

EMS System Components

Your electrified monorail system (EMS) contains the following major components:

- EMS Load/Unload Guides
- EMS Rail
- EMS Carrier - Trolley Assembly
- EMS Carrier - Upper Frame Assembly
- EMS Carrier - Lower Frame Assembly
- EMS Shuttle



EMS Load/Unload Guides



UHMV Bar



Rubber Bumper



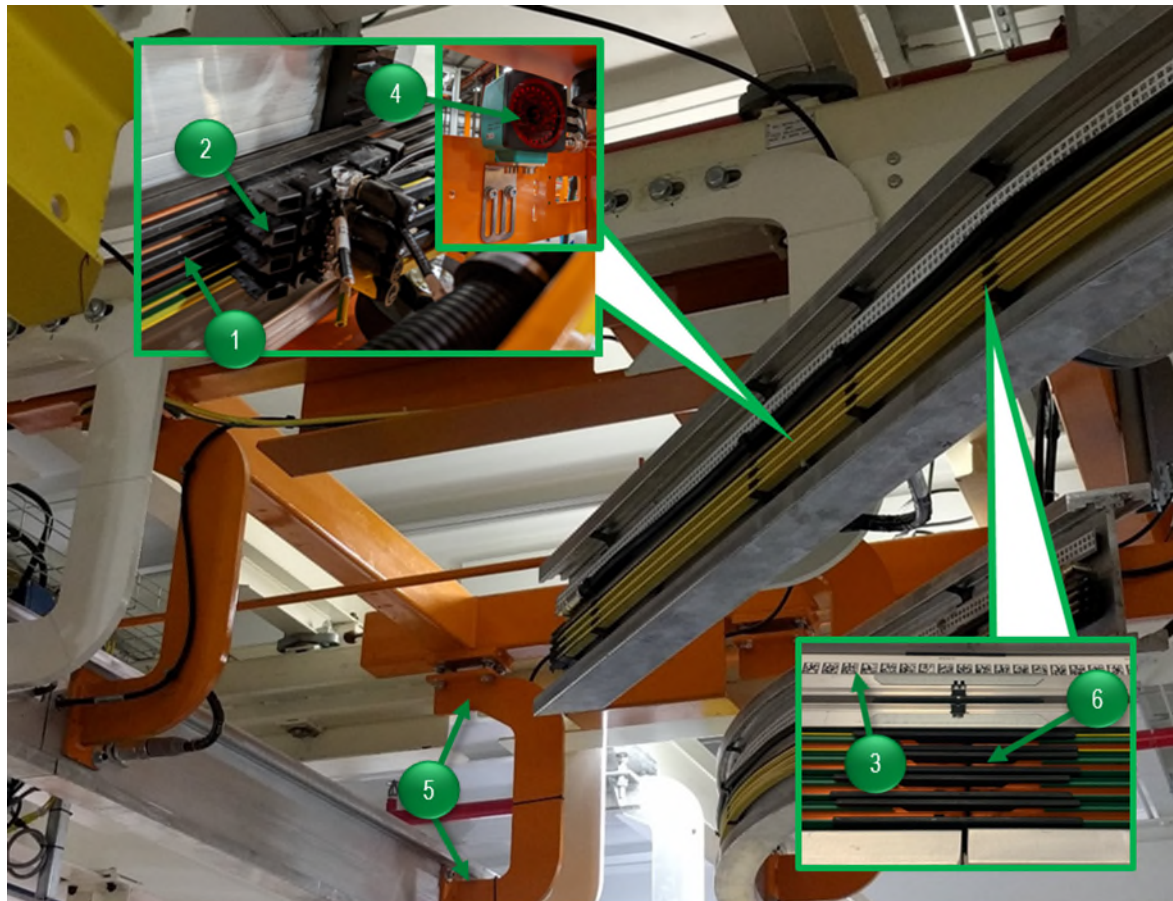
Guide Roller

EMS Load/Unload Guides Overview

Directly below the EMS system are two sets of guides: one for loading the product onto an EMS carrier and one for unloading product onto a skid.

As the EMS carrier is lowered, UHMW bars and guide rollers aid in positioning the EMS lower frame for product transfer. Rubber bumpers are mounted on pedestals to prevent over travel.

