HALLENGER

In&Out ROBOTICS

Challenging limits: safety in motion

www.inoutrobotics.com

Challenger: innovation, efficiency & control

Challenger is the latest-generation satellite developed by **In&Out Robotics** to ensure maximum reliability and efficiency in multi-depth pallet storage. Equipped with **advanced detection systems**, it identifies people and obstacles in real time, ensuring a safe working environment.
Its intelligent kinematics regulate acceleration and deceleration based on the load, allowing smooth movement, minimizing component wear, and preserving the integrity of transported products.

Powered by a 48Vdc, 24Ah lithium battery, Challenger is controlled via an **advanced remote system**. It seamlessly integrates with traditional forklifts and LGVs, facilitating pallet storage, retrieval, picking, placement and reordering while supporting FIFO (First In, First Out), LIFO (Last In, First Out), or hybrid storage strategies.
Challenger is designed for a wide range of industries and can handle various pallet types and load units. It operates efficiently across a temperature range of -30°C to +45°C, making it suitable for both standard and extreme environments.
This innovative solution **optimizes space, speed, and energy efficiency** in modern automated warehouses, enhancing workflow management and improving overall operational performance.

CHALLENGER complies with:

EU DIRECTIVES AND REGULATION	REFERENCE STANDARDS
Machinery Directive 2006/42/EC	EN ISO 12100:2010
EMC Directive 2014/30/EC	EN ISO 13849 – 1 / 2 2015
LVD Directive 2014/35/EC	EN 60204 – 1 :2018
	EN 61000 – 4/6

Advantages

Cutting-edge technology

Challenger sets a new industry benchmark with:

- standard-equipped safety laser scanners
- intelligent kinematics
- io-link sensors
- ethercat network communication

Optimized warehouse layout

Challenger enhances storage and retrieval efficiency, meeting predefined throughput and KPI targets while maximizing the use of available space.

Application flexibility

Designed to operate in extreme temperatures from -30°C to +45°C, making it suitable for diverse industries and applications, including frozen storage, food processing, and industrial manufacturing.

Scalable solutions

Challenger can evolve from a semi-automatic to a fully automated solution, offering flexibility for future expansions, allowing businesses to gradually transition to full automation as needed.

Customizable configuration

Flexible software and modular design allow full customization to meet specific customer requirements, ensuring adaptability to evolving business needs.

High reliability & safety

Equipped with self-diagnosis sensors and predictive maintenance capabilities, Challenger minimizes downtime and maximizes operational efficiency, ensuring a long-lasting and sustainable solution for logistics management.

Increased productivity

With a high handling speed, it achieves fast loading and unloading cycles of up to 30 pallets per hour, significantly increasing operational efficiency and reducing downtime.

Seamless connectivity

The integrated wi-fi kit enables real-time communication with WMS and MES systems, ensuring continuous inventory updates, optimized stock management, and error reduction through data-driven insights.

System integrability

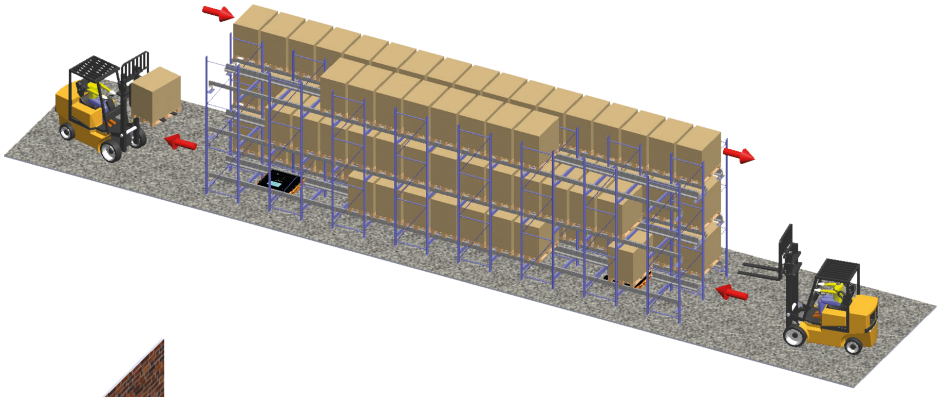
Standard communication protocols enable seamless interaction with AGVs, stacker cranes, and other automation systems, ensuring fully automated workflows and synchronized warehouse operations.

