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Advanced internal logistics made simple

The GoPal robot solution makes it easy to automate internal logistics in a wide range of industries – either as part of Industry 4.0 automation or on its own.

About Robotize

- Robotize is an innovative mobile robotics company founded by engineers. We are is based in Kgs. Lyngby, close to Copenhagen, Denmark
- Robotize is the marked leader in Autonomous Mobile Robots for pallet transportation and has set new standards for flexibility and agility within internal logistics
- Our solution is currently installed in DK, SE, FI, NO, NL, PL, DE, RO, RU and USA
- Our vision is to offer simple, agile and flexible automation of internal logistics

The Need

- Efficiency has improved significantly in production and warehousing
  - High level of automation in production
  - Automation in warehouses maturing
- No real efficiency improvement in internal transportation
  - Lots of old technology requiring human labor
  - No data to support logistics and optimizations
  - Both inbound and outbound goods pileup in the production cells
  - Safety is a major issue with trucks

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The GoPal Solution

- The GoPal system fully automates internal transportation and create major efficiency gains by removing the need for labor
- Natural navigation enables the robot to drive freely. The robot autonomously optimizes routes and passes obstacles
- The system can be installed in less than a week without affecting the current setup
- The user interface is intuitive and simple
- A complete solution with all required accessories to easily integrate with the current setup
- Safety first – major improvement in safety at work

System Overview

Elevation

- The robot is carrying the pallet on the back to minimize space requirement
- Pallet stations are used for loading and unloading pallets
- Different pallet stations provided for interface to existing infrastructure
- Transports are ordered simply by pressing a button
- System is safety approved to co-work with people

Automatic charging

Conveyer interface

Simple Pallet Station

GoPal Robot

GoPal 400

- GoPal 400 is an Autonomous Mobile Robot that uses natural navigation to find its way within the factory
  - The robot does not require modifications to the existing environment to navigate (no tape, reflectors…)
  - No requirement for specific robot roads. Obstacles are simply passed
- GoPal 400 is very agile and can turn around its own center
  - Suited for busy environments and pickup/delivery at the production cell
- No user interface at the robot
  - Key-switch for turning on/off and entering manual modes
  - Push buttons for releasing brakes and resetting safety system
- Safe among people

Key specifications	Values
Robot dimensions	1400 x 860 x 315 mm
Maximum cargo weight	425 kg
Driving speed (max)	2,4 m/s (8,6 km/h)
Driving speed (typical)[1]	3,5 km/h
Operational time (depending on load)	10 - 14 hours
Recharge time – full charge[2]	45 minutes
Battery type	$LiFePO_4$
Battery lifetime	> 5.000 charges
Turning radius	850 mm
Operating temperature	-10 - 45°C

[1] The robot's speed depends on driving conditions, like driving a car.
[2] The robot will automatically utilize any breaks to recharge the batteries.

GoPal E24 (GoPal 800)

- GoPal E24 is our second generation GoPal Autonomous Mobile Robot.
  - GoPal E24 has the same physical size as the GoPal 400 but has an extended lifting capacity.
- Safe among people
  - GoPal E24 has the same safety approval as the GoPal 400 and is complete safe among people despite the higher loading capacity.

Key specifications	Values
Robot dimensions	1400 x 860 x 340 mm
Maximum cargo weight	1000 kg
Driving speed (max)	2 m/s (7,2 km/h)
Driving speed (typical)[1]	3,5 km/h
Operational time (depending on load)	5 - 8 hours
Recharge time – full charge[2]	45 minutes
Battery type	$LiFePO_4$
Battery lifetime	> 5.000 charges
Turning radius	850 mm
Operating temperature	-10 - 45°C

[1] The robot's speed depends on driving conditions, like driving a car.
[2] The robot will automatically utilize any breaks to recharge the batteries.

