



FORI AUTOMATION

Flex Floor Vehicles

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GLOBAL HEADQUARTERS

FORI FLEX FLOOR

Fori Flex Floor Vehicles for Automated Assembly & Material Handling Systems



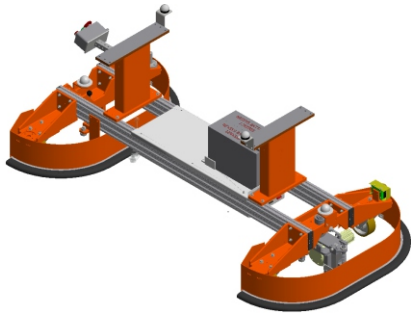
The Fori Flex Floor is a flexible, safe and scalable assembly and material handling platform for the automotive and non-automotive industries. The Flex Floor includes varying levels of capability based on the capacity and maneuverability required for the assembly or material handling system. The Flex Floor platform includes rail guided carts (RGCs), unit load automated guided carts (AGCs) and tunnel AGCs.

Flex Floor Product Line

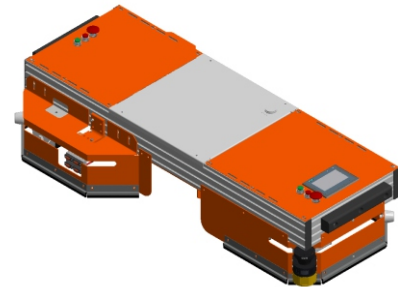


The Fori Flex Floor is a flexible assembly and material handling system designed to fit around the end users process and product. Whereas many of the other material handling products on the market require the end user process and product to fit around the material handling system. The Flex Floor platform includes a variety of vehicles based on a single mechanical & electrical architecture. The Flex Floor vehicles have varying levels of capability depending on the end users specific requirements. The platform is based on a reconfigurable chassis that utilizes standard building blocks, making dimensional modifications simple.

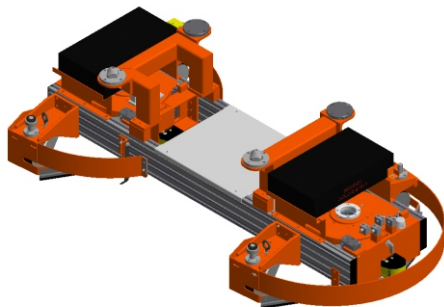
Flex Floor - RGC: Flex Floor Rail Guided Carts (RGCs) are a direct replacement for traditional, monument based conveyor systems. The RGCs utilize a low profile, floor mounted rail for guidance.



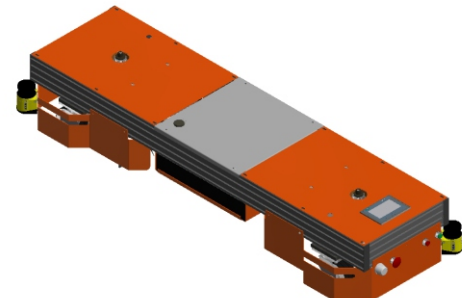
Flex Floor - 1.0 & 1.0T: Flex Floor 1.0 & 1.0T is a scalable unit load or tunnel AGC for assembly and material handling. The vehicle includes a single drive wheel, perfect for loop style assembly & material handling systems.



Flex Floor - 2.0 & 2.0T: Flex Floor 2.0 & 2.0T offer additional capability by utilizing dual drive wheels. The result is a vehicle with double the capacity of the 1.0 and omni-directional capability. Vehicles can be configured as a unit load assembly AGC or as a Tunnel AGC for material handling.



Flex Floor - 2.0 & 2.0T - HD: Flex Floor 2.0 & 2.0T - HD offer the same capability as the standard 2.0 & 2.0T, but the HD series provides nearly double the total unit load and towing capacity. The maximum load capacity for the HD series is 14,000 lbs.



