



The Mobile Robot Company

Knowledge Center — Concepts and Terminology · 2026-08-04

<https://info.mobilerobot.com/category/concepts-and-terminology>

Concepts and Terminology

The ideas and vocabulary behind the J1600 — human-in-the-loop automation, dual mode, teach and repeat, VDA 5050, pallet-automation fundamentals, and a full glossary.



Human-in-the-Loop Automation

What human-in-the-loop automation means, how work is divided between operator and robot on the J1600, and why keeping a person in charge lowers cost, risk, and rigidity.



Dual Mode

The dual-mode concept — one vehicle that works as a manual electric pallet jack and as a self-driving robot, how the handover works, and why the combination exists.



Teach and Repeat

The teach-and-repeat concept — creating robot tasks by driving to a point and saving it, with no code, no infrastructure, and no limit on saved locations.



Mobile Robot Terminology

The vocabulary of mobile robotics explained — AMR versus AGV, SLAM and LiDAR, brownfield, fleet managers, WMS, protective fields, and where the J1600 fits among the categories.



Glossary

Definitions of the terms used across the Knowledge Center — from AGV, AMR, and API to teach and repeat, VDA 5050, WMS, and the 360-degree safety field.



VDA 5050 Explained

What the VDA 5050 interoperability standard is, the multi-vendor fleet problem it solves, and what full VDA 5050 support means for the J1600.



Pallet Automation Fundamentals

The pallet-transport market in numbers, the spectrum from manual pallet jacks to full automation, the three adoption barriers, and where dual-mode automation fits.

Human-in-the-Loop Automation

Human-in-the-loop automation — also called human-robot collaboration or operator-centric automation — is the operating philosophy behind [the J1600](https://info.mobilerobot.com/products/j1600/overview/). A person retains task authority, performs contextual handling, and can take over instantly; the robot performs repetitive, predictable travel. This page explains the concept, the division of work, and the reasoning behind it.

Division of work

Human operator	J1600
Judges load stability, pallet condition, congestion, urgency, and exceptions	Builds and updates a 3D map and navigates to saved points
Picks pallets and performs difficult or high manual handling	Carries up to 1,600 kg along repetitive routes
Selects the destination and what happens after delivery	Avoids obstacles and applies speed-dependent safety fields
Confirms entry into autonomous mode	Drops at floor level, then returns, parks, continues, or waits
Overrides or resumes manual control at any time	Repeats stored tasks consistently

Why the operator stays in the loop

The final part of pallet work is disproportionately difficult to automate: checking a pallet, placing forks, judging an unstable load, interfacing with a conveyor, choosing an improvised drop point, or reprioritizing when a production line runs dry. Removing the operator from those decisions typically requires [warehouse-management-system \(WMS\) and fleet integration](https://info.mobilerobot.com/applications/results/lower-integration-complexity/), infrastructure, expert configuration, and tightly controlled processes.

By keeping the operator, the J1600 avoids treating human judgment as a system failure. The intended balance is roughly 80% of automation's [productivity gain](https://info.mobilerobot.com/applications/results/lower-integration-complexity/).

[fo.mobilerobot.com/applications/results/productivity-improvements/](https://info.mobilerobot.com/applications/results/productivity-improvements/)) — the repetitive travel — while retaining [manual flexibility](https://info.mobilerobot.com/applications/results/operational-flexibility/) (<https://info.mobilerobot.com/applications/results/operational-flexibility/>), and lowering cost and implementation risk. See [dual mode](https://info.mobilerobot.com/documentation/concepts/dual-mode/) (<https://info.mobilerobot.com/documentation/concepts/dual-mode/>) for how the handover works in the vehicle.

Where human judgment beats automation

Warehouses are messy, dynamic, and unpredictable. The design assumes a person handles situations such as:

1. spotting a damaged pallet — a broken bottom board or protruding nail — before it becomes 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/) (<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 catches a rack or doorframe;
4. finding a pallet that is not exactly at its recorded position instead of stopping on a system error;
5. catching leaks or crushed corners before goods reach a customer or production line;
6. handling steep dock plates and slopes — autonomous-mode gradeability is 0°, so ramps stay manual;
7. improvising a safe route through a [crowded or cluttered receiving area](https://info.mobilerobot.com/applications/scenarios/operation-in-crowded-environments/) (<https://info.mobilerobot.com/applications/scenarios/operation-in-crowded-environments/>);
8. reprioritizing a delivery immediately when a line is starving;
9. [teaching a new route](https://info.mobilerobot.com/documentation/concepts/teach-and-repeat/) (<https://info.mobilerobot.com/documentation/concepts/teach-and-repeat/>) by driving there and tapping **Save location**, without calling IT;
10. capturing most of the efficiency gain without the cost and rigidity of full automation.

