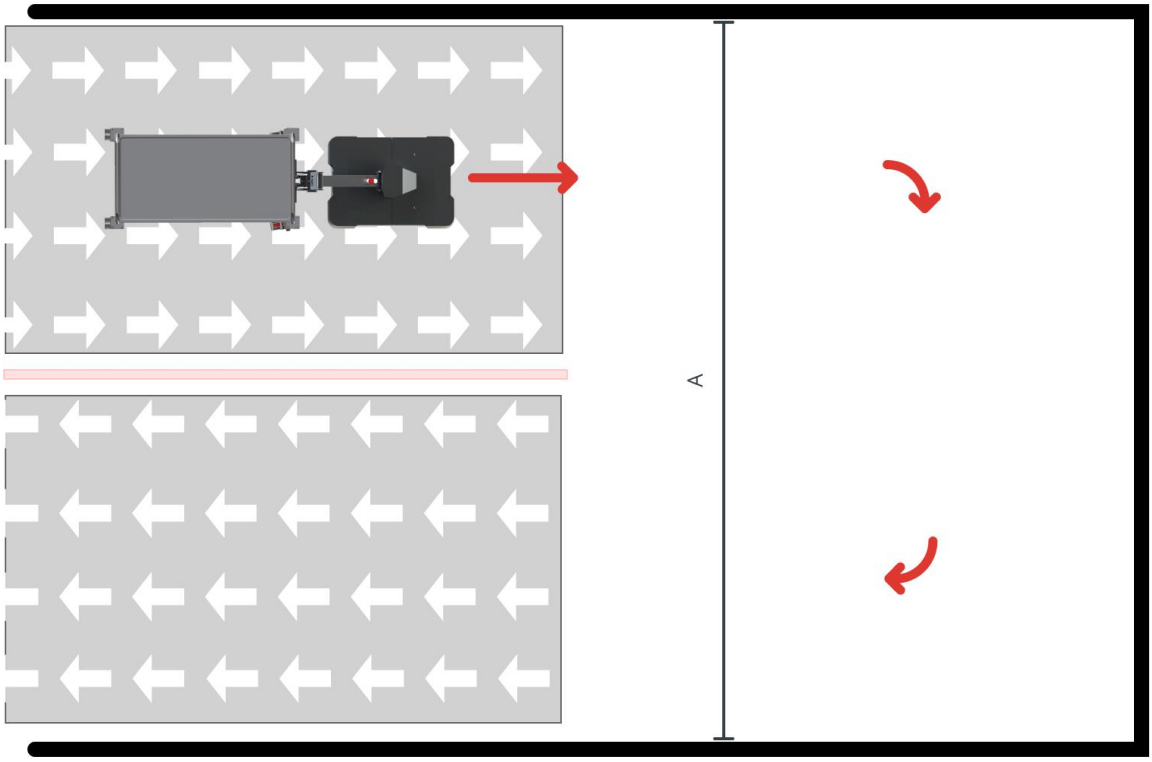
Robot performance	Description	With default robot setup	With muted Protective fields
Good	Entry and exit corridor width (A)	2.70 m	2.60 m
Good	End corridor width (B)	2.70 m	2.60 m



In this case, the Muted setup uses the default footprint with muted Protective fields. Hook robots do not perform well with the minimized footprint.

Without the obstacle in the center, the robot can execute a U-turn with the dimensions in the table below:

Robot performance	Description	With default robot setup	With muted Protective fields
Good	Corridor width (A)	4.75 m	4.55 m

