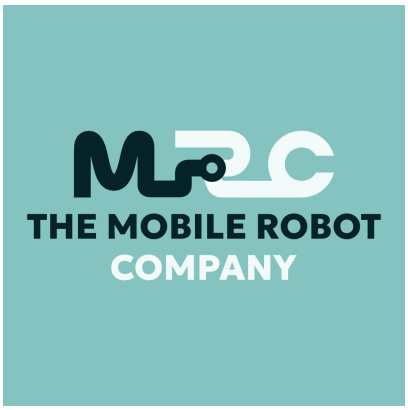

The Mobile Robot Company

Knowledge Center — Safety & Compliance · 2026-08-04

https://info.mobilerobot.com/category/safety-compliance

Safety & Compliance

How J1600 safety works, safety functions, standards, and safe deployment.

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How J1600 Safety Works

This page explains the safety design of the J1600 self-driving pallet jack (https://info.mobilerobot.com/products/j1600/overview/) at a glance: what protects people around the vehicle, what the operator is responsible for, and where to find the details. It is written for anyone evaluating or working near the J1600.

Safety in layers

The J1600 does not rely on a single mechanism. Protection comes from several independent layers working together:

1. **Navigation and mapping.** 3D LiDAR SLAM (https://info.mobilerobot.com/products/j1600/navigation-and-obstacle-avoidance/) (simultaneous localization and mapping) builds and updates a three-dimensional model of the facility so the vehicle plans routes around obstacles.
2. **Certified safety sensing.** Two separate 2D safety LiDAR scanners, mounted front and rear, provide a full 360-degree protective field around the vehicle. The field is speed-dependent and expands as travel speed increases.
3. **Independent safety control.** An independent safety controller, safety-certified driving-speed and driving-direction encoders (https://info.mobilerobot.com/safety-compliance/safety-functions/speed-monitoring/), and two safety-certified motor controllers supervise motion.
4. **Human confirmation.** A person initiates every task and must confirm entry into automatic mode (https://info.mobilerobot.com/documentation/user-guides/autonomous-operation/) with a physical button press. The vehicle only enters autonomous mode when the operator judges the environment ready.
5. **Physical override.** Three emergency-stop buttons, a belly button for stop and reverse, and tiller-based takeover let anyone stop the vehicle or return it to manual control immediately.

The navigation stack and the safety stack are deliberately separate systems — see Navigation sensors vs. safety sensors (https://info.mobilerobot.com/safety-compliance/safety-overview/navigation-sensors-vs-safety-sensors/).

What the vehicle does

- Detects people (https://info.mobilerobot.com/safety-compliance/safety-functions/person-detection/) and obstacles in a 360-degree protective field that supports both forward and reverse autonomous travel.
- Adjusts the size of its protective field with speed (https://info.mobilerobot.com/safety-compliance/safety-functions/safety-field-adjustment/), expanding it at higher speeds.
- Shows its status on the floor: white light indicates manual mode, and blue light strips display the current protected area in automatic mode.
- Stops on any emergency-stop input and brakes with a certified braking function (https://info.mobilerobot.com/safety-compliance/safety-functions/braking/).
- Asks the operator to confirm automatic mode and instructs the operator to step away before starting.

Each certified safety function carries an assigned Performance Level (PL) between PL b and PL d under EN ISO 13849-1 (https://info.mobilerobot.com/safety-compliance/standards/iso-13849-1/). The full list is in Performance levels (https://info.mobilerobot.com/safety-compliance/safety-functions/performance-levels/).

What the operator does

The J1600 is built for human-in-the-loop automation (https://info.mobilerobot.com/documentation/concepts/human-in-the-loop-automation/): the operator keeps judgment-heavy work and full authority over when the machine drives itself. Pallet pickup is always manual, autonomous mode must be confirmed by a person, and grabbing or moving the tiller returns the vehicle to manual control at once. See Human responsibilities (https://info.mobilerobot.com/safety-compliance/safety-overview/human-responsibilities/) and Emergency stops and manual takeover (https://info.mobilerobot.com/safety-compliance/safety-overview/emergency-stops-and-manual-takeover/).

Standards and certification

The J1600 is CE marked (https://info.mobilerobot.com/safety-compliance/certificates/ce-declaration-of-conformity/). Its preliminary compliance list (https://info.mobilerobot.com/safety-compliance/certificates/compliance-statements/) includes EN ISO 3691-4:2023 (https://info.mobilerobot.com/safety-compliance/standards/iso-3691-4/) (driverless industrial trucks), EN ISO 13849-1:2023 (safety-related control systems), EN ISO 12100:2010 (https://info.mobilerobot.com/safety-compliance/standards/iso-12100/), EN ISO 3691-1:2015+A1:2020 (https://info.m

obilerobot.com/safety-compliance/standards/iso-3691-1/), ANSI/ITSDF B56.5-2024 (https://info.mobilerobot.com/safety-compliance/standards/ansi-itsdf-b56-5/), and ANSI/ITSDF B56.1-2020 (https://info.mobilerobot.com/safety-compliance/standards/ansi-itsdf-b56-1/), together with the Machinery, EMC, Radio Equipment, and RoHS directives and the EU Batteries Regulation (https://info.mobilerobot.com/safety-compliance/standards/emc-red-rohs-and-battery-regulations/). The battery is tested to UN 38.3 (https://info.mobilerobot.com/safety-compliance/certificates/battery-un-38-3-documentation/) for transport.

PRELIMINARY SPECIFICATIONS

The January 2026 specifications, including the assigned Performance Levels, are preliminary and subject to change. No stopping-distance curves, validation reports, or declaration of conformity are published; use current product documentation for deployment decisions.

Where to go next

- Human responsibilities (https://info.mobilerobot.com/safety-compliance/safety-overview/human-responsibilities/) — the operator's share of safe operation.
- Manual and autonomous mode safety (https://info.mobilerobot.com/safety-compliance/safety-overview/manual-and-autonomous-mode-safety/) — how safety behaves in each mode and during handover.
- Safety architecture (https://info.mobilerobot.com/safety-compliance/safety-overview/safety-architecture/) — the complete list of safety components.
- Emergency stops and manual takeover (https://info.mobilerobot.com/safety-compliance/safety-overview/emergency-stops-and-manual-takeover/) — every way to stop the vehicle.
- Performance levels (https://info.mobilerobot.com/safety-compliance/safety-functions/performance-levels/) — each certified function and its Performance Level.

Human Responsibilities

The J1600 automates repetitive travel, not judgment. This page describes the operator's share of safe operation: the decisions and actions that stay with a person in the human-in-the-loop (https://info.mobilerobot.com/documentation/concepts/human-in-the-loop-automation/) design.

The division of work

Human operator	J1600
Judge load stability, pallet condition, congestion, urgency, and exceptions	Build and update a 3D map and navigate to saved points
Pick pallets and perform manual height handling up to 1.6 m	Carry up to 1,600 kg along repetitive routes
Select the destination and what happens after delivery	Avoid obstacles and apply speed-dependent safety fields
Confirm entry into autonomous mode	Drop at floor level, then return, park, continue, or wait
Override or resume manual control at any time	Repeat stored tasks consistently

Before starting an autonomous task

- **Pick up the pallet manually.** Pallet pickup is always a manual operation (https://info.mobilerobot.com/applications/scenarios/manual-pickup-and-autonomous-delivery/). Use your own judgment on pallet condition, load stability, fork placement, and approach.
- **Check the load.** The operator judges whether a pallet or open-base carrier is stable and within the supported envelope. No blanket approval (https://info.mobilerobot.com/safety-compliance/safe-deployment/approved-loads-and-pallets/) exists for every carrier or for hazardous materials.
- **Judge the environment.** The vehicle only enters autonomous mode (https://info.mobilerobot.com/documentation/user-guides/autonomous-operation/) when the operator

judges the environment ready. Autonomous driving requires level floors — automatic gradeability is 0 percent, so dock plates and slopes remain manual work (https://info.mobilerobot.com/documentation/user-guides/manual-operation/).

- **Confirm the mode change.** The robot asks for confirmation before entering automatic mode (https://info.mobilerobot.com/safety-compliance/safety-overview/manual-and-autonomous-mode-safety/). Confirm with the physical start/resume button, then step away when the interface instructs you to.

During autonomous operation

The vehicle drives itself, but a person remains in charge of exceptions (https://info.mobilerobot.com/applications/scenarios/handling-exceptions-and-irregular-loads/):

- Take over immediately by grabbing or moving the tiller, or stop the vehicle with any emergency-stop control. See Emergency stops and manual takeover (https://info.mobilerobot.com/safety-compliance/safety-overview/emergency-stops-and-manual-takeover/).
- Reprioritize when circumstances change — for example, when a production line urgently needs material.

Situations that stay human

The design deliberately keeps the following in human hands, because context and improvisation matter:

1. Spotting damaged pallets — a broken bottom board or protruding nail — before they become a hazard or a jam.
2. Judging a top-heavy, leaning, or poorly stacked load (https://info.mobilerobot.com/applications/use-cases/sensitive-or-unstable-loads/) before lifting it.
3. Seeing and tucking away a loose shrink-wrap tail before it snags a rack or doorframe.
4. Finding a pallet that is not exactly at its recorded position.
5. Catching leaks or crushed corners before goods reach a customer or production line.
6. Handling steep dock plates, bumps, and misalignment when entering a truck or trailer.
7. Improvising a safe route through a crowded or cluttered receiving area (https://info.mobilerobot.com/applications/scenarios/operation-in-crowded-environments/).

8. Responding immediately to urgent reprioritization.
9. Teaching new routes (https://info.mobilerobot.com/documentation/concepts/teach-and-repeat/) by driving to a point and saving it, instead of calling in an automation expert.

Responsibility is a complement, not the whole system

Human control is not the vehicle's only safety mechanism. Independent controllers, certified components, two safety LiDAR scanners, emergency stops, and a 360-degree protective field operate regardless of the operator. Human takeover complements the safety architecture (https://info.mobilerobot.com/safety-compliance/safety-overview/safety-architecture/); it does not replace it. See How J1600 safety works (https://info.mobilerobot.com/safety-compliance/safety-overview/how-j1600-safety-works/) for the full picture.

Manual and Autonomous Mode Safety

The J1600 is a dual-mode (https://info.mobilerobot.com/products/j1600/dual-mode/) vehicle: it drives like a conventional walk-behind electric pallet jack under manual control and drives itself to saved locations in autonomous mode. This page describes how safety works in each mode and at the handover between them.

Selecting a mode

A three-position key switch selects the vehicle's state:

Key position	Meaning
Power off	Vehicle powered down
Manual	Manual tiller operation only
Automatic	Autonomous task execution permitted

Automatic/manual mode selection is a certified safety function rated PL c — see Mode selection (https://info.mobilerobot.com/safety-compliance/safety-functions/mode-selection/).

Manual mode

In manual mode (https://info.mobilerobot.com/documentation/user-guides/manual-operation/) the operator controls travel and lift with the tiller, like a conventional electric pallet jack. Manual mode covers the judgment-heavy work: pallet pickup, handling up to 1.6 m, difficult approaches, sensitive or unstable loads (https://info.mobilerobot.com/applications/use-cases/sensitive-or-unstable-loads/), and exceptions (https://info.mobilerobot.com/applications/scenarios/handling-exceptions-and-irregular-loads/).

