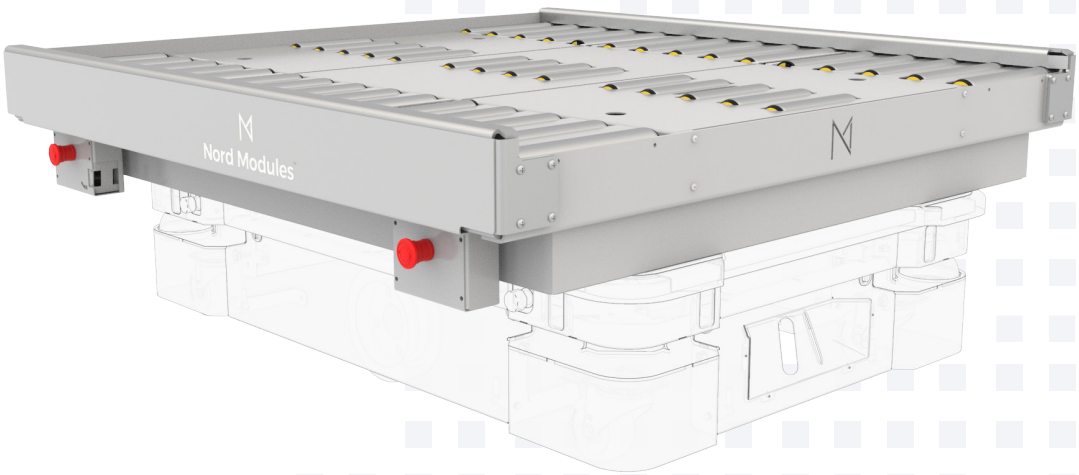
Nord Modules™

Installation manual



Pallet Mover

PM1500 & PM1548

Nord Modules

Nord Modules A/S strives to improve workspaces by automating production lines and storage systems.

With our products, you have taken a step towards eliminating repetitive and monotonous work, improving efficiency and bettering your workspace.

”I truly appreciate that you chose Nord Modules. I am sure you will enjoy using our solution”

Bruno Hansen, CEO

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Product details

Danger

You must read, understand and follow all safety information in this manual, and the mobile robot manual and all associated equipment before initiating any motion. Failure to comply with safety information could result in death or serious injury.

The following installation manual will describe the installation process based on the PM1548, but the process will be identical for the PM1500.

Mechanical specifications

Parameter	PM1500	PM1548
Dimensions (LWH)	1346 x 1124 x 137 mm | 53” x 44” x 5.4”	1346 x 1344 x 188 mm | 53” x 53” x 7.4”
Handling capacity	MiR500: Up to 370 kg MiR1000: Up to 870 kg	MiR500: Up to 308 kg MiR1000: Up to 808 kg
Transport area	1320 x 1036 mm | 52” x 41”	1320 x 1256 mm | 52” x 49.45”
Conveyor weight	130 kg | 287 lbs	192 kg | 423 lbs
Color	RAL 7035	
Conveyor roller working height	426 mm | 16.77”	508 mm | 20”

The PM1500 / 1548 must never be loaded with more than 1500 kg

The Pallet Mover fits both the MiR500 and the MiR1000. There are mounted 4 emergency stop-buttons on the Pallet Mover. When pressed stops both the Pallet Mover and the MiR-robot immediately. The Pallet Mover is also equipped with 4 retaining skates, which must always be active during transport. The retaining skates ensure that a pallet is secured on the Pallet Mover in the event of an emergency stop. The Pallet Mover is built to carry solid-bottom items such as pallets. The pallet must be carried by the rollers and placed within the frame. The pallet must not be larger than the conveyor surface of the rollers. The load of the pallet must placed securely on the pallet and must not overturn/slip in case of MiR’s emergency stop during transport.

Software updates

If the PLC software should be updated, please contact
support@nord-modules.com

Maintenance and repair

All maintenance and repairs must be performed in compliance with this manual, including safety instructions. All maintenance and repair work must be performed according to the latest versions of service manuals available on
nord-modules.com/product/.

Only authorized system integrators, or Nord Modules, shall perform repairs.
Only use original spare parts.

The Pallet Mover must only be cleaned with a slightly damp cloth; it must not be wet!
The Pallet Mover must not be exposed to water, steam or cleaning detergents.
The Pallet Mover does not need greasing and is maintenance-free.

In case of a repair, contact your distributor.

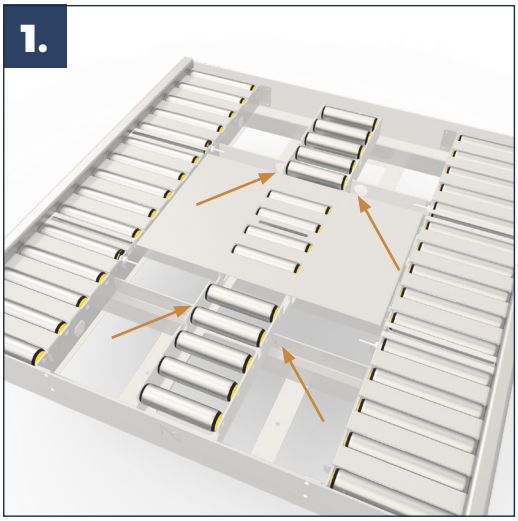
In special cases, write an e-mail to support@nord-modules.com.

Installation instructions

Unpacking and lifting instructions

Instructions on unpacking and lifting the Pallet Mover.
Always be careful not to damage cables and plugs on the MiR when mounting the Pallet Mover.

1.

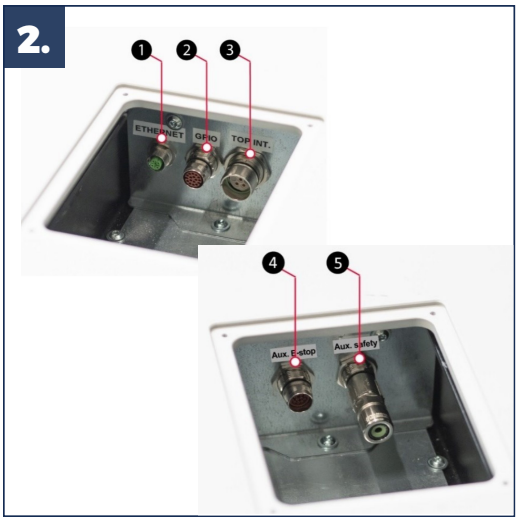


Unpack the Pallet Mover carefully to avoid damage.

Remove the front and back middle cover which are mounted on loosely.
Use your approved lifting equipment with a hook and place it in the holes to lift the Pallet Mover onto the MiR-robot.

The PM1500 should be mounted onto the MiR-robot with the screws that came with the MiR-robot. The PM1548 should be mounted onto the MiR-robot with the screws that came with the PM1548. Thereafter mount the covers back on the PM.

2.



Plug the cables into the MiR. The PM is connected to the MiR with the following connections:

1. Ethernet connection - not in use with PM
2. GPIO: General purpose IO
3. Power
4. Auxiliary emergency stop
5. Auxiliary safety functions

The PM is hereafter ready for the software setup.