The Fori Flex Floor utilizes a heavy duty extrusion frame that allow the footprint of each vehicle to be easily modified to fit the product being assembled or transported. The Flex Floor platform utilizes commercially available drive wheels, casters, batteries and control components. The Flex Floor platform is based on a Siemens Safety PLC control architecture, providing an open architecture to the end user. A Vehicle Management System (VMS) is supplied with each vehicle system enabling the system to be fully autonomous, only requiring input for scheduling of moves from the end user or plant production system.

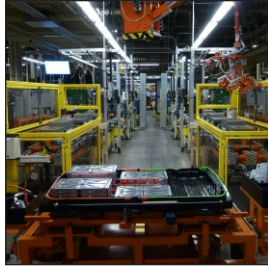
Assembly & Material Handling Applications

The Fori Flex Floor is utilized for a variety of assembly and material handling applications within the automotive & non-automotive industries. Applications include rack transfer, kit assembly transfer, companion cart transfer, axle assembly, battery pack assembly, chassis assembly (frame or body), engine dress, automotive module assembly and many others.

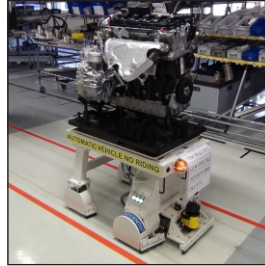
Axle Assembly



Battery Assembly



Engine Dress



Material Handling

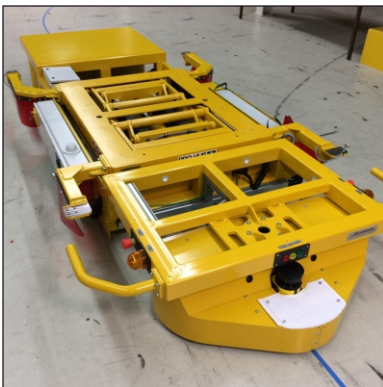


Module Assembly



Companion Carts, Integrated Lifts & Trunnions

Integrated Scissor Lifts



Powered Trunnions



Conveyance Companion Cart



Flex Floor RGC Specifications



TECHNICAL SPECIFICATIONS

Maximum Payload	1,000 lbs (455 kg)*
Maximum Speed	2 fps (.61 m/s)*
Stopping Accuracy	+/- 10 mm
Turning Radius	60 in (1524 mm)
Maximum Grade	1%*
Operating Environment	Indoor
Maneuverability	Uni-Directional
Guidance	Rail

SIZE AND WEIGHT

Dimensions	84 x 40 x 13.5 in* 2134 x 1016 x 343 mm*
Vehicle Weight	500 lbs (227 kg)

BATTERY / POWER SYSTEM

Power Supplies	Lead Acid Lithium Ion
Voltage [dc]	24

(*) - Can be customized based on project requirements



Flex Floor 1.0 Specifications



TECHNICAL SPECIFICATIONS

Maximum Payload	3,000 lbs (1,364 kg)*
Maximum Speed	3 fps (.91 m/s)*
Stopping Accuracy	+/- 12 mm
Turning Radius	60 in (1524 mm)
Maximum Grade	1%*
Operating Environment	Indoor
Maneuverability	Uni-Directional
Guidance	Magnetic Optical

SIZE AND WEIGHT

Dimensions	75 x 38 x 16 in* 1905 x 966 x 407 mm*
Vehicle Weight	750 lbs (341 kg)

BATTERY / POWER SYSTEM

Power Supplies	Lead Acid Lithium Ion Induction
Voltage [dc]	24

(*) - Can be customized based on requirements, final speed determined based on load and turn radius



Flex Floor 2.0 & 2.0T Specifications



TECHNICAL SPECIFICATIONS

Maximum Payload	6,000 lbs (2,727 kg)*
Maximum Speed	3 fps (.91 m/s)*
Stopping Accuracy	+/- 12 mm
Turning Radius	0 in / mm
Maximum Grade	1%*
Operating Environment	Indoor
Maneuverability	Omni-Directional
Guidance	Magnetic Optical

