



ERMAFLEX 6-axis Robotic Cell with vision control and RFID tracking

Robotic packaging cell designed around a KUKA 6-axis industrial robot

Description of the technological support

The **ERMAFLEX 6-axis robotic cell (ref: RO20)** is an industrial packaging training system (Cartoning, Quality Control and Traceability).

This cell can be **used alone** or in conjunction with other systems in the **Ermaflex mini-factory**, for example downstream of the Polyprod (multi-format dosing/sealing unit) and upstream of the Palletiser.

This training system is mainly intended for **system operation and maintenance** activities. For advanced design and development/programming activities, we propose the "Ready2_Educate Cell" instead.

The functions of the **ERMAFLEX 6-axis robotic cell** are :

- ✓ **Picking up** and placing jars/flasks in cartons or trays
- ✓ **Identify and reject non-compliant products**
- ✓ **Sampling** products for a **quality control** scenario
- ✓ Carry out a **control** of non-conforming products
- ✓ Carry out **vision control** of product levels and correct screwing of caps (optional)
- ✓ Load traceability information onto **RFID tags** associated with products (optional)

This product is accompanied by a technical and educational file in digital format (HTML site) including :

- ✓ Installation and commissioning instructions, technical data sheets, etc.
- ✓ Functional and electrical diagrams, programs, etc.
- ✓ The manufacturer's documentation for the components
- ✓ The educational activities (Word source files available)

References

- ✓ **RO20**: ERMAFLEX 6-axis robotic cell with vision control and RFID tracking
- ✓ **UC13**: Industrial Supervision Option
- ✓ **UC90**: Option: Fault box for electrical cabinet, remotely configurable on a tablet (Not supplied)
- ✓ **KU//Kukasim-15**: 3D simulation software option KUKA.Sim 4.0 (15 licences)
- ✓ **EA62**: Environment 4.0 PLC + 6-axis Ermaflex Robot Cell with 3D Digital Twin on Virtual Universe Pro
- ✓ **SK20**: Sick TDCE Smart IoT Gateway & Smart Sensors Kit for Ermaflex 6-Axis Robot
- ✓ **IO00**: IO-Link package for electrical and pneumatic measurements
- ✓ **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
- ✓ **DF00**: Industrial augmented reality solution DIOTA Tablet

Highlights of the ERMAFLEX 6-axis Robotic Cell

- ✓ Genuine industrial system, totally secure and adapted to technological and vocational education
- ✓ Analysis and learning of more and more widespread industrial solutions (6-axis robot for Pick and Place applications, Vision, RFID traceability, etc.) and with high added value
- ✓ Parameterisation and programming of a 6-axis robot on interfaces similar to those used in industry.
- ✓ Carrying out **production control** and **industrial maintenance** activities on a real robotic workstation

CAP CIP, Bac PRO PLP and MSPC
BTS CRSA and MS - IUT
Universities - Engineering schools

Themes addressed

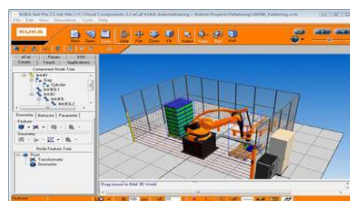
Industrial Maintenance
Production Control
Multi-technology Systems Design
Industrial Automation and Robotics

Trouble-shooting box

IoT Sick Pack

IoT IFM Pack

KUKA
TULIP
IO-Link



KUKA simulation software



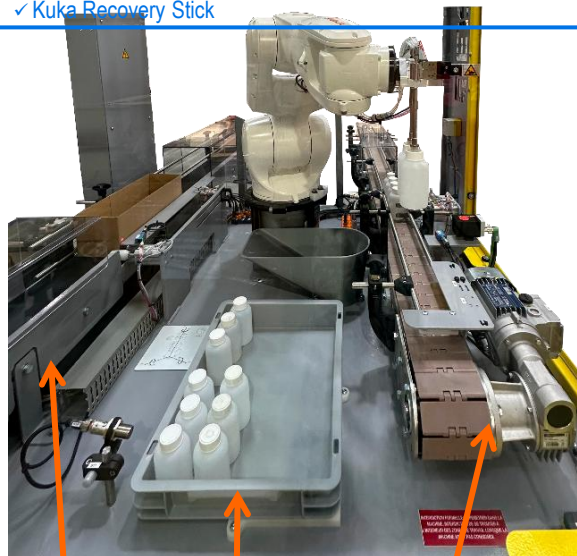


Functional architecture

6-axis robot sub-assembly

It consists mainly of :

- ✓ A 6-axis industrial robot with a 700 mm range
- ✓ Its pneumatic valves integrated in the arm
- ✓ Gripping head (Suction cups for gripping 2 products, Single product gripper for sampling)
- ✓ The robot controller with an industrial communication board to communicate with the PLC
- ✓ The SMART PAD (robot control panel)
- ✓ Kuka Agilus robot axis calibration case
- ✓ Kuka Recovery Stick