Software setup

This chapter will describe the necessary missions to make the MiR use the Pallet Mover safely and correctly. It is highly recommended to follow all the steps in the given order. This will give you the best experience.

Before any configuration can be made, you should log on to MIR's own accespoint.

SetRollerSpeed mission

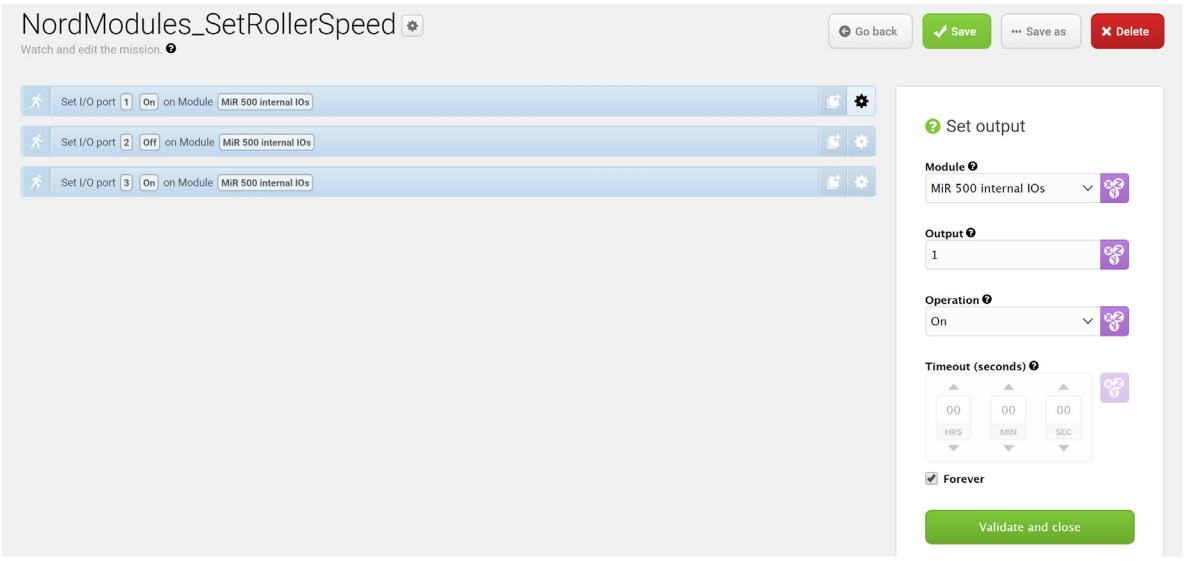
This mission will set the default transference speed of the rollers on the Pallet Mover. The first step is to create a helper mission called **"NordModules_SetRollerSpeed"** through MiR's GPIO's.
In order to obtain one of the 8 predetermined speeds of the rollers, the three bits should be combined as shown in the table to the right.

Speed (cm/s)	Bit 1	Bit 2	Bit 3
0	off	off	off
1	off	off	on
3	off	on	off
6	off	on	on
9	on	off	off
11	on	off	on
14	on	on	off
16	on	on	on

If for example you want to set the speed of the rollers to 11 cm/s:
Add an "Set output"-module and set the parameters as following

Module: MiR 500 Internal IOs
Output: 1
Operation: On

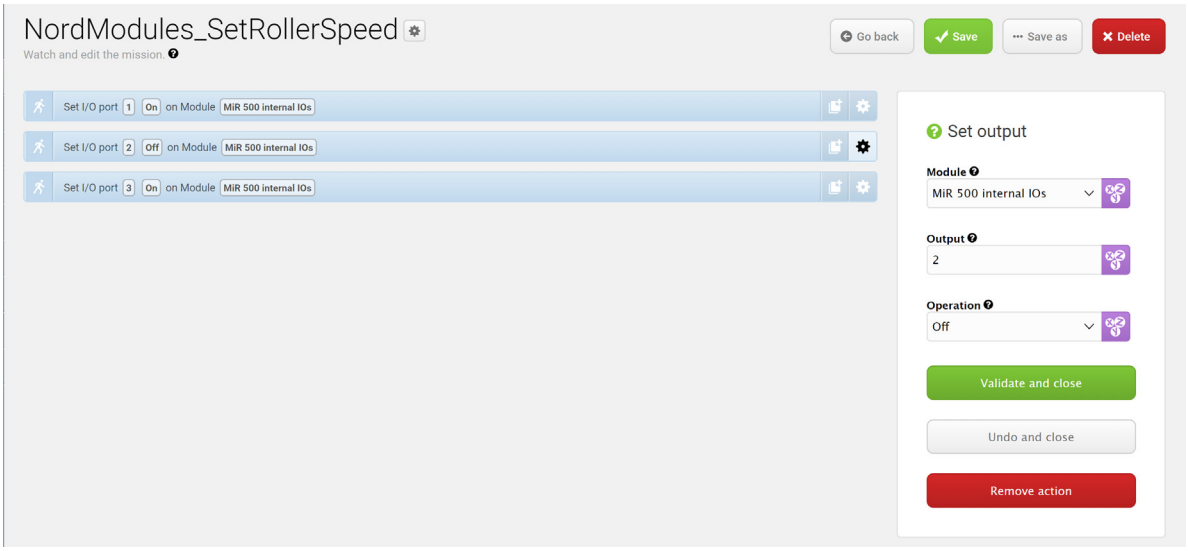
And tick "Forever" in Timeout.



Add two further ”Set output”-modules as seen below.

Set the parameters of the second ”Set output”-module as following

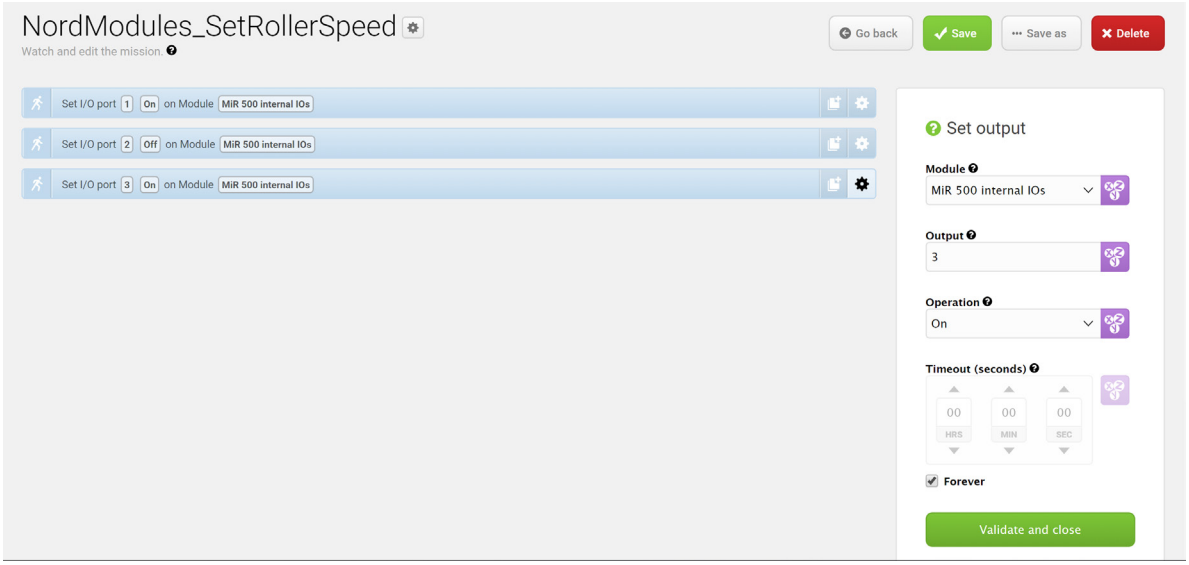
Module: MiR 500 Internal IOs
Output: 2
Operation: Off