EMS Rail



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|------------------|--------------------|----------------------------|
| 1 Conductor Rail | 3 Code Rail | 5 Yokes |
| 2 Collector Shoe | 4 Code Rail Reader | 6 Conductor Rail Connector |

EMS Rail Overview

The EMS rail is composed of copper housed in a PVC jacket.

The collector shoe is bolted to the trolley door and slides into the grooves of the conductor rail where it passes an electrical current.

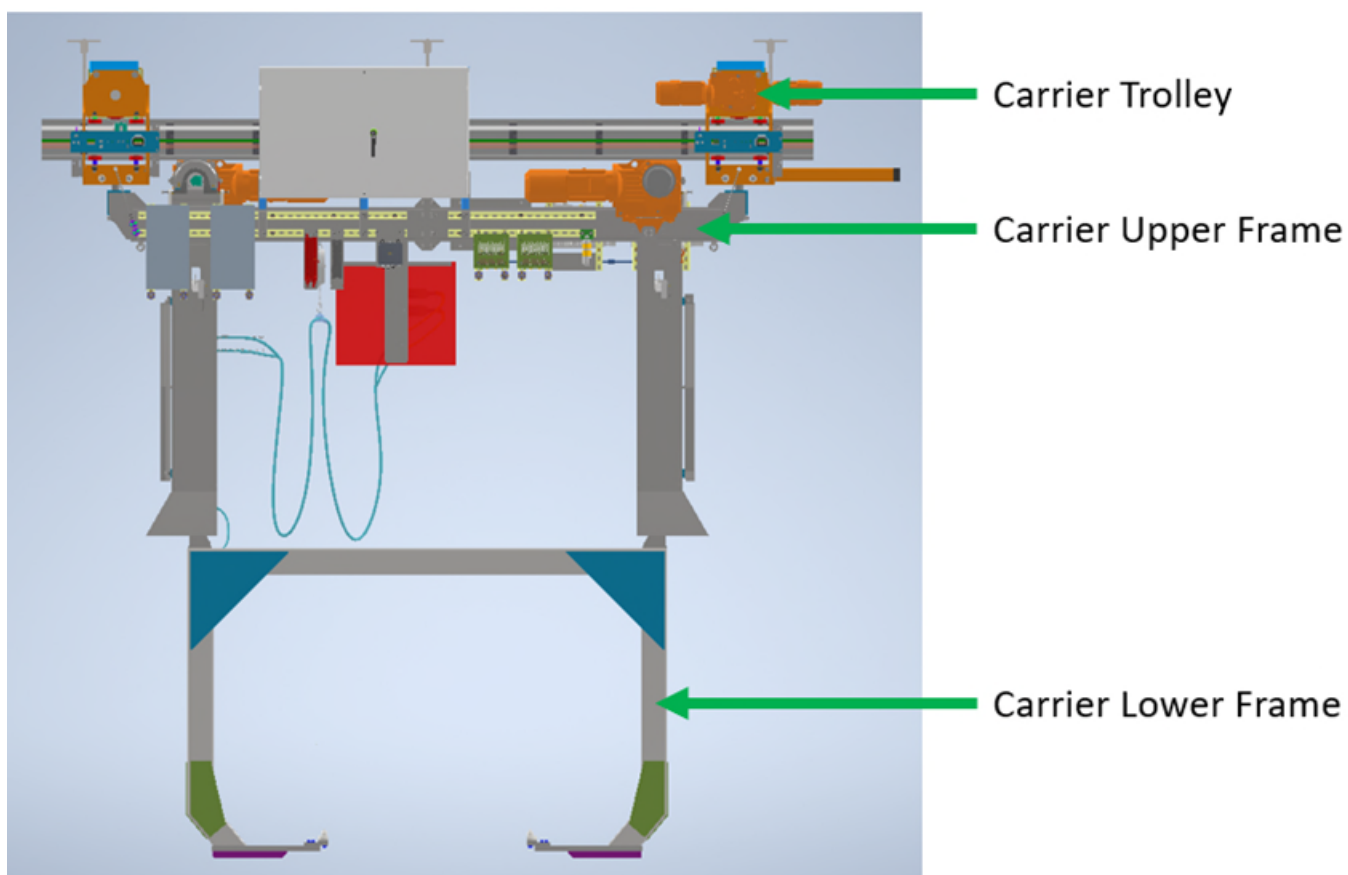
As the trolleys move through the system, its position is sensed when the code reader tape scans the code tape.

