AMR

USER MANUAL FLEXLEY MOVER

AMR P604



3HAS006173E001 (P604V)

3HAS006173E002 (P604M)

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User manual

AMR P604

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TABLE OF CONTENTS

Table of contents 5
Overview of this manual 6
About this manual 6
Usage 6
Who should read this manual? 6
Prerequisites 6
References 6
Revisions 7
Magnetic vs Visual SLAM guidance 8
1 Safety systems 10
1.1 Safety Laser System 10
1.2 Emergency stop button 12
1.3 Operational stop button 13
2 Other AMR systems 14
2.1 AMR LED Lights 14
2.2 ON/OFF switch 15
2.3 Reset button 16
2.4 Insert button 17
2.5 Display 18
2.5.1 Overview 18
2.5.2 Display screens – P604 M 19
2.5.3 Display screens – P604 V 29
3 Operating modes 42
3.1 Automatic mode 43
3.1.1 Automatic mode using the magnetic guidance system — P604 M 43
3.1.2 Automatic mode using the Visual SLAM guidance system — P604 V 45
3.1.3 Muting/Reduced safety laser fields — P604 M & P604 V 46
3.2 Manual mode 47
3.2.1 Manual mode from controller 47
3.2.2 Manual mode from control panel - P604 M 51
3.2.3 Manual mode from control panel - P604 V 52
4 Mode switching 54
4.1 Mode switching – (P604 M & P604 V) 54
4.2 Manual to Automatic mode – P604 M 56
4.3 Manual to Automatic mode – P604 V 57
4.4 Automatic to Manual mode – P604 M & P604 V. 58
INDEX 59

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OVERVIEW OF THIS MANUAL

About this manual

This user manual contains instructions for:

- AMR P604 M users.
- AMR P604 V users.

All the information in this manual is based on the most recent data available at the time of printing.

ABB reserves the right to make changes without prior notice and shall not be subject to any further obligations as a result thereof.

This manual must be considered a permanent part of the AMR and must always remain in the vehicle.

No part of this manual may be reproduced without written consent.

Usage

This manual should be used during the handling of the AMR P604 M or P604 V.

Who should read this manual?

This manual is intended for:

- The users of the AMR P604 M.
- The users of the AMR P604 V.

Prerequisites

The reader should have the basic knowledge of the following:

- Working with mobile robots.
- Personal safety.

References

Documentation referred to in the manual, is listed in the table below.

Document name	Document ID
Product manual – Flexley Mover AMR P604	*3HAS00005-001*
Maintenance manual - Flexley Mover AMR P604	*3HAS00003-001*
P604 Laser configuration Master	Rev2.0

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Revisions

Revision	Description
A	First edition



WARNING

Personnel operating the AMR must be qualified for the tasks to be carried out and must be specifically instructed in the proper use of the AMR.



WARNING

Must consider all AMR hazards described in the latest version of the Product manual Flexley Mover AMR P604. (For more information, see the References section).

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MAGNETIC VS VISUAL SLAM GUIDANCE

This Product manual contains information about two versions of the same AMR, depending on the guidance system used:

- P604 M (3HAS006173E002), using Magnetic guidance
- P604 V (3HAS006173E001), using Visual SLAM

The aim of the **Magnetic guidance** is to read and follow the magnetic tape laid on the floor or buried under the floor.The magnetic tape forms part of the AMR's guidance system. The tape provides the path followed by the AMR. This tape can either be applied on the floor's surface, embedded in the bottom or buried under it. It is usually black in color. The AMR reads the tape to follow a circuit. For example, as shown in the figure below. The main software for this version is SIGAT.

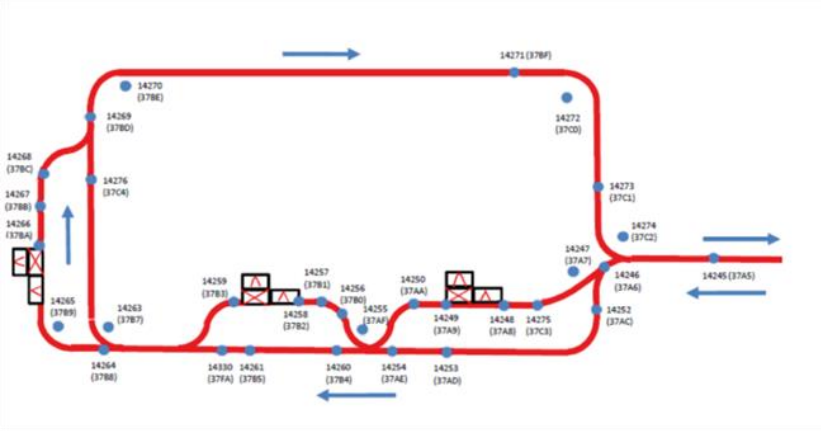


Figure 1.Example of AMR circuit represented in layout view

S. Nº.	Representation	Description
1		AMR circuit
2		AMR direction
3		RFID Tags

The **Visual SLAM** is a technology based on AI-Perception system utilizing off-the-shelf cameras. On P604 V, 6 monocular cameras are used to detect and track natural features in the environment, then a 3D map is constructed from these tracked features. This technology can differentiate between moving and static objects in the environment to decide what are the good references that the AMR should depend on for localization. In addition, VSLAM allows the AMR to always track what is changing in the environment and update the map in real-time. The main software for this version is AMR Studio.

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Figure 2: Representation of how the Visual SLAM interacts with the surroundings

Most of the information in this manual is shared for both versions. When the information is related to only one of the possible vehicles, the title will indicate it. For example, **Navigation system — P604 M**.

From the point of view of an external user, the main differences are the Navigation system and the HMI display, since the information appearing on the screen is showed on a different way, but some procedures like the Insertion procedure would be different as well.

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1 SAFETY SYSTEMS

1.1 Safety Laser System

This section describes the safety laser system. The safety laser is designed to prevent accidents and stops the AMR to protect persons or objects near the AMR.

The safety laser location is shown in the figure below.

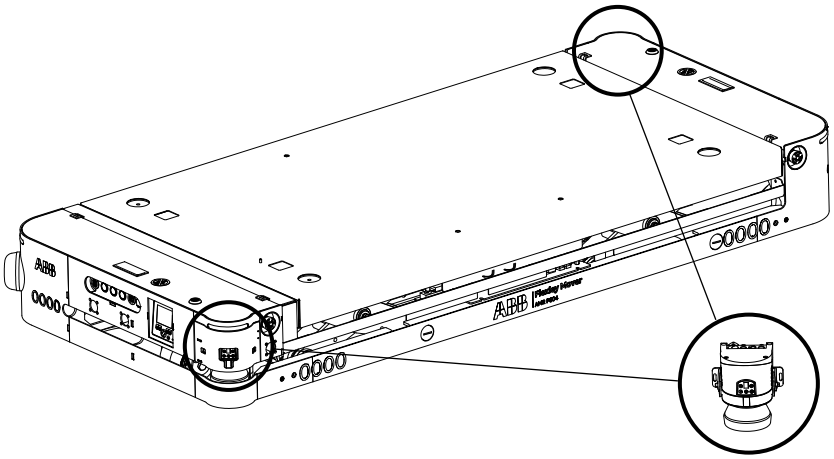


Figure 3. Standard AMR laser's location

The laser scans the area around the AMR for this vehicle, as shown in the following figure:

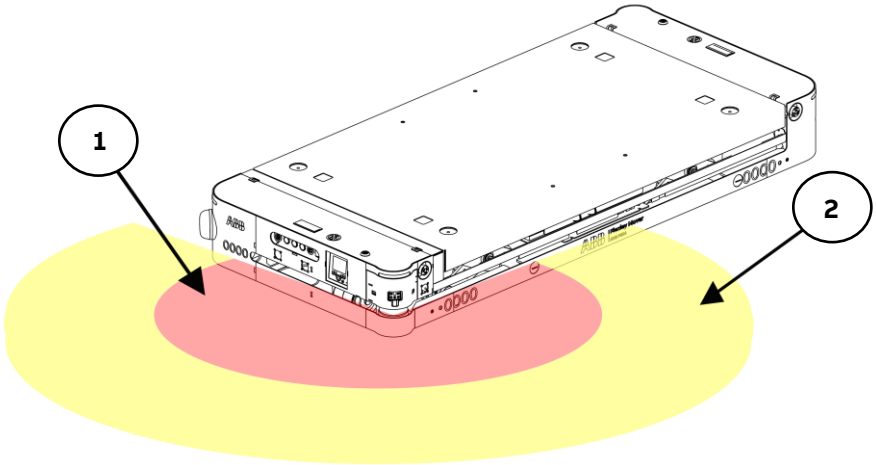


Figure 4: Safety laser fields

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Whether these areas detect:

ID Nº	Field	Description
1	Protective Field	The AMR Executes a controlled stop
2	Warning field	The AMR slows down



WARNING

The safety laser's detection beam is positioned 105 mm above the ground. Therefore, objects below or above beam height will not be detected, and the AMR could collide with them If the original safety laser fields are changed, the integrator must validate them according to ISO 3691-4 to ensure the persons safety.

The safety detection field switches according to:

- The speed the vehicle is moving, per readings registered by the encoders.
- The pre-programmed configuration in the SIGAT software, which is updated after reading a tag.

The safety stops are activated at electrical and software levels:

- **Electrical**: By opening a safety relay when:
  - An object is found in the laser’s protection field and the laser safety stop fails.
  - The safety PLC detects a fault in the wiring.
  - The operational stop fails.
  - The emergency stop is activated.
- **Software**: By ordering a zero speed when it detects an object in protective field.

The selection of the laser fields is made according to:

- Maximum speed at some point of the vehicle and load.
- Load condition of the vehicle.
- Longitudinal or transversal motion configuration.
- Special configuration for the travelled segment, defined in the pre-programmed circuit map layout.

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1.2 Emergency stop button

The AMR is equipped with four emergency stop buttons. When pressed, the AMR stops immediately and the emergency stop light, lit.

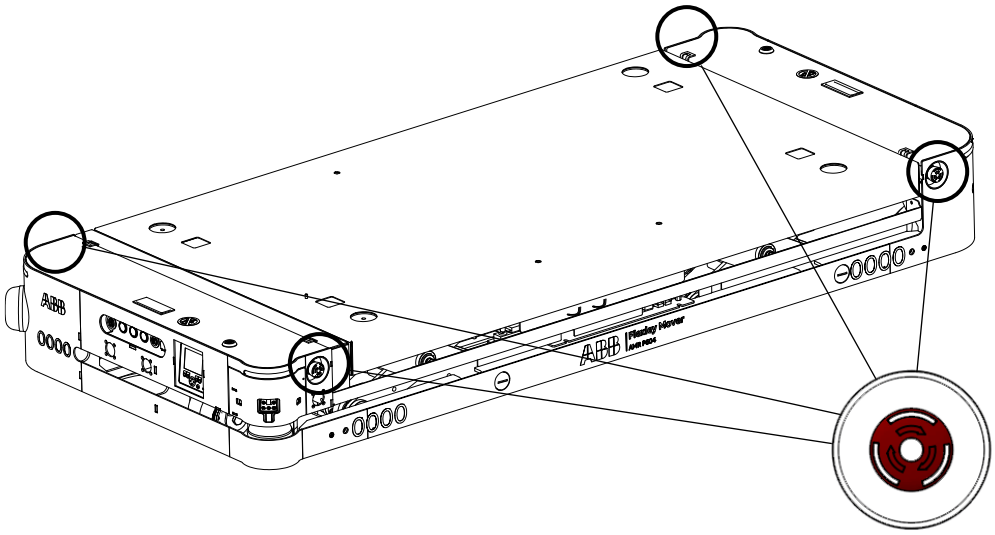


Figure 5. Emergency stop button

- **Activate:** Push the button.
- **Deactivate:** Simultaneously push and twist the button in the arrows' direction. Then push the Reset button for 2 seconds.