Set the parameters of the third ”Set output”-module as following

Module: MiR 500 Internal IOs
Output: 3
Operation: On

And tick ”Forever” in Timeout.



Nord Modules

PMWorking mission

This helper mission will launch during the main mission, which will be configurated in the following pages.

To set up this helper mission follow the steps and screenshots below.

Add an ”Set output”-module and set the parameters as follows:

Module:	MiR 500 Internal IOs
Output:	0
Operation:	On

And tick ”Forever” in Timeout.

Add a ”Wait for input”-module and set the parameters as following

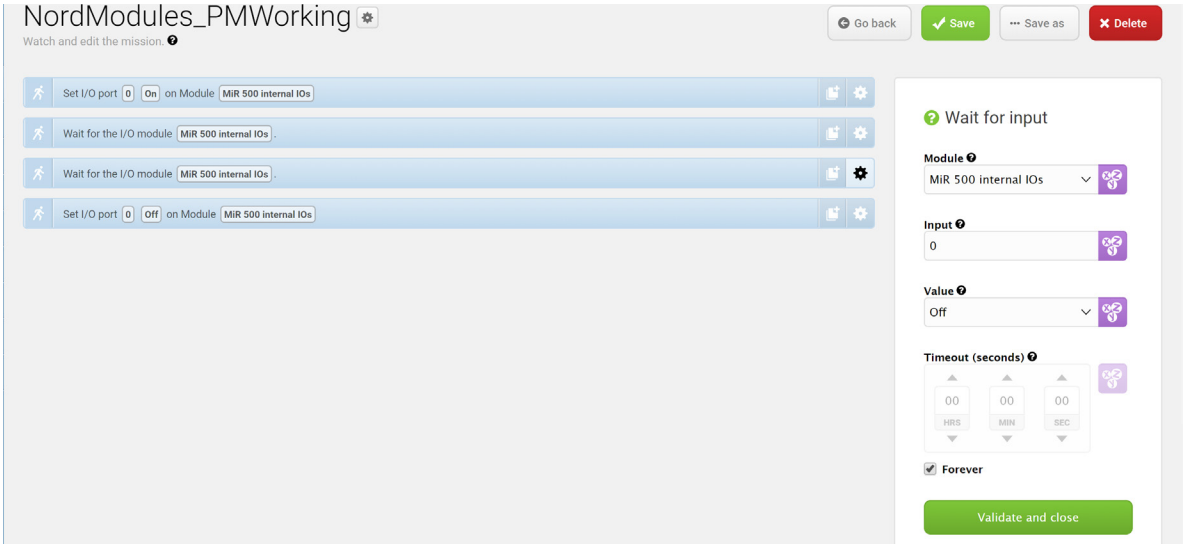
Module: MiR 500 Internal IOs
Output: 0
Operation: On

And tick ”Forever” in Timeout.

Add a ”Wait for input”-module and set the parameters as following

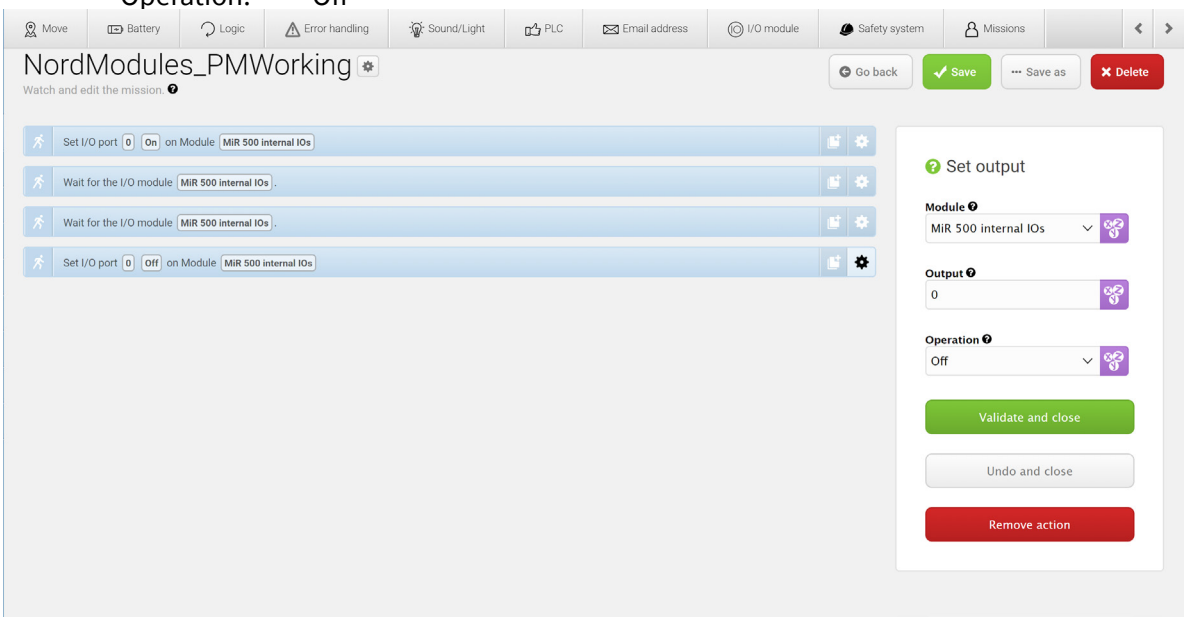
Module: MiR 500 Internal IOs
Output: 0
Operation: Off

And tick ”Forever” in Timeout.