These examples explain the [design logic](https://info.mobilerobot.com/company/about/our-approach-to-automation/) (<https://info.mobilerobot.com/company/about/our-approach-to-automation/>); they are not comparative test results.

Safety role

Human control is not the vehicle's only safety mechanism. The J1600 also uses an independent safety controller, certified components, two 2D safety LiDARs, emergency stops, and a 360-degree speed-dependent protective field. Human

takeover complements the [certified safety architecture](https://info.mobilerobot.com/safety-compliance/safety-overview/safety-architecture/) rather than replacing it. See [how J1600 safety works](https://info.mobilerobot.com/safety-compliance/safety-overview/how-j1600-safety-works/).

Product category

Human-in-the-loop operation places the J1600 in a tier of its own between manual pallet jacks and classic [automated guided vehicles \(AGVs\)](https://info.mobilerobot.com/documentation/concepts/mobile-robot-terminology/): more automated than a manual tool, more flexible and immediate than a fully automated system. For the market picture behind this positioning, see [pallet automation fundamentals](https://info.mobilerobot.com/documentation/concepts/pallet-automation-fundamentals/).

Dual Mode

Dual mode means one vehicle combines two operating behaviors: manual control like a conventional electric pallet jack, and operator-initiated autonomous driving. It is [the J1600](https://info.mobilerobot.com/products/j1600/overview/) (<https://info.mobilerobot.com/products/j1600/overview/>)'s defining concept. This page explains both modes, the handover between them, and the reasoning behind the combination.

The two modes

- **Manual mode:** a person controls the tiller and lift functions exactly as on a conventional electric pallet jack. [Manual operation](https://info.mobilerobot.com/documentation/user-guides/manual-operation/) (<https://info.mobilerobot.com/documentation/user-guides/manual-operation/>), covers nuanced pickup, handling up to 1.6 m, difficult approaches, [sensitive or unstable loads](https://info.mobilerobot.com/applications/use-cases/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/) (<https://info.mobilerobot.com/applications/scenarios/handling-exceptions-and-irregular-loads/>).
- **Automatic mode:** after the operator selects a saved destination and [confirms the mode change](https://info.mobilerobot.com/safety-compliance/safety-overview/manual-and-autonomous-mode-safety/) (<https://info.mobilerobot.com/safety-compliance/safety-overview/manual-and-autonomous-mode-safety/>), the vehicle [drives autonomously](https://info.mobilerobot.com/documentation/user-guides/autonomous-operation/) (<https://info.mobilerobot.com/documentation/user-guides/autonomous-operation/>), performs a floor-level pallet drop, and follows its configured return, park, wait, or continue behavior.

How the handover works

The operator initiates autonomous work from the task interface and the physical start/resume button. The robot asks for confirmation and instructs the person to step clear before moving. Manual control is regained at any time through the tiller and safety controls: [tiller-position switches](https://info.mobilerobot.com/safety-compliance/safety-functions/tiller-detection/) (<https://info.mobilerobot.com/safety-compliance/safety-functions/tiller-detection/>), govern emergency stop and manual control, and a [three-position key switch](https://info.mobilerobot.com/safety-compliance/safety-functions/mode-selection/) (<https://info.mobilerobot.com/safety-compliance/safety-functions/mode-selection/>) selects power off, manual-only, or automatic mode. Grabbing or moving the tiller enables [immediate manual takeover](https://info.mobilerobot.com/safety-compliance/safety-overview/emergency-stops-and-manual-takeover/) (<https://info.mobilerobot.com/safety-compliance/safety-overview/emergency-stops-and-manual-takeover/>).

Capability ladder

Level	Capabilities
Manual functions	Pallet pick and drop up to 1.6 m; full manual tiller control
Basic automation	On-screen task start; saved locations; autonomous travel to saved points; floor-level drop; return-to-me; go-to-parking
Advanced automation	Come-to-me; automatic charging; VDA 5050 fleet management; API integrations

The ladder describes what the vehicle can do; the [Standard and Advanced software packages](https://info.mobilerobot.com/products/software/software-comparison/) describe how capabilities are licensed. See the [integration overview](https://info.mobilerobot.com/documentation/technical-integration/integration-overview/).

Why dual mode exists

Full automation becomes expensive and rigid when the judgment-heavy part of a task — checking loads, placing forks, improvising around congestion — has to be engineered away with WMS and fleet integration, precise load data, and controlled processes. Dual mode leaves those decisions to a person and automates the long travel instead. The intended balance is [roughly 80% automation rather than 100%](https://info.mobilerobot.com/applications/results/productivity-improvements/), with greater [flexibility](https://info.mobilerobot.com/applications/results/operational-flexibility/) and a lower entry cost.