The rail is supported by a series of yokes hung from white steel, providing stability to the system.

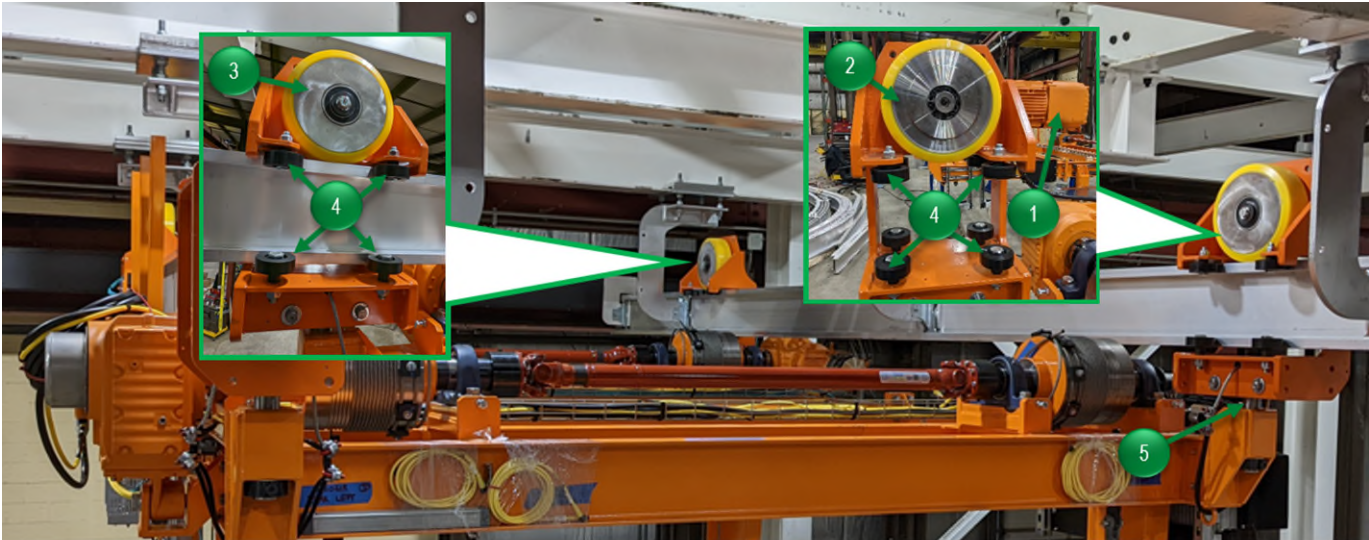
EMS Carrier

The EMS Carrier is made of three mechanically unique sub-components that each serve a different role in the overall function of the carrier. The image below provides a simplified diagram of where each sub-component is located within the overall structure:

- *Carrier Trolley* provides forward movement along the rail
- *Carrier Upper Frame* houses electrical components and provides vertical movement
- *Carrier Lower Frame* houses the vehicle body on part touching details



EMS Carrier - Trolley Assembly



- | | | |
|---------------|----------------------|-----------|
| 1 Gearmotor | 3 Idle Wheel | 5 Kingpin |
| 2 Drive Wheel | 4 Side Guide Rollers | |

EMS Carrier - Trolley Assembly Overview

The trolley assembly moves the carrier through the system along the rail. Each assembly consists of two drive assemblies and two idle assemblies.