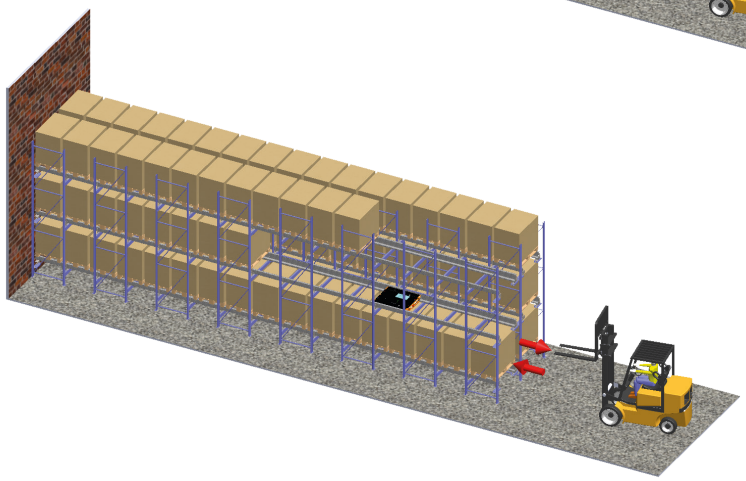
Storage layout & strategies

Challenger's storage system adapts to various operational configurations, optimizing space and pallet management for different industry requirements.

FIFO / LIFO STORAGE STRATEGIES

Ideal for industries requiring strict stock rotation, such as food, beverage, pharmaceutical and chemical sectors, as well as manufacturing processes adhering to FIFO - based ISO standards (e.g., IATF 16949:2016 in the automotive industry). This ensures product quality, traceability and compliance with regulatory requirements.





Technical specification

Advanced safety: laser scanners

Challenger is equipped with high-performance safety laser scanners that detect people and obstacles in real time, ensuring a high native performance level (PL) for enhanced workplace safety.

Intelligent kinematics

- Automatically adjusts speed based on load conditions
- Ensures smooth, precise movements while optimizing pallet handling
- Reduces mechanical stress, extending component durability

EtherCAT Communication:

Challenger features an advanced EtherCAT system that provides fast, reliable real-time data exchange across its integrated components. This technology supports synchronized operations and enhances overall performance while maintaining a streamlined design.

High-efficiency brushless motors

- Precise movement control and extended lifespan
- Significantly reduced maintenance needs
- Smooth motion and optimized load management

IO-link sensors

- Seamless integration into the io-link network
- Automatic configuration for quick sensor replacement
- Predictive maintenance reduces system downtime and enhances overall efficiency

LED system

- High-visibility indicators provide instant feedback on system status
- Facilitates user interaction and real-time monitoring for operational clarity

Technical specification

Lithium power unit

- High-quality lithium iron phosphate (LFP) battery
- 48Vdc, 24Ah capacity for superior performance and extended lifespan
- 2000 + cycles with 80% depth of discharge, ensuring long-term efficiency

Advanced battery management system (BMS)

- Protects against overloads, excessive discharge, and short circuits
- Optimized temperature control for enhanced reliability and longer battery life

Fast & easy charging

- Quick downtime reduction for continuous operations
- Spring-loaded contacts enable rapid battery removal and reinsertion
- Streamlined charging process for improved operational efficiency

High-power charger

- Minimizes downtime with optimized charging cycles
- Smart BMS connection for real-time charging profile management
- Supports universal input voltage (110Vac –240Vac, 50/60 Hz) for global compatibility

Unmatched reliability

- Advanced diagnostics track operational hours of essential components, allowing for scheduled servicing and fault prevention
- Modular design simplifies maintenance and ensures quick servicing
- Remote technical support for continuous operational efficiency and minimal downtime

Wide operating temperature range

- Functions in extreme conditions from -30°C to +45°C
- IP65 casing for protection against dust and water
- Ideal for industrial environments with variable temperatures and humidity levels

Advanced remote control

- Manages up to 100 machines with a single device
- Ergonomic handheld design with intuitive physical buttons
- Interactive display with quick access to critical functions
- Secure and stable communication for efficient satellite handling

Innovation & differentiation

Challenger offers a reliable, efficient, and sustainable solution for modern logistics, featuring:

- Intelligent motion optimization: advanced software dynamically manages movement within storage lanes, reducing idle time and enhancing overall efficiency
- Self-diagnosis & status monitoring: thanks to its automation system, BMS, and innovative system architecture, the Challenger provides real-time feedback on its status, including warnings and alarms, enabling timely interventions and enhanced operational control
- Extensive customization: flexible configuration options ensure seamless adaptation to specific warehouse requirements and future scalability
- Precise pallet lane management: the Challenger can manage storage lanes to a specific quota, allowing for modular pallet locations and enabling operation on two fronts (First In, Last Out) of shelving, where each front can be configured with diversified pallet locations.