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The simple Pallet Station

- The simple Pallet Station is the most common station
  - It is simple and cheap
  - Only slightly larger than a pallet
  - Several Pallet Stations can be grouped as a single delivery location. The GoPal will select the first vacant for delivery
- Dispatching of pallets can be ordered by different methods
  - The most common method is to use a Call Button to issue a request for a transportation between specific Pallet Stations
  - For advanced dispatching, the GoControl offers a web page that can be accessed by a PC/iPad/mobile phone
  - By integrating WMS/ERP system with GoControl orders can be issued automatically

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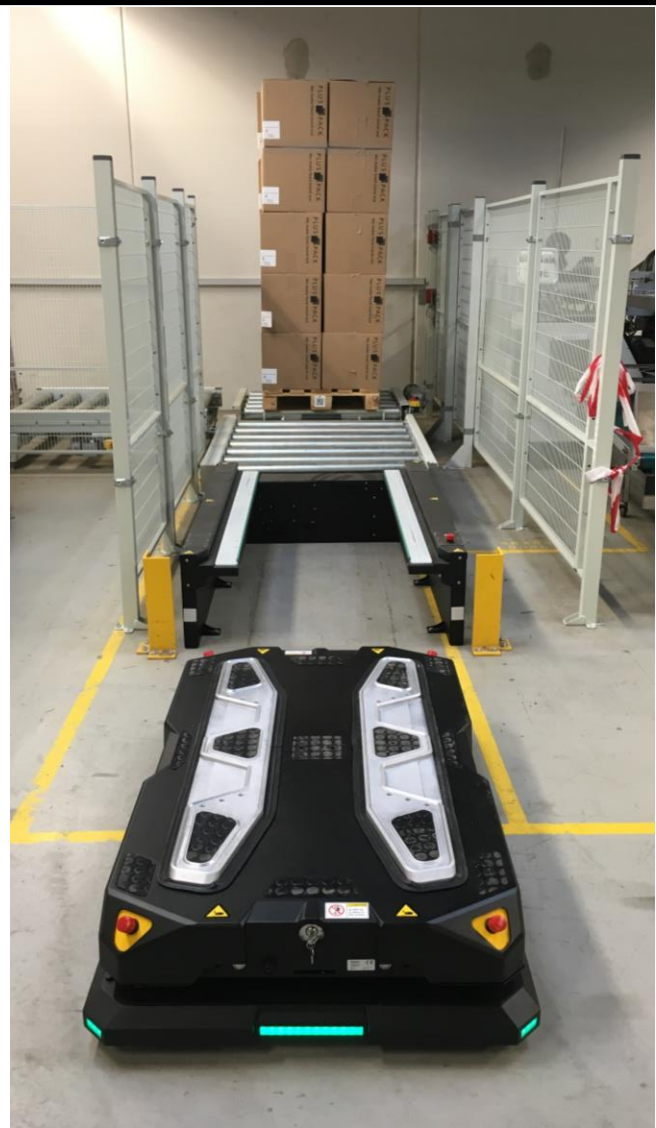
Conveyer Pallet Station

- The Conveyer Pallet Station is the typical GoPal interface to warehouses
- The Conveyer Pallet Station enables the GoPal to collect from - or deliver to - a conveyer system
- Control signals to integrate smoothly with the existing conveyer control system
- Height of belt is 355mm. To interface with conveyer systems at different heights a standard conveyer lift should be used
- Can be used together with passive conveyers to achieve buffer capacity
- Fully integrated with GoControl



Elevation Pallet Station

- The Elevation Pallet Station has a dual purpose
  - As a GoPal interface to normal pallet jacks that are unable to lift pallets on top of a normal pallet station
  - As a lifting table that can provide ergonomic better heights for packaging a pallet
- The Elevation Pallet Station has a build-in call button
- Fully integrated with GoControl