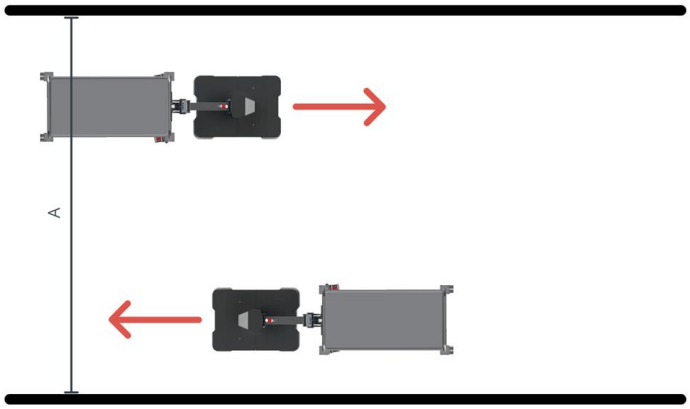


4.5 Passing another robot

Using a 1.28 m × 0.80 m cart.

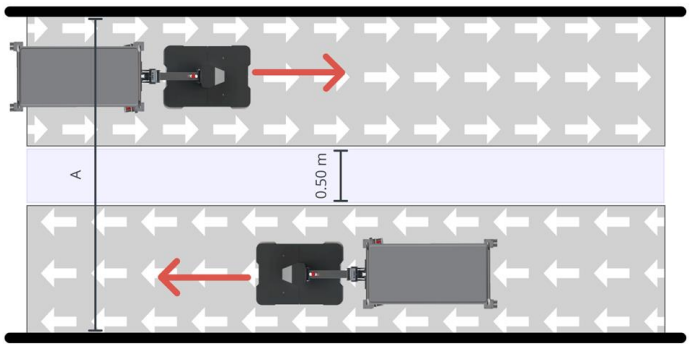
NOTICE
The values in this section are also applicable for robots connected to MiR Fleet where Collision avoidance is enabled.

Robot performance	Description	With default robot setup
Good	Corridor width (A)	3.60 m
Compromised	Corridor width (A)	3.40 m



If you make two lanes using two opposing Directional zones and an Unpreferred zone between them, the corridor can be reduced to the dimensions in the table below:

Robot performance	Description	With default robot setup
Good	Corridor width (A)	3.00 m
Compromised	Corridor width (A)	2.70 m



4.6 Place a cart in reverse

Using a 1.28 m × 0.80 m cart.

The space in front of the Cart position depends on which option you choose in the Place cart action in the robot's mission. You can choose between Standard, Compact, and Fast. Each method affects the required space and time it takes to place the cart.

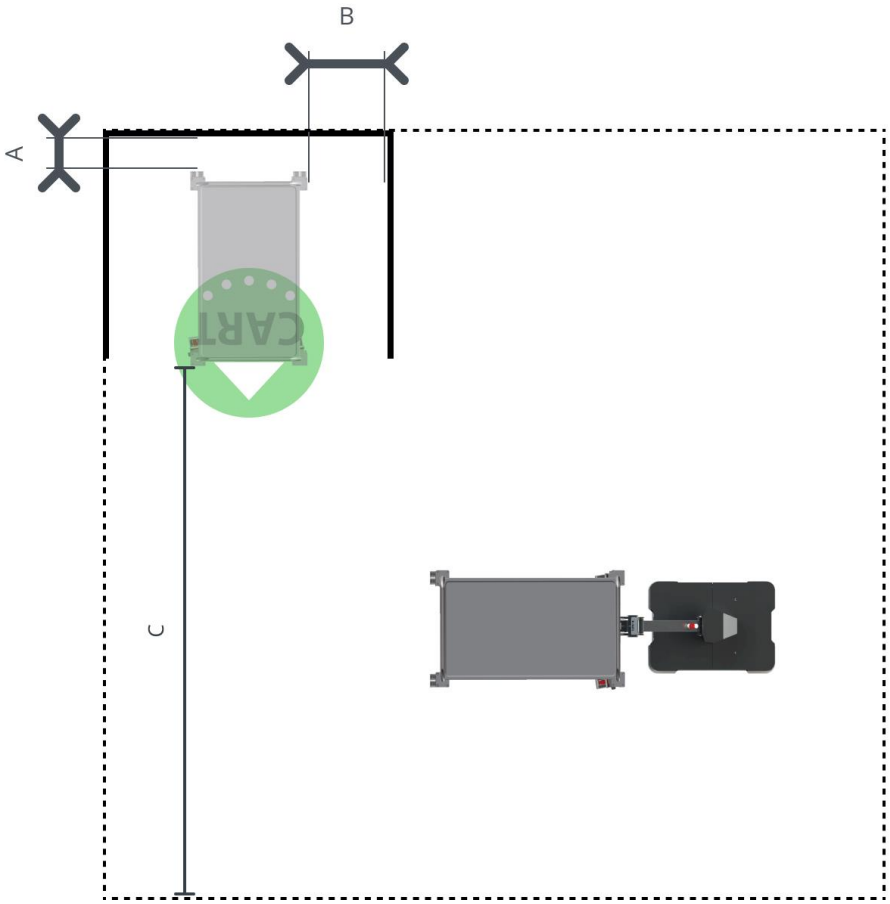
The space to the sides of the cart depend on whether you enable Collision check. When Collision check is enabled, the robot checks for obstacles around the Cart position before placing the cart.