Manual control preserves the ability to unload trucks, handle unstable or sensitive loads, work around congestion, and respond to exceptions; autonomy [removes the repeated walking](https://info.mobilerobot.com/applications/results/reduction-in-manual-walking/). The result is a product tier between manual electric pallet jacks and conventional [AGVs](https://info.mobilerobot.com/documentation/concepts/mobile-robot-terminology/) and fully automated systems — see [pallet automation fundamentals](https://info.mobilerobot.com/documentation/concepts/pallet-automation-fundamentals/) and [human-in-the-loop automation](https://info.mobilerobot.com/documentation/concepts/human-in-the-loop-automation/).

Dual mode on the J1600

For the J1600-specific implementation — controls, workflows, and demonstrations — see the product page on [dual mode](https://info.mobilerobot.com/products/j1600/dual-mode/) (<https://info.mobilerobot.com/products/j1600/dual-mode/>) and the [example workflows](https://info.mobilerobot.com/documentation/technical-integration/example-workflows/) (<https://info.mobilerobot.com/documentation/technical-integration/example-workflows/>).

Teach and Repeat

Teach and repeat is the task-creation method at the heart of the J1600's [Standard software](https://info.mobilerobot.com/products/software/standard-software/): an operator demonstrates a destination once by driving to it, saves it, and the robot can then travel there autonomously — no code, no configuration project, no infrastructure. This page explains the concept and its practical consequences.

How teaching works

1. [Drive the vehicle manually through the facility](https://info.mobilerobot.com/documentation/getting-started/creating-the-first-map/). While you drive, the robot continuously builds and updates a 3D map using [LiDAR SLAM](https://info.mobilerobot.com/products/j1600/navigation-and-obstacle-avoidance/) (simultaneous localization and mapping).
2. Drive to a desired [drop point](https://info.mobilerobot.com/documentation/installation/mapping-and-drop-point-setup/).
3. **Tap Save location on the touchscreen and name the point** [on the touchscreen and name the point](https://info.mobilerobot.com/documentation/getting-started/saving-the-first-location/).
4. Repeat for every destination you need.

There is no software limit on the number of saved locations; practical limits come from available warehouse space. No tracks, wires, reflectors, or building modifications are involved.

How repeating works

The operator [picks up a pallet manually](https://info.mobilerobot.com/applications/scenarios/manual-pickup-and-autonomous-delivery/), selects a saved destination and a post-delivery behavior on the touchscreen, [confirms automatic mode](https://info.mobilerobot.com/documentation/user-guides/autonomous-operation/) on the physical start/resume button, and steps away. The robot drives itself, avoids obstacles, and drops the pallet at floor level. See [example workflows](https://info.mobilerobot.com/documentation/technical-integration/example-workflows/) for the standard task patterns.

Locations recombine freely

Saved points are independent of each other. The robot navigates from wherever it is to any [saved location](https://info.mobilerobot.com/documentation/user-guides/location-management/) (<https://info.mobilerobot.com/documentation/user-guides/location-management/>), so you never demonstrate every possible origin-destination pair. Ten saved points support [cross-docking](https://info.mobilerobot.com/applications/use-cases/cross-docking/) (<https://info.mobilerobot.com/applications/use-cases/cross-docking/>) and changing flows without ten-squared taught routes.

Why it matters

- **No-code operation:** adding a destination is an operator action, not an automation-engineering task. When a layout changes, the person who noticed the change fixes it.
- **Speed:** [a new location takes minutes](https://info.mobilerobot.com/applications/scenarios/temporary-location-setup/) (<https://info.mobilerobot.com/applications/scenarios/temporary-location-setup/>) — drive there once and save it. [Operator training](https://info.mobilerobot.com/documentation/getting-started/operator-training/) (<https://info.mobilerobot.com/documentation/getting-started/operator-training/>) takes about 30 minutes, and a first-time user can typically create and launch an autonomous task within about 15 minutes.
- **Brownfield fit:** because the map is learned by driving and updated continuously, teach and repeat works in [existing facilities](https://info.mobilerobot.com/applications/use-cases/brownfield-automation/) (<https://info.mobilerobot.com/applications/use-cases/brownfield-automation/>), with [changing layouts](https://info.mobilerobot.com/applications/scenarios/dynamic-route-changes/) (<https://info.mobilerobot.com/applications/scenarios/dynamic-route-changes/>).
- **Low threshold:** teach and repeat is why basic J1600 use needs [no Wi-Fi](https://info.mobilerobot.com/documentation/installation/network-and-wi-fi-requirements/) (<https://info.mobilerobot.com/documentation/installation/network-and-wi-fi-requirements/>), no WMS, and [no systems integration](https://info.mobilerobot.com/applications/results/lower-integration-complexity/) (<https://info.mobilerobot.com/applications/results/lower-integration-complexity/>). — see [human-in-the-loop automation](https://info.mobilerobot.com/documentation/concepts/human-in-the-loop-automation/) (<https://info.mobilerobot.com/documentation/concepts/human-in-the-loop-automation/>) for the philosophy behind that choice.