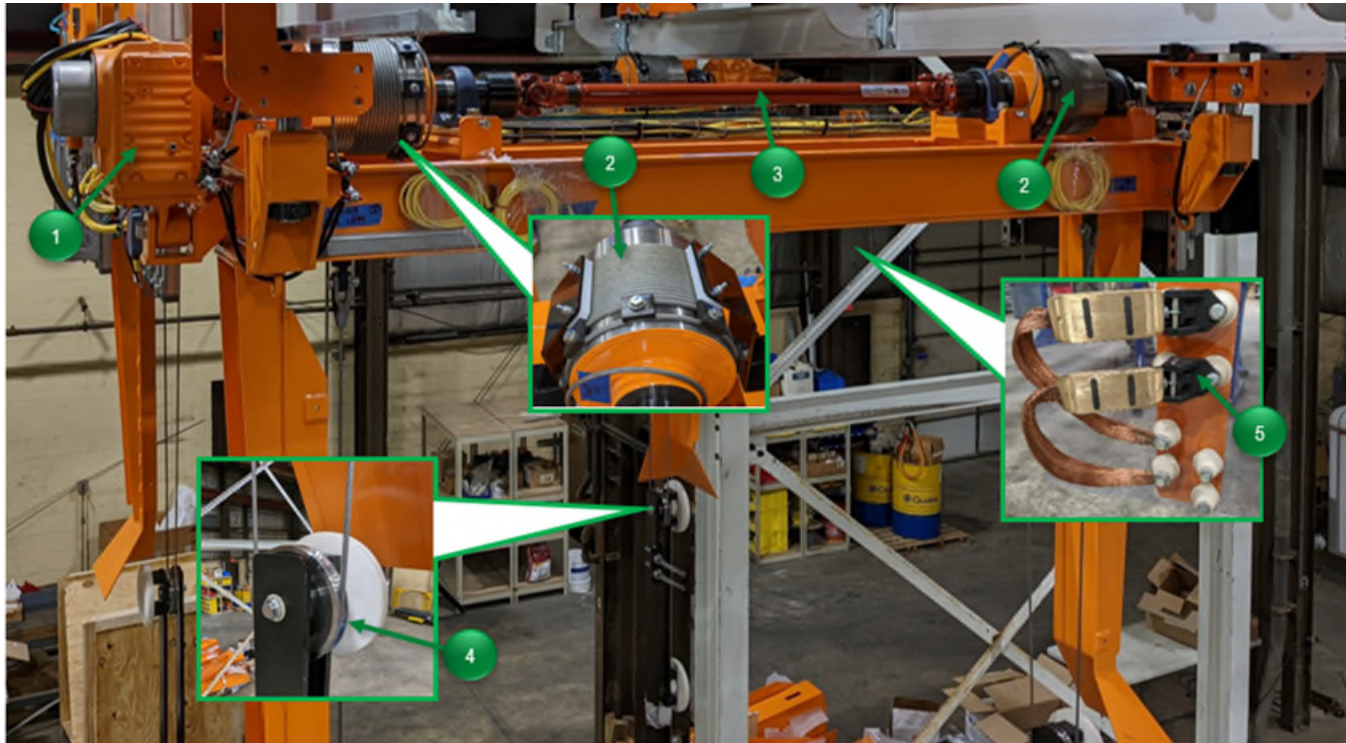
The gearmotors are mounted as part of the drive trolley assemblies. All trolley's have eight side guide rollers to provide stability as the trolley travels along the rail.

Kingpins seated at the base of each wheel assembly secures all four trolleys to the upper frame. The kingpins are held in place by two steel pins that feed through the trolley assembly frame and kingpin block. Each trolley has a secondary wire that is tethered to the upper frame assembly for safety.



▲ Seated kingpin assembly.