CAUTION
If you disable Collision check, the robot will not check if there is an obstacle in the way of the Cart position before beginning to park the cart in reverse. While the robot is reversing, the cart may collide with an object or person behind it and cause damage or injury.

- Only disable Collision check if you are certain the Cart position is always clear of obstacles before the robot reverses with a cart.
- Mark areas with Cart positions where the robot reverse parks as operating hazard zones. You should also do this even when Collision check is enabled.

Robot performance	Description	Standard	Compact	Fast
Good	In front of Cart position (C)	3.50 m	2.80 m	4.80 m
Compromised	In front of Cart position (C)	3.40 m	Not recommended	4.70 m

Robot performance	Description	With Collision check enabled	With Collision check disabled
Good	Behind parked cart (A)	0.20 m	0.10 m
Good	To the sides of the parked cart (B)	0.50 m	0.30 m
Compromised	Behind parked cart (A)	0.15 m	0.05 m
Compromised	To the sides of the parked cart (B)	0.40 m	0.20 m



4.7 Pivoting

When the robot is towing a cart, it is not possible for the robot to pivot.

5. Shelf carrier maneuvers

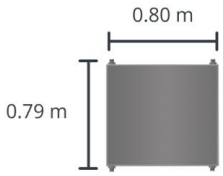
There are differences between hardware version 1.0 and 2.0 of MiR250 Shelf Carrier in terms of footprints and required space. Refer to your User Guide if in doubt about which hardware version you have.

The following sections describe the required space for robots with a MiR Shelf Carrier 250 top module to dock to MiR supported shelves and for robots to maneuver while carrying an unloaded shelf.

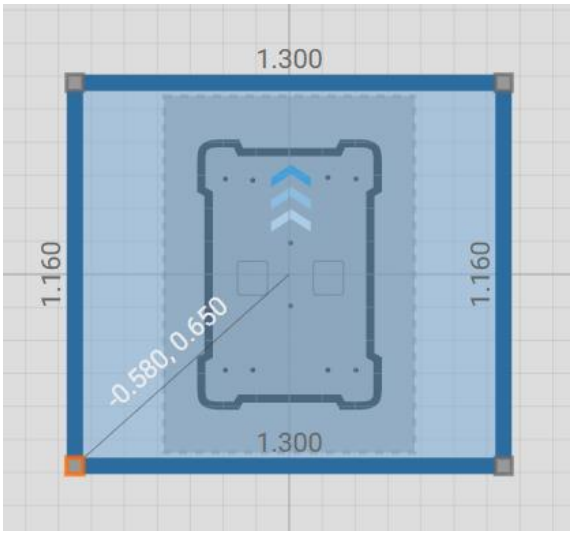
For the dimensions of MiR supported shelves, see *MiR250 Shelf Carrier User Guide*. You can find this guide on MiR Support Portal.