Conveyor belt for cartons or trays

Sample tray

Gripping area for jars and bottles

RFID read/write head for trays and cartons



Gripping head (Suction cups for gripping 2 products, Grippers for gripping a single product for sampling or scrap)

Sub-assembly "Conveyor for the supply and removal of cartons or trays

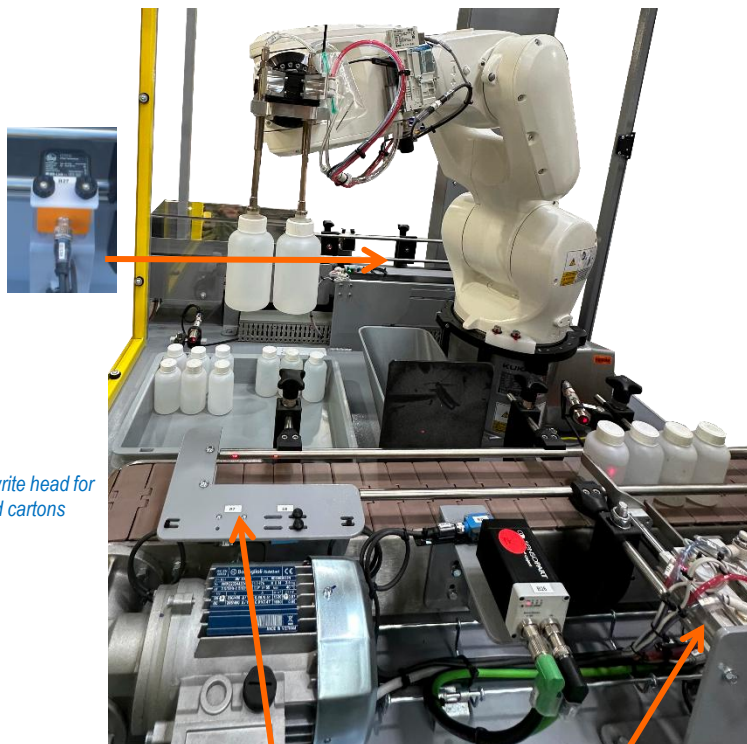
It consists mainly of :

- ✓ A motorised belt conveyor with adjustable edges to feed empty cartons/tray (4 container sizes) and to discharge full cartons/tray
- ✓ 2 presence sensors, 4 indexing cylinders with magneto-resistive sensors....

Feed conveyor sub-assembly and product positioning

It consists mainly of :

- ✓ A motorised pallet chain conveyor for the supply of products to be packaged (two product formats) from the production/packaging station
- ✓ A product jogging system and cap presence and screwing detection system (2 cylinders / 2 photoelectric sensors / 1 optical fork sensor / 2 magneto-resistive detectors)



Area for picking up pots/vials with the robot's gripping head

Product jogging system and cap presence and screwing detection system



View of the robot's KRC5 Micro controller



Functional architecture

Chassis and safety enclosure" sub-assembly

It consists mainly of :

- ✓ A painted welded steel frame (lower part) and aluminium profiles with transparent polycarbonate walls (upper part). Three tunnels provide protection on the product inlets and outlets.
- ✓ Four doors with door safety sensors
- ✓ A bin for receiving the sampled jars/vials
- ✓ A bin for receiving production waste
- ✓ A pneumatic supply unit (FRL...)

The waste bin is accessible to the operator from the outside. The top of the housing is closed with a polycarbonate cover (safety and dust protection).

This type of safe enclosure is required by the standards for the automatic operation of 6-axis robots.

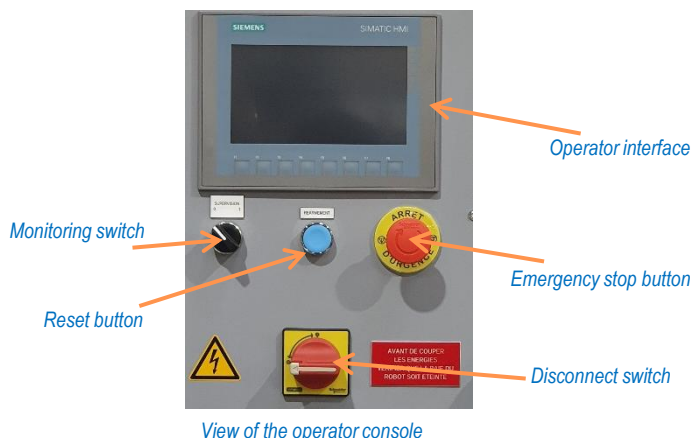


Vue de l'armoire électrique

Sub-assembly "Electrical cabinet and operator panel".

