DENSO

DENSO

www.densorobotics-europe.com

Headquarters:
DENSO Robotics Europe I DENSO EUROPE B.V.
Waldecker Str. 9, 64546 Moerfelden-Walldorf, Germany
t: +49 (0) 6105 27 35 150 f: +49 (0) 6105 27 35 180
@: info@densorobotics-europe.com (commercial information)
@: support@densorobotics-europe.com (technical support)

www.facebook.com/DENSORoboticsEurope

www.twitter.com/DENSORoboticsEU

www.youtube.com/DENSORoboticsEurope

Watch our latest videos

DENSO - Inventor of the QR-Code

EN_Global_EU_042015_V1

www.densorobotics-europe.com

English

"The highest evolution of the arm"

ABOUT DENSO ROBOTICS

04 | DENSO. Technology with tradition
06 | History of DENSO Robotics
08 | Our products. The ultimate answer
09 | Industries and applications. Flexible. Fast. Effective.
10 | Programming DENSO robots and peripheral devices.
12 | How we can help you. Increasing your productivity, increasing your success
14 | We care about the environment
16 | Global companies trust in DENSO robots
20 | A full line-up of small industrial robots

DENSO 6-AXIS ROBOTS

22 | Overview. DENSO 6-axis robots
25 | VP Series (up to 2.5 kg/up to 432 mm)
29 | VP-G2 Series (up to 2 kg/up to 432 mm)
35 | The new VS Series
39 | The new VS Series. VS-050/VS-060 (up to 4 kg/up to 605 mm)
43 | The new VS Series. VS-068/VS-087 (up to 7 kg/up to 905 mm)
47 | New VSH_20_2 / UV Series VS-050-S2
50 | The new VS Series - options
53 | VS Series (up to 7 kg/up to 854 mm)
57 | VM Series (up to 13 kg/up to 1298 mm)

DENSO 4-AXIS ROBOTS

60 | Overview. DENSO 4-axis robots
63 | HS Series (up to 5 kg/up to 550 mm)
67 | HM Series (up to 20 kg/up to 1000 mm)
71 | XR Series

PROGRAMMING DENSO ROBOTS

75 | Robot controllers
77 | RC8 controller
83 | RC7 controller
89 | Main functionalities of DENSO Robotics
94 | DENSO teaching & mini pendants
97 | Programming & development
99 | DENSO's offline programming, simulation and monitoring software. WINCAPS III
100 | Working with common programming languages (C++, VB, etc.). ORiN2
102 | Control protocol based on TCP/IP. b-CAP
103 | Vision library for ORiN2. ORiN Vision
104 | Easy Vision Picking. EVP
106 | Machine vision and robot programming. HALCON Extension Package
107 | Virtual Robot Controller (VRC)
108 | Command Slave
111 | Simulation
112 | Enhanced MUlti-robot simulator (EMU)
113 | Simulation software for complete factory layouts. 3DCreate®
115 | Support Tools
116 | Robot stand/maintenance support tools. Robot Tools

SERVICE AND SUPPORT

119 | Service and Support. We're only satisfied when you are
120 | Training
121 | Customer Support
122 | Contact us. Our worldwide network

TECHNOLOGY WITH TRADITION

DENSO is market leader in the small assembly industrial robot segment

DENSO is one of the 500 largest companies worldwide

there are more than 85,000 DENSO robots installed across the globe

17,000 are employed in our own manufacturing facilities

When you choose a robotic solution from DENSO you can rest assured that you are investing in a product of the highest calibre. Our commitment to quality and customer satisfaction is, quite simply, second-to-none.

DENSO Robotics is proud to be a part of the DENSO Corporation, which is recognised as one of the 500 largest companies worldwide (Fortune Global 500) and is also one of the two largest automotive parts manufacturers in the world.

It is this strength in depth that allows DENSO Robotics to be such a pioneering force. In fact, our vision and aptitude have seen the company become the recognised worldwide leader in small robotic design and manufacturing.

When industrial robots first appeared in the early 1960s, DENSO began to develop and apply the emerging technologies to its own production processes, allowing the company to constantly improve and advance the hardware and software.

And now, today, as the established market leader in the small assembly industrial robot segment, DENSO Robotics continues to set the benchmark in reliability, flexibility and functionality. With more than **85,000 DENSO robots installed across the globe – 17,000 are employed in its own manufacturing facilities** – no other company has more expertise.

DENSO Robotics is the automatic choice when it comes to industrial robot arms.

HISTORY OF DENSO ROBOTICS

Global supplier of high quality small industrial assembly robots for nearly 50 years

We are a company with long history and tradition in innovation. This is why we offer only the best for our customers. Worldwide.

NEARLY 50 YEARS

1967 Robot development started

1970 Manufacture of the first aluminium die-casting operation robot for actual use (implemented at our head factory)

1982 Mid-sized 4-axis robot development

1983 Mid-sized 6-axis robot development

1985 In-house implementation of assembly robots started

1991 Robot controller RC3
Robot sales started

1998 Robot controller RC5

2001 DENSO WAVE INCORPORATED established

2002 DENSO WAVE

2004 DENSO 4-axis robot HS/HM series
DENSO 6-axis robot VS series

2005 DENSO 5-and 6-axis robot VP series

2011 Robot controller RC7M

2012 DENSO 6-axis robot new VS series

2014 Robot controller RC8

New VS H_2O_2 / UV resistant

THE ULTIMATE ANSWER

Whatever challenge you face, DENSO Robotics has the answer. Our product range includes **four-axis (SCARAs) and five and six-axis robots**. All of which are defined by their outstanding speed, precision and build quality.

For the pinnacle in functionality, **our robots can manage payloads of up to 20 kg and offer a maximum arm reach of up to 1298 mm and speed up to 11,500 mm/s.** Compact, light and requiring only **minimal periodic maintenance** (e.g. our 6-axis robots have been manufactured with lifetime greasing), our entire robot range also comes with a class leading **two-year guarantee.**

To add to the cost efficiency and ease of use of our robots, there is only **one controller type for all robot models**, you only need one controller for each robot. DENSO robots have also been designed to operate in virtually any environment including dusty, wet or clinical surroundings. The protection ratings of our robots are classed as follows:

- Standard
- Dust & splash proof (IP65/54)
- Protected (IP67)
- Cleanroom classes ISO 5 and 3
- Cleanroom (ISO 5) + H_2O_2 and Cleanroom (ISO 5) + H_2O_2 / UV resistant*
- UL specifications (for the USA and Canada)

As further testament to DENSO Robotics credentials and reputation in the robotic arm marketplace, important competitors rely on us to supply them with unbranded hardware so they can increase and complete their own product ranges.

There is no better answer than DENSO Robotics.

Example of product configuration

*H_2O_2 (Hydrogen Peroxide) is a chemical used for sterilization purposes in the pharmaceutical and medical industries
*UV - sterilisation method that uses ultra violet light

FLEXIBLE. FAST. EFFECTIVE.

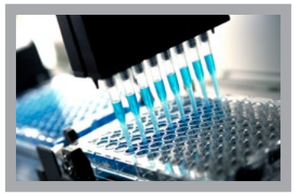
From general manufacturing through to the pharmaceutical sector, a huge range of industries can benefit from the ways DENSO robots streamline and improve processes and procedures.

The versatility and advanced functionality of our products allow them to be programmed for virtually any situation where a robotic arm is applicable. Whether the requirement is for straightforward "pick and place" or incredibly complex tasks and routines, such as the fully automated preparation of a medical injection, DENSO robots are at the forefront of today's industrial applications.

Here is a brief overview of where and how DENSO Robotics can add value and efficiency to your business.

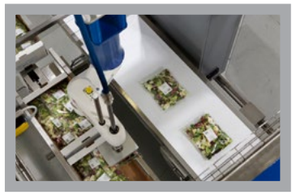
Industries:

- Appliances
- Automotive
- Chemicals
- Consumer products
- Electronics
- Food
- General manufacturing
- Greenhouse
- Machine tools
- Medical devices
- Pharmaceuticals
- Semiconductor
- Plastics
- And many others



Applications:

- Pick & place
- Assembly
- Packaging
- Dispensing
- Palletizing
- Inspection
- Material removal
- Material handling
- Customised projects



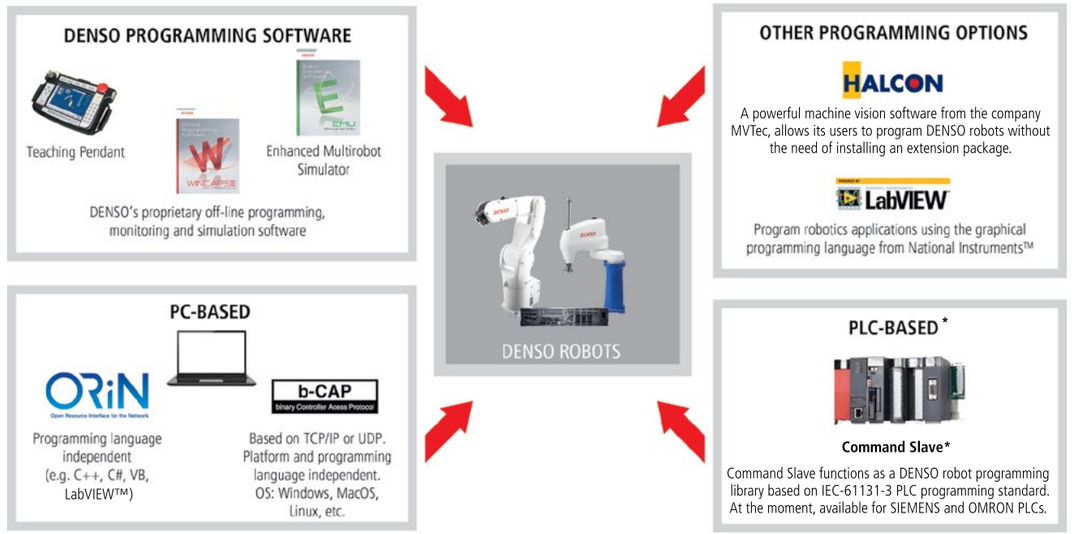
PROGRAMMING OPTIONS

DENSO robots have been conceived and produced so that programming them is as convenient and user-friendly as possible. We have developed a range of tools that allow you to interact with our robots in a manner you find the most comfortable and familiar.

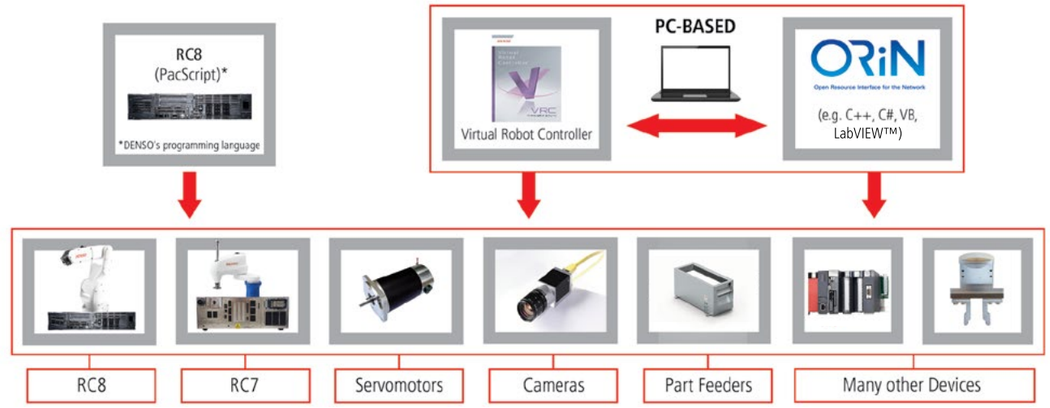
For ease and simplicity, all DENSO robot controllers have a standard Ethernet connection for attaching to another device such as a PLC or industrial PC.

The adaptable choice of ways that you can input instructions into DENSO robots includes the following:

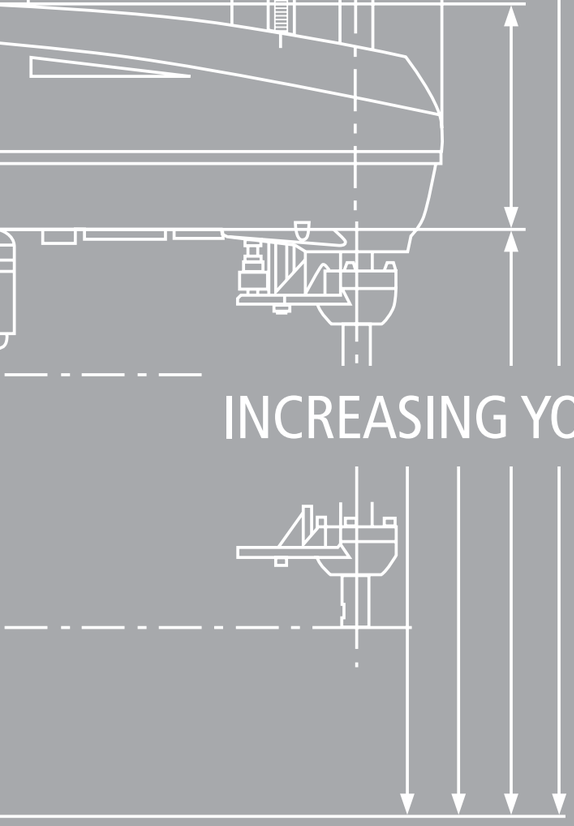
Programming DENSO Robots ...



... and Peripheral Devices



NI LabVIEW™ Software is trademark of National Instruments™ HALCON and MVTec are registered trademarks
*Command Slave will be soon avaliable for Beckhoff and Rockwell.



INCREASING YOUR PRODUCTIVITY

INCREASING YOUR SUCCESS

As a business operating in today's global economy, it is imperative to be as lean and proficient as possible without compromising anything in terms of quality and service.

Consumers demand the highest class of products at the most competitive prices. And shareholders expect a positive return on their investments.

So how do you establish an advantage while still maintaining integrity?

How do you ensure that your systems are delivering the most effective TCO?

That's where DENSO Robotics can help.

We can reduce your production costs and increase your speed to market in the following ways

- The unparalleled speed and precision of our robots **save you time**. Processes are completed faster and more accurately
- Our robots are hugely reliable and durable. And that means your production procedures operate at **maximum efficiency**
- The highly compact and lightweight design of our robots **saves space**. There is no unnecessary bulk or equipment. Your manufacturing area is utilised to its full capacity
- Our robots require the **minimum amount of servicing and upkeep**. Which means they constantly perform without the time and expenditure incurred by regular maintenance
- Because of their **low energy consumption**, DENSO robots keep power costs to a minimum **while also helping the environment**

ENVIRONMENT

Putting the environment first

The environment is a crucial consideration during the production of DENSO robots and we are completely dedicated to **reducing the use of hazardous substances.**

Our awareness and commitment mean that DENSO robots are an environmentally friendly, ultra efficient and highly profitable investment. Our robots have been conceived for **low energy consumption**. For this, they have been provided with standard electric sockets for their **use with 230V energy sources**. Ultimately, our products and systems can help realise the full potential of your business in an eco-friendly manner.

"Our awareness and commitment mean that DENSO robots are an environmentally friendly, ultra efficient and highly profitable investment."

Global companies **trust** in DENSO robots.

Aerospace Industry

Airbus

Airbus is a leading aircraft manufacturer, it forms part of EADS, a global leader in aerospace, defence and related services. This group – which is comprised of Astrium, Cassidian and Eurocopter, in addition to Airbus – has a presence on every continent, and employs a total workforce of more than 119,000.

"The Airbus low speed wind tunnel (LSWT) in Bremen enables wind tunnel tests in internal facilities and supplies wind tunnel models with instrumentation for internal and external facilities. Its mission is also the design and monitoring of the manufacture and calibration of new engine simulators for wind tunnels.
A continuous control of the probes which are used in wind tunnel tests is required after test campaigns in the different wind tunnels. Multi-hole pressure probes, such as five- and seven-hole probes, are cost-effective devices which provide accurate flow measurements in the different wind tunnel tests. All the probes used are calibrated, and once they have been used in a wind tunnel test campaign, they will be controlled with the DENSO VM-60B1G-V in order to determine the new calibration required, or to follow on with more test campaigns (structural characteristic maintained). This control will be performed by placing the probe in a flowfield with known velocity magnitude and direction. The movements are enabled by the DENSO VM-60B1G-V, and the new characteristic values are compared with the calibration values.

The LSWT wind tunnel Airbus utilizes DENSO robots because the control of these robots is very flexible and can be integrated in the wind tunnel measurement environment without changing existing software philosophy."

Eva-Maria Mendez Montilla, Aerodynamics Testing, AIRBUS Airbus Operations GmbH, Germany

General Manufacture

Danfoss

Danfoss is a family owned, global company employing 26,000 staff worldwide. Producing 250,000 components per day from 93 factories in 25 countries, it has 140 sales companies and over 450 global dealers and distributors.

One of Danfoss factories in Denmark, utilizes approximately 40 DENSO robots.

"We prefer to use a single brand of robot in our production process and chose DENSO as it could offer the largest range of models. We wanted to use the combined approach to programming for all of our robots, and DENSO uses the same programming and unit for both Scara and 6-axis robots."

Svend Arne Dynnweber, Project Manager for Danfoss, Denmark

Fishing Industry

SINTEF

SINTEF is the largest independent research organization in Scandinavia. Its broadly based, multidisciplinary research concern that possesses international top-level expertise in technology, medicine and the social sciences. SINTEF employs 2100 staff who come from 70 different countries.

"The processing of fish and meat is subject to strict regulations. The production process has to be completely hygienic. We want to automate and optimize the way these foods are processed. In our research, for the processing we use the highly efficient 6-axis robot of the model VS-087 produced by DENSO Robotics. The robot operates the fish fillets with cutting blades. The fish is measured with the help of sensors, so it can then be analyzed at which exact points the blade has to cut around the skin and the bones. Also any unwanted bloody spots can be identified by the sensors and removed by the robot. The use of robots ensures that the weight and shape of the filets are perfect when they go into sale. The production process becomes more hygienic and safer. The quality of the fish and meat is increased because only high quality cuts make it into sale. Additionally, the origin of the products and every single step in the production process is traceable. The process is also intended for cutting chicken breasts. The work environment is cold and yet very wet, which is corrosive to all objects made of metal; nonetheless, DENSO robots are very robust, resistant and operate extremely fast. This is why we have chosen DENSO."

Harry Westavik, Research Manager for Automation and Product Efficiency, SINTEF, Norway

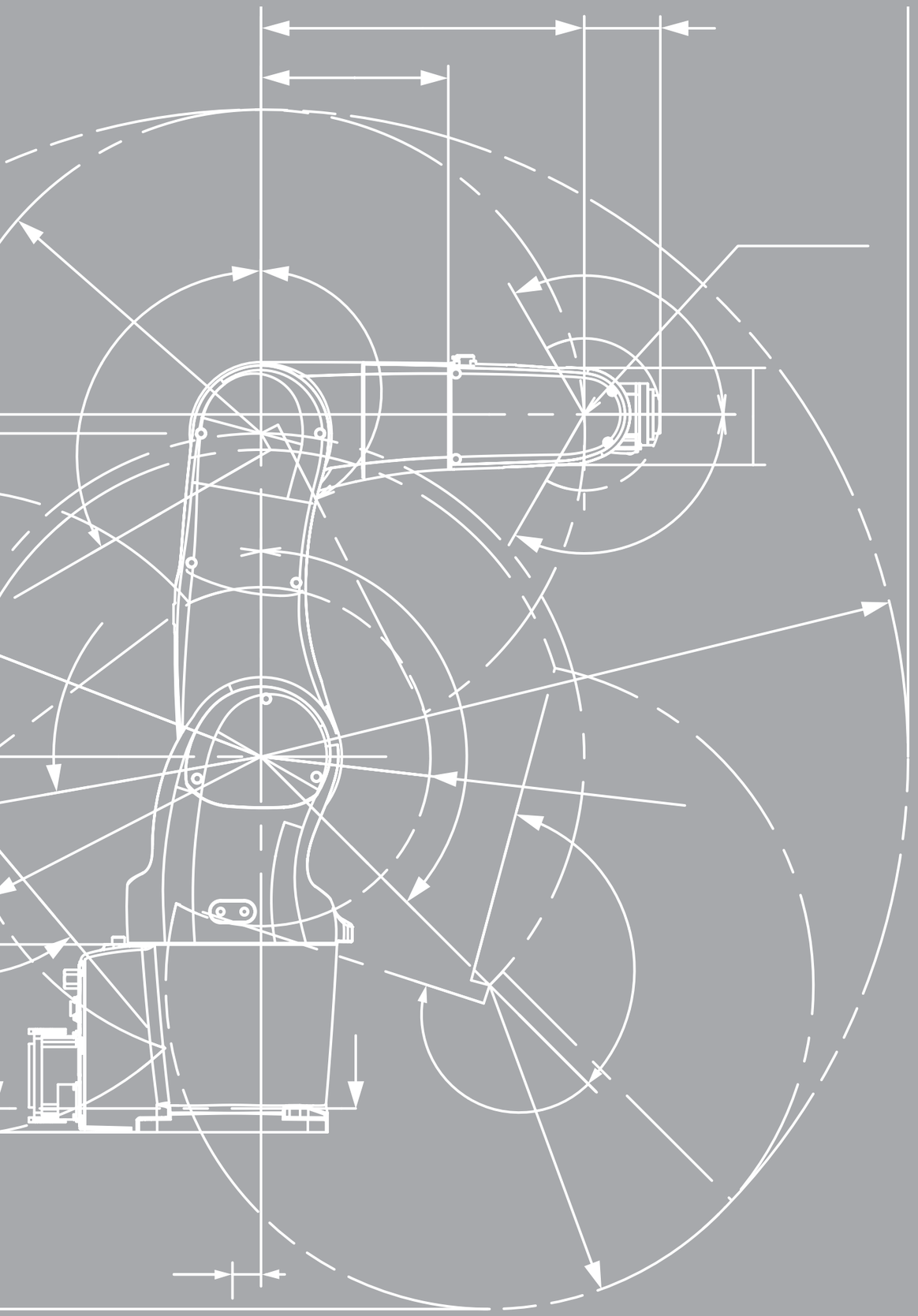
Hospitality Industry

Rofobox

Rofobox is the technology leader for automated, creative napkins folding in the hotel, restaurant, leisure and tourism industry.

"Folding napkins is one of the most labour consuming processes in the hospitality industry. Each year, around 400,000 napkins are folded in larger hotels. In addition to this, in food courts, napkins fall under special hygienic requirements as they come into contact with the mouth. By automating processes of folding rigid napkins, we enable our customers to reduce costs and to deploy employees efficiently. Together with our partners we developed a fully automated machine that uses DENSO robots for the handling and folding of napkins in 3D. The robots are compact, fast, light and have a long arm reach. In addition, the small floor area required for the robot allows for easy installation - whether it is on the ground, or mounted on the ceiling. The VS-087 DENSO robots that we use have an attractive design and their white color portrays the purity of their design. These are precisely the skills we need for our innovative napkin machine."

Kartal Can, CEO, Rofobox GmbH, Germany



DENSO delivers. **Every time.**

Over the following pages you will discover details about the fantastic choice of product ranges and programming software solutions that DENSO offers.

Whatever challenge you face, **DENSO** can help.

A FULL LINE-UP OF SMALL INDUSTRIAL ROBOTS

ROBOT CONTROLLER SUPPORTED RC8 / RC7

6-AXIS ROBOTS

6-AXIS ARM REACH

400 mm | 500 mm | 600 mm | 700 mm | 800 mm | 900 mm | 1000 mm | 1300 mm

VP Series (RC8 / RC7)

VP-5243G | VP-6242G

Only Standard available

VP-G2 Series (RC7)

VP-6242G2

Options available:
- Standard
- Cleanroom (ISO 5) + H_2O_2
- UL specifications

New VS Series (RC8 / RC7)

VS-050 | VS-060

Options available:
- Standard
- Dust & splash proof (IP65/54)
- Protected (IP67)
- Cleanroom (ISO 5 & 3)
- UL specifications
- Cleanroom (ISO 5) + H_2O_2 / UV resistant (only VS-050)

VS Series (RC8 / RC7)

VS-6556G

Options available:
- Standard
- Dust & splash proof (IP65/54)
- Cleanroom (ISO 5 & 3)
- UL specifications

New VS Series (RC8 / RC7)

VS-068

Options available:
- Standard
- Dust & splash proof (IP65/54)
- Protected (IP67)
- Cleanroom (ISO 5 & 3)
- UL specifications

VS Series (RC8 / RC7)

VS-6577G

Options available:
- Standard
- Dust & splash proof (IP65/54)
- Cleanroom (ISO 5 & 3)
- UL specifications

New VS Series (RC8 / RC7)

VS-087

Options available:
- Standard
- Dust & splash proof (IP65/54)
- Protected (IP67)
- Cleanroom (ISO 5 & 3)
- UL specifications
- Cleanroom (ISO 5) + H_2O_2 / UV resistant

VM Series (RC8 / RC7)

VM-6083G | VM-60B1G

Options available:
- Standard
- Dust & splash proof (IP65/54)
- Cleanroom (ISO 5)

6-AXIS PAYLOAD

2 kg - 3 kg | 4 kg - 7 kg | 13 kg

4-AXIS ROBOTS

4-AXIS ARM REACH

350 mm | 450 mm | 550 mm | 600 mm | 700 mm | 850 mm | 1000 mm

XR Series (RC8 / RC7)

XR

HS Series (RC8 / RC7)

HS-4535G

HS-4545G

HS-4555G

Cleanroom type

Ceiling mounted

Options available:
- Standard
- Bellows on 3rd axis
- Dust & splash proof (IP65)
- Cleanroom (ISO 3)[1]
- UL specifications[2]

HM Series

HM-4060G

HM-4070G

HM-4A85G

HM-4AA0G

Ceiling mounted

Options available:
- Standard
- Bellows on 3rd axis
- Dust & splash proof (IP65)
- UL specifications[3]

[1] Cleanroom type are for floor type only (HS series)
[2] UL specifications are for floor type only (HS series)
[3] UL specifications are for floor and ceiling type available (HM series)

4-AXIS PAYLOAD

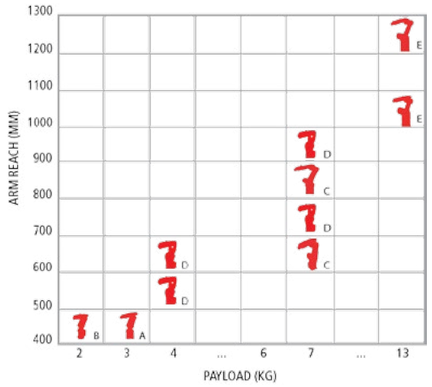
5 kg | 10 kg - 20 kg

DENSO 6-AXIS ROBOTS

The DENSO range of 6-axis robots includes the **VP** Series, the **VP-G2** Series, the **New VS** Series, the **VS** Series and the **VM** Series.