Where the concept sits in the product

Teach and repeat is the core of the **Standard software**, which is deliberately reduced to essential functions. The [Advanced software](https://info.mobilerobot.com/products/software/advanced-software/) (<https://info.mobilerobot.com/products/software/advanced-software/>) builds on the same foundation with [VDA 5050](https://info.mobilerobot.com/documentation/concepts/vda-5050-explained/) (<https://info.mobilerobot.com/documentation/concepts/vda-5050-explained/>), a [REST API](https://info.mobilerobot.com/documentation/technical-integration/rest-api-documentation/) (<https://info.mobilerobot.com/documentation/technical-integration/rest-api-documentation/>), [Fleet Manager](https://info.mobilerobot.com/documentation/technical-integration/fleet-manager-guide/) (<https://info.mobilerobot.com/documentation/technical-integration/fleet-manager-guide/>), and advanced

mission planning — see the [integration overview](https://info.mobilerobot.com/documentation/technical-integration/integration-overview/) (<https://info.mobilerobot.com/documentation/technical-integration/integration-overview/>).

Mobile Robot Terminology

Mobile robotics comes with a dense vocabulary. This page explains the key terms in context — what they mean, how they differ, and how they apply to the J1600. For short definitions of every term, see the [glossary](https://info.mobilerobot.com/documentation/concepts/glossary/) (<https://info.mobilerobot.com/documentation/concepts/glossary/>).

AGV, AMR, and the tier in between

An **AGV** (automated guided vehicle) is the conventional automation category: vehicles that follow predefined guidance and typically require expert configuration, controlled processes, and integration work. An **AMR** (autonomous mobile robot) is the broader label for robots that navigate by sensing the environment rather than following fixed guidance; it is also used for the J1600 and comparable machines.

The J1600 occupies a tier between manual pallet jacks and classic AGVs: a [dual-mode](https://info.mobilerobot.com/documentation/concepts/dual-mode/) (<https://info.mobilerobot.com/documentation/concepts/dual-mode/>) vehicle that runs as a familiar manual tool and as a self-driving robot. Immediate human takeover is central to the category — see [human-in-the-loop automation](https://info.mobilerobot.com/documentation/concepts/human-in-the-loop-automation/) (<https://info.mobilerobot.com/documentation/concepts/human-in-the-loop-automation/>).

Pallet jacks and lowlifters

A pallet jack (pallet truck) moves palletized loads at or near floor level. **Lowlifter** is the warehouse-truck class the J1600 competed in as an IFOY applicant — trucks that lift loads for transport rather than for high-bay stacking. The J1600 picks and drops manually up to 1,600 mm and delivers autonomously at floor level.

SLAM, LiDAR, and navigation

LiDAR is a laser ranging sensor. **SLAM** (simultaneous localization and mapping) is the technique of building a map while simultaneously tracking the vehicle's position in it. The J1600 uses [3D LiDAR SLAM](https://info.mobilerobot.com/products/j1600/navigation-and-obstacle-avoidance/) (<https://info.mobilerobot.com/products/j1600/navigation-and-obstacle-avoidance/>) on an industrial NVIDIA Jetson AI computer: it learns the

environment continuously while an operator drives, then localizes and plans routes to saved destinations without tracks, wires, or reflectors.

[Navigation sensing and safety sensing are distinct](https://info.mobilerobot.com/safety-compliance/safety-overview/navigation-sensors-vs-safety-sensors/) (<https://info.mobilerobot.com/safety-compliance/safety-overview/navigation-sensors-vs-safety-sensors/>). The 3D LiDAR and RGB AI camera belong to the navigation stack; personnel protection uses two separate 2D safety LiDARs, [certified components](https://info.mobilerobot.com/safety-compliance/safety-overview/safety-architecture/) (<https://info.mobilerobot.com/safety-compliance/safety-overview/safety-architecture/>), and a safety controller.

Protective fields and Performance Levels

A **protective field** (safety field) is the monitored zone around the vehicle in which detected persons or obstacles trigger a safe reaction. The J1600's field covers 360 degrees and [expands with speed](https://info.mobilerobot.com/safety-compliance/safety-functions/safety-field-adjustment/) (<https://info.mobilerobot.com/safety-compliance/safety-functions/safety-field-adjustment/>). A **Performance Level (PL)**, from EN ISO 13849-1, grades a safety function's reliability from PL a to PL e; J1600 safety functions range from [PL b to PL d](https://info.mobilerobot.com/safety-compliance/safety-functions/performance-levels/) (<https://info.mobilerobot.com/safety-compliance/safety-functions/performance-levels/>). See [how J1600 safety works](https://info.mobilerobot.com/safety-compliance/safety-overview/how-j1600-safety-works/) (<https://info.mobilerobot.com/safety-compliance/safety-overview/how-j1600-safety-works/>).

