DENSO
robotics

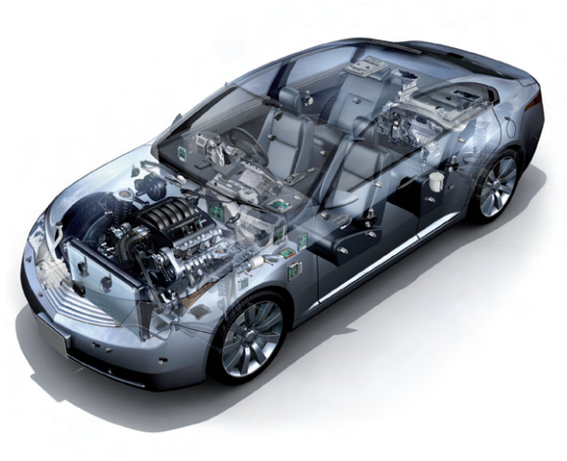
Product Overview

DENSO robotics

Innovation is in our DNA

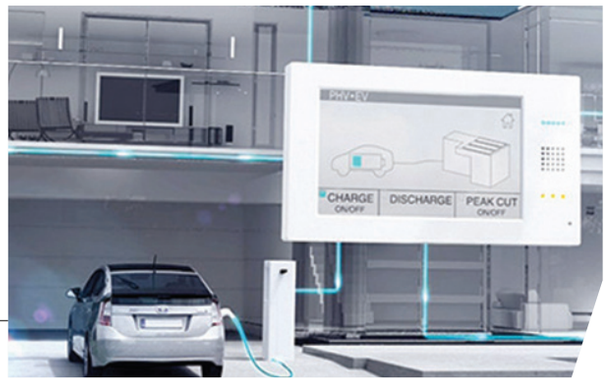
Our story began in 1949 when Nippondenso Co. Ltd. (today DENSO), a separate entity from Toyota Motor Co. Ltd., was established.

Our Business Fields



Automotive

One of TOP 3 auto parts suppliers worldwide



Customer Products

New business fields

Micro Grid, Electric Power Assist, Security, Healthcare, Biotechnology, Agriculture Support, Cold Chain, Community Network Solution Business

Industrial products

DENSO Corporation at a Glance*

$48.3b
in annual revenue (USD)

170,000
employees in 211 group companies

9%
of revenue re-invested in R&D

1994
QR-Code invented

*Data as of 31.3.2021

Robotics pioneer

50 years

Over 50 Years Developing Industrial Robots
Since 1967 we are developing robots for our automotive industry.

120,000 robots

Worldwide Market Leader
With over 120,000 DENSO robots we are the market leaders in small industrial robots.

OEM supplier

Trusted OEM Robot Supplier
Companies around the world trust in the quality of our products.

20,000 own use

One of the World's Largest Robot Users
Over 20,000 DENSO robots work in our own manufacturing facilities.

Customer Voice

”For nearly two decades DENSO robots have proven their performance and reliability in our machines. Furthermore, a wide product range in the size of robots we are using, makes DENSO robots a natural choice for us.”

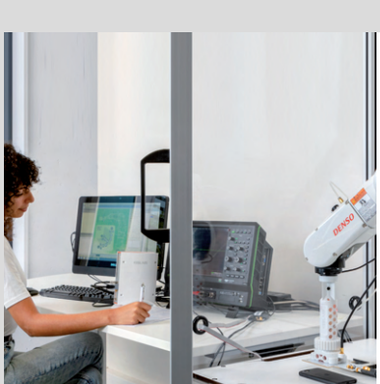
Jakob Nors, Innovation Manager, PJM, Denmark

”DENSO deliver fast and precise robots that are reliable and robust. Denso is also a highly reliable supplier who delivers at the agreed time in an increasingly difficult market.“

Anders Linneberg, Sales Director, Eltronic, Denmark

“We want to bring happiness among our customers and avoid troubles for ourselves.
Denso robotics has been our technology partner almost over 12 years”.

Ossi Parviainen, CEO Newicon Oy, Pharmacy automation



„DENSO robots are easy to integrate into our NFC object test benches and provide robustness, reliability, and precision for both characterization and compliance testing.“

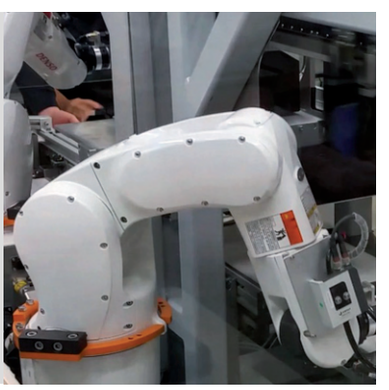
David Mouret, R&D Director, KEOLABS, France

"With DENSO robots, in combination with measuring camera systems, we achieve particularly precise, highly flexible and fast handling of very small components."

Florian Föll, Sales, HOLZ automation GmbH

„In order to be able to maintain its high quality standard, USIMECA seeks for a safe, innovative and cost-efficient support for robotics solution."

Thierry Blay, Technical Director, USIMECA, France



„The excellent quality is appreciated not only by us when installing and programming the technology, but also by our innovative customers in the field of automation. We are very satisfied with the long-term cooperation and support of our contact partner."