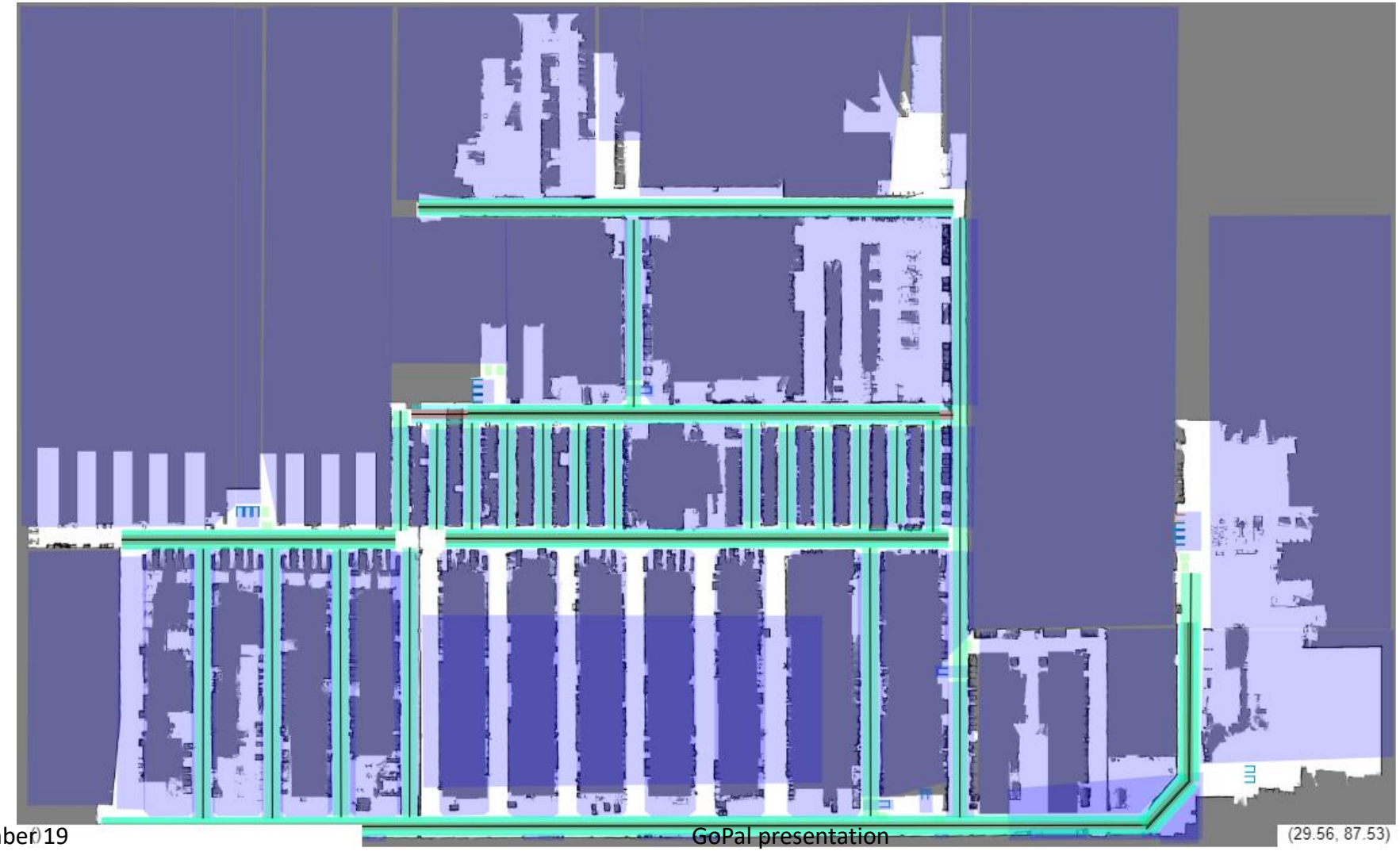
Power Station

- The Power Station is used to automatically charge the GoPal robots
- Whenever a GoPal is unemployed it will seek for a vacant charging station to top up the power level
- Charging is monitored and controlled by GoControl and will immediately be interrupted when transport orders are received
- In a multi robot system two Power Stations are recommended
- The Power Station requires access to 230V, 13A power outlet.

GoControl

- GoControl is the heart of the GoPal system. All robots, call buttons and advanced pallet stations are tied together in the GoControl server. The primary areas of functionality in GoControl are
  - Order central: Receives orders and dispatches robots to the next job and keeps transportation orders prioritized and organized
  - Traffic Control: Implements traffic control in a multi robot system to ensure an optimal traffic flow
  - Provides a site map with position of pallet stations and current position of robot(s)
  - Configuration and Alerts
  - Interface to WMS/ERP system
- GoControl has a WEB based user interface and can be accessed from common browsers