The values in this section were determined using:

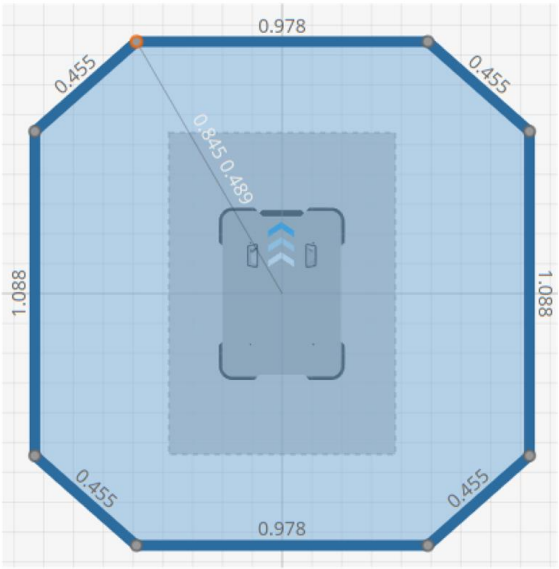
- A shelf with asymmetric legs and the dimensions 0.790 m × 0.800 m, a bar length of 0.550 m, a bar distance of 0.765 m, and no additional payload.



- The standard footprint for MiR250 Shelf Carrier hardware version 1.0 (1.300 × 1.160 m).



- The standard shelf footprint for MiR250 Shelf Carrier hardware version 2.0 (1.690 × 1.660 m).



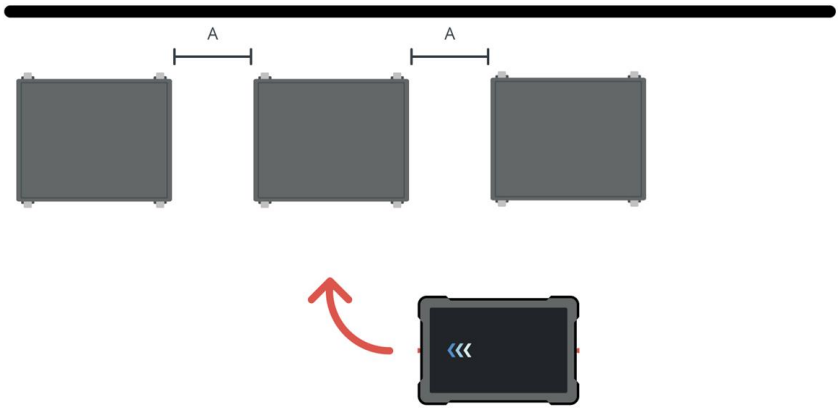
If your robot transports shelves with other characteristics than those described, the space requirements in this section may not apply directly to your application.

Note that MiR250 Shelf Carrier hardware version 2.0 has an additional footprint, which is used whenever no shelf is carried. This footprint differs from the MiR250 base robot. Refer to the User Guide for more information.

NOTICE
The values in this guide are for general guidance only. The design of the cart (width and length of the cart and size, type, and position of the caster wheels) and the load on the cart greatly impact the maneuverability of the robot when towing the cart. Therefore, testing with the actual equipment in the operating environment is strongly recommended to determine the actual space required.

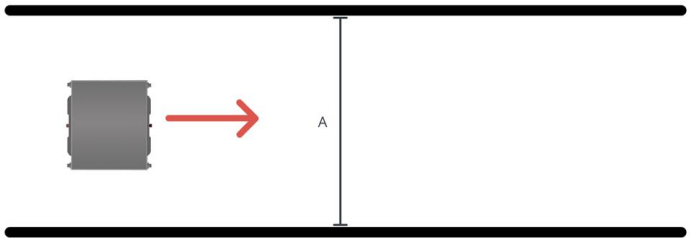
5.1 Distance between shelves

Robot performance	Dimension	Hardware 1.0		Hardware 2.0	
		With default robot setup	With minimum footprint and muted Protective fields	With default robot setup	With minimum footprint and muted Protective fields
Good	A	0.65 m	0.35 m	0.60 m	0.20 m
Compromised	A	N/A	N/A	0.55 m	0.15 m