Add a ”Set output”-module and set the parameters as following

Module: MiR 500 Internal IOs
Output: 0
Operation: Off



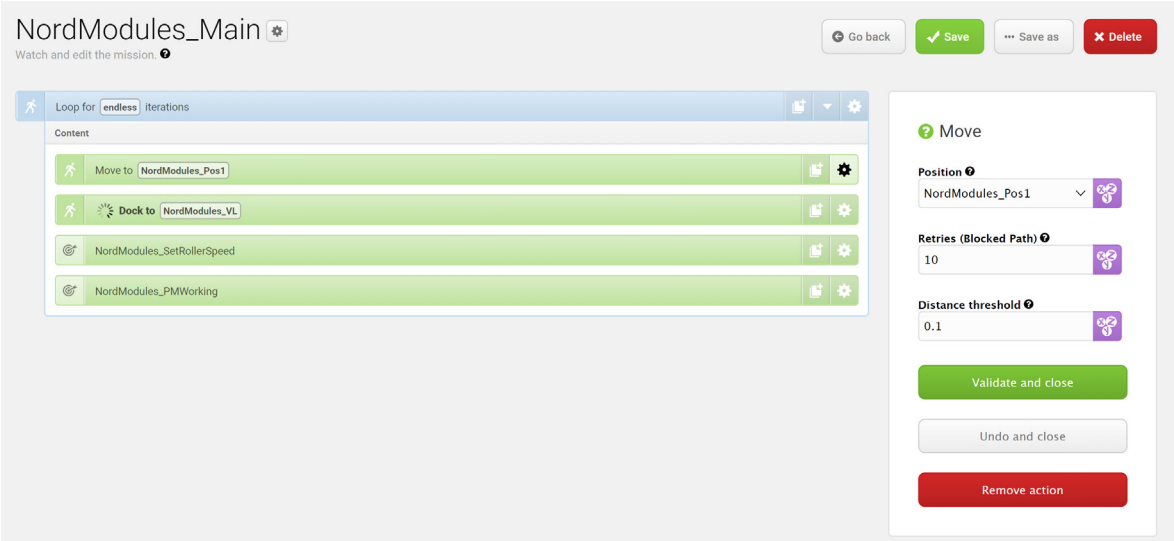
Main mission

This main mission will consists of four core steps, where it is vital for the operation of the Pallet Mover that the steps 2 to 4 are executed in their specific order. The user can choose to add as many steps as they want before step 2 and after step 4.

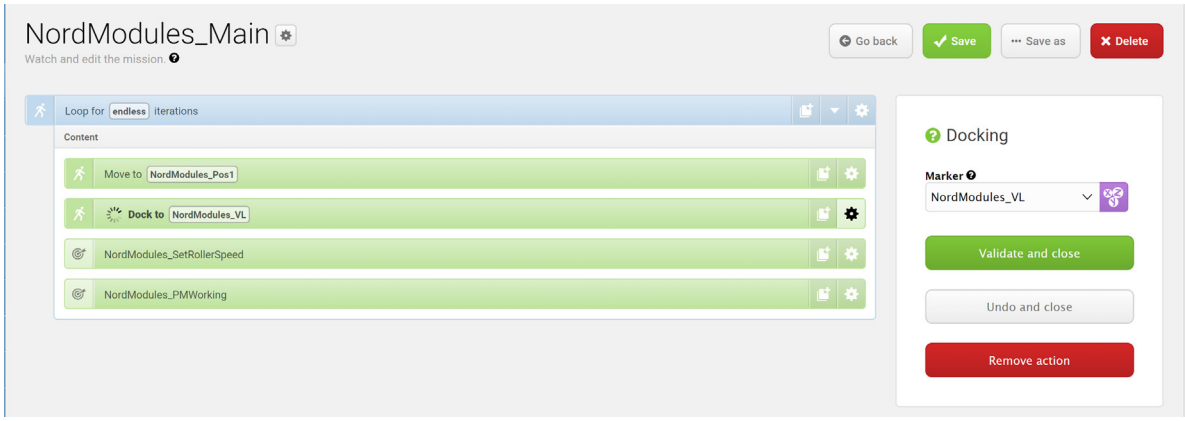
Start by creating a mission called **”NordModules_Main”.**

1. Add a ”Move”-module, which will move the MiR into a preset position where it will execute the rest of the sequence. Set the parameters as follows:

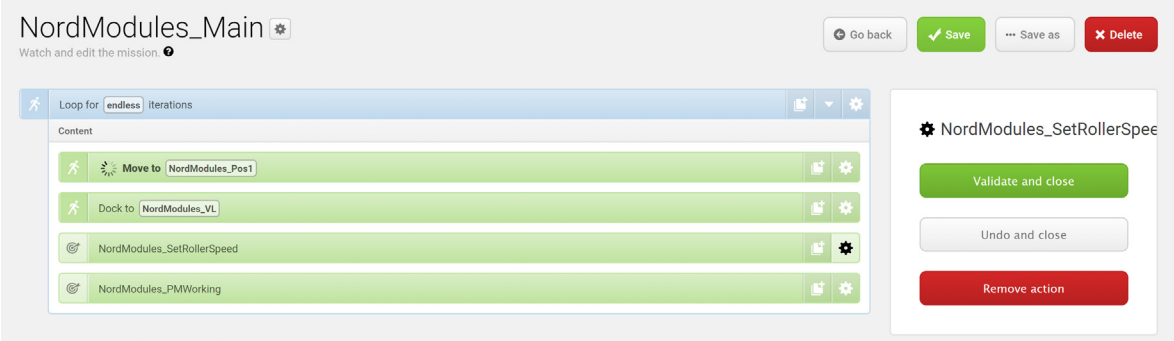
Position:	Predetermined position by user
Retries:	10
Distance threshold:	0.1



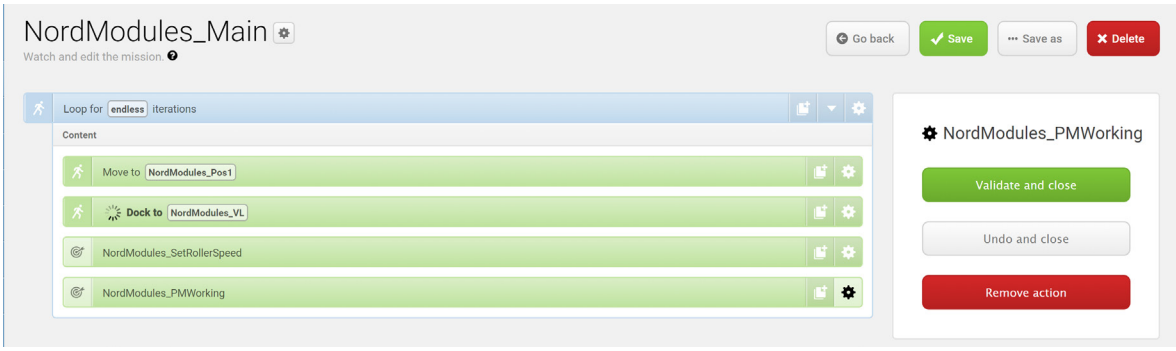
2. Add a ”Docking”-module, whch is set to the VL-marker that is connected to the docking point.



