

Force Sensor

# Precise, force-guided applications

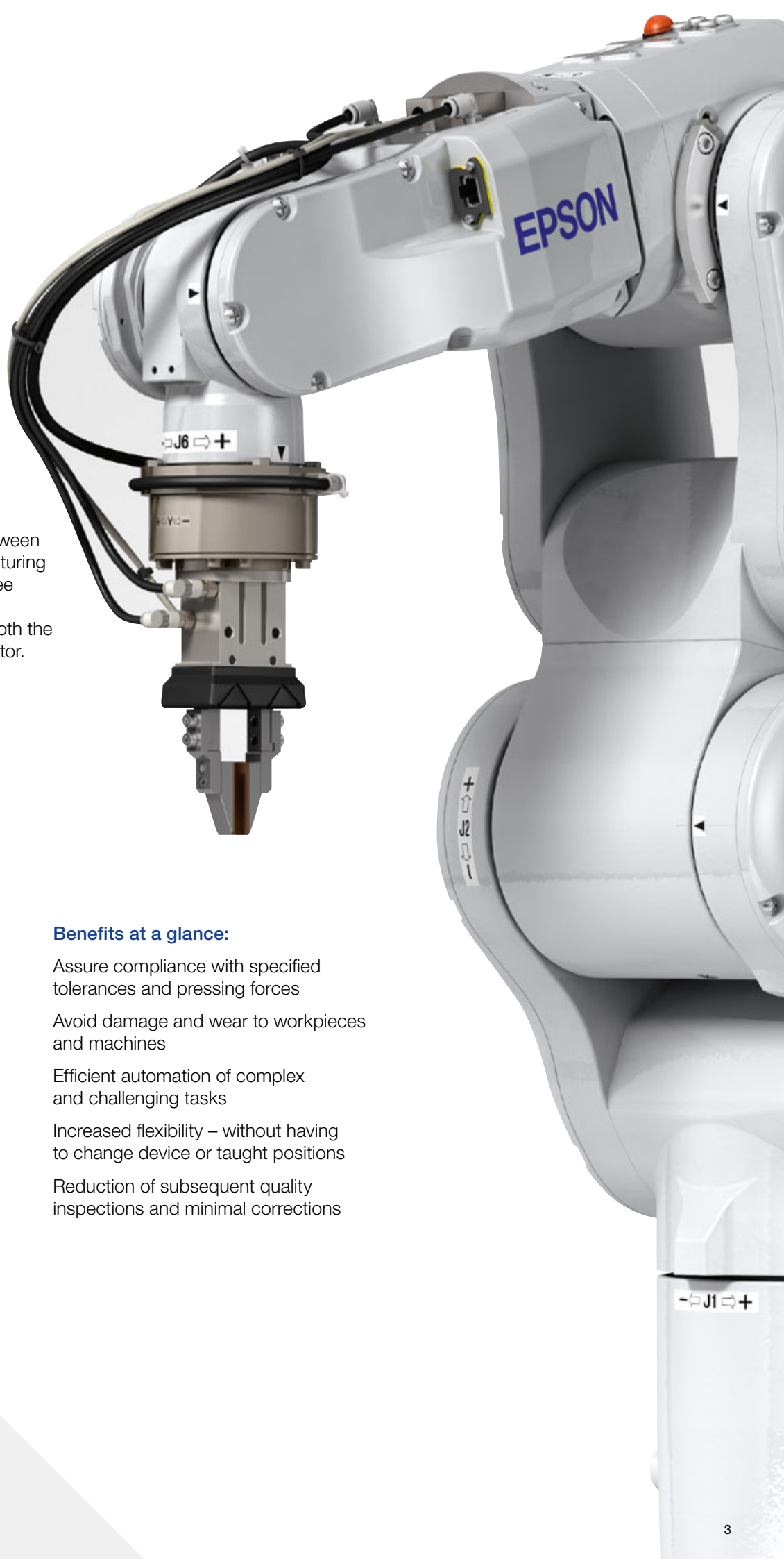


# Maximum precision for force-guided applications

Force-guided manufacturing processes, such as controlled joining, bending and insertion, as well as production tasks such as polishing and parts assembly, must all meet the highest standards of quality requirements. The force applied to a workpiece is always securely maintained to exact specified tolerances in order to prevent deformation or tilting.

Epson robots with force and torque sensors automate even the most challenging tasks with precise sensitivity. The sensors can accurately recognise the smallest of force changes and react accordingly. This means that robots integrated with imaging systems can handle sensitive components and achieve desired results.





The Force Sensor is installed between robot hand and end-effector, capturing both forces and torques in all three spatial directions and providing accurate measurement data to both the Epson robot controller and operator.