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1.3 Operational stop button

The AMR has an operational stop pushbutton located on the front of the AMR, which plays a support role.

When the operational stop pushbutton is pushed, the AMR performs a controlled deceleration by progressively reducing the speed until it comes to a stop.

Once stopped, the AMR will activate the brakes. If it remains stopped, it will go into resting status.

To resume the path, it is necessary to push the Insert button.

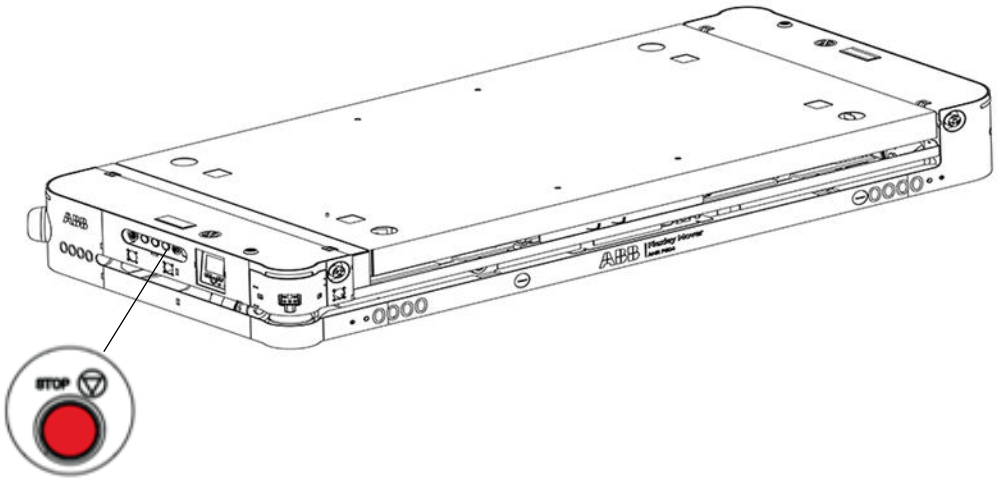


Figure 6. Operational stop button

- **Activate:** Push and hold the button for 2 seconds.

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2 OTHER AMR SYSTEMS

2.1 AMR LED Lights

The AMR is equipped with four signaling LEDs located on each corner of the AMR.

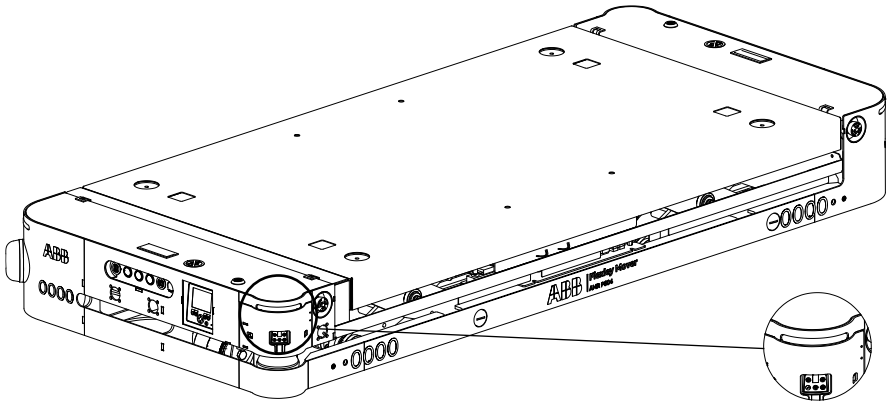


Figure 7. Signaling LEDs

Status	Front left LED	Front right LED	Rear left LED	Rear right LED
Initializing sequence	Blue, green, red, off	Blue, green, red, off	Blue, green, red, off	Blue, green, red, off
Forwards	White	White	Yellow	Yellow
Backwards	Yellow	Yellow	White	White
Forwards left/Backwards right	Amber with a sequence	White	Amber with a sequence	White
Forwards right/Backwards left	White	Amber with a sequence	White	Amber with a sequence
Line/Validation	Blue	Blue	Blue	Blue
S. Maintained	Light blue	Light blue	Light blue	Light blue
Traffic	Purple	Purple	Purple	Purple
Resettable malfunction	Red	Red	Red	Red
Non-resettable malfunction	Red/Off 5 Hz	Red/Off 5 Hz	Red/Off 5 Hz	Red/Off 5 Hz
Special cases (*)/Reduced safety laser fields/Muting	White/Yellow 2 Hz	White/Yellow 2 Hz	White/Yellow 2 Hz	White/Yellow 2 Hz
Manual without safeguards	Purple 5 Hz	Purple 5 Hz	Purple 5 Hz	Purple 5 Hz
Charging	Green	Green	Green	Green
Stopped	Indigo 2 Hz	Indigo 2 Hz	Indigo 2 Hz	Indigo 2 Hz

(*) For more information about special cases refer to Masters of Lasers document section (see the References section).

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2.2 ON/OFF switch

The ON/OFF switch is located on the AMR button panel and switches the AMR On or Off.

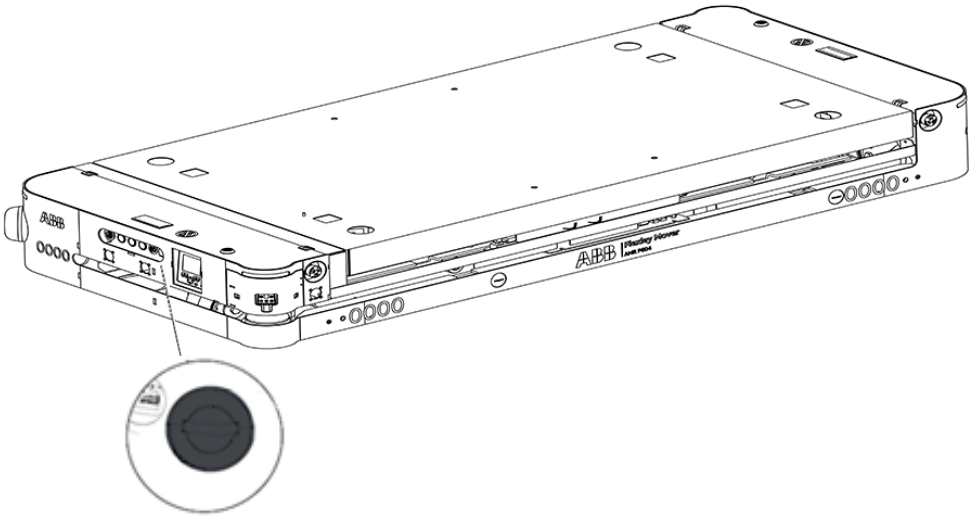


Figure 8. ON/OFF switch

- **ON:** Turn the switch to the right for three seconds.
- **OFF:** Turn the switch to the left for three seconds.

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2.3 Reset button

The reset button allows the AMR to reset once the emergency stop button releases, to start up in manual or automatic mode. It blinks if the AMR needs to reset.

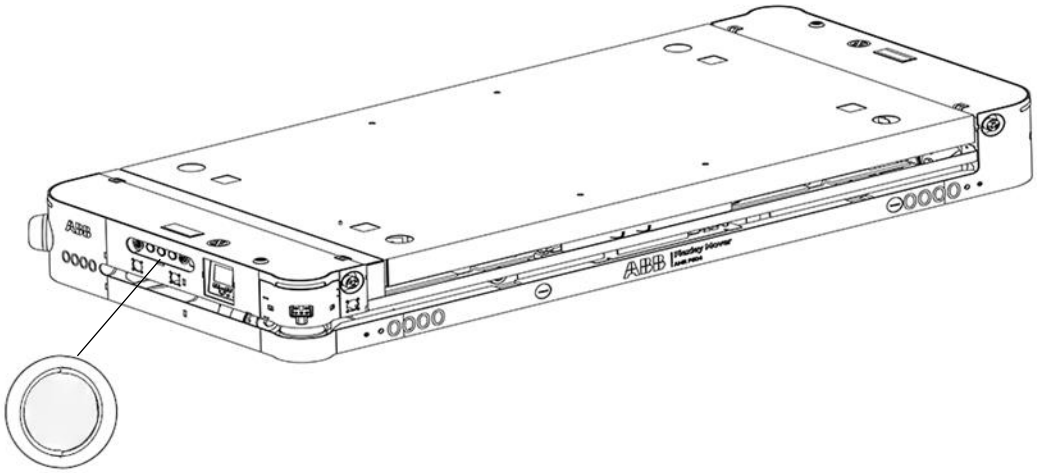


Figure 9: Reset button

- **Activate:** Push the button for 2 seconds.

Note

To reset the AMR effectively, the button must be kept pushed for 2 seconds before releasing it. This way we make sure the reset is intended.

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2.4 Insert button

The Insert allows the AMR to insert into the system. The button to insert the vehicle on automatic mode (green button) only will be enabled when the AMR is on automatic mode (identifiable via the green band explained in the “Mode Switching” section, depending on the model version, P604M or P604V).

The status of the green button will be identified by a light indicator. When it blinks, it should be pressed, when it does not, it indicates the automatic mode has already been inserted.

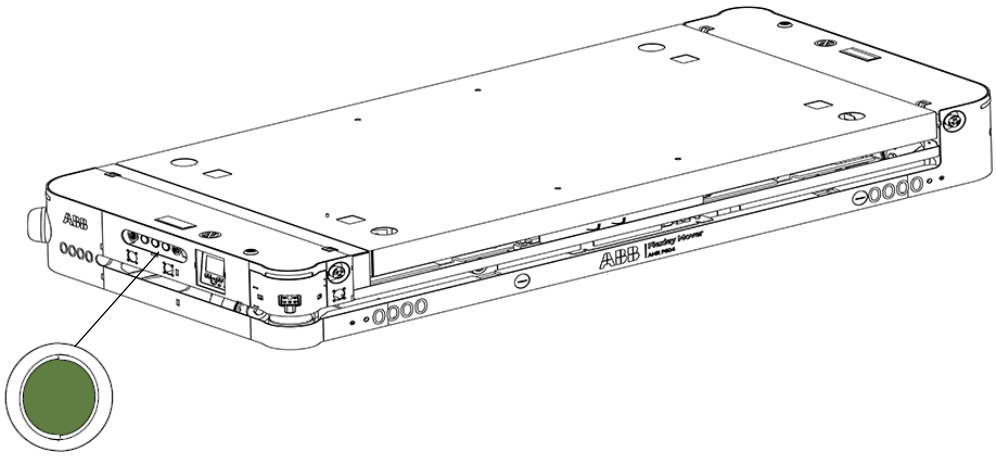


Figure 10: Insert button.

- **Activate:** Push and hold the button for 2 seconds.