- White light indicates that the vehicle is in manual mode.
- Tiller-position switches serve two safety roles: one acts as an emergency stop, the other enables manual control. Tiller-position detection is rated PL c — see Tiller detection (https://info.mobilerobot.com/safety-compliance/safety-functions/tiller-detection/).

- Manual gradeability is 5 percent (2.86°) without load and 3 percent (1.72°) with full load; slopes and dock plates are manual-mode territory.

Handover to autonomous mode

Handover is deliberate and operator-controlled:

1. The operator creates or selects a task on the 15-inch touchscreen and chooses the saved destination and post-delivery behavior.
2. The robot asks for confirmation to enter automatic mode.
3. The operator confirms with the physical LED start/resume button.
4. The interface instructs the operator to step away.
5. The vehicle starts the autonomous task.

The vehicle only enters autonomous mode (https://info.mobilerobot.com/documentation/user-guides/autonomous-operation/) when the operator judges the environment ready. Pallet pickup has already happened manually; autonomous delivery is at floor level.

Autonomous mode

While driving itself, the J1600:

- applies a 360-degree protective field from two 2D safety LiDAR scanners, supporting forward and reverse travel;
- expands the protective field as speed increases (https://info.mobilerobot.com/safety-compliance/safety-functions/safety-field-adjustment/), up to the top speed of 5.4 km/h (1.5 m/s);
- displays the current protected area with blue floor light strips;
- detects people in the safety field (person detection (https://info.mobilerobot.com/safety-compliance/safety-functions/person-detection/), PL d) and brakes with a certified braking function (https://info.mobilerobot.com/safety-compliance/safety-functions/braking/) (PL d);
- avoids obstacles (https://info.mobilerobot.com/products/j1600/navigation-and-obstacle-avoidance/) using its continuously updated 3D map, separately from the certified safety sensing — see Navigation sensors vs. safety sensors (https://info.mobilerobot.com/safety-compliance/safety-overview/navigation-sensors-vs-safety-sensors/).

Autonomous mode is a level-floor application: automatic gradeability is 0 percent, the maximum traversable bump is 25 mm, and the maximum traversable gap is 20 mm.

Returning to manual control

Manual control is always immediately available:

- **Grab or move the tiller.** The vehicle returns to manual control at once.
- **Press an emergency stop.** Three emergency-stop buttons and a belly button for stop and reverse are fitted.
- **Use the key switch.** Turning to manual or power-off ends autonomous operation.

See Emergency stops and manual takeover (https://info.mobilerobot.com/safety-compliance/safety-overview/emergency-stops-and-manual-takeover/) for details, and Human responsibilities (https://info.mobilerobot.com/safety-compliance/safety-overview/human-responsibilities/) for what remains the operator's job in both modes.

Safety Architecture

The J1600's safety architecture layers navigation, sensing, safety control, certified actuation, human confirmation, and physical override. This page lists every safety component and explains how the layers combine. For the high-level introduction, see How J1600 safety works (https://info.mobilerobot.com/safety-compliance/safety-overview/how-j1600-safety-works/).

Safety components

- Independent safety controller
- Two 2D safety LiDAR scanners, mounted front and rear on the chassis
- Three emergency-stop buttons
- Belly button for stop and reverse
- Load-detection sensor (https://info.mobilerobot.com/safety-compliance/safety-functions/load-detection/)
- Tiller-position switch (https://info.mobilerobot.com/safety-compliance/safety-functions/tiller-detection/) for emergency stop
- Tiller-position switch for manual control
- Safety-certified driving-speed encoder
- Safety-certified driving-direction encoder
- Two safety-certified motor controllers

The 360-degree protective field

The two 2D safety LiDAR scanners together cover the full perimeter of the vehicle, producing a 360-degree protective field that supports both forward and reverse autonomous travel — including certified safe reversing without specially marked target zones. The field is speed-dependent: it changes with travel speed and expands at higher speeds. Field-size adjustment is itself a certified safety function rated PL d — see Safety-field adjustment (https://info.mobilerobot.com/safety-compliance/safety-functions/safety-field-adjustment/).

Blue floor light strips — three in total — display the current safety zone so people nearby can see the protected area. White light indicates manual mode.

Certified motion control

Motion is supervised by the independent safety controller working with a safety-certified driving-speed encoder, a safety-certified driving-direction encoder, and two safety-certified motor controllers. These support the certified braking (https://info.mobilerobot.com/safety-compliance/safety-functions/braking/) (PL d) and speed monitoring and control (https://info.mobilerobot.com/safety-compliance/safety-functions/speed-monitoring/) (PL c) functions.

Human confirmation and override

Two layers involve people directly:

- **Confirmation.** The operator must confirm entry into automatic mode with the physical start/resume button, and the robot instructs the operator to step away before starting. See Manual and autonomous mode safety (https://info.mobilerobot.com/safety-compliance/safety-overview/manual-and-autonomous-mode-safety/).
- **Override.** Grabbing or moving the tiller enables immediate manual takeover; emergency stops halt the vehicle. See Emergency stops and manual takeover (https://info.mobilerobot.com/safety-compliance/safety-overview/emergency-stops-and-manual-takeover/).

Separation from the navigation stack

The 3D navigation LiDAR and RGB AI camera map the environment and route the vehicle around objects; the 2D safety stack supplies the certified personnel protection. The two systems are independent — see Navigation sensors vs. safety sensors (https://info.mobilerobot.com/safety-compliance/safety-overview/navigation-sensors-vs-safety-sensors/).

Performance levels

Each certified safety function carries an assigned Performance Level between PL b and PL d — for example braking, emergency stop, person detection (https://info.mobilerobot.com/safety-compliance/safety-functions/person-detection/), and safety-field adjustment at PL d. The full table is in Performance levels (https://info.mobilerobot.com/safety-compliance/safety-functions/performance-levels/).

What this architecture delivers — and its documentation limits

The layered design improves predictability and may reduce workplace accidents (https://info.mobilerobot.com/applications/results/safety-improvements/) compared with manual pallet handling.

> **DEPLOYMENT DECISIONS NEED CURRENT DOCUMENTATION**
>
> No accident-rate test data, safety-distance curves, stopping distances, validation reports, or declaration of conformity (https://info.mobilerobot.com/safety-compliance/certificates/ce-declaration-of-conformity/) are published on this site. The January 2026 specifications are preliminary and subject to change; use current product documentation for deployment decisions.

Navigation Sensors vs. Safety Sensors

The J1600 carries two distinct sensor systems that are easy to confuse: the navigation stack that drives the vehicle, and the safety stack that protects people. This page explains what each does and why they are separate.

Two stacks at a glance

	Navigation stack	Safety stack
Sensors	3D LiDAR, RGB AI camera	Two 2D safety LiDAR scanners, front and rear
Processing	Industrial NVIDIA Jetson AI computer	Independent safety controller
Job	Mapping, localization, route planning, obstacle avoidance	Certified person detection and protective fields
Certification role	Control/navigation function	Certified safety functions with assigned Performance Levels

The navigation stack

The 3D LiDAR performs SLAM (https://info.mobilerobot.com/products/j1600/navigation-and-obstacle-avoidance/) (simultaneous localization and mapping): it builds and continuously updates a three-dimensional map of the facility while an operator drives, then localizes the vehicle and plans routes to saved destinations. It scans environmental structures at heights reaching up to 70 m above the vehicle, works without fixed tracks, wires, reflectors, or building modifications, and routes around obstacles in dynamic environments. An RGB AI camera is part of the same control stack, and preferred travel zones can be defined for safer routing through production areas.

3D mapping is designed for greater precision and reliability than traditional 2D navigation in complex or changing environments — one reason the vehicle suits brownfield sites (https://info.mobilerobot.com/applications/use-cases/brownfield-automation/).

For exact sensor geometry, range, accuracy, minimum aisle width, and localization tolerances, contact the company or a partner.

The safety stack

Personnel protection does not depend on the navigation system. Two separate 2D safety LiDAR scanners feed an independent safety controller and certified components. Together they produce a full 360-degree protective field that supports forward and reverse autonomous travel, changes size with speed, and triggers certified reactions:

- Person detection in the safety field (https://info.mobilerobot.com/safety-compliance/safety-functions/person-detection/) — PL d
- Safety-field size adjustment (https://info.mobilerobot.com/safety-compliance/safety-functions/safety-field-adjustment/) — PL d
- Braking (https://info.mobilerobot.com/safety-compliance/safety-functions/braking/) — PL d
- Speed monitoring and control (https://info.mobilerobot.com/safety-compliance/safety-functions/speed-monitoring/) — PL c

Why the separation matters

Obstacle avoidance by the navigation stack is a productivity feature: it keeps the vehicle moving efficiently around whatever is in the way. The 2D safety stack is the certified protection layer: it guarantees the response when a person enters the protective field (https://info.mobilerobot.com/support/troubleshooting/obstacle-or-safety-field-stops/), independently of what the navigation software decides. Keeping the two systems separate means personnel protection rests on certified components rather than on the AI navigation stack.

For the complete component list, see Safety architecture (https://info.mobilerobot.com/safety-compliance/safety-overview/safety-architecture/). For terms such as LiDAR, SLAM, and Performance Level, see the glossary (https://info.mobilerobot.com/documentation/concepts/glossary/).

Emergency Stops and Manual Takeover

Anyone working near a J1600 can stop it, and the operator can reclaim manual control at any moment. This page lists every stop and takeover control and what each does.

Emergency-stop buttons

The J1600 has three emergency-stop buttons. The emergency-stop function is rated Performance Level d (PL d) (https://info.mobilerobot.com/safety-compliance/safety-functions/performance-levels/), the highest level assigned to any J1600 safety function. The emergency stop is one of the externally visible controls (https://info.mobilerobot.com/documentation/technical-reference/interface-specifications/) on the vehicle, alongside the start/resume button, key switch, and tiller.

Belly button

A belly button provides stop and reverse. It protects the person at the tiller position: activating it stops the vehicle and reverses it away.

Tiller takeover

The tiller is both the manual control and a safety device:

- **Grab or move the tiller** during autonomous operation and the vehicle immediately returns to manual control.
- Two tiller-position switches back this up: one functions as an emergency stop, the other enables manual control. Tiller-position detection is a certified safety function rated PL c — see Tiller detection (https://info.mobilerobot.com/safety-compliance/safety-functions/tiller-detection/).

Takeover requires no menu, code, or supervisor: the design principle (https://info.mobilerobot.com/company/about/our-approach-to-automation/) is that immediate human intervention is always available. See Human responsibilities (https://info.mobilerobot.com/safety-compliance/safety-overview/human-responsibilities/).

Key switch

The three-position key switch selects power off, manual-only, or automatic mode. Turning it out of the automatic position ends autonomous operation. Mode selection is a certified safety function rated PL c — see Mode selection (https://info.mobilerobot.com/safety-compliance/safety-functions/mode-selection/).