These robots provide greater flexibility and improved performance over their 4-axis counterparts. Because of their increased scale of movement, they are suited to handle a far wider range of applications without compromising neither speed nor precision.

Our 6-axis robots provide you a large choice of payloads and arm reaches:



Mounting Options*

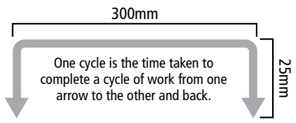
*Wall mounted: only new VS

A: VP Series, B: VP-G2 Series, C: VS Series, D: New VS Series, E: VM Series

DENSO 6-axis robots deliver the following industry leading specifications:

Main Features

- Fastest possible cycle time up to 0.33 s
- Repeatability from ±0.02 mm
- Maximum composite speed up to 11,000 mm/s
- Arm lengths up to 1298 mm
- Payloads up to 13 kg
- All models include internal wiring (the new VS Series up to the end of flange as option) and air piping for maximum efficiency in restricted spaces



Options

- Standard
- Dust & splash proof (IP65/54)
- Protected (IP67)
- Cleanroom classes ISO 3 and ISO 5
- Cleanroom (ISO 5) + H_2O_2 and Cleanroom (ISO 5) + H_2O_2 / UV resistant
- UL specifications (for the USA and Canada)

DENSO 6-axis robots are the ultimate solution for the following:

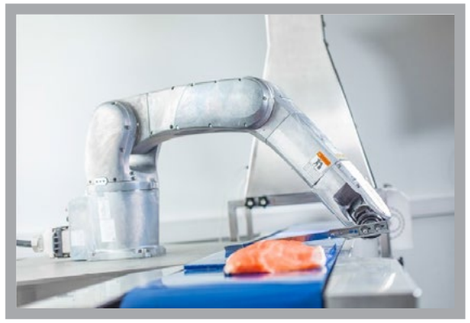
Applications

- Assembly
- Inspection
- Matching
- Material handling
- Material tending
- Packaging
- Palletizing
- Customised applications

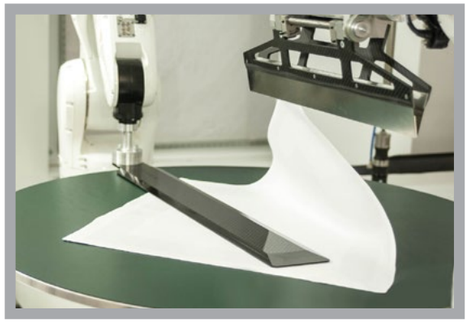
Used in a wide array of industries...

Automotive

Pharmaceutical and medical



Food



Gastronomy

VP Series

The most compact of all our 6-axis robots is perfect for installations where operational space is very limited and payloads up to 3 kg are needed

	PAYLOAD (KG)	ARM REACH (MM)
VP-5243	3	430
VP-6242	2.5	432

- **COMPACT:** the most compact of all our 6-axis robots is perfect for installations where operational space is very limited and payloads of up to 3 kg are needed
- **LIGHT:** robot arms weigh 13 kg and 15 kg
- **OPTIONAL NUMBER OF AXIS:** robot series is available in 5- & 6-axis

VP SERIES

	PAYLOAD	ARM REACH
VP-5243G	3 kg	430 mm
VP-6242G	2.5 kg	432 mm

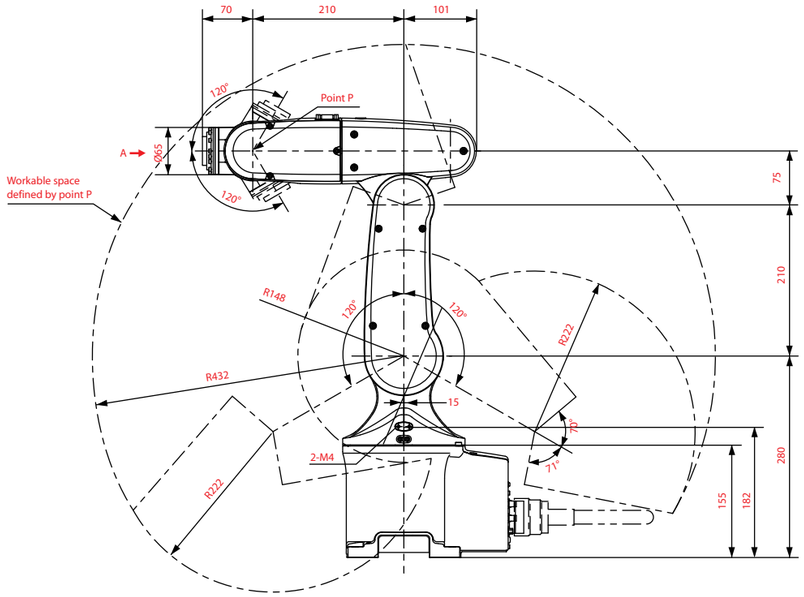
Mounting Options

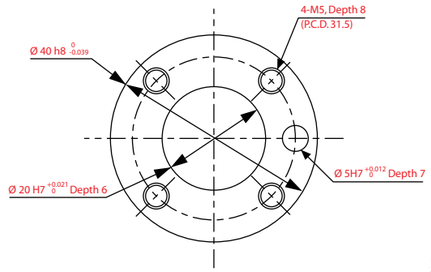
VP-5243G

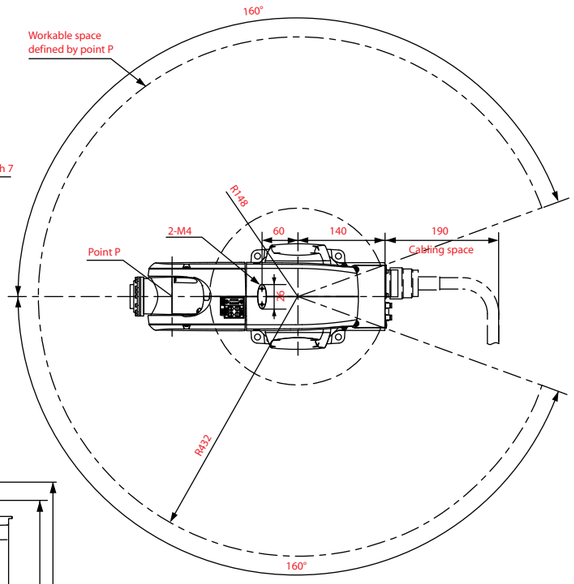
VP-6242G

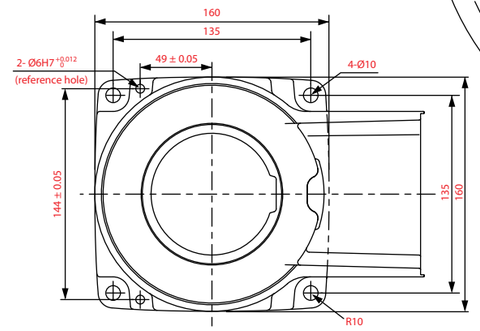
		Unit	VP-5243G	VP-6242G
Number of axis			5	6
Maximum arm area (Point P: Wrist center)		mm	430	432
Payload (1)		kg	3 (wrist direction downward)	2.5 (wrist direction downward)
Maximum composite speed		mm/s	3900 (at the center of an end-effector mounting face)	
Cycle time		s	0.99	0.99
Position repeatability (2)		mm	±0.02 (2)	
Environment resistance	Protection class		IP30	
	Cleanroom class		-	-
UL specification			-	-
Motion range	J1	deg	±160	±160
	J2		±120	±120
	J3		+136, -128	+160, +19
	J4		-	±160
	J5		±120	±120
	J6		±360	±360
Maximum allowable inertia	J4	kgm^2	-	0.03
	J5		0.04	0.03
	J6		0.01	0.007
Signal lines & air piping	Signal lines		9 (for proximity sensor signals, etc.)	
	Air piping		4 systems (φ4x4)	
Brakes			Brakes for all joints	
Mounting configuration			Floor, Ceiling	Floor, Ceiling
Arm weight		kg	Approx. 13	Approx. 15

1. If the payload exceeds 2.5 kg (for VP-5243G) and 2 kg (for VP-6242G), the robot units must be used with the flange facing down at ±45 degrees from vertical. 2. Position repeatability is the value at constant ambient temperature. 3. In every direction.









Unit: mm

Legend

VP - □ 2 □□

- VP: Mini 5- and 6-axis type
- □: Axes: 5: 5-axis; 6: 6-axis
- 2: Standard payload: 2: 2 kg (6-axis) 2.5 kg (5-axis) *The maximum payload is 2.5 kg (6-axis) or 3 kg (5-axis)
- □□: Total arm length: 42: 420 mm; 43: 430 mm

VP-G2 Series

Like the VP-G Series, the VP-G2 Series is ideal for compact applications that require small payloads (up to 2 kg).

	PAYLOAD (KG)	ARM REACH (MM)
VP-6242G2	2	432
VP-6242G2-S1	2	432

- **VP-G2 SERIES:** includes a specialised robot for pharmaceutical and medical applications (VP-G2-S1)
- **PRECISE:** ±0.02 mm
- **OPTIONAL SPECIFICATIONS:** ISO 5 + H_2O_2 resistant and UL specifications (for the USA & Canada)

VP-G2 SERIES

	PAYLOAD	ARM REACH
VP-6242G2	2 kg	432 mm
VP-6242G2-S1	2 kg	432 mm

A tailor-made solution

Like the VP-G Series, the VP-G2 Series is ideal for compact applications that require small payloads (up to 2 kg).

The VP-G2 Series includes a specialised robot for pharmaceutical and medical applications; the VP-G2-S1.
This robot provides anodized aluminium coverings and a protective outer coating, as well as specially sealed joints that protect the robot against corrosion.

The robot model VP-G2-S1 for pharmaceutical and medical applications offers:

- **Hydrogen peroxide-washable surface (wipe):** anodized aluminium coverings and a protective outer coating, as well as specially sealed joints, protect robot against corrosion (6% H_2O_2 concentration)
- **Class ISO 5 cleanroom performance:** designed for cleanrooms and other contamination-control environments
- **Certified by the Fraunhofer IPA**: one of Europe's leading and most respected Research Institutes for Manufacturing Engineering and Automation
- **Ultra compact, space-saving design:** 432 mm reach, yet only a 200 mm dia. footprint
- **Bottom-side cable connection:** removes cables from cleanroom environment, facilitates robot cleaning
- **Low energy consumption:** total capacity of motors less than 300 W
- **ANSI and CE compliance:** allows global deployment. Choose a Safety board / Safety box controller
- **UL specifications** (for the USA and Canada)
- Hygienic design based on Good Manufacturing Practice **(GMP)** and European Hygienic Engineering & Design Group **(EHEDG)**

Low energy consumption

Cleanroom class ISO 5 performance

Hydrogen peroxide-washable surface

Ultra compact, space-saving design

For the pharmaceutical and medical industries, the new VP-G2-S1

VP-G2 SERIES

	PAYLOAD	ARM REACH
VP-6242G2	2 kg	432 mm
VP-6242G2-S1	2 kg	432 mm

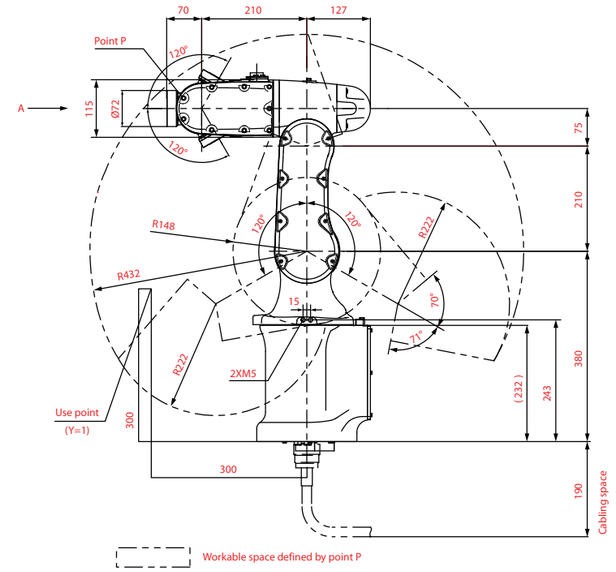
Mounting Options

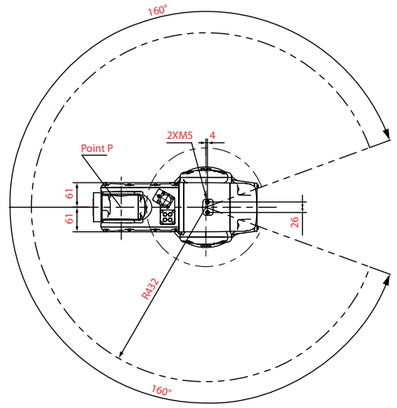
VP-6242G2

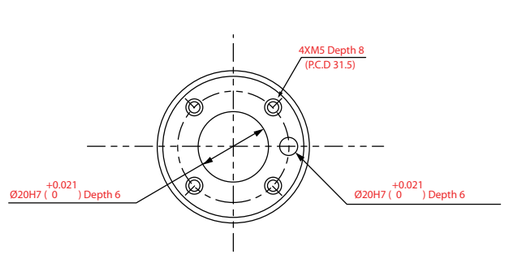
VP-6242G2-S1

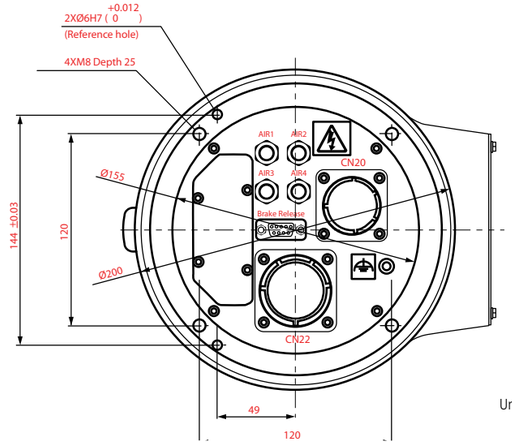
		Unit	VP-6242G2	VP-6242G2-S1
Number of axis			6	6
Maximum arm area (Point P: Wrist center)		mm	432	432
Payload		kg	2	2
Maximum composite speed		mm/s	3900 (at the center of an end-effector mounting face)	
Cycle time		s	0.99	0.99
Position repeatability (1)		mm	±0.02 (2)	
Environment resistance	Protection class		IP40	-
	Cleanroom class		-	Class ISO 5 + 6% hydrogen peroxide (H_2O_2) wipe
UL specification			✔	✔
Motion range	J1	deg	±160	±160
	J2		±120	±120
	J3		+160, +19	+160, +19
	J4		±160	±160
	J5		±120	±120
	J6		±360	±360
Maximum allowable inertia	J4	kgm^2	0.03	0.03
	J5		0.03	0.03
	J6		0.007	0.007
Signal lines & air piping	Signal lines		16 (for proximity sensor signals, etc.)	
	Air piping		4 systems (φ4x4)	
Brakes			Brakes for all joints	
Mounting configuration			Floor	Floor
Arm weight		kg	Approx. 24	Approx. 25

1. Position repeatability is the value at constant ambient temperature. 2. In every direction.







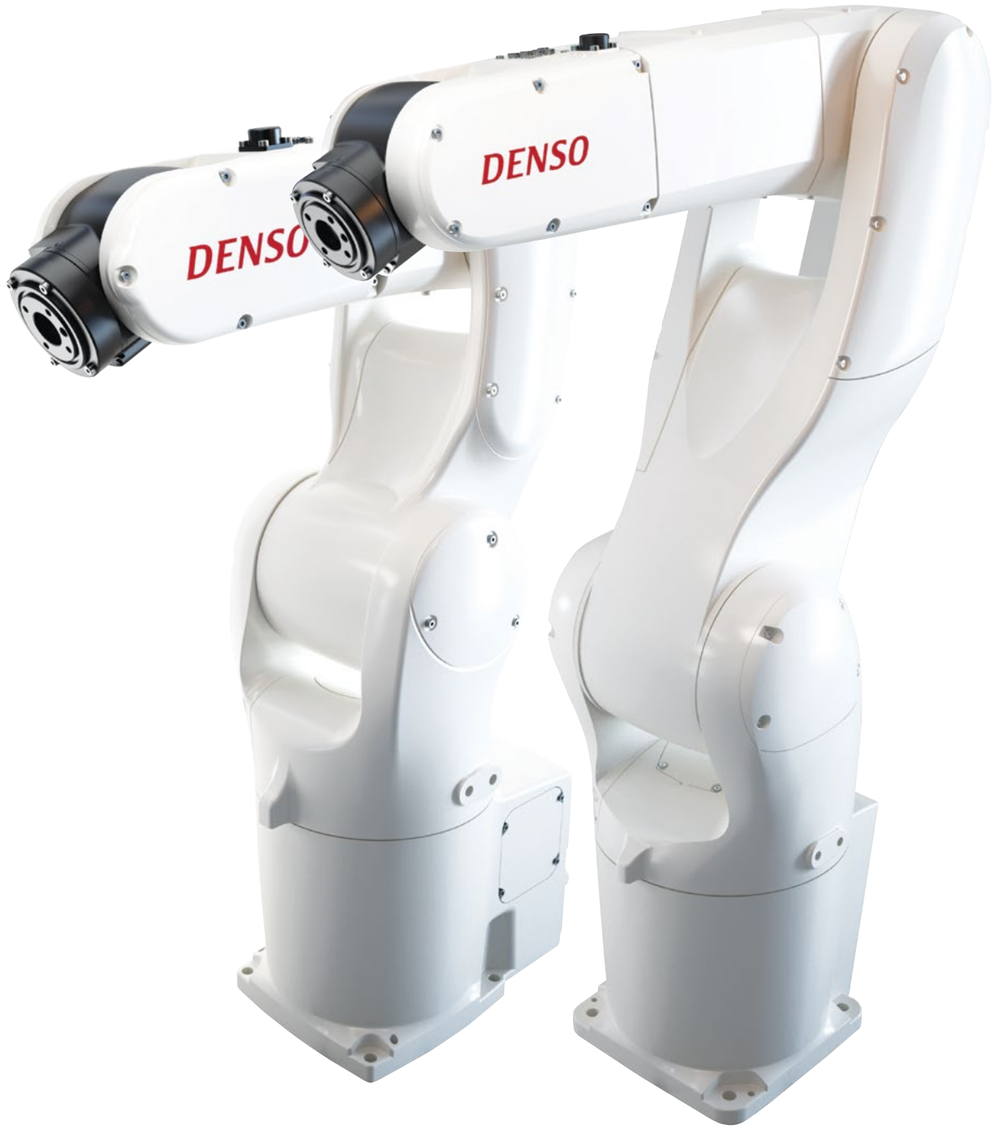


Unit: mm

Legend

VP - 6 2 42 G2 - □ - □

- Mini 5- and 6-axis type
- Axes: 6: 6-axis
- Maximum payload: 2: 2 kg
- Total arm length: 42: 420 mm
- Series name: G2: G2 series
- Options: None: Standard type; S1: H_2O_2-resistant
- Compliant standard: None; UL: UL standard



The New VS Series

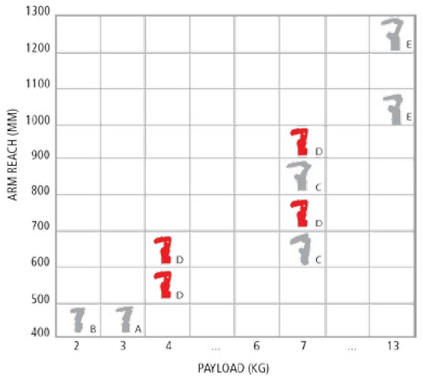
The new VS Series is the fastest of all our 6-axis robots and features a unique patented internal wiring up to the end of the robot arm (6th axis)

	PAYLOAD (KG)	ARM REACH (MM)
VS-050	4	505
VS-060	4	605
VS-068	7	710
VS-087	7	905

- **FAST:** up to 11,000 mm/s
- **PRECISE:** from ±0.02 mm
- **FLEXIBLE:** install them on floors, ceilings or walls
- **OPTIONAL SPECIFICATIONS:** robots are available as Standard (IP40), Dust & splash proof (IP65/54), Protected (IP67), Cleanroom classes ISO 3 and 5, H_2O_2 resistant and H_2O_2 + UV resistant

KEY FEATURES

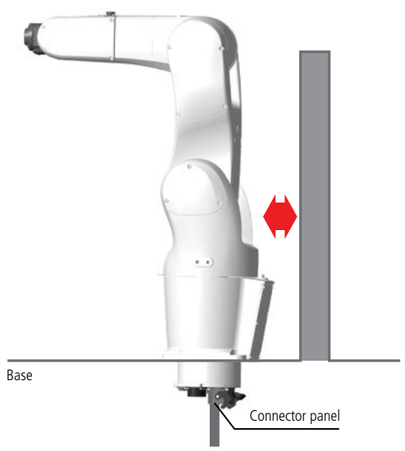
4 arm lengths available. Payloads up to 7 kg

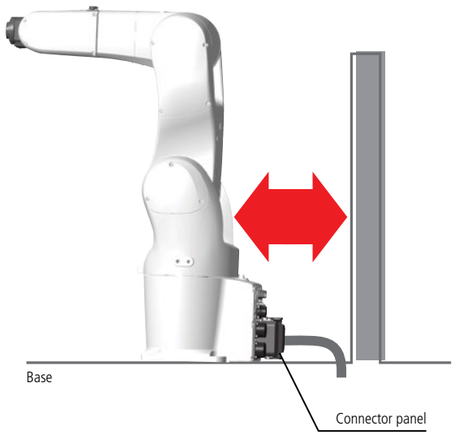


Mounting Options

A: VP Series, B: VP-G2 Series, C: VS Series, D: New VS Series, E: VM Series

Efficient use of dead space





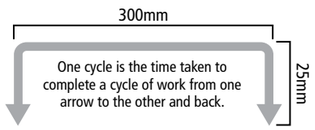
Fast motion for improved productivity

■ Pick & place / maximum composite speed:

	VS-050	VS-068
Pick & place time [s] at 1 kg (measurement)	0.37	0.33
Maximum composite speed [mm/s]	9000	11,000

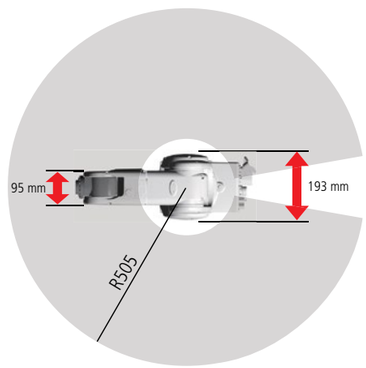
Pick & Place time

Time required for a robot to lift an object to a height of 2.5 cm and move back and forth between two locations 30 cm apart.

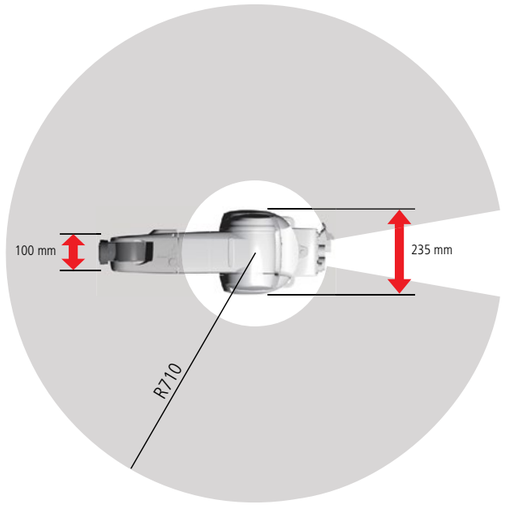


Can be integrated into compact equipment

■ Arm width/wrist width/motion area



VS-050



VS-068

The New VS 050/060

The most compact robots of the new VS Series. Perfect for installations where operational space is limited

	PAYLOAD (KG)	ARM REACH (MM)
VS-050	4	505
VS-060	4	605

- **COMPACT:** slim and compact design allows you to save on installation space
- **FAST:** up to 9000 mm/s
- **PRECISE:** from ±0.02 mm
- **OPTIONAL SPECIFICATIONS:** robots are available as Standard (IP40), Dust & splash proof (IP65/54), Protected (IP67), Cleanroom classes ISO 3 and 5, and H_2O_2 + UV resistant (only VS-050*)
- **BOTTOM-SIDE CABLE CONNECTION:** this optional feature facilitates robot cleaning and saves space

* For more information about this robot see page 47

NEW VS SERIES

	PAYLOAD	ARM REACH
NEW VS-050	4 kg	505 mm
NEW VS-060	4 kg	605 mm

Mounting Options

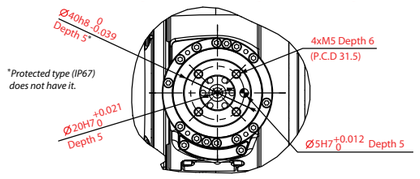
VS-050

VS-060

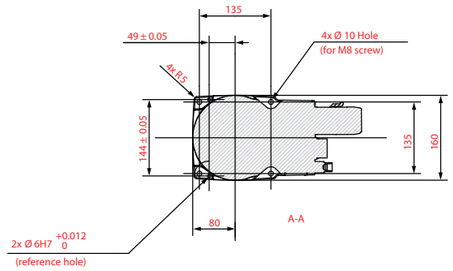
		Unit	VS-050	VS-060
Number of axis			6	6
Maximum arm area (Point P: Wrist center)		mm	505	605
Payload		kg	4	4
Maximum composite speed		mm/s	9000	9000
Cycle time		s	0.37 (with 1 kg weight)	0.37 (with 1 kg weight)
Position repeatability (1)		mm	±0.02 (2)	±0.02 (2)
Communication Interface Flange-A [Option]			17 line power wire for cameras, etc. (3)	
			LAN (1000BASE-T) x 1 (4)	
Environment resistance	Protection class		IP40, IP65/54 (IP65 only in J4, J5 and J6), IP67 (5)	
	Cleanroom class		Class ISO 5 and 3	
UL specification			-	-
Motion range	J1	deg	±170 (6)	±170 (6)
	J2		±120	±120
	J3		+151, -120	+155, -125
	J4		±270	±270
	J5		±120 (installed Communication Interface Flange-A [Option] +120 -110)	
	J6		±360	±360
Maximum allowable inertia	J4	kgm^2	0.200	0.200
	J5		0.200	0.200
	J6		0.050	0.050
Maximum allowable moment	J4	N·m	6.66	6.66
	J5		6.66	6.66
	J6		3.13	3.13
Signal lines & air piping	Signal lines		10 line (for proximity sensor signals, etc.) (3), (7)	
	Air piping		5 systems (φ4x4, φ4x1) -2 x solenoid valves (2 position, double solenoid)	
Brakes			Brakes for all joints	
Mounting configuration			Floor, Ceiling, Wall	Floor, Ceiling, Wall
Arm weight		kg	29	30

1. Position repeatability is the value at constant ambient temperature. 2. In every direction. 3. Allowable current is limited. 4. LAN cable connected with robot must be shorter than 20 m. 5. Do not operate the robot in water. 6. Limited motion when wall mounted. 7. 4 lines when Communication Interface Flange-A [Option] is installed.

