e.DO is a unique, modular, open-source, Industry 4.0-enabled, “build-it-yourself” robot created for anyone who wants to explore or expand the world of robotics.

Build it yourself robot. The e.DO robot has everything needed to construct an articulated multi-axis robot with integrated open-source intelligence.
Product Positioning Definition

Complexity/Costs

Less Complexity
Modular Solution
Lower Costs

Environment

Made in Comau
e.DO Product Positioning

- Robotics for kids: 1,000€
- Home Robotics: 5,000€
- Labs Robotics: 15,000€
- Industrial Robotics: 10,000€

TARGET
e.DO Drivers

**What**
- Small and modular Robot
- Software development kit
- Additional options Parts and apps to customize

**To Whom**
- Educational world
- Passionate Community

**How**
- Online store
- Third parties
e.DO Key Features

- Powerful 6-axes/4-axes articulated robot based on an open-source hardware and software architecture.
- Kit includes motion units composed of DC motors, composite plastic casings, a base unit with integrated memory and control logic.
- Modular, flexible structure supports personalized configuration.
- Educational package and application support.
- User-friendly programming and control interface.
- Embedded Raspberry Pi control system.
- Application storage server and community-backed expansion.
e.DO 6-Axis

e.DO comes with everything you need to construct a 6-axis articulated robot with integrated control logic and an open-source hardware and software platform. Its six articulated axes interface and communicate between themselves in a modular and independent manner, and each motorized unit has an autonomous mechanical and electronic control that can be configured as needed by the operator. With a full six degrees of motorized freedom, e.DO can pick up and move any piece in any position – rotating its axes as needed to accomplish the desired task.
e.DO 4-Axis

e.DO comes with everything you need to construct a 4-axis articulated robot with integrated control logic and an open-source hardware and software platform. Its four articulated axes interface and communicate between themselves in a modular and independent manner, and each motorized unit has an autonomous mechanical and electronic control that can be configured as needed by the operator. With a full four degrees of motorized freedom, e.DO can pick up and move only axial symmetrical pieces – rotating its axes as needed to accomplish the desired task.
Product HW / SW Main Architecture

N joints:
- e.DO joint board
- Motor
- Brake

Intra-Robot communication
CAN BUS

Embedded Controller
Raspberry Pi3

Power Management

External HMI Controller:
- Tablet (Android, Windows)
- Desktop (Windows)

TCP/IP Communication
(WiFi or Ethernet)
e.DO Controller Architecture

Universal external power source with 12V power adapter

Emergency Devices

USB RosSerial

Power Management

RASPRESSBY PI 3 MODEL B

ROS Kinetic Kame

OS: RASPBIAN JESSIE

USBs, WiFi and Ethernet

Storage: SD card

• Power supply for controller electronics and for robot joints.
• Provide temporary power in case of power cut for power failure operation.
Raspberry PI SW

ROS Modules

- ORL
- Algorithms
- State Machine
- Diagnosis
- RosSerial
- RosBridge
- TCP External communication (e.g. HMI)
- USB RosSerial

Standard modules
e.DO modules
Raspberry PI SW

C5G slave
Modality

- Joint value coming from C5G simulator on a TCP/IP socket.
- Bypass of e.DO HMI

Comau C5G Simulator

C5G Client

RosBridge

State Machine

Diagnosis

RosSerial

USB RosSerial

Standard modules

e.DO modules
USB Card

USB to CAN board:

- **Novalab** USB board
- 1 real time ROS node per joint
- 1 USB real time ROS node
- standard ST Bootloader

- Communication to uDC cards at 100Hz (not real time)
uDC Card

One board per joint:

• Drive motor with torque, speed, and position closed loop control.

• Integrated IMU
  ➢ 3-axis accelerometer
  ➢ 3-axis gyroscope
  ➢ 3-axis magnetometer
  ➢ pressure sensor

• Hall effect sensor
PID Control Loops

3 concentric PID control loops (position, velocity and torque)
Frequency 1KHz. PWM H-Bridge 18KHz Max
HMI

HMI interface developed in HTML5 + Javascript. Compatible with Android and Windows Tablets and Windows desktop PC.
SW Licenses

All e.DO software is released as Open Source:

- Code on raspberry PI → FreeBSD License
- Code on robot joints (uDC Card) → GPL3 License
- HMI → FreeBSD License

The source code is uploaded on GitHub