Rüdiger Storre, Senior Key Account Manager, SIM Automation GmbH

„From start to finish, COBOTTA from DENSO Robotics proved to be an ideal candidate to create a standardized mobile manipulator. The straight forward integration does not stop at a tiny hardware footprint, but it also includes ready-made software interfaces."

Christian Deppe, Product Manager Robotics and Virtual Training, Festo Didactic

DENSO robotics

Our full range of small industrial robots

5 & 6-AXIS - VP Series

Max arm reach:	430 – 432 mm
Payload:	2.5 – 3 kg

6-AXIS - VS Series

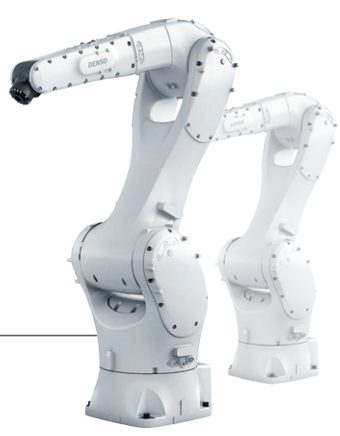
Max arm reach:	505 – 905 mm
Payload:	4 – 7 kg

6-AXIS - VS-6 Series

Max arm reach:	653 – 854 mm
Payload:	7 kg

6-AXIS - VM Series

Max arm reach:	1.021 – 1.298 mm
Payload:	13 kg



6-AXIS - VMB Series

Max arm reach:	1.506 – 1.804 mm
Payload:	25 kg

6-AXIS - VLA Series

Max arm reach:	2.503 – 2.257 mm
Payload:	40 – 60 kg

4-AXIS - HS-A1 Series

Max arm reach:	350 – 550 mm
Payload:	5 kg

4-AXIS - HSR Series

Max arm reach:	480 – 650 mm
Payload:	8 kg

4-AXIS - HM Series

Max arm reach:	600 – 1.000 mm
Payload:	10 – 20 kg

COBOTTA Series

Max arm reach:	342 – 1.303 mm
Payload:	0.5 – 12 kg

DENSO robotics

6 AXIS Robots

	VP Series		VS-6 Series		VS Series			
	VP-5243	VP-6242	VS-6556	VS-6577	VS-050	VS-060	VS-068	VS-087
Reach	430 mm	432 mm	653 mm	854 mm	505 mm	605 mm	710 mm	905 mm
Payload	3 kg	2,5 kg	7 kg		4 kg		7 kg	
Repeatability	± 0,02 mm		± 0,02 mm	± 0,03 mm	± 0,02 mm		± 0,02 mm	± 0.03 mm
Cycle Time	0.99 s[1]		0.49 s[1]	0.59 s[1]	0.35 s[1]		0.31 s[1]	0.34 s[1]
Standard protection class	Standard IP30		Standard IP40		Standard IP40			
Option			Dust & Spash-proof (IP65/54), Cleanroom (ISO 5 & 3), UL Specifications		Dust & Spash-proof (IP65/54), Protected Type: IP67 Cleanroom (ISO 5 & 3), UL Specifications			
	RC8A controller							

[1] With 1 kg Payload

Communication Interface – Patented Technology

- Connect servo grippers and GigE devices easily to the robot´s flange.
- Avoid long cables and their entanglement with surrounding equipment.
- Available for VS-Series and VS-050-S2

	VM Series		VMB Series		VLA Series	
	VM-6083	VM-60B1	VMB-2515	VMB-2518	VLA-4025	VLA-6022
Reach	1.021 mm	1.298 mm	1.506mm	1.804 mm	2.503 mm	2.257 mm
Payload	13 kg		25 kg		40 kg	60 kg
Repeatability	± 0.05 mm	± 0.07 mm	± 0.05 mm		± 0.06 mm	
Cycle Time	0.89 s[1]	0.95 s[1]				
Standard protection class	Standard IP40		Standard IP40		Dust & Spash-proof (IP67/65)	
Option	Dust & Spash-proof (IP65/54), Cleanroom (ISO 5)		Dust & Spash-proof (IP67), Cleanroom (ISO 5)			
	RC8A controller		RC9 controller			

[1] With 1 kg Payload, [2] With 5 kg Payload

VS-050-S2

Hygienic design according to GMP, certified by Fraunhofer institute, perfectly suited for pharmaceutical and medical industries.

- Payload 4 kg
- Arm reach 520 mm
- Round edges and no external screws, avoiding bacteria accumulation and maintain high sanitation levels
- Resistant to UV light, H2O2 (35% concentration) and other chemicals

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COBOTTA-Series

	COBOTTA	COBOTTA PRO 900	COBOTTA PRO 1300
Reach	342.5 mm	908 mm	1.303 mm
Payload	0.5 (0.7 kg[3])	6 kg	12 kg
Repeatability	± 0.05 mm	± 0.03 mm	± 0.04 mm
Max. TCP speed	450 mm/s	2.100 mm/s [2]	2.500 mm/s [2]
Protection	IP 30	IP 54 Clean room ISO 5 [1]	IP 54 Clean room ISO 5 [1]
Weight	4 kg	28.5 kg	38 kg
ISO Standards	EN ISO 102181:2011, EN ISO 13849 1:2015, ISO/TS 15066:2016		

[1] Option, [2] Maximum TCP speed during high speed operation
[3] When the end-effector faces downward (within ±10 °)

By expanding our collaborative product portfolio with our new COBOTTA PRO, which inspires with reaches of up to 1300 mm and maximum loads of up to 12 kg, we offer an ideal solution for almost every application. Work that previously could only be done by humans can now be easily automated.