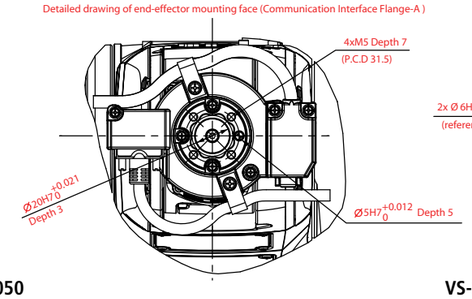
Detailed drawing of end-effector mounting face (Standard Flange)



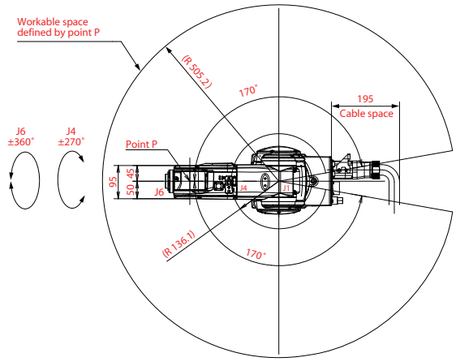
Detailed drawing of base mounting face



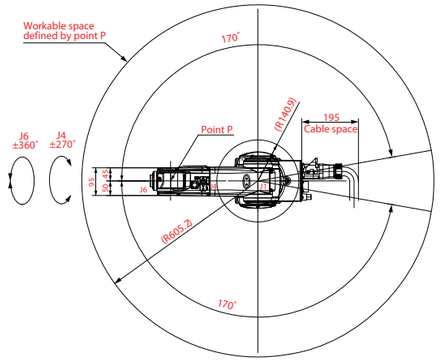
Detailed drawing of end-effector mounting face (Communication Interface Flange-A)

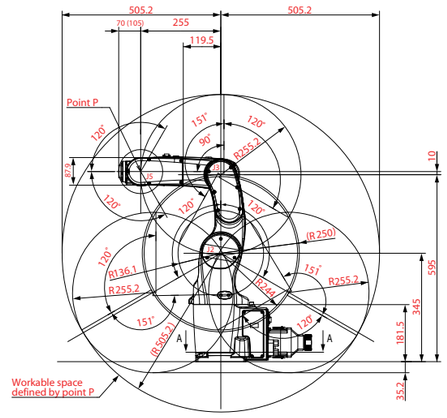


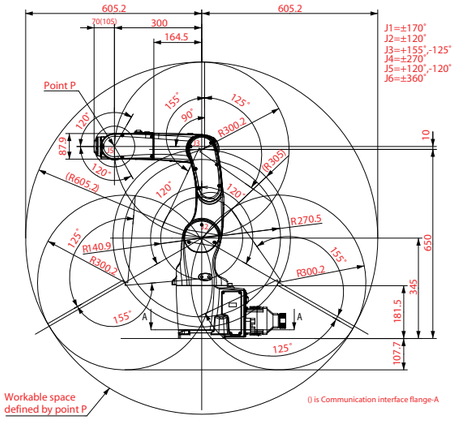
VS-050



VS-060







Unit: mm

Legend

VS □□□ □□ - A V6 - □□ N - □ □ N □ N - □ NNN

- Robot name: VS: DENSO 5- and 6-axis robots
- Total arm length: 050 A1: 505 mm RC7M supported; 060 A1: 605 mm RC7M supported; 050 A3: 505 mm RC8 supported; 060 A3: 605 mm RC8 supported
- Mounting orientation: A: All directions
- Axes: V6: 6-axis
- Protected: NN: Standard type; W7: Protected type (IP67); W4: Dust & splash proof type (wrist: IP65, unit: IP54); C3: Cleanroom type (ISO class 3); C5: Cleanroom type (ISO class 5)
- Flange: N: Standard flange; A: Communication interface flange-A (*1)
- Connector panel: N: Rear connector panel; A: Bottom connector panel
- Signal lines / Air pipe solenoid valve: A: 2 x solenoid valves (2 position, double solenoid); N: Specification without signal lines / air pipe solenoid valve
- Paint / Surface finish: N: DENSO standard colors (*2); A: Unpainted (*3)

*1: Standard flange specification only when protected type (IP67) is selected *2: When standard type is selected *3: When protected type (IP67) is selected (DENSO standard colors are a special specification (option).) For details, please contact our sales representative.

The New VS 068/087

The fastest of all our 6-axis robots with speed of up to 11,000 mm/s. Perfect for applications that require high speed and longer arm reach (up to 905 mm)

	PAYLOAD (KG)	ARM REACH (MM)
VS-068	7	710
VS-087	7	905

- **FAST:** fastest possible cycle time of 0.33 s
- **PRECISE:** from ±0.02 mm
- **OPTIONAL SPECIFICATIONS:** robots are available as Standard (IP40), Dust & splash proof (IP65/54), Protected (IP67), Cleanroom classes ISO 3 and 5, and H_2O_2 + UV resistant (only VS-087*)

* For more information about this robot see page 47

NEW VS SERIES

	PAYLOAD	ARM REACH
NEW VS-068	7 kg	710 mm
NEW VS-087	7 kg	905 mm

Mounting Options

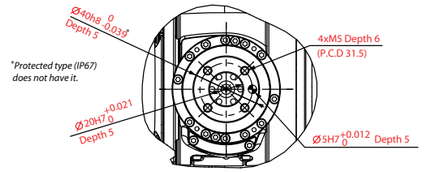
VS-068

VS-087

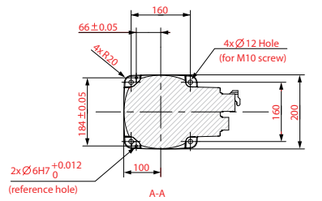
		Unit	VS-068	VS-087
Number of axis			6	6
Maximum arm area (Point P: Wrist center)		mm	710	905
Payload		kg	7	7
Maximum composite speed		mm/s	11,000	11,000
Cycle time		s	0.33 (with 1 kg weight)	0.36 (with 1 kg weight)
Position repeatability (1)		mm	±0.02 (2)	±0.03 (2)
Communication Interface Flange-A [Option]			17 line power wire for cameras, etc. (3)	
			LAN (1000BASE-T) x 1 (4)	
Environment resistance	Protection class		IP40, IP65/54 (IP65 only in J4, J5 and J6), IP67 (5)	
	Cleanroom class		Class ISO 5 and 3	
UL specification			-	-
Motion range	J1	deg	±170 (6)	±170 (6)
	J2		+135, -100	+135, -100
	J3		+153, -120	+153, -136
	J4		±270	±270
	J5		±120	±120
	J6		±360	±360
Maximum allowable inertia	J4	kgm^2	0.450	0.450
	J5		0.450	0.450
	J6		0.100	0.100
Maximum allowable moment	J4	N·m	16.2	16.2
	J5		16.2	16.2
	J6		6.86	6.86
Signal Line & Air Piping	Signal Line		10 line (for proximity sensor signals, etc.) (3), (7)	
	Air Piping		7 systems (φ4x6, φ6x1) -3 x solenoid valves (2 position, double solenoid) -3 x solenoid valves (3 position, Exhaust Center) -3 x solenoid valves (3 position, Closed Center)	
Brakes			Brakes for all joints	
Mounting configuration			Floor, Ceiling, Wall	Floor, Ceiling, Wall
Arm weight		kg	49	51

1. Position repeatability is the value at constant ambient temperature. 2. In every direction. 3. Allowable current is limited. 4. LAN cable connected with robot must be shorter than 20 m. 5. Do not operate the robot in water. 6. Limited motion when wall mounted. 7. 4 lines when Communication Interface Flange-A [Option] is installed.

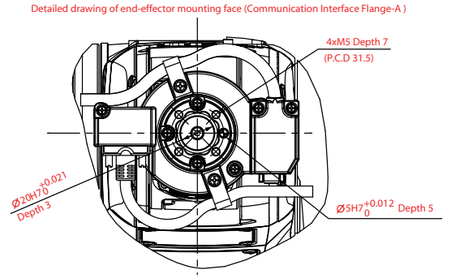
Detailed drawing of end-effector mounting face (Standard Flange)



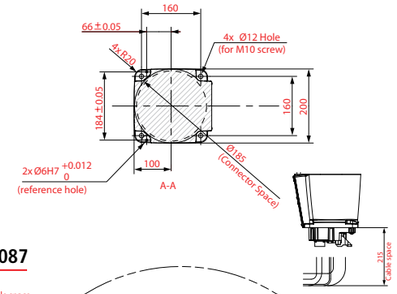
Detailed drawing of base mounting face(Rear Connector Panel)



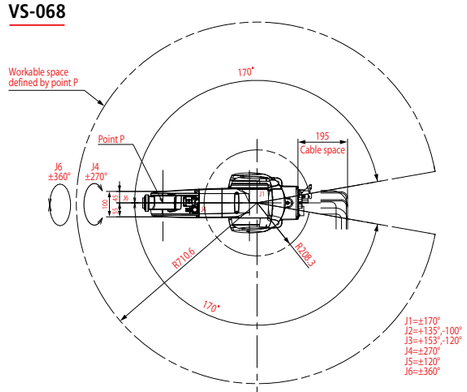
Detailed drawing of end-effector mounting face (Communication Interface Flange-A)

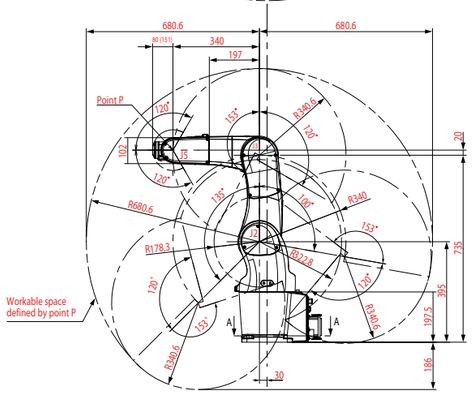


Detailed drawing of base mounting face(Bottom Connector Panel)

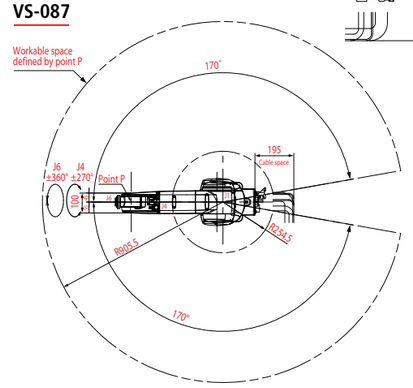


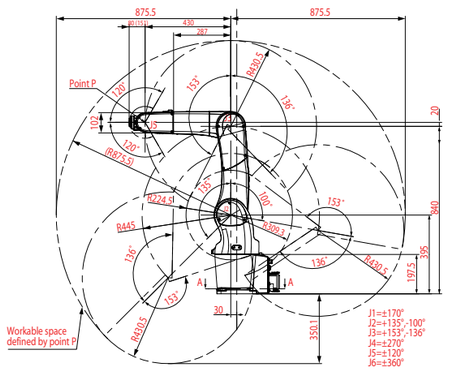
VS-068





VS-087





() is Communication interface flange-A

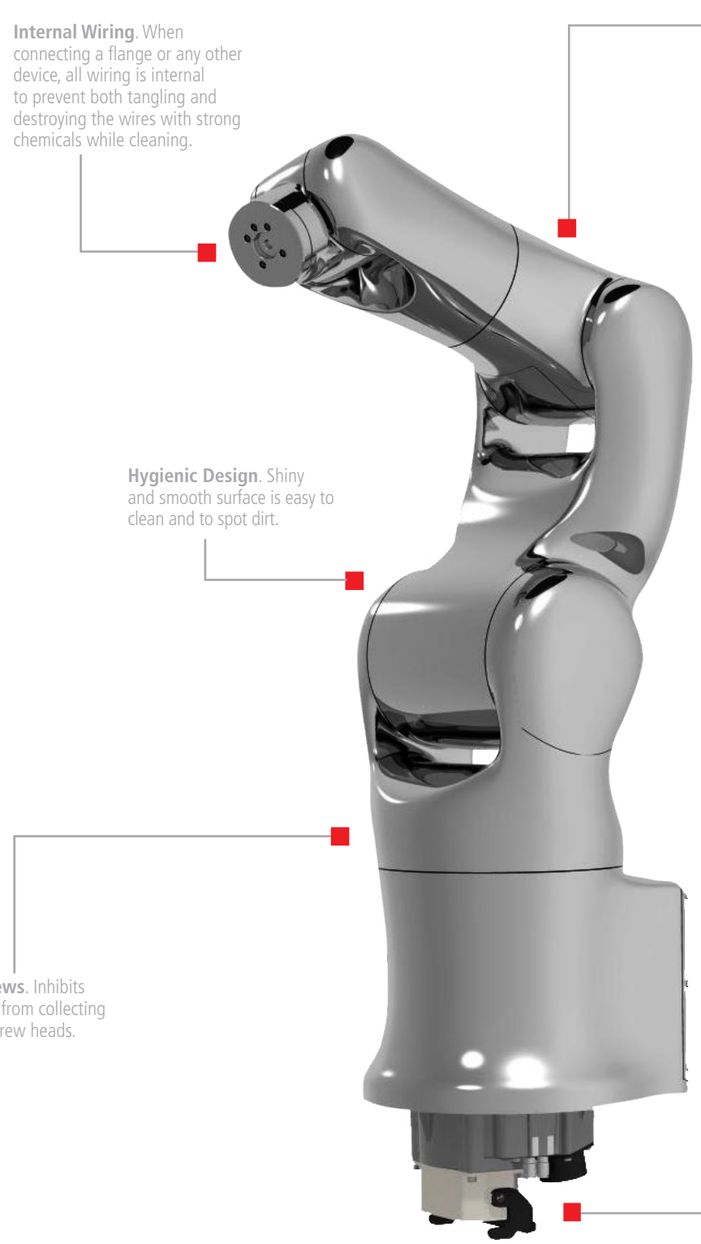
Unit: mm

Legend

VS □□□ □□ - A V6 - □□ N - □ □ N □ N - □ NNN

- Robot name: VS: DENSO 5- and 6-axis robots
- Total arm length: 068 A2: 680 mm RC7M supported; 087 A2: 875 mm RC7M supported; 068 A4: 680 mm RC8 supported; 087 A4: 875 mm RC8 supported
- Mounting orientation: A: All directions
- Axes: V6: 6-axis
- Protected: NN: Standard type; W7: Protected type (IP67); W4: Dust & splash proof type (wrist: IP65, unit: IP54); C3: Cleanroom type (ISO class 3); C5: Cleanroom type (ISO class 5)
- Connector panel: N: Rear connector panel; A: Bottom connector panel
- Flange: N: Standard flange; A: Communication interface flange-A (*1)
- Signal lines / Air pipe solenoid valve: B: 3 x solenoid valves (2 position, double solenoid); C: 3 x solenoid valves (3 position, exhaust center solenoid); D: 3 x solenoid valves (3 position, closed center solenoid); N: Specification without signal lines / air pipe solenoid valve
- Paint / Surface finish: N: DENSO standard colors (*2); A: Unpainted (*3)

*1: Standard flange specification only when protected type (IP67) is selected *2: When standard type is selected *3: When protected type (IP67) is selected (DENSO standard colors are a special specification (option).) For details, please contact our sales representative.



New VS H_2O_2 / UV Series

The DENSO 6-axis New VS H_2O_2 / UV Series offers a sleek and futuristic design that is suitable specifically for a cleanroom environment. All while preserving DENSO's fast, precise, compact and now highly resistant image.

	PAYLOAD (KG)	ARM REACH (MM)
VS-050-S2	4	520

- **CLEAN:** ideal for sterile work environments (Cleanroom class ISO 5 and H1 grease inside)
- **RESISTANT:** against strong sterilization chemicals such as H_2O_2 spray and Ultra Violet light
- **COMPLIANT:** with sanitary standards such as IPA and UL

Mounting Options

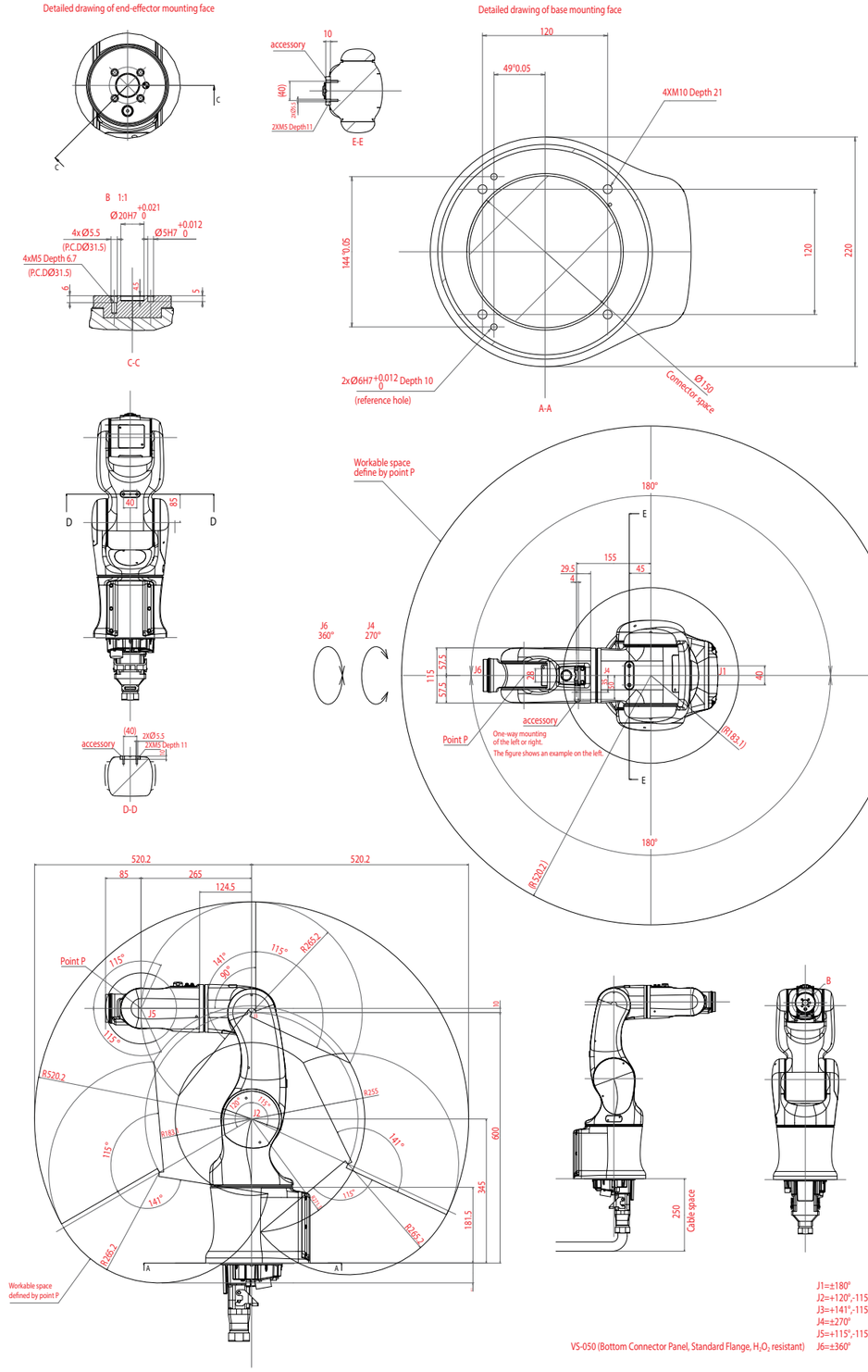
VS-050-S2

		Unit	VS-050-S2
Number of axis			6
Max. arm reach (Point P: wrist center)		mm	520
Overall arm length (first arm + second arm)		mm	520 (255 + 265)
Payload		kg	4
Maximum composite speed (at the center of an end-effector mounting face)		mm/sec	8573
Cycle time (1)		sec	0.35
Position repeatability (at the center of an end-effector mounting face) (2)		mm	±0.02
Communication Interface Flange-A (Option)			25 (17 + 8) lines (3)
Environment resistance	Hydrogen peroxide		Vaporized Hydrogen Peroxide Hydrogen Peroxide 35% water
	Protection class		IP65 (IP67 for the wrist part)
	Cleanroom class		ISO 5
Motion range	J1	deg	±180 (4)
	J2		120, -115
	J3		141, -115
	J4		±270
	J5		±115 (5)
	J6		±360
Maximum allowable inertia	J4. J5	kgm^2	0.2
	J6		0.05
Maximum allowable moment	J4. J5	Nm	6.66
	J6		3.13
Signal lines & air piping (Option)	Signal line		10 lines (3,6)
	Air piping		2 x solenoid valves (2 positions, double solenoids)
Air source	Operating pressure	Mpa	0.20~0.39
	Maximum allowable pressure		0.49
Airborne noise (A-weighted equivalent continuous sound pressure level)		dB	(65 or less)
Drive motor and brake			AC servomotors for all joints, brakes for all joints
Position detection			Absolute encoder
Arm weight		kg	Approx. 34

1. Time required for a robot to lift an object to a height of 25 mm and move back and forth between two locations 300 mm apart.
2. Position repeatability is the value at constant ambient temperature.
3. Limited motion when wall mounted.
4. When electric gripper interface Flange-A is additionally selected, J5 moves between angles +110 and -105 degrees.
5. When electric gripper interface Flange-A is additionally selected, the number of signal lines will be reduced to 4.

Note: All the information contained here is for reference purposes only. Information in this document is subject to change without previous notice. Please get in contact with us for further information.

VS-050-S2*



Unit: mm

*To get the technical drawings of this robot with communication flange, please get in contact with us.

THE NEW VS SERIES

OPTIONS

■ Flange

Flange has connectors for electrical signals and Ethernet, allowing wiring to be embedded in the robot unit. Use them to connect a motorized hand, camera, etc. Embedded internally up to end-of-arm flange, wires are prevented from becoming entangled and broken

No cables tangling around

■ Connector panel

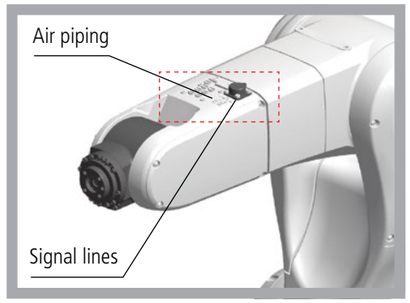
Choose from two mounting orientations when connecting cables (robot-to-controller cable, etc.) to the robot for increased flexibility accommodating user's robot installation conditions

Rear connector panel

Bottom connector panel

■ Signal lines & air piping

Signal lines and air pipe solenoid valves are embedded in the top area of the second arm. Three varieties are available for VS-068 / 087 and one for VS-050 / 060



■ Paint / surface finish

Where Protected type (IP67) is selected, the unit is left as unpainted aluminum. Protected type (IP67) plus standard coloring is available as (optional) extra specification. Contact us for further information

DENSO standard colors

Unpainted

■ Air purge unit

The Protected type (IP67) maintains an IP67 protection level by air pressure produced inside the robot

■ External battery extension unit

Encoder backup battery installed outside the robot facilitates replacement of batteries and improves maintainability

■ Brake release unit

A switch that allows you to release the brake of each axis (wiring of this switch is directly connected to the brake release signal of each axis)

■ Second arm cover (with tapped holes)

This cover has tapped holes to secure wires for the robot's second arm

Category	Part name	VS-050 / 060					VS-068 / 087				
		Standard type (IP40)	Dust and splash proof type (IP65/54)	Protected type (IP67)	Cleanroom Class ISO 3	Cleanroom Class ISO 5	Standard type (IP40)	Dust and splash proof type (IP65/54)	Protected type (IP67)	Cleanroom Class ISO 3	Cleanroom Class ISO 5
Connector Panel	Rear connector panel	4	4	4	4	4	4	4	4	4	4
	Bottom connector panel	4	4	4	4	4	4	4	4	4	4
Flange	Standard flange	4	4	4	4	4	4	4	4	4	4
	Communication interface flange-A	4	-	-	-	-	4	-	-	-	-
Signal lines	2 x solenoid valves (2 position, double solenoid)	4	4	4	4	4	-	-	-	-	-
	3 x solenoid valves (2 position, double solenoid)	-	-	-	-	-	4	4	4	4	4
	3 x solenoid valves (3 position, exhaust center solenoid)	-	-	-	-	-	4	4	4	4	4
	3 x solenoid valves (3 position, closed center solenoid)	-	-	-	-	-	4	4	4	4	4
Paint / surface finish	DENSO standard colors	4	4	*1	4	4	4	4	*1	4	4
	Unpainted	-	-	4	-	-	-	-	4	-	-
External battery extension unit		4	4	4	4	4	4	4	4	4	4
Brake release unit		4	4	4	4	4	4	4	4	4	4
Air purge unit		-	-	4	-	-	-	-	4	-	-
Second arm cover R (with tapped holes)		4	-	-	-	-	4	-	-	-	-

*1. Extra specification (optional). Contact us for further information.