Teach and repeat

Teach and repeat means an operator demonstrates destinations by driving to them and saving them, and the robot then repeats the travel autonomously — no code, no configuration project. It is the J1600's standard task-creation method; see [teach and repeat](https://info.mobilerobot.com/documentation/concepts/teach-and-repeat/) (<https://info.mobilerobot.com/documentation/concepts/teach-and-repeat/>).

Fleet managers, VDA 5050, and WMS

A **fleet manager** orchestrates multiple robots: assigning missions, coordinating traffic, and managing charging. **VDA 5050** is the interoperability interface that lets robots from different vendors run under one compatible fleet layer — see [VDA 5050 explained](https://info.mobilerobot.com/documentation/concepts/vda-5050-explained/) (<https://info.mobilerobot.com/documentation/concepts/vda-5050-explained/>). A **WMS** (warehouse management system) manages inventory and warehouse processes; full automation projects typically integrate WMS, fleet manager, and robots, while basic J1600 use requires none of them.

Brownfield and greenfield

A **brownfield** site is an existing facility whose layout and processes were not designed around new automation — the opposite of a purpose-built greenfield site. The J1600 targets [brownfield use](https://info.mobilerobot.com/applications/use-cases/brownfield-automation/) (<https://info.mobilerobot.com/applications/use-cases/brownfield-automation/>): 3D mapping handles changing layouts, and human takeover absorbs the [exceptions](https://info.mobilerobot.com/applications/scenarios/handling-exceptions-and-irregular-loads/) (<https://info.mobilerobot.com/applications/scenarios/handling-exceptions-and-irregular-loads/>) that would otherwise require engineering.

Dig deeper

- [Glossary](https://info.mobilerobot.com/documentation/concepts/glossary/) (<https://info.mobilerobot.com/documentation/concepts/glossary/>) — compact definitions, A to Z.
- [Pallet automation fundamentals](https://info.mobilerobot.com/documentation/concepts/pallet-automation-fundamentals/) (<https://info.mobilerobot.com/documentation/concepts/pallet-automation-fundamentals/>) — the market context behind the categories.
- [J1600 overview](https://info.mobilerobot.com/products/j1600/overview/) (<https://info.mobilerobot.com/products/j1600/overview/>) — the product these terms describe.

Glossary

Compact definitions of the terms used across the Knowledge Center, in alphabetical order. For fuller explanations of the central concepts, follow the links.

A–C

AGV — [Automated guided vehicle](https://info.mobilerobot.com/documentation/concepts/mobile-robot-terminology/) (<https://info.mobilerobot.com/documentation/concepts/mobile-robot-terminology/>); the conventional automation category contrasted with the J1600's product tier between manual pallet jacks and full automation.

AMR — Autonomous mobile robot; a broad label applied to the J1600 and comparable mobile automation.

API / REST API — Software interface for integrating the J1600 with other software and equipment; included in the [Advanced software](https://info.mobilerobot.com/products/software/advanced-software/) (<https://info.mobilerobot.com/products/software/advanced-software/>). See [REST API documentation](https://info.mobilerobot.com/documentation/technical-integration/rest-api-documentation/) (<https://info.mobilerobot.com/documentation/technical-integration/rest-api-documentation/>).

Automatic charging — Optional capability where the robot drives to a charging station, positions itself, and charges through extending contact plates; an advanced automation function. See [Automatic Charging](https://info.mobilerobot.com/applications/scenarios/automatic-charging/) (<https://info.mobilerobot.com/applications/scenarios/automatic-charging/>).

Boomerang — Task pattern: [deliver to a destination and return](https://info.mobilerobot.com/applications/scenarios/deliver-and-return/) (<https://info.mobilerobot.com/applications/scenarios/deliver-and-return/>) to the origin/operator. See [example workflows](https://info.mobilerobot.com/documentation/technical-integration/example-workflows/) (<https://info.mobilerobot.com/documentation/technical-integration/example-workflows/>).

Brownfield — An existing facility or process not designed around new automation. The J1600 is designed for [brownfield sites](https://info.mobilerobot.com/applications/use-cases/brownfield-automation/) (<https://info.mobilerobot.com/applications/use-cases/brownfield-automation/>).