EMS Carrier - Upper Frame Assembly



1 Gearmotor

3 Cardan Shaft

5 Grounding Shoe

2 Drum

4 Pulley

EMS Carrier - Upper Frame Assembly Overview

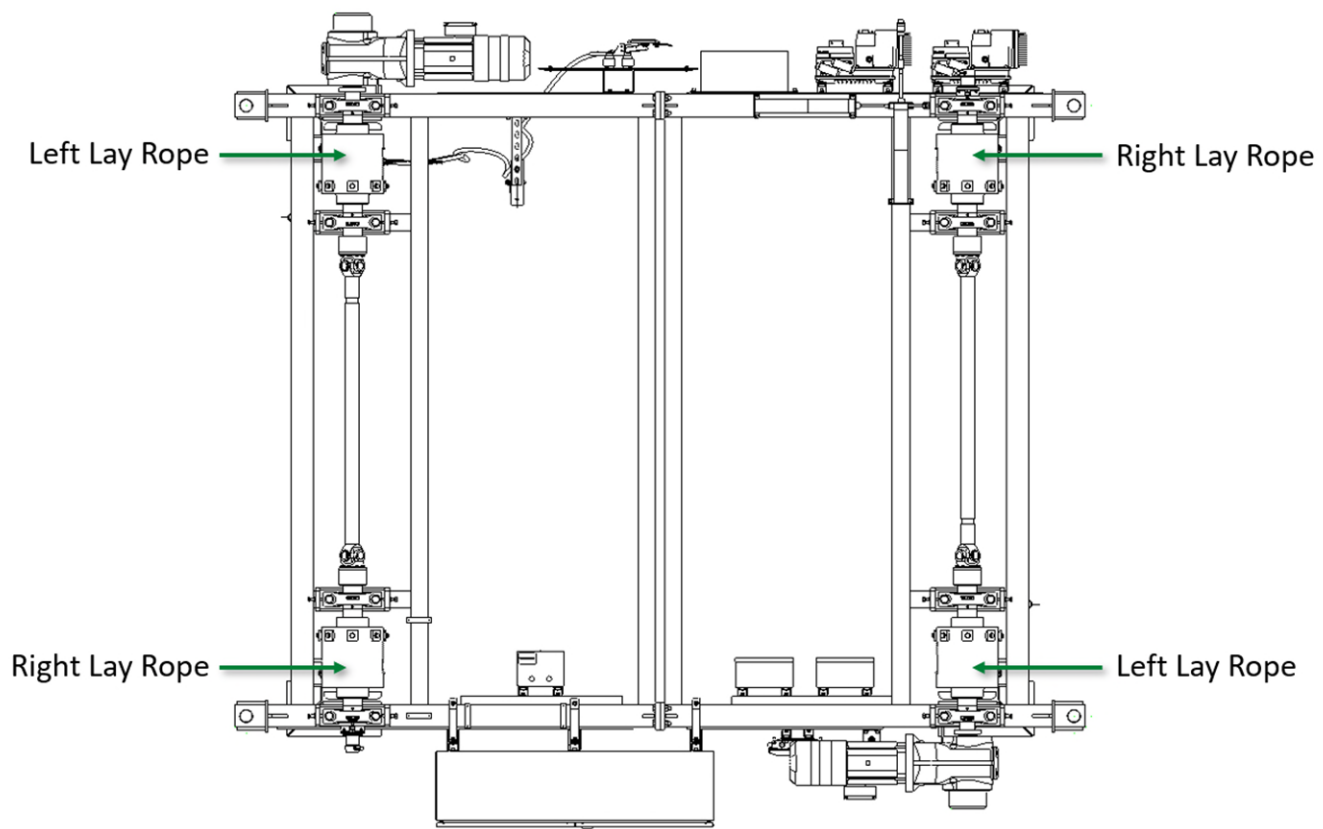
The upper frame assembly is secured below the trolleys via the kingpins. This portion of the carrier controls the electrical and mechanical components that allow the vertical motion of the lower frame into the tanks. There are two gearmotors installed on each upper frame: one for the front and one for the rear.

The gearmotor and drums provide vertical movement via the wire rope and pulley system. A cardan shaft is secured between the two drums and is attached to the gearmotor that produces rotation of the cable pulley system.

A pair of grounding shoes are mounted to the side of the frame. A retractor is attached to the wiring to allow slack and flexibility as the lower frame cycles in and out of the tanks.