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2.5 Display

2.5.1 Overview

The display shows all the information associated with the AMR. It contains the buttons and selectors detailed below. You can see a detailed list of all the screens, depending on the model, P604 M or P604 V.

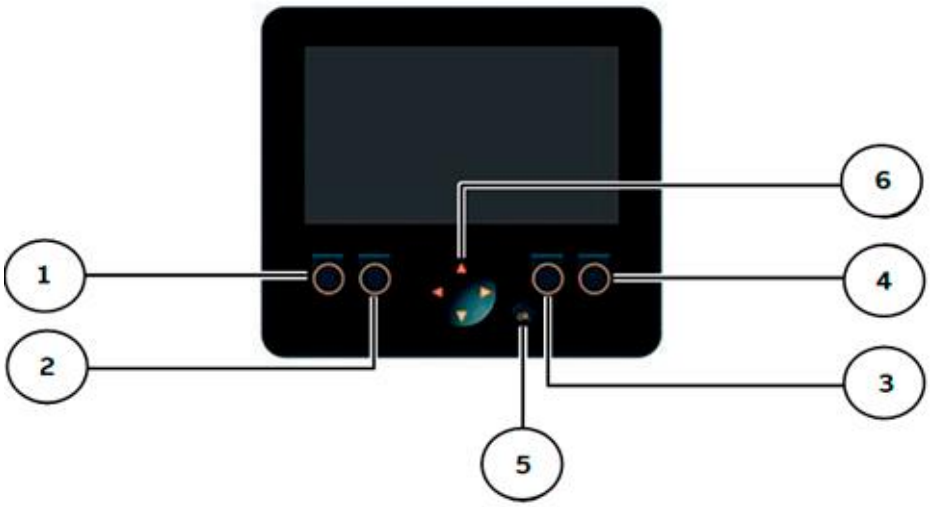


Figure 11: Display

S. No.	Description
1	Button 1
2	Button 2
3	Button 3
4	Button 4
5	Enter/OK
6	Screen selector

Note

All display screens shown below may be subject to have changes in their design without notice.

To control the display, you need to use the buttons below the screen.

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2.5.2 Display screens – P604 M

Display screen: Start-up screen

The start-up screen will show a countdown while the AMR is starting.



Figure 12: Start-up screen

Display screen: Follow-up screen

After finishing the countdown, the screen will show the % Battery voltage (battery charge status).

Use the right and left arrows to navigate between screens.

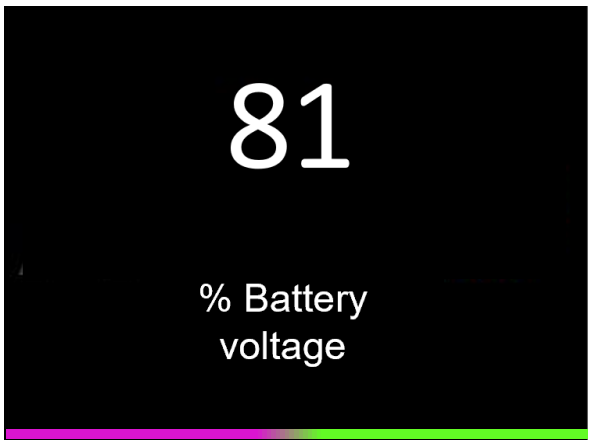


Figure 13: Follow-up screen

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Display screen: Screen one

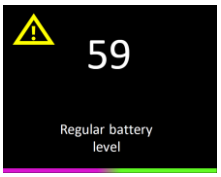
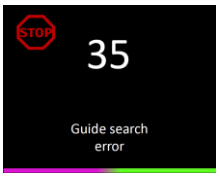
Provides information of the AMR status. It shows when the reset button is pushed for the first time.

- Code 0: Automatic mode (no errors).
- Code 180: Manual mode.
- Miscellaneous. For a complete list of display error codes, refer to the *Maintenance manual – Flexley Mover AMR P604* or the *Product manual – Flexley Mover AMR P604* (see References).



Figure 14: Screen one

It displays three types of messages:

		
Information on the AMR's status (reading a tag, loading, etc.). **The AMR continues operating.**	**WARNING** A **warning** of an upcoming event (start of maintenance, charging, dirty laser shroud, etc.). **The AMR continues operating. The AMR continues operating.**	AMR **error** (check the error code table to identify the problem). **The AMR completely stops all operation**.

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Display screen: Screen two

This screen displays the route and segment on which the AMR is located.



Figure 15: Screen two

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Route and segment configuration:

1. Push the **OK** button on the display to access the **SEGMENT** configuration screen. After pushing **OK**, the screen will flash yellow/white to indicate that the segment shown in the right-hand corner of the screen can now be configured.

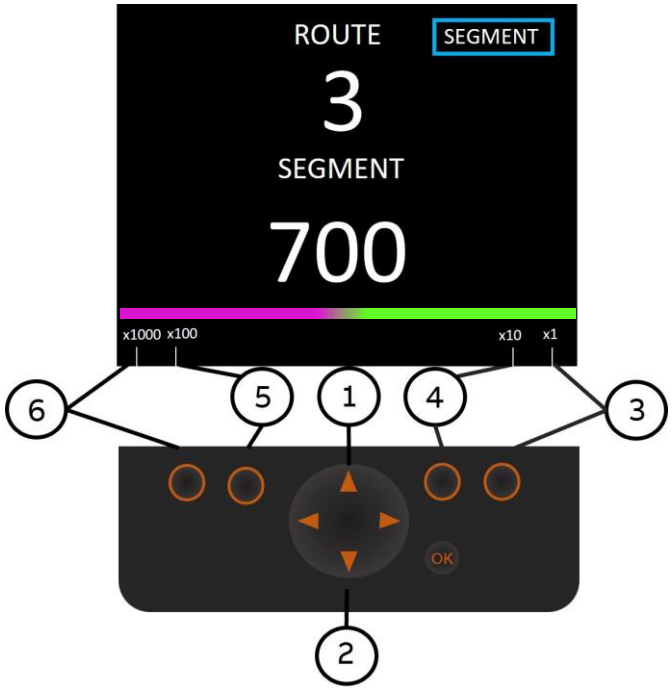


Figure 16: Segment configuration

S. No	Description
1	Scroll forward through segments
2	Scroll backwards through segments
3	Button 4 - Segment x1
4	Button 3 - Segment x10
5	Button 2 - Segment x100
6	Button 1 - Segment x1000

Simultaneously push the Segment x1, x10, x100 or x1000 button and the up/down arrow on the central control pad

2. Once the segment is configured, push the **OK** button again to configure the **ROUTE** shown in the right-hand corner of the screen.

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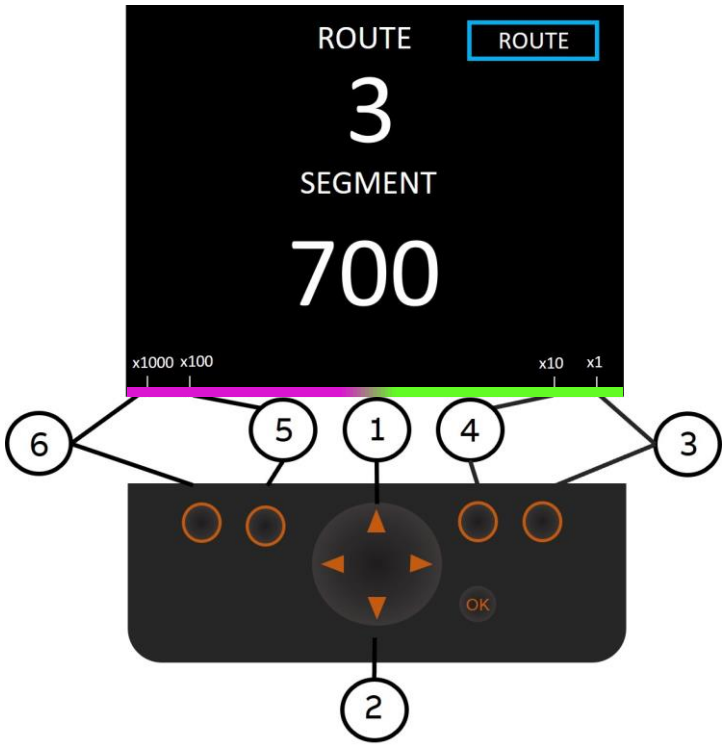


Figure 17: Route configuration

S. No	Description
1	Scroll forward through routes
2	Scroll backwards through routes
3	Button 4 - Route x1
4	Button 3 - Route x10
5	Button 2 – Route x100
6	Button 1 – Route x1000

Simultaneously push the Route x1, x10, x100 or x1000 button and the up/down arrow on the central control pad

3. Once the route has been configured, push the **OK** button again and push the white reset button.
4. The AMR will then follow the instructions programmed.

Note

Do NOT push the **OK** button to return to the previous route and segment configuration. Instead, change the screen, which will re-establish the previous values.

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Display screen: Screen three

This screen displays wired inputs.

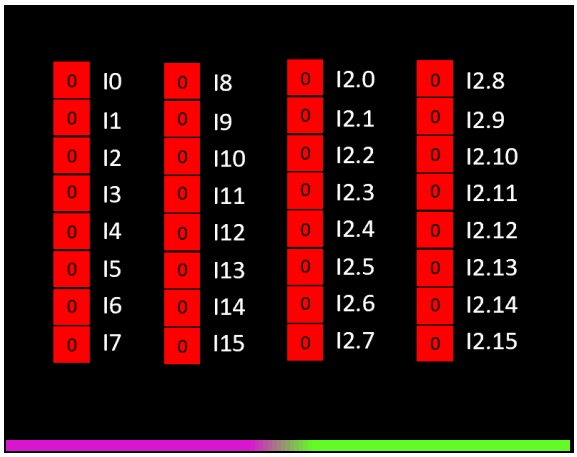


Figure 18: Screen three

Display screen: Screen four

This screen displays wired outputs.

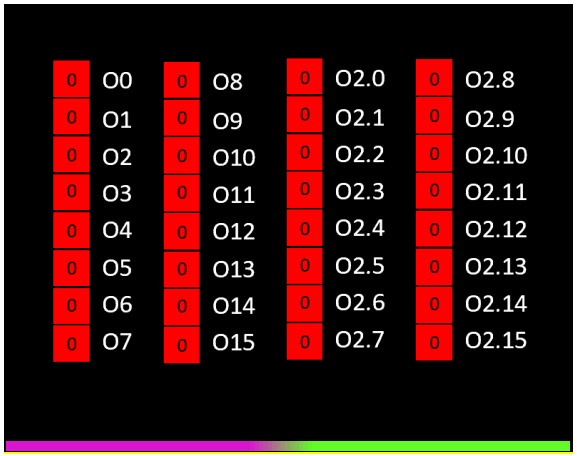


Figure 19: Screen four

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Display screen: Screen five

Displays SIGAT console inputs. The screen shows 32 inputs, to display more, push the fourth button.



Figure 20: Screen five

Display screen: Screen six

This screen provides information about the activated mode and indicates when manual mode is active. It also allows switching between manual mode via the HMI or via the controller, and vice versa.