CE marked — European conformity marking; the J1600 is CE marked. See [CE Declaration of Conformity](https://info.mobilerobot.com/safety-compliance/certificates/ce-declaration-of-conformity/) (<https://info.mobilerobot.com/safety-compliance/certificates/ce-declaration-of-conformity/>).

Come to me — Advanced automation function that calls the robot to a location through a mobile app or web interface. See [Come-to-Me](https://info.mobilerobot.com/applications/scenarios/come-to-me/) (https://info.mobilerobot.com/applications/scenarios/come-to-me/).

D-I

Dual mode — Manual pallet-jack operation plus operator-initiated autonomous travel in one vehicle. See [dual mode](https://info.mobilerobot.com/documentation/concepts/dual-mode/) (https://info.mobilerobot.com/documentation/concepts/dual-mode/).

EPAL — European Pallet Association pallet formats; the J1600 supports the [EPAL Euro Pallet, EPAL 3, and EPAL 6](https://info.mobilerobot.com/products/j1600/pallet-and-load-compatibility/) (https://info.mobilerobot.com/products/j1600/pallet-and-load-compatibility/).

Experience center — A partner-maintained showroom with a dedicated robot, pallets, and chargers for hands-on customer demonstrations.

Fleet Manager — Per-robot software for orchestrated multi-robot J1600 deployments. See the [Fleet Manager guide](https://info.mobilerobot.com/documentation/technical-integration/fleet-manager-guide/) (https://info.mobilerobot.com/documentation/technical-integration/fleet-manager-guide/).

GMA pallet — Grocery Manufacturers Association pallet format; open-base variants are supported within the J1600's size limits.

HMI — Human-machine interface; the J1600 uses a [15-inch multi-touch panel](https://info.mobilerobot.com/documentation/technical-reference/interface-specifications/) (https://info.mobilerobot.com/documentation/technical-reference/interface-specifications/).

Human in the loop — Operating philosophy in which the operator retains judgment, task initiation, pickup, and takeover. See [human-in-the-loop automation](https://info.mobilerobot.com/documentation/concepts/human-in-the-loop-automation/) (https://info.mobilerobot.com/documentation/concepts/human-in-the-loop-automation/).

IFOY — International Intralogistics and Forklift Truck of the Year award. The J1600 won [Industrial Truck of the Year 2026](https://info.mobilerobot.com/newsroom/awards/ifoy-award-2026/) (https://info.mobilerobot.com/newsroom/awards/ifoy-award-2026/).

IP21 — The J1600's ingress-protection rating: protected against objects over 12.5 mm and vertically dripping water; indoor use.

J–P

J1600 — [The Mobile Robot Company](https://info.mobilerobot.com/company/about/company-overview/) (https://info.mobilerobot.com/company/about/company-overview/)'s 1,600 kg dual-mode self-driving pallet jack. See the [J1600 overview](https://info.mobilerobot.com/products/j1600/overview/) (https://info.mobilerobot.com/products/j1600/overview/).

LiDAR — Laser ranging sensor. The J1600 uses one 3D LiDAR for mapping and navigation and two 2D safety LiDARs for protective fields.

LiFePO4 — Lithium iron phosphate, the J1600's battery chemistry. See [battery specifications](https://info.mobilerobot.com/documentation/technical-reference/battery-specifications/) (https://info.mobilerobot.com/documentation/technical-reference/battery-specifications/).

Lowlifter — Warehouse-truck class for trucks that lift loads for transport rather than stacking; the J1600's IFOY applicant category.

Pallet location — A [saved destination created by driving the vehicle to a point](https://info.mobilerobot.com/documentation/getting-started/saving-the-first-location/) (https://info.mobilerobot.com/documentation/getting-started/saving-the-first-location/) and tapping **Save location**.

Performance Level (PL) — Safety-function reliability grade under [EN ISO 13849-1](https://info.mobilerobot.com/safety-compliance/standards/iso-13849-1/) (https://info.mobilerobot.com/safety-compliance/standards/iso-13849-1/); J1600 safety functions range from [PL b to PL d](https://info.mobilerobot.com/safety-compliance/safety-functions/performance-levels/) (https://info.mobilerobot.com/safety-compliance/safety-functions/performance-levels/).

POC — [Proof of concept](https://info.mobilerobot.com/applications/planning/proof-of-concept-planning/) (https://info.mobilerobot.com/applications/planning/proof-of-concept-planning/); an on-site validation before wider purchase or deployment.

S–Z

SLAM — Simultaneous localization and mapping; the J1600 runs [3D LiDAR SLAM](https://info.mobilerobot.com/products/j1600/navigation-and-obstacle-avoidance/) (https://info.mobilerobot.com/products/j1600/navigation-and-obstacle-avoidance/), on an industrial NVIDIA Jetson AI computer.