VS Series

The DENSO 6-axis VS Series are a simpler version of the new VS Series. If your application requires more basic features, the VS Series robots are an excellent solution

	PAYLOAD (KG)	ARM REACH (MM)
VS-6556G-B	7	653
VS-6577G-B	7	854

PREDECESOR OF THE NEW VS SERIES

OPTIONAL SPECIFICATIONS: robots are available as Standard (IP40), Dust & splash proof (IP65/54), Cleanroom classes ISO 3 and UL specifications (for the USA and Canada)

VS SERIES

	PAYLOAD	ARM REACH
VS-6556G-B	7 kg	653 mm
VS-6577G-B	7 kg	854 mm

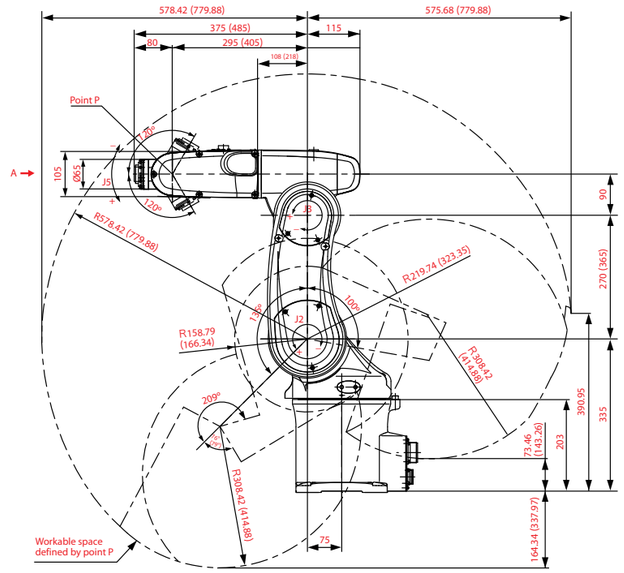
VS-6556G-B

VS-6577G-B

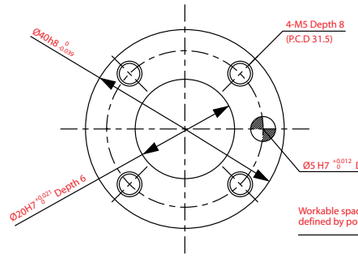
Mounting Options

		Unit	VS-6556G-B	VS-6577G-B
Number of axis			6	6
Maximum arm area (Point P: Wrist center)		mm	653	854
Payload (1)		kg	7	7
Maximum composite speed		mm/s	8200 (at the center of an end-effector mounting face)	7600 (at the center of an end-effector mounting face)
Cycle time		s	0.49 (with 1 kg weight)	0.59 (with 1 kg weight)
Position repeatability (2)		mm	±0.02 (3)	±0.03 (3)
Environment resistance	Protection class		IP40, IP65/54 (IP65 only in J4, J5 and J6)	
	Cleanroom class		Class ISO 5 & 3	
UL specification (4)			✔	✔
Motion range	J1	deg	±170	±170
	J2		+135, -100	+135, -100
	J3		+166, -119	+169, -119
	J4		±190	±190
	J5		±120	±120
	J6		±360	±360
Maximum allowable inertia	J4	kgm^2	0.413	0.413
	J5		0.063	0.063
	J6		0.063	0.063
Signal lines & air piping	Signal lines		10 (for proximity sensor signals, etc.)	
	Air piping		Standard and Dust & Splash-proof: 7 systems (φ4x6, φ6x1), 3 solenoid valves (2-position, double solenoid), Clean: 6 systems (φ4x6), 3 solenoid valves (2-position, double solenoid)	
Brakes			Brakes for joints J2 to J6	
Mounting configuration			Floor, Ceiling	Floor, Ceiling
Arm weight		kg	Approx. 35	Approx. 36

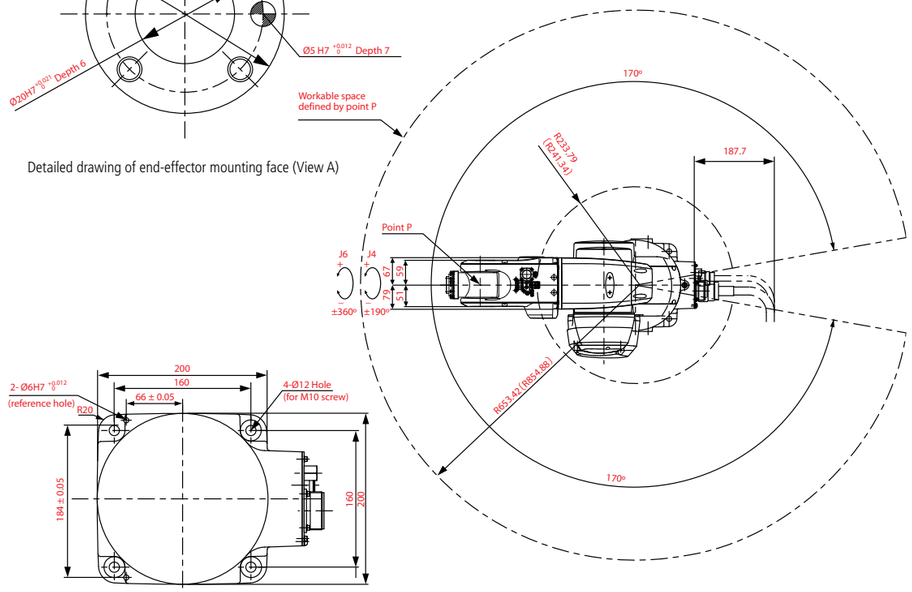
1. If the payload exceeds 6 kg, the robot unit must be used with the flange facing down at ±45 degrees from vertical. 2. Position repeatability is the value at constant ambient temperature. 3. In every direction. 4. Only for Dust & Splash-proof model with brakes.



() is VS-6577



Detailed drawing of end-effector mounting face (View A)



Detailed drawing of base mounting face (Top view)

Unit: mm

Legend

VS - 6 5 □□ - □

- Small 5- and 6-axis type
- Axes: 6: 6-axis
- Standard payload: 5: 6 kg *Maximum payload is 7 kg
- Total arm length: 56: 565 mm 77: 770 mm
- Options: None: Standard type; B: With brake; W: Dust & splash proof type (wrist: IP65, unit: IP54); BW: With brake/dust & splash proof type; P: Cleanroom type (class 10/100); BP: With brake/cleanroom type; UL: UL specifications

VM Series

If you require payloads higher than 7 kg (and up to 13 kg) and arm reach of up to approx. 1.3 m, the VM Series is the ideal robot series for you. These are the biggest 6-axis robots we offer

	PAYLOAD (KG)	ARM REACH (MM)
VM-6083G	13	1021
VM-60B1G	13	1298

- **LONGEST ARM REACH** of all 6-axis robots
- **LARGEST PAYLOADS** at high speed
- **OPTIONAL SPECIFICATIONS:** Dust & splash proof (IP65/54) and Cleanroom class ISO 5

VM SERIES

	PAYLOAD	ARM REACH
VM-6083G	13 kg	1021 mm
VM-60B1G	13 kg	1298 mm

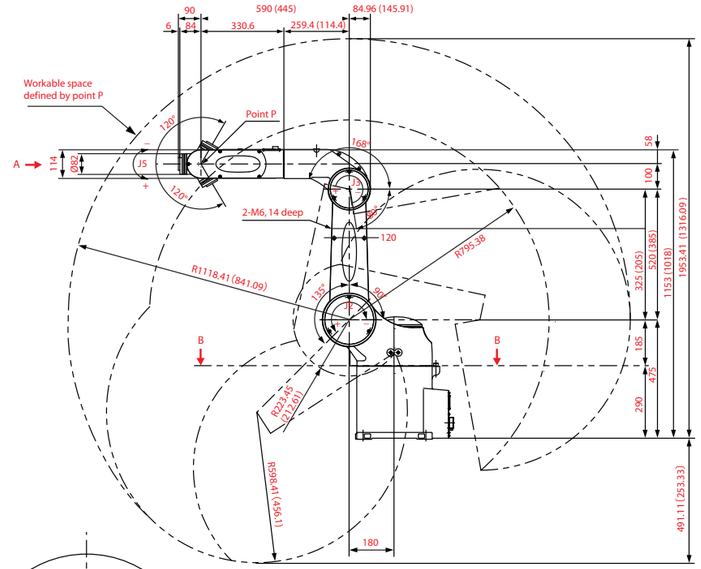
Mounting Options

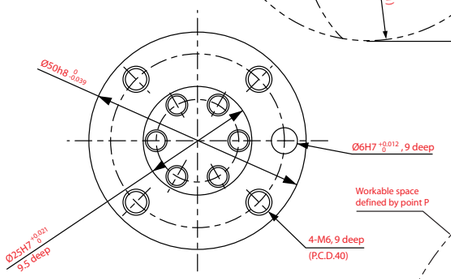
VM-6083G

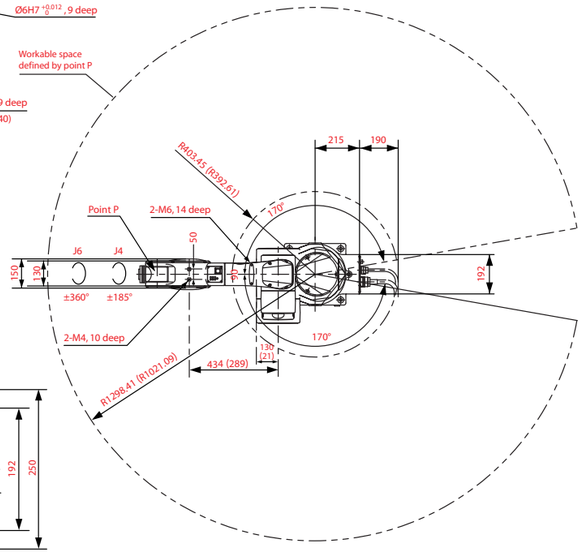
VM-60B1G

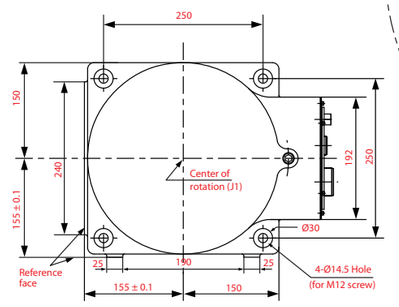
		Unit	VM-6083G	VM-60B1G
Number of axis			6	6
Maximum arm area (Point P: Wrist center)		mm	1021	1298
Payload		kg	13	13
Maximum composite speed		mm/s	8300	8300
Cycle time		s	0.89 (with 5 kg weight)	0.95 (with 5 kg weight)
Position repeatability (1)		mm	±0.05 (2)	±0.07 (2)
Environment resistance	Protection class		IP40, IP65/54 (IP65 only in J4, J5 and J6)	
	Cleanroom class		Class ISO 5	
UL specification			-	-
Motion range	J1	deg	±170	±170
	J2		+135, -90	+135, -90
	J3		+165, -80	+168, -80
	J4		±185	±185
	J5		±120	±120
	J6		±360	±360
Maximum allowable inertia	J4	kgm^2	0.36	0.36
	J5		0.36	0.36
	J6		0.064	0.064
Signal lines & air piping	Signal lines		10 (for proximity sensor signals, etc.)	
	Air piping		Standard, Dust & Splash-proof: 7 systems (φ4x6 - ϕ6x1), 3 x solenoid valves (2 position, double solenoid), Clean: 6 systems (φ4x6), 3 x solenoid valves (2 position, double solenoid)	
Brakes			Brakes for joints J2 to J6	
Mounting configuration			Floor, Ceiling	Floor, Ceiling
Arm weight		kg	Standard: 82, Dust & Splash-proof, Clean: 86	

1. Position repeatability is the value at constant ambient temperature. 2. In every direction.









Unit: mm

Legend

VM - 6 0 □□ - □

- Mid-sized 4-axis robot
- Axes: 6: 6-axis
- Maximum payload: 0: 13 kg
- Total arm length: 83: 830 mm; B1: 1110 mm
- Options: None: Standard type; W: Dust & splash proof type (wrist: IP65, unit: IP54); P: Cleanroom type (class 100)

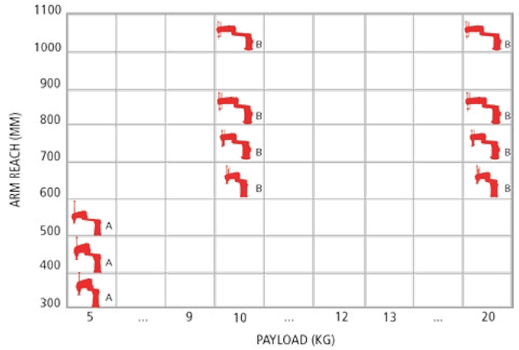
DENSO 4-AXIS ROBOTS

The DENSO range of 4-axis robots includes the **HS** Series and the **HM** Series.

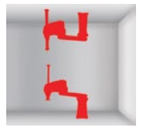
Because of their extremely compact dimensions, light weight and flexibility to be mounted on both floor and ceiling, DENSO SCARA robots are perfectly suited for environments where space is limited.

The circular work envelope of the robots is controlled by movement through 4-axis and, while rigid, the units have increased horizontal flexibility, enhancing the scope of their effectiveness.

Our 4-axis robots provide you a large choice of payloads and arm reaches:



Mounting Options

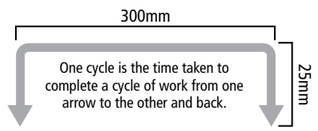


A: HS Series, B: HM Series

DENSO 4-axis robots deliver the following industry leading specifications:

Main Features

- Fastest possible cycle time: 0.29 s
- Repeatability from ±0.015 mm
- Maximum composite speed up to 11,500 mm/s
- Arm lengths up to 1000 mm
- Payloads up to 20 kg
- All models include internal wiring and air piping for maximum efficiency in restricted spaces



To allow operation in virtually any industrial condition, DENSO 4-axis robots are available in the following protection classes:

Options

- Standard
- Dust & splash proof (IP65)
- Cleanroom class ISO 3 (only HS Series)
- UL specifications (for the USA and Canada)
- HS Series available with bellows for the 3rd axis

Also known as SCARA (Selective Compliance Assembly Robot Arm) they are the perfect option for a wide range of purposes.

If you are looking for a high speed, exceptionally precise arm that can handle payloads up to 20 kg then DENSO SCARA robots are the ideal choice for the following:

Applications

- Pick & place
- Assembly
- Packaging
- Dispensing
- Inspection
- Material removal
- Material handling
- Bespoke applications

Used in a wide array of industries...

Automotive

Food

HS Series

The DENSO HS Series of robots is ideal for circumstances where size constraints are a key consideration.

	PAYLOAD (KG)	ARM REACH (MM)
HS-4535*G	5	350
HS-4545*G	5	450
HS-4555*G	5	550

- **EXCEPTIONAL PRECISION:** from ±0.015 mm
- **FAST:** cycle time: 0.35 s
- **OPTIONAL SPECIFICATIONS:** Dust & splash proof (IP65/54) and Cleanroom class ISO 3 and UL specifications (for the USA and Canada)

HS SERIES

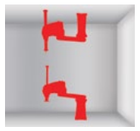
	PAYLOAD	ARM REACH
HS-4535*G	5 kg	350 mm
HS-4545*G	5 kg	450 mm
HS-4555*G	5 kg	550 mm

HS-4535*G

HS-4545*G

HS-4555*G

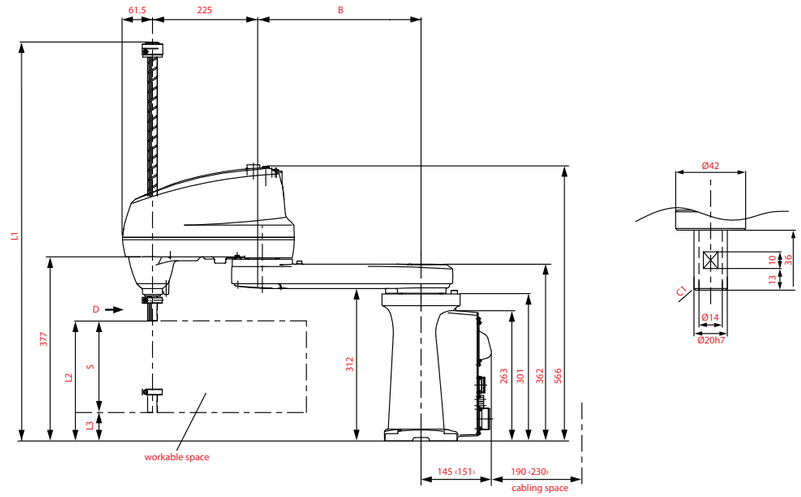
Mounting Options

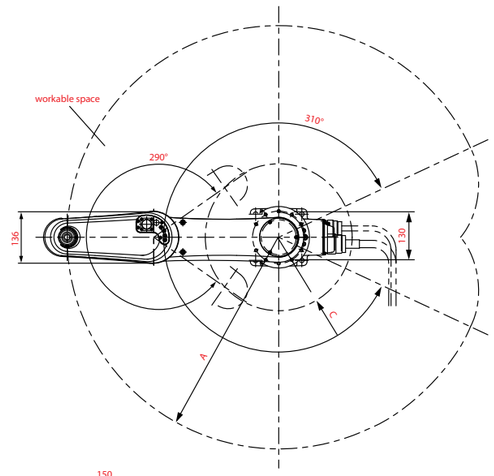


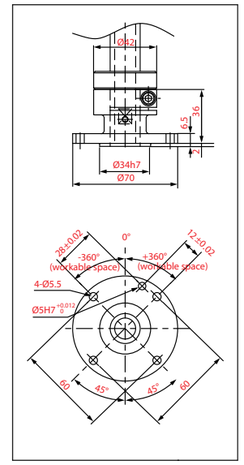
		Unit	HS-4535*G	HS-4545*G	HS-4555*G
Number of axis			4	4	4
Maximum arm reach (Point P: wrist center)		mm	350	450	550
Payload		kg	5	5	5
Maximum composite speed	At the center of the hand mounting flange	mm/s	7200	6300	7100
	Z		2000	2000	2000
	T	deg/s	2400	2400	2400
Cycle time		s	0.35 (with 2 kg weight)	0.35 (with 2 kg weight)	0.35 (with 2 kg weight)
Position repeatability (1)	J1+J2	mm	±0.015	±0.02	±0.02
	Z	mm	±0.01	±0.01	±0.01
	T	deg	±0.05	±0.05	±0.05
Environment resistance	Protection class		IP40, IP65		
	Cleanroom class (2)		Class ISO 3		
UL specification (2)			✔	✔	✔
Motion range	J1	deg	±155	±155 (Ceiling ±152)	±155
	J2		±145	±145 (Ceiling ±141)	±145
	Z	mm	150, 200, 320 (3)	150, 200, 320 (3)	150, 200, 320 (3)
	T	deg	±360	±360	±360
Maximum allowable inertia		kgm^2	0.1 (with 5 kg)	0.1 (with 5 kg)	0.1 (with 5 kg)
Signal lines & air piping	Signal lines		19 (for proximity sensor signals, etc.)		
	Air piping		4 systems (φ4x2, φ6x2)		
Brakes			Brakes for Z axis (3rd axis) and T axis (4th axis)		
Mounting configuration			Floor	Floor, Ceiling	Floor, Ceiling
Arm weight		kg	25	25	25

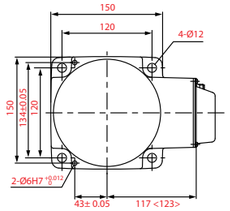
1. Position repeatability is the value at constant ambient temperature. 2. Only for floor-mounted. 3. Z-axis stroke 150 mm is available only for HS. For details, please contact our sales.

Model	A	B	C
HS-4535*G	350	125	143
HS-4545*G	450	225	136
HS-4555*G	550	325	191









Unit: mm

*1 If the Z-axis stroke is 320 mm, the Z axis in the lowermost position may reach below the base mounting face.

S (mm)	Type	L1	L2	L3
*=2:200	Standard	697	246	46
	Dust- & splash-proof	790	206	6
	Cleanroom	798		
*=3:320	Standard	817	246	-74*1
	Dust- & splash-proof	910	206	-114*1
	Cleanroom	918		

Legend

HS □ - 4 5 □□ □ - □

- Small 4-axis type
- Robot type: None: Floor; S: Ceiling
- Axes: 4: 4-axis
- Maximum payload: 5: 5 kg
- Total arm length: 35: 350 mm; 45: 450 mm; 55: 550 mm
- Vertical stroke: 2: 200 mm; 3: 320 mm
- Options: None: Standard type; W: Dust & splash proof type (IP65); P: Cleanroom type (class 10); UL: UL specifications

HM Series

The DENSO HM Series of robots offers a higher payload and higher speed than the HS model range and also features a longer arm reach.

	PAYLOAD (KG)	ARM REACH (MM)
HM-4A60*G	20	600
HM-4A70*G	20	700
HM-4A85*G	20	850
HM-4AA0*G	20	1000

- **PRECISE:** from ±0.02 mm
- **THE FASTEST OF ALL OUR ROBOTS:** speed of up to 11,500 mm/s.
  Fastest possible cycle time: 0.29 s
- **OPTIONAL SPECIFICATIONS:** Dust & splash proof (IP65/54)
  & UL specifications (for the USA and Canada)

HM SERIES

	PAYLOAD	ARM REACH
HM-4A60*G	20 kg	600 mm
HM-4A70*G	20 kg	700 mm
HM-4A85*G	20 kg	850 mm
HM-4AA0*G	20 kg	1000 mm

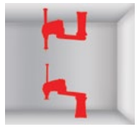
HM-4A60*G

HM-4A70*G

HM-4A85*G

HM-4AA0*G

Mounting Options

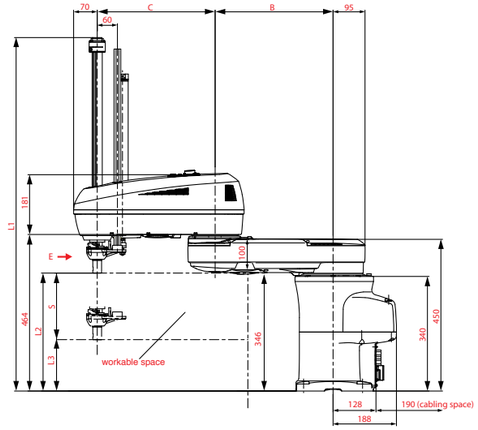


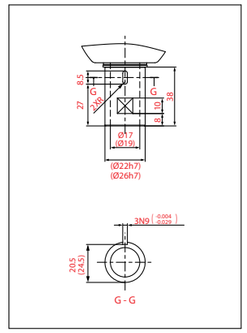
		Unit	HM-4060*G	HM-4A60*G	HM-4070*G	HM-4A70*G	HM-4085*G	HM-4A85*G	HM-40A0*G	HM-4AA0*G
Number of axis			4	4	4	4	4	4	4	4
Maximum arm reach (Point P: wrist center)		mm	600	600	700	850	850	1000	1000	1000
Payload		kg	10	20	10	20	10	20	10	20
Maximum composite speed	At the center of the hand mounting flange	mm/s	8780	8780	9570	9570	11,450	11,450	11,390	11,390
	Z		2760	2760	2760	2760	2760	2760	2760	2760
	T	deg/s	2220	1540	2220	1540	2220	1540	2220	1540
Cycle time		s	0.29 (with 2 kg weight)	0.29 (with 2 kg weight)	0.29 (with 2 kg weight)	0.29 (with 2 kg weight)	0.31(with 2 kg weight)	0.31(with 2 kg weight)	0.31(with 2 kg weight)	0.31(with 2 kg weight)
Position repeatability (1)	J1+J2	mm	±0.02	±0.02	±0.02	±0.02	±0.025	±0.025	±0.025	±0.025
	Z	mm	±0.01	±0.01	±0.01	±0.01	±0.01	±0.01	±0.01	±0.01
	T	deg	±0.05	±0.05	±0.05	±0.05	±0.05	±0.05	±0.05	±0.05
Environment resistance	Protection class		IP40, IP65							
	Cleanroom class		-	-	-	-	-	-	-	-
UL specification (2)			✔	✔	✔	✔	✔	✔	✔	✔
Motion range	J1	deg	±165	±165	±165	±165	±165	±165	±165	±165
	J2		±143 (Dust & Splash-proof type ±140)		±147 (Ceiling ±145, Dust & Splash-proof type ±146, Ceiling Dust & Splash-proof type ±142)		±147 (Ceiling ±142)		±147	
	Z	mm	100, 200, 300, 400 (3)	100, 200, 300, 400 (3)	100, 200, 300, 400 (3)	100, 200, 300, 400 (3)	100, 200, 300, 400 (3)	100, 200, 300, 400 (3)	100, 200, 300, 400 (3)	100, 200, 300, 400 (3)
	T	deg	±360	±360	±360	±360	±360	±360	±360	±360
maximum allowable inertia		kgm^2	0.25 (with 10 kg)	0.45 (with 20 kg)	0.25 (with 10 kg)	0.45 (with 20 kg)	0.25 (with 10 kg)	0.45 (with 20 kg)	0.25 (with 10 kg)	0.45 (with 20 kg)
Signal lines & air piping	Signal lines		24 (for proximity sensor signals, etc.)							
	Air piping		4 systems φ6)							
Brakes			Brake for Z axis (3rd axis)							
Mounting configuration			Floor	Floor	Floor, Ceiling	Floor, Ceiling	Floor, Ceiling	Floor, Ceiling	Floor	Floor
Arm weight		kg	Standard: 53, Ceiling: 54, Dust & Splash-proof: 56							

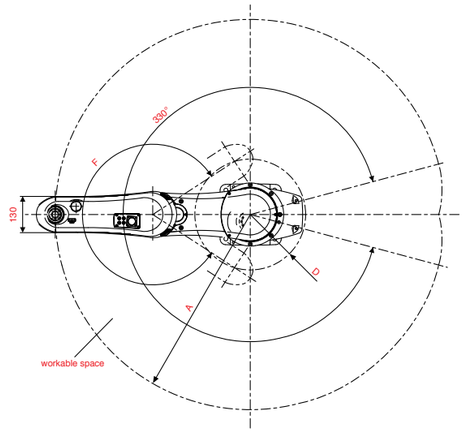
1. Position repeatability is the value at constant ambient temperature. 2. Only for floor-mounted. 3. Z-axis stroke 100 mm is available only for HM (floor-mounted). For details, please contact our sales.