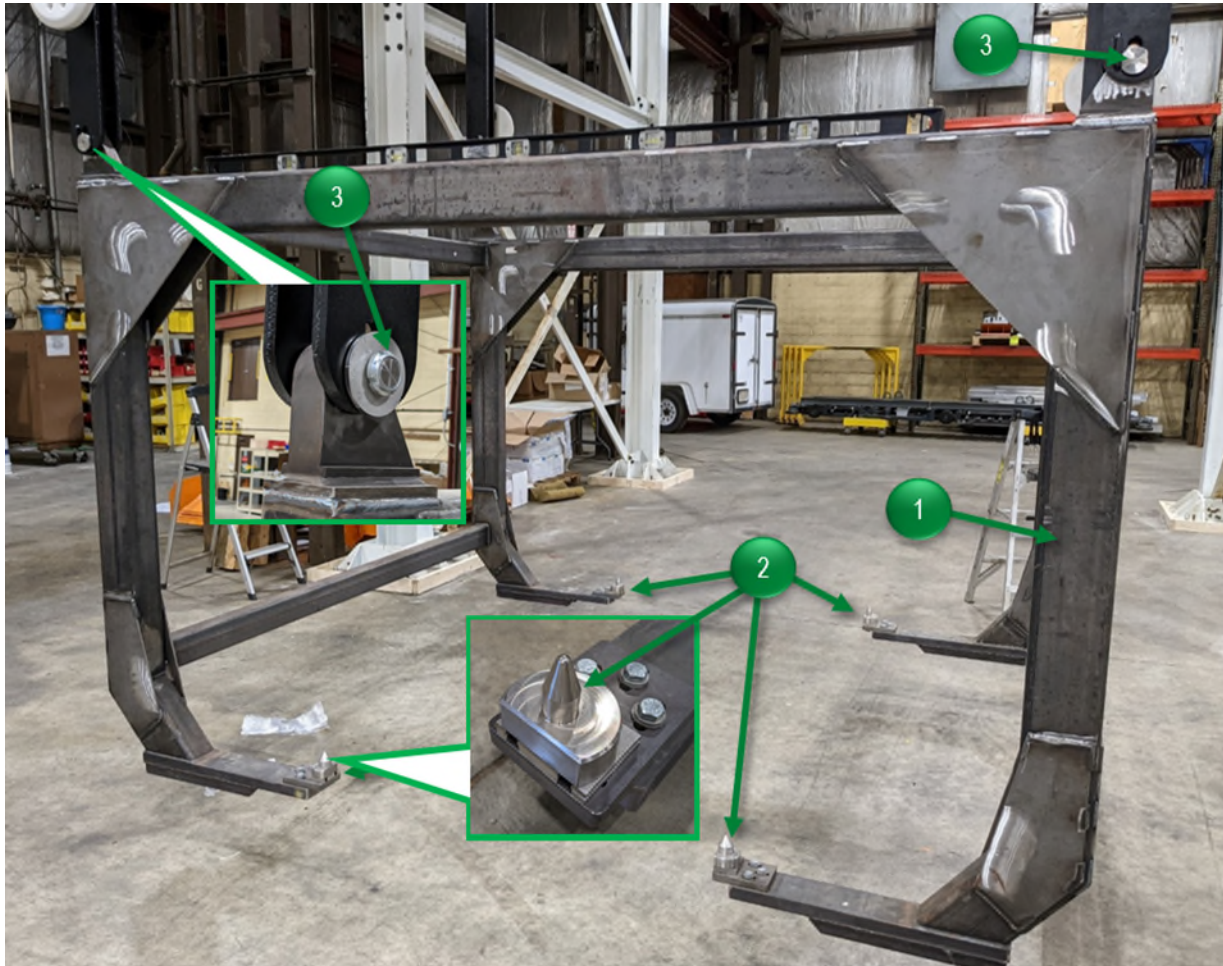
▲ EMS Drum with wire rope



EMS Carrier – Upper Frame Rope Lay

Within the EMS Carrier, there are four wire ropes: two left lay ropes and two right lay ropes. Each drum has a specific rope that it utilizes. Both rope types are fabricated to be used at their designated drum locations and are **not interchangeable**.