Standard software — The [configuration-light J1600 software](https://info.mobilerobot.com/products/software/standard-software/) (https://info.mobilerobot.com/products/software/standard-software/), built around teach and repeat, intended for single-unit deployments.

Teach and repeat — Task creation by demonstration: the operator drives to a point and saves it; the robot repeats the travel autonomously. See [teach and repeat](https://info.mobilerobot.com/documentation/concepts/teach-and-repeat/) (https://info.mobilerobot.com/documentation/concepts/teach-and-repeat/).

Tiller — The manual pallet-jack handle; on the J1600 it also carries [position switches](https://info.mobilerobot.com/safety-compliance/safety-functions/tiller-detection/) (<https://info.mobilerobot.com/safety-compliance/safety-functions/tiller-detection/>) for emergency stop and manual takeover.

VDA 5050 — Interoperability interface for multi-vendor mobile-robot fleets; fully supported by the J1600 under the Advanced software. See [VDA 5050 explained](https://info.mobilerobot.com/documentation/concepts/vda-5050-explained/) (<https://info.mobilerobot.com/documentation/concepts/vda-5050-explained/>).

WMS — Warehouse management system; not required for basic J1600 use, but commonly integrated in full automation projects.

360-degree safety field — The all-around protective coverage produced by the J1600's [layered safety architecture](https://info.mobilerobot.com/safety-compliance/safety-overview/safety-architecture/) (<https://info.mobilerobot.com/safety-compliance/safety-overview/safety-architecture/>); the field is [speed-dependent and expands at higher speeds](https://info.mobilerobot.com/safety-compliance/safety-functions/safety-field-adjustment/) (<https://info.mobilerobot.com/safety-compliance/safety-functions/safety-field-adjustment/>).

VDA 5050 Explained

VDA 5050 is the interoperability interface that lets mobile robots from different vendors work together in the same space under one compatible fleet-management layer. This page explains the concept for readers planning or evaluating fleet automation.

The problem it solves

Without a shared interface, every robot vendor speaks its own protocol, and a site running robots from two vendors ends up with two control systems that cannot coordinate — or with a lock-in decision to buy everything from one vendor. VDA 5050 standardizes the communication between vehicles and the fleet layer, so a compatible fleet manager can coordinate mixed-vendor traffic in the same aisles.

What this means in practice

- A site can add J1600 robots to an existing VDA 5050 fleet without replacing its fleet layer.
- Robots from different vendors can share zones and routes under one coordinating system.
- Fleet decisions and robot purchases decouple: the fleet layer is chosen for the site, the vehicles for the task.

VDA 5050 and the J1600

The J1600 has full VDA 5050 support as part of its [Advanced software](https://info.mobilerobot.com/products/software/advanced-software/) (<https://info.mobilerobot.com/products/software/advanced-software/>), and The Mobile Robot Company works with established VDA 5050 fleet-management providers. A J1600 deployment can therefore start as a single standalone [teach-and-repeat](https://info.mobilerobot.com/documentation/concepts/teach-and-repeat/) (<https://info.mobilerobot.com/documentation/concepts/teach-and-repeat/>) unit and later join a coordinated fleet — the same hardware, upgraded software.

VDA 5050 sits on the advanced rung of the capability ladder, alongside [come-to-me](https://info.mobilerobot.com/applications/scenarios/come-to-me/) (<https://info.mobilerobot.com/applications/scenarios/come-to-me/>), automatic charging, and API

integrations. Basic use of the robot requires none of them.

When you need it — and when you do not

Situation	VDA 5050 needed?
One robot, one or a few flows, touchscreen tasks	No
Several J1600s coordinated as one fleet	Fleet software needed; VDA 5050 or Fleet Manager (https://info.mobilerobot.com/documentation/technical-integration/fleet-manager-guide/)
Mixed-vendor robot fleet under one fleet layer	Yes
Direct integration with site software or equipment	No — use the REST API (https://info.mobilerobot.com/documentation/technical-integration/rest-api-documentation/).

Deployment details

For requirements, planning steps, and commissioning of a VDA 5050 setup on the J1600, see the [VDA 5050 documentation](https://info.mobilerobot.com/documentation/technical-integration/vda-5050-documentation/) (<https://info.mobilerobot.com/documentation/technical-integration/vda-5050-documentation/>) in Technical Integration.

Pallet Automation Fundamentals

This page gives the market and technology context for automating pallet transport: how large the manual segment is, what the automation options look like, and why most pallet movement is still done by hand. It is for readers evaluating automation for the first time.

The market in numbers

Pallet transport is a large, lightly automated market:

- more than one million pallet jacks are sold worldwide each year;
- more than 300,000 are sold in Europe annually;
- more than six million people use pallet jacks in their daily work;
- only about 1% of pallet handling is automated.