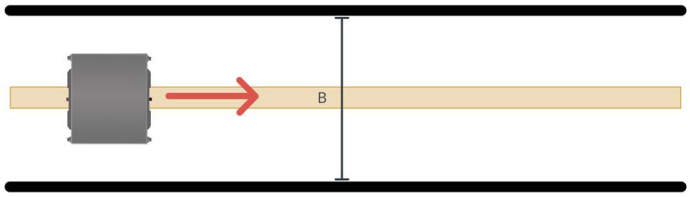


5.2 Driving straight

Robot performance	Dimension	Hardware 1.0		Hardware 2.0	
		With default robot setup	With minimum footprint and muted Protective fields	With default robot setup	With minimum footprint and muted Protective fields
Good	A	1.75 m	N/A	2.00 m	1.1 m
Compromised	A	1.65 m	N/A	1.95 m	1.05 m
Critical zone (SW 2.x only)	B	N/A	1.55 m	N/A	N/A

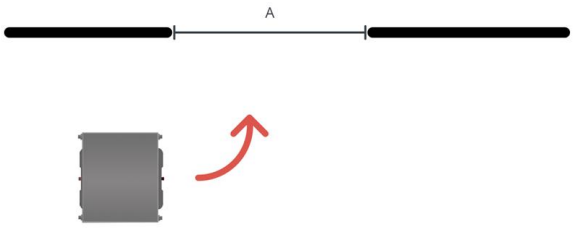


SW 2.x only: You can implement a Critical zone to reduce the minimum space requirement to 1.55 m.

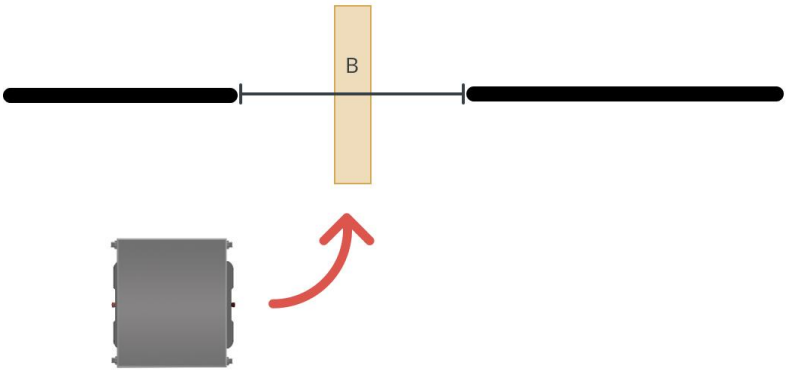


5.3 Driving through a doorway

Robot performance	Dimension	Hardware 1.0		Hardware 2.0	
		With default robot setup	With minimum footprint and muted Protective fields	With default robot setup	With minimum footprint and muted Protective fields
Good	A	1.60 m	1.50 m (w/ Critical zone (software 2.x only))	1.85 m	1.00 m
Compromised	A	1.50 m	N/A	1.00 m	0.95 m
Critical zone (SW 2.x only)	B	N/A	1.45 m	N/A	N/A

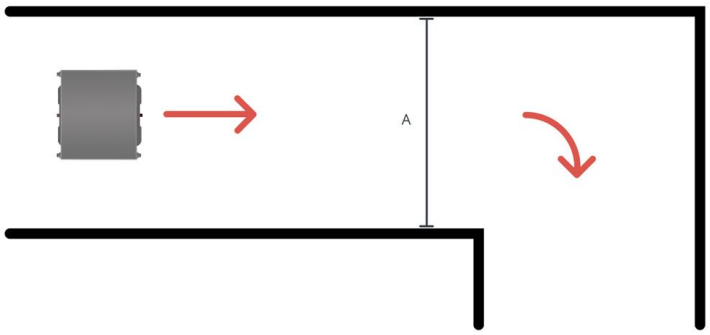


Software 2.x only: you can implement a Critical zone to reduce the minimum space requirement to 1.50 m and still have good performance. The robot can drive through a 1.45 m wide doorway with a critical zone, but this compromises its performance significantly.



