



ErmaFlex #11

# Automatic palletiser

System for palletising cartons on a pallet

## Automatic palletiser at a glance

### Highlights & Key Activities

- ✓ Study of electrical, pneumatic and hydraulic technologies
- ✓ Adjustment, control and production

### Specific components

- ✓ Motorised XYZ axes (1 horizontal, 1 transverse and 1 vertical)
- ✓ Interleaving shop
- ✓ Twin chain conveyor
- ✓ Light curtain (pallet output)
- ✓ Adjustable gripping head for picking up cartons
- ✓ Hydraulic lifting table for pallet levelling
- ✓ Control cabinet with programmable logic controller
- ✓ This system is accompanied by a technical and educational file

## References

- ✓ **PM90**: Automatic palletiser with Schneider M340 PLC (integrated Ethernet and CANopen networks), Schneider Magelis XBTGT colour graphic touch screen operator panel and XYZ axes with Schneider Lexium 05 drives and brushless motors
- ✓ **UC13**: Single Machine Supervision
- ✓ **UC90**: Option: Fault box for electrical cabinet, remotely configurable on a tablet (Not supplied)
- ✓ **UC51**: Option: Visual Instructions & Monitoring of Production Indicators on the Tulip open application environment and touch pad, for one machine
- ✓ **UC52**: Option Visual instructions on Tulip open application environment and touch pad, for one machine
- ✓ **SK25**: Sick TDCE Smart IoT Gateway & Smart Sensors Kit for Ermaflex Palletizer
- ✓ **IO00**: IO-Link package for electrical and pneumatic measurements
- ✓ **MN14**: Programmable 3D Digital Model Palletizer
- ✓ **EA63**: Environment 4.0 PLC + Palletizer Desk with 3D Digital Twin on Virtual Universe Pro
- ✓ **SP20**: Palletizer Subsystem

## Functional description

- ✓ The palletising unit of the ERMAFLEX automated system is a system for packing different types of cartons on wooden pallets.
- ✓ The system has 2 main functions:
  - it allows the boxes to be placed on the pallets
  - it allows you to place dividers between each row of cardboard

## Pallet Conveyor Subassembly

- ✓ It transfers pallets from the system input (unstacking unit) to the palletising area and then out of the system.
- ✓ It is mainly made up of:
  - A two-chain conveyor
  - A three-phase asynchronous electric gear motor to drive the blades
  - Various photoelectric sensors to detect the presence of pallets at various points on the conveyor.

## Features

- ✓ L/ W/ H: 3350 x 2600 x 3000 mm - L/ W/ H: 3450 x 2600 x 3050 mm
- ✓ Electrical energy: 400 V three-phase + neutral
- ✓ Pneumatic energy: 7 bar
- ✓ Mass: 1500 kg

Bac PRO PLP - MSPC

BTS MS - IUT

Universities - Engineering schools

Trouble-shooting box

IO-Link

IoT Sick Pack

TULIP



## Sub-assembly Conveying of cartons

- ✓ It allows the transfer of cartons from the system entrance to the palletising area.
- ✓ It is mainly made up of:
  - Two belt conveyors
  - Two three-phase asynchronous electric gearmotors of the "drum motor" type driving the belts
  - Various photoelectric sensors to detect cartons at various points on the conveyors
  - A box blocking device