Start and resume

Autonomous execution is controlled by a physical LED start/resume button. The vehicle does not enter automatic mode on a touchscreen tap alone (https://info.mobilerobot.com/support/troubleshooting/robot-will-not-enter-autonomous-mode/) — the operator must confirm with this button, and the interface instructs the operator to step away before the task starts. See Manual and autonomous mode safety (https://info.mobilerobot.com/safety-compliance/safety-overview/manual-and-autonomous-mode-safety/).

Automatic protection alongside manual controls

Manual stops complement, rather than replace, the automatic protection layers: certified person detection (https://info.mobilerobot.com/safety-compliance/safety-functions/person-detection/) (PL d) and braking (https://info.mobilerobot.com/safety-compliance/safety-functions/braking/) (PL d) act on the 360-degree protective field regardless of operator input. The full component list is in Safety architecture (https://info.mobilerobot.com/safety-compliance/safety-overview/safety-architecture/).

Braking

The braking system is one of the J1600's certified safety functions. It is rated **Performance Level d (PL d) (https://info.mobilerobot.com/safety-compliance/safety-functions/performance-levels/)** — the highest level assigned to any J1600 safety function.

Role in the safety architecture

Braking is the reaction layer of the safety architecture (https://info.mobilerobot.com/safety-compliance/safety-overview/safety-architecture/): when a safety function demands a stop — a person detected in the protective field (https://info.mobilerobot.com/support/troubleshooting/obstacle-or-safety-field-stops/), an emergency-stop input, or a takeover — the certified braking system halts the vehicle. It works together with:

- the independent safety controller;
- the safety-certified driving-speed encoder and driving-direction encoder;
- the two safety-certified motor controllers;
- speed monitoring and control (https://info.mobilerobot.com/safety-compliance/safety-functions/speed-monitoring/) (PL c), which supervises how fast the vehicle is allowed to travel.

The 360-degree protective field supports both forward and reverse autonomous travel, so certified stopping applies in both travel directions. The vehicle's top speed is 5.4 km/h (1.5 m/s), and the protective field expands at higher speeds to preserve reaction margin — see Safety-field adjustment (https://info.mobilerobot.com/safety-compliance/safety-functions/safety-field-adjustment/).

Triggers

- Person detection (https://info.mobilerobot.com/safety-compliance/safety-functions/person-detection/) in the 360-degree safety field (PL d).
- Any of the three emergency-stop buttons (PL d) or the tiller-position emergency-stop switch (https://info.mobilerobot.com/safety-compliance/safety-functions/tiller-detection/).
- The belly button, which stops and reverses the vehicle.

See Emergency stops and manual takeover (https://info.mobilerobot.com/safety-compliance/safety-overview/emergency-stops-and-manual-takeover/) for the full set of stop controls.

PRELIMINARY SPECIFICATION

The January 2026 Performance Levels are preliminary and subject to change. This page does not give stopping distances or safety-distance curves; base deployment decisions on the current product documentation.

Speed Monitoring

Speed monitoring and control is a certified J1600 safety function rated **Performance Level c (PL c)**. It supervises how fast the vehicle travels and feeds the speed-dependent behavior of the other safety functions.

How it is built

The function rests on dedicated certified hardware in the safety architecture (https://info.mobilerobot.com/safety-compliance/safety-overview/safety-architecture/):

- a safety-certified driving-speed encoder;
- a safety-certified driving-direction encoder;
- an independent safety controller;
- two safety-certified motor controllers.

Because the direction encoder is part of the certified chain, supervision covers both forward and reverse travel — the J1600's 360-degree protective field supports autonomous driving in both directions.

Why speed is safety-relevant

The J1600's top speed is 5.4 km/h (1.5 m/s / 3.4 mph). Its protective field is speed-dependent: the field changes with travel speed and expands at higher speeds, so the vehicle always monitors a zone matched to its current motion. Reliable speed measurement is what makes that adjustment trustworthy — see Safety-field adjustment (https://info.mobilerobot.com/safety-compliance/safety-functions/safety-field-adjustment/) (PL d).

Speed monitoring also underpins the certified braking (https://info.mobilerobot.com/safety-compliance/safety-functions/braking/) function (PL d), which stops the vehicle when a person enters the field or an emergency stop is triggered.

Related pages

- Safety-field adjustment (https://info.mobilerobot.com/safety-compliance/safety-functions/safety-field-adjustment/) — how field size follows speed.
- Person detection (https://info.mobilerobot.com/safety-compliance/safety-functions/person-detection/) — what happens when someone enters the field.
- Performance levels (https://info.mobilerobot.com/safety-compliance/safety-functions/performance-levels/) — all assigned levels in one table.

PRELIMINARY SPECIFICATION

Performance Levels come from the preliminary January 2026 product documentation and are subject to change.

Safety-Field Adjustment

Safety-field size adjustment is a certified J1600 safety function rated **Performance Level d (PL d)**. It matches the size of the protective field to the vehicle's current speed.

The 360-degree protective field

Two 2D safety LiDAR scanners, mounted front and rear on the chassis, together cover the vehicle's full perimeter. The resulting 360-degree protective field supports autonomous travel in both forward and reverse — including certified safe reversing without specially marked target zones.

Speed-dependent sizing

The protective field is not static:

- the field changes with travel speed;
- it expands as speed increases, up to the top speed of 5.4 km/h (1.5 m/s);
- certified speed monitoring (https://info.mobilerobot.com/safety-compliance/safety-functions/speed-monitoring/) (PL c), built on safety-certified speed and direction encoders, supplies the speed signal.

A faster vehicle needs more room to react, so the monitored zone grows with speed. When a person enters the active field, certified person detection (https://info.mobilerobot.com/safety-compliance/safety-functions/person-detection/) (PL d) and braking (https://info.mobilerobot.com/safety-compliance/safety-functions/braking/) (PL d) respond.

Visible status on the floor

People near the vehicle can see what is protected:

- three blue light strips display the current safety zone in automatic mode;
- white light indicates manual mode;
- floor-indicator lights signal automatic operation.

Related pages

- Navigation sensors vs. safety sensors (https://info.mobilerobot.com/safety-compliance/safety-overview/navigation-sensors-vs-safety-sensors/) — why the 2D safety LiDARs are separate from the 3D navigation LiDAR.
- Safety architecture (https://info.mobilerobot.com/safety-compliance/safety-overview/safety-architecture/) — the complete certified component list.
- Performance levels (https://info.mobilerobot.com/safety-compliance/safety-functions/performance-levels/) — all assigned levels in one table.

PRELIMINARY SPECIFICATION

Performance Levels are preliminary (January 2026) and subject to change. Exact field geometries and safety-distance curves are not available.

Person Detection

Person detection in the safety field is a certified J1600 safety function rated **Performance Level d (PL d) (https://info.mobilerobot.com/safety-compliance/safety-functions/performance-levels/)** — the highest level assigned to any J1600 safety function.

How it works

Two 2D safety LiDAR scanners, mounted front and rear on the chassis, monitor a 360-degree protective field around the vehicle. The field covers forward and reverse autonomous travel and is speed-dependent: it expands as the vehicle drives faster, so detection distance grows with speed. See Safety-field adjustment (https://info.mobilerobot.com/safety-compliance/safety-functions/safety-field-adjustment/).

Detection feeds an independent safety controller, and the certified braking (https://info.mobilerobot.com/safety-compliance/safety-functions/braking/) function (PL d) provides the stopping reaction (https://info.mobilerobot.com/support/troubleshooting/obstacle-or-safety-field-stops/). This chain is built from certified safety components (https://info.mobilerobot.com/safety-compliance/safety-overview/safety-architecture/) and runs separately from the 3D navigation system.

Detection vs. obstacle avoidance

The J1600 also avoids obstacles (https://info.mobilerobot.com/products/j1600/navigation-and-obstacle-avoidance/) using its 3D LiDAR map and RGB AI camera — but that is a navigation capability, not the certified protection layer. Person detection belongs to the independent 2D safety stack, so personnel protection does not depend on the AI navigation software. The distinction is explained in Navigation sensors vs. safety sensors (https://info.mobilerobot.com/safety-compliance/safety-overview/navigation-sensors-vs-safety-sensors/).

What bystanders see

Three blue floor light strips display the currently protected area during automatic operation, so people nearby can see the active safety zone. White light indicates

manual mode.

Operator's part

Before autonomous operation starts, the robot instructs the operator to step away — person detection protects people who end up in the vehicle's path, but the design keeps people clear of the field from the start. See Human responsibilities (https://info.mobilerobot.com/safety-compliance/safety-overview/human-responsibilities/).

PRELIMINARY SPECIFICATION

Performance Levels are preliminary January 2026 specifications and are subject to change. For detection ranges, field geometries, and stopping distances, use current product documentation for deployment decisions.

Load Detection

Load detection is a certified J1600 safety function rated **Performance Level b (PL b)**. A dedicated load-detection sensor is part of the vehicle's safety architecture (https://info.mobilerobot.com/safety-compliance/safety-overview/safety-architecture/).

What the vehicle senses

The load-detection sensor lets the vehicle register whether it is carrying a load. Load state matters to safe operation: the J1600's rated payload is 1,600 kg (about 3,500 lb), and performance figures (https://info.mobilerobot.com/products/j1600/dimensions-and-performance/) differ between loaded and unloaded travel — for example, fork lifting speed is 0.10 m/s without load and 0.08 m/s at full load. A lifting-height sensor is also fitted as part of the control system.

The limits load detection works within

Load detection is a sensor function, not a substitute for load limits or judgment:

Limit	Value
Rated payload	1,600 kg / about 3,500 lb
Maximum pallet or load length, including overhang	1,250 mm / 49 in
Maximum pallet or load width, including overhang	1,250 mm / 49 in
Maximum load height from floor	1,700 mm / 67 in
Carrier type	Open-base, forkable, no bottom deck board

The operator's part

Judging load stability stays with the operator: pallet condition, stacking, top-heaviness, and whether a carrier is suitable at all. Pallet pickup is always manual, and no blanket approval (https://info.mobilerobot.com/safety-compliance/safe-deployment/approved-loads-and-pallets/) exists for every carrier or for hazardous materials. See Human responsibilities (https://info.mobilerobot.com/safety-compliance/safety-overview/human-responsibilities/).

Related pages

- Performance levels (https://info.mobilerobot.com/safety-compliance/safety-functions/performance-levels/) — all assigned levels in one table.
- Technical specifications (https://info.mobilerobot.com/products/j1600/technical-specifications/) — full load and dimension data.

> **PRELIMINARY SPECIFICATION**
>
> Performance Levels come from the preliminary January 2026 product documentation and are subject to change.

Mode Selection

Automatic/manual mode selection is a certified J1600 safety function rated **Performance Level c (PL c) (https://info.mobilerobot.com/safety-compliance/safety-functions/performance-levels/)**. It guarantees that the vehicle is always in a deliberately chosen state: powered off, manual, or automatic.

The key switch

A three-position key switch selects:

Position	State
Power off	Vehicle powered down
Manual	Manual tiller operation only
Automatic	Autonomous task execution permitted

Entering automatic mode

Turning the key to automatic is not enough on its own. The sequence requires deliberate operator action at every step (https://info.mobilerobot.com/safety-compliance/safe-deployment/operator-responsibilities/):

1. The operator creates or selects a task on the touchscreen.
2. The robot asks for confirmation to enter automatic mode.
3. The operator confirms with the physical LED start/resume button.
4. The interface instructs the operator to step away.
5. The vehicle begins autonomous operation (https://info.mobilerobot.com/documentation/user-guides/autonomous-operation/).

