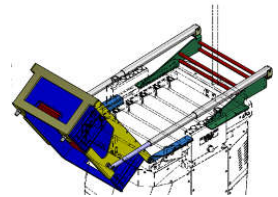
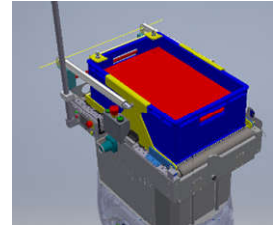


General technical Description

- **AIV Type LD250-ULD-P (Palette Transporter)**

The omron LD90 AIVs are equipped with a roller conveyor structure and additional tipping mechanism for KLTs. This enables the installation of a KLT 600x400. At the destination, the KLT material can be tipped out into a suitable container or machine (separator). KLTs with a total weight of 15 kg can be driven and tipped. The transfer height is 1000mm. The maximum height of the Funnel at the bunker of the vibration feeder is 850mm. The AIV picks up the KLT e.g. at a warehouse from a conveyor, transfer height 1000mm, moves to the vibration feeder and positions itself in front of the bunker (which maybe has to be equipped with a kind of mechanical funnel) where either the bunker or the funnel has its upper point at max. 850mm. Then the AIV activates its tipping mechanism and the content of the KLT gets tipped into the bunker.



- **AIV: Starting package**

For the first AIV the Starting Package is needed. This Package includes a docking station, the teach tool (joystick) to guide the robot while scanning the map and the traffic planning software MobilePlanner with a USB-Dongle.

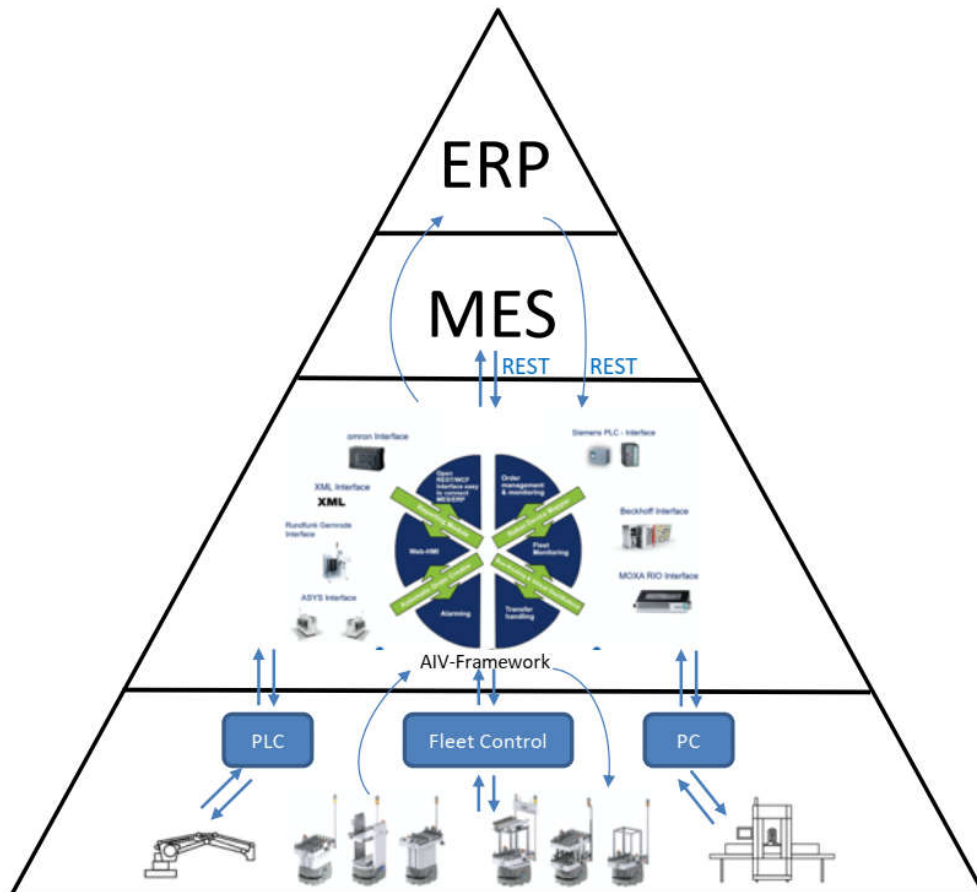
This package is needed only once per location.

- **AIV: Fleet manager EM2100**

The fleet manager is necessary to handle the traffic and charging management of the fleet and also the deployment of orders to the different robots. Also it is the central point for map and configuration management. The EM2100 is able to handle 100 robots.



- AIV-Framework Unlimited, licensed to use with up to 3 AIVs:



- **Process description:**

Warehouse (Material supply) area:

- Transfer stations with either motorized or gravity controller
- PLC inside (Siemens or Beckhoff), signals if a KLT is ready for pick-up and which Assembly line should be filled with the KLT

Assembly area:

- Each Assembly cell has a feeder which is equipped with a funnel at a height of 800-850mm

The warehouse is operated automatically or manually, we assume it is manually.

Each KLT with material which is placed on a transfer station gets somehow identified and related to a assembly line. As soon as the KLT is on the place where it gets picked up by the AIV, the PLC signals that the KLT is ready for Pick-up and which assembly line is waiting for it.

The AIV-Framework is constantly monitoring the PLC and uses this signals in its rules processor to automatically create a transport order for the AIV to pick-up a KLT at one of the transfer stations and deliver it to the assembly line and tip it via the funnel into the feeder. After the KLT is empty the AIV moves back to to a central station for collecting empty KLTs and drops the empty KLT off at this station. After that it is ready for the next job.

The interface modules are monitoring all configured machines/devices on their state and represents them via its REST-Interface. The OrderCreationService uses this state informations to create an order based on its rules file and send the order to the OrderManager. The OrderManager stores the order in its internal queue and continuously transmits the orders to the fleet manager via the FleetManagerClient and monitors all order states. The fleet manager forwards the orderst o available AIVs which are able to execute the job. The AIV moves to the loading point, where based on the order monitoring the OrderManager calls the TransferHandlingModule and transmits it the information about the requested transport (AIV, machine/device, goalname, loading/unloading). The transfer of the product starts, where process it controlled and monitored step by step via the TransferHandlingModule. If an error occurs an alarm is created in the OrderManager (visible via the WebClient and also available via the REST-Interface of the OrderManager) resp. via the machines/devices. After successful transfer of the product the AIV moves to the unloading point where the OrderManager again calls the TransferHandlingModule which takes care of the transfer handling and errors (same as described above). These processes are handled concurrently for more AIVs and machines/devices, because the fleet manager uses all available AIVs to fulfill the orders.