## Carton gripping sub-assembly

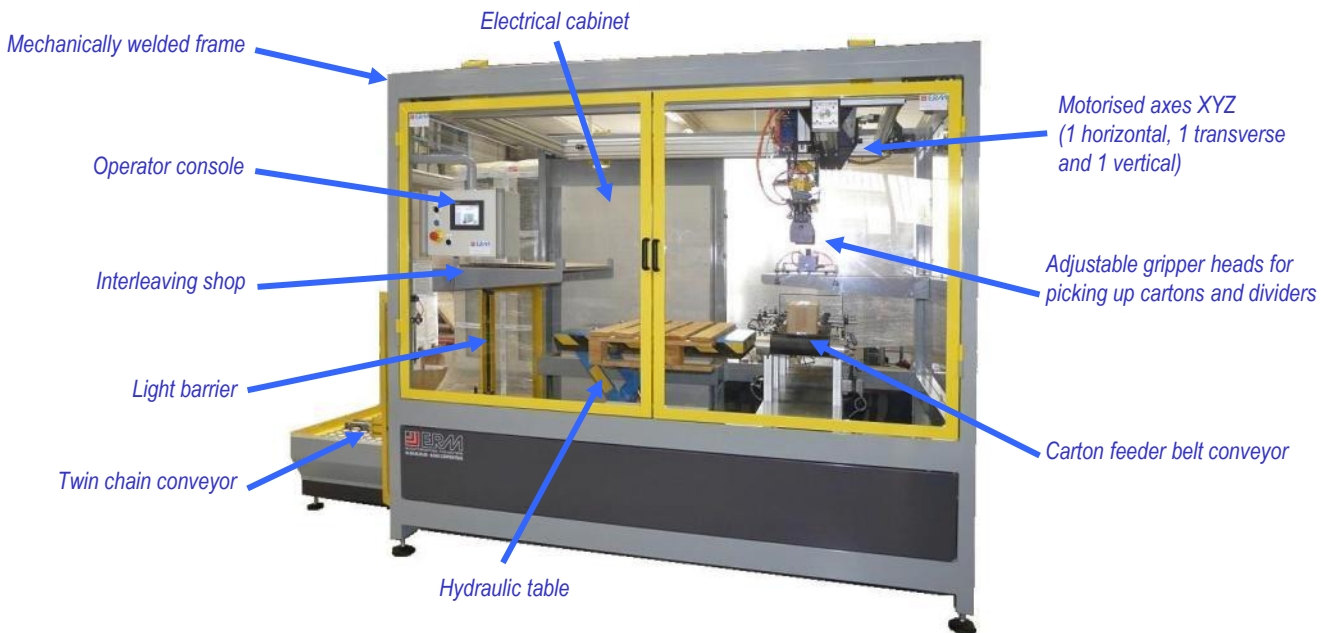
- ✓ It allows the boxes to be picked up and raised
- ✓ It is mainly made up of:
  - A pneumatically clamped gripper head
  - A rotary cylinder for clamping the clamp
  - A rotary actuator for pivoting the head
  - A rack and pinion (Z-axis) elevation unit
  - A brushless gear motor
  - 2 inductive sensors (grripper in carton pick-up position on the conveyor and gripper turned 90°)
  - 2 inductive sensors (clamp closed) and (clamp open)

## Subassembly for gripping dividers

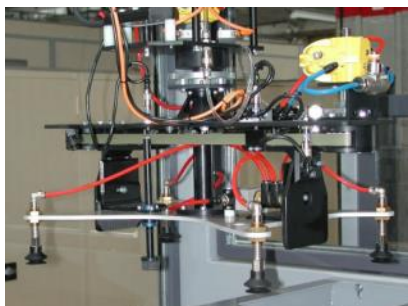
- ✓ It transfers pallets from the system input (unstacking unit) to the palletising area and then out of the system.
- ✓ It is mainly made up of:
  - A two-chain conveyor
  - A three-phase asynchronous electric gear motor to drive the blades
  - Various photoelectric sensors to detect the presence of pallets at various points on the conveyor.



**Functional architecture (continued)**



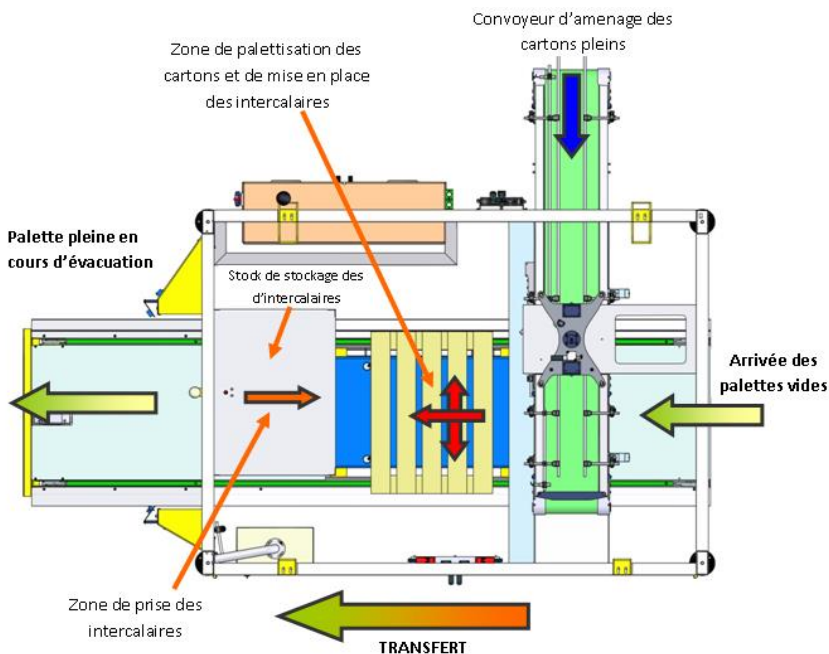
Hydraulic lifting table for pallet levelling



