



UR3 or UR5 Cobot Station (CB3 or eSeries)

Universal Robots UR3 or UR5 collaborative robot on mobile chassis with light beacon and worktop

ErmaSmart #1

Description of the technological support

The **UR3 or UR5 Cobot & Vision Station (CB3 or eSeries)** is an industrial training system for implementing a 6-axis collaborative robot with machine vision.

This system integrates a 6-axis **Universal Robot UR3 CB3 or eSeries** (3kg load - 500mm radius - Indirect force measurement by intensity for CB3 - Force sensor in each axis for eSeries) or **UR5 eSeries** (5kg - 850mm) with its controller and its Teach Pendant (colour touch panel) The system is fully secured (collaborative robot) and can be used to implement practical activities based on collaborative industrial robotics.

The UR3 or UR5 Cobot Station (CB3 or eSeries) can be used on its own, for collaborative robotics training, or within the **ErmaSmart, Ermaflex and ErmaLean** production lines. The **height adjustment of the work surface** also allows it to be adapted to a wide range of industrial situations.

In "isolated" use, three experimental environments are proposed:

- ✓ Parts for **clip and glue simulation** projects
- ✓ Parts for **2D and pick-and-place** projects
- ✓ Parts for **3D uncoiling** projects

But the open character of the station and its height adjustment allow it to be adapted to many other scenarios.

The **numerous options** (safety laser scanners, 2D/3D cameras, grippers, project parts) allow for a **complete educational approach to robotics and vision**.

All references are listed on the last page.

This **robotic** system, designed in the spirit of **Industry 4.0**, meets the main requirements for intelligence and the evolution of production methods:

- ✓ **Scalability & Flexibility** with the possibility to assign the station to different uses within the workshop
- ✓ **IoT & Communications** with the UR CB3 or eSeries industrial robot and optional 2D cameras

This training system is mainly intended for **activities in driving, system control, industrial maintenance, robotics & automation**.

The main references are :

- ✓ **UR03: Cobot & Vision Station UR3 eSeries: Universal Robots UR3 eSeries 3kg R500 collaborative robot on a height-adjustable mobile frame with light beacon and removable worktop**
- ✓ **UR00: Cobot & Vision Station UR5 eSeries: Universal Robots UR5 eSeries 5kg R850 on mobile height adjustable chassis with light beacon and removable worktop**

This product is accompanied by a technical and educational file in digital format.

CAP CIP - Bac PRO PLP / MELEC / MEI
BTS CRSA / Electrical engineering / MS
IUT - Universities - Engineering schools

Main themes

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

Themes
"Industry 4.0"
addressed

Scalability & Flexibility

Customisation

Simplified programming

Digital twin

Mobile Robotics

Collaborative Robotics

Efficient Actuators

CAPM & CMMS

Digital instructions & MES

Quality control "online".

Vision & Smart Sensors

IOT & Communications

Big Data, AI & Predictive Maintenance

Augmented reality

Virtual reality

Additive manufacturing for tooling...



Highlights of the Cobot & Vision Station UR3 or UR5(CB3 or eSeries)

- ✓ Real industrial system with modern technologies (collaborative robotics, 2D vision, etc.)
- ✓ **Production flexibility:** station can be assigned to different tasks and is height adjustable. Removable work surface
- ✓ System that can be integrated into Ermaflex, ErmaLean and ErmaSmart production lines (didactic factory 4.0) with integration into CAM / MES / Supervision information systems (customer order ⇄ planning ⇄ production ⇄ delivery).
- ✓ Universal Robots are widely used in industry (Universal Robots is the world leader in collaborative robotics).



6-axis collaborative robot" sub-assembly (in UR03 and UR00)

It consists mainly of:

- ✓ A 6-axis industrial collaborative robot with a range of 500 or 850mm and a maximum load of 3 or 5kg (Universal Robots UR3 or UR5 eSeries)
- ✓ A robot controller
- ✓ A colour touch panel for setting parameters (Teach Pendant)
- ✓ A set of software for controlling and programming the robot
- ✓ Various accessories (USB restoration key, etc.)

Low-cost variants with the UR3 CB3 and UR5 CB3 collaborative robots (indirect force measurement by intensity in the axes)



Chassis and work table sub-assembly (In UR03 and UR00)

It consists mainly of :

- ✓ A frame made of aluminium profiles with height adjustment of the robot's position and its work surface
- ✓ A removable, scalable worktop for the robot
- ✓ A lighted beacon
- ✓ An electrical cabinet with **protection, power supply** and space available to accommodate other electrotechnical components depending on the project (PLC, Dimmer, etc.)

The following can be added to this frame

- ✓ The set of two laser scanners for safe management of travel speeds (Ref: UR11)
- ✓ The FRL when using pneumatic grippers (Ref: UR16)



Options UR16 "Vacuum and air grippers and FRL".

This sub-assembly allows the gripping of parts (jars, cans, prisms...) on the work table and allows the deposit of these parts in vertical mini-stores, on an evacuation conveyor... It is supplied with a suction cup, the pneumatic distributors, the vacuum generator with vacuum switch, the air treatment unit (FRL) and a pneumatic gripper with parallel jaws (8 mm stroke and 30N clamping capacity).