3. Execute the **”NordModules_SetRollerSpeed”**-helper mission, which was set up in the previous pages.

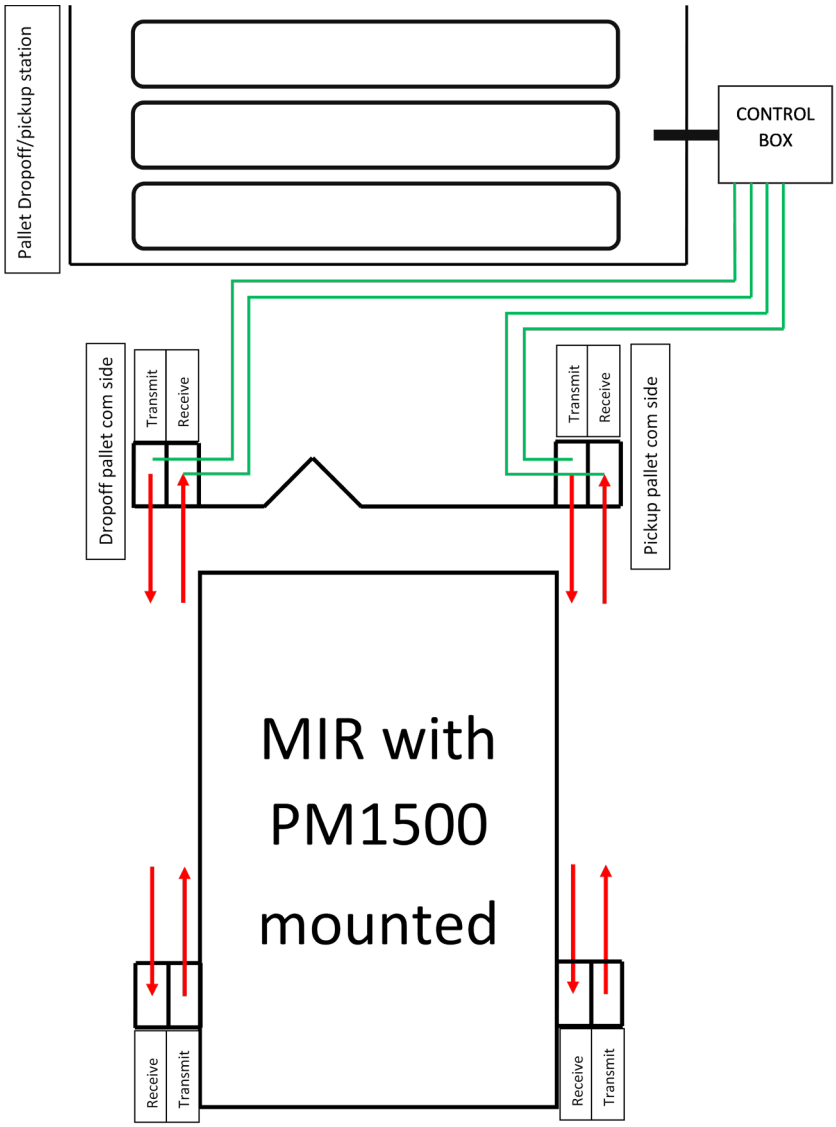


3. Execute the **”NordModules_Main”**-helper mission, which was also set up in the previous pages.



Communication system

For the PM1500/1548 to work as intended there must be some communication between the PM1500/1548 and the dropoff /pickup site. The dropoff/pickup site must know when a pallet transfer is to begin and end. Also the possibility to stop the transfer if an error merits a stop must be possible.
A control box (PLC, microcontroller or other) will have to be connected to the VL marker and the dropoff /pickup site. This way the communication between dropoff /pickup site and PM1500/1548 is done via the VL marker and in extension the control box.
The communication system is implemented as seen in the figure below.



In the following sections the following applies:

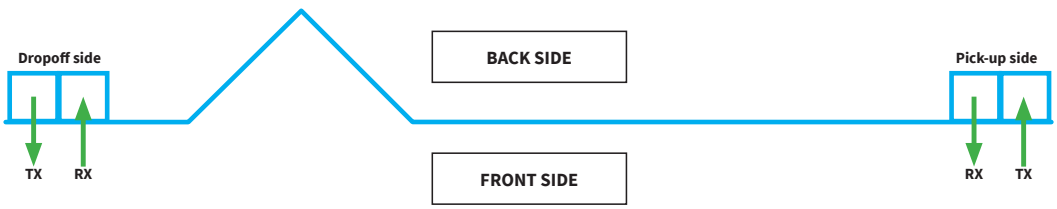
- dropoff /pickup site will be named as VL (VL marker)
- PM1500/1548 will be named as PM
- A pallet transfer from PM1500/1548 to dropoff /pickup site will be named as dropoff
- A pallet transfer from dropoff /pickup site to PM1500/1548 to will be named as pickup

VL-marker description

The communication system of the VL marker consists of two pairs of:

- Transmitter (TX)
  - SICK GS6-D4311
- Receiver (RX)
  - SICK GS6-P4211

Each pair is configured so the TX is placed on the outermost side and RX is placed on the inner most side. One pair is placed on the left side (seen from front side). This side is responsible for the communication when the PM is delivering at pallet to the conveyer belt. (dropoff)
The other pair is placed on the right side (seen from front side). This side is responsible for the communication when the PM is receiving a pallet. (pickup)



Transmitter and receiver data
Type and wiring for the transmitter and receiver are given in the tables below.

GS6-D4311			
Manufact: SICK		Part Number: 2058059	
	Wire color	Connection	Note
1	BN	+(L+)	24V
2	WH	NC	Not connected
3	BU	-(M)	GND/RTN
4	BK	NC	Not connected

GS6-P4211			
Manufact: SICK		Part Number: 1059241	
	Wire color	Connection	Note
1	BN	+(L+)	24V
2	WH	NC	Not connected
3	BU	-(M)	GND/RTN
4	BK	Q	Output

Communication protocol

Please note:

- All communication will be initiated and ended by the PM (except for errors)
  - Errors can be initiated by the VL-marker as well as the PM
- During all transfers the signals between PM and VL-marker must be enabled
  - If for any reason the signal from the PM or the VL-marker is disabled during a transfer, the transfer will stop
  - Unless disabled by an error the transfer will continue when the signal is restored
  - The one that initiates the error signal is also responsible for disabling it
- The PM knows whether it carries a pallet or not- therefore it knows whether it is has to do a pick-up or a dropoff

Error handling

- If the VL-marker initiates an error:
  - “Error disabled” switches to “Error enabled”
    - All moving parts stop
    - MiR goes to safeguard stop
    - Both dropoff and pick-up signals are enabled
    - Latest transfer state (dropoff or pick-up or none) is stored
  - “Error enabled” to “Error disabled”
    - Dropoff and pickup signal disabled for 3 seconds
    - After 3 seconds the MiR goes out of safeguard stop
      - Depending on the transfer state the transfer will continue
      - If the transfer state is none no transfer will be enabled

- If the PM initiates an error:
  - “Error disabled” to “Error enabled”
    - All moving parts stop
    - MiR goes to safeguard stop
    - Both dropoff and pick-up signals are enabled
    - Latest transfer state (dropoff or pick-up or none) is stored
  - Error enabled to error disabled
    - Dropoff and pickup signal disabled for 3 seconds
    - After 3 seconds the MiR goes out of safeguard stop
      - Depending on the transfer state the transfer will continue
      - If the transfer state is none no transfer will be enabled

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Communication functions: Truth table

Below is the truth table for the communications protocol. Also in this chapter you will find examples on how the communication works.