Functionalities

STANDARD FUNCTIONS

FUNCTION	DESCRIPTION
HOMING	Return to the "home" position to define the start of the storing lane.
LOADING - STORAGE	Operation dedicated to the loading - storage of a single pallet within the storing lane.
UNLOADING – RETRIEVAL	Operation for the individual unloading - retrieval of a pallet from the storing lane.
INVENTORY	Counting of the pallets present within the storing lane.
CONTINUOUS UNLOADING - RETRIEVAL (WITH OR WITHOUT COUNTING)	Execution in continuous mode of pallet unloading - retrieval, with two operational modes: if the counter is set to 0, the system continues the missions until the operator's stop command or until the storing lane is empty; if the counter has a value different from 0, operations are executed equal to the set value.
PUSH COMPACTION	Compaction of all pallets present in the storing lane to eliminate any gaps, in accordance with the FIFO principle.
CONTINUOUS LOADING – STORAGE (WITH OR WITHOUT COUNTING)	Mode for continuous loading - storage of pallets, with two operational options: with the counter set to 0, missions continue until the operator's stop command or in case of failure to position the pallet at the beginning of the storing lane; if the counter is different from 0, the system executes a number of loads equal to the set value. **Note:** In case the operator with a forklift does not position the pallet at the beginning of the storing lane, the Challenger makes three attempts to verify the pallet's arrival; if detected in one of these attempts, the mission continues, otherwise it ends automatically.
MULTIPALLET	Management of pallets with dimensions smaller than the Challenger's standard size.
GAP (20 MM – > 350 MM)	Adjustment of the distance between pallets during loading - storage or compaction operations, configurable via remote control within a range from 20 mm to 350 mm.

OPTIONAL FUNCTIONS

FUNCTION	DESCRIPTION
ADVANCED CONTINUOUS UNLOADING - RETRIEVAL (WITH OR WITHOUT COUNTING)	A mode similar to the standard continuous unloading - retrieval, but with the capability to start a new mission without waiting for the removal of the previous pallet by the operator. If, at the end of the second mission, the first pallet has not been removed, the Challenger remains in standby while retaining the load.
LOADING AT POSITION/LEVEL - STORAGE	Allows the positioning of the pallet in a defined location within the storing lane, configurable via remote control.
PULL COMPACTION	Compaction of all pallets located at the beginning of the storing lane to ensure optimal space organization.
REVERSE	Function for inverting the fronts of the Challenger, useful for operations that require a change in direction.
EXTRA GAP (350 MM – > 800 MM)	Possibility to adjust the distance between pallets during loading – storage or compaction operations, configurable via remote control within a range from 20 mm to 800 mm.
QR AND RFID CHANNEL	Reading system that identifies the storing lane in which the Challenger is located, ensuring traceability and precision.
WI-FI	Wireless communication functionality for direct interfacing with the WMS or other Challengers, facilitating system integration.
CHALLENGER ANTICOLLISION SYSTEM	System designed to prevent collisions between two Challenger vehicles operating within the same storing lane, increasing safety and operational efficiency.

Dimensions & variants

Challenger is available in multiple configurations to meet diverse operational requirements: (A= Ambient F=Frozen) and both variants can be customized for specific needs.

MODEL CHOOSING TABLE FOR CHALLENGER ACCORDING TO THE PALLET TYPE								
PALLET TYPE, TEMPERATURE AND LOAD APPLIED				SUITABLE MODEL	LOADING CAPACITY DaN		TEMPERATURE	
SERIES	PALLET	FRONT (mm)	DEPTH (mm)	Challenger	1500	2000	0°C / -30°C	1°C /+45°C
EUROPALLET	EUR (*)	1000	1000	CH10.10	N	H	F	A
	EUR1/CHEP	1200	800	CH12.08				
	EUR 2 - 3	1200	1000	CH12.10				
	EUR (*)	1200	1200	CH12.12				
CP1 <--> CP9	CP1	1200	1000	CH12.10				
	CP2	1200	800	CH12.08				
	CP3	1140	1140	CH11.11				
	CP4	1300	1100	CH11.11 (**)				
	CP5	1140	760	CH12.08 (**)				
	CP6	1200	1000	CH12.10				
	CP7	1300 (base 1200)	1100	CH12.10 (**)				
	CP8	1140	1140	CH11.11				
	CP9	1140	1140	CH11.11				
U.S.A.	GMA	1016	1220	CH10.12				
AUSTRALIA	AU	1140	1140	CH11.11				
		1165	1165					
GIAPPONE	JP	1100	1100	CH12.12 (**)				

NOTE
(*) For EUROPALLET series the measures 1000x1000 e 1200x1200 they do not fit into the standard measurement EPAL - EUR.
(**) Must be mandatory added the function "Multipallet

