

# REDVIKING®

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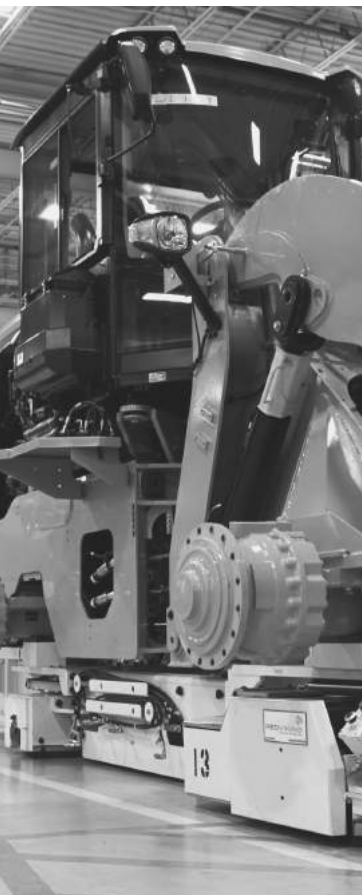
## Automated Guided Vehicles



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## REDVIKING AGVS

AGVs are the intelligent automated guided vehicles that avoid the expense of chain-based conveyance. They're a perfect fit for assembly lines and material handling where you need 24/7 operation, onboard power for lift or rotation, or heavy payload transport. Retrofitting an old plant with low volumes or building a brand new facility with high volumes, high duty cycles and heavy payloads, we have you covered.

01

**INDUCTIVELY POWERED**

04

**SAFE & ERGONOMIC**

02

**SCALABLE & FLEXIBLE**

05

**UNLIMITED PAYLOADS**

03

**LOW RISK**

06

**MULTIPLE MODES**

Increasingly, companies are turning to RedViking for ways to increase throughput and minimize infrastructure. RedViking AGVs (Automated Guided Vehicles) are the efficient, operator friendly solution for material handling. Our AGV solutions are cleaner, more sustainable, and require less infrastructure than traditional conveyance methods. RedViking's AGV solution is designed for your production process and your product.

AGVs can handle a broad range of applications. Whether your product has a high payload and low throughput or high throughput and high volume, our AGVs are an engineered solution for your needs. This scalability allows for lower entry cost than other conveyance methods because the system does not require additional infrastructure and is customized to your specific application.

Unlike traditional conveyance, the travel path of an AGV can be quickly and cost-effectively reconfigured to accommodate changes in product, process, or path. Additional AGVs can be added as needed as the line changes or to increase the production rate. This flexibility also provides cost savings as your system does not need to be more robust to accommodate future needs.

## BATTERY POWER

RedViking's Battery operated Automatic Guided Vehicles (AGVs) have a wide variety of technology to offer based on the needs of your application. Each of our AGVs start with an industrial hardened PLC based Motion Control System to manage all Battery Power, I/O, wireless communications, guidance, speed control and safety systems. Our Human Machine Interface (HMI) system will ensure ease of operation for all skill levels of operators.

Our AGVs can be also be equipped with a variety of auxiliary systems such as an Andon light system to signal operators for process related information. Whether it is an operator pendant, touch screen, kick-plates, manual pushbuttons or other equipment, RedViking can integrate operator controls for any process related scenario.

RedViking has developed a cost effective industrialized battery AGV solution by choosing the appropriate components to make sure the overall system is optimized for both reliability and cost. We have researched and selected the best technology to exceed today's demanding manufacturing requirements.







## THIN PLATE PURE LEAD

Thin Plate Pure Lead (TPPL) is a type of an Absorbed Gas Mat (AGM) battery. The lead plates inside the battery are much thinner than traditional lead acid batteries and allow for a greater efficiency. This type of battery is reliable, affordable and low maintenance.



## LITHIUM

Lithium-ion (Li-ion) or Lithium Polymer (Li-Po) are more compact and lighter than traditional lead acid batteries which makes them easier to package in the AGV. Better suited for applications, they run continuously or near continuous. The power level can be drained and charged incrementally as needed without worry of battery life degradation.



# AGV BATTERY CHARGING SOLUTIONS

There are several different methods for charging AGV batteries ranging in costs and features. RedViking will work with you to determine the specific needs of your application which will allow us to determine the appropriate method.

Some AGV applications that only have light production requirements may suffice with a simple manual plug-in style charging solution while other high volume production systems will require a specific type of fully automated charging solution. In either case, our RedViking smart AGV control system will communicate with the Master Control System and determine exactly when charging is required for all AGV's as well as when the required charging cycle has been completed.