GoPal map example



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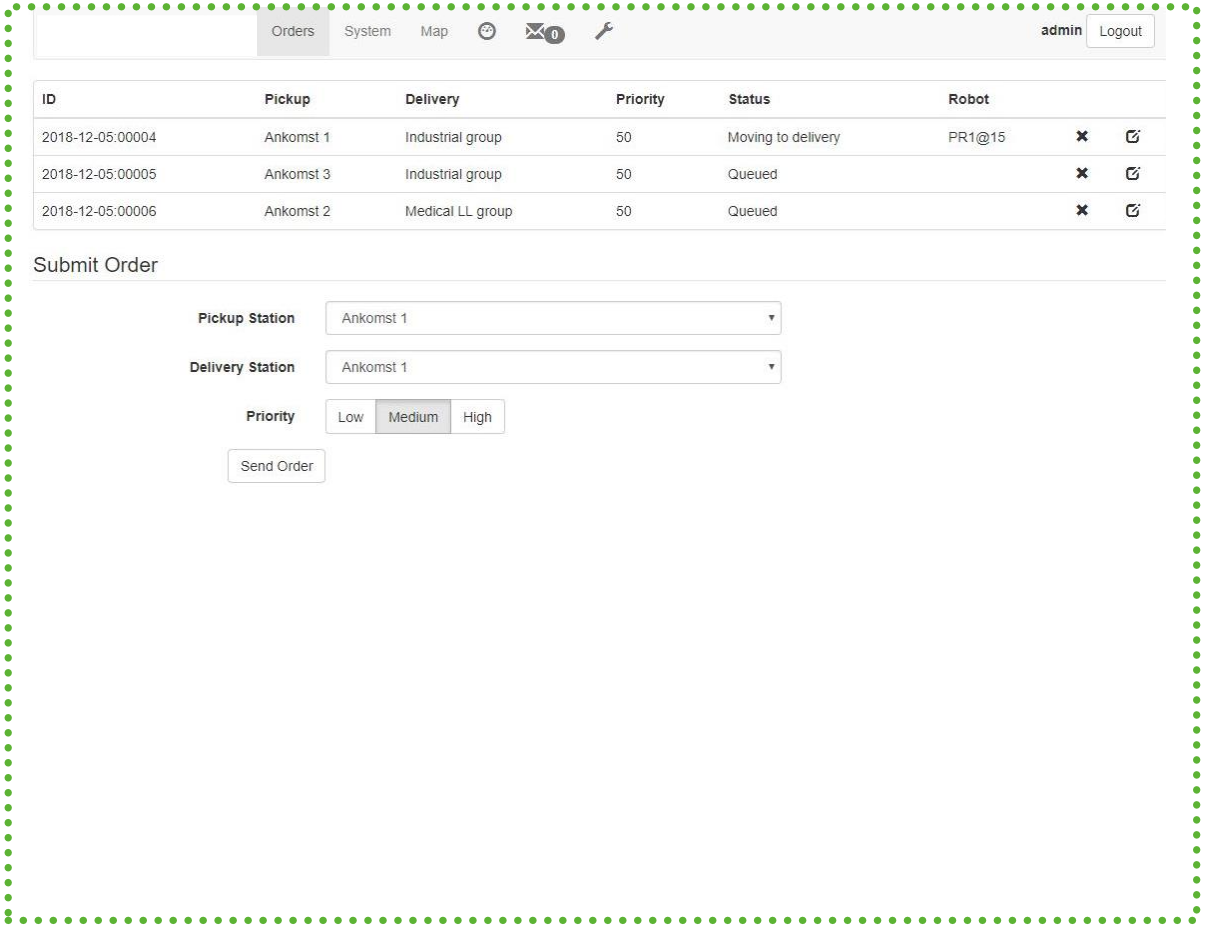
GoControl: Orders

- The Orders menu of GoControl consist of two parts
- List of current orders and their status
  - Existing orders can be modified or deleted
- Manually entering of new orders
  - Pickup and delivery stations should be entered
  - Specific priority or orders can be set



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GoControl: Data

- The GoControl server continuously collects data on the system performance. This data can be used to optimize the internal logistic operation
  - On daily basis: Hourly registration of robot distance driven with and without pallet
  - Data for the last 30 days can be used to compare today's performance with historical data

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GoControl: Data

- The GoPal system also collects data on number of deliveries

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Internal logistics with GoPal – a new era!

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