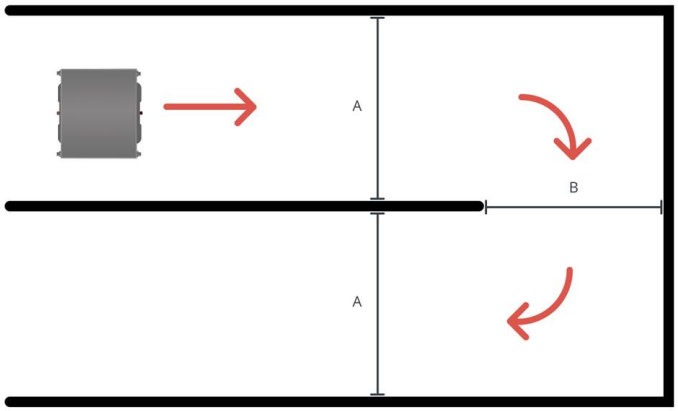
5.4 Taking a turn around an obstacle or wall

Robot performance	Dimension	Hardware 1.0		Hardware 2.0	
		With default robot setup	With minimum footprint and muted Protective fields	With default robot setup	With minimum footprint and muted Protective fields
Good	A	1.75 m	N/A	2.00 m	1.20 m
Compromised	A	1.65 m	N/A	N/A	N/A



5.5 Taking a U-turn around an obstacle or wall

Robot performance	Dimension	Hardware 1.0		Hardware 2.0	
		With default robot setup	With minimum footprint and muted Protective fields	With default robot setup	With minimum footprint and muted Protective fields
Good	A	1.75 m	N/A	2.05 m	1.25 m
Compromised	A	1.70 m	N/A	2.00 m	1.20 m
Good	B	1.70 m	N/A	2.05 m	1.25 m
Compromised	B	1.70 m	N/A	2.00 m	1.20 m

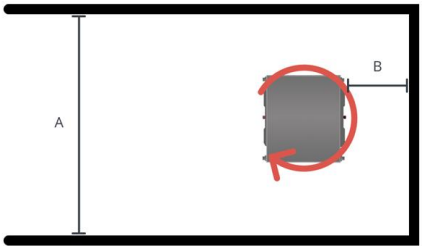


For MiR250 Shelf Carrier hardware version 1.0, dimension B cannot be less than 1.70 m.

For MiR250 Shelf Carrier hardware version 2.0, dimension A and B cannot be less than 2.05 m.

5.6 Pivoting

Robot performance	Dimension	Hardware 1.0		Hardware 2.0	
		With default robot setup	With minimum footprint and muted Protective fields	With default robot setup	With minimum footprint and muted Protective fields
Good	A	2.00 m	N/A	2.15 m	1.40 m
Compromised	A	1.95 m	N/A	N/A	1.35 m
Good	B	0.60 m	N/A	0.70 m	N/A



For MiR250 Shelf Carrier hardware version 1.0: We do not recommend pivoting the robot when there is less than 0.60 m from the robot to the end of the wall.

For MiR250 Shelf Carrier hardware version 2.0: We do not recommend pivoting the robot when there is less than 0.70 m from the robot to the end of the wall.

If you are using a Relative move action to execute the pivot, the required corridor width can be reduced to 1.90 m, but the performance is Compromised.

5.7 Passing another robot

If you have any aisles that are wide enough to let two robots pass each other, we recommend managing these aisles with two Directional zones. This prevents robots from blocking each other in the aisle.