Suction cup gripper head for dividers



Gripper head for cartons





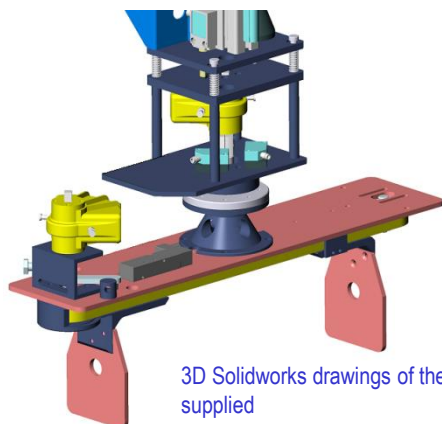
## Functional architecture (continued)

### Sub-assembly Transfer of cartons and dividers

- ✓ It allows the positioning of cartons (or dividers) on the pallets according to the defined palletisation plan
- ✓ It is mainly made up of:
  - A toothed belt longitudinal travel unit
  - For the X axis, a brushless gear motor
  - A transverse rack and pinion drive unit
  - For the Y-axis, a brushless geared motor

### Pallet Levelling Sub-Assembly

- ✓ It ensures the correct vertical positioning of the pallet during the palletising operation. Due to the short vertical travel of the carton gripping system, it is necessary to lower the pallet as it is loaded.
- ✓ It consists mainly of :
  - A lifting table
  - A photoelectric sensor for levelling the pallet
  - A hydraulic lifting cylinder
  - 2 sensors for detecting the low and high positions placed under the hydraulic table and an inductive sensor for detecting the standby position.



3D Solidworks drawings of the machine supplied

### Control and power cabinet

- It contains:
- A disconnecting switch
  - A safety relay to manage the emergency stop
  - Circuit breakers and fuse holders
  - A power supply to supply all the low voltage circuits
  - Contactors and relays to control the various electrical actuators
  - Three drives to control the feed speed of the X, Y and Z of the X, Y and Z axes
  - A Siemens S7-315

### Hydraulic and pneumatic distribution

- The system includes:
- 1 bistable distributor (gripper head rotation)
  - 1 monostable distributor on the clamp (clamp closure)
  - 1 monostable distributor (suction)
  - 1 distributor belonging to the hydraulic table system

### Control panel

The control panel of the system integrates a Siemens TP177 or Schneider Magelis XBTGT (depending on the version) colour touch screen graphic operator panel. It contains all the dialogue components needed to operate the system.



Operator Console Displays

### Educational activities

- ✓ Functional analysis
- ✓ Study of technologies: electrical, pneumatic, hydraulic and mechanical
- ✓ Programming
- ✓ Servo control
- ✓ Settings
- ✓ Production
- ✓ Maintenance
- ✓ Optional supervision
- ✓ Steering

## Pedagogical approach

### Examples of practical work proposed by ERM Automatismes

#### TP1: Changing the unit format Palletising

- ✓ Timeline of the TP:
- ✓ Learn about the format change, prepare your tools and your workstation
- ✓ Making the automated mechanical system safe
- ✓ Adjusting the gripper subassembly
- ✓ Adjusting the conveyor sub-assembly
- ✓ Setting up the equipment
- ✓ Carry out tests and final adjustments