The operator only confirms when the environment is ready — this judgment stays human (https://info.mobilerobot.com/safety-compliance/safety-overview/human-responsibilities/). See Manual and autonomous mode safety (https://info.mobilerobot.com/safety-compliance/safety-overview/manual-and-autonomous-mode-safety/).

Leaving automatic mode

Automatic mode ends immediately when:

- the operator grabs or moves the tiller (tiller detection (https://info.mobilerobot.com/safety-compliance/safety-functions/tiller-detection/), PL c);
- an emergency-stop control is used;
- the key switch is turned to manual or power off.

See Emergency stops and manual takeover (https://info.mobilerobot.com/safety-compliance/safety-overview/emergency-stops-and-manual-takeover/).

Mode visibility

White light indicates manual mode; blue floor light strips display the protected area during automatic operation, and floor-indicator lights signal automatic mode to people nearby.

> **PRELIMINARY SPECIFICATION**
>
> Performance Levels come from the preliminary January 2026 product documentation and are subject to change.

Tiller Detection

Tiller-position detection is a certified J1600 safety function rated **Performance Level c (PL c)**. The tiller — the handle familiar from any walk-behind electric pallet jack — doubles as a safety device.

Two tiller-position switches

The safety architecture (https://info.mobilerobot.com/safety-compliance/safety-overview/safety-architecture/) includes two dedicated tiller-position switches:

- **Emergency-stop switch.** One tiller position acts as an emergency stop.
- **Manual-control switch.** Another tiller position enables manual control.

Certified detection of the tiller's position is what makes both behaviors reliable.

Instant takeover

During autonomous operation, grabbing or moving the tiller returns the vehicle to manual control immediately. There is no menu, code, or delay — immediate human intervention is central to the dual-mode (https://info.mobilerobot.com/products/j1600/dual-mode/) concept. Tiller takeover works alongside the three emergency-stop buttons and the belly button; the full set of stop controls is listed in Emergency stops and manual takeover (https://info.mobilerobot.com/safety-compliance/safety-overview/emergency-stops-and-manual-takeover/).

A familiar tool by design

One of the product's design principles (https://info.mobilerobot.com/company/about/our-approach-to-automation/) is that the tiller and manual behavior should feel like a conventional electric pallet jack, so an experienced operator needs only about 30 minutes of training. The safety design (https://info.mobilerobot.com/safety-compliance/safety-overview/how-j1600-safety-works/) builds on that familiarity: the natural reaction of reaching for the handle is also the takeover mechanism.

Related pages

- Mode selection (https://info.mobilerobot.com/safety-compliance/safety-functions/mode-selection/) — the key switch and confirmation sequence (PL c).
- Manual and autonomous mode safety (https://info.mobilerobot.com/safety-compliance/safety-overview/manual-and-autonomous-mode-safety/) — safety behavior in each mode.
- Performance levels (https://info.mobilerobot.com/safety-compliance/safety-functions/performance-levels/) — all assigned levels in one table.

> **PRELIMINARY SPECIFICATION**
>
> The assigned Performance Levels are preliminary January 2026 specifications and subject to change.

Charging Safety

Charging the J1600 is covered by a certified safety function: the **charging-current relay**, rated **Performance Level b (PL b)**. This page collects the safety-relevant facts about the battery and both charging methods.

The battery

Parameter	Value
Battery	24 V, 200 Ah
Chemistry	Lithium iron phosphate (LiFePO4)
Charging rate	About 47 percentage points per hour
Transport testing	UN Manual of Tests and Criteria, subsection 38.3 (UN 38.3)
Regulatory coverage	Regulation (EU) 2023/1542 — Batteries Regulation

LiFePO4 chemistry (https://info.mobilerobot.com/documentation/technical-reference/battery-specifications/) is part of the vehicle's industrial-use design, alongside its certified safety architecture. The battery is tested to UN 38.3 (https://info.mobilerobot.com/safety-compliance/certificates/battery-un-38-3-documentation/), the standard transport-safety test series for lithium batteries.

Charging-current relay

The charging-current relay is one of the nine certified safety functions on the Performance levels (https://info.mobilerobot.com/safety-compliance/safety-functions/performance-levels/) table. It governs the charging current path between charger and vehicle.

Manual charging

Manual charging works like charging a conventional electric pallet jack: plug in the charger during a break or when the machine is idle.

Automatic charging

With the optional automatic charger, the robot drives to the station, positions itself at the charger, and a charging interface extends to the vehicle's charging plates — no human contact with the connection is needed. This supports opportunity charging (https://info.mobilerobot.com/applications/scenarios/automatic-charging/) while the robot is not busy. Automatic charging is an advanced automation capability; when purchased, its setup is part of installation Day 1.

Related pages

- Safety architecture (https://info.mobilerobot.com/safety-compliance/safety-overview/safety-architecture/) — where the charging-current relay sits among the certified components.
- Performance levels (https://info.mobilerobot.com/safety-compliance/safety-functions/performance-levels/) — all assigned levels in one table.
- Technical specifications (https://info.mobilerobot.com/products/j1600/technical-specifications/) — full battery and power data.

> **PRELIMINARY SPECIFICATION**
>
> Performance Levels come from the preliminary January 2026 product documentation and are subject to change.

Performance Levels

A **Performance Level (PL)** describes the reliability of a safety function in a machine's control system, defined by EN ISO 13849-1 (https://info.mobilerobot.com/safety-compliance/standards/iso-13849-1/). Levels run from PL a (lowest) to PL e (highest). The J1600's certified safety functions are assigned levels from PL b to PL d.

Assigned levels

Safety function	Performance Level	Details
Braking system	PL d	Braking (https://info.mobilerobot.com/safety-compliance/safety-functions/braking/)
Emergency-stop button	PL d	Emergency stops and manual takeover (https://info.mobilerobot.com/safety-compliance/safety-overview/emergency-stops-and-manual-takeover/)
Person detection in safety field	PL d	Person detection (https://info.mobilerobot.com/safety-compliance/safety-functions/person-detection/)
Safety-field size adjustment	PL d	Safety-field adjustment (https://info.mobilerobot.com/safety-compliance/safety-functions/safety-field-adjustment/)
Speed monitoring and control	PL c	Speed monitoring (https://info.mobilerobot.com/safety-compliance/safety-functions/speed-monitoring/)
Automatic/manual mode selection	PL c	Mode selection (https://info.mobilerobot.com/safety-compliance/safety-functions/mode-selection/)
Tiller-position detection	PL c	Tiller detection (https://info.mobilerobot.com/safety-compliance/safety-functions/tiller-detection/)
Load detection	PL b	Load detection (https://info.mobilerobot.com/safety-compliance/safety-functions/load-detection/)
Charging-current relay	PL b	Charging safety (https://info.mobilerobot.com/safety-compliance/safety-functions/charging-safety/)

Reading the table correctly

- The levels apply to **individual safety functions** within the safety architecture (https://info.mobilerobot.com/safety-compliance/safety-overview/safety-architecture/) — they are not a statement that every subsystem shares the same PL.
- The highest-rated functions (PL d) are those protecting people directly: braking, emergency stop, person detection, and safety-field adjustment.

- EN ISO 13849-1:2023 appears in the J1600's preliminary compliance list (https://info.mobilerobot.com/safety-compliance/certificates/compliance-statements/) together with EN ISO 3691-4:2023 (https://info.mobilerobot.com/safety-compliance/standards/iso-3691-4/), the standard for driverless industrial trucks. See How J1600 safety works (https://info.mobilerobot.com/safety-compliance/safety-overview/how-j1600-safety-works/) for the full standards context.

PRELIMINARY SPECIFICATION

These Performance Levels come from the preliminary January 2026 product documentation and are subject to change. No certificates (https://info.mobilerobot.com/safety-compliance/certificates/), test reports, declaration numbers, or notified-body information are published here; use current product documentation for deployment decisions.

ISO 3691-4

EN ISO 3691-4:2023 is the central European safety standard for driverless industrial trucks and appears in the J1600's compliance list (https://info.mobilerobot.com/safety-compliance/certificates/compliance-statements/). This page explains what the standard covers and how it relates to the J1600.

What the standard covers

ISO 3691-4, *Industrial trucks — Safety requirements and verification — Part 4: Driverless industrial trucks and their systems*, sets safety requirements for industrial trucks that travel without an onboard or accompanying driver. It addresses, among other things:

- detection of persons in the truck's path and the protective devices used for it;
- speed control (https://info.mobilerobot.com/safety-compliance/safety-functions/speed-monitoring/) and braking in automatic operation;
- behaviour in operating zones shared with pedestrians;
- load handling and stability during automatic travel;
- warning devices and mode indication;
- verification of the safety requirements.

The EN edition is harmonized under the EU machinery requirements (https://info.mobilerobot.com/safety-compliance/standards/eu-machinery-requirements/), so conformity with it supports the presumption of conformity with the Machinery Directive's essential health and safety requirements.

How it applies to the J1600

In autonomous mode the J1600 operates as a driverless industrial truck, and its compliance list includes EN ISO 3691-4:2023. The company summarizes its position as compliance with EU and US safety requirements, especially ISO 3691-4 and ANSI/ITSDF B56.5 (https://info.mobilerobot.com/safety-compliance/standards/ansi-itsdf-b56-5/).

The requirements of the standard map directly onto the J1600's protective measures:

- a 360-degree protective field built on two 2D safety LiDAR scanners;
- speed-dependent safety fields (https://info.mobilerobot.com/safety-compliance/safety-functions/safety-field-adjustment/) that expand as travel speed increases;
- person detection (https://info.mobilerobot.com/safety-compliance/safety-functions/person-detection/) and braking (https://info.mobilerobot.com/safety-compliance/safety-functions/braking/) functions with assigned Performance Levels (see ISO 13849-1 (https://info.mobilerobot.com/safety-compliance/standards/iso-13849-1/));
- blue floor-light strips that display the current protected area;
- operator confirmation before the vehicle enters automatic mode (https://info.mobilerobot.com/safety-compliance/safety-overview/manual-and-autonomous-mode-safety/).

How these elements work together is described in How J1600 safety works (https://info.mobilerobot.com/safety-compliance/safety-overview/how-j1600-safety-works/) and the safety architecture (https://info.mobilerobot.com/safety-compliance/safety-overview/safety-architecture/).

Dual mode and the companion standard

ISO 3691-4 addresses driverless operation. The J1600 is a dual-mode (https://info.mobilerobot.com/products/j1600/dual-mode/) vehicle, so its manual, walk-behind operation falls under the companion standard ISO 3691-1 (https://info.mobilerobot.com/safety-compliance/standards/iso-3691-1/). Both parts appear in the compliance list.

> **PRELIMINARY COMPLIANCE LIST**
>
> The J1600's compliance list comes from the preliminary January 2026 product documentation and is subject to change. No certificates (https://info.mobilerobot.com/safety-compliance/certificates/), test reports, declaration numbers, or notified-body information are published here; use current product documentation for deployment decisions.