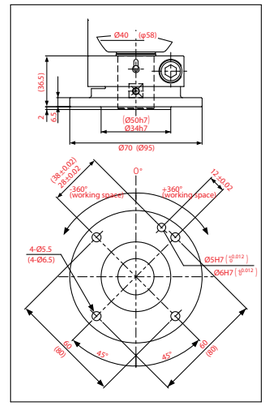
Type	A	B	C	D	F
HM-4060*G, HM-4A60*G	600	250	350	213	286°
HM-4070*G, HM-4A70*G	700	350	350	199	294°
HM-4085*G, HM-4A85*G	850	350	500	281	294°
HM-40A0*G, HM-4AA0*G	1000	500	500	284	294°

Note 1: Values denote dimensions for the 10 kg payload type (HM-40**G), and values enclosed in () denote dimensions for the 20 kg payload type (HM-4A**G).

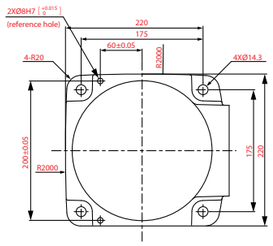








Unit: mm



S	L1		L2	L3
(z axis stroke)	10 kg	20 kg		
100	755	749	350	250
150	805	799	350	200
200	855	849	350	150
300	955	949	350	50
400 (Note 2)	1055	1049	350	-50

Note 2: In the case of the Z axis 400 mm stroke type, the lowermost end of the Z axis may reach a lower position than the base mounting face.

Legend

HM □ - 4 □ □□ □ - □

- HM: Mid-sized 4-axis robot
- Robot type: None: Floor; S: Ceiling
- Axes: 4: 4-axis
- Maximum payload: 0: 10 kg; A: 20 kg
- Total arm length: 60: 600 mm; 70: 700 mm; 85: 850 mm; A0: 1000 mm
- Vertical stroke: 2: 200 mm; 3: 300 mm; 4: 400 mm
- Options: None: Standard type; W: Dust & splash proof type (IP65); UL: UL specifications

XR Series

The DENSO XR Series of robots can be mounted on the ceiling

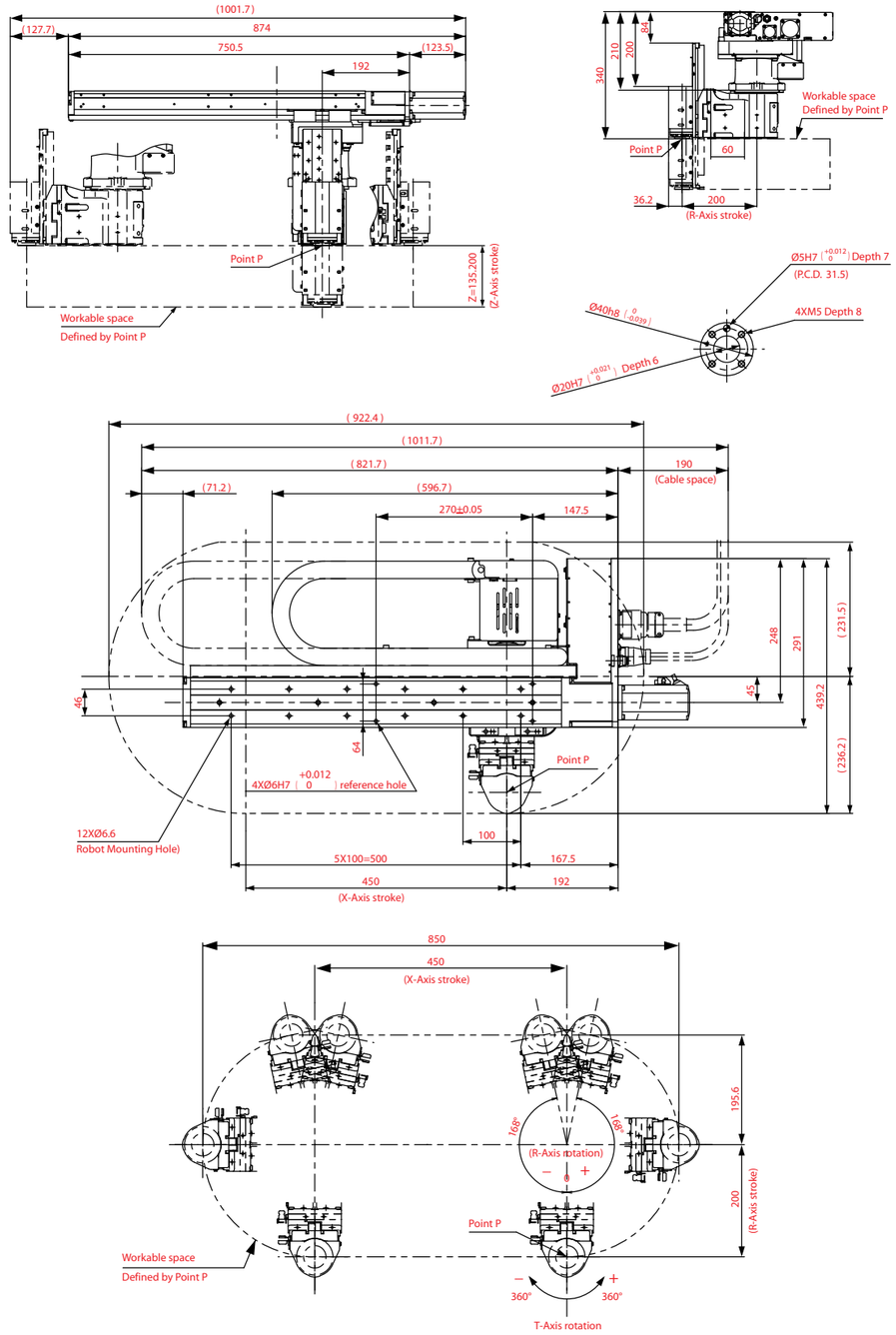
	PAYLOAD (KG)	X-AXIS (MM)	R-AXIS REACH (MM)
XR-4341*G	5	450	200
XR-4371*G	5	760	200
XR-4372*G	5	760	250
XR-4373*G	5	760	300
XR-43A1*G	5	1060	200
XR-43A2*G	5	1060	250
XR-43A3*G	5	1060	300

- **COMPACT:** operation in restricted spaces. Easily fits into low-height restrictions. Compatible with narrow frontage facility with its compact size
- **FASTER THAN CARTESIAN ROBOTS:** with combined movement of coordinated slide (X-axis) and swivel motions (R-axis)
- **WIDE RANGE MOTION AREA:** combined compactness and wide range motion area by original "X-R" structure

XR SERIES

		Unit	XR-4341*G	XR-4371*G	XR-4372*G	XR-4373*G	XR-43A1*G	XR-43A2*G	XR-43A3*G
Number of axis			4	4	4	4	4	4	4
Payload		kg	5	5	5	5	5	5	5
Maximum composite speed	X + R-axis	mm/s	3650	3600	3600	3600	3240	3240	3240
	Z-axis / T-axis	mm/s, deg/s	Z: 1500, T: 720						
Position repeatability (1)	X + R-axis	mm	±0.015	±0.015	±0.015	±0.015	±0.015	±0.015	±0.015
	Z-axis	mm	±0.010	±0.010	±0.010	±0.010	±0.010	±0.010	±0.010
	T-axis	deg	±0.005	±0.005	±0.005	±0.005	±0.005	±0.005	±0.005
Environment resistance	Protection class		IP40						
	Cleanroom class		-	-	-	-	-	-	-
UL specification			-	-	-	-	-	-	-
Motion range	X-axis	mm	450	760	760	760	1060	1060	1060
	R-axis reach	mm	200	200	250	300	200	250	300
	R-axis	deg	±168	±168	±168	±168	±168	±168	±168
	Z-axis	mm	*=1: 135, *=2: 200						
	T-axis	deg	±360	±360	±360	±360	±360	±360	±360
Maximum allowable inertia		kgm^2	0.05						
Signal lines & air piping	Signal lines		10 (for proximity sensor signals, etc.)						
	Air piping		1 system (φ8) (with optional manifold valve: 4 systems (φ4x8))						
Brakes			Brake for Z-axis						
Mounting configuration		Ceiling	Ceiling	Ceiling	Ceiling	Ceiling	Ceiling	Ceiling	Ceiling
Arm weight (2)		kg	33	45	46	47	51	52	53

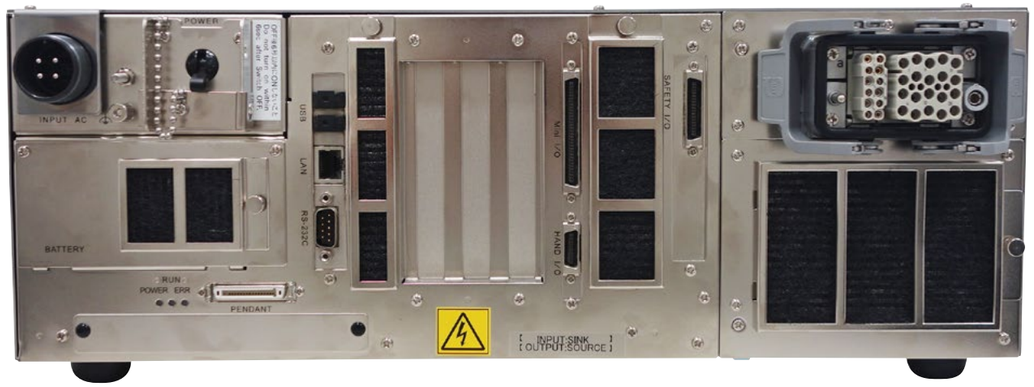
1. Position repeatability is the value at constant ambient temperature. 2. In the case of the heaviest model (Z=200 mm).



Legend

XR - 4 3 □ □ □

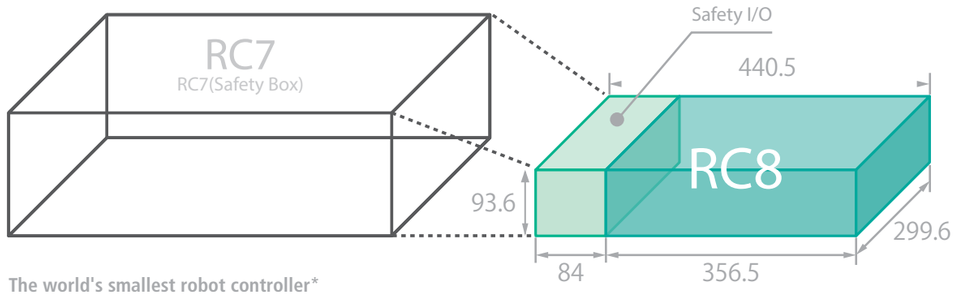
- Built-in type
- Axes: 4: 4-axis
- Maximum payload: 3: 5 kg
- X-axis stroke: 4: 450 mm, 7: 760 mm, A: 1060 mm
- Total arm length: 1: 200 mm, 2: 250 mm, 3: 300 mm
- Z-axis stroke: 1: 135 mm, 2: 200 mm



Robot Controllers

When you purchase a DENSO robot, a robot controller (RC8 or RC7) is included. DENSO robot controllers are characterized as being compact and user-friendly.

RC8	SMALL FOOTPRINT, LIGHTWEIGHT, IMPROVED EASE OF USE
RC7	PREDECESOR OF THE RC8

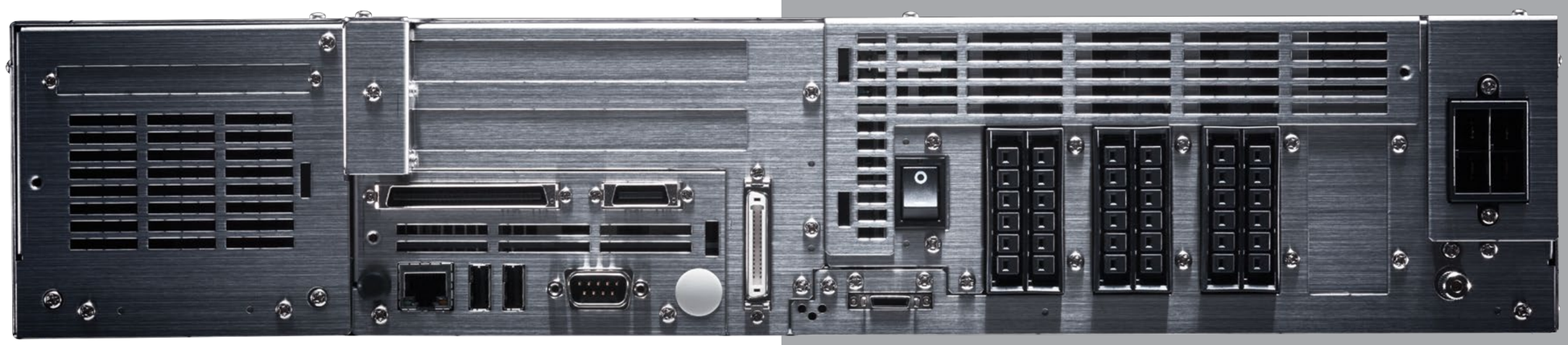


The world's smallest robot controller*

RC8 Controller

Compact size greatly improves freedom of layout: install anywhere

RC8	SMALL FOOTPRINT, LIGHTWEIGHT, IMPROVED EASE OF USE



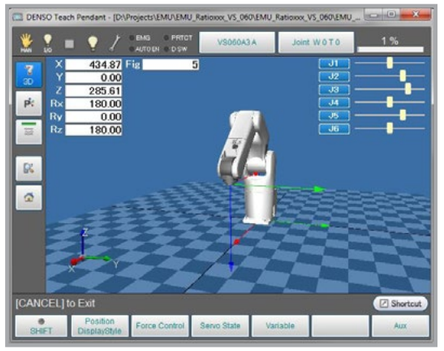
- **SMALL FOOTPRINT:** the size of an A3 paper sheet
- **60% SIZE REDUCTION:** compared to the current RC7 controller
- **LIGHT WEIGHT:** only 12 Kg

* As of April, 2013, in-house research. For robot controllers supporting 6-axis robots (3kW class)

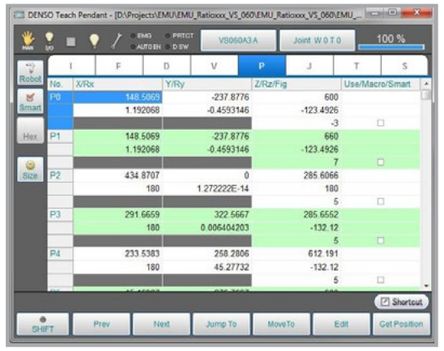
Advanced functions and usability. Improved ease of use

Improved GUI (Graphical User Interface) for increased efficiency

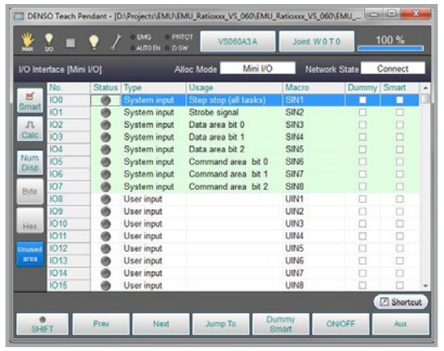
- **EASY TO USE.** Comprehensive menu structure and improved usability
- **REDUCE TIME.** Improved GUI and functions reduce time required to operate a robot
- **ARM 3D VIEW.** Teaching pendant equipped with the Arm 3D View. Possible to check the robot motion on the display
- **SIMILARITY.** Very similar menu hierarchy and screen elements as in the RC7 controller



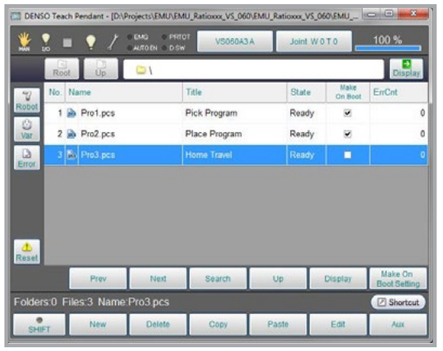
Arm 3D view



Variables window



I/O window



Program window

Extensible. Around 80% of the worldwide networks are supported

With the RC8 it is possible to connect to multiple devices and applications since it is already equipped with the Open Network (ORiN). For more information about ORiN refer to page X.

Standards

- ISO 10218-1: 2011 / CE / UL
- PLe / SIL3 (Safety I/O)

TÜVRheinland®
Precisely Right.

Networks supported

Fieldbus

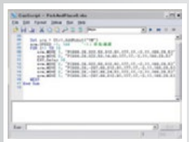
CC-Link, PROFIBUS, DeviceNet

Industrial EtherNet

EtherNet/IP, EtherCAT, PROFINET

Control and connect to many devices

CONTROL EXTERNAL DEVICES WITHOUT USING PLC



PacScript

You can access your provider from PacScript to create a control program to allow control from RC8 if a provider that supports external devices is available.

EASY-TO-USE TP CONTROL PANEL

Use WINCAPS III to customize the multi-functional teaching pendant easily.

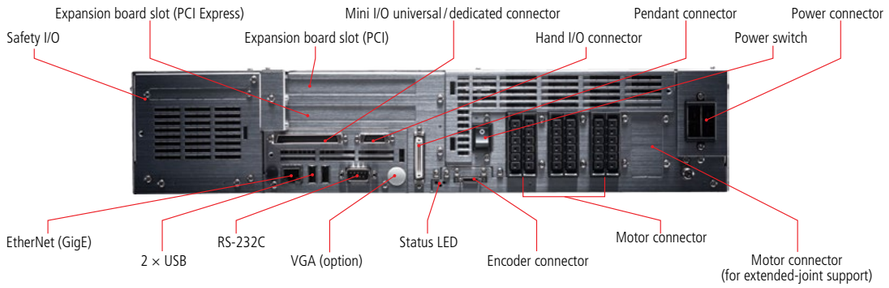
CONTROL MANY DEVICES WITH PROVIDER DEVELOPMENT

The custom provider allows additional connection and control over different products.
*Contact us for further information about development.

Specifications

Term			Unit	Specifications							
Applicable robots				VP -5243/6242	VS -050/060	VS -068/087	VS -6556/6577	VM -6083/60B1	HS -45***	HM -4*****	XR -43***
Power	Power supply		KVA	1.00 (*1)	1.15	2.78	1.80	3.30	1.80	2.45	1.85
	Input voltage range			Three-phase, 200 VAC –15% to 240 VAC +10% (100 V specification also available for the VP series)							
				Single-phase, 230 VAC –10% to 240 VAC +10% (*1)				—	Single-phase, 230 VAC –10% to 240 VAC +10%		
	Power supply frequency		Hz	50 / 60							
Power cable			m	5							
Controllable axes				5 / 6	6				4		
Control method				PTP, CP 3-dimensional linear, 3-dimensional arc (PTP control only for additional axes)							
Drive method				All axes all digital AC servo							
Language used				DENSO Robotics language (PacScript)							
Memory capacity				User area Variable area : 1.75 MB (32,766 points equivalent), file area : 400 MB (5000 steps × 256 files)							
Teaching system				1) Remote teaching 2) Numerical entry (MDI) 3) Direct teaching (HS series and HM series only)							
External signal (I/O, etc.)	Universal / dedicated I/O	Mini I/O		Input : User open 8 points + system fix 14 points (the safety I/O less version has system fix 13 points) (*2) Output : User open 8 points + system fix 16 points (the safety I/O less version has system fix 12 points)							
		Hand I/O		Input : User open 8 points / Output : User open 8 points							
	Parallel I/O boards (option)			Bus : PCI Input : User open 40 points / Output : User open 48 points							
	DeviceNet slave board (option)			Bus : PCI Express Input : 256 points / Output : 256 points							
	CC-Link remote device board (option)			Bus : PCI Express Input : 128 points / Output : 128 points Remote registers Input : 256 points / Output : 256 points							
	PROFIBUS slave board (option)			Bus : PCI Express Input : 256 points / Output : 256 points							
	EtherNet / IP adapter board (option)			Bus : PCI Express Input : 4032 points / Output : 4032 points							
External communication				RS-232C : 1 line, EtherNet : 1 line (GbE : Gigabit EtherNet), USB : 2 lines, VGA : 1 line (option)							
Expansion slot				• PCI 1 slot • PCI Express 1 slot							
Self diagnosis function				Overrun, servo error, memory error, input error, short circuit detection (user wiring part), etc.							
Environmental condition (in motion)				Temperature : 0 to 40 degree C, Humidity : 90% RH or less (no condensation allowed)							
Safety category				Standard specification Category 4, PL = e (ISO 13849-1 : 2006) (*2)							
Protect grade				IP20							
Weight			kg	Standard approx. 12 (*3)							

*1: Power for the 100 VAC specification is "Single-phase 100 VAC –5% to 110 VAC +10% 50/60 Hz, 1 kVA."
*2: If the built-in safety I/O is not necessary for the standard specification, please specify a safety-I/O-less specification.
*3: Does not include the supplied cables.

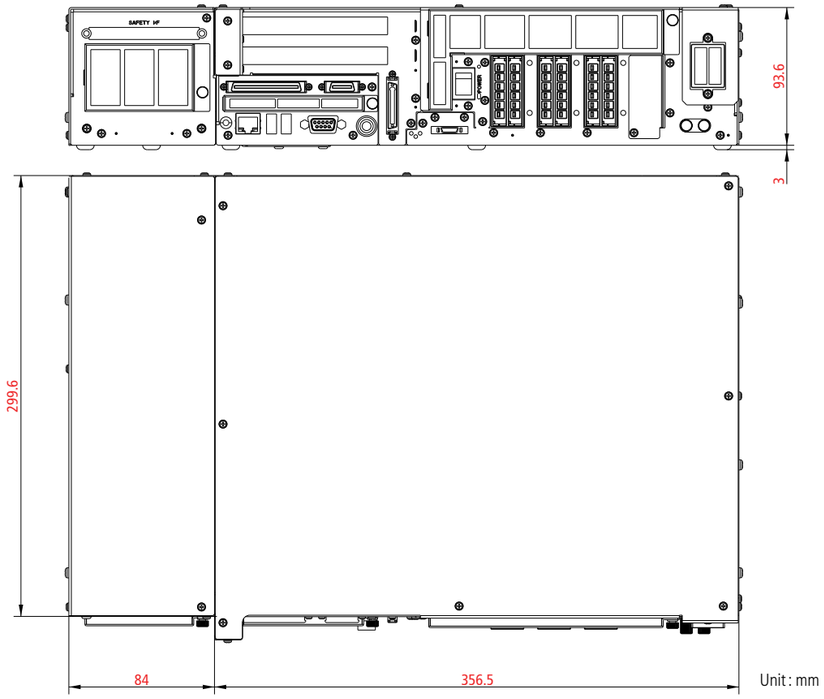


Legend

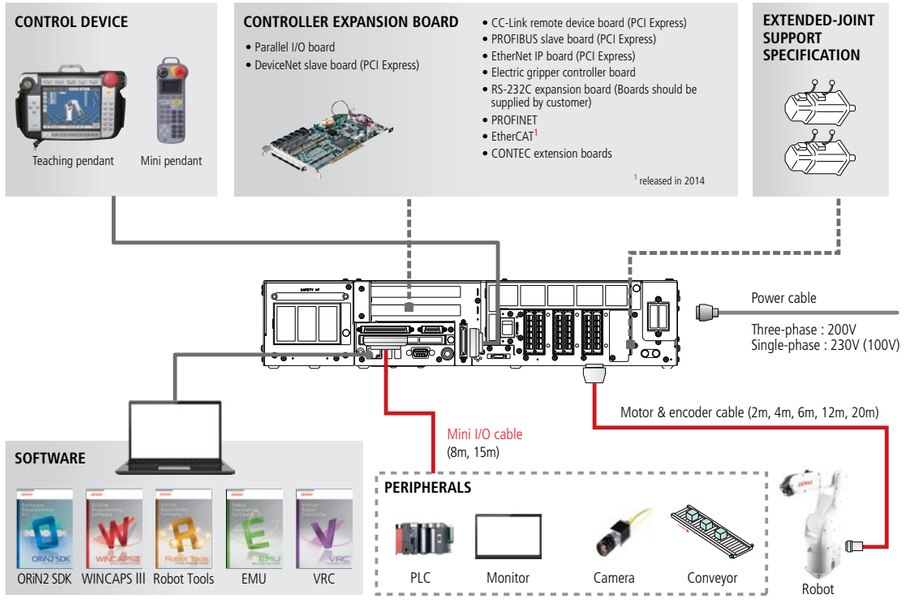
RC8 - □□□□ - NNN □ - □□ - NNN

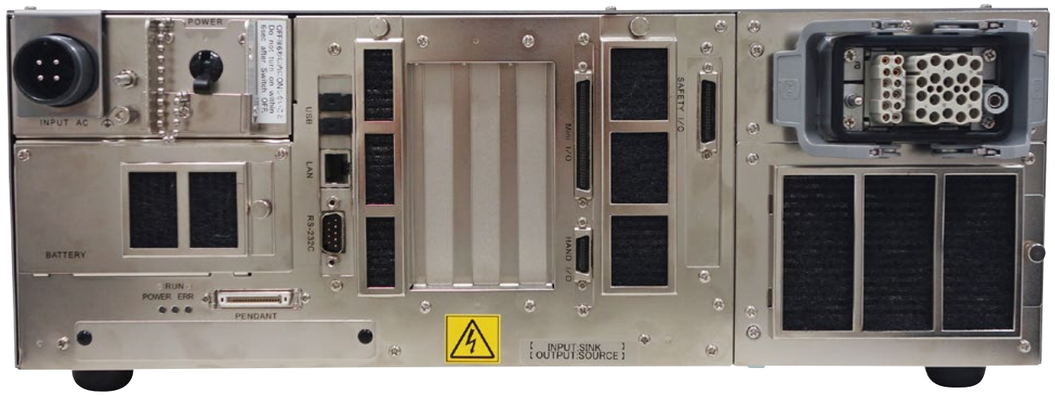
- Controller name
- Robot type format:
  - VMA0: VM series
  - VSA3: VS-050 / 060
  - VSA4: VS-068 / 087
  - VSA0: VS-6556 / 6577
  - VPA0: VP-5243 / 6242
  - HSA0: HS series
  - HMA0: HM series
  - XRA0: XR series
- I/O type:
  - M: Negative common (NPN)
  - P: Positive common (PNP)
- Compliant standard:
  - NI: Standard specification (safety I/O, safety category 4 / PLe)
  - NN: Safety I/O less specification (safety I/O less, no safety category)