#### TP2: Designing a diagnostic process (Fault on the lifting table)

- ✓ Timeline of the TP:
- ✓ Identify the failure
- ✓ Locate the fault
- ✓ Formulating hypotheses
- ✓ Analyse and rank assumptions by probability of occurrence and ease of verification
- ✓ Making the automated mechanical system safe
- ✓ Carry out checks and diagnose
- ✓ Re-commissioning the installation

#### TP3: Designing a diagnostic process (Safety loop failure)

- ✓ Timeline of the TP:
- ✓ Identify the failure
- ✓ Locate the fault
- ✓ Formulate hypotheses
- ✓ Analyse and rank assumptions by probability of occurrence and ease of verification
- ✓ Intervening safely
- ✓ Carry out checks, tests and trials
- ✓ Diagnose

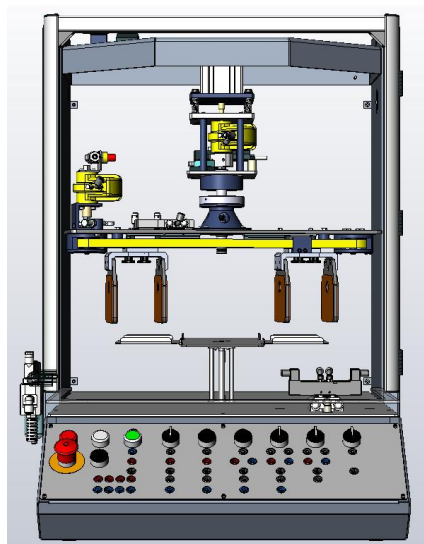


# Automatic palletiser subsystem

Sub-system for wiring and adjusting the carton/tray gripper head

## Automatic palletizer sub-system

- Family of components addressed
    - ✓ Pneumatic (∩ Linear and rotary cylinders)
  - Educational activities
    - ✓ Wiring with double-well plugs to operate :
      - the linear actuator and detection of the low position of the elements
      - The linear and high position sensing actuator
      - The rotary cylinder of the head and detection of the product position
      - The head rotation cylinder and its 90° detection
      - The clamp cylinder and closure detection
    - ✓ Adjusting the clamp
  - Features
    - ✓ L/ W/ H: 840 x 760 x 980 mm
- Electrical energy: Single-phase 230 V mains
- This system is accompanied by a technical and educational file



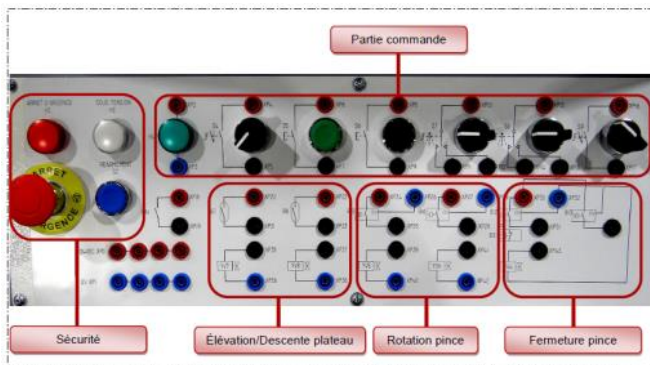
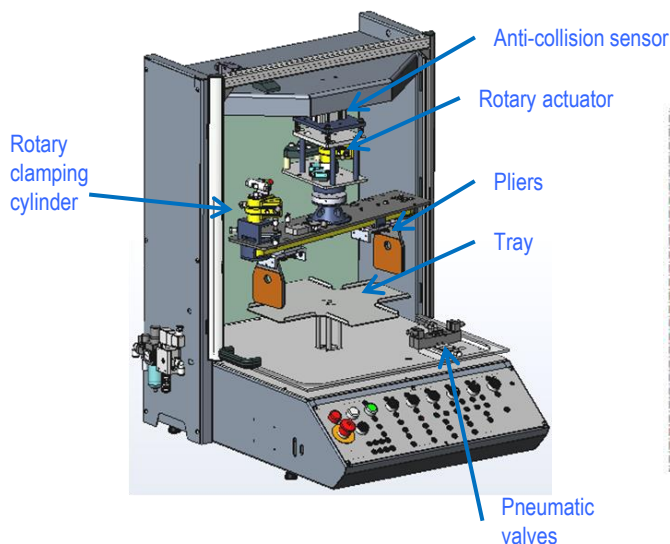
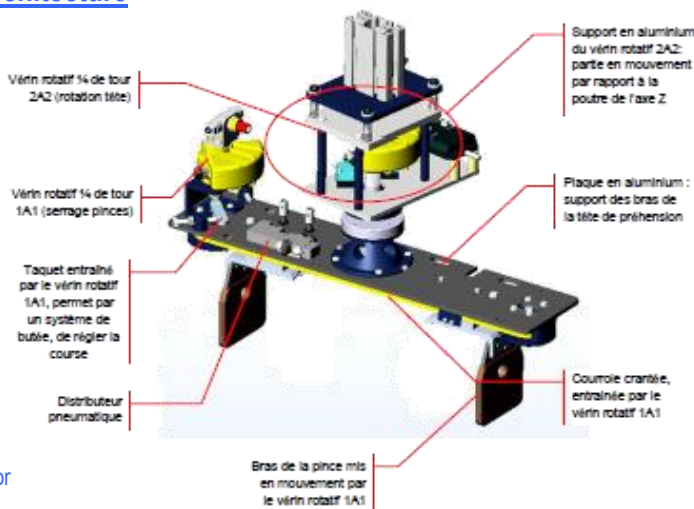
## Reference