SIZE AND WEIGHT

Dimensions	90 x 31 x 16 in* 2286 x 788 x 407 mm*
Vehicle Weight	1,100 lbs (500 kg)

BATTERY / POWER SYSTEM

Power Supplies	Lead Acid Lithium Ion Induction
Voltage [dc]	24

(*) - Can be customized based on requirements, final speed determined based on load and turn radius
Pat. Pending



Flex Floor 2.0 & 2.0T-HD Specifications



TECHNICAL SPECIFICATIONS

Maximum Payload	13,000 lbs (5,909 kg)*
Maximum Speed	2.5 fps (.76 m/s)*
Stopping Accuracy	+/- 12 mm
Turning Radius	0 in / mm
Maximum Grade	1%*
Operating Environment	Indoor
Maneuverability	Omni-Directional
Guidance	Magnetic Optical

SIZE AND WEIGHT

Dimensions	96 x 34 x 18 in* 2439 x 864 x 458 mm*
Vehicle Weight	1,200 lbs (546 kg)

BATTERY / POWER SYSTEM

Power Supplies	Lead Acid Lithium Ion Induction
Voltage [dc]	48

(*) - Can be customized based on requirements, final speed determined based on load and turn radius
Pat. Pending



Fori Flex Floor - Assembly & Material Handling Cart Features



- Variety of power supplies available
- Multiple guidance technologies
- Drive wheel units integrated with floor contouring suspension systems
- Opportunity charging for continuous operation
- 360° assembly access
- Simple path modifications
- Improved setup times
- Cart length can be modified based on product
- On board expandable I/O accommodation
- Low maintenance costs
- Capital reutilization with replaceable tooling trays
- Flexible line configuration
- Vehicle management system for autonomous vehicle control



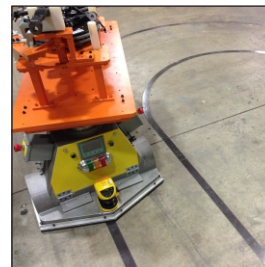
Vehicle Guidance

The Flex Floor vehicle platform includes a variety of guidance technologies. In total there are three different guidance feedback methods available, including magnetic, optical and induction. Each of the guidance technologies has its own unique performance, flexibility and reliability factors to consider. There are also mechanical guidance methods, such as above floor rail guidance. Additional information on each guidance method is available upon request.

Rail Guidance



Magnetic Tape



Magnetic Bar



Magnet Marker



Optical



Induction



Power Supplies

Fori offers a variety of power supply options depending on the requirements of the project. Power supplies include different battery chemistries, induction power and hybrid systems that combine battery and induction. The ideal power supply for the process will be selected to ensure the automated vehicle meets the requirements of the project.

Lead Acid (AGM)



Lead Acid (GEL)



Lead Acid (TPPL)



Lithium Ion (NMC)



Lithium Ion (LFP)



Induction



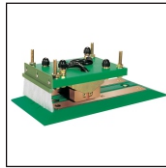
Battery Charging

Based on the duty cycle of a system there are different styles of vehicle charging available. Best fit charging infrastructure will be determined during the application engineering phase.

Manual Plug-In



Floor Mounted Charging



Side Mounted Charging



Control Pendant / HMI

Depending on the style of vehicle multiple configurations of control pendant and HMI can be utilized. The HMI and pendants provided are commercially available products.

Onboard HMI



Control Pendant



Tethered HMI & Control Pendant



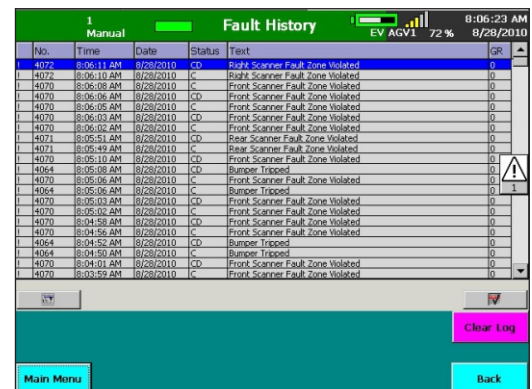
Vehicle Management

A Fori Vehicle Management System (VMS) serves as the traffic controller for the AGC system. Scheduling of moves, AGC status, plant I/O status and fault messaging are all available from the main VMS panel. The user interface is customizable based on end user preference. PLC based for loop path system. PC & PLC based system for complicated routing.