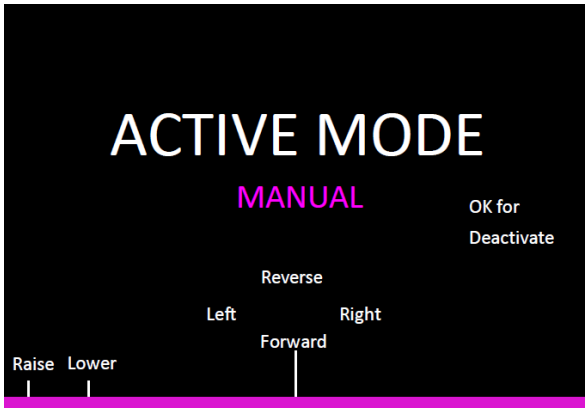


Figure 21: Screen six

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When pushing the OK button and activate manual mode from the HMI, it allows operators to move the vehicle from the display. See Section 3.2.2 Manual mode from control panel – P604 M.

> **Note**
>
> For further information about enter in manual mode see Section 4 – Mode switching.

Display screen: Screen seven

This screen displays the battery status and charge.

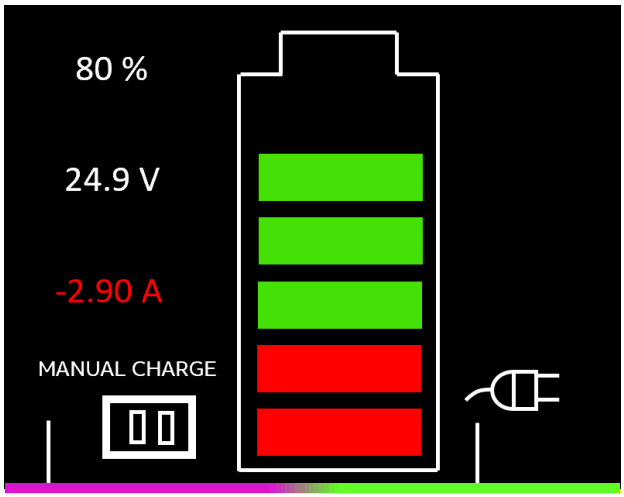


Figure 22: Screen seven

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Display screen: Screen eight

This screen displays the travel direction and drive unit angle.

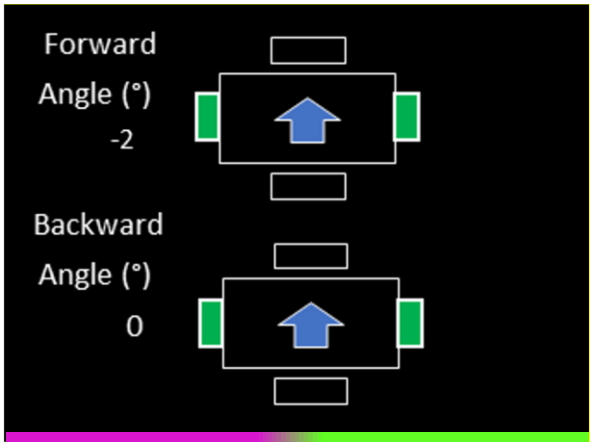


Figure 23: Screen eight

Display screen: Screen nine

This screen displays the variable-speed drives parameters.

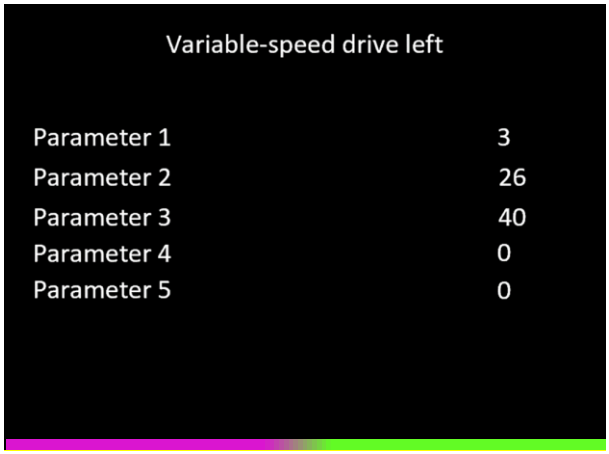


Figure 24: Screen nine

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Display screen: Screen ten

This screen displays the parameter setting.



Figure 25: Screen ten

> **Note**
>
> Screen to be used by ABB personal only.

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2.5.3 Display screens – P604 V

Display screen: Start-up screen

The start-up screen will appear for a couple of seconds when the AMR is starting. The dots will sequentially change color to red, indicating the status of the start-up process.

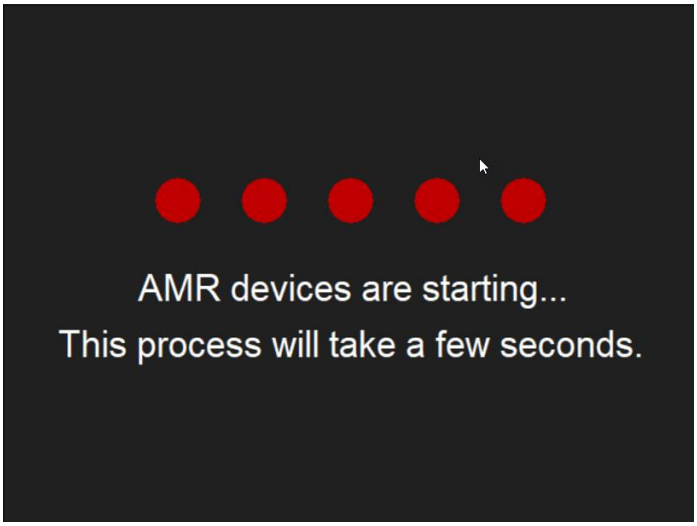


Figure 26.Start-up screen

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Display screen: Home screen

After finishing the start-up screen, the display will show the AMR status, indicating any relevant errors.

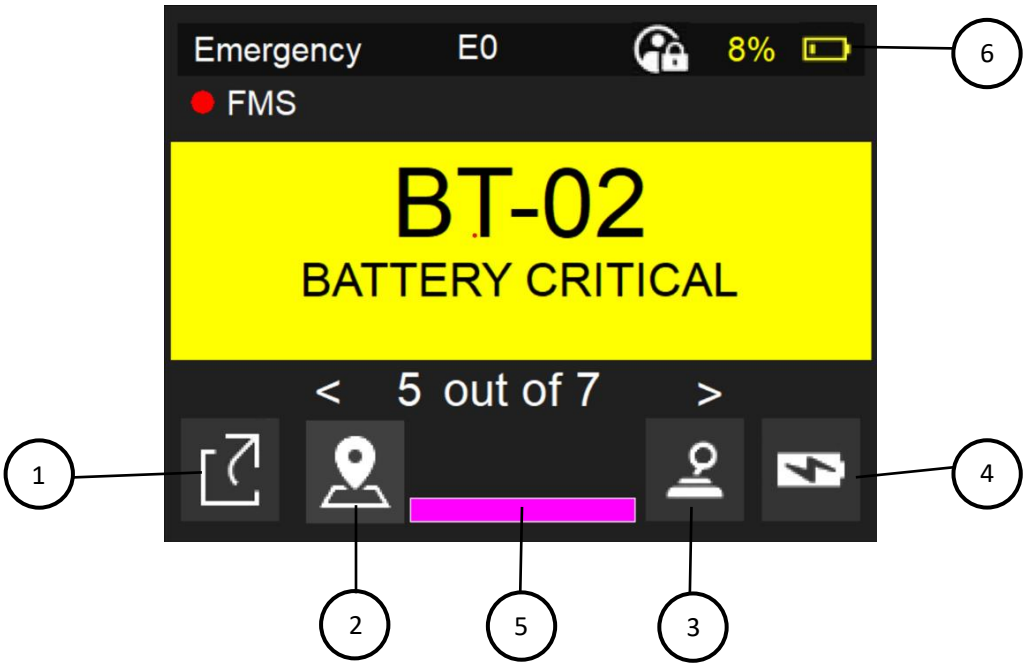


Figure 27. Follow-up screen

S.Nº	Description
1	Maintenance screen
2	Location
3	Manual movement
4	Battery
5	Manual/Automatic mode status bar
6	Battery status

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Display screen: Screen 0 - Vehicle information screen

From the Follow-up screen, press **OK** to go to the “Vehicle information” screen. This screen allows you to access different screens using the arrows. After selecting one, press the OK button to enter any of them. You can always come back to the “Home screen” by pressing the button below the “Home” icon (in this case, Button 4).

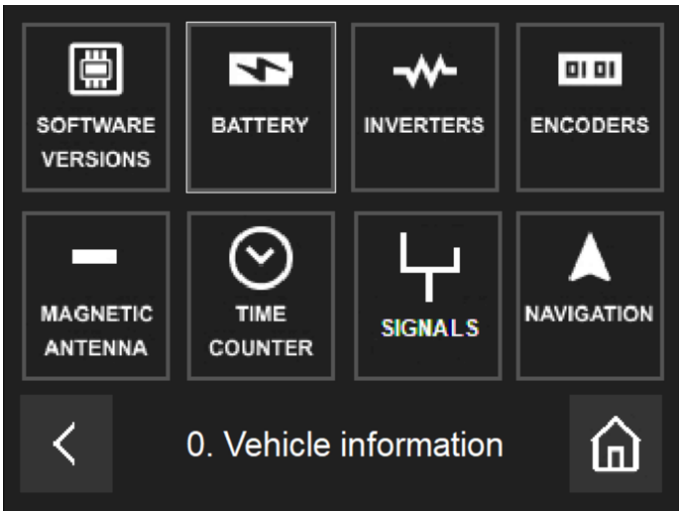


Figure 28. Configuration screen

Display screen: Screen 1 – Software versions

From this screen you can check the **Serial number**, **Firmware version**, and **Software version** for the PLC, PC, and HMI. It also indicates if the HMI used is the forward or the backward one.

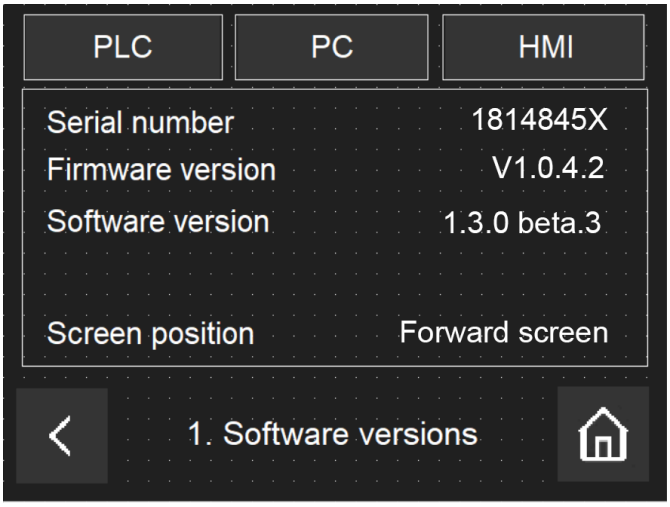


Figure 29. Software versions screen

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Display screen: Screen 2 – Battery

From this screen you can check the **Battery status** and set what type of manual charging you want to use.