#### **Benefits at a glance:**

- Assure compliance with specified tolerances and pressing forces
- Avoid damage and wear to workpieces and machines
- Efficient automation of complex and challenging tasks
- Increased flexibility – without having to change device or taught positions
- Reduction of subsequent quality inspections and minimal corrections

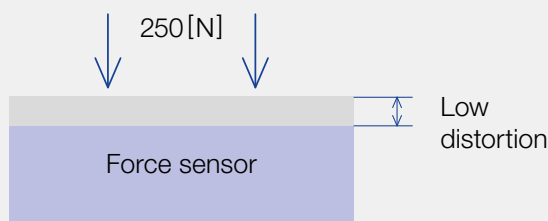
# Unique combination: sturdy and sensitive

The piezoelectric quartz crystal-based Epson Force Sensor applies a unique combination of high rigidity and sensitivity to ensure high force/torque recording in all six degrees of freedom – with extremely low noise sensitivity

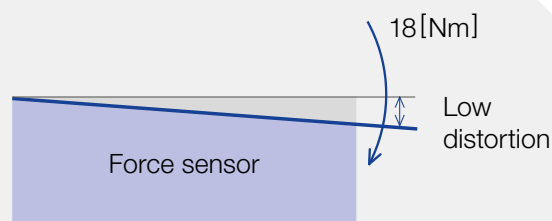
## Sturdy

Epson Force Sensors are particularly robust and durable, with exceptional shock and temperature resistance. Even when operating at significant force and torque, the displacement of sensors is minimal.

### Force component



### Torque component

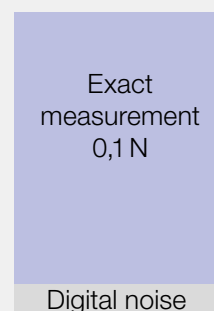


## High sensitivity

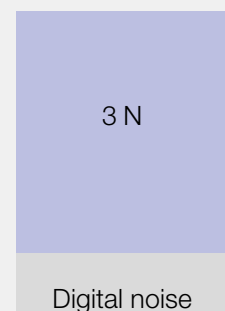
The digital noise in our sensors is extremely low compared to competitor products – at just 0.035N. This results in a measurement resolution of just 0.1 N with XYZ components, enabling forces to be captured with superior sensitivity.

## Digital noise

EPSON sensors



Competitors



**For use with various robots across a range of environments**

Our force and torque sensors can be used with both six-axis and SCARA robots particularly the cleanroom version of C8 series robots, enabling them to perform across a wide range of applications and environments.



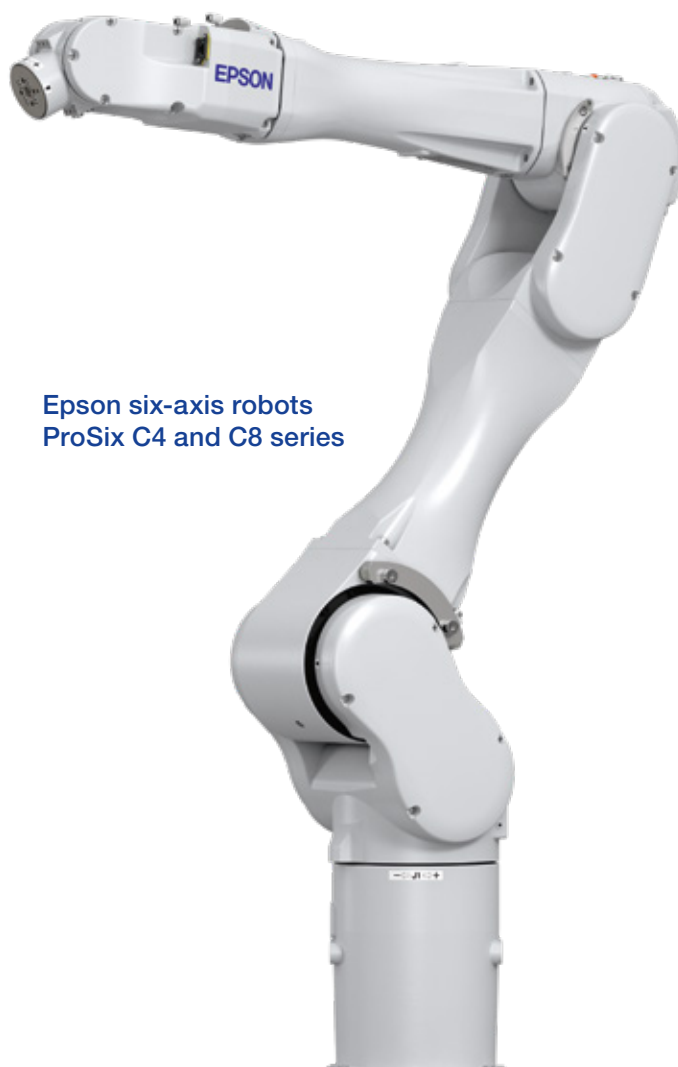
**Epson Spider RS series**



**Epson Prosix N2 series six-axis robot**



**Epson G series SCARA robots**



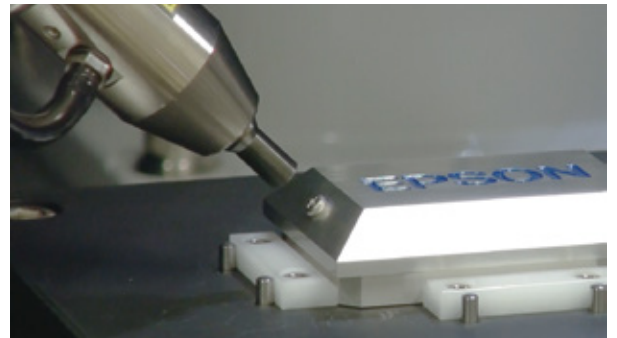
**Epson six-axis robots ProSix C4 and C8 series**

# Efficient automation of demanding tasks

Force and torque sensors are a significant component for material testing, assembling, development and quality assurance. Their inherent accuracy, versatility and reliability means they are being widely adopted in today's highly demanding manufacturing industry.