PM dropoff	PM pickup	VL dropoff	VL pickup		
0	0	0	0	Idle	
0	0	0	1	VL ready pickup	VL is signaling to PM that it is ready to deliver pallet
0	0	1	0	VL ready dropoff	VL is signaling to PM that it is ready to recieve pallet
0	0	1	1	VL has error	VL is experiencing an error Signals to PM that the transfer must stop
0	1	0	0	PM ready pickup	PM is signaling to VL that it is ready to receive pallet
0	1	0	1	Transfer from VL to PM	Both PM and VL are in agreement Pallet will be transferred from VL
0	1	1	0	N/A	Nothing wil happen
0	1	1	1	VL has error	VL is experiencing an error Signals to PM that transfer must stop
1	0	0	0	PM ready dropoff	PM is signaling to VL that it is ready to deliver pallet
1	0	0	1	N/A	Nothing wil happen
1	0	1	0	Transfer from PM to VL	Both PM and VL are in agreement Pallet will be transferred from PM to VL
1	0	1	1	VL has error	VL is experiencing an error Signals to PM that transfer must stop
1	1	0	0	PM has error	PM is experiencing an error Signals to VL that transfer must stop
1	1	0	1	PM has error	PM is experiencing an error Signals to VL that transfer must stop
1	1	1	0	PM has error	PM is experiencing an error Signals to VL that transfer must stop
1	1	1	1	Error	All transfer stops until error is resolved

Green = pickup
Yellow = dropoff
Red = error

Use-example of function table

Example of pickup routine

Dropoff side has been omitted. It is assumed that dropoff side is not active. Below is the example of a pickup routine and the following table describes its corresponding truth table.

1. The MiR-robot docks to the VL-marker
2. The PM enables the ”*PM ready pickup*”-signal
3. The VL-marker detects the ”*PM ready pickup*”-signal
4. The VL-marker enables the “*VL ready pickup*”-signal
    - Shortly after it will initiate the rollers on the VL-side
5. The PM detects the “*VL ready pickup*”-signal
    - Shortly after it will initiate the rollers on the PM
6. The pallet transfer from the VL-side to the PM begins
7. The pallet is received by the PM
8. The PM disables the “*PM ready pickup*”-signal
    - Shortly after it will stop the rollers on the PM
9. The VL-marker detects the absence of the “*PM ready pickup*”-signal
10. The VL-marker disables the “*VL ready pickup*”-signal
    - Shortly after it will stop the rollers on the VL-side
11. The PM detects the absence of the “*VL ready pickup*”-signal
12. The MiR-robot transports the pallet to where it is needed

Pickup side					
Step	PM TX	PM RX	VL TX	VL RX	Description
1	0	0	0	0	MiR docks to VL-marker
2	1	0	0	0	PM enables ready pickup bit
3	1	0	0	1	VL detects PM ready pickup bit
4	1	0	1	1	VL enables VL ready pickup bit
5	1	1	1	1	PM detects VL ready pickup bit
6	1	1	1	1	Pallet transfer from VL to PM begins
7	1	1	1	1	Pallet is received by PM
8	0	1	1	1	PM disables the PM ready pickup bit
9	0	1	1	0	VL detects the abscence of the PM ready pickup bit
10	0	1	0	0	VL disables the VL ready pickup bit
11	0	0	0	0	PM detects the absence of the VL ready pickup bit
12	0	0	0	0	The MiR transports the pallet to where it is needed

Nord Modules

Example of dropoff routine

Pickup side has been omitted. It is assumed that pickup side is not active.

1. The MiR-robot docks to the VL-marker
2. The PM enables the ”*PM ready dropoff*”-signal
3. The VL-marker detects the ”*PM ready dropoff*”-signal
4. The VL-marker enables the “*VL ready dropoff*”-signal
    - Shortly after it will initiate the rollers on the VL-side
5. The PM detects the “*VL ready dropoff*”-signal
    - Shortly after it will initiate the rollers on the PM
6. The pallet transfer from the PM to the VL-side begins
7. The pallet has left the PM
8. The PM disables the “*PM ready dropoff*”-signal
    - Shortly after it will stop the rollers on the PM
9. The VL-marker detects the absence of the “*PM ready dropoff*”-signal
10. The VL-marker disables the “*VL ready dropoff*”-signal
    - Shortly after it will stop the rollers on the VL-side
11. The PM detects the absence of the “*VL ready dropoff*”-signal
12. The pallet can be moved down the conveyor or be picked from the VL-marker position

Pickup side					
Step	PM TX	PM RX	VL TX	VL RX	Description
1	0	0	0	0	MiR docks to VL-marker
2	1	0	0	0	PM enables ready dropoff bit
3	1	0	0	1	VL detects PM ready dropoff bit
4	1	0	1	1	VL enables VL ready dropoff bit
5	1	1	1	1	PM detects VL ready dropoff bit
6	1	1	1	1	Pallet transfer from PM to VL begins
7	1	1	1	1	Pallet is received by VL
8	0	1	1	1	PM disables the PM ready dropoff bit
9	0	1	1	0	VL detects the abscence of the PM ready dropoff bit
10	0	1	0	0	VL disables the VL ready dropoff bit
11	0	0	0	0	PM detects the absence of the VL ready dropoff bit
12	0	0	0	0	Pallet can be transported from VL through conveyor

Example of pickup error

The following sequence will describe an example of a pickup error. The corresponding function table can be viewed on the next page.

1. The MiR docks to the VL-marker
2. The PM enables the ”*PM ready pickup*”-signal
3. The VL-marker detects the ”*PM ready pickup*”-signal
4. The VL-marker enables the “*VL ready pickup*”-signal
    - Shortly after it will initiate the rollers on the VL-side
5. The PM detects the “*VL ready pickup*”-signal
    - Shortly after it will initiate the rollers on the PM
6. The pallet transfer from the VL-side to the PM begins

During transfer an error happens on the VL that merits that the transfer must stop.
Someone might have enabled the e-stop.

7. The rollers on the VL-side stops
8. The VL-marker enables the “*VL ready dropoff*”-signal so that both the “*VL ready dropoff*”- and “*VL ready pickup*”-signal is enabled
9. The PM detects the error signal (“*VL ready dropoff*” and “*VL ready pickup*”)
10. The PM immediately stops its rollers

At this point the VL-marker has its dropoff and pickup signals enabled (error state). Since it was the VL-marker that initiated the error it is also the one that must disable the error.

11. The PM waits for the VL-marker to disable the error signal

The problem on the VL side has been solved and the transfer can now continue.

12. The VL-marker disables both the “*VL ready dropoff*”- and the “*VL ready pickup*”-signal.
    - The VL-marker will enable the “*VL ready pickup*” signal again after 3 seconds
13. The PM detects the abscense of both the “*VL ready dropoff*”- and “*VL ready pickup*”-signal and waits a minimum of 3 seconds for the “*VL ready pickup*”-signal to be enabled again

3 seconds later.