It consists mainly of :

- ✓ A communicating Siemens 1200 PLC
- ✓ Variable speed drives for conveyor control
- ✓ A machine safety relay
- ✓ Electrical protection of the various actuators
- ✓ A Siemens KTP700 operator panel with a touch screen operator interface



View of the operator console

Software tools

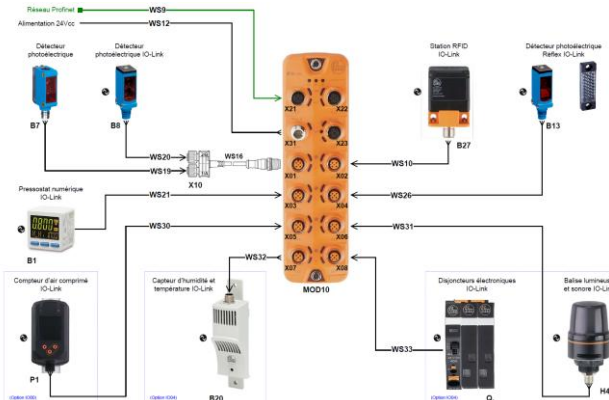
The following tools are supplied with the robotic cell:

- ✓ Software suite required to implement the robot
- ✓ The Siemens TIA PORTAL basic software is supplied with the cell (PLC and operator panel programming)
- ✓ Optional KukaSim 3D simulation software including the Ermaflex 6-axis robot cell (15 licences)



Touchscreen control panel for the robotSmartPad

IO-Link sensors

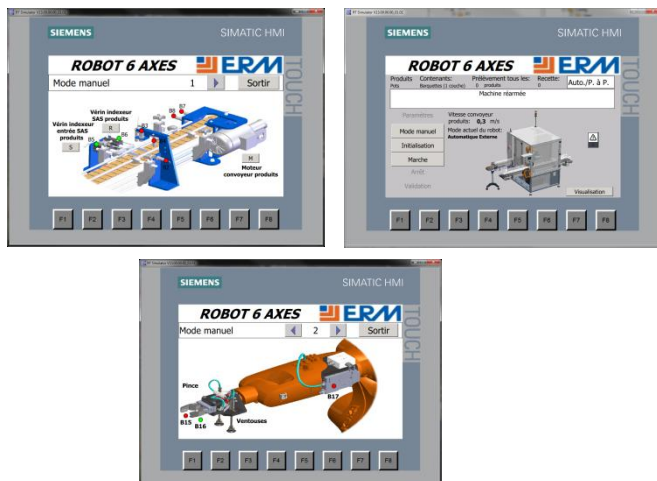


SICK
Sensor Intelligence.



List of sensors:

- ✓ IO-Link master
- ✓ IO-Link photoelectric sensor
- ✓ Digital pressure switch
- ✓ RFID station
- ✓ Reflex photoelectric sensor



Screenshots of the colour touch control panel

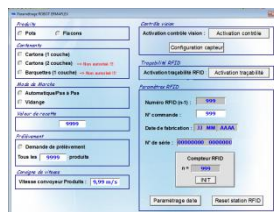


Options

Industrial Supervision Option (UC13)

This option allows you to obtain the operating information of the Ermaflex 6-axis robot cell on a PC:

- ✓ Remote control of the robot
- ✓ 6-axis robot operating data
- ✓ Number of products packed and rate (number of products / minute)
- ✓ Machine running time and downtime
- ✓ Visualisation of Graficets
- ✓ Mass curve of the weighed products



Screenshots Supervision

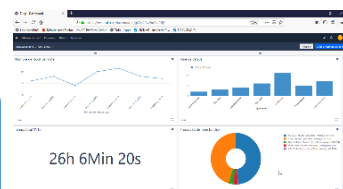
Options Visual instructions & Monitoring of production indicators (UC51-UC52)

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



Sick TDCE Smart IoT Gateway & Smart Sensors Kit for Ermaflex (Ref: SK20)

The Sick TDCE Smart IoT Gateway & Smart Sensors Kit for Ermaflex and Unbundler (Ref: SK20) contains :

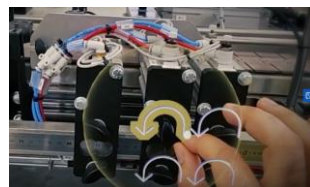
- 1 Sick Smart IoT Gateway TDC-E200EU
- 1 IO-Link Master communicating with Node-RED to create a dashboard and dashboard and generate alerts
- 1 USB IO-Link Master Kit for setting up IO-Link components
- 1 IO-Link photoelectric sensor
- 2 TOR photoelectric sensors
- 2 Temperature sensors with IO-Link signal conditioners
- 1 Vibration sensor
- 1 IO-Link compressed air meter (for leak detection)
- 1 MODBUS TCP electrical energy meter

SICK
Sensor Intelligence.