The COBOTTA PRO was not only developed to facilitate cooperation between humans and robots, but also to continuously maximise productivity. It offers an ideal mix of productivity and safety for both simple tasks and multi-step processes.

Safe Design

- Power and force limited Cobots
- Inherent safe design & functional safety (TÜV certified)
- COBOTTA PRO: safeguards worker by augmenting proprietary torque sensors
- Option: Touch sensing soft cover to improve productivity safety

Easy to use / Easy to programm

- Direct teach-in, hand guiding modus
- Intuitive programming COBOTTA World visual tablet app
- Easy programming Blockly:
  flexible visual programming even for high precision & complex tasks

Flexibility & High Performance

- COBOTTA: built-in controller, built-in gripper (option) and built-in AF camera
- COBOTTA PRO: Highspeed meets collaboration, TCP up to 2500mm/s
- Track memorization
- Fine adjustment up to 0.1 mm
- Internal wiring (signals & air)

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4 AXIS Robots

	HS-A1 Series			HSR Series		
	HS-035A1	HS-045A1	HS-055A1	HSR-048	HSR-055	HSR-065
Reach	350 mm	450 mm	550 mm	480 mm	550 mm	650 mm
Vertical Stroke	100,150,200 and 320 mm			100, 200, 320 and 510 mm (with bellows 170 and 290mm)		
Payload	5 kg			8 kg		
Repeatability	± 0.015 mm	± 0.02 mm	± 0.02 mm	± 0.01 mm	± 0.012 mm	±0.012 mm
Cycle time	0.29 s [3]			0.28 s[3]		0.31 s[3]
Standard Protection class	Standard IP20			Standard IP20		
Options	Bellows on 3rd axis, Dust & splash-proof (IP65) Cleanroom (ISO3) [4], UL Specification [5] Ceiling Mounted (only with 045A1&HS055A1)			Bellows on 3rd axis, Dust & splash-proof (IP65), Cleanroom (ISO3&5), UL Specification [5] Ceiling Mounted (all models)		

HSR Highlights

High-speed motion

High acceleration & motion profiles. Improved cycle per minute allows the robot to move at high speed continuously.

Continuous motion

Improved heat dissipation performance at the base unit allows the robot to achieve continuous motion.

[1]With 1 kg Payload [2]With 5 kg Payload [3]With 2 kg Payload [4]Cleanroom type is only suitable for floor mounting
[5]UL Specifications are only for floor mounting (HS-A1 Series) [6]UL Specifications are for floor and ceiling mounting (HM series) [7]Not for Dust & Splash Proof

	HM Series			
	HM-4060*	HM-4070*	HM-4085*	HM40A0*
Reach	600 mm	700 m	850 mm	1.000 mm
Vertical Stroke	100,150, 200, 300 and 400 mm			
Payload	10/20 KG			
Repeatability	± 0.02 mm		± 0.025 mm	
Cycle time	0.29 s [3]		0.31s[3]	
Standard Protection class	Standard IP20			
Options	Bellows on 3rd axis, Dust & Splash-proof (IP65), Cleanroom (ISO 5), UL Specification [6] Ceiling Mounted (only HM-4070*G & HM-4085*G 10 kg and 20 kg)			

XR Series

Payload: 5 kg
Motion range: Up to 1660 mm
R-axis stroke: 1660 mm
Application examples: palletizing, assembly, pick & place, feeding & carrier, etc.

Longer motion range
Compared to 4 and 6-axis robots thanks to X-R structure.

Compact
Ideal for shortened production lines with restricted spaces and low-height areas.