We recommend two possible setups:

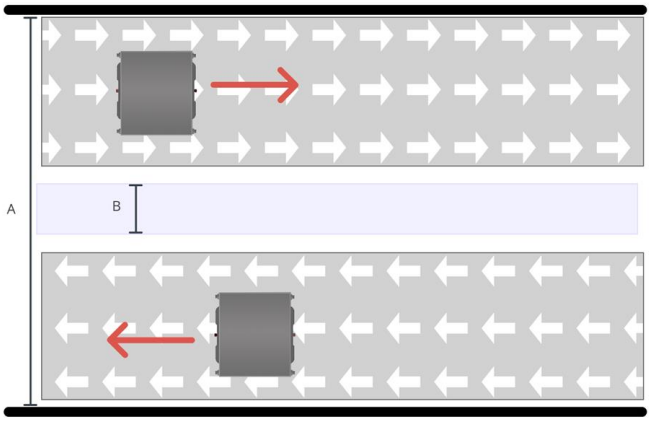
- A simple setup where you have two Directional zones, one in each direction, and an Unpreferred zone between them in the middle.
- An extended setup where you add Preferred and Forbidden zones to the simple setup. These help robots drive closer to the walls, thus reducing the amount of space required.

NOTICE
The values in this section are also applicable for robots connected to MiR Fleet where Collision avoidance is enabled.

To ensure that two robots can pass each other in a corridor, the corridor must have one of the zone setups described above and be at least as wide as the dimensions given in the tables below. In the following cases, the Minimum setup uses a footprint that has the dimensions 820 × 800 mm.

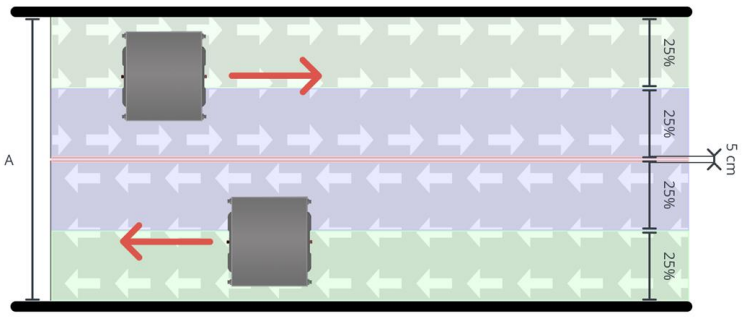
Minimum space required for two robots to pass each other with the simple zone setup:

Robot performance	Dimension	Hardware 1.0		Hardware 2.0	
		With default robot setup	With minimum footprint and muted Protective fields	With default robot setup	With minimum footprint and muted Protective fields
Good	A	3.75 m	2.50 m	3.95 m	2.20 m
Compromised	A	3.60 m	2.40 m	N/A	2.15 m
Good	B	0.50 m	0.50 m	0.50 m	0.50 m
Compromised	B	0.50 m	0.50 m	0.50 m	0.50 m



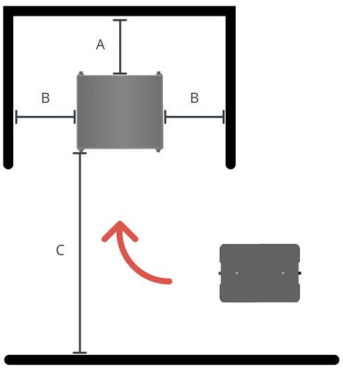
Minimum spaced required for two robots to pass each other with the extended zone setup:

Robot performance	Dimension	Hardware 1.0		Hardware 2.0	
		With default robot setup	With minimum footprint and muted Protective fields	With default robot setup	With minimum footprint and muted Protective fields
Good	A	3.25 m	2.20 m	3.90 m	N/A
Compromised	A	Not recommended	Not recommended	3.85 m	2.10 m



