

# Depalletizing Solution

## Universal Layer Handling™ – Flexible Depalletizing

### Basic Description

The FANUC Robotics Universal Layer Handling EOAT (End of Arm Tool) makes use of an innovative, patented\* handling approach that allows it to load or unload single layers of packaged products to or from pallet loads, as would be typical in palletizing and depalletizing operations. This EOAT is designed to accommodate handling a very large assortment of SKU products (common SKU within a layer of product) with a layer weight of up to 550 lbs (up to 950 lbs or more if some of the Handling Modules and options are not installed). This tool can be used in a variety of applications for a wide array of products that are stacked in a rectangular pattern on a shipping pallet, skid, slip sheet, or even on a conveyor surface.

This EOAT makes use of a combination of many handling features that can be used individually, in sequence, in parallel, or in any combination desired to achieve the ultimate in product handling. These handling features are grouped into distinct Handling Modules that can be installed as single units or all installed together.

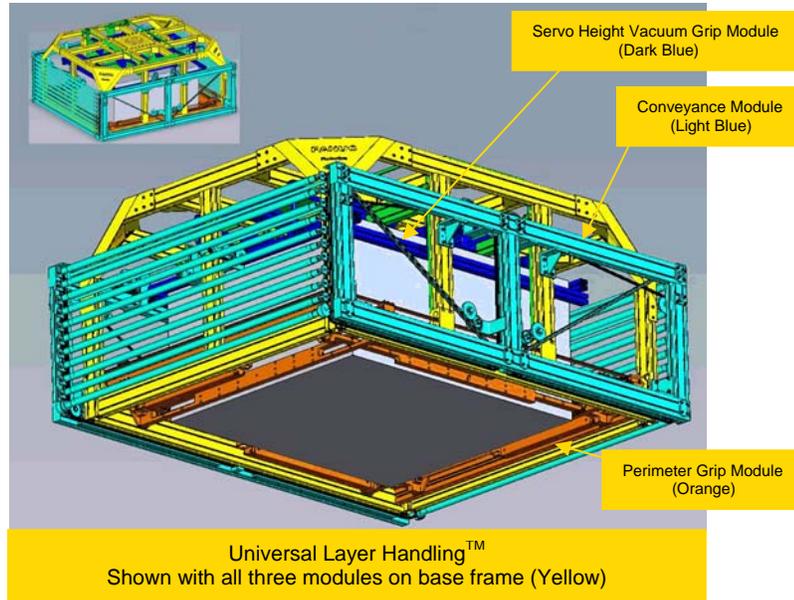
- Perimeter Grip Module
- Servo height Vacuum Grip Module
- Conveyance Module

### FANUC Robotics' Universal Layer Handling, the Solution for -

Mixed-or-fixed layer sizes:

- Min size 36 x 34 x 2 inches.
  - Max size 54 x 46 x 26 inches.
  - Weight up to 550 or 950 lbs depending on features selected.
- Any palletized product (i.e. Cases, Bundles, etc...)

\*US PATENT PENDING



### Technical Description

**Perimeter Grip Module** – This is a base module that can stand-alone and provides 360 degrees of gripping force by providing initial perimeter crowding, compliance between the gripping arms and the product, and then final gripping force of the EOAT to the product (approximately 600 lbs per pair of arms or 1,200 lbs at the center of the layer at 65psi system air pressure). For larger payloads, increased air pressure would be used. The module can handle layer sizes of 36"-54" Length by 34"-46" Width by 2"-26" Height products. The Perimeter Grip Arms allow for an additional 2" clearance at its maximum to allow "dead-reckoning" picking (a "Pick Window" of 58" Length by 50" Width). It also allows for an additional 2" compression stroke on the smallest size layer. This module has unique features built within it to accomplish these unique feats

- **Clamp Ring Crowding Feature:** Independent pneumatic actuators (two per pair of opposing arms) are linked to opposing arms so that they are synchronized during the gripping process.

Initial crowding pressure is located at the bottom of the product and is controlled to allow for lower pressure

gripping forces to provide "just the right" amount of gripping force to crowd the product centrally to the layer.

- **Clamp Ring Squeeze Feature:** This innovative feature increases the initial 360 degree crowding force and provides intensified squeezing or clamping action on the product which amplifies overall perimeter holding power of the EOAT. The compression ring utilizes rod-lock mechanisms to prevent loss of gripping force in the event the power source (air) is lost.
- **Product Compliance Feature:** Embedded in the face of the Perimeter Grip Side Arms are bellow-type continuous grip bands that contour to the irregularities of the contact points which ensure a tight perimeter friction grip on all sides of the layer for secure and quick transfer of product. (Note that these bellow-type bands can provide additional grip force and are controllable).
- **Upper Clamp Ring Squeeze Feature:** An optional upper clamping feature may be added to assist in stabilizing tall product and provide an additional 360 degree gripping force. Note that if this option is chosen, the shortest case that can be handled is 5" and a reduction in layer handling capability would result.