## MANUAL PLUG-IN

The manual charging solution is the most basic and affordable of all the charging methods. It will require an operator to manually insert a plug into the AGV. An alert system can be installed to prompt the operator when it is time to charge the AGV and also when it is time to disengage the charger. This type of application is best suited for an AGV that will have extended amounts of downtime or only run a single shift.



## INDUCTIVE CHARGING

Inductive charging is ideal for fully automatic charging. With a transmitter along the track and a collector attached to the bottom or the side of the AGV, the benefit of inductive charging is that no materials are in contact with one another eliminating the opportunity for parts to wear out. There is an airgap of about 40 mm between the receiver and the transmitter allowing for a contact free charging system.

## CONTACT CHARGING

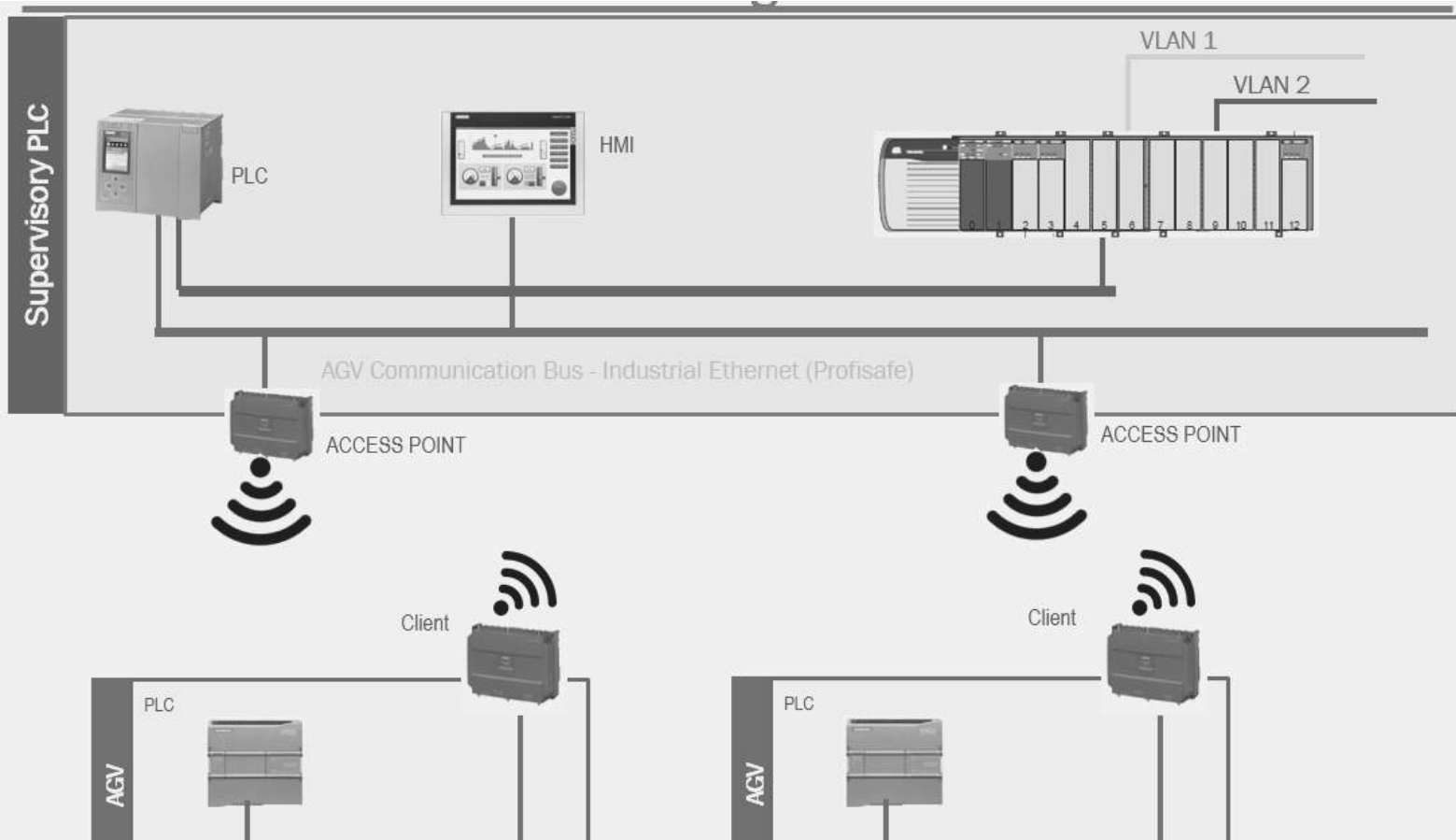
The CA collector plate is attached to either the bottom or the side of the AGV and the transmitter plate is placed along the track either in station or in an external charging spur. Recognizing when it's time to charge, the AGV will drive to the designated area and the charger will actuate to begin the charging procedure. Once fully charged, the charger will retract and the AGV will be ready to return to operation.