ISO 13849-1

EN ISO 13849-1:2023 is the machinery standard behind the Performance Levels (PL) assigned to the J1600's safety functions. It appears in the J1600's compliance list (https://info.mobilerobot.com/safety-compliance/certificates/compliance-statements/).

What the standard covers

ISO 13849-1, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design*, defines how the parts of a control system that perform safety functions must be designed and evaluated. Its core concept is the **Performance Level**: a measure of how reliably a safety function can be expected to perform, running from PL a (lowest) to PL e (highest). The required level for each function follows from the severity of possible injury, the frequency of exposure, and the possibility of avoiding the hazard.

How it applies to the J1600

The J1600's product documentation assigns Performance Levels to nine safety functions:

Safety function	Performance Level
Braking system	PL d
Emergency-stop button	PL d
Person detection in safety field	PL d
Safety-field size adjustment	PL d
Speed monitoring and control	PL c
Automatic/manual mode selection	PL c
Tiller-position detection	PL c
Load detection	PL b
Charging-current relay	PL b

The functions that protect people directly — braking (https://info.mobilerobot.com/safety-compliance/safety-functions/braking/), emergency stop, person detection (https://info.mobilerobot.com/safety-compliance/safety-functions/person-detection/), and safety-field adjustment (https://info.mobilerobot.com/safety-compliance/safety-functions/safety-field-adjustment/) — carry the highest assigned level, PL d. Each function is described in detail under Performance Levels (https://info.mobilerobot.com/safety-compliance/safety-functions/performance-levels/) and the surrounding safety-function pages.

The levels apply to individual safety functions within the safety architecture (https://info.mobilerobot.com/safety-compliance/safety-overview/safety-architecture/); they are not a statement that every subsystem shares the same PL.

Relationship to other standards

ISO 13849-1 defines *how reliable* a safety function must be; product standards such as ISO 3691-4 (https://info.mobilerobot.com/safety-compliance/standards/iso-3691-4/) define *which* safety functions a driverless industrial truck needs. The risk assessment that connects hazards to required Performance Levels follows the method of ISO 12100 (https://info.mobilerobot.com/safety-compliance/standards/iso-12100/).

PRELIMINARY COMPLIANCE LIST

The Performance Levels above come from the preliminary January 2026 product documentation and are subject to change. No certificates (https://info.mobilerobot.com/safety-compliance/certificates/) or test reports are published here; use current product documentation for deployment decisions.

ISO 12100

EN ISO 12100:2010 is the foundational machinery-safety standard in the J1600's compliance list (https://info.mobilerobot.com/safety-compliance/certificates/compliance-statements/). It defines the risk-assessment and risk-reduction method on which the other safety standards build.

What the standard covers

ISO 12100, *Safety of machinery — General principles for design — Risk assessment and risk reduction*, describes how a machine designer identifies hazards, estimates and evaluates risks, and reduces them. Its three-step method, applied in order, is:

1. **Inherently safe design** — remove the hazard or reduce it by design choices.
2. **Safeguarding and protective measures** — guard against risks that cannot be designed out.
3. **Information for use** — warn about and document residual risks that remain after the first two steps.

How it applies to the J1600

The J1600's layered protection (https://info.mobilerobot.com/safety-compliance/safety-overview/how-j1600-safety-works/) follows this logic. Design measures such as operator-confirmed mode changes and floor-level autonomous delivery are complemented by safeguarding — the 360-degree protective field, two 2D safety LiDAR scanners, emergency stops, and safety functions with assigned Performance Levels under ISO 13849-1 (https://info.mobilerobot.com/safety-compliance/standards/iso-13849-1/) — and by documented operating limits and residual risks (https://info.mobilerobot.com/safety-compliance/safe-deployment/residual-risks/).

The same method reappears at deployment: the pre-installation phase of the commissioning package includes a risk assessment of the customer site and the selected tasks and loads. See Site risk assessment (https://info.mobilerobot.com/safety-compliance/safe-deployment/site-risk-assessment/) and Commissioning and validation (https://info.mobilerobot.com/safety-compliance/safe-deployment/commissioning-and-validation/).

Relationship to other standards

ISO 12100 supplies the general method; the product-specific requirements for the J1600's two operating modes come from ISO 3691-4 (https://info.mobilerobot.com/safety-compliance/standards/iso-3691-4/) (driverless operation) and ISO 3691-1 (https://info.mobilerobot.com/safety-compliance/standards/iso-3691-1/) (manual operation). All three are harmonized under the EU machinery requirements (https://info.mobilerobot.com/safety-compliance/standards/eu-machinery-requirements/).

PRELIMINARY COMPLIANCE LIST

The J1600's compliance list comes from the preliminary January 2026 product documentation and is subject to change. Use current product documentation for deployment decisions.

ISO 3691-1

EN ISO 3691-1:2015+A1:2020 appears in the J1600's compliance list (https://info.mobilerobot.com/safety-compliance/certificates/compliance-statements/). It is the safety standard for self-propelled industrial trucks operated by a person — the standard that covers the J1600 when it is used manually.

What the standard covers

ISO 3691-1, *Industrial trucks — Safety requirements and verification — Part 1: Self-propelled industrial trucks, other than driverless trucks, variable-reach trucks and burden-carrier trucks*, sets safety requirements for powered industrial trucks under operator control, including pedestrian-controlled (walk-behind) trucks such as electric pallet trucks. It addresses truck construction, controls, braking (https://info.mobilerobot.com/safety-compliance/safety-functions/braking/), stability, load handling, and the verification of these requirements.

How it applies to the J1600

In manual mode the J1600 handles like a conventional walk-behind electric pallet jack: the operator controls travel and lift with the tiller, picks and drops pallets at up to 1,600 mm, and manoeuvres in situations that need judgment. That mode of operation is the domain of ISO 3691-1.

Because the J1600 is a dual-mode (https://info.mobilerobot.com/products/j1600/dual-mode/) vehicle, both parts of the standard family apply:

Operating mode	Applicable standard
Manual (tiller-controlled)	ISO 3691-1 (https://info.mobilerobot.com/safety-compliance/standards/iso-3691-1/) — self-propelled industrial trucks
Autonomous (driverless)	ISO 3691-4 (https://info.mobilerobot.com/safety-compliance/standards/iso-3691-4/) — driverless industrial trucks and their systems

The transition between the two modes (https://info.mobilerobot.com/documentation/getting-started/manual-and-autonomous-modes/) is itself safeguarded: automatic/manual mode

selection (https://info.mobilerobot.com/safety-compliance/safety-functions/mode-selection/) and tiller-position detection (https://info.mobilerobot.com/safety-compliance/safety-functions/tiller-detection/) are safety functions with assigned Performance Levels under ISO 13849-1 (https://info.mobilerobot.com/safety-compliance/standards/iso-13849-1/), and the operator must confirm entry into automatic mode.

The US counterpart for operator-controlled trucks is ANSI/ITSDF B56.1 (https://info.mobilerobot.com/safety-compliance/standards/ansi-itsdf-b56-1/).

PRELIMINARY COMPLIANCE LIST

The J1600's compliance list comes from the preliminary January 2026 product documentation and is subject to change. Use current product documentation for deployment decisions.

ANSI/ITSDF B56.5

ANSI/ITSDF B56.5-2024 appears in the J1600's compliance list (https://info.mobilerobot.com/safety-compliance/certificates/compliance-statements/). It is the United States safety standard for driverless industrial vehicles — the American counterpart to ISO 3691-4 (https://info.mobilerobot.com/safety-compliance/standards/iso-3691-4/).

What the standard covers

ANSI/ITSDF B56.5, *Safety Standard for Driverless, Automatic Guided Industrial Vehicles and Automated Functions of Manned Industrial Vehicles*, is maintained by the Industrial Truck Standards Development Foundation (ITSDF) and accredited by the American National Standards Institute (ANSI). It sets safety requirements for vehicles that operate without a driver, covering areas such as object and personnel detection, braking, speed control, warning indication, and the responsibilities of manufacturers and users.

The 2024 edition is the version named in the J1600's compliance list.

How it applies to the J1600

In autonomous mode the J1600 operates as a driverless industrial vehicle, so B56.5 is the reference standard for its automatic operation in the US market. The company summarizes its compliance position as meeting EU and US safety requirements, especially ISO 3691-4 and ANSI/ITSDF B56.5.

The protective measures that address these requirements are the same layered system described in How J1600 safety works (https://info.mobilerobot.com/safety-compliance/safety-overview/how-j1600-safety-works/): a 360-degree protective field from two 2D safety LiDAR scanners, speed-dependent field adjustment (https://info.mobilerobot.com/safety-compliance/safety-functions/safety-field-adjustment/), person detection (https://info.mobilerobot.com/safety-compliance/safety-functions/person-detection/) and braking (https://info.mobilerobot.com/safety-compliance/safety-functions/braking/) with assigned Performance Levels, emergency stops, and operator-confirmed entry into automatic mode.

For the J1600's manual mode, the corresponding US standard is ANSI/ITSDF B56.1 (https://info.mobilerobot.com/safety-compliance/standards/ansi-itsdf-b56-1/).

PRELIMINARY COMPLIANCE LIST

The J1600's compliance list comes from the preliminary January 2026 product documentation and is subject to change. No certificates (https://info.mobilerobot.com/safety-compliance/certificates/), test reports, or country-specific approvals are published here; use current product documentation for deployment decisions.

ANSI/ITSDF B56.1

ANSI/ITSDF B56.1-2020 appears in the J1600's compliance list (https://info.mobilerobot.com/safety-compliance/certificates/compliance-statements/). It is the United States safety standard for operator-controlled powered industrial trucks — the standard that covers the J1600 when a person drives it manually.

What the standard covers

ANSI/ITSDF B56.1, *Safety Standard for Low Lift and High Lift Trucks*, is maintained by the Industrial Truck Standards Development Foundation (ITSDF) and accredited by the American National Standards Institute (ANSI). It sets safety requirements for powered industrial trucks under operator control, including walk-behind (pedestrian-controlled) trucks, and addresses both manufacturer obligations (design, construction, controls, braking (https://info.mobilerobot.com/safety-compliance/safety-functions/braking/), stability) and user obligations (operation, maintenance, operator training).

The 2020 edition is the version named in the J1600's compliance list.

How it applies to the J1600

In manual mode the J1600 is a walk-behind electric pallet jack: the operator steers with the tiller and can pick and drop pallets at up to 1,600 mm. As a low lift truck under operator control, that use falls within the scope of B56.1.

The division of standards mirrors the vehicle's dual mode (https://info.mobilerobot.com/products/j1600/dual-mode/):

Operating mode	US standard	European standard
Manual (tiller-controlled)	ANSI/ITSDF B56.1-2020	EN ISO 3691-1 (https://info.mobilerobot.com/safety-compliance/standards/iso-3691-1/)
Autonomous (driverless)	ANSI/ITSDF B56.5-2024 (https://info.mobilerobot.com/safety-compliance/standards/ansi-itsdf-b56-5/)	EN ISO 3691-4 (https://info.mobilerobot.com/safety-compliance/standards/iso-3691-4/)

Operator responsibilities during manual operation — pallet pickup, judgment-heavy handling, and immediate takeover — are described in Operator responsibilities (https://info.mobilerobot.com/safety-compliance/safe-deployment/operator-responsibilities/).