External dimensions



System configuration diagram





RC7 Controller

Predecesor of the RC8 robot controller.
Compact and user-friendly

RC7	PREDECESOR OF THE RC8

- **COMPACT DIMENSIONS:** 440 mm x 425 mm x 152 mm
- **VERY LIGHTWEIGHT:** less than 20 kg
- **LARGE MEMORY CAPACITY:** 3.25 MB (10,000 steps and 30,000 points)

The DENSO Controller RC7 is easy to use, extremely light, adaptable and highly intuitive. Key features of the DENSO Controller include:

- **EXTENSIVE VARIETY OF CONNECTION INTERFACES.**
  - 1 x Ethernet
  - 1 x RS232C
  - 2 x USB
  - Mini I/O
  - Safety IO
  - Hand IO
- **SUPPLEMENTARY INTERFACE OPTIONS INCLUDE.**
  - 2 x RS232C
  - Profibus
  - DeviceNet
  - Parallel I/O extension
  - Ethernet/IP
- **UTILISES DENSO'S PROPRIETARY WINCAPS III SOFTWARE.** For off-line programming, simulation and management of variables, I/Os and log-files

Specifications

Term			Unit	Specifications									
Applicable robots				VP -5243 / 6242	VP -6242G2 / 6242G2-S1	VS -050 / 060	VS -068 / 087	VS -6556 / 6577	VM -6083 / 60B1	HS -45□□	HM -4□□□□	XR -43□□	XYC -40□□G
Power	Power supply		KVA	1.00 (*2)	1.00 (*2)	1.15	2.78	1.85	3.30	1.80	2.45	1.80	1.15
	Input voltage range			Three-phase, 200 VAC –15% to 230 VAC +10% (100 VAC specification also available for the VP / VP-G2 Series) (*2)									
				Single-phase, 230 VAC –10% to 230 VAC +10%					—	Single-phase, 230 VAC –10% to 230 VAC +10%			
	Power supply frequency		Hz	50 / 60									
Power cable			m	5									
Controllable axes				5 / 6	6					4			
Control method				PTP, CP 3-dimensional linear, 3-dimensional arc									
Drive method				All axes all digital AC servo									
Language used				DENSO Robotics language (conforming to SLIM)									
Memory capacity				3.25 MB (equivalent to 10,000 steps, 32,766 points) (Can be increased to 5.5 MB (option)) (*3)									
Teaching system				1) Remote teaching 2) Numerical entry (MDI)						1) Remote teaching 2) Numerical entry (MDI) 3) Direct teaching		1) Remote teaching 2) Numerical entry (MDI)	
External signal (I/O, etc.)	Standard I/O	Mini I/O		Input : User open 8 points + system fix 11 points / Output : User open 8 points + system fix 14 points (*4)									
		Hand I/O		Input : User open 8 points / Output : User open 8 points									
	Safety I/O (*1)			Input : System fix 6 points / Output : System fix 5 points									
	Parallel I/O board (option)	Mount 2 boards		Input : User open 80 points / Output : User open 96 points (expandable)									
		Mount 1 board		Input : User open 40 points / Output : User open 48 points (expandable)									
	DeviceNet board (option)	Master / Slave		Input : 1024 points (master) + 256 points (slave) / Output : 1024 points (master) + 256 points (slave)									
		Master		Input : 1024 points / Output : 1024 points									
		Slave		Input : 256 points / Output : 256 points									
	CC-Link remote device board (option)	Remote device		Input : 384 points / Output : 384 points (including remote registers RWw and RWr)									
External communication				RS-232C : 1 line, EtherNet : 1 line, USB : 2 lines (Supporting flash memory)									
Expansion slot				3 (For optional boards)									
Self diagnosis function				Overrun, servo error, memory error, input error, etc.									
Timer function				0.02 s to 10 s (1 / 60 s step)									
Environmental condition (in motion)				Temperature : 0 to 40 degree C, Humidity : 90% RH or less (no condensation allowed) Altitude : 1000 m or less									
Protect grade				IP20 (IP54 when controller protection box is used)									
Weight			kg	Approx. 18 (*5)						Approx. 17 (*5)			

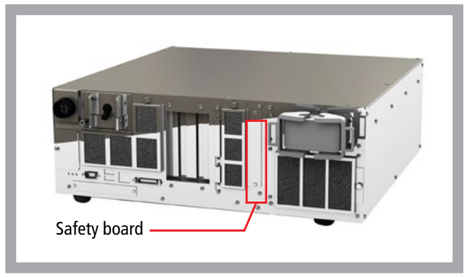
*1: Used with safety specification and UL specifications. (Requires a safety I/O cable)
*2: Power for the 100 V specification is "Single-phase 100 VAC –10% to 110 VAC +10% 50/60 Hz, 1 kVA." *3: Requires additional functionality at controller shipping.
*4: The global type of the controller cannot use system-fixed emergency stop I/Os. *5: Does not include the supplied cables.

Options

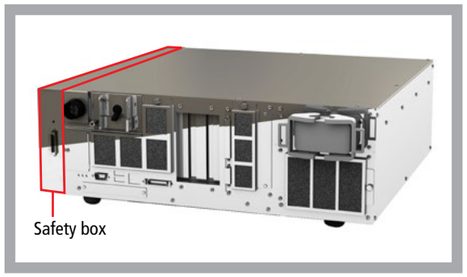
	Controller Type		Safety Category	Requirement	I/O Type
Standard	Standard				NPN (negative common) (*8) / PNP (positive common)
	Safety specification	With safety board	3	CE	
		With safety box	4		
	UL specification (*7)	With safety board	3	CE+UL	
		With safety box	4		
Extended-joint support specification	Standard				
	Safety specification	With safety board	3	CE	
		With safety box	4		

*6: Specifications must be specified when placing an order. Changes to specifications cannot be made after shipment.
*7: UL specifications are also required for the robot unit. A multi-functional teach pendant or mini pendant is also required.
*8: Standard used in Japan.

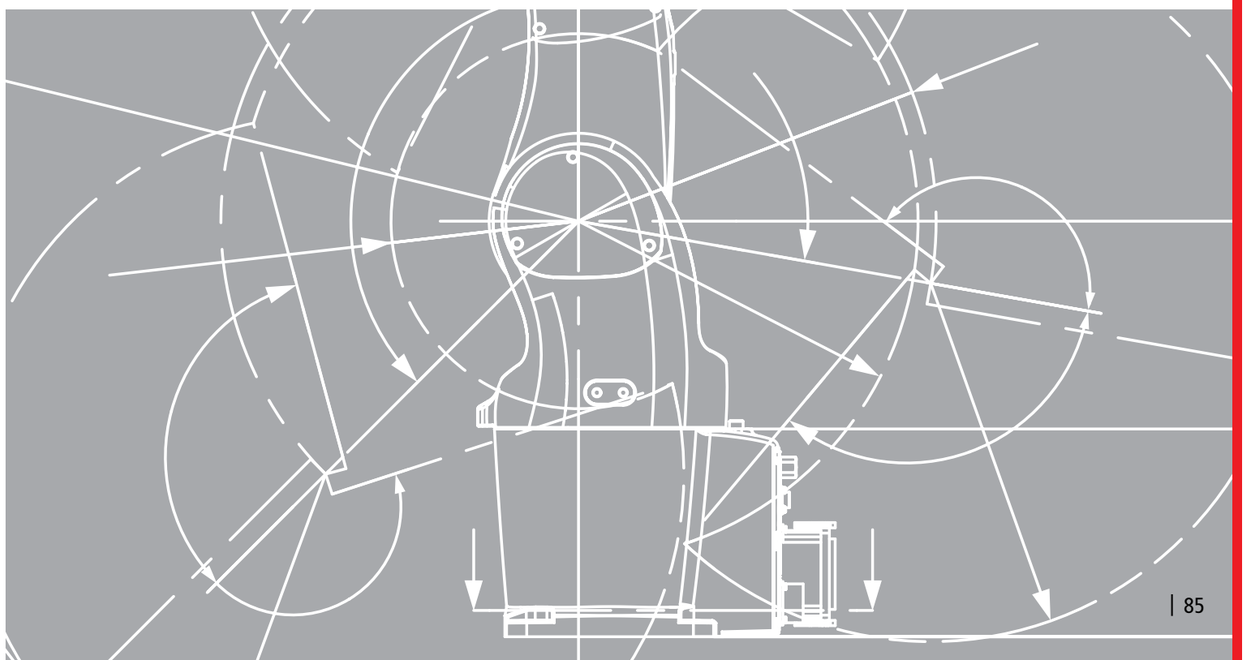
Compliant robot safety standards: ISO 10218-1: 2011, ANSI/RIA R15.06-1999, UL standards UL1740, CSA Z434, etc.



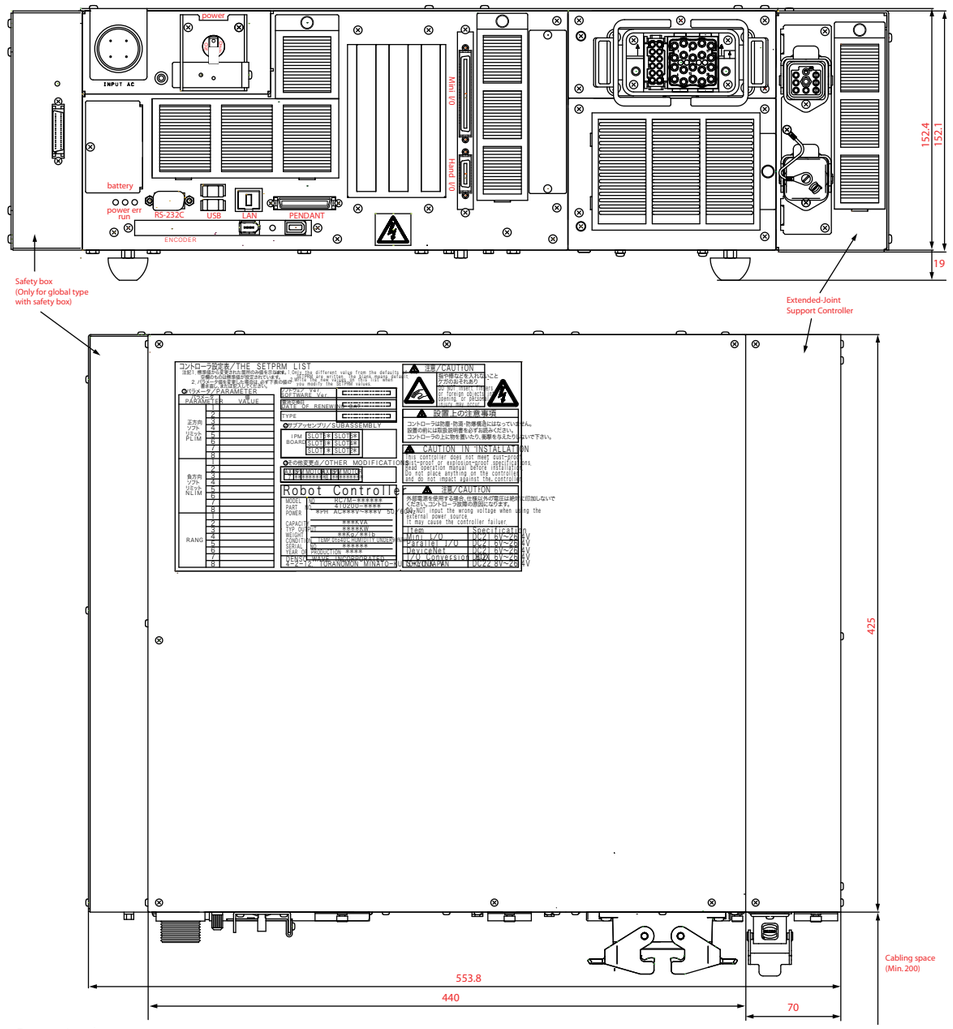
Safety category 3



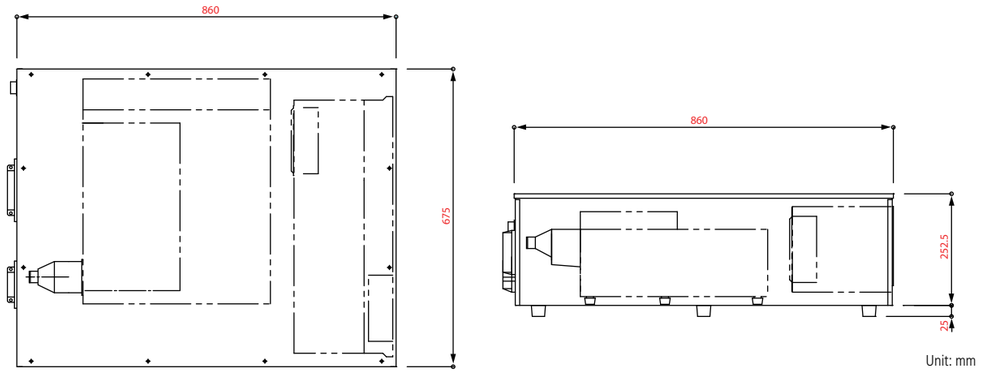
Safety category 4



External dimensions

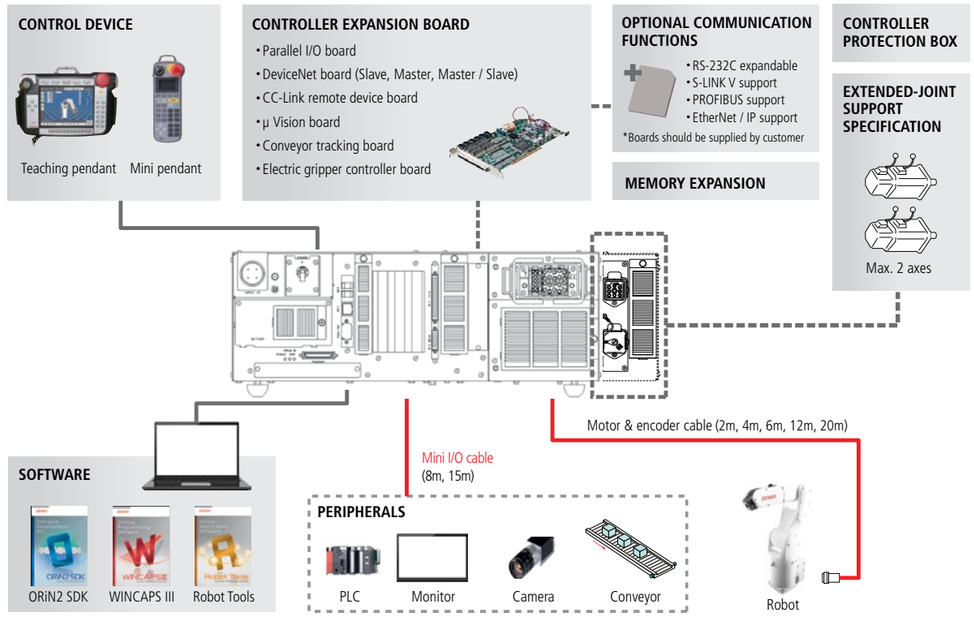


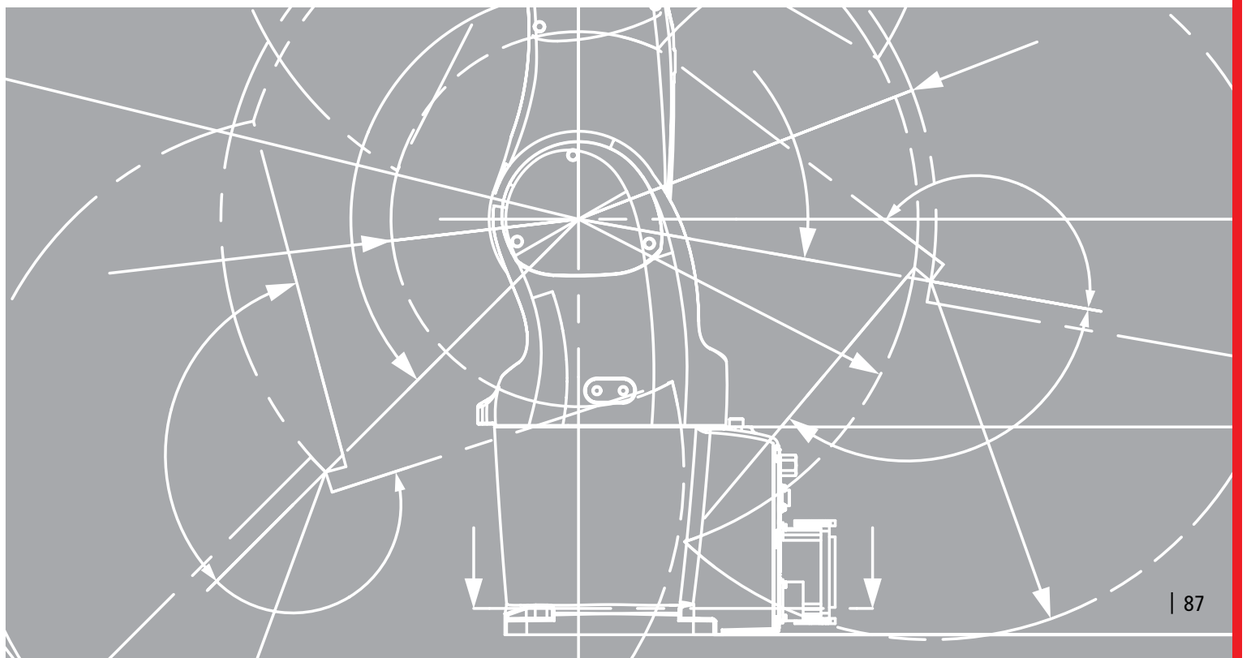
Protection box

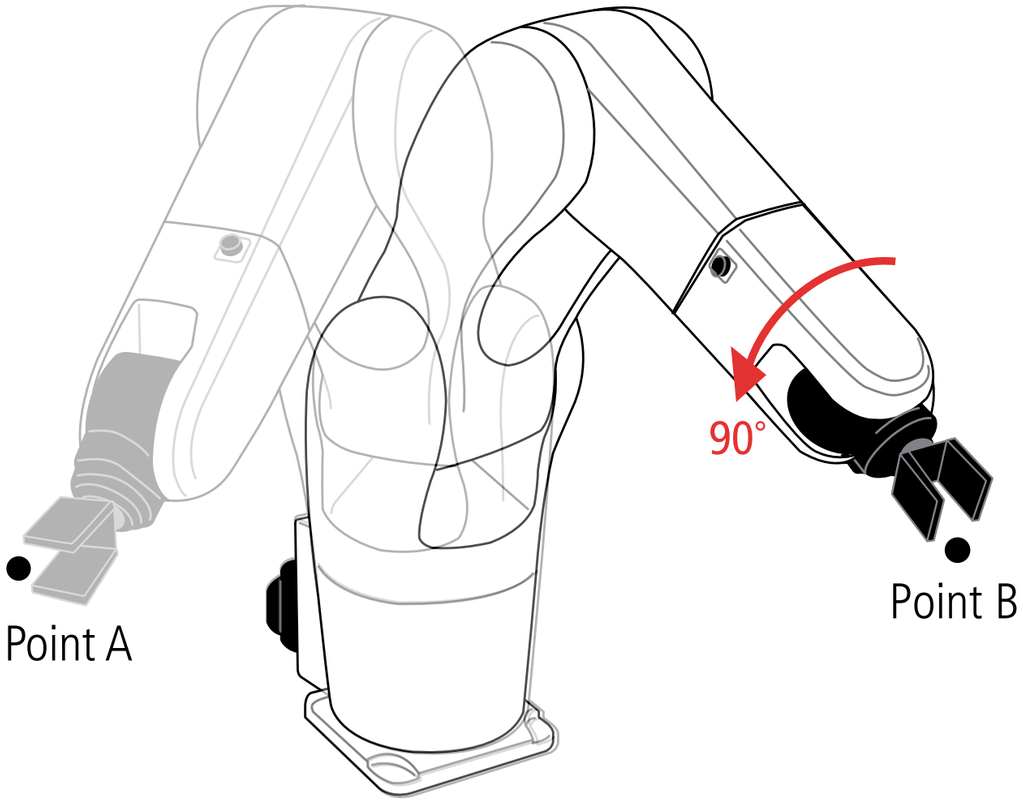


Unit: mm

System configuration diagram







Main functionalities of DENSO robots

- EXTENDED-JOINT SUPPORT SYSTEM
- CONVEYOR TRACKING
- NEW MOTION SKIP
- EXTERNAL TCP
- AUTOFIG
- SINGULAR POINT AVOIDING FUNCTION

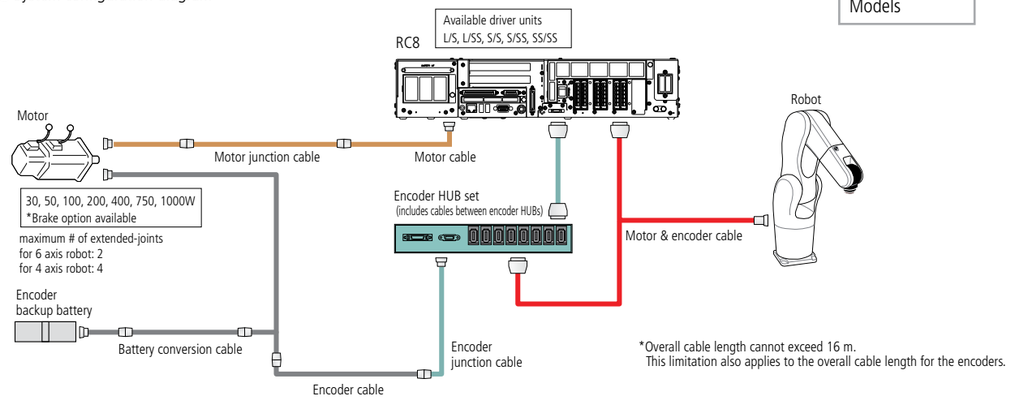
Main functionalities of DENSO Robotics

Connectability

EXTENDED-JOINT SUPPORT SYSTEM

Supported Robots: All RC8 Robot Models

○ System configuration diagram



Functions:

- Robot and extended-joints are controlled through the same interface

Main applications:

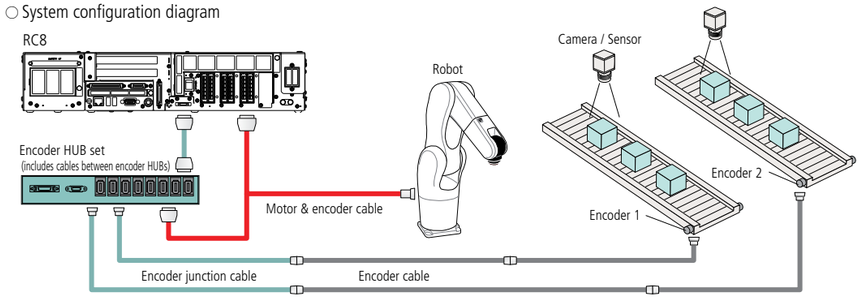
- Drive axis and servo hand
- Mounting robot on linear slide, controlling rotary axis

CONVEYOR TRACKING

Supported Robots: All RC8 Robot Models

*The conveyor tracking option can be added for an additional cost

○ System configuration diagram



Functions:

- Reduces conveyor tracking setup time by utilizing simple conveyor tracking wizard

Main applications:

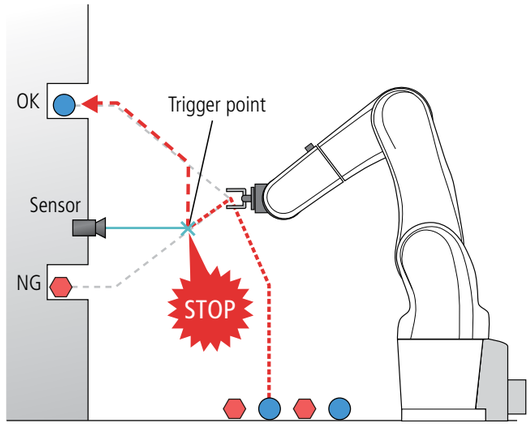
- Transferring workpieces from the conveyor belt

Operability

NEW MOTION SKIP

Supported Robots: All RC8 Robot Models

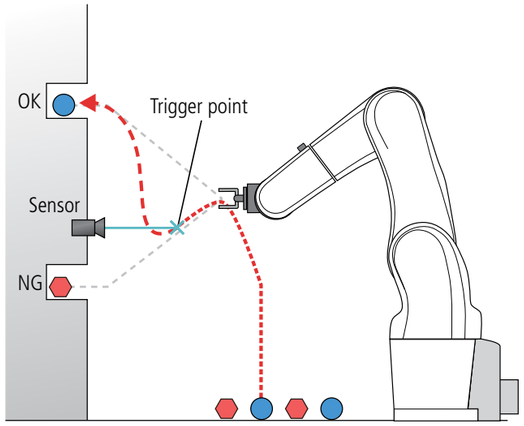
■ Sorting and transporting workpieces



Before — Pauses on inspection points and restarts via external command on a corrected course.

BEFORE

AFTER



After — Moves to the designated point based on inspection results without stopping on the inspection point.