EMS Carrier - Lower Frame Assembly



1 Carrier Frame

2 Part Touching Pins

3 Pins

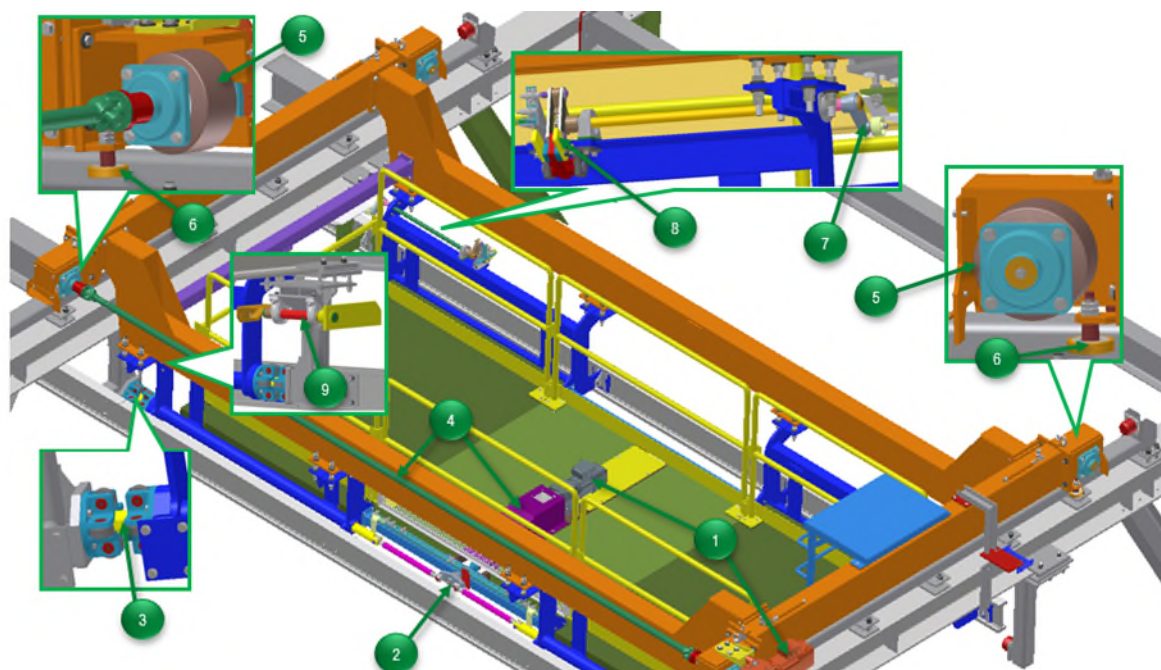
EMS Carrier - Lower Frame Assembly Overview

The carrier lower frame is designed to house the product as it travels through the EMS system. The vehicle body will rest internally on the part touching pins at four nod holes.

The mounting surfaces for the part touching pins contain slotted shims that allow adjustments to be made during mastering the fixture.

The lower frame assembly is connected to the upper frame assembly via pins located at the base of each link assembly that is attached to the upper frame assembly in a similar fashion.

EMS Shuttle



- | | | |
|---------------------------|---------------------------|----------------------------------|
| 1 Gearmotor | 4 Cardan Shaft | 7 Locking Cam |
| 2 Shot Pin Shaft Assembly | 5 Shuttle Wheel | 8 Carrier Trolley Locking Device |
| 3 Shot Pin | 6 Eccentric Guide Rollers | 9 Rail Locking Device |

EMS Shuttle Overview

The EMS Shuttle provides horizontal movement for the EMS Carriers as they travel through the system.

Before the EMS Carrier enters, the shuttle is locked into place by an alignment shot pin. The alignment gearmotor on the platform activates the shot pin shaft on the exterior with rotation of a cardan shaft. As the gearmotor rotates, the shot pin is extended, enabling the pin to secure the shuttle rail with the fixed rail.

The drive gearmotor mounted to the frame of the shuttle moves the shuttle forward and reverse, utilizing a cardan shaft between two shuttle wheels with bearings. Two additional wheels are mounted at the opposite ends of the shuttle and act as idle wheels for motion. All four wheel assemblies are equipped with eccentric guide rollers to guide the shuttle along the rail.

As the shuttle approaches its programmed destination, locking devices on the rail and shuttle are disengaged via cam arms. As the shuttle leaves its programmed destination, the trolley locking device is activated with the cam and secures the EMS Carrier by lever arms over the trolley. This locking device secures the EMS Carrier and prevents travel off the shuttle as it is in motion.



▲ Extended shot pin