PRELIMINARY COMPLIANCE LIST

The J1600's compliance list comes from the preliminary January 2026 product documentation and is subject to change. Use current product documentation for deployment decisions.

EU Machinery Requirements

The J1600 is CE marked, and Directive 2006/42/EC — the Machinery Directive — heads its compliance list (https://info.mobilerobot.com/safety-compliance/certificates/compliance-statements/). This page explains what the directive requires and how the J1600's standards list fits into it.

What the Machinery Directive requires

Directive 2006/42/EC sets the essential health and safety requirements that machinery must meet before it can be placed on the market in the European Union. For a manufacturer this means:

- performing a risk assessment and designing the machine to meet the essential requirements;
- compiling a technical file that documents conformity;
- issuing an EU Declaration of Conformity;
- affixing the CE marking.

Machinery designed to **harmonized standards** — European standards published in the Official Journal of the EU — benefits from a presumption of conformity with the requirements those standards cover.

The J1600's conformity basis

The harmonized standards in the J1600's compliance list address the machinery requirements from complementary angles:

Standard	Role
EN ISO 12100:2010 (https://info.mobilerobot.com/safety-compliance/standards/iso-12100/)	General risk-assessment and risk-reduction method
EN ISO 13849-1:2023 (https://info.mobilerobot.com/safety-compliance/standards/iso-13849-1/)	Reliability of safety-related control functions (Performance Levels)
EN ISO 3691-1:2015+A1:2020 (https://info.mobilerobot.com/safety-compliance/standards/iso-3691-1/)	Safety of self-propelled industrial trucks — manual mode
EN ISO 3691-4:2023 (https://info.mobilerobot.com/safety-compliance/standards/iso-3691-4/)	Safety of driverless industrial trucks — autonomous mode

The Machinery Directive is one of several EU acts in the compliance list; the others cover electromagnetic compatibility, radio equipment, hazardous substances, and batteries. See EMC, RED, RoHS and Battery Regulations (https://info.mobilerobot.com/safety-compliance/standards/emc-red-rohs-and-battery-regulations/).

CE marking and documentation

The CE marking on the J1600 states conformity with the applicable EU legislation. The formal document behind it is the CE Declaration of Conformity (https://info.mobilerobot.com/safety-compliance/certificates/ce-declaration-of-conformity/).

PRELIMINARY COMPLIANCE LIST

The J1600's compliance list comes from the preliminary January 2026 product documentation and is subject to change. No declaration numbers or notified-body information are published here; use current product documentation for deployment decisions.

EMC, RED, RoHS and Battery Regulations

Beyond the Machinery Directive (https://info.mobilerobot.com/safety-compliance/standards/eu-machinery-requirements/), the J1600's compliance list (https://info.mobilerobot.com/safety-compliance/certificates/compliance-statements/) names three further EU directives and one EU regulation. Together they cover the vehicle's electronics, radio functions, materials, and battery.

EMC Directive 2014/30/EU

The Electromagnetic Compatibility (EMC) Directive requires that equipment neither generates electromagnetic disturbance that affects other equipment nor is unduly affected by such disturbance. It applies to the J1600's electrical and electronic systems (https://info.mobilerobot.com/documentation/technical-reference/electrical-specifications/), which include the drive electronics, the industrial NVIDIA Jetson AI computer, sensors, and the 15-inch touchscreen interface.

Radio Equipment Directive 2014/53/EU

The Radio Equipment Directive (RED) sets requirements for equipment that transmits or receives radio waves, covering safety, electromagnetic compatibility, and efficient spectrum use. It is relevant to the J1600's wireless connectivity: Wi-Fi is optional for basic use (https://info.mobilerobot.com/documentation/installation/network-and-wi-fi-requirements/) but available for connected features and advanced integrations.

RoHS Directive 2011/65/EU

The RoHS Directive (Restriction of Hazardous Substances) limits the use of certain hazardous substances — such as lead, mercury, and cadmium — in electrical and electronic equipment placed on the EU market. It applies to the J1600's electronics and electrical components.

Batteries Regulation (EU) 2023/1542

The EU Batteries Regulation sets requirements for batteries placed on the EU market, covering safety, sustainability, and labelling across a battery's life cycle. It applies to the J1600's 24 V, 200 Ah lithium iron phosphate (LiFePO4) battery (https://info.mobilerobot.com/documentation/technical-reference/battery-specifications/).

Battery transport is addressed separately by the UN 38.3 test regime; see Battery UN 38.3 Documentation (https://info.mobilerobot.com/safety-compliance/certificates/battery-un-38-3-documentation/).

Where these fit in the compliance list

EU act	Subject
Directive 2006/42/EC	Machinery safety (https://info.mobilerobot.com/safety-compliance/standards/eu-machinery-requirements/)
Directive 2014/30/EU	Electromagnetic compatibility
Directive 2014/53/EU	Radio equipment
Directive 2011/65/EU	Restriction of hazardous substances
Regulation (EU) 2023/1542	Batteries

All five underpin the J1600's CE marking, documented in the CE Declaration of Conformity (https://info.mobilerobot.com/safety-compliance/certificates/ce-declaration-of-conformity/).

PRELIMINARY COMPLIANCE LIST

The J1600's compliance list comes from the preliminary January 2026 product documentation and is subject to change. Use current product documentation for deployment decisions.

CE Declaration of Conformity

The J1600 is CE marked. This page explains what stands behind that marking and where to direct requests for the formal declaration document.

What a Declaration of Conformity is

An EU Declaration of Conformity (DoC) is the manufacturer's formal, signed statement that a product meets the EU legislation that applies to it. It identifies the product, lists the applicable directives and regulations, names the harmonized standards used, and takes legal responsibility for conformity. Affixing the CE marking requires that this declaration exists.

The J1600's conformity basis

The J1600's compliance list (https://info.mobilerobot.com/safety-compliance/certificates/compliance-statements/) names the following EU acts and standards:

Category	Reference
Machinery safety	Directive 2006/42/EC — EU Machinery Requirements (https://info.mobilerobot.com/safety-compliance/standards/eu-machinery-requirements/)
Electromagnetic compatibility	Directive 2014/30/EU
Radio equipment	Directive 2014/53/EU
Hazardous substances	Directive 2011/65/EU (RoHS)
Batteries	Regulation (EU) 2023/1542
Harmonized standards	EN ISO 3691-4:2023 (https://info.mobilerobot.com/safety-compliance/standards/iso-3691-4/), EN ISO 13849-1:2023 (https://info.mobilerobot.com/safety-compliance/standards/iso-13849-1/), EN ISO 12100:2010 (https://info.mobilerobot.com/safety-compliance/standards/iso-12100/), EN ISO 3691-1:2015+A1:2020 (https://info.mobilerobot.com/safety-compliance/standards/iso-3691-1/)

Details on the non-machinery acts are in EMC, RED, RoHS and Battery Regulations (https://info.mobilerobot.com/safety-compliance/standards/emc-red-rohs-and-battery-regulations/).

Obtaining the declaration document

The Knowledge Center does not publish the declaration itself, declaration numbers, or notified-body information. For the current Declaration of Conformity and related conformity documentation, contact your local partner or the company at hello@mobilerobot.com.

> **PRELIMINARY COMPLIANCE LIST**
>
> The compliance list above comes from the preliminary January 2026 product documentation and is subject to change. Use current product documentation for deployment decisions.

Certificates

Two kinds of certificate come up in connection with the J1600: product-conformity documentation and the independent recognition the vehicle earned during the 2026 IFOY process. This page explains both and what is — and is not — published.

Conformity documentation

The J1600's conformity with EU legislation is documented through the manufacturer's CE Declaration of Conformity (https://info.mobilerobot.com/safety-compliance/certificates/ce-declaration-of-conformity/), based on the directives, regulation, and harmonized standards in the compliance list (https://info.mobilerobot.com/safety-compliance/certificates/compliance-statements/).

The Knowledge Center does not publish product-safety certificates, notified-body certificates, declaration numbers, or country-specific approvals. For current conformity documentation, contact your local partner or hello@mobilerobot.com.

Best in Intralogistics Certificate 2026

The J1600 received the **Best in Intralogistics** certificate (https://info.mobilerobot.com/newsroom/awards/best-in-intralogistics/) on 16 April 2026 at TEST CAMP INTRALOGISTICS (https://info.mobilerobot.com/newsroom/events/test-camp/) in Dortmund's Westfalenhalle. The certificate recognizes IFOY finalists that successfully complete the three-stage IFOY Audit:

1. the practical IFOY Test;
2. the scientific IFOY Innovation Check (https://info.mobilerobot.com/newsroom/awards/ifoy-innovation-check/), involving research institutions including Fraunhofer IML and Fraunhofer IPA;
3. assessment by the independent international jury.

Performance and application testing covered efficiency, sustainability, safety, and usability. The Chairman of the Board of the VDMA Materials Handling and Intralogistics Association formally presented the certificate.

The certificate preceded the final award: on 26 June 2026 the J1600 was announced as IFOY Industrial Truck of the Year 2026 (https://info.mobilerobot.com/newsroom/awards/ifoy-award-2026/). Coverage of the award and the audit is in the Newsroom (https://info.mobilerobot.com/category/newsroom/).

AWARD CERTIFICATE VERSUS COMPLIANCE CERTIFICATE

The Best in Intralogistics certificate documents independent testing and jury recognition. It is not a regulatory approval and does not replace the conformity documentation described above.

Compliance Statements

This page consolidates the J1600's compliance position in one place. The short version: the J1600 is CE marked and complies with EU and US safety requirements, especially ISO 3691-4 and ANSI/ITSDF B56.5.

The compliance list

European directives and regulation

- Directive 2006/42/EC — Machinery Directive (EU Machinery Requirements (https://info.mobilerobot.com/safety-compliance/standards/eu-machinery-requirements/))
- Directive 2014/30/EU — EMC Directive
- Directive 2014/53/EU — Radio Equipment Directive (RED)
- Directive 2011/65/EU — RoHS
- Regulation (EU) 2023/1542 — Batteries Regulation

The non-machinery acts are explained in EMC, RED, RoHS and Battery Regulations (https://info.mobilerobot.com/safety-compliance/standards/emc-red-rohs-and-battery-regulations/).

Standards

- EN ISO 3691-4:2023 (https://info.mobilerobot.com/safety-compliance/standards/iso-3691-4/) — driverless industrial trucks (autonomous mode)
- EN ISO 13849-1:2023 (https://info.mobilerobot.com/safety-compliance/standards/iso-13849-1/) — safety-related control systems and Performance Levels
- EN ISO 12100:2010 (https://info.mobilerobot.com/safety-compliance/standards/iso-12100/) — risk assessment and risk reduction
- EN ISO 3691-1:2015+A1:2020 (https://info.mobilerobot.com/safety-compliance/standards/iso-3691-1/) — self-propelled industrial trucks (manual mode)
- ANSI/ITSDF B56.5-2024 (https://info.mobilerobot.com/safety-compliance/standards/ansi-itsdf-b56-5/) — driverless industrial vehicles, US
- ANSI/ITSDF B56.1-2020 (https://info.mobilerobot.com/safety-compliance/standards/ansi-itsdf-b56-1/) — low lift and high lift trucks, US

Battery transport testing

- UN Manual of Tests and Criteria, subsection 38.3 (UN 38.3) — see Battery UN 38.3 Documentation (https://info.mobilerobot.com/safety-compliance/certificates/battery-un-38-3-documentation/)

How to read broader claims

The shorthand "complies with EU and US safety requirements" summarizes this list. General references to worldwide compliance or to OSHA do not add named certifications beyond the list above. For deployment in a specific country, confirm the applicable requirements with the company or your local partner.