The unautomated remainder is dominated by smaller operations — typically one to five pallet-jack operators on a single shift — without the budget, time, or resources for a full automation project.

The automation spectrum

Model	Setup	Flexibility	Labor saving
Manual pallet jack	None	Full manual flexibility	None
Dual-mode vehicle	Hours	Manual control plus saved autonomous delivery	Up to 80% of operator time on repetitive travel
Fully automated system	Weeks or a longer project	Preprogrammed, expert-configured	Up to 100% of task labor, if fully automated

Manual solutions preserve flexibility but consume [operator walking](https://info.mobilerobot.com/applications/results/reduction-in-manual-walking/) and travel time. Full automation

can remove labor from a task but usually needs expert configuration, [systems integration](https://info.mobilerobot.com/applications/results/lower-integration-complexity/) — typically warehouse management system (WMS) to fleet manager — infrastructure, and stable processes; a full automation project can require investment approaching €1 million. [Dual mode](https://info.mobilerobot.com/documentation/concepts/dual-mode/) keeps manual control and automates the travel portion, targeting most of the labor benefit at a fraction of the cost and complexity.

The three adoption barriers

Three barriers keep pallet automation at about 1%:

1. **Price.** Large projects are hard to justify for single-shift economics; the J1600 [lists at €65,000](https://info.mobilerobot.com/products/j1600/pricing-and-roi/), and a typical configuration lands around or below €80,000.
2. **Flexibility**. Warehouses are messy and changing — damaged pallets, misplaced loads, congestion, reprioritization. Rigid systems handle these poorly; see [human-in-the-loop automation](https://info.mobilerobot.com/documentation/concepts/human-in-the-loop-automation/).
3. **Complexity.** Classic projects require experts to configure, integrate, and change. [Teach and repeat](https://info.mobilerobot.com/documentation/concepts/teach-and-repeat/) puts [route changes](https://info.mobilerobot.com/applications/scenarios/dynamic-route-changes/) in the operator's hands instead.

What "automating the walking" means

The repetitive, low-judgment part of pallet work is the travel between points. The judgment-heavy part — checking pallets, placing forks, [handling unstable loads](https://info.mobilerobot.com/applications/use-cases/sensitive-or-unstable-loads/), adapting to congestion — is the hardest and most expensive to automate. Automating the travel while keeping a person for judgment captures roughly 80% of the [productivity gain](https://info.mobilerobot.com/applications/results/productivity-improvements/) at a fraction of full automation's cost. That division of work is the fundamental design idea behind the J1600 — see the [J1600 overview](https://info.mobilerobot.com/products/j1600/overview/).

Who benefits first

- [small and medium manufacturers](https://info.mobilerobot.com/applications/industries/manufacturing/) (<https://info.mobilerobot.com/applications/industries/manufacturing/>), and [warehouse operators](https://info.mobilerobot.com/applications/industries/warehousing/) (<https://info.mobilerobot.com/applications/industries/warehousing/>), with roughly one to five pallet-jack operators;
- [single-shift facilities](https://info.mobilerobot.com/company/about/markets-we-serve/) (<https://info.mobilerobot.com/company/about/markets-we-serve/>) that cannot justify a large automation project;
- small [third-party logistics](https://info.mobilerobot.com/applications/industries/third-party-logistics/) (<https://info.mobilerobot.com/applications/industries/third-party-logistics/>), providers, [grocery and FMCG distribution](https://info.mobilerobot.com/applications/industries/grocery-and-fmcg/) (<https://info.mobilerobot.com/applications/industries/grocery-and-fmcg/>), and [e-commerce fulfillment](https://info.mobilerobot.com/applications/industries/e-commerce-and-fulfillment/) (<https://info.mobilerobot.com/applications/industries/e-commerce-and-fulfillment/>);
- larger sites with [local work cells](https://info.mobilerobot.com/applications/use-cases/local-work-cell-automation/) (<https://info.mobilerobot.com/applications/use-cases/local-work-cell-automation/>) too small or changeable for a conventional fleet project;
- [brownfield sites](https://info.mobilerobot.com/applications/use-cases/brownfield-automation/) (<https://info.mobilerobot.com/applications/use-cases/brownfield-automation/>), seeking incremental automation without infrastructure changes.

Related vocabulary

For the terms used here — AGV, AMR, WMS, fleet manager, brownfield — see [mobile robot terminology](https://info.mobilerobot.com/documentation/concepts/mobile-robot-terminology/) (<https://info.mobilerobot.com/documentation/concepts/mobile-robot-terminology/>), and the [glossary](https://info.mobilerobot.com/documentation/concepts/glossary/) (<https://info.mobilerobot.com/documentation/concepts/glossary/>).