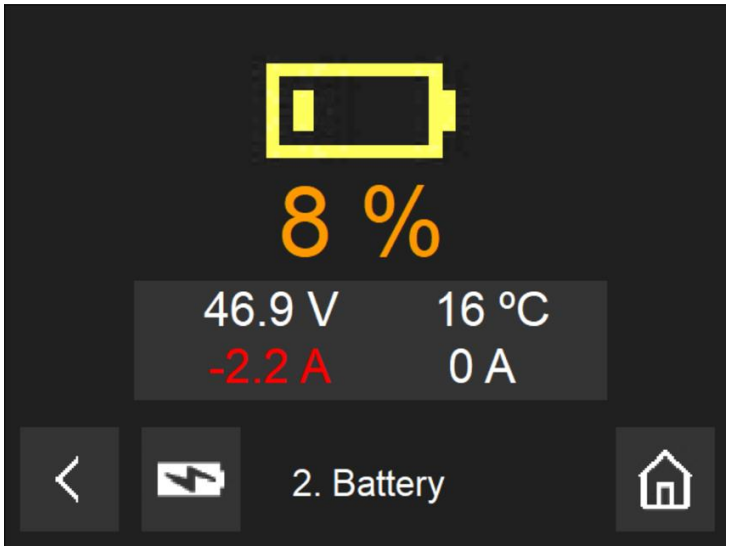


Figure 30. Battery screen

If you are charging the AMR manually, press Button 2 to access Screen 2.1.

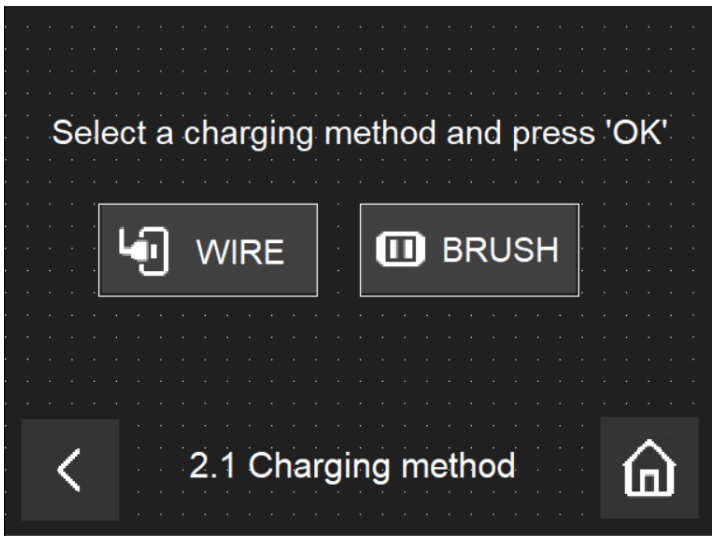


Figure 31. Charging method screen

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Display screen: Screen 3 – Inverters

From this screen you can check the inverters status.

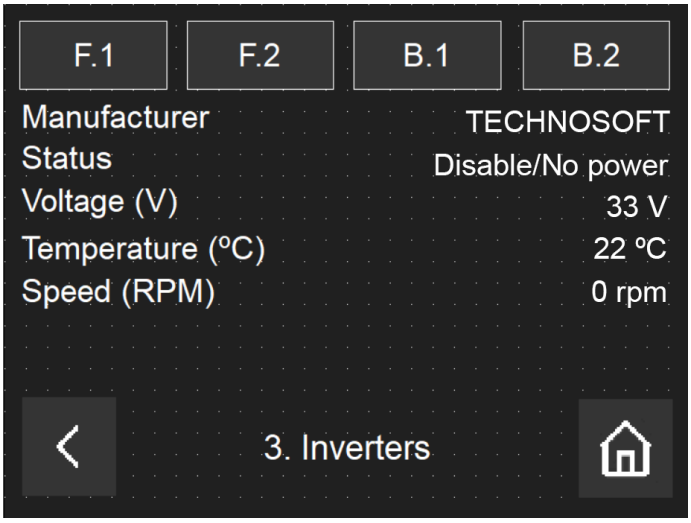


Figure 32. Inverters screen

Display screen: Screen 4 – Encoders

From this screen you can check the encoders status.

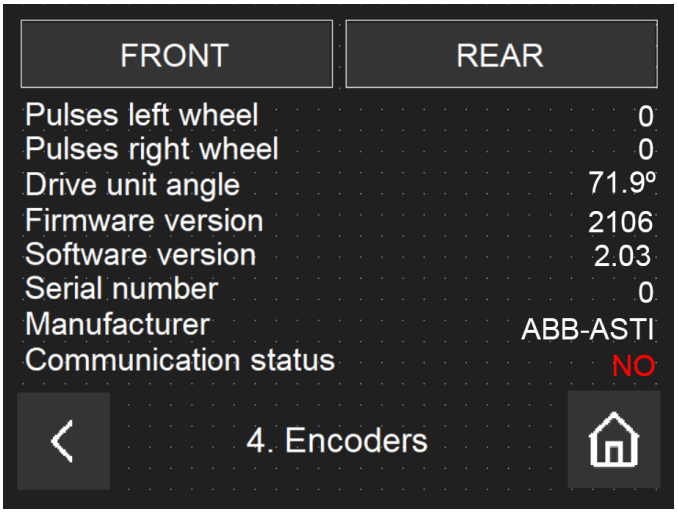


Figure 33. Encoders screen

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Display screen: Screen 5 – Magnetic antenna

From this screen you can check the magnetic antenna.

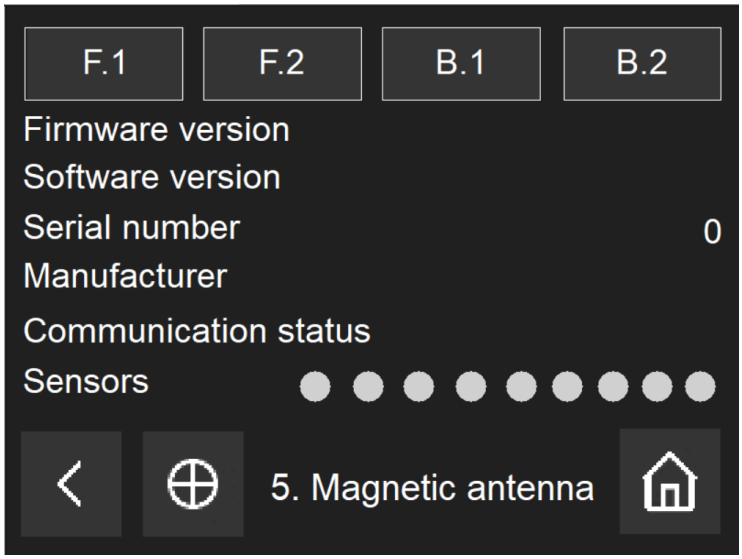


Figure 34. Magnetic antenna screen

Display screen: Screen 6 – Counter

From this screen you can check how much time the AMR has been used, in which modes, the distance traveled by it, contactors counters... etc.

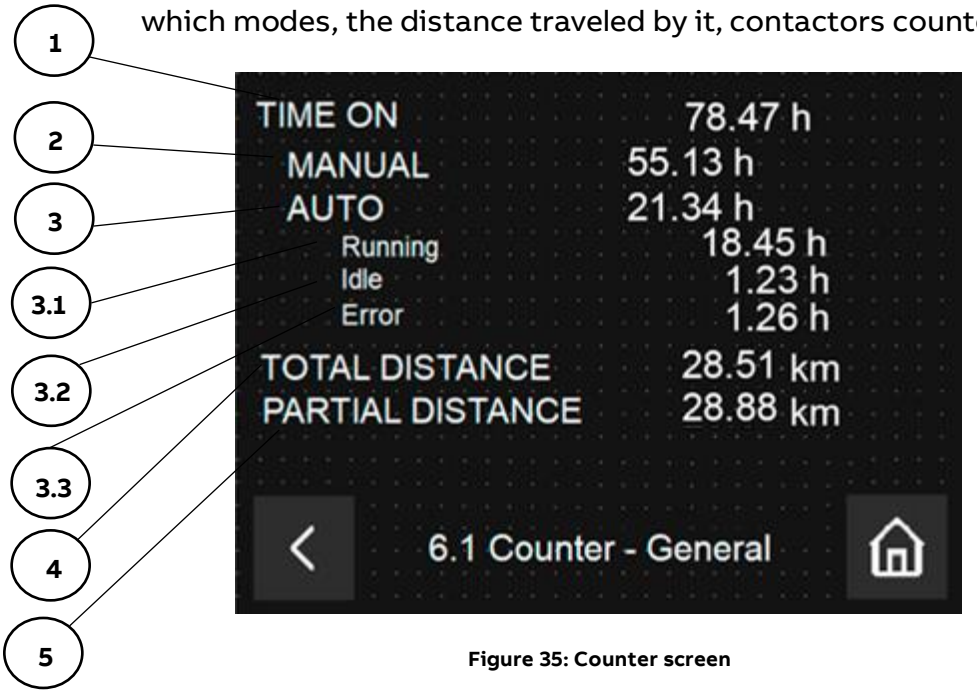


Figure 35: Counter screen

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S. No.	Description
1	Time ON (General)
2	Time ON in Manual Mode
3	Time ON in Auto Mode
3.1	Time active (Running) in Auto Mode
3.2	Time inactive (Idle) in Auto Mode
3.3	Time Error in Auto Mode
4	Total distance travelled
5	Partial distance travelled

Display screen: Screen 7 – Signals

This screen displays the actual wired output status coming into the PLC and the actual inputs status, wired or not, coming into the PLC.

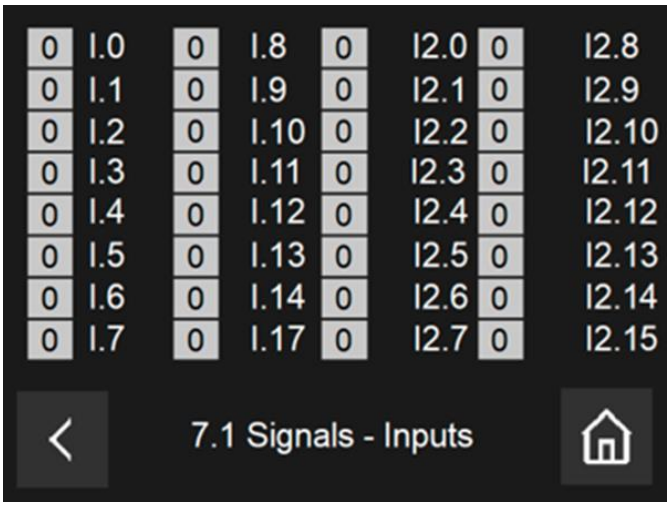


Figure 36. Inputs screen



Figure 37. Outputs screen

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Display screen: Screen 8 – Navigation

This screen displays the travel direction, drive units' angle, deviation, and quality of the navigation.

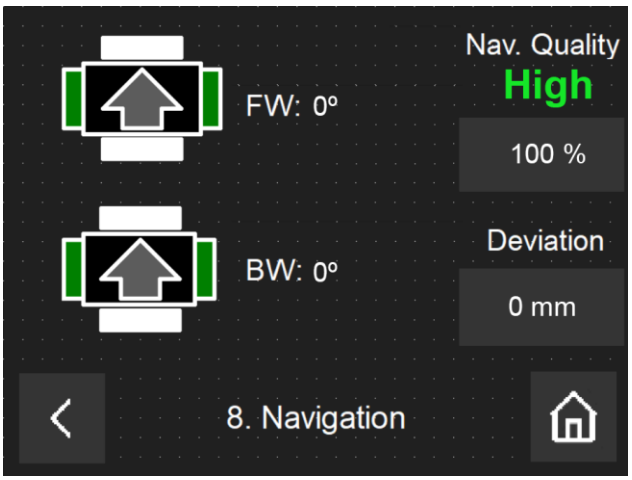


Figure 38. Navigation screen

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Display screen: Screens 9 to 10 – Maintenance screen

On the home screen it is necessary to insert a button sequence to enable maintenance screen, while pressing the OK button, press Button 3 > Button 2 > Button 4 > Buttons 1 and 3 at the same time, the sequence has a small window of time to facilitate its insertion.