Thanks to the detailed operating procedures proposed for each machine below, the activity of deploying Industrial IoT monitoring on an industrial system is accessible from the Bac PRO level.

Augmented Reality Scenario 'Taqtile Manifest'



Augmented/mixed reality Manifest work instructions improve operational workflows so that tasks are performed more accurately and consistently.

Learn more about Taqtile Manifest: www.erm.li/tq



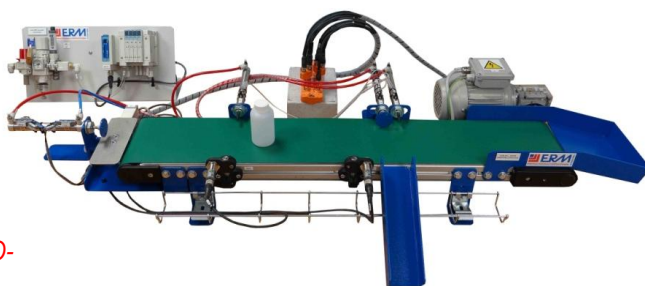
Related & complementary products

Automate 4.0 environment

Evolving environment for the factory of the future



Communicating IO-Link Master



Modular and scalable offer, from the PLC board to the mini-factory of the future

Secure control cabinet with protection for the wiring

professional on terminal blocks

Industrial solutions integrating modern technologies:

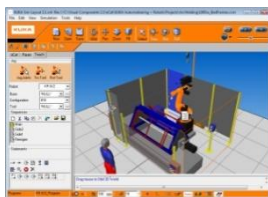
- ✓ IO-Link RFID for traceability
- ✓ Pneumatic assembly with integrated IO-Link components
- ✓ Weighing (strain gauge)
- ✓ Vision (camera)

www.erm.li/ea

- Discovering the IOT
- Discovering the IO-Link
- Use and setting of intelligent sensors
- Contextualisation of sensor measurements
- Setting up and using a Cloud service (Option)



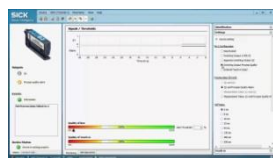
PLC & Touch Panel + Digital Twin in VU Pro



Programming in the Siemens environment then simulation in the digital twin

Smart IoT Sick TDCE & Smart Sensors Case (SK00)

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



SICK
Sensor Intelligence.

www.erm.li/sk00

IO-Link electrical and pneumatic measurement package (IO00)

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



www.erm.li/io00

Ethernet IO-Link Master Kit, Supervision & IO-Link Sensors (IO10)

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



www.erm.li/io10





Educational activities

Educational activities

The ERMAFLEX 6-axis robotic cell allows the following educational activities to be carried out

✓ Production control

- Control in normal production and handling of the robot cell
- Campaign set-up and quality control by sampling
- Production optimisation (**Management, organisation and improvement** of manufacturing processes: cycle time calculation, profitability analysis)
- Establishment of a **production traceability**
- Trajectory correction using the SMART PAD following a drift or modification
- Tool measurement and base measurement (For registration of pick-up marks and robot removal)

✓ Automation & Robotics

- Functional analysis and study of robotics technologies
- Setting up vision control
- Programming and simulation of the robot cycle and associated peripherals (conveyors, vision)
- Programming of the operator interface

✓ Industrial maintenance

- **Preventive maintenance on the 6-axis robot** (axis recalibration, etc.)
- **Corrective maintenance** (Modification of a trajectory, Diagnosis of a failure using the TIA PORTAL basic software delivered with the airframe...)
- **Improved maintenance** (Study of a quick release clamp fastening...)
- Improved maintenance (New pot format programming project)

✓ Mechanical engineering

- **Constructive studies** of industrial robotic systems (mechanical assemblies Gearbox and Arm+Wrist with SolidWorks files)
- Learning in SolidWorks: editing paths
- Editing of travel speed versus time curves

Educational activities (continued)

Production control - Operations required for format change:

- Emptying the cell
- Separation of cell energies
- Adjustment of the suction cup spacing and mounting (or not) of the sampling clamp
- Adjustment of the edges of the product conveyor and change of the positioning vee,
- Adjustment of the product indexing system
- Adjustment of the cap detection system (fibre optic height for the correct screwing of caps and photoelectric sensor for the presence of caps)
- Adjustment of the moving edge of the container conveyor
- Re-energising
- Setting up and checking before going into production

Spare parts for activities

Production control - Operations required for format change:

- Cylinders (2 compact cylinders, 1 double-acting compact anti-rotation cylinder)
- Suction cups x 2
- Fuses
- Photoelectric detectors
- NO reed sensors x 2
- Supports

These components are accompanied by a document with implementation scenarios. The parts are stored in a storage tray.



Robotic cell integrated into the Ermafex line