Advanced Diagnostics

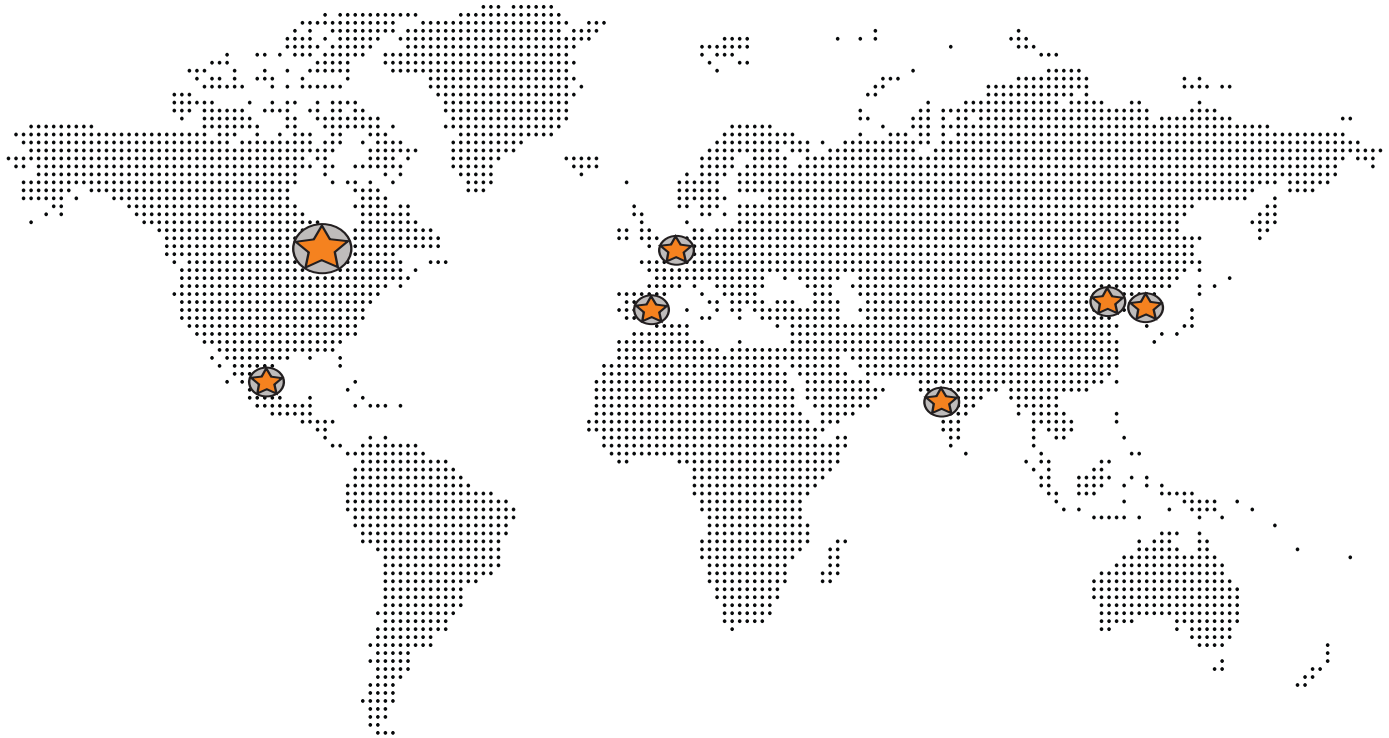
The VMS includes fault messaging which provides diagnostic information in order to help maintenance teams debug issues that may arise within the automated vehicle system. Information on vehicle status such as safety and battery status is also available.



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