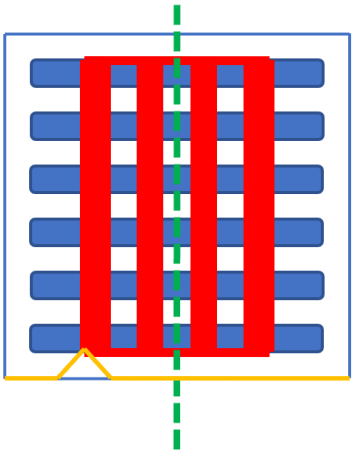
14. The VL-marker enables the “*VL ready pickup*”-signal
15. PM detects the “*VL ready pickup*”-signal and the PM enables its “*PM ready pickup*”-signal
16. The pallet transfer from the VL-side to the PM continues
17. The pallet is received by the PM
18. The PM disables the “*PM ready pickup*”-signal
    - Shortly after it will stop the rollers on the PM
19. The VL-marker detects the absence of the “*PM ready pickup*”-signal
20. The VL-marker disables the “*VL ready pickup*”-signal
    - Shortly after it will stop the rollers on the VL-side
21. The PM detects the absence of the “*VL ready pickup*”-signal
22. The MiR-robot transports the pallet to where it is needed

	Pickup side				Dropoff side				
Step	PM TX	PM RX	VL TX	VL RX	PM TX	PM RX	VL TX	VL RX	**Description**
1	0	0	0	0	0	0	0	0	MiR docks to VL-marker
2	1	0	0	0	0	0	0	0	PM enables ready pickup bit
3	1	0	0	1	0	0	0	0	VL detects PM ready pickup bit
4	1	0	1	1	0	0	0	0	VL enables VL ready pickup bit
5	1	1	1	1	0	0	0	0	PM detects VL ready pickup bit
6	1	1	1	1	0	0	0	0	Pallet transfer from VL to PM begins
7	1	1	1	1	0	0	0	0	VL stops the VL rollers
8	1	1	1	1	0	0	1	0	VL enables VL dropoff bit
9	1	1	1	1	0	1	1	0	PM detects the VL dropoff bit
10	1	1	1	1	0	1	1	0	PM stops rollers
11	1	1	1	1	0	1	1	0	PM waits for VL to disable error signal
12	1	1	0	1	0	1	0	0	VL disables VL ready pickup and VL ready dropoff bits
13	1	0	0	1	0	0	0	0	PM detects absence of VL ready pick-up and VL ready dropoff bits
14	1	0	1	1	0	0	0	0	VL enables VL ready pickup bit
15	1	1	1	1	0	0	0	0	PM detects VL ready pickup bit and enables PM ready pickup bit
16	1	1	1	1	0	0	0	0	Pallet transfer from VL to PM con-tinues
17	1	1	1	1	0	0	0	0	Pallet is received at the PM
18	0	1	1	1	0	0	0	0	PM disables PM ready pickup bit
19	0	1	1	0	0	0	0	0	VL detects the abscence of PM ready pickup bit
20	0	1	0	0	0	0	0	0	VL disables VL ready pickup bit
21	0	0	0	0	0	0	0	0	PM detects absence of the VL ready pickup bit
22	0	0	0	0	0	0	0	0	MiR moves pallet to where it is needed

VL-marker placement

MiR VL marker creation and parameter setup

1. Place the VL-marker under the conveyer belt or as close to the conveyer belt as possible. Make sure the VL-marker is placed as parallel to the edge of the conveyer belt as possible.
    - The best position of the VL-marker in relation to the conveyer belt is under the conveyer belt where the VL-marker is aligned with the edge of the conveyer belt. This is not a necessity, but it will make this setup a bit easier in the following steps.
2. Place the VL-marker so that the center of the VL-marker is aligned with the center of the pallet when positioned on the conveyer belt



Conveyer belt (blue) with pallet (red), VL-marker (orange) placed under conveyer belt.
VL maker and pallet center lines are aligned (green line).

3. Manually drive the MiR-robot with the PM mounted up to the VL-marker.
   Make sure the MiR-robot is between 30 – 50 cm away from the VL-marker
4. Create a VL-marker point with the following parameters:
   X: The distance between the PM and the VL-marker
    - This depends on where the VL-marker was placed in relation to the conveyer belt. Start with a value of 1 and go downward from there.
      Y: sideways position
    - Value is 0.033
5. Make the MiR-robot dock to the VL-marker
    - Change the value of X. Do this step until the distance is as you wish
        - If you placed the VL-marker as shown in the figure above you can also measure the distance between the PM and VL. Subtract that distance from the former start value of 1 and add the distance you want from PM to the conveyer belt

TX- and RX- setup

When the X distance is found the transmitter and receivers on PM and VL must be aligned so they can communicate with each other.

1. Make sure there is power on the PM
2. Remove the protective plates to gain access to the wiring
3. Find the three terminal blocks X54-X55, X54, X55 and connect them with a plug-in bridge
    - This will turn on the transmitters in both the pickup- and dropoff-side
4. Now align the transmitters on the PM and the VL-marker so they can detect each other's transmitters
5. When you've finalized step 4 remove the plugin bridge from the terminal blocks X54-X55, X54, X55

Safety

The integrators of the equipment are responsible for ensuring that the applicable safety laws and regulations in the country of installation are observed and that any and all significant hazards in the complete mobile robot application are eliminated. This includes, but is not limited to:

- Performing a risk assessment for the complete mobile robot system
- Interfacing other equipment and additional safety devices if defined by the risk assessment
- Setting up the appropriate safety settings in the equipment
- Validating that the complete mobile robot system is designed and installed correctly
- Ensuring that the user does not modify any safety measures
- Specifying instructions for use
- Marking the mobile robot installation with relevant signs and contact
- information of the integraton
- Collecting all documentation in a technical file, including this manual

Intended use

Use deviating from intended use is deemed to be impermissible misuse. This includes, but is not limited to:

- Use before performing a risk assessment
- Use in potentially explosive atmospheres
- Use in medical and life critical applications
- Use outside the permissible operational conditions and technical specifications
- Use where small children have access
- Use as a climbing aid

Features of the Pallet Mover are only available when integrated with a MiR robot.
Please contact your supplier regarding integration with other mobile robots.

Risk assessment

The integrator of the mobile robot system must perform a risk assessment on the complete mobile robot application. The Pallet Mover is only one of the components in a robot application and the safe use of the Pallet Mover relies on the integrators ability to design a safe mobile robot environment.

Nord Modules have identified the potential hazards listed below as significant hazards that must be considered by the integrator:

- Contact with the moving mobile robot. Observe relevant MiR guides
- Injuries due to workpieces falling off the Pallet Mover under movement of the mobile robot
- Consequences due to loose bolts

It is recommended that the Pallet Mover is integrated in compliance with in the following guides and standards:

- ISO 12100
- ISO 3691, relevant parts in this series of truck standards

Environmental safety

Nord Modules' products must be disposed of in accordance with the applicable national laws, regulations and standards.
The product is produced with restricted use of hazardous substances to protect the environment; as defined by the EU RoHS directive 2011/65/EU. These substances include lead, mercury, cadmium, chromium VI, polybrominated biphenyls and polybrominated diphenyl ethers.
Observe national registration requirements for importers according to EU WEEE Directive 2012/19/EU.