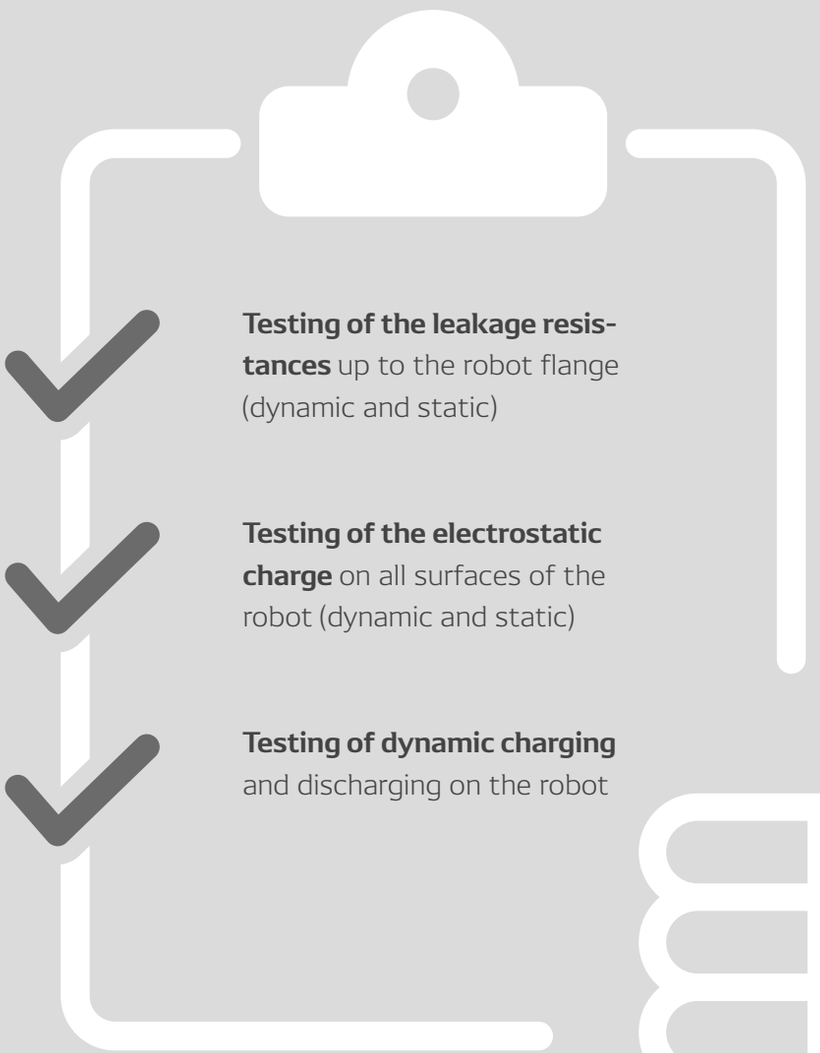
DENSO robotics

ESD Series

When handling electronic components, for example during PCB assembly, visual inspection, product testing and packaging, uncontrolled electrostatic discharges (ESD) endanger product integrity.

By expanding the possible protection classes to include ESD, DENSO offers the ideal solution for the electronics industry. The ESD series includes the HS-A1 series, as well as the VS series. Ranges from 350 mm up to 905 mm with payloads of up to 7 kg are fully covered. In order to achieve the ESD conformity, required in many parts of the electronics industry, the HS-A1 series as well as the VS series have been subjected to a type approval test by the ESD Academy to ensure that all necessary limits according to IEC 61340-5-1:2016 / ANSI/ESD S20.20:2021 are met and that the product integrity is not compromised.

The ESD conformity was determined and certified by an independent testing institute (ESD Academy) with the following tests.

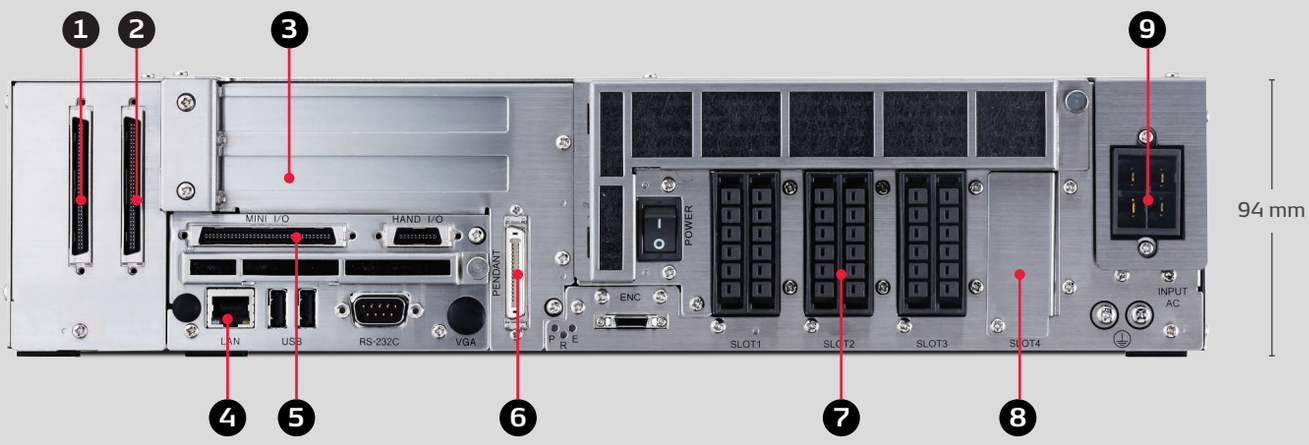


Testing of the leakage resistances up to the robot flange (dynamic and static)

Testing of the electrostatic charge on all surfaces of the robot (dynamic and static)

Testing of dynamic charging and discharging on the robot

RC8A Controller



1 **Safety Motion Input Cable (8m, 15m)**
Safety Devices, Safety Laser Scanner, Safety Light Curtain, Safety Mat, Safety PLC

2 **Safety Motion Output Cable (8m, 15m)**
Safety Devices, Safety PLC

3 **Control Expansion Boards**
- Parallel I/O
- DeviceNet Slave
- DeviceNet Master
- PROFIBUS Slave
- PROFINET I/O Device
- CC-Link RD
- EtherNet/IP
- EtherCAT Slave
- CONTEC Serial Comm.
- CONTEC Analog I/O
- CONTEC Digital I/O
- External Axis

4 **Software**
- WINCAPS III
- EMU
- Robot Tools
- VRC
- ORIN 2 SDK
- RC Vision

5 **Mini I/O Cable** (8 m, 15 m)
Peripheral Devices: PLC, Conveyor

6 **Operating Devices**
Teach Pendant, Mini Pendant, Emergency Stop Box

7 **Robot Connector Cable**
(2,4,6,12,20 m)

8 Additional Axis, Eyefeeder with Camera

9 Power-Supply Cable

RC8A Features

Compact & light
357mm x 320mm x 94mm
smallest lightweight high-performance 8-axis controller in his class

High control capacity
- Control up to 8 axis
- Control additional peripheral

Safe control
- Safety I/O
- Safety Motion up to Ple, Cat 4

Expandability
- Supporting all network standards
- Control versatile external devices

Programming Flexibility
3D visual programming, PacScript, Python, Java, C++, C#, VB, LabVIEW, ... or PLC code

Standard Connections
- 16 Inputs / 16 Outputs
- GigE Ethernet

RC8A Functions

Command Slave
Robots can be controlled with PLC languages (ladder programs). Function blocks that support 107 robot commands are offered.