Functions:

- Changes the target point and performs actions via external command during automatic operation without stopping
- Reduced cycle for applications with dynamic workpiece positioning

Main applications:

- Sorting and transporting various kinds of workpieces

EXAMPLES CONTINUED

Operability continued

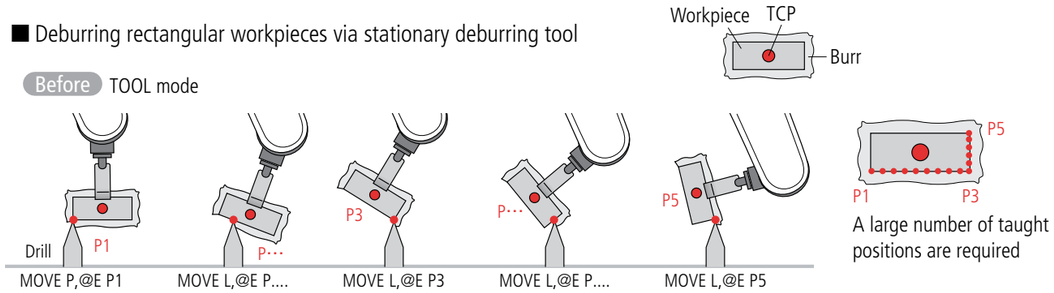
EXTERNAL TCP

RC8*1 RC7*2

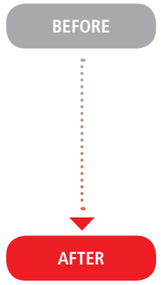
Supported Robots:
All RC8 Robot Models

*1 Support for RC8 is to be added in March 2014
*2 Support for RC7 is available as an option

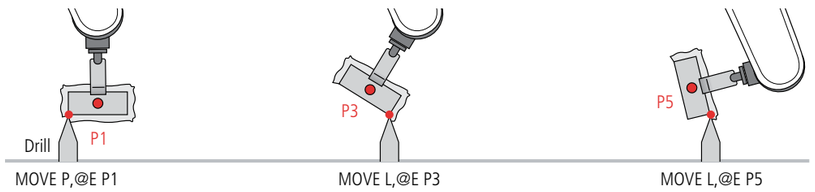
■ Deburring rectangular workpieces via stationary deburring tool

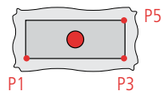


A large number of taught positions are required



After External TCP mode





Reduces the number of ta positions to 3
→Result : better efficie

Functions:

- Rotation about a defined center point of the workpiece allows for an easier method of teaching points and reduction of required positions

Main applications:

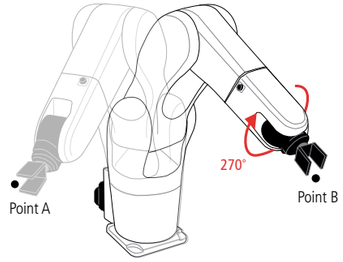
- Deburring and sealant coating

Connectability

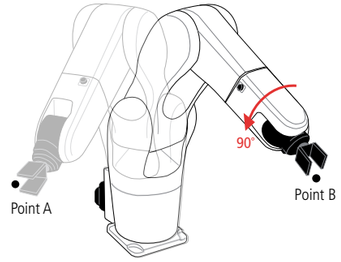
AUTOFIG

RC8

Supported Robots:
All RC8 Robot Models



Before Unable to detect optimal motion profile which resulted in unexpected motion.



After Autofig automatically calculates the optimal path between A and B resulting in the most efficient path with no wasted motion.

Functions:

- Automatically calculates the optimal "figure" for motion to a designated position resulting in reduction of setup time

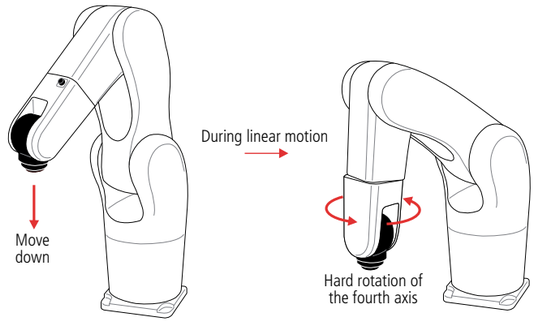
Main applications:

- When used with a program that employs a palletize library

SINGULAR POINT AVOIDING FUNCTION

RC8 RC7

Supported Robots:
VP series
VP–G2 series
VS series:
VS–050 / 060
VS–068 / 087
VS–6556
VS–6577
VM series



Functions:

- Use for smooth movement when linear interpretation is required to pass a point at which a robot's position changes, such as in the vicinity of a singular point.

Main applications:

- Used with a program that employs a palletize library

DENSO TEACHING & MINI PENDANTS

POWER AT YOUR FINGERTIPS

The DENSO teaching and mini pendants include the following user-friendly features:

Key Advantages

- Touch screen display
- Very light
- Small and compact
- Easy to use
- Safe and secure
- 5 languages available: Japanese, English, German, Korean, Chinese

Item		Teaching pendant	Mini-pendant
Functions	Programming	✔	✔(1)
	Operating the robot and teaching	✔	✔
	Maintaining	✔	✔(2)
Display		Liquid crystal display with backlight 640 × 480 pixels	Liquid crystal display 128 × 64 pixels
Power source		DC24V (supplied from robot controller)	
Outside dimensions		198 x 290 x 104 mm	242 x 102 x 75 mm
Degree of protection		IP65	
Weight		1.3 kg or less	Approx. 0.3 kg (excluding cables)
Cable length		4 m, 8 m, 12 m (3)	

1. Mini-pendant is not able to create and edit programs. WINCAPS III Light included with mini-pendant is available to do that.
2. Mini-pendant is able to use the following maintenance functions.
   - (1) Performing CALSET
   - (2) Resetting the motor encoder data
   - (3) Setting the calendar clock built in the robot controller (Date setting)
   - (4) Setting the next battery replacement
   - (5) Releasing and locking brakes
3. Extension cable for teaching pendant available (4 m and 8 m).

Keys, switches and buttons on the teaching-pendant

Keys and switches on the mini-pendant

WINCAPS III

DENSO's offline programming, monitoring and simulation software.

ORiN

ORiN is a middleware to program our robots and other devices such as PLCs, HMIs, servo motors, etc. with common high-level programming languages such as C++, C#, VB and LabVIEW.

b-CAP

b-CAP enables connection to DENSO robots and peripheral devices using a PC, PLC or other device which incorporates Ethernet TCP/IP or UDP.

COMMAND SLAVE

Use this library to program your DENSO robot using PLC programming language.

EVP

EVP (Easy Vision Picking) is an easy-to-use image processing software for 'pick & place' applications with DENSO robots that enables you to execute your vision projects directly in the robot's controller.

VRC

With VRC (Virtual Robot Controller) you can program DENSO robots and peripheral devices and simulation of a single robot.

ORiN VISION

ORiN Vision is the extensive vision library designed exclusively for ORiN2 middleware.

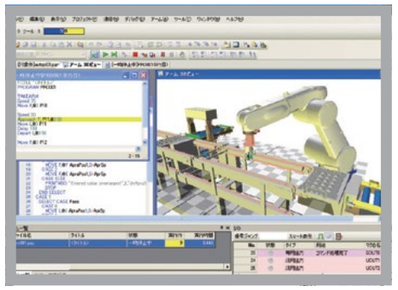
HALCON EXTENSION PACKAGE

For experienced HALCON users (a powerful software for machine vision) for programming vision and robotics applications.

Programming & Development

- WINCAPS III
- ORiN
- b-CAP
- COMMAND SLAVE (PLC)
- EVP
- VRC
- ORiN VISION
- HALCON EXTENSION PACKAGE

Offline Programming



WINCAPS III is a software used to both program DENSO robots (PAC language, PacScript) as well as create simulations on a PC.

Functions

■ **Create a program**

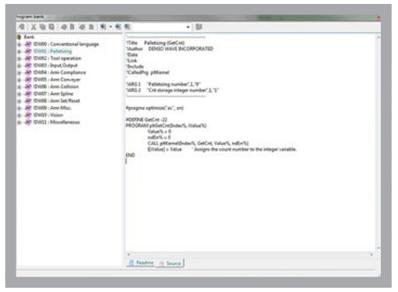
Use a PAC Language Editor for programming tasks. Includes the following functions:

■ Line No. display ■ Color support for commands ■ Command input support (displays input candidates)
■ Indent display ■ Comment block ■ Bookmarks

■ **Program bank**

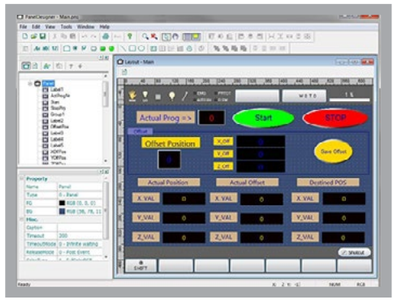
A program created by a user can be registered for use by other robot applications. Includes the following functions pre-registered as sample programs:

■ Palletizing ■ Tool operation ■ Arm motion
■ Create TP panel screen and more



■ **Panel screen editor**

Create a panel screen for a teaching pendant on a PC.



■ **Simple calibration**

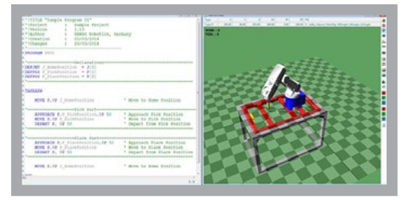
The following 3 types of calibration can be used:

CALSET	Overwrites a CALSET value with the correct value based on a standard position when a motor is replaced or when the CALSET value is lost.
TOOL	Corrects the value of the selected TOOL. Use when a hand or other end effector is recreated, replaced, or newly created.
WORK	Corrects the value of the selected WORK. All WORK coordinates that were set when the robot mounting position changed can be corrected at once.

■ **Arm 3D view**

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

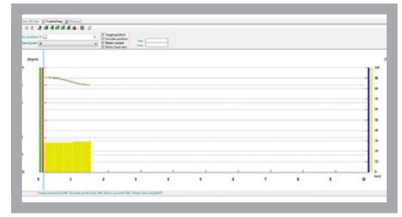
■ Import 3D graphic data (VRML and Direct X formats)
■ Check for interference with equipment
■ Measure cycle time of a created project
■ Click on an object to move it to a robot end object and obtain that position data [3D view teach]



■ **Log function**

Users can view the following logs:

■ Error log ■ Operation log ■ Trace log
■ Control log [command position of each axis, encoder value, current value, payload rate, etc.]
■ Variables [PRO name and variable name, type, written value, write source, etc.]
■ I/O log [port, type, status, initial value]
■ Servo minor axis data log [speed reference value, actual speed, torque command, deviation angle, absolute current value]



■ **Online functions**

Connect to the robot controller to use the following functions:

[Monitor function]

Monitor robot status

■ 3D view display ■ Variables ■ I/O ■ Execution program
■ Log data reception and save

[Debug functions]

Execute programs in the robot controller from the PC

■ Adjust robot speed ■ Reset all programs
■ Start / stop supervisory tasks ■ Program start
■ Step stop / cycle stop / suspend, halt / program reset
■ Step feed ■ Mock I/O settings of dedicated input and others

Functions	Full Function Version	Light Version (*1)	Trial Version (*2)
Create new program / edit program	√	√	(*5)
Program bank	√	(*3)	(*3)
3D CAD data import	√		
3D view teach	√	√	√
Simulation function	√		
Debug function	√		
Monitoring	√	(*4)	(*4)
Movie save function	√	√	√
Print	√		
Simple calibration	√	√	√

*1: Included with purchase of mini pendant.
*2: Supplied with robot.
*3: There are limits to the number of libraries that can be used.
*4: Sampling interval: 1 sec.
*5: One program (PRO1) only.

System requirements :
OS: Windows® XP SP1 or later / Vista / 7
PC: CPU Pentium® IV 1.5 GHz, Memory 512 MB, HDD500 MB
Languages supported: 5
Japanese, English, German, Korean, Chinese

Windows is a trademark or registered trademark of Microsoft Corporation in the U.S. and / or other countries.

Integration Middleware for PC

ORiN2 SDK is a software tool kit used to develop an application program or provider based on ORiN2 specifications.

It provides a standard communication interface for robots as well as various factory automation peripherals and databases.

ORiN2 SDK is equipped with a variety of functions (including a CAO engine, test program, sample program and skeleton provider auto generate tool) to support development.

The superior expandability of ORiN2 supports not only industrial robots, but a variety of devices (including PLC, CNC machine tools, bar code readers and RFID) to enable application development that is independent of manufacturer or model.

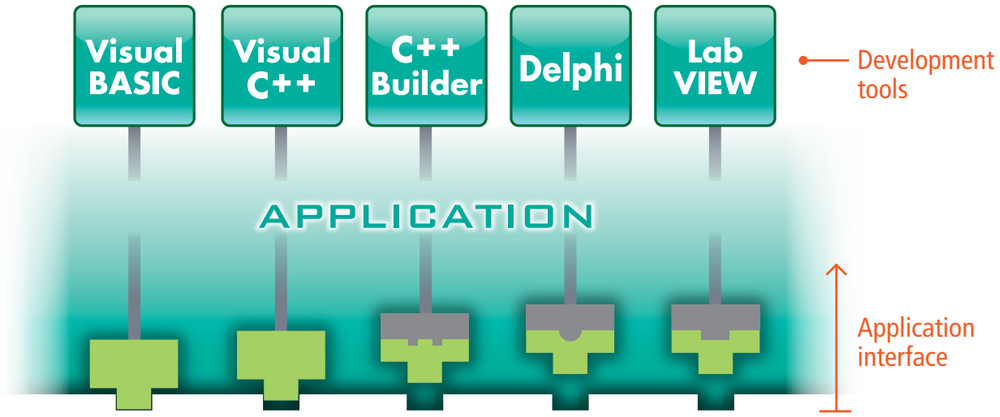
Key Features

- **Provides a standard interface**
  ORiN2 enables easy system development that supports distributed object technologies such as DCOM and SOAP, and provides two standard interfaces: the application interface and device interface.
- **Recycles applications**
  Equipped with a gateway to reciprocally connect with different standards (OPC and UPnP) and improve reusability of existing applications.
- **Development tool options**
  Use any of the following development tools that support OLE (COM, ActiveX):
  • Visual C++ • C++ Builder • Visual BASIC • Delphi • LabVIEW • Excel and others
- **Create an original provider**
  With Provider Wizard, a user can create an original provider to expand functions.

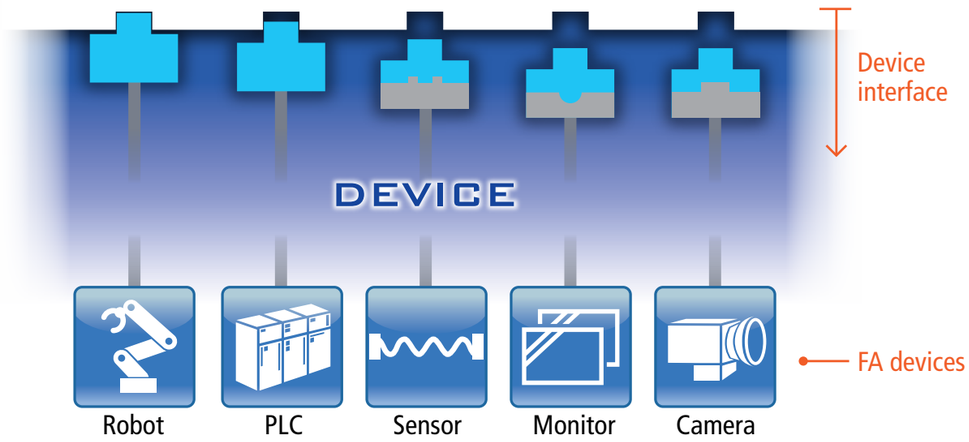
Package Type	ORiN2 Software Development Kit (ver2.1.13)											
	Provider Development			Runtime + Utilities Set			Runtime			DENSO Products		
Purpose	Provider Development + Execution Environment			Execution Environment + Expanded Components			Execution Environment			Execution Environment (limited to DENSO Products)		
Application	Support	Binary	Source	Support	Binary	Source	Support	Binary	Source	Support	Binary	Source
CAO engine	√	√		√	√		√	√		√	√	
CAO provider development tools	√	√										
CAO provider (quantity)	√	√	√	√	√		√	√		√	√	
	15	97	59	15	97	0	15	97	0	13	17	0
Test and configuration tools	√	√		√	√		√	√		√	√	
CAO-OPC	√	√		√	√							
CAO-SQL	√	√		√	√		√	√		√	√	
CAO-UPnP		√			√							
CAO-Script		√			v							

System requirements: OS: Windows® XP SP1 or later / Vista / 7 PC: CPU Pentium® III 1 GHz or faster, Memory 512 MB or more, HDD 500 MB or more

Windows is a trademark or registered trademark of Microsoft Corporation in the U.S. and / or other countries.
OPC is a trademark or registered trademark of the OPC Foundation in the U.S. and / or other countries.
ORiN is a trademark or registered trademark of Japan Robot Association.



ORiN
Open Resource Interface for the Network



b-CAP

RC8 RC7

b-CAP is based on Transmission Control Protocol / Internet Protocol (TCP/IP)

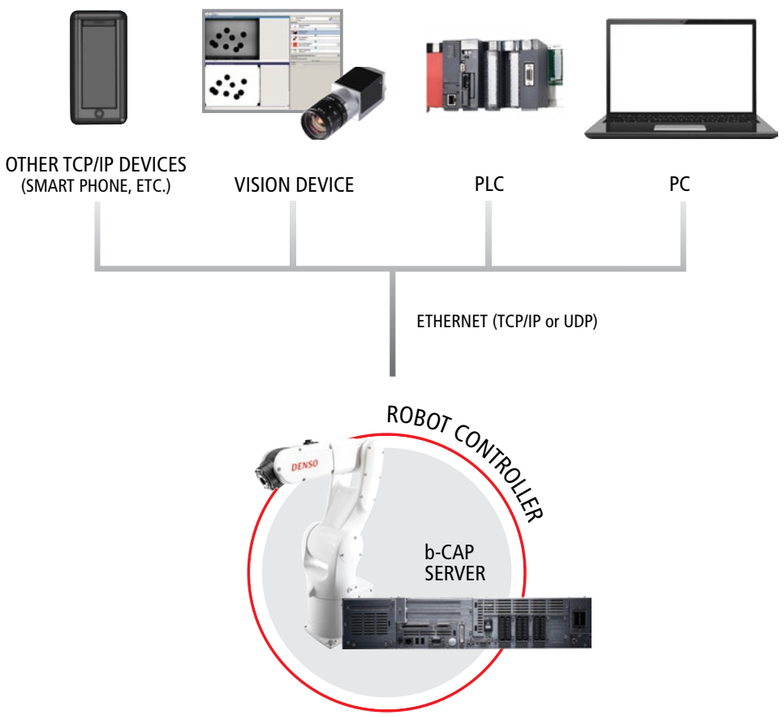
This control protocol enables connection to DENSO robots and peripheral devices using a PC, PLC or other device which incorporates Ethernet TCP/IP or UDP.

It works completely independently of any incumbent platform (iOS, Linux, Windows, etc.) or programming language.

With b-CAP it is possible to control the robot directly by sending a destination position in short time intervals using your own kinematic calculation in real time.

Key advantages

- Highly flexible and powerful control through PCs, PLCs or other applicable hardware device using TCP/IP or UDP
- Platform and programming language independent
- No requirement to learn a new robotic programming language
- Real time control of robots



ORiN VISION

RC8 RC7

DENSO

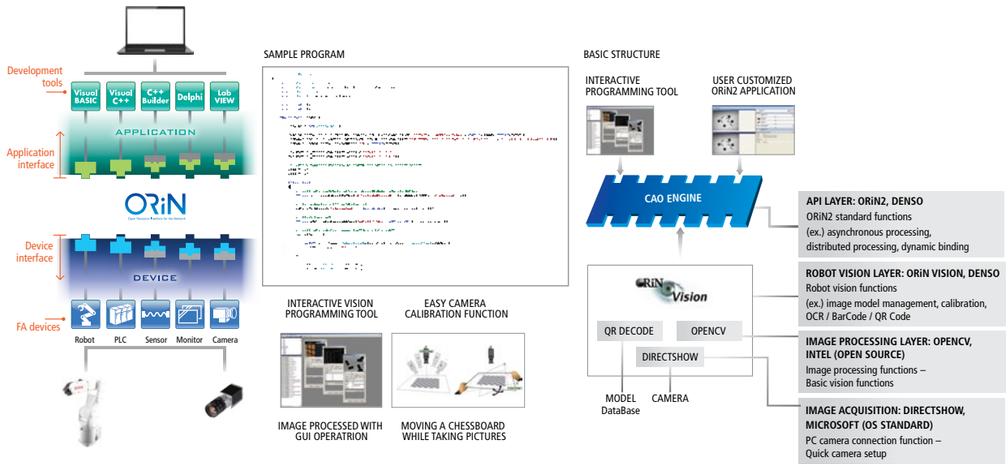
ORiN Vision

ORiN Vision is the extensive vision library designed exclusively for ORiN2 middleware.

ORiN Vision provides many functions for image capturing, image processing (like edge detection, filters, etc.), image analysis (like blob analysis, finding contours, etc.), image interpretation and also for robot and camera calibration. Because it combines ORiN2 and OpenCV the library allows you to directly program DENSO robots and vision applications with standard high-level languages including C++, C# and VB among others through only one interface.

Key advantages

- Built-in processing functions use the OpenCV standard
- High-level image processing fuctionality
- The system is hardware independent allowing you to connect to any off-the-shelf camera regardless of interface (analogue, USB, IEE 2394, etc.)
- Fast and efficient procedures result in short development times



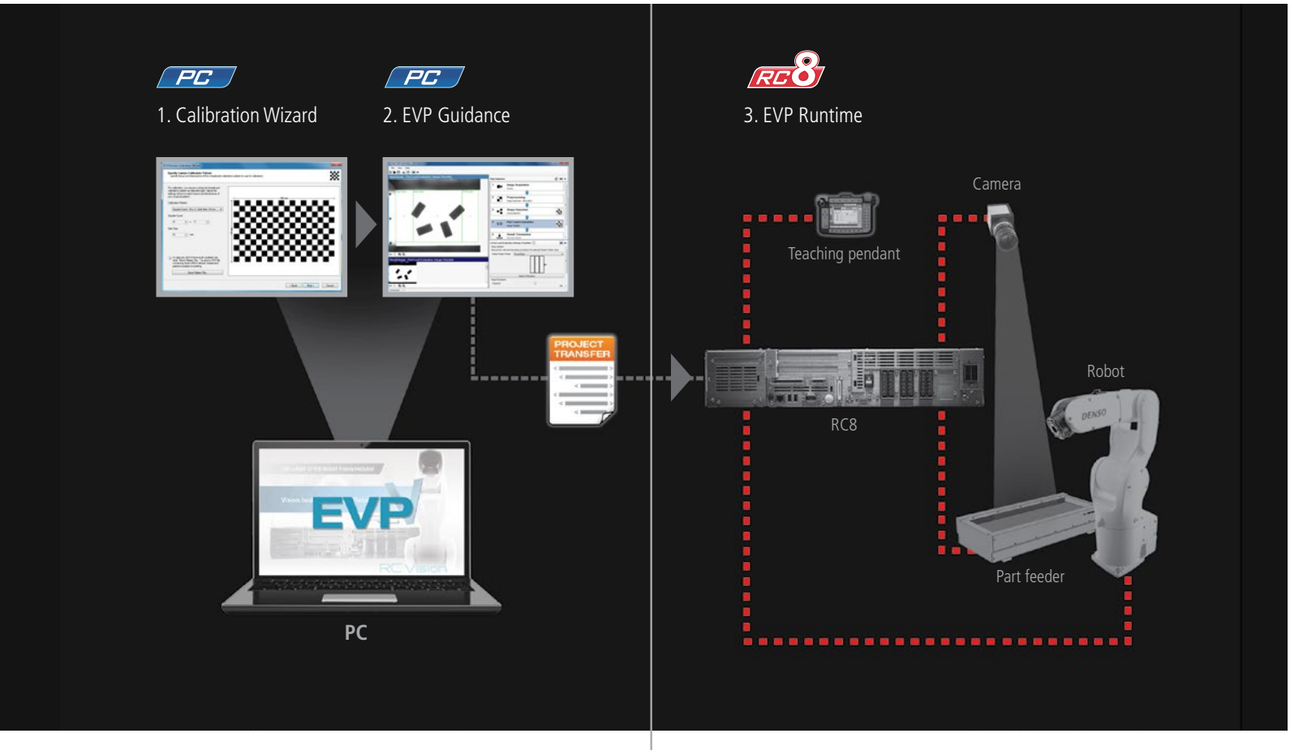
SET UP IN A FEW EASY STEPS

DENSO has developed easy-to-use image processing software for 'pick & place' applications with DENSO robots that enables you to execute your vision projects directly in the robot's controller.

Key Advantages

- Complete vision application is running on DENSO's robot controller RC8 (no PC needed)
- No need of an external vision system; EVP is already preinstalled in the RC8
- Easy to set up and use; no high level experience in vision applications needed
- Simple camera and robot calibration process
- Connect and configure part feeders to your vision applications; e.g. EYEFEEDER® and Anyfeed™
- Reduce costs, setup time and effort
- Use a wide array of industrial cameras

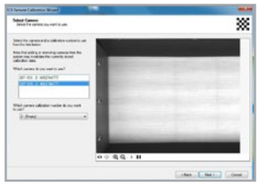
How it works



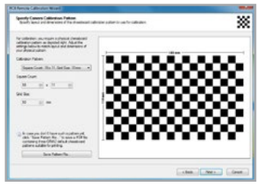
PC

The **Calibration Wizard** guides you through the process of calibrating a camera and robot to a common world coordinate system.

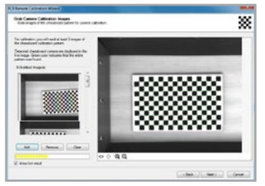
1. Start the Calibration Wizard



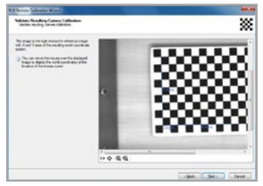
2. Select the camera to be used



3. Specify layout and dimensions of the calibration pattern to use for calibration



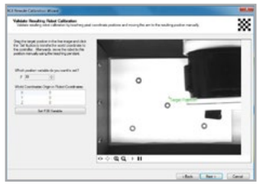
4. Grab images of the chessboard for camera calibration



5. Validate the resulting camera calibration

6. Select target positions from live image for robot calibration

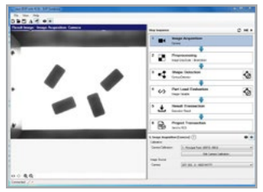
7. Teach the robot to the selected positions



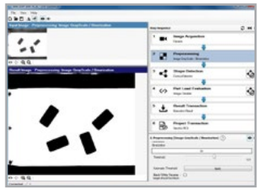
8. Validate the resulting robot calibration

PC

The **EVP Guidance** enables you to create your vision application in an easy and intuitive manner in only 6 steps.