Options UR18 " OnRobot suction cup gripper and on-board vacuum generator for Cobot Station

This sub-assembly allows the gripping of parts (jars, cans, prisms...) on the work tray and allows the deposit of these parts in vertical mini-stores, on an evacuation conveyor... It is supplied with two suction cups, an OnRobot autonomous vacuum generator.



Option UR17: OnRobot's RG2 collaborative electric gripper

The RG2 gripper is an end-of-arm collaborative tool designed for seamless integration with Universal Robots' collaborative robot arms.

Some technical features and benefits:

- ✓ No external cables
- ✓ Adjustable gripping force from 3 to 40N
- ✓ Adjustable gripping distance from 0 to 110mm
- ✓ Absolute reading of the width in mm, without initialisation
- ✓ Grip status indications
- ✓ Automatic depth compensation
- ✓ Automatic calculation of payload and tool centre point (PCO)
- ✓ Multi-position mounting bracket
- ✓ Customisable fingertips



Options UR12/UR13: Visor Robotic 2D vision sensor (Brand: Sensopart) monochrome/color at the end of the robot arm

These options allow the practical activities proposed to be put into practice through major industrial problems involving 2D vision (object detection, quality control, code identification, etc.)

It is supplied with a 1440x1080 pixel Sensopart V10 monochrome (UR12) or Sensopart V20 colour (UR13) machine vision sensor, 50 fps (frames per second) acquisition. It is GigE compliant and PoE compatible. The camera is equipped with a lens and a motorised focal length



Option UR14: 3D camera at the end of the robot arm for 3D uncoiling

This option allows jars, boxes or loose objects to be captured in 3D in a carton. In addition to the ability to work in 3D, the advantage of this structured light solution is that it is not affected by light conditions and works even under changing and difficult conditions.



Option UR11: Set of two laser scanners for safe management of travel speeds

This option allows the use of laser scanners that will slow down and then stop the robot as an operator approaches it.

It is a solution that is widely used in collaborative robotics, as it combines operator safety with speed of movement.

A tutorial on the safety of collaborative robotic cells is provided.





Educational activities

The UR3 or UR5 Cobot Station (CB3 or eSeries) allows educational activities of :

- ✓ Discovering and getting to grips with the system
- ✓ Commissioning and validation of operation
- ✓ Adjustment and parameterisation of the various components
- ✓ Programming the UR robot and the vision, safety and gripping peripherals
- ✓ Production control and validation
- ✓ Change of production
- ✓ Diagnosis
- ✓ Enhanced maintenance with new features
- ✓ Safety of collaborative robotic cells (Risk analysis, Scanners configuration...)
- ✓ Design and manufacture of 3D printed robot jaws and tools
- ✓ Development of a mini-supervision of equipment on Node-RED (Communication with the S7-1200 PLC, Creation of supervision pages, Creation of operator alerts...)

Installation features

- ✓ UR03: Dimensions (WxDxH): 1300x710x1500 mm
- ✓ UR00: Dimensions (WxDxH): 1300x710x1800 mm
- ✓ Weight: 100 / 110 kg
- ✓ Power supply: 230 V single phase (P + N + T)
- ✓ Pneumatic supply: 6 to 7 bar

Software tools

The UR3 or UR5 Cobot Station (CB3 or eSeries) is supplied with the necessary software suite for the implementation of the robot and the application programs.

Additional software is available as an option.

Practical work available

- TP1: Bases and tools for 6-axis robot trajectories
- TP2: Creation of a cycle on a 6-axis robot
- TP3: Vision-based detection in a robotic application
- TP4: Study of a robotized station
- TP5: Safety and risks on Universal Robots



Cobot & Vision UR5 eSeries station with parts for 2D and pick-and-place projects

References

- ✓ UR00: Cobot & Vision Station UR5 eSeries: Universal Robots UR5 eSeries 5kg R850 on mobile height adjustable chassis with light beacon and removable worktop
- ✓ UR02 : Cobot & Vision Station UR3 CB3: Universal Robots UR3 CB3 3kg R500 collaborative robot on a height adjustable mobile frame with light beacon and removable work surface
- ✓ UR03: Cobot & Vision Station UR3 eSeries: Universal Robots UR3 eSeries 3kg R500 collaborative robot on a height-adjustable mobile frame with light beacon and removable worktop
- ✓ UR11: Option Set of two laser scanners for safe management of travel speeds, for Cobot Station
- ✓ UR12: Option 2D monochrome vision sensor Visor Robotic V10 (Brand: Sensopart) at the end of the robot arm, for Cobot Station
- ✓ UR13: Visor Robotic V20 2D colour vision sensor option (Brand: Sensopart) at the end of the robot arm, for Cobot Station
- ✓ UR14: 3D camera option at the end of the robot arm for 3D uncoiling, for Cobot Station
- ✓ UR16: Option: Vacuum and air grippers and FRL for Cobot Station
- ✓ UR17: OnRobot RG2 Collaborative Electric Clamp Option for Cobot Station
- ✓ UR18: Option: OnRobot suction cup gripper and autonomous on-board vacuum generator for Cobot Station
- ✓ RK11: Parts for robotic clip and glue simulation projects
- ✓ RK12: Parts for 2D and pick-and-place projects

Diota" Augmented Reality Scenario available



From the CAD/PLM tool (Solidworks Composer) to the industrial maintenance RA scenario job card
DF10: Industrial augmented reality solution DIOTA Tablet