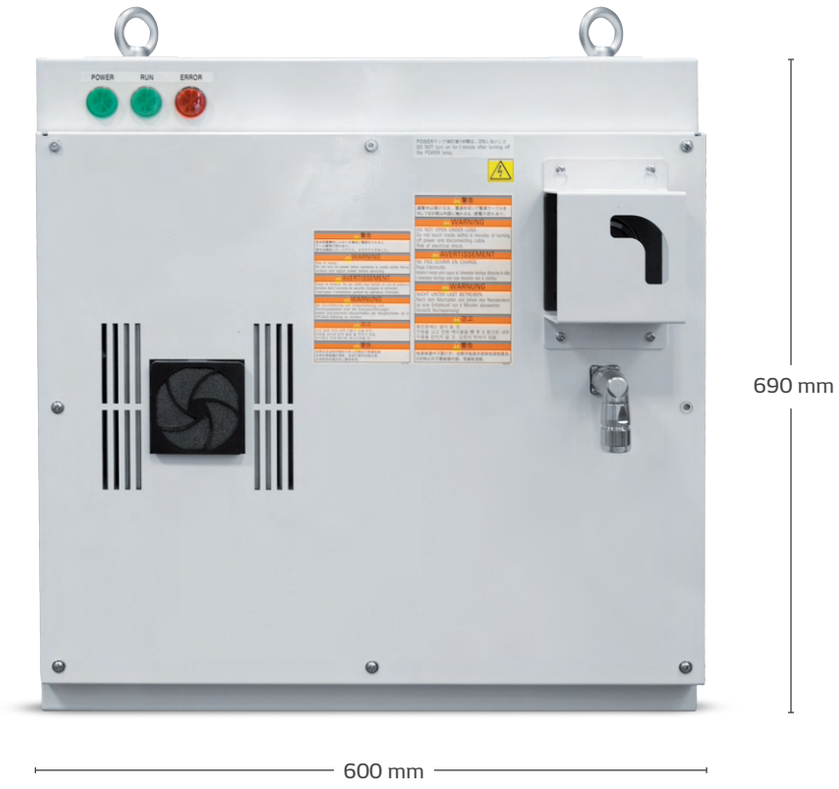
Conveyer tracking
Since a robot can track workpieces, workpieces can be conveyed and aligned without stopping the conveyer.

b-CAP (communications protocol)
By directly sending packets of motion commands to the robot from a PC, PLC or other device, the robot can be controlled.

Dual Arm Control
Allows a single controller to control two SCARA robots. Saves space and simplifies operations.

DENSO robotics

RC9 Controller



Simplified teaching and operation
- Master & Slave Cloud
- Smart TP

Software
- WINCAPS III
- WINCAPS Plus
- EMU
- EVP2
- Imitative learning engine

Enable various field networks
- Fieldbus

CC-Link PROFIBUS DeviceNet

- Industrial EtherNet

EtherNet/IP EtherCAT PROFINET

Extensive line of robots
- VM1500/1800
- VL2500

(RC8 can also be connected with EtherCAT Slave)

RC9 Features

Built in PLC
- Fully integrated Beckhoff TwinCAT Real Time control
- Compatible with all Beckhoff components

Real-time Control Architecture
- Real-time intelligent control robots & equipment
- 250 ms motion control real-time capability

Safe control
- Safety I/O
- Safety Motion up to Ple, Cat 4

Smart Teach Pendant
Multifunctional smart Teach pendant
TwinCAT3 PLC UI and Wincaps Plus UI

Programming Flexibility
Advanced software functionality / known RC8 programming environment

Standard Connections
- 20 Inputs / 20 Outputs
- GigE Ethernet

Expandability
- Control up to 4 robot arms or 32 axis

DENSO robotics

Safety Motion Function

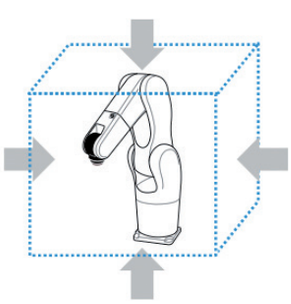
Safety function that allows humans and robots to work in a shared area

- EN ISO 13849-1 (safety function). Certified by TÜV Rheinland.
- Performance level PL = d/SIL2 (standard controller; PL = e/SIL3).

TÜVRheinland®

Overview

The safety function monitors and controls the robot operation status to realize safe and highly-productive robot equipment.



1. Monitor the motion area

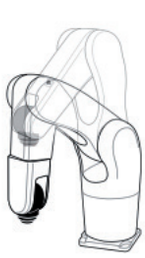
Robot motion area is limited to monitor the motions is within the limited area.

• Small-sized equipment Mutual access to the work area common to human and robots.

2. Monitor the speed

Robot speed is controlled to monitor the robot speed is slower than the speed limit.

