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)

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
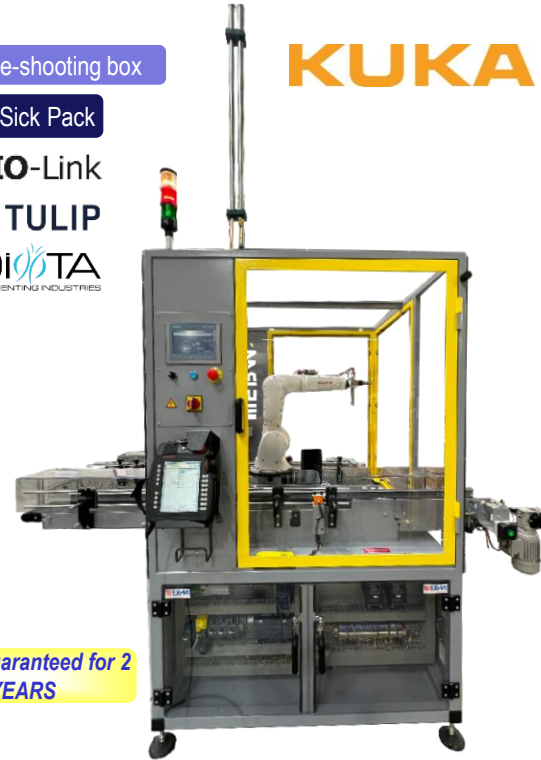Industrial Automation and Robotics
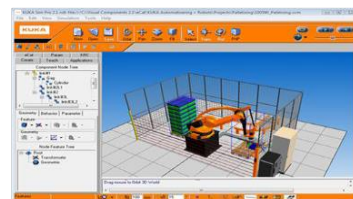
Trouble-shooting box

IoT Sick Pack

IO-Link

TULIP

DIOTA
AUGMENTING INDUSTRIES

KUKA

Robot guaranteed for 2 YEARS

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

KUKA simulation software

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

6-axis robot

SMART PAD (touch screen) for robot control

Robot controller

More information on www.erm-automatismes.com

ERM AUTOMATISMES

Didactique | Robotique | Fab&Test | Energies

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

## 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

Conveyor belt for cartons or trays

Sample tray

Gripping area for jars and bottles
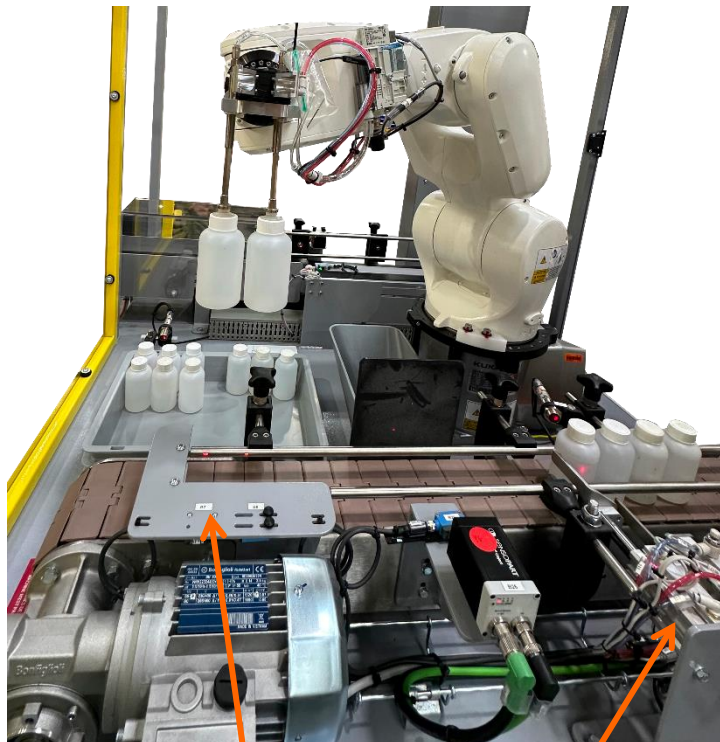
Area for picking up pots/vials with the robot's gripping head