Certificates and formal documents

Certificates (https://info.mobilerobot.com/safety-compliance/certificates/), test reports, declaration numbers, notified-body information, and country-specific approvals are not available in the Knowledge Center. The formal document behind the CE marking is described under CE Declaration of Conformity (https://info.mobilerobot.com/safety-compliance/certificates/ce-declaration-of-conformity/).

> **PRELIMINARY COMPLIANCE LIST**
>
> The compliance list is preliminary (January 2026) and subject to change. Use current product documentation for deployment decisions.

Battery UN 38.3 Documentation

The J1600's compliance list (https://info.mobilerobot.com/safety-compliance/certificates/compliance-statements/) includes UN 38.3, the international test regime for transporting lithium batteries. This page explains what UN 38.3 is and where to direct requests for transport documentation.

What UN 38.3 is

UN 38.3 is subsection 38.3 of the UN *Manual of Tests and Criteria*. Lithium cells and batteries must pass its test series before they may be transported, whether installed in equipment or shipped separately. The tests subject cells and batteries to transport conditions such as altitude simulation, thermal cycling, vibration, shock, external short circuit, and overcharge.

Why it matters for the J1600

The J1600 runs on a 24 V, 200 Ah lithium iron phosphate (LiFePO4) battery (https://info.mobilerobot.com/documentation/technical-reference/battery-specifications/). Shipping a vehicle with a lithium battery falls under dangerous-goods transport rules, and carriers and freight forwarders commonly ask for evidence of UN 38.3 testing before accepting such a shipment. The J1600's compliance list names UN 38.3 as its battery transport-testing reference.

The battery's place in the wider regulatory picture — including the EU Batteries Regulation (EU) 2023/1542 — is described in EMC, RED, RoHS and Battery Regulations (https://info.mobilerobot.com/safety-compliance/standards/emc-red-rohs-and-battery-regulations/).

Obtaining transport documentation

The Knowledge Center does not publish UN 38.3 test summaries or test reports. For current battery transport documentation, contact your local partner or the company at hello@mobilerobot.com.

PRELIMINARY COMPLIANCE LIST

The compliance list comes from the preliminary January 2026 product documentation and is subject to change. Use current product documentation for shipping and deployment decisions.

Site Risk Assessment

Before the J1600 goes live (https://info.mobilerobot.com/documentation/installation/deployment-checklist/) at a site, the site, the selected tasks, and the loads should be assessed for risk. This page describes what that assessment involves and which factors matter for a dual-mode (https://info.mobilerobot.com/products/j1600/dual-mode/) pallet jack.

Where risk assessment fits

Risk assessment is the method at the heart of ISO 12100 (https://info.mobilerobot.com/safety-compliance/standards/iso-12100/), which appears in the J1600's compliance list (https://info.mobilerobot.com/safety-compliance/certificates/compliance-statements/): identify hazards, evaluate risks, and reduce them in order of priority. The vehicle's built-in safeguards handle the machine side; the site assessment handles everything the machine cannot know about your facility.

When the installation and commissioning package (https://info.mobilerobot.com/safety-compliance/safe-deployment/commissioning-and-validation/) is purchased, its pre-installation phase covers this formally:

- a feasibility check for all selected tasks and loads;
- a risk assessment;
- a project plan.

Site factors to evaluate

The J1600's operating limits define what to check:

Factor	What to verify	Details
Floors	Level routes for autonomous travel (0% automatic gradeability), bumps up to 25 mm, gaps up to 20 mm, TR34 FM3 / FF 25 / FL 20 flatness	Floor and environment requirements (https://info.mobilerobot.com/safety-compliance/safe-deployment/floor-and-environment-requirements/)
Environment	Indoor use, 5–40°C, 20–80% relative humidity non-condensing, IP21 exposure limits	Floor and environment requirements (https://info.mobilerobot.com/safety-compliance/safe-deployment/floor-and-environment-requirements/)
Loads	Open-base carriers within 1,250 × 1,250 mm, up to 1,600 kg and 1,700 mm load height	Approved loads and pallets (https://info.mobilerobot.com/safety-compliance/safe-deployment/approved-loads-and-pallets/)
Manual-only areas	Slopes, dock plates, and ramps stay manual tasks; manual gradeability is 5% unloaded and 3% at full load	Operator responsibilities (https://info.mobilerobot.com/safety-compliance/safe-deployment/operator-responsibilities/)
Traffic	Routes shared with pedestrians and other vehicles, congestion points, and where the speed-dependent protective field needs room	How J1600 safety works (https://info.mobilerobot.com/safety-compliance/safety-overview/how-j1600-safety-works/)
Charging	Placement and setup of the manual or automatic charger	Charger safety (https://info.mobilerobot.com/safety-compliance/safe-deployment/charger-safety/)

Residual responsibility

A completed risk assessment does not remove the operator from the loop. Task initiation, pallet pickup, and judgment-heavy handling remain human responsibilities (https://info.mobilerobot.com/safety-compliance/safety-overview/human-responsibilities/) by design, and some risks remain after safeguarding — see Residual risks (https://info.mobilerobot.com/safety-compliance/safe-deployment/residual-risks/).

USE CURRENT PRODUCT DOCUMENTATION

No safety-distance curves, stopping distances, or validation reports are published in the Knowledge Center. Base deployment decisions on the current product documentation supplied with the vehicle.

Floor and Environment Requirements

The J1600 (https://info.mobilerobot.com/products/j1600/overview/) is designed for indoor, floor-to-floor pallet transport. This page lists the floor and environmental limits a site must meet.

Floor requirements

Parameter	Metric	Imperial/other
Gradeability, automatic mode	0°	0%
Gradeability, manual mode, no load	2.86°	5%
Gradeability, manual mode, full load	1.72°	3%
Maximum traversable bump height	25 mm	1 in
Maximum traversable gap width	20 mm	0.8 in
Floor flatness/levelness	TR34 FM3	FF 25 / FL 20
Ground clearance	30 mm	1.2 in

Autonomous travel is a level-floor application: automatic gradeability is 0%. Slopes, ramps, and dock plates remain manual tasks, within the manual-mode limits above. Plan autonomous routes accordingly during the site risk assessment (https://info.mobilerobot.com/safety-compliance/safe-deployment/site-risk-assessment/).

Environmental requirements

Parameter	Metric	Imperial/other
Minimum operating temperature	5°C	41°F
Maximum operating temperature	40°C	104°F
Relative humidity	20–80%	non-condensing
Ingress protection	IP21	protected against objects over 12.5 mm and vertically dripping water

IP21 means the vehicle is protected against solid objects larger than 12.5 mm and vertically dripping water — it is an indoor rating, not protection against wash-down, spray, or outdoor conditions.

Real-world floors

The company validates the J1600 under intentionally imperfect conditions at its Copenhagen test and demo facility (https://info.mobilerobot.com/company/locations/test-and-demonstration-facility/), including uneven flooring and water-filled test loads. The limits on this page still apply to production deployments.

No infrastructure changes are required within these limits: the J1600 navigates by 3D LiDAR SLAM (https://info.mobilerobot.com/products/j1600/navigation-and-obstacle-avoidance/) without tracks, wires, reflectors, or building modifications.

Related requirements

- Load and carrier limits: Approved loads and pallets (https://info.mobilerobot.com/safety-compliance/safe-deployment/approved-loads-and-pallets/)
- Full specification table: J1600 technical specifications (https://info.mobilerobot.com/products/j1600/technical-specifications/)
- Validation at go-live: Commissioning and validation (https://info.mobilerobot.com/safety-compliance/safe-deployment/commissioning-and-validation/)

PRELIMINARY SPECIFICATIONS

These January 2026 specifications are preliminary and subject to change. Use current product documentation for deployment decisions.

Approved Loads and Pallets

The J1600 moves pallets and other forkable load carriers within a defined envelope. This page sets out the limits and the judgment calls that remain with the operator.

The open-base requirement

The J1600 requires an **open-base carrier with no bottom deck board** so its forks can enter. Fork geometry: 1,150 mm long, 180 mm wide, 60 mm thick, with 680 mm outer and 320 mm inner fork distance.

Load envelope

Parameter	Limit
Maximum rated payload	1,600 kg / about 3,500 lb
Maximum pallet/load length, including overhang	1,250 mm / 49 in
Maximum pallet/load width, including overhang	1,250 mm / 49 in
Maximum load height from floor	1,700 mm / 67 in

The exact maximum envelope is 1,250 mm; some shorter product summaries round it to 1.2 m.

Supported carrier types

Carrier	Support
EPAL Euro Pallet	Supported
EPAL 3	Supported
EPAL 6	Supported
GMA pallets	All GMA pallets with an open base
Custom carriers	Any forkable open-base carrier within the size limits

Beyond standard pallets, demonstrated examples include open cages and barrels (https://info.mobilerobot.com/applications/use-cases/open-cages-and-alternative-load-carriers/). Compatibility depends on base geometry, size, stability — and operator judgment.

Where judgment applies

Pallet pickup is always manual (https://info.mobilerobot.com/applications/scenarios/manual-pickup-and-autonomous-delivery/), which keeps a person's assessment in the loop for exactly the cases that need it: damaged pallets, top-heavy or leaning loads, loose shrink wrap, and sensitive or unstable goods (https://info.mobilerobot.com/applications/use-cases/sensitive-or-unstable-loads/). Manual mode also allows picks and drops at up to 1,600 mm, while autonomous delivery is at floor level. See Operator responsibilities (https://info.mobilerobot.com/safety-compliance/safe-deployment/operator-responsibilities/).

> ⚠ **NO BLANKET APPROVAL**
>
> There is no blanket approval for every carrier or for hazardous materials. Assess non-standard carriers and critical loads case by case as part of the site risk assessment (https://info.mobilerobot.com/safety-compliance/safe-deployment/site-risk-assessment/).

Related pages

- Load detection is a monitored safety function: see Load detection (https://info.mobilerobot.com/safety-compliance/safety-functions/load-detection/).

- Full vehicle dimensions and specifications: J1600 technical specifications (https://info.mobilerobot.com/products/j1600/technical-specifications/).

Charger Safety

The J1600 charges either manually or through an optional automatic charging station (https://info.mobilerobot.com/products/chargers-and-accessories/automatic-charger/). This page covers the safety-relevant aspects of both.