• Continuous motion as maintaining the safe speed is enabled even when human approaches the robot.



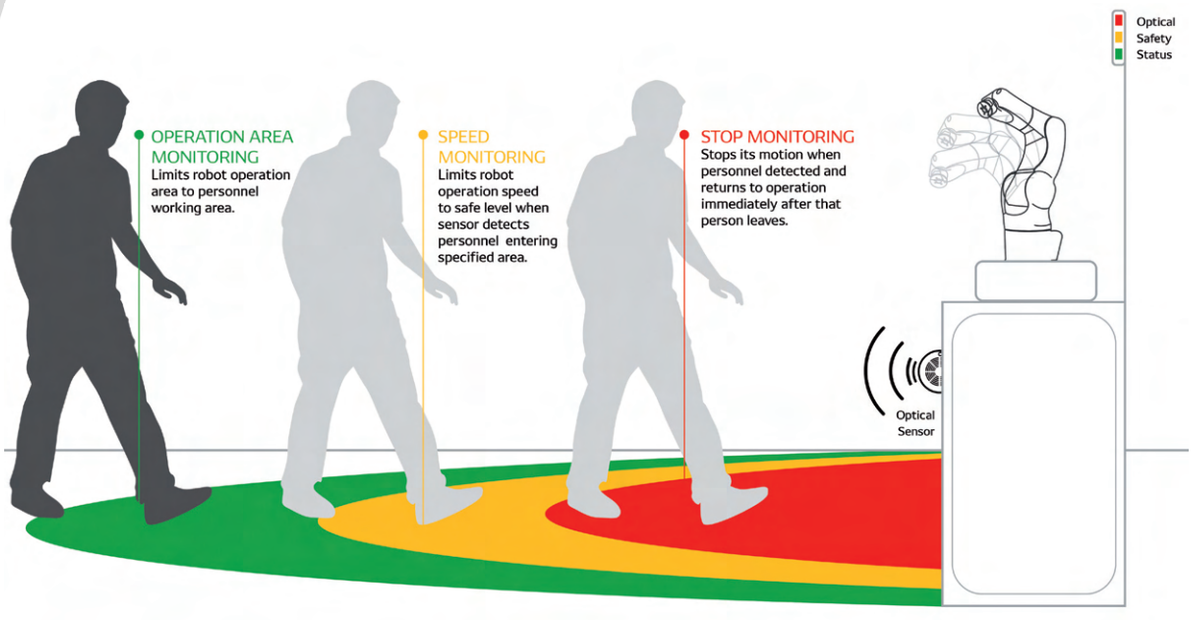
3. Monitor the robot stop

The stop status of the robot is monitored without shutting down the motive power.

• Smooth recovery of robot motion when human leaves the common work area is assured to improve the productivity.

Use scenarios

When entry of a human into the set motion area is detected by devices such as laser scanners, the robot speed is limited to the specified safe speed or less to enable continuous production. The robot stops moving when the human enters the stop area.



Safety Function

STO (Safe Torque Off)	Function of immediate shutdown of the motor power
SS1 (Safe Stop 1)	Function to shut down the motor power after slowing down and stopping the robot
SS2 (Safe Stop 2)	Function to leave the power on after slowing down and stopping the robot
SOS (Safe Operating Stop)	Function to monitor the robot does not move from the stop position
SLP (Safely-Limited Position)	Function to monitor the axes do not exceed the soft limit
RSM (Robot Speed Monitoring)	Function to monitor the robot`s specified sections do not exceed the specified speed.
RMP (Robot Position Monitoring)	Function to monitor the robot`s specified sections do not exceed the specified motion area.
SBC (Safe Brake Control)	Function to turn off the external brake power and lock the brake.

* Equipment must be used only after performing risk assessment, implementing safety measures, and checking that hazard to humans is thoroughly prevented.

DENSO robotics

Standard Software

Wincaps III - Offline Programming Software

Arm 3D View

Displays the robot and peripheral devices in 3D and simulates robot motion.

Online Functions

Connect online to robot controller to use various monitoring and debugging functions

Simulation functionality

Execute offline user created programs on the pc to check cycle time, robot movement, pose and interference.

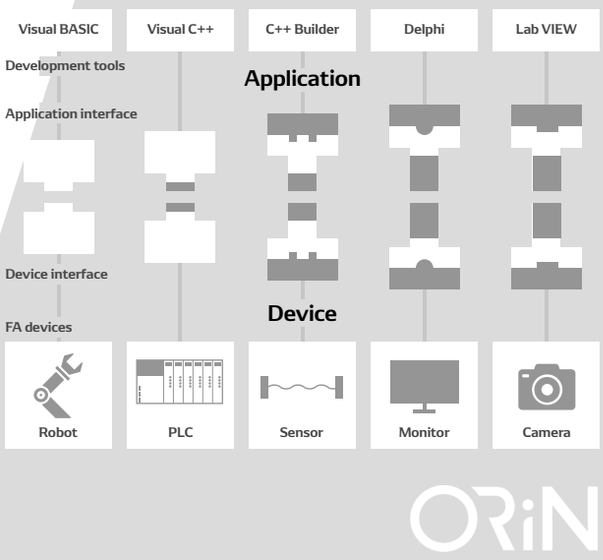
Log Function

User can view and export various logs to analyze.