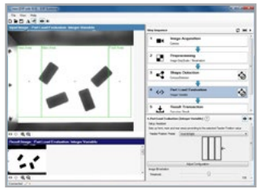


1. **Image Acquisition:** Select camera and calibration ID



2. **Preprocessing:** Binarize the image or select a color filter

3. **Detection:** Configure the parts to be detected



4. **Part Load Evaluation:** Configure your feeder output

5. **Result Transaction:** Check the pick positions of the robot

6. **Project Transaction:** Send the project to the RC8 controller

Project transfer from PC to robot controller (RC8)

RC8

With **EVP Runtime** you can start your vision application directly in the robot's controller (no PC needed anymore at this stage).

1. Create an EVP Runtime project by using a defined template

2. Adapt the template as needed. Load the created vision project and start it. That's it!

For more information about EVP visit our website: www.densorobotics-europe.com/en

HALCON from MVTec with Extension Package for DENSO robots based on ORiN2

HALCON software provides an integrated development environment (IDE) for machine vision and has become one of the worldwide industry standards.

HALCON offers a complete and powerful solution with more than 1400 commands for operations including blob analysis, morphology, pattern matching, measuring, identification and 3D vision.

Because HALCON is so widely used and highly regarded, DENSO has created a comprehensive, dedicated extension package to enable HALCON and DENSO users to conveniently program DENSO robots and control their vision applications through the same simple graphical interface.

This integrated development environment, which is called HDevelop, is intended for engineers with a thorough knowledge of machine vision. With our DENSO extension package for HALCON users can program our robots easily.

Key advantages

- DENSO robots can be programmed directly using one clear and practical interface
- The DENSO extension package is conveniently and seamlessly incorporated into the HALCON integrated development environment, HDevelop
- No previous experience of robotic programming is required

*HALCON from MVTec supports already the RC8.
No extension package installation is necessary.

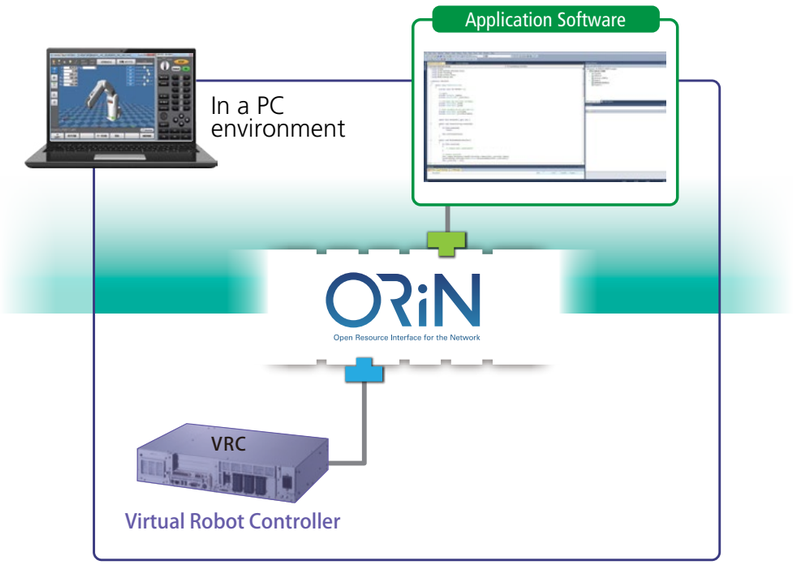
Virtual Robot Controller

As an RC8 (robot controller) virtual robot module, VRC provides an RC8 virtual environment on the PC. When programming in a universal language (Visual C++, Visual BASIC, Delphi, LabVIEW, etc.) on the PC, connecting to the VRC lets you control DENSO Robotics and monitor their statuses in a virtual environment. Being able to simulate the operation of actual robots without actually using them dramatically improves development efficiency.

- **Provides GUI**

  As a tool to make VRC states visible, the VRC teaching pendant allows for the same usage and monitoring as the teaching pendant.

System requirements :
OS: Windows® XP SP1 or later / Vista / 7
PC: CPU 2 GHz or faster multi-core processor, Memory 2 GB or more, HDD 1 GB or more
*Usage of VRC will also require the purchase of ORiN2 SDK.



COMMAND SLAVE

RC8 RC7

Function for PLC Programming

Command Slave function is a DENSO robot programming library based on IEC-61131-3 PLC programming standard.

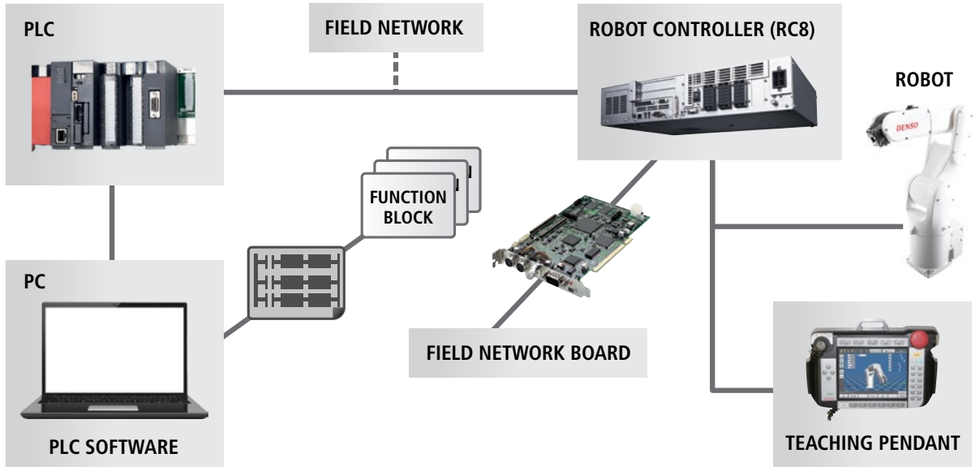
This dedicated library allows you to program DENSO robots using PLC programming languages. This function is established by connecting a PLC to a DENSO RC8 controller through a de-facto standard field network.

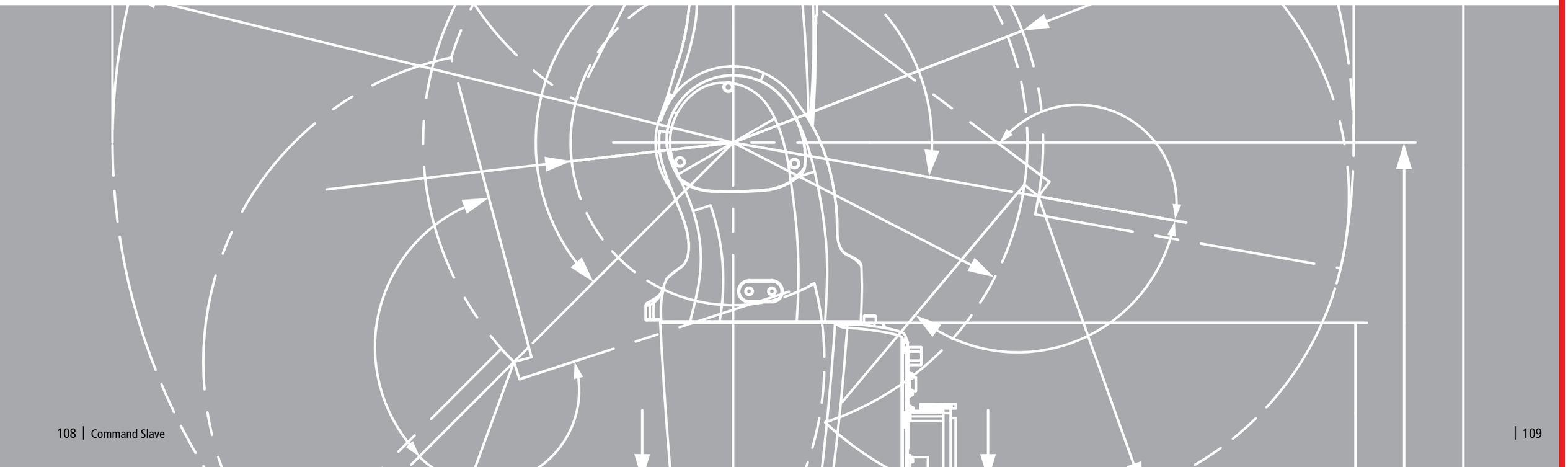
This function enables control of a DENSO robot from various PLC manufacturers (Siemens, Rockwell, Omron, etc.) without programming the robot itself.

Key Advantages

- DENSO robots can be directly programmed with a PLC using DENSO's function block library
- Reduces costs and saves time
- Simplifies the control signal exchange between PLC and the RC8
- Possibility to access the DENSO Robot trouble shooting and debugging functions directly in the PLC
- No need to learn DENSO's programming language

Example of connection between PLC and the RC8





EMU

Program DENSO robots and peripherial devices and create simulations of multiple robots.

3DCreate®

Software tool that enables machine builders, system integrators and manufacturers to simulate complete factory layouts in a virtual environment.

Simulation

EMU

3D CREATE®

Robot Simulations

EMU (Enhanced MUlti-robot simulator) is a software that allows you to make simulations with multiple DENSO Robots.

EMU allows you to use projects created in WINCAPS III in coordination with peripheral devices (models) and testing functionality in a state that is virtual and real. In this way, EMU helps you achieve vertical startup for preliminary testing and production systems with DENSO robots at the design stage.

Key Advantages

- **Sequence control**
  You can control all operating sequences for each robot by starting up each robot and using variables and I/O from the system controller program. Coordinated operation testing using multiple DENSO Robotics is also possible.
- **Coordination of peripheral devices**
  EMU enables testing of the operation of all equipment linked to robots and peripheral devices such as workpiece conveyors and loaders without using the actual equipment.
- **Interference checking**
  The ability to check for interference between devices and preliminarily test operating sequences ensures a higher degree of perfection at the initial stage of design while helping to minimize development times and reduce costs.

System requirements : OS: Windows® XP SP1 or later / Vista / 7 PC: CPU 2 GHz or faster multi-core processor, Memory 2 GB or more, HDD 1 GB or more
*Usage of EMU will also require the purchase of WINCAPS III.

3DCreate®

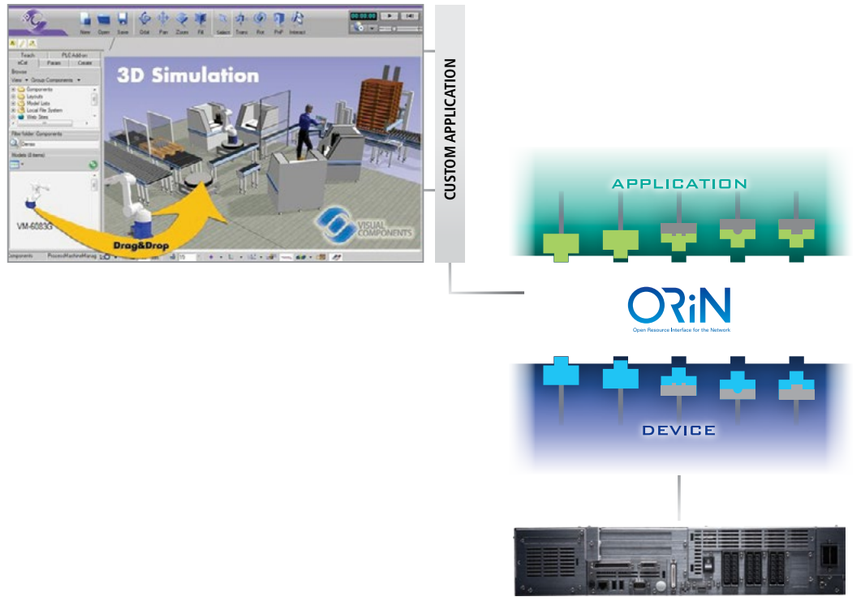
Implementing a professional robotic solution is a substantial and serious project which can have a major impact on the whole of your business. Whether you are investing in a single arm, or a complete automated production facility, it is vital that you are confident in the potential performance of your installation.

Visual Components® – the world's leading provider of 3D robotic and manufacturing software created 3DCreate® which is a simple, quick and cost-effective software tool that enables machine builders, system integrators and manufacturers to simulate complete factory layouts in a virtual environment.

This highly innovative and powerful solution provides all of the functions you need to create new simulated components from existing 3D CAD data, allowing you to customise, observe and evaluate your industrial robotic applications in advance.

Key advantages

- Use ready-made robot models from online eCatalogue
- Easy plug'n'play interface for layout design
- Integrate robot cells with factory layouts
- Parametric components suit various customer cases
- Connect to an external controller



For more information please visit www.visualcomponents.com

Robot Stand / Maintenance Support Tools

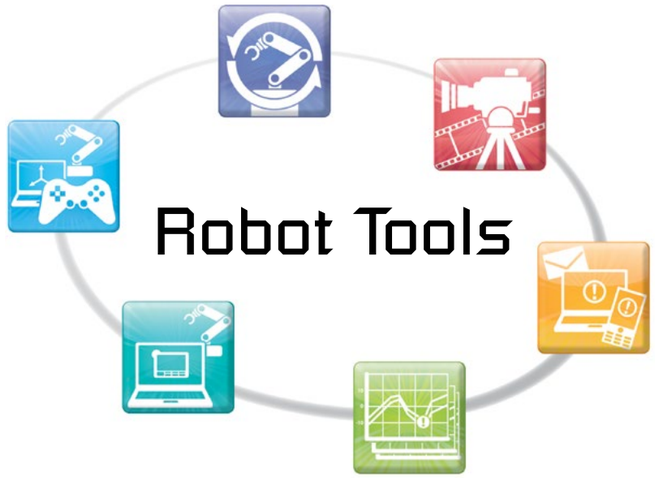
Suite of utility tools that enables the optimum maintenance and operation of DENSO robots.

Support Tools

ROBOT STAND / MAINTENANCE SUPPORT TOOLS

Robot Stand / Maintenance Support Tools

Robot Tools is a fully featured suite of utility tools created for optimum maintenance and operation of DENSO Robotics. The software streamlines daily maintenance workflow and reduces the running costs of a robot after installation.



Key Features

Image Logger

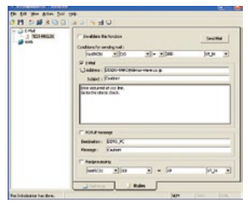
Supported controllers RC8 RC7

Helps to determine causes of sudden errors and incorrect equipment assembly. Takes images before and after problems happen and saves equipment data (I/O, variables, etc.) at the time they happen. Specifies errors caused through image and data validation to help with improving equipment.

Mobile Monitor

Supported controllers RC8 RC7

Monitors controller operating status and enables quick response to an error by sending an error notification email to a portable device when an operator is offsite. Contributes to improved maintainability and task efficiency.

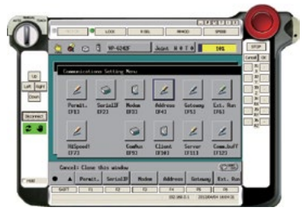


Key Features ...continued

Virtual TP

Supported controller RC7

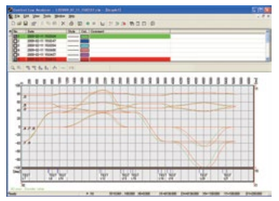
A virtual teaching pendant on the PC works with a controller set on manual mode, allowing various controller settings (GUI) to be configured and monitored even from a remote location. Improves maintainability and helps a user create settings when no mini pendant or teaching pendant is available.



Control log Analyzer

Supported controller RC7

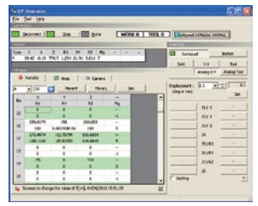
Obtains the control log from a designated controller and automatically displays it in a graph. This graph can be used to analyze robot control status (such as detection of NG waveforms), or the control log can be entered into a database to be compared with past data. Improves maintainability and visualizes (quantifies) an error occurrence.



GP Operator

Supported controllers RC8 RC7

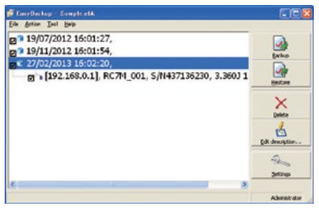
Connect a robot controller to a PC and use a mouse or game pad for easy robot operation. Allows teaching to a designated variable (P type, J type or T type) to assist developer teaching in which a PC is used to control a robot.



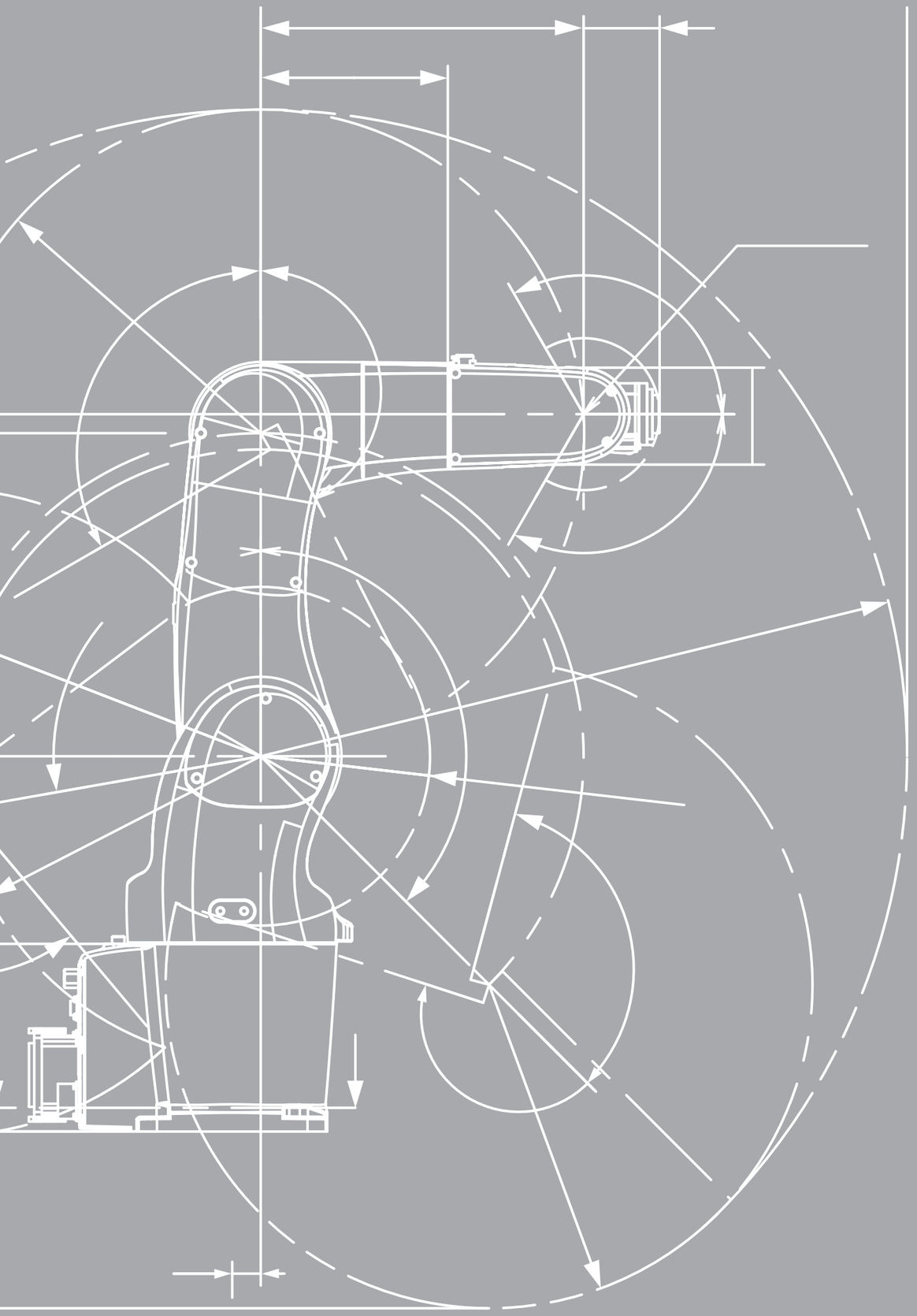
Easy Backup

Supported controller RC7

Performs backup and restores all data from multiple controllers in a batch. Automatic Easy Backup reduces task time and Easy Restore enables fast recovery when an error occurs. Contributes to improved maintainability and task efficiency.



System requirements: OS: Windows® XP SP1 or later / Vista / 7 PC: CPU Pentium® III 1 GHz or faster, Memory 512 MB or more, HDD 500 MB or more



Service and Support.

We're only satisfied when you are

Cutting edge technology, class leading products and groundbreaking systems are only part of what you can expect when you choose DENSO Robotics.

Our international customer support facility also leads the way in terms of service and delivery. We provide a highly personalised, professional and friendly resource to help with all of your questions and queries. Whether you need one-to-one assistance over the telephone, or a physical site visit, our teams of highly qualified engineers, technicians and partner system integrators are ready and waiting all over the globe.

TRAINING

DENSO Robotics provides in Europe the following services:

Training [1]

Operator:

This training is intended for robot operators or people in charge of performing maintenance on it

Basic programming:

This training embraces the tasks and procedures that an operator, technician, engineer or programmer needs to set up and program a robot

Advanced programming:

This training is offered after Operator Training and Basic Programming has been carried out. Knowledge acquired in these previous trainings will be required in order to develop a more complex scenario

Maintenance:

This training is directed for maintenance personnel responsible for the installation and maintenance of any system. The training provides detailed instructions and procedures necessary to perform complete disassembly, inspection, repair and reassembly of a DENSO robot mechanical unit

RC8 migration:

This course is intended for people who have been using the robot controller RC7 and would like to upgrade to the RC8. The training includes an overview of the changes between the RC7 and the RC8, new functions, improved DENSO programming language (PAC Script), etc.

...and many more

ORiN2:

Introduction to PC-based robot applications created with a common high-level programming language (Visual Studio)

CUSTOMER SUPPORT

Customer Support

Programming support:

Software development for robot applications

Technical support:

This includes: robot application simulations, cycle tests, troubleshooting and technical consulting

Absolute accuracy calibration service:

We help you to increase the already precise accuracy of your DENSO robot

Robot repair centre[2]:

An expert team of professionals at our repair centre in the Netherlands provides our customers a reliable and fast service

On-site services:

- Programming Support
- Maintenance
- Repair
- Troubleshooting

Spare parts delivery[2]:

Fast spare part availability through our world's largest warehouse outside Japan

[1] Our Training Centre is located in Mörfelden-Walldorf, Germany; near Frankfurt airport
[2] Our warehouse is located in The Netherlands

OUR WORLDWIDE NETWORK

Our international network of offices provides comprehensive service and support all over the world.

Our representations in Europe.

- Germany (Headquarters)
- Austria | Benelux | Czech Republic (covers Slovakia & Poland) | Denmark (covers Norway) | Finland | France | Israel | Italy Lithuania (covers Latvia) | Romania (covers Hungary) | Russia (covers all Russian speaking countries) | Serbia (covers Slovenia, Croatia, Bosnia & Herzegovina, Montenegro, Macedonia & Bulgaria) | Spain | Sweden | Switzerland | Turkey | United Kingdom (covers Ireland)

Europe:
DENSO ROBOTICS EUROPE
Waldecker Str. 9, 64546
Moerfelden-Walldorf
GERMANY
Tel: +49 (0) 6105 27 35 150
Fax: +49 (0) 6105 27 35 180
info@densorobotics-europe.com
support@densorobotics-europe.com

America:
DENSO SALES CALIFORNIA INC.
3900 Via Oro Avenue
Long Beach, California
90810 U.S.A
Tel: + 1 310 834 6352
Fax: + 1 310 513 7379
info@densorobotics.com

Asia:
Worldwide headquarters
DENSO WAVE INCORPORATED
1 Yoshiike, Kusaki, Agui-cho
Chita-gun, Aichi 470-2297
JAPAN
Tel: +81 569 49 5018
Fax: +81 569 49 5484
faoverseas@denso-wave.co.jp

DENSO (CHINA)
INVESTMENT CO. LTD.
Room No.518, The Beijing Fortune
Building, No.5 Dong SanHuan
Bei-Lu, ChaoYang District, Beijing
CHINA 100004
Tel: +86-10-6590-8337
Fax: +86-10-6590-9044
fa-support@denso-wave.co.jp

DENSO SALES KOREA
CORPORATION
8F, JPlus B/D, 16-13, Yangjae-dong
Seocho-gu, Seoul, 137-130
KOREA
Tel: +82-2-460-0694
Fax: +82-2-3452-7484
haedon_lee@densokorea.co.kr

DENSO (MALAYSIA) SDN. BHD.
Ground Floor, No.14, Jalan
Glenmarie
(Persiaran Kerjaya) Section U1
40150 Shah Alam, Selangor
Darul Ehsan
MALAYSIA
Tel: +60-3-5569-9933
Fax: +60-3-5567-3301
fa-support@denso-wave.co.jp

DENSO INTERNATIONAL ASIA
PTE. LTD.
51 Science Park Road
Unit + ACM – 01-19
The Aries, Science Park II
SINGAPORE 117586
Tel: +65 6771 2423
Fax: +65 6776 8698
fa-support@denso-wave.co.jp

DENSO TAIWAN CORPORATION
No.525, Sec2, Mei Su Rd.
Jui Ping Li, Yang Mei Town
Taoyuan Hsien
TAIWAN
Tel: +886-3-482-8001
Fax: +886-3-482-8003
fa-support@denso-wave.co.jp

DENSO SALES (THAILAND) CO. LTD.
888 Moo 1 Bangna - Trad Rd.
KM. 27. 5, T. Bangbo, A. Bangbo
Samutprakam 10560
THAILAND
Tel: +66-2-315-9500
Fax: +66-2-315-9556
fa-support@denso-wave.co.jp

Headquarters:
DENSO Robotics Europe | DENSO EUROPE B.V.
Waldecker Str. 9, 64546 Moerfelden-Walldorf, Germany
t: +49 (0) 6105 27 35 150 f: +49 (0) 6105 27 35 180
@: info@densorobotics-europe.com (commercial information)
@: support@densorobotics-europe.com (technical support)

© 2014 DENSO Corporation
Information in this document is subject to change without notice.
All the information contained here is for reference purposes only.

ORiN2 is a registered trademark of Japan Robot Association
NI LabVIEW™ Software is trademark of National Instruments™
HALCON and MVTec are registered trademarks