# AGV WIRELESS COMMUNICATION OPTIONS

RedViking has developed multiple AGV communication methods and have determined that over air wireless radio based wireless communications to be the most versatile and reliable method of communication.

We currently offer multiple industrial wireless communication product sources. Power Over Ethernet (POE) Master Radios are mounted on columns and strategically placed around the AGV track. Each AGV is outfitted with a wireless access point. The AGV's on-board PLC communicates essential information like position, speed, battery level and other information back the Master Control System. The system is also capable of communicating Manufacturing Execution Systems (MES) process related data. It seamlessly integrates with RedViking Argonaut MES System or can be implemented with an existing MES system.





## NAVIGATION SOLUTIONS

RedViking has a wide variety of methods to navigate our AGV's autonomously as well as different methods for track based guidance and specific reasons to use each method.

Some methods such as inductive, magnetic and optical provide guidance only (AGV centered on track) and are coupled in parallel with our location marker system to give absolute position information. Free space methods of navigation are all inclusive and do not require the aid of any other components for navigation.

### MAGNETIC

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### OPTICAL

This system is coupled with our position marker system. This is the most simple and cost-effective of the guidance solutions that RedViking offers. The AGV sees a contrasting line on the floor, either paint or tape, and centers the vehicle over the line. This guidance coupled with the barcode tape would allow for a system that could change paths with minimal effort.

## INDUCTIVE

This system is coupled with our position marker system to achieve autonomous navigation. This method is mainly used in our inductive power transfer AGVs to guide and power our IPT AGVs but is compatible to guide our battery AGVs if needed. The inductive method involves having an electrified wire buried beneath the floor. The sensor on the AGV detects the voltage emitted by the wire and ensures that the AGV is centered over the electric field. It can also be installed sub-floor with the position markers for a seamless sub-floor navigation system. This type of system is immune to dust dirt and debris.



## INERTIAL

Inertial guidance combines multiple sensor technologies such as accelerometers and gyroscopes to allow for a self-contained navigation system. It does not need input from any other devices. After the AGV takes an initial reference point, it will use the accelerometers to calculate how much linear distance it covers. It will then use the gyroscopic sensor to detect the angle of turn and can navigate in any direction.

## LIGHT DETECTION & RANGING

Light Detection and Ranging (LiDAR) work on a similar principle to sonar only. Using a laser instead of sound, a laser pulse is emitted out of the LiDAR sensor then it measures the time it takes to see the reflection of the laser. A 3-dimensional map is then created of the environment in real time. This technology also can command the AGV to slow down, avoid obstacles, and navigate in any direction.

# HUMATICS SPATIAL INTELLIGENCE PLATFORM

Humatics Spatial Intelligence Platform (free space navigation) is a unique type of navigation that uses beacons in the ceiling or wall to transmit light to the receivers mounted on the AGV. There must be line of sight between the receiver and at least two of the transmitters. Any other equipment that would require navigation like cranes or other robots can also navigate from the same beacons. This system can navigate in any direction.

## TRANSPONDERS

Transponders are a passive radio-frequency identification (RFID) device that are installed sub-floor close to the AGV track. When the AGV passes over the top of the device, a reader inside the AGV energizes the sub-floor transponder and receives the unique number. With this information, the system knows where the AGV is located along the track. The AGV then uses the encoders on the wheels to calculate how far it has moved until it reaches the next transponder point.



## BARCODE

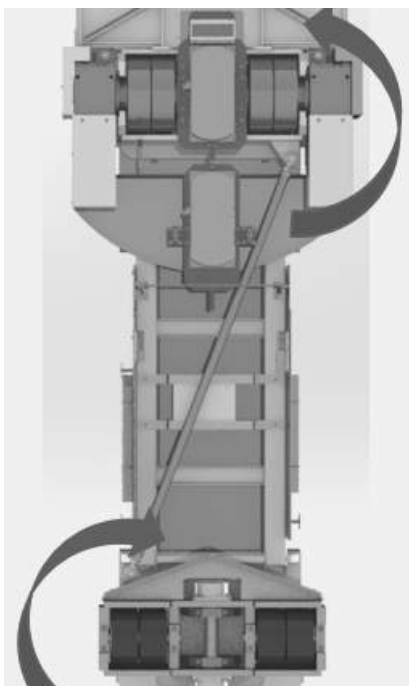
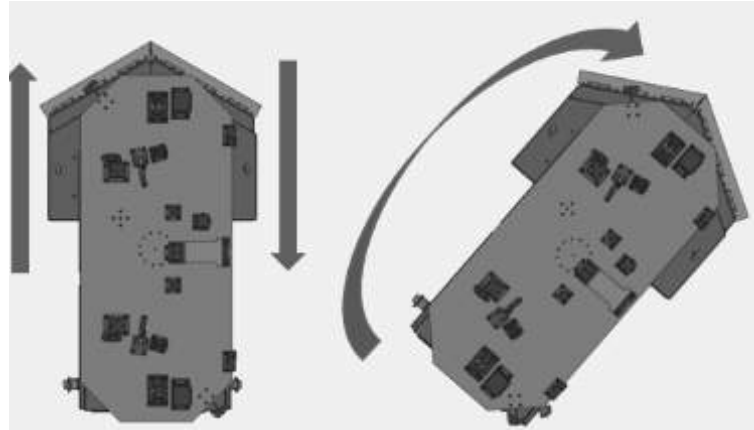
Barcodes are used as a means of associating a number with a position. When the AGV passes over the top of the barcode, the optical sensor will read the unique number on the barcode and the AGV's PLC will associate it with a position. The barcodes can come in a tape form making it easy, fast and convenient to install them.