Wincaps Plus

The Software package offers five independent software packages and is a perfect add-on for WINCAPS to reduce man-hours for nearly each Industrial Scenario during Design, Installation, Operation and Maintenance.

- 3d visual programming
- Optimized motion planner
- Home position guidance
- Robot viewer
- Palletizing builder



ORIN

ORiN 2 SDK is a software tool kit used to develop an application program or provider based on ORiN2 specification.
It provides a standard communication interface for robots as well as various FA peripherals and databases.
The superior expendability of ORiN2 supports not only industrial robots, but a variety of devices (including PLC, CNC machine tools, bar code readers and many more) to enable application development that is independent of manufacturer or model.

Robot Tools

Fully featured suite of utility tools created for optimize maintenance and operation of DENSO robots.

Virtual TP
A virtual teach pendant on the PC works with a controller set on manual mode, allowing configuration and monitoring from a remote location.

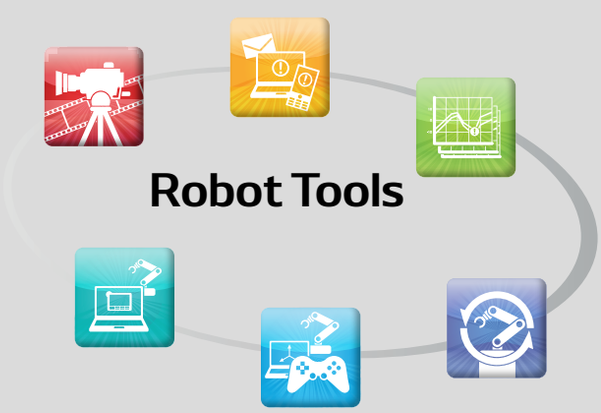
Mobile monitor
Monitors controller operating status and enables quick response to an error by sending notification email.

Control log analyzer
Obtains the control log from a designated controller and automatically displays it in a graph.

Image logger
Help to determine cause of sudden errors and incorrect equipment assembly.

GP Operator
Connect a robot controller to a PC and use a mouse or game pad for easy robot operation.

Easy Backup
Performs backup and restores all data from single or multiple controllers in a batch.



DENSO robotics

DENSO Difference + USP´s

Our highest priority at DENSO is offering you the best quality and cost-effective products, which allows you to maximise your production while delivering maximum ROI.

Over 10 Years Working Life and Reliability
DENSO robots are well-known for operating over decade delivering the same precision and performance as from their first day.

Ease of Integration
Solutions to program DENSO robots and factory automation devices such as external axis, feed systems and sensors using only one interface.

Ease of Programming
Templates and wizards to program pick & place and palletising.
Program DENSO robots with LabVIEWTM, Matlab, C++, C#, Java and Visual Basic or via PLC.

Low Maintenance
DENSO robot gears are lubricated with life-time grease. This results in a low cost of ownership.

Standard 24-Months Guarantee
DENSO offers a 24 months guarantee to all of our customers.

Unique Technologies
Optional Ethernet and electrical internal wiring up to the robot's flange to protect cables.

Compact Design
Small and slim robot arm.
Smallest robot controller.

Wide Variety of Options
Extensive array of robot arms and optional features, e.g. from standard to water protected and clean room.

Cost of ownership

DENSO RC3 V3-C series robot

Installed at 601 plant 11/06/2003

- Performed oxygen sensor heater setting at DENSO Manufacturing plant in Athens, TN
- Total hours run in production: **45.400**
- Total cycles on robot: **35.000.000**
- Removed from production on 6/1/2016

- Original purchase price **$20.000 USD**
- Maintenance performed over 20 years service life: Batteries, belts, filters, grease exchange, amplifier replacement, motor an drive replacement cost **$6978,45**
- Total cost of ownership per production hour: **$0,59**

- What is your total cost of ownership on your current robot system?

DENSO robotics

OUTSTANDING
Worldwide Service and Support

No matter where you need us, our team of highly qualified specialists are ready to help you; fast and personal contact, no hotlines.

We offer a vast range of services such as:

Training

- Programming
- Operator
- Maintenance
- Repair
- And more

Repair centre located in Germany

- Quick and professional repair (on and off-site)
- Robot overhaul

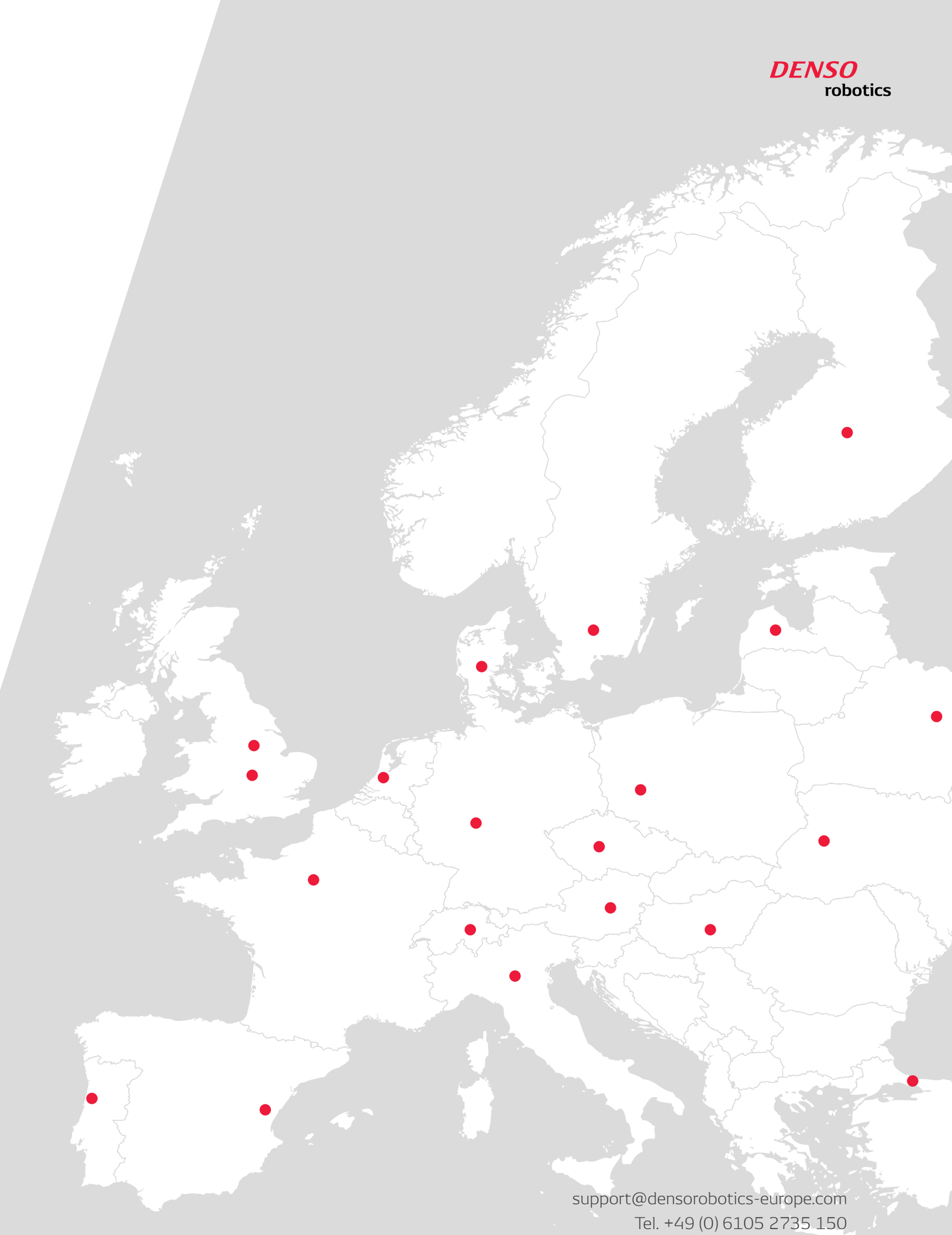
Technical support

- Simulations
- Tests
- Troubleshooting
- Programming
- And more

AMC

- Trouble-free production thanks to plannable maintenance
- Priority spare parts supply
- Attractive pricing and further discounts

Local spare parts centres that provide fast delivery



support@densorobotics-europe.com
Tel. +49 (0) 6105 2735 150

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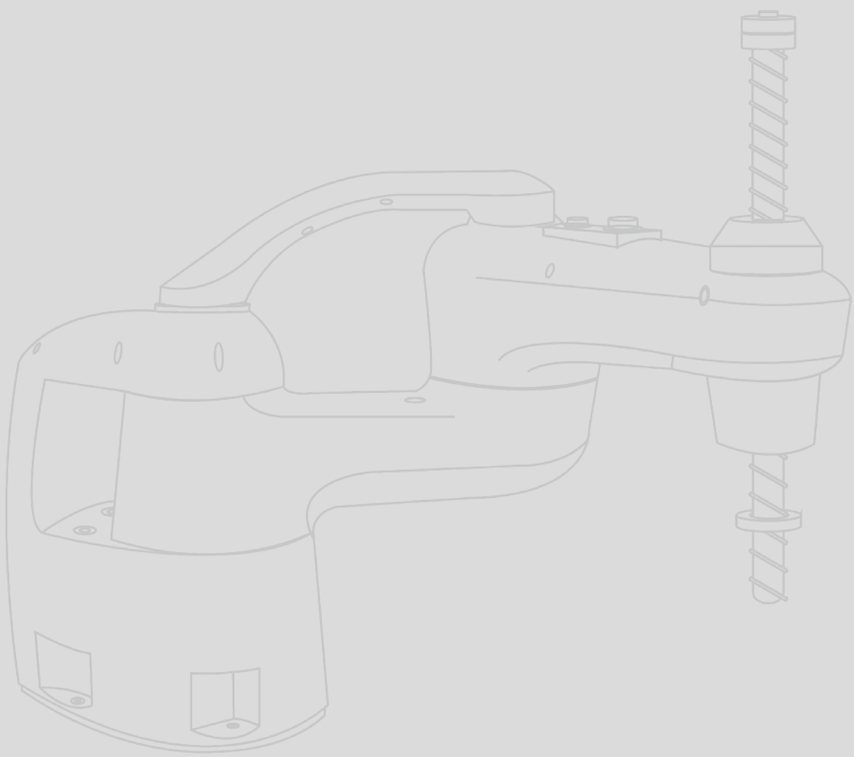

DENSO Robotics
Waldeckerstr. 9
64546 Mörfelden-Walldorf

info@densorobotics-europe.com

+49(0) 610 527 351 50

densorobotics-europe.com