General safety instructions

All national regulations, legislations and laws in the country of installation must be observed. Use and integration of the product must be done in compliance with precautions in this manual.
Particular attention must be paid to the following warnings:

DANGER

- You must read, understand and follow all safety information in this manual, and the mobile robot manual and all associated equipment before initiating any motion. Failure to comply with safety information could result in death or serious injury.
- Service must be performed by authorized personal, according to all relevant repair manuals, user manuals and with use of original spare parts only.
- Mobile robot applications must be constructed in such a way that a detour of the mobile robot cannot result in any injury to humans or animals.
- Bolts that are insufficiently secured or repetitive overloads can cause the product to separate or fail unexpectedly and in unexpected ways.
- The product must not be used when the workpiece itself represents a hazard. Necessary measures must be taken to avoid changes in work items which has not been addressed by the risk assessment.
- The information in this manual does not cover designing, installing and operating a complete mobile robot system, nor does it cover other equipment that can influence the safety of the mobile robot environment. The complete system must be designed and installed in accordance with the safety requirements set forth in the standards and regulations of the country where the equipment is operated.
- Any safety information provided in this manual must not be construed as a warranty, by Nord Modules, that the equipment will not cause injury or damage, even if mobile robot application complies with all safety instructions.
- Nord Modules disclaims any and all liability if the product is damaged, changed or modified in any way. Nord Modules cannot be held responsible for any damages caused to the product(s), the mobile robot or any equipment due to programming errors or malfunctioning of the product.

Warranties

Product warranty

Without prejudice to any claim the user (customer) may have in relation to the dealer or retailer, the customer shall be granted a manufacturer's warranty under the conditions set out below:

In the case of new devices and their components exhibiting defects resulting from manufacturing and/or material faults within 12 months of entry into service (maximum of 15 months from shipment), Nord Modules shall provide the necessary spare parts, while the customer (user) shall provide working hours to replace the spare parts, either replace the part with another part reflecting the current state of the art, or repair said part. This warranty shall be invalid if the device defect is attributable to improper treatment and/or failure to comply with information contained in the user manuals. This warranty shall not apply to or extend to services performed by the authorized dealer or the customer themselves (e.g. installation, configuration, software downloads). The purchase receipt, together with the date of purchase, shall be required as evidence for invoking the warranty. Claims under the warranty must be submitted within two months of the warranty default becoming evident. Ownership of devices or components replaced by and returned to Nord Modules shall vest in Nord Modules. Any other claims resulting out of or in connection with the device shall be excluded from this warranty. Nothing in this warranty shall attempt to limit or exclude a customer's statutory rights nor the manufacturer's liability for death or personal injury resulting from its negligence. The duration of the warranty shall not be extended by services rendered under the terms of the warranty. Insofar as no warranty default exists, Nord Modules reserves the right to charge the customer for replacement or repair. The above provisions do not imply a change in the burden of proof to the detriment of the customer. In case of a device exhibiting defects, Nord Modules shall not be liable for any indirect, incidental, special or consequential damages, including, but not limited to, lost profits, loss of use, loss of production or damage to other production equipment.
In case of a device exhibiting defects, Nord Modules shall not cover any consequential damage or loss, such as loss of production or damage to other production equipment.

Disclaimer

Nord Modules continues to improve reliability and performance of its products, and therefore reserves the right to upgrade the product without prior warning. Nord Modules takes every care that the contents of this manual are precise and correct but takes no responsibility for any errors or missing information.

Intellectual property rights

The Pallet Mover and other products of Nord Modules are intellectual property of Nord Modules. All manufacturers of copies and all violations of any intellectual property rights will be prosecuted.

Certifications

Declarations, certificates and applied standards are listed in this chapter.

Applied standards

Standards applied under development of the product is listed in this section. When an EU Directive number is noted in brackets it indicates that the standard is harmonized under that Directive.

- ISO 12100:2010
  EN ISO 12100:2010 [2006/42/EC]
  Safety of machinery – General principles for design – Risk assessment and risk reduction
  The product is evaluated according to the principles of this standard.

- ISO 13850:2006
  EN ISO 13850:2008 [2006/42/EC]
  Safety of machinery – Emergency stop – Principles for design
  The emergency stop button and function is designed according to this standard.

- ISO 13732-1:2006
  EN ISO 13732-1:2008 [2006/42/EC]
  Ergonomics of the thermal environment – Methods for the assessment of human responses to contact with surfaces
  Part 1: Hot surfaces
  The product is designed so that the surface temperature is kept under the ergonomic limits defined in this standard.

- IEC 61000-6-2:2005
- IEC 61000-6-4/A1:2010
- EN 61000-6-2:2005 [2014/30/EC]
- EN 61000-6-4/A1:2011 [2014/30/EC]
  Electromagnetic compatibility (EMC)
  Part 6-2: Generic standards - Immunity for industrial environments
  Part 6-4: Generic standards - Emission standard for industrial environments
  These standards define requirements for the electrical and electromagnetic disturbances. Conforming to these standards ensures that the electrical parts of the product perform well in industrial environments and that it do not disturb other machinery.

EU/CE Declaration of incorporation

According to the EU Machinery Directive 2006/42/CE annex ll 1.B
The Manufacturer

Nord Modules A/S
Kaervej 29
DK-5220 Odense
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declares that the product

Type:	Mobile Robot Module
Model:	Pallet Mover PM1500/PM1548
Serial-no.:	PM1500.0001.2019 – PM1500.9999.2019
	PM1548.0001.2019 – PM1548.9999.2019

may not be put into service before the machinery in which it will be incorporated is declared in conformity with the provisions of Directive 2006/42/EC and with the regulations transposing it into national law.
The product is prepared for compliance with all essential requirements of Directive 2006/42/EC under the correct incorporation conditions with a MiR mobile robot, see instructions and guidance in the accompanying guide. Compliance with all essential requirements of Directive 2006/42/EC relies on the specific installation, its environment and the final risk assessment.
Technical documentation is compiled according to Directive 2006/42/EC annex Vll part B and available in electronic form to national authorities upon legitimate request. Undersigned is based on the manufacturer address and authorized to compile this documentation.

Additionally the product declares in conformity with the following directives, according to which the product is CE marked:

2014/30/EU - Electromagnetic Compatibility Directive (EMC)
2011/65/EU - Restriction of the use of certain Hazardous Substances (RoHS)

Relevant essential health and safety requirements of the following EU directives are also applied:

2014/35/EU - Low Voltage Directive (LVD)
2012/19/EU - Waste of Electrical and Electronic Equipment (WEEE)
ISO 13850:2015 - Safety of machinery -- Emergency stop function -- Principles for design

Odense, June 1st, 2019

Bruno Hansen, Managing Director

Nord Modules™

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