Cobot & Vision Dobot Station

Dobot CR *collaborative robot*
on mobile frame with light beacon and worktop

ErmaSmart #1

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

Description of the technological support

The Dobot Robotic Cobot & Vision Station is an industrial training system for implementing a 6-axis collaborative robot with machine vision.

This system integrates a 6-axis collaborative robot **Dobot Robotic :**

- **CR3** (3 Kg load - 620mm radius) Ref : DB20
- **CR5** (5kg load - 1096mm radius) Ref: DB21
- **CR10** (10kg load - 1525mm radius) Ref: DB22

Each robot is supplied with its controller and an Android touch pad.

The Dobot Robotic Cobot Station 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, two experimental environments are proposed:
- ✓ Parts for clip and glue simulation projects
- ✓ Parts for 2D and pick-and-place projects

But the open nature of the station and its height adjustment allow it to be adapted to many other scenarios.
The many options 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 Dobot Robotic industrial robot and optional 2D cameras

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

The cell can be equipped with a choice of :
- light beacon
- removable work surface
- safety laser scanners
- 2D cameras
- Collaborative grippers
- SafeSkin envelope

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

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 Dobot Station

- ✓ 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).
- ✓ Dobot Robotic robots are widely used in industry and are the market leader in Japan, with customers including Toyota and Omron.

6-axis collaborative robot sub-assembly (DB20, DB21 or DB22)

It consists mainly of:

- ✓ A 6-axis collaborative industrial robot and its controller
- ✓ A touch-sensitive teach pendant
- ✓ A set of software for the control and programming of the robot (One-Hand-Teaching, Blockly, Lua, VirtualRobot) included with the robot and these licenses are free for life

Sub-assembly "Chassis and work table".

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).

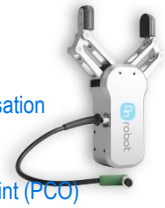
Options MD28: Suction cup gripper and OnRobot on-board vacuum generator for Cobot Station

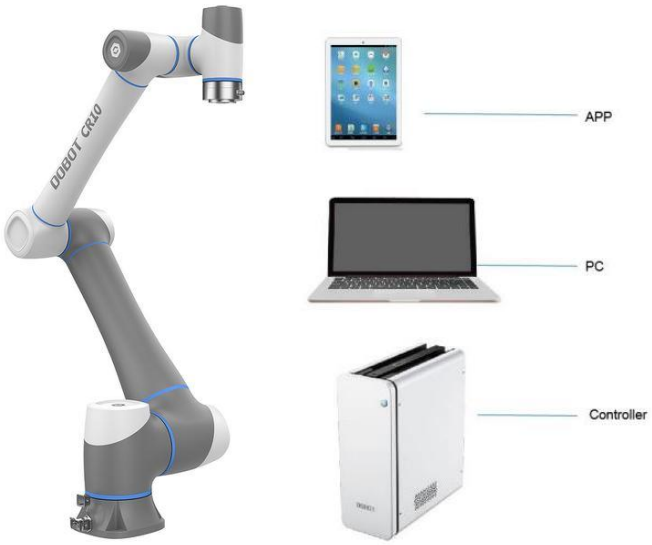
This sub-assembly allows the gripping of parts (jars, cans, prisms...) on the work tray and allows the deposit of these parts in vertical mini-stores, on an evacuation conveyor... It is supplied with two suction cups, an OnRobot autonomous vacuum generator.

Option MD27: OnRobot's RG2 electric collaborative 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 comes with a 1440x1080 pixel monochrome (UR12) or 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 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 Dobot Robotic Cobot Station 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 of the Dobot robot** and the vision, safety, gripping and tracking peripherals
- ✓ **Production control** and **validation**
- ✓ **Change of production**
- ✓ Diagnostics and predictive maintenance software
- ✓ 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...)

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 Dobot CR robot

Installation features

- ✓ DB20: Dimensions (WxDxH): 1300x710x1500 mm
- ✓ DB21: Dimensions (WxDxH): 1300x710x1800 mm
- ✓ DB22: Dimensions (WxDxH): 1300x800x1800 mm

- ✓ Weight: 100 / 110 kg
- ✓ Power supply: 230 V single phase (P + N + T)
- ✓ Pneumatic supply: 6 to 7 bar

Software tools

The Dobot Robotic Cobot Station is supplied with the necessary software suite for the implementation of the robot and the application programs.
These programs are free.

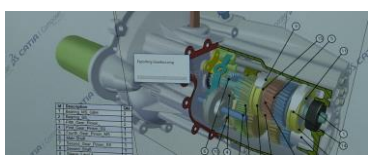
Cobot Dobot station with vision and parts for 2D and pick-and-place uncoiling projects

References

- ✓ **DB20**: Cobot&Vision Dobot CR3 Station: Dobot CR3 3kg R620mm collaborative robot on height adjustable mobile chassis with light beacon and removable work tray
- ✓ **DB21**: Dobot CR05 Cobot&Vision Station: Dobot CR5 5kg R900mm collaborative robot on height adjustable mobile chassis with light beacon and removable work surface
- ✓ **DB22**: Cobot&Vision Dobot CR10 Station: Dobot CR10 10kg R1300mm collaborative robot on height adjustable mobile chassis with light beacon and removable work tray
- ✓ **DB24**: Safeskin for Dobot CRxx collaborative robot
- ✓ **MD27:** OnRobot RG2 Collaborative Electric Gripper Option for Dobot Robotic Cobot Station
- ✓ **MD28:** 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/3D and pick-and-place projects
- ✓ **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
- ✓ **UR16**: Option: Vacuum and air grippers and FRL for Cobot Station

Diota" Augmented Reality Scenario available

DIOTA
AUGMENTING INDUSTRIES



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

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