SP20: Palletiser sub-system

## Functional architecture

### Description of the sub-system

- ✓ This sub-system consists of the palletiser gripper head, which allows a carton or tray to be gripped by clamping it between two grippers.
- ✓ A tray allows the carton/tray to be lifted to be picked up by the gripper head.
- ✓ Once the carton/tray has been gripped, the gripper rotates around the Z-axis by a maximum of 90°.





## RELATED & COMPLEMENTARY PRODUCTS

### Industrial IoT for Ermaflex Palletizer

The Sick TDCE Smart IoT Gateway & Smart Sensors Kit for Ermaflex Palletiser (Ref: SK25) contains:

- Sick Smart IoT Gateway TDC-E200EU
- SIG100 module for implementing logic gates and timers
- Vibration sensor on the head
- Cabinet" temperature sensor
- Vacuum level sensor at the suction cups
- Compressed air meter (to detect possible leaks)
- Carton detection sensor for calculating line efficiency based on measured vs. theoretical throughput



**SICK**  
Sensor Intelligence.

[www.erm.li/sk10](http://www.erm.li/sk10)



### Sick TDCE Smart IoT Gateway Kits & Smart Sensors



[www.erm.li/sk10](http://www.erm.li/sk10)

### Smart IoT Sick TDCE & Smart Sensors Case (SK00)

The Smart IoT Sick TDCE & Smart Sensor Gateway Toolkit contains several industrial smart sensor application cases.



[www.erm.li/sk00](http://www.erm.li/sk00)



**SICK**  
Sensor Intelligence.

### IO-Link package for electrical and pneumatic measurements (IO00)

Study and implementation of an energy measurement system, communicating and IOT compatible



[www.erm.li/io00](http://www.erm.li/io00)

### Ethernet IO-Link Master Kit, Supervision & IO-Link Sensors (IO01)

Design and implementation of IO-Link master and IOT compatible sensors

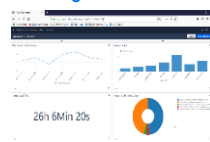


[www.erm.li/io10](http://www.erm.li/io10)

### Visual instructions & Monitoring of production indicators (UC51-UC52)

Tulip is a web-based environment for creating applications on tablets and touch screens designed to digitalise workstations

- ✓ Visual 0-paper intervention procedures
- ✓ Supervision of machines by OPC-UA to retrieve production data
- ✓ Declarations of production stoppages and defects
- ✓ Suggestions for continuous improvement by operators
- ✓ 0-paper control thanks to connected tools (Scale...)
- ✓ Dashboards for monitoring production indicators (OEE, output, etc.)
- ✓ Easy to modify applications and create new ones (100% graphical)
- ✓ Implementation of lean manufacturing concepts (Andon, 5S...)



[www.erm.li/tul](http://www.erm.li/tul)



### PLC & Touch Panel + Digital Twin in VU Pro



Programming in Schneider and Siemens environments and then simulation in the digital twin