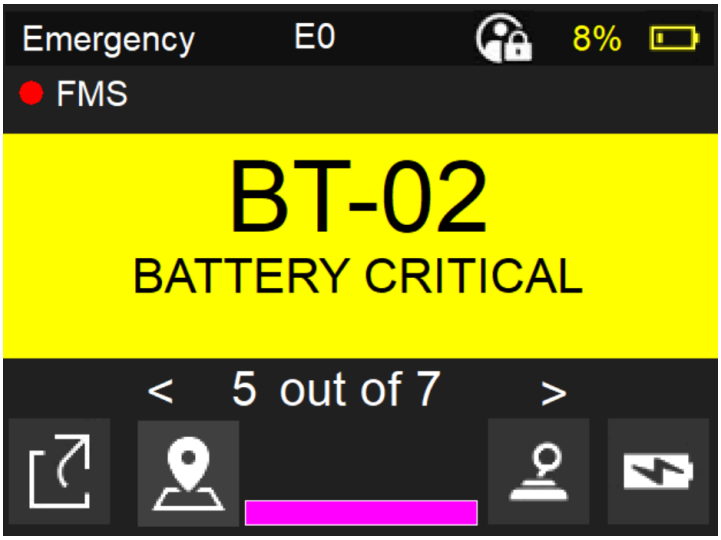


Figure 39: Home screen

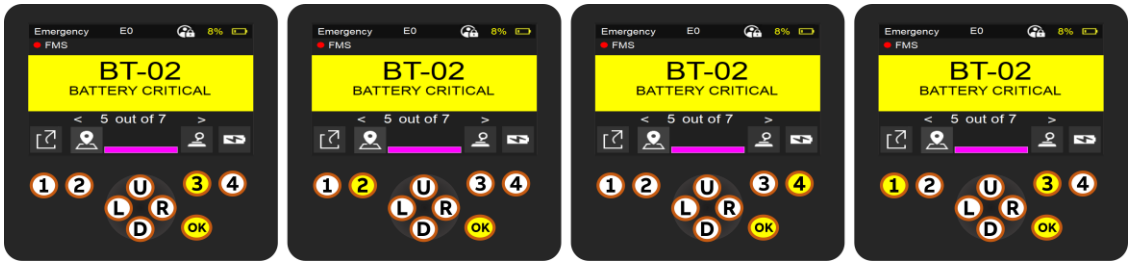


Figure 40: Maintenance sequence

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1. To enter on maintenance screen press Button 1 in home screen and the following screen will be displayed.

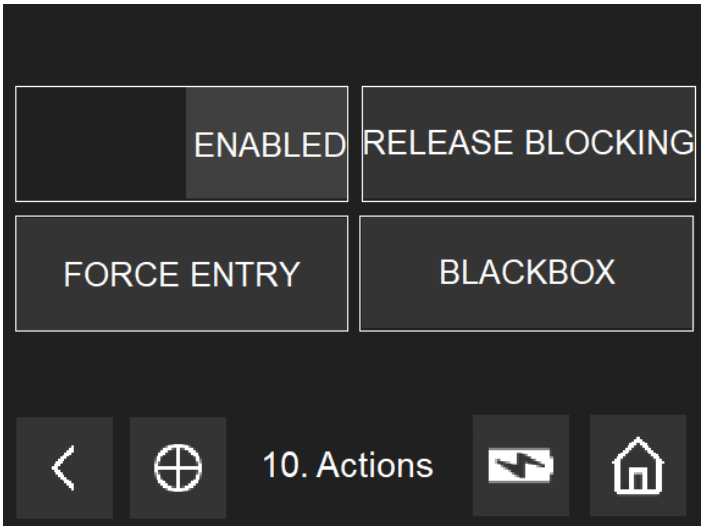


Figure 41: Maintenance screen

Note

If the button sequence is not used, the following message will appear when trying to access the maintenance screen:

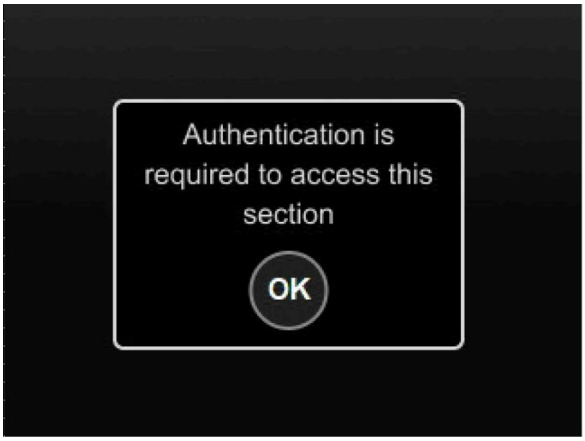


Figure 42: Authentication request

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2. Once on the maintenance screen it is available to fulfill an interaction with the four different blocks displayed with the help of the screen selector by pressing the **OK** button. For more information, see the Maintenance Manual (see References).

The position screen allows the user to check in which step of the circuit the AMR is working. VSLAM steps work in a similar way to Magnetic tags for the P604 M.

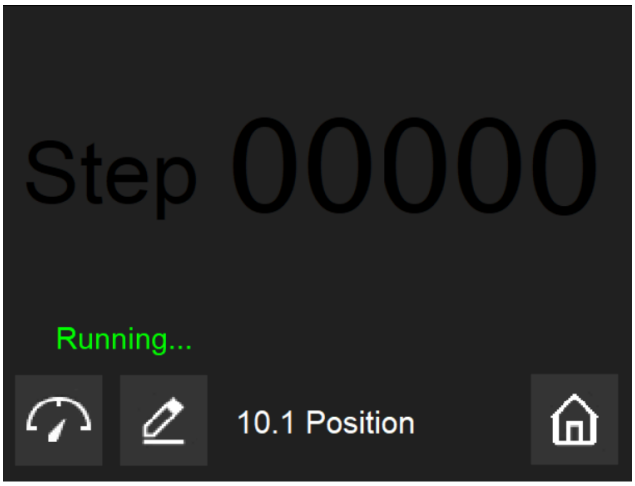


Figure 43: Position screen

3. To access to calibration menu in maintenance screen press Button 2 and the following screen will be displayed:

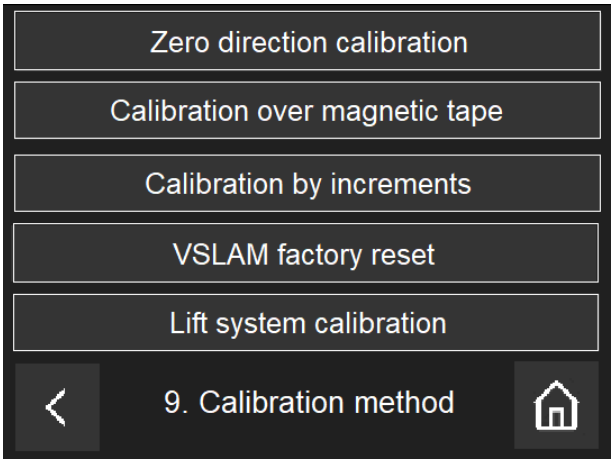


Figure 44: Calibration screen

Once on the calibration screen it is available to access to different screens with the help of the screen selector and pressing OK in the desired option. For more information, see the Maintenance Manual.

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Display screen: Screen 11 – Manual

From the Home screen you can go to the Manual screen, where you can move manually (Section 3.2.3 - Manual mode from control panel — P604 V) the vehicle and the lift platform. When pressing the **OK** button, you can see all the possible movements.

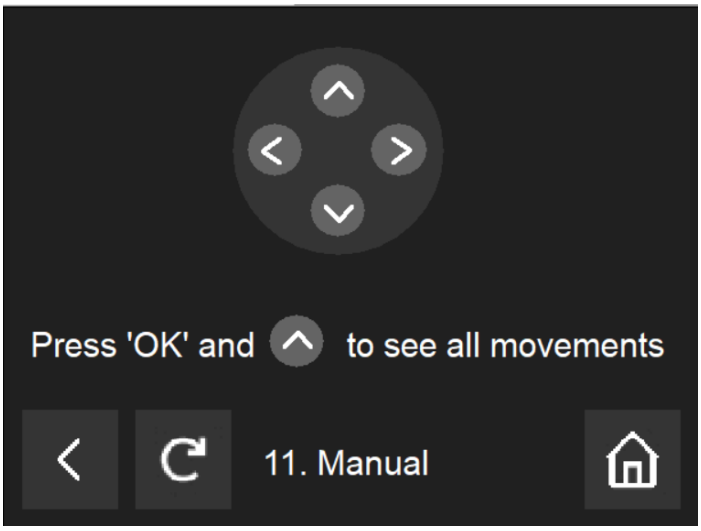


Figure 45. Manual movement screen (1)

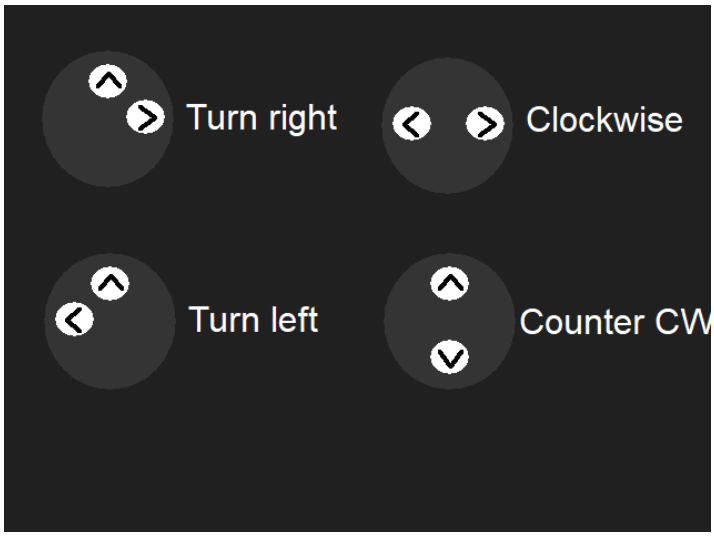


Figure 46. Manual movement screen (2)

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Display screen: Screen 11.2 – Manual

Allows you to elevate the lift platform

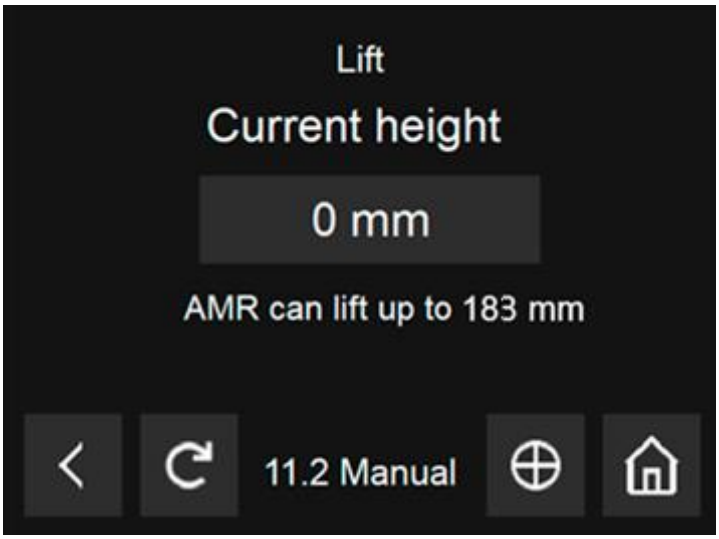


Figure 47: Manual lifting screen

Note

The data displayed on the screen may differ from the specifications depending on the lifting table calibration.