## Technical Description

**Servo Vacuum Module** – This module can be used in combination with either the Perimeter Grip Module or Conveyance Module (or both) and consists of a vertically servo-driven vacuum plenum to apply surface vacuum to the top of the product. This vacuum feature has two unique functions. The first function helps to create a vacuum gripping force which prevents cases from “fanning-out”, or falling from the EOAT. The second function helps to make the top surface of the cases rigid, thereby allowing for better gripping by perimeter grip arms/fingers. Some of the features and benefits are:

- Servo-Driven Vertical Positioning
- Vacuum Plenum
- Vacuum Cups
- Integral Check Valves or “Sized” Orifice Reducers
- Adjustable High-Volume Vacuum Blower
- Vacuum/Blow-Off Slider Valve
- Vacuum Filter
- Robot Waist Mounted Blower Structure

**Conveyance Module** – This module can be added to the Perimeter Grip Module (with or without the Vacuum Module) and consists of two opposing integral servo-driven retractable conveyors within the EOAT to provide for product lifting force (due to the lead roller rotation) and underneath product support. This unique module allows secure handling of difficult product, where top vacuum gripping and/or side gripping is not feasible or reliable enough for secure handling of product. Additionally, by utilizing underneath support (or carrying of the product), higher transfer speeds with low, or zero, perimeter gripping force is achieved.

- Servo-Driven Product Rotational Lift
- Product Support & Conveyance

## Optional Features

### Product Sensor Array

This detection provides the robot with the current layers' height enabling the robot to determine the proper height to grip the product. The Sensor Array also provides the ability to detect for “orphaned cases” and “dropped cases”.

### 3D Laser Profile Sensor

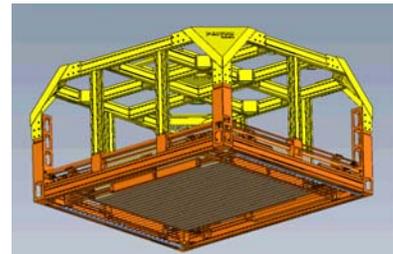
Optical detection less susceptible to product graphics changes. Allows the robot to detect any rotational and/or X-Y location deviation of a layer to provide the necessary compensation of the EOAT to retrieve the layer.

## Included in Packaged Solution

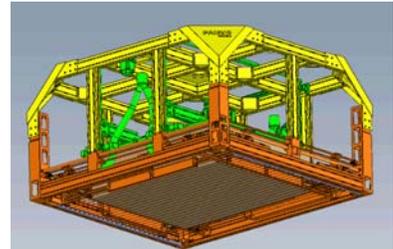
- FANUC M-410iB/700 Robot
- Cabling Dress For robot arm only
- Selected Tool Configuration: (pick one)
  - Perimeter Grip Only
  - Perimeter Grip & Servo Vacuum Grip
  - Perimeter Grip & Conveyance & Servo Height Vacuum Grip
- Assembly of all components
- Custom Universal Layer Handling Gripper Control Software macros
- Custom Universal Layer Handling Teach Pendant Screens
- Aux Axis Configuration
- Tested and Ready for System Integration
- ROBOGUIDE® Basic Cell; configured with 3D model. (provided after order placement for workcell development)

## Options Priced Separately

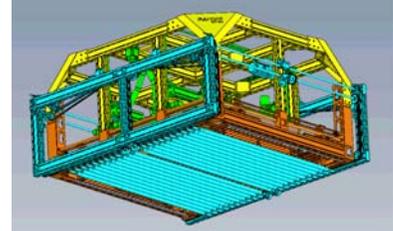
- Custom Software
- Customer Specific Processing
- Work Cell peripherals
- Optional Photo Sensor Array
- Optional 3D Laser Profiling
- Optional 3D Time-Of-Flight Profiling
- ROBOGUIDE®-HandlingPRO™



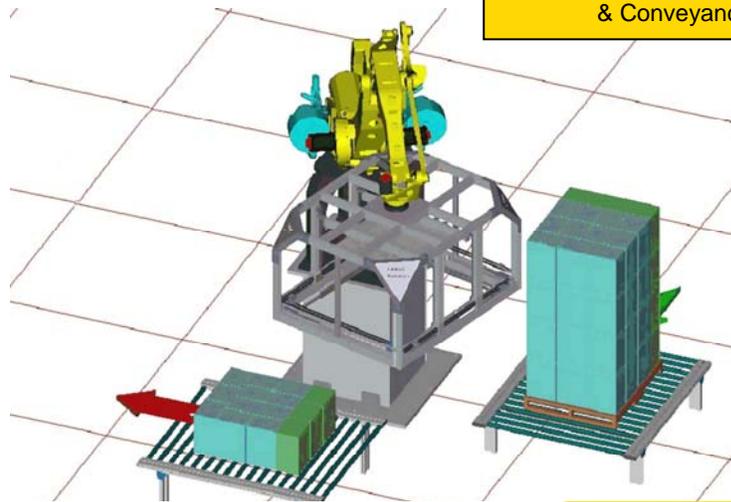
Perimeter Grip Only



Perimeter Grip & Servo Vacuum



Perimeter Grip, Servo Vacuum & Conveyance



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