The battery

The J1600 uses a 24 V, 200 Ah lithium iron phosphate (LiFePO4) battery (https://info.mobilerobot.com/documentation/technical-reference/battery-specifications/). Charging is monitored by a dedicated safety function: the **charging-current relay**, assigned Performance Level PL b under ISO 13849-1 (https://info.mobilerobot.com/safety-compliance/standards/iso-13849-1/). Details of the function are on the Charging safety (https://info.mobilerobot.com/safety-compliance/safety-functions/charging-safety/) page.

Battery transport testing is covered by UN 38.3 — see Battery UN 38.3 Documentation (https://info.mobilerobot.com/safety-compliance/certificates/battery-un-38-3-documentation/).

Manual charging

Manual charging works the way operators of a conventional electric pallet jack expect: plug in the charger during a break or whenever the machine is idle. Charging restores approximately 47 percentage points of charge per hour.

Automatic charging

With the optional automatic charger, the robot drives to the station, positions itself at the charger, and a charging interface extends to the vehicle's charging plates. No person handles connectors, and the robot can opportunity-charge (https://info.mobilerobot.com/applications/scenarios/automatic-charging/) whenever it is not busy.

Two points matter for safe setup:

- Automatic charging is an advanced automation capability, and its station placement (https://info.mobilerobot.com/documentation/installation/charger-installation/)

becomes part of the robot's autonomous routes — include it in the site risk assessment (https://info.mobilerobot.com/safety-compliance/safe-deployment/site-risk-assessment/).

- When purchased with the installation and commissioning package (https://info.mobilerobot.com/safety-compliance/safe-deployment/commissioning-and-validation/), automatic-charging setup is performed on Day 1 by the commissioning team.

Charging and runtime figures

Parameter	Value
Charging rate	approximately 47 percentage points per hour
Drain, driving fully loaded	approximately 13% per hour
Drain, driving unloaded	approximately 12% per hour
Drain, standby	approximately 2% per hour

Runtime exceeds eight hours in a typical duty cycle. See J1600 technical specifications (https://info.mobilerobot.com/products/j1600/technical-specifications/) for the full battery data.

USE CURRENT PRODUCT DOCUMENTATION

Follow the charging instructions in the current product documentation supplied with the vehicle and charger. The Knowledge Center does not replace the product manual.

Operator Responsibilities

The J1600 is built around human-in-the-loop automation: the operator keeps authority over what the robot does and when. This page lists what that means in daily operation.

Core responsibilities

- **Initiate every task.** Autonomous work (https://info.mobilerobot.com/documentation/user-guides/autonomous-operation/) starts only when a person selects or creates a task on the touchscreen.
- **Pick up pallets manually.** Pallet pickup is always manual (https://info.mobilerobot.com/applications/scenarios/manual-pickup-and-autonomous-delivery/). The operator judges pallet condition, load stability, and the approach before lifting.
- **Confirm entry into automatic mode (https://info.mobilerobot.com/safety-compliance/safety-overview/manual-and-autonomous-mode-safety/).** The robot asks for confirmation, and the operator confirms with the physical start/resume button.
- **Step clear before autonomous travel.** The interface instructs the operator to step away before the vehicle starts.
- **Take over when conditions require it.** Grabbing or moving the tiller returns the vehicle to manual control immediately; emergency stops are always available. See Emergency stops and manual takeover (https://info.mobilerobot.com/safety-compliance/safety-overview/emergency-stops-and-manual-takeover/).
- **Select the operating mode deliberately.** A three-position key switch (https://info.mobilerobot.com/safety-compliance/safety-functions/mode-selection/) selects power-off, manual-only, or automatic mode.

Judgment calls that stay with the operator

The division of work is deliberate: the robot automates repetitive travel, and the operator handles everything that needs context (https://info.mobilerobot.com/documentation/user-guides/operator-manual/) —

- spotting damaged pallets, broken boards, or protruding nails before lifting;
- judging top-heavy, leaning, or poorly stacked loads (https://info.mobilerobot.com/applications/use-cases/sensitive-or-unstable-loads/);

- tucking away loose shrink-wrap tails before they snag;
- locating pallets that are not exactly where the system expects them;
- catching leaking or damaged goods before delivery;
- handling dock plates, ramps, and slopes manually — automatic gradeability is 0%;
- improvising a route through congested areas;
- reprioritizing urgent deliveries.

The reasoning behind this split is described under Human-in-the-loop automation (https://info.mobilerobot.com/documentation/concepts/human-in-the-loop-automation/), and the safety dimension under Human responsibilities (https://info.mobilerobot.com/safety-compliance/safety-overview/human-responsibilities/).

Training

About 30 minutes of training (https://info.mobilerobot.com/documentation/getting-started/operator-training/) is sufficient for an existing electric-pallet-jack operator. The vehicle carries an on-screen tutorial, and the commissioning package (https://info.mobilerobot.com/safety-compliance/safe-deployment/commissioning-and-validation/) adds group training plus individual hands-on practice for up to six operators.

Boundaries to respect

Operators should keep tasks within the vehicle's approved envelope: approved loads and pallets (https://info.mobilerobot.com/safety-compliance/safe-deployment/approved-loads-and-pallets/), floor and environment requirements (https://info.mobilerobot.com/safety-compliance/safe-deployment/floor-and-environment-requirements/), and the site rules established by the site risk assessment (https://info.mobilerobot.com/safety-compliance/safe-deployment/site-risk-assessment/).

> **OPERATOR AUTHORITY IS A DESIGN PRINCIPLE, NOT A FALLBACK**
>
> Human control complements the safety system and its certified components — independent safety controller, two 2D safety LiDARs, emergency stops, and the 360-degree protective field. It never replaces them. See How J1600 safety works (https://info.mobilerobot.com/safety-compliance/safety-overview/how-j1600-safety-works/).

Commissioning and Validation

The J1600 works out of the box, but sites that want a structured, validated go-live can purchase a fixed-price installation and commissioning package (https://info.mobilerobot.com/products/buying-and-deployment/installation-and-commissioning/). This page describes what it contains.

Package at a glance

Item	Detail
End-user list price	€10,000
Duration	Five on-site days plus pre-installation work
Purpose	Reduce go-live risk through structured setup, validation, training, and handover

Pre-installation

Before anyone is on site:

- feasibility check for all selected tasks and loads;
- risk assessment — see Site risk assessment (https://info.mobilerobot.com/safety-compliance/safe-deployment/site-risk-assessment/);
- project plan.

The five on-site days

Day 1 — setup and validation

Unboxing; Wi-Fi connection if desired; automatic-charging setup if purchased (see Charger safety (https://info.mobilerobot.com/safety-compliance/safe-deployment/charger-safet

y/)); creation of up to 25 drop points (https://info.mobilerobot.com/documentation/installation/mapping-and-drop-point-setup/); task validation; safety validation.

Day 2 — training

Group training (https://info.mobilerobot.com/documentation/getting-started/operator-training/) for all operators, plus individual hands-on practice for up to six operators. See Operator responsibilities (https://info.mobilerobot.com/safety-compliance/safe-deployment/operator-responsibilities/) for what operators take over from here.

Days 3–4 — supervised operation

Monitoring of robot performance; on-site troubleshooting and support; additional operator training as needed.

Day 5 — acceptance and handover

Acceptance test; handover.

Add-ons

- integration with other software or equipment;
- additional validated drop points beyond the included 25;
- Fleet Management System setup (https://info.mobilerobot.com/documentation/technical-integration/fleet-manager-guide/).

Commissioning versus out-of-box deployment

The package is an optional commercial service, not a prerequisite. Basic deployment (https://info.mobilerobot.com/documentation/getting-started/first-time-setup/) needs no building modifications, tracks, wires, or reflectors; Wi-Fi is optional; and typical setup takes hours to one day (https://info.mobilerobot.com/applications/results/faster-deployment/). Operators add new locations themselves by driving to a point and saving it. The commissioning package matters most when go-live risk, task complexity, or the number of operators justifies a validated, documented process.

Partners may deliver the commissioning service themselves; current partner terms are available from the partner team (https://info.mobilerobot.com/partners/become-a-partner/cont

act-the-partner-team/). See the partner section (https://info.mobilerobot.com/category/partners/) for the partner model.

VALIDATION IS SITE-SPECIFIC

Task and safety validation confirm behaviour for your tasks, loads, and routes — within the limits in Floor and environment requirements (https://info.mobilerobot.com/safety-compliance/safe-deployment/floor-and-environment-requirements/) and Approved loads and pallets (https://info.mobilerobot.com/safety-compliance/safe-deployment/approved-loads-and-pallets/).

Residual Risks

No safeguarding removes risk entirely. This page describes the risks that remain after the J1600's built-in protective measures, and where operator vigilance and site discipline stay essential.

Why residual risks are documented

The risk-reduction method of ISO 12100 (https://info.mobilerobot.com/safety-compliance/standards/iso-12100/) ends with *information for use*: after design measures and safeguarding, the remaining risks must be communicated so users can manage them. The J1600's layered protection (https://info.mobilerobot.com/safety-compliance/safety-overview/how-j1600-safety-works/) — independent safety controller, two 2D safety LiDARs, a speed-dependent 360-degree protective field, emergency stops, and safety functions rated up to PL d (https://info.mobilerobot.com/safety-compliance/safety-functions/performance-levels/) — reduces risk substantially, and the built-in safety functions improve predictability compared with manual pallet handling. It does not make the vehicle risk-free.

Where risk remains

- **Manual mode (https://info.mobilerobot.com/safety-compliance/safety-overview/manual-and-autonomous-mode-safety/) relies on the operator.** Pallet pickup, high-level handling up to 1,600 mm, dock plates, slopes, and congested areas are deliberately manual. In these situations the operator's judgment is the protective measure. See Operator responsibilities (https://info.mobilerobot.com/safety-compliance/safe-deployment/operator-responsibilities/).
- **Operating limits are boundaries, not suggestions.** Autonomous travel assumes level floors (0% automatic gradeability), indoor conditions, 5–40°C, and IP21-compatible exposure. Outside these limits, behaviour is not specified. See Floor and environment requirements (https://info.mobilerobot.com/safety-compliance/safe-deployment/floor-and-environment-requirements/).
- **Loads are not universally approved.** There is no blanket approval for every carrier or for hazardous materials; stability and base geometry must be judged case by case. See Approved loads and pallets (https://info.mobilerobot.com/safety-compliance/safe-deployment/approved-loads-and-pallets/).

- **The protective field needs room.** The safety field grows with speed (https://info.mobilerobot.com/safety-compliance/safety-functions/safety-field-adjustment/). Route planning should account for pinch points and shared traffic identified in the site risk assessment (https://info.mobilerobot.com/safety-compliance/safe-deployment/site-risk-assessment/).

Data that is not available

Accident-rate test data, safety-distance curves, stopping distances, and validation reports are not available. The reduction in workplace accidents (https://info.mobilerobot.com/applications/results/safety-improvements/) compared with manual pallet handling is a design intent, not a measured result.

> ⚠ **BASE DEPLOYMENT DECISIONS ON CURRENT DOCUMENTATION**
>
> Use the current product documentation supplied with the vehicle — not this Knowledge Center alone — for site-specific safety decisions, and complete a site risk assessment (https://info.mobilerobot.com/safety-compliance/safe-deployment/site-risk-assessment/) before go-live.