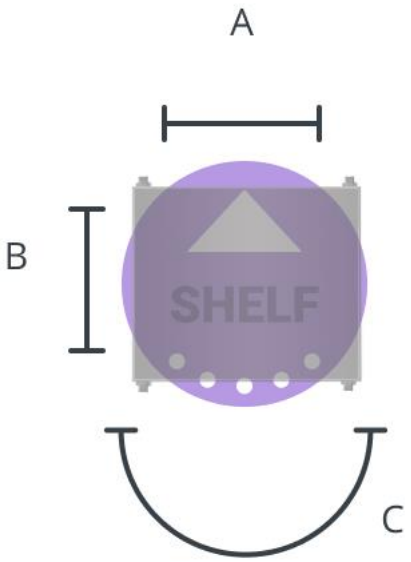
5.8 Docking to shelves

Robot performance	Dimension	Hardware 1.0		Hardware 2.0	
		With default robot setup	With minimum footprint and muted Protective fields	With default robot setup	With minimum footprint and muted Protective fields
Good	A	0.55 m	N/A	0.65 m	0.15 m
Compromised	A	0.50 m	N/A	N/A	0.10 m
Good	B	0.60 m	N/A	0.70 m	0.20 m
Compromised	B	0.55 m	N/A	N/A	0.15 m
Good	C	2.00 m	N/A	2.20 m	1.80 m
Compromised	C	1.95 m	N/A	N/A	1.75 m



5.9 Picking up shelves

Hardware 1.0			Hardware 2.0		
X-axis (A)	**Y-axis (B)**	**Yaw (C)**	**X-axis (A)**	**Y-axis (B)**	**Yaw (C)**
± 100 mm	± 100 mm	± 10°	± 100 mm	± 100 mm	± 10°



6. Charging stations

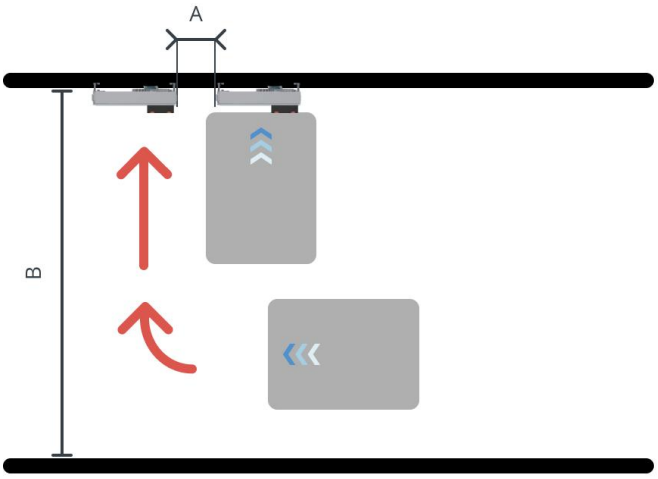
The following section describes the space required around MiR Charge 48V stations for the robot to be able to dock to them successfully.

NOTICE
The values in this section are also applicable for robots connected to MiR Fleet where Collision avoidance is enabled.

Docking to charging stations

You must use the default entry position for these values to apply.

Performance	Dimension	Default	Modified
Good	Between adjacent charging stations (A)	0.75 m	0.45 m
Good	In front of the charging station (from fixed structure) (B)	2.80 m	N/A
Compromised	Between adjacent charging stations (A)	Not recommended	N/A
Compromised	In front of the charging station (from fixed structure) (B)	2.60 m	N/A



NOTICE
If you use the modified setup, you will need more space in front of the charger.

The modified setup requires that you move the point where the robot begins docking and finishes undocking far enough from the charging station that the robot is outside the blue cloud (detected obstacle data) generated around the neighboring robot before docking to and after undocking from the charger. To do this:

- Move the charging station's Entry position away from the charger until it is outside the blue cloud.
- Under **System > Settings > Planner > Advanced > Charging station reverse distance**, modify the Charging station reverse distance, so the robot undocks to the same distance as the Entry position.
- Restart the robot for the changes to take effect.

The Entry positions for the chargers are placed further from the chargers so they are outside the blue cloud generated around the robot already docked to the charger.