Note

For further information about enter in manual mode see Section 4 – Mode switching.

.

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3 OPERATING MODES

The AMR can function in the next operating modes or functionalities:

- **Automatic mode**: The AMR autonomously follows the route created for it.
- **Manual mode**: The operator can control the AMR movement either manually from a controller or from the control panel located at the front part.



WARNING

No person may be near the AMR while moving in automatic mode or during turns because of possible blind spots.



Note

Emergency stop is operational in all operating modes.

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3.1 Automatic mode

Automatic mode allows the AMR to carry out automatic transport orders anywhere on the working table at speed and with the perimeter protection parameters configured via the SIGAT console (for the P640 M) or the AMR Studio (for the P640 V)



Note

In this operating mode, the safety systems are enabled. The safety laser will apply the corresponding fields depending on the speed, trajectory and loading status of the AMR.

3.1.1 Automatic mode using the magnetic guidance system — P604 M

Its operation is as follows:

When the AMR's RFID antenna reads a tag, it evaluates its ID and, based on the actions configured by the user, it performs the programmed actions.

Common programmed actions include:

- Increase or decrease speed.
- Change the laser safety fields geometry.
- Operational stop of the AMR to await validation by the operator, traffic management, request of permissions, etc.
- Load transfer operations.

The speed is limited to a safely monitored maximum allowable value, depending on the movement direction and load.

For more information, refer to Product Manual (see References).

Move direction	Load	P604 M (max speed)
Longitudinal	✓	1.2 m/s
	x	1.2 m/s
Transversal	✓	1.5 m/s
	x	1.7 m/s

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If any of these thresholds are exceeded, the AMR will try to stablish a restrictive laser field for this movement configuration. If it does not exist, a 107 error will appear, indicating security cannot be granted. This restrictive laser field must be created by the integrator.

For more information related to laser fields and its configuration refer to Laser configuration Master (see References).

If a higher speed than the allowed for that enforced field is applied, the control will decrease the speed automatically. Likewise, if the value is lower, it will apply that value because it is even more restrictive than the allowed one.

For example, if the Large Laser field is configured up to 2 m/s and maximum speed is 1.2 m/s, the AMR will move at 1.2 m/s. If the large Laser field is configured up to 1 m/s and maximum speed is 1.2 m/s, the AMR will move at 1 m/s.



Note

Both longitudinal and transversal speed components are being supervised, taking the fastest point of the vehicle as a reference.

The maximum payload when making any turn on a stop is 1000kg.

The conditions of maximum load and maximum speed are conditioned; the load conditions the speed and vice versa.

Laser fields need to be retrofitted for transversal speeds above 0.5 m/s.

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3.1.2 Automatic mode using the Visual SLAM guidance system — P604 V

Its operation is similar:

When the AMR arrives to a specific node in the predesigned layout (specified by certain X and Y coordinates); it performs the programmed actions based on the configuration created by the user on AMR Studio.

Common programmed actions include:

- Increase or decrease speed.
- Change the laser safety fields geometry.
- Operational stop of the AMR to await validation by the operator, traffic management, request of permissions, etc.
- Load transfer operations.

The speed is limited to a safely monitored maximum allowable value, depending on the movement direction and load.

For more information, refer to Product Manual (see References).

Move direction	Load	P604 V (max speed)
Longitudinal	✓	1.5 m/s
	x	1.7 m/s
Transversal	✓	1.5 m/s
	x	1.7 m/s

The speed is limited to a safely monitored maximum allowable value. If any of these thresholds are exceeded, the AMR will try to stablish a restrictive laser field for this movement configuration. If it does not exist, a error will appear, indicating security cannot be granted. This restrictive laser field must be created by the user.

For more information related to laser fields and its configuration refer to Laser configuration Master (see References).

If a higher speed than the allowed for that enforced field is applied, the control will decrease the speed automatically. Likewise, if the value is lower, it will apply that value because it is even more restrictive than the allowed one. For example, if the Large Laser field is configured up to 2 m/s and maximum longitudinal speed is 1.7 m/s, the AMR will move at 1.7 m/s. If the large Laser field is configured up to 1 m/s and maximum speed is 1.7 m/s, the AMR will move at 1 m/s.

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Note

Both longitudinal and transversal speed components are being supervised, taking the fastest point of the vehicle as a reference.

The maximum payload when making any turn on a stop is 1000kg.

The conditions of maximum load and maximum speed are conditioned; the load conditions the speed and vice versa.

Laser fields need to be retrofitted for transversal speeds above 0.5 m/s.

3.1.3 Muting/Reduced safety laser fields — P604 M & P604 V

If in any section of the circuit it is required to use reduced safety laser fields (not covering the area swept by the AMR and the load) or to disable the safety laser, the muting/reduced safety laser fields functionality can be activated.

The conditions for applying this function are as follows:

- The vehicle speed while maintaining reduced safety laser fields may not exceed 0.3 m/s. This speed is monitored with SF4 (PLc).
- The vehicle speed while muting is monitored with SF19 (PLd).
- The vehicle emits an acoustic/visual signal to indicate or warn of danger.

For more information about SF4 and SF19, refer to Product Manual, Safety Functions section (see References).

WARNING

There is a risk of being run over. Muting/reduced safety laser fields should be activated as late as possible to ensure that the area is clear of people.

The activation of muting/reduced safety laser fields is performed by manual configuration in the working chart or AMR Studio by the integrator, who is therefore responsible for supervising the conditions under which it is executed as well as for indicating these conditions to the end user.

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3.2 Manual mode

3.2.1 Manual mode from controller

Manual mode operation involves moving the AMR using a controller that is connected to the AMR via USB.

To access manual mode, follow the steps detailed in, depending on the AMR version Section 4 – Mode switching.



Figure 48: Front view of the controller.

S. No	Description/Function
1	Up button
2	Left button
3	Down button
4	Right button
5	Joystick 1
6	Joystick 2
7	X button
8	A button
9	B button
10	Y button

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Figure 49: Top view of the controller.

S. No	Description/Function
1	Left fast speed enabling pushbutton button (LT)
2	Left slow speed enabling pushbutton button (LB)
3	Right slow speed enabling pushbutton button (RB)
4	Right fast speed enabling pushbutton button (RT)
5	DirectInput “D” – Xinput “X”

Operation

1. With the AMR turned on, connect the controller’s USB to the USB input located at the front of the AMR.
2. Activate the communication by moving the button (DirectInput “D” – XInput “X”) left and right again. Leave it in position XInput “X”.
3. Push the reset button at the AMR front panel until the display shows code 180.
4. A mode of operation must be chosen between left or right enabling pushbutton.

Note

Controller vibration can be disabled by pushing the “Vibration” button ..

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> **Note**
>
> To start any movement with the AMR, the enabling pushbutton button must be held down. There are two options, left enabling pushbutton (LT) 
>
> and right enabling pushbutton (RT) 
>
> . They cannot be used simultaneously, and their function is to reverse the action of the joysticks depending on whether you press one or the other

Controls for total free movement

Combination	Function
	Raise lift platform (controlled movement)
	Lower lift platform (controlled movement)
	Forward (Fast movement)
	Backward (Fast movement)
	Forward and turn right/left (Rapid movement)
	Backward and turn right/left (Rapid movement)
	Forward (Controlled movement)
	Backward (Controlled movement)
	Forward and turn right/left (Controlled movement)

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Note

When accessing the manual controller movement mode, the laser remains activated and the maximum speed in this mode is 0.5 m/s.

How to stop the vehicle using the controller

To stop the vehicle using the controller, it is necessary to release **ALL** buttons.



WARNING

If the vehicle doesn’t stop and it is possible to be near the vehicle without risk, push the emergency stop button. If it’s not possible, in any case the vehicle will stop after moving 1 meter.

In any case, change the controller **immediately**.

Laser override in manual mode

Laser fields application will be done automatically depending on the movement status of the AMR when is working on manual mode. Additionally, there is a mechanism to bypass the laser detection in a controlled way. This mechanism is limited to a reduced velocity of 0.1 m/s and a maximum distance of 1 m, after which it will automatically reapply the fields.

This functionality can be accessed both via HMI display using the screen selectors (the arrows) or pressing the left slow speed enabling pushbutton (LB + the direction) on the gamepad. If, after a 1 m displacement, it is necessary to activate this functionality again, it can be done using any of the previously mentioned methods.

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3.2.2 Manual mode from control panel - P604 M

To access manual mode, follow the steps detailed in Section 4.1 – Mode switching – P604 M & P604 V.

To raise or lower the lifting table and to move the AMR, push and hold the corresponding button according to the table below.

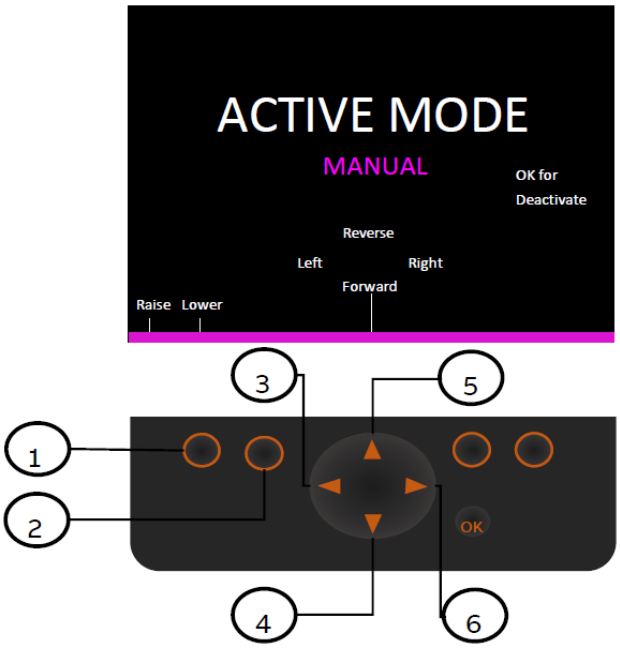


Figure 50: Manual mode from control panel (Magnetic)

S. No	Combination	Description/Function
1	○ (Raise)	Raise lifting table
2	○ (Lower)	Lower lifting table
3	◀	Left movement
4	▼	Forward movement
5	▲	Reverse movement
6	▶	Right movement

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0 Automatic mode allows the AMR to carry out automatic transport orders anywhere on the working table at speed and with the perimeter protection parameters configured via the SIGAT console (for the P640 M) or the AMR Studio (for the P640 V)

Note

In this operating mode, the safety systems are enabled. The safety laser will apply the corresponding fields depending on the speed, trajectory and loading status of the AMR.