# AGV STEERING TECHNOLOGY

RedViking has developed different types of steering technology for our custom applications. If the turning radius requirements are a minimum of 0 feet or 30 feet, RedViking is able to provide you a solution.

## SKID STEERING

Skid steering is a very common and basic method to steering the AGV. This concept moves the AGV in the same style that a tank would move only with wheels instead of tracks. When turning, the AGV will engage the motor on one side faster than the other. If the wheels are turning in opposite directions, an even sharper turn can be achieved. This type of steering is suitable for a wide variety of applications.

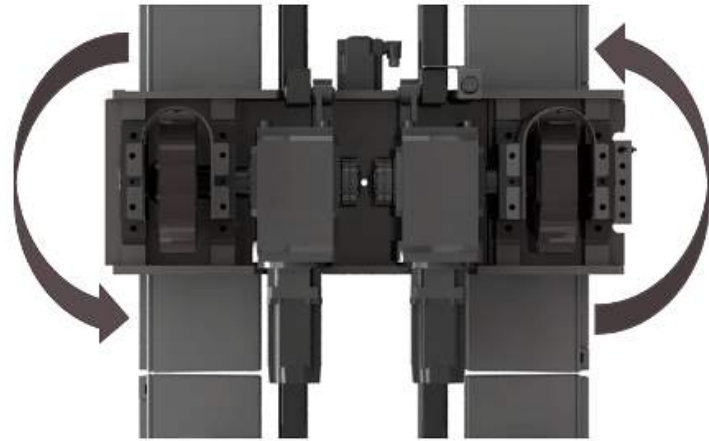


## AXLE STEERING

When extra heavy payloads and high mobility are required we will equip our AGVs with heavy duty axles that rotate about a base plate and tie them together with a steering link. It still uses the same concept as skid steering except the wheels are supported with an axle making it suitable for extra heavy payloads. This allows our large AGVs to still be able maneuver around tight spaces. The front and the back wheel assemblies are on plates that rotate independently.

## CENTRAL PIVOT STEERING

Two drive wheels are attached to a base plate that is driven by another servo motor on top of the assembly. This allows the top of the AGV to maintain orientation while the wheel assembly is free to rotate. When it is necessary to change the orientation of the top of the AGV, the baseplate is locked and the whole vehicle will rotate. This type of configuration would have the steering assembly near the center of the vehicle that would have casters on the outer corners of the AGV to support approximately 60% of the load.



## SWERVE DRIVE STEERING

This system is a combination of a drive motor, steering motor, gearbox and wheel. This type of system is suitable for AGVs with a lighter payload that require a higher level of maneuverability. Each wheel can be driven and steered independently creating an Omni-directional capable vehicle.





# OMNI-DIRECTIONAL STEERING WITH MECANUM WHEELS

Mecanum wheels are a very unique design that allow the AGV to travel in any direction. With every wheel independently controlled in multiples of four, this type of movement can be achieved. When all four wheels are rotating in the same direction, forward or backward movement is achieved. Running them on one side in the opposite direction to those on the other side will rotate the vehicle. Running the wheels on one diagonal in the opposite direction to those on the other diagonal achieves sideways motion. This system is useful when there are tight space constraints and maximum maneuverability is required.



# AGV SYSTEM MASTER CONTROL PANEL

The Master Control Panel (MCP) will traffic all of the AGVs to your specifications. The MCP will show where all the AGVs are in real time. Speeds and distances between AGVs can be adjusted from the panel. The MCP can also route the AGVs through different paths. If integrated with an MES system, we can also display information related to throughput, part and process traceability, error proofing, part kitting and sequencing, and other helpful information if desired.