Product jogging system and cap presence and screwing detection system

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

Control by presence detector cap and fork screwdriver control

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.
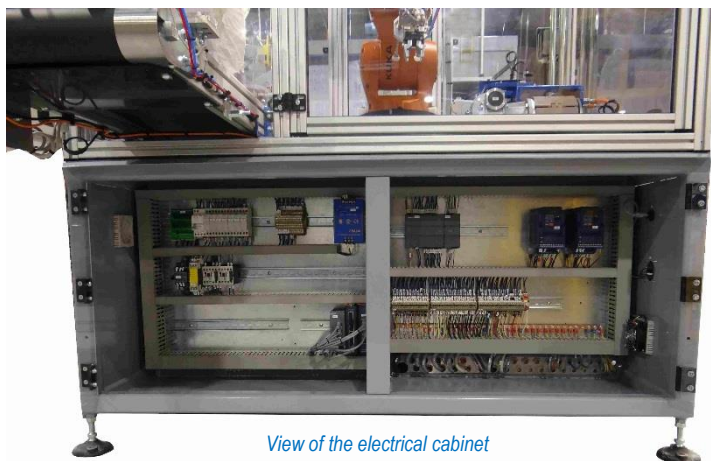
View of the electrical cabinet

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
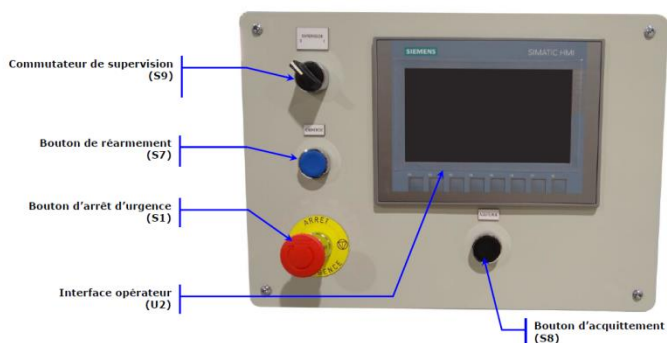- A Siemens KTP700 operator panel with a touch screen operator interface

Software tools

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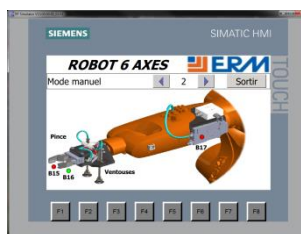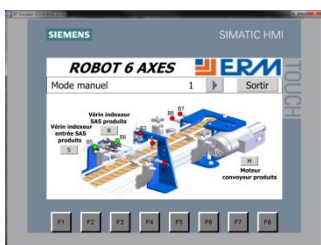- Software suite required to implement the robot
- The Siemens TIA PORTAL basic software is supplied with the cell (PLC and operator panel programming)
- Optional KukaSim 3D simulation software including the Ermaflex 6-axis robot cell (15 licences)

View of the pneumatic supply and distribution

View of the KRC5 Micro controller on the robot

Commutateur de supervision (S9)
Bouton de rêarmement (S7)
Bouton d'arrêt d'urgence (S1)
Interface opérateur (U2)
Bouton d'acquittement (S8)

View of the operator console

*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 Grafcets
- ✓ Mass curve of the weighed products
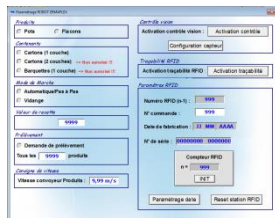
Screenshots Supervision

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...)

TULIP

26h 6Min 20s

www.erm.li/tul
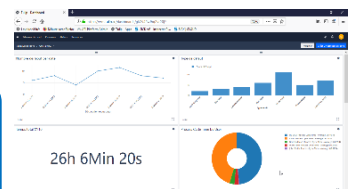
Sick TDCE Smart IoT Gateway & Smart Sensors Kit for Ermaflex (Ref: SK20)

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.
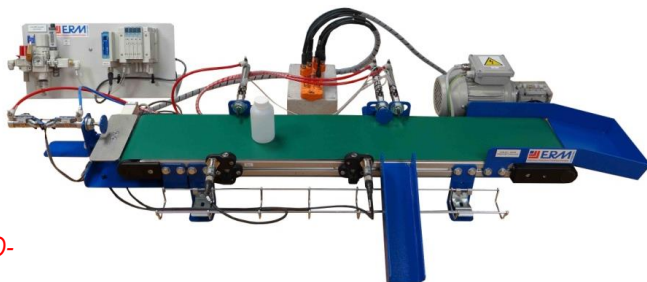
Related & complementary products

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)

IO-Link

PLC & Touch Panel + Digital Twin in VU Pro
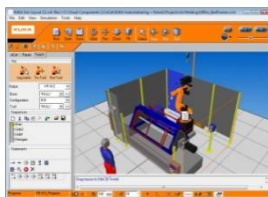
Programming in the Siemens environment then simulation in the digital twin

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 (IO01)

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

www.erm.li/io10

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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

Robotic cell integrated into the Ermaflex line

561, allée Bellecour-84200 Carpentras - France - Tel + 33 (0) 4 90 60 05 68
www.erm-automatismes.com - contact@erm-automatismes.com

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