1.1.1 Automatic mode using the magnetic guidance system — P604 M

Its operation is as follows:

When the AMR's RFID antenna reads a tag, it evaluates its ID and, based on the actions configured by the user, it performs the programmed actions.

Common programmed actions include:

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To access manual mode, follow the steps detailed in Section 4.1 – Mode switching – P604 M & P604 V.

To move the AMR, push and hold the corresponding button according to the table below.

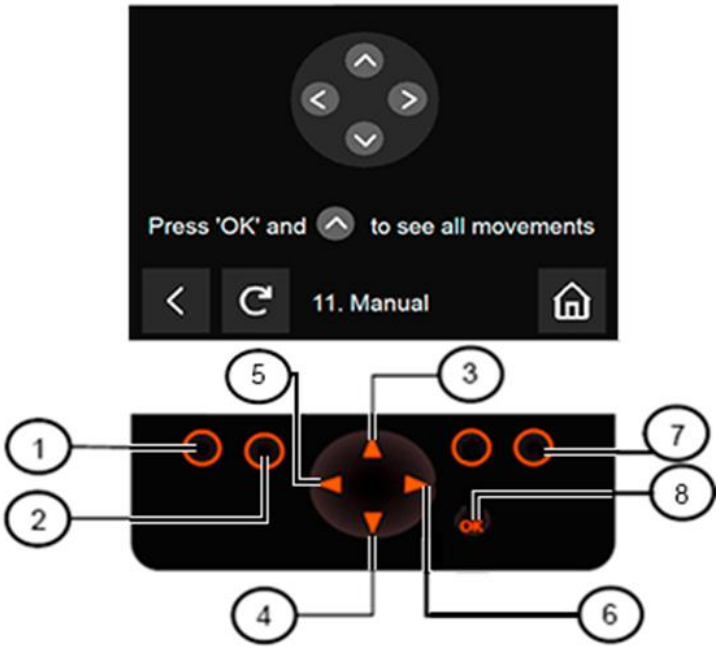


Figure 51. Manual move mode from control panel (VSLAM)

S. No	Combination	Description/Function
1	○ (Back)	Go back
2	○ (Swap)	Swap to lifting table control display
3	▲	Reverse movement
4	▼	Forward movement
5	◀	Left movement
6	▶	Right movement
7	○ (HOME)	Go back to “Home” screen
8	○ (OK)	OK
3+8	○ + ▲	Other movements

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0 Automatic mode allows the AMR to carry out automatic transport orders anywhere on the working table at speed and with the perimeter protection parameters configured via the SIGAT console (for the P640 M) or the AMR Studio (for the P640 V)

Note

In this operating mode, the safety systems are enabled. The safety laser will apply the corresponding fields depending on the speed, trajectory and loading status of the AMR.

1.1.1 Automatic mode using the magnetic guidance system — P604 M

Its operation is as follows:

When the AMR's RFID antenna reads a tag, it evaluates its ID and, based on the actions configured by the user, it performs the programmed actions.

Common programmed actions include:

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according to the table below.

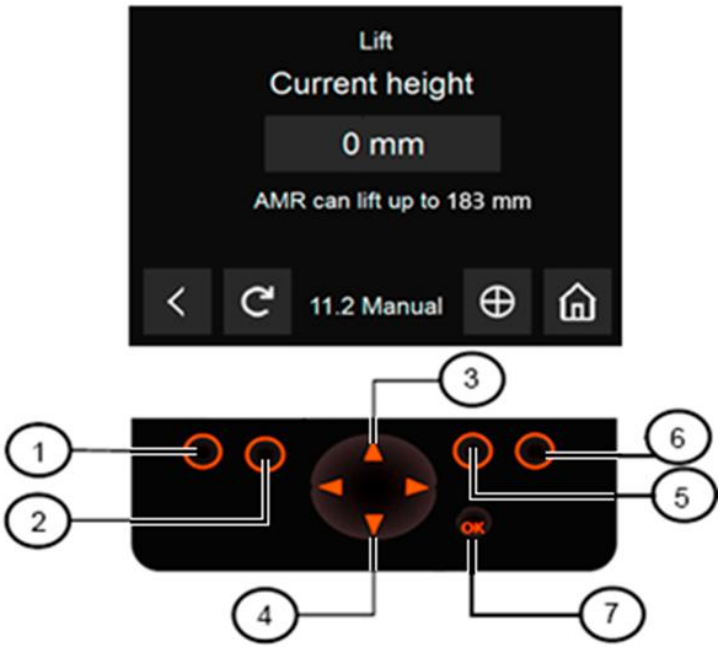


Figure 52. Manual lift mode from control panel (VSLAM)

S. No	Combination	Description/Function
1	○ (Back)	Go back
2	○ (Swap)	Swap to movement control display
3	▲ (Raise)	Raise lifting table
4	▼ (Low)	Low lifting table
5	○	Calibration screen
6	○ (HOME)	Go back to “Home” screen
7	○ (OK)	OK

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4 MODE SWITCHING

4.1 Mode switching – (P604 M & P604 V)

The transition from manual mode to automatic mode and vice versa is keycode protected. The keycode could be set via the HMI display or the gamepad.

- From HMI: The keycode, detailed in the table below, can be inserted from any screen except the battery screen (Magnetic).
- From controller: Insert the USB into the USB port and wait until the purple LED lights up. Then, enter the keycode detailed in the table below.

The AMR being on automatic mode does not imply that is inserted into the circuit. The usual process for that remains. In any case, the AMR can be controlled manually when the manual mode is activated, when entering the corresponding screen on the control panel, or when communication with the gamepad has been detected.

Device	Combination
HMI display	**OK + 1,4** after **OK + 2,3**
Gamepad Logitech	**LT + ◂,B** after **LT + ▸,X** or **◂ + B** after **▸ + X**

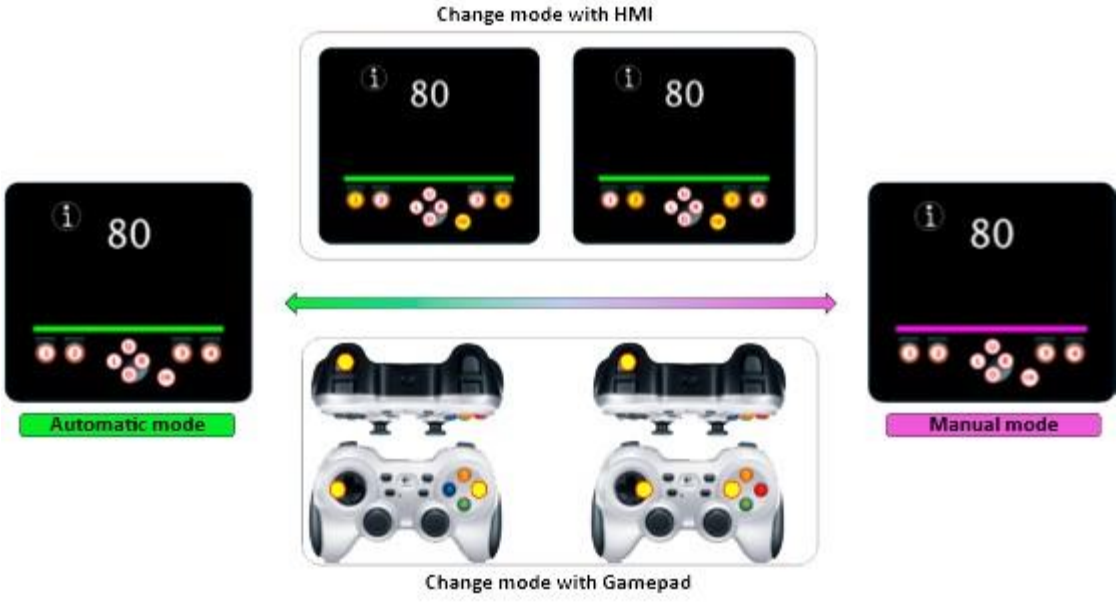


Figure 53. Mode switching: HMI and Controller (Magnetic)

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Figure 54. Mode Switching HMI and controller (VSLAM)

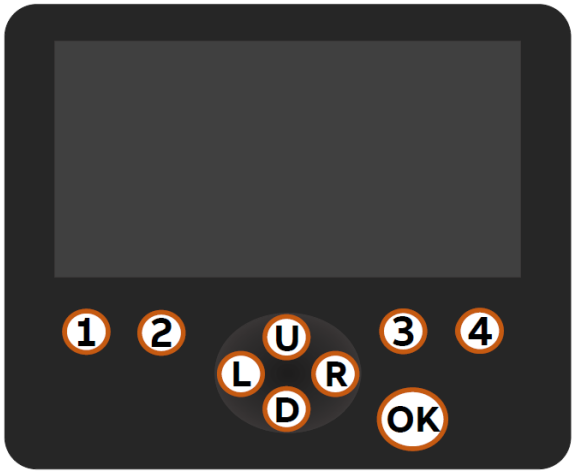


Figure 55: HMI buttons diagram

Note

This transition is not affected by vehicle restarting. That means, if the vehicle is already on manual mode, the vehicle will continue in manual mode even after being switched off.

The vehicle's mode is identifiable via a color band incorporated to the HMI display. A green display for the automatic mode and a purple one for the manual mode.

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4.2 Manual to Automatic mode – P604 M

From display manual mode

Follow these steps:

1. With the AMR in manual mode, move it towards the magnetic tape.
2. Push the green Insert button located on the button panel. The AMR will follow the tape until it reads the next tag and will perform the actions associated with that tag.

From controller manual mode

Follow these steps:

1. Move the AMR in controller manual mode towards the magnetic tape.
2. Disconnect the controller.
3. Push the green Insert button located on the button panel. The AMR will follow the tape until it reads the next tag and will perform the actions associated with that tag.

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4.3 Manual to Automatic mode – P604 V

From display manual mode

Follow these steps:

1. With the AMR in manual mode, move the AMR to a location that belongs to its original work routine (1 m far from the routine limit).
2. Push the green Insert button located on the button panel. The AMR will synchronize and will continue its routine from that location.

From controller manual mode

Follow these steps:

1. Move the AMR in controller manual mode to a location that belongs to its original work routine.
2. Disconnect the controller.
3. Push the green Insert button located on the button panel. The AMR will synchronize and will continue its routine from that location.

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4.4 Automatic to Manual mode – P604 M & P604 V.

To use the magnetic guidance system

Follow these steps:

1. Push the emergency stop button when the AMR is on a safe section. If work needs to be performed on the AMR, turn it off using the ON/OFF switch.
2. Manually move the AMR to the desired location.

To use the manual controller guidance system

Follow these steps:

1. Push the emergency stop button when the AMR is on a safe section. If work needs to be performed on the AMR, turn it off using the ON/OFF switch.
2. Connect the manual controller.
3. Drive the AMR to the desired location.

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INDEX

A

AMR operation, 42
Auto to Manual, 58
Automatic mode, 43
C

Components of the AMR, 14
D

Display, 18
E

Emergency·stop·button, 12
I

Insert·button, 17
L

LED·lights, 14
M

Manual mode, 47
Manual to Automatic – P604 M, 56
Manual to Automatic – P604 V, 57
O

On/Off·switch, 15
Operational stop button, 13
R

Reset·button, 16
S

Safety·laser, 10
Switching on and setting up, 54

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