EXAMPLE	
Challenger for pallet EUR 1 – loading capacity 1500 kg – operative temperature = 0°C / -30°C:	CH12.08-N-F
Challenger for pallet CP3 – loading capacity 2000 kg – operative temperature = 1°C / +45°C:	CH11.11 -H-A
Challenger per pallet EUR2 – loading capacity 1500 kg – operative temperature = 1°C / +45°C:	CH12.10-N-A

Challenger additionally is also available for the aforementioned version in

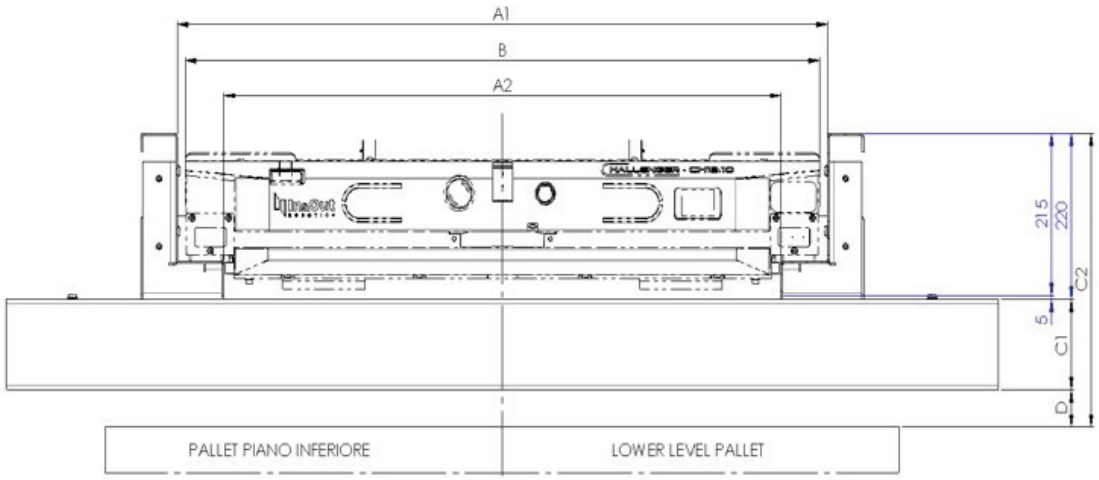
MODEL / VERSION	DESCRIPTION
Wi- Fi	For shuttle connection with WMS by handheld or AGV laser guided vehicle
STAINLESS STEEL	Destinated to dairy and food industries application where is requested a high level of hygiene

TECHNICAL DATA OF THE VEHICLE

MAXIMUM IDLE SPEED	80 m/min
ACCELERATION NO LOAD	1.2 m/s²
DECELERATION NO LOAD	1.2 m/s²
LOADED SPEED	Minimal 5 m/min – Maximum 65 m/min
ACCELERATION UNDER LOAD	Minimal: 0.05 m/s² - Maximum: 1.2 m/s² - Perfect balance between speed and load safety.
DECELERATION UNDER LOAD	Minimal: 0.05 m/s² - Maximum: 1.2 m/s² - Precise and safe stops even with heavy loads
MAXIMUM WEIGHT TRANSPORTED	Standard version: 1.500 kg Customized version: until 2.000 kg
UPPER STRUCTURE UP / DOWN TRAVEL TIME	About 3 s
OPERATING TEMPERATURE RANGE	From -30°C to +45°C,
CONNECTIVITY	Supports various communication systems for easy integration into automation system
COMPATIBILITY WITH HANDLING SYSTEM	Easily integrable with forklift, AGV and other devices

Dimensions & characteristics of the storage

CHALLENGER - TYPICAL DIMENSION OF THE OPERATIONAL CHANNEL



MODELS	DIMENSIONS (mm)					
	A1	A2	B	C1	C2	D
CH10.10-N-F	856	716	832	SUPPORT BEAM'S HEIGHT ACCORDING TO THE CALCULATION IMPOSED BY RACK DESIGNER AND CONSTRUCTOR	220+C1+D	MIN. mm 50
CH10.10-N-A						
CH10.10-H-F						
CH10.10-H-A						
CH10.12-N-F	856	716	832			
CH10.12-N-A						
CH10.12-H-F						
CH10.12-H-A						
CH12.08-N-F	983	843	959			
CH12.08-N-A						
CH12.08-H-F						
CH12.08-H-A						
CH12.10-N-F	983	843	959			
CH12.10-N-A						
CH12.10-H-F						
CH12.10-H-A						
CH12.12-N-F	983	843	959			
CH12.12-N-A						
CH12.12-H-F						
CH12.12-H-A						
CH11.11-N-F	983	843	959			
CH11.11-N-A						
CH11.11-H-F						
CH11.11-H-A						
LEGENDA:	Width of channel front	Guidance Width	Challenger width	Height of beam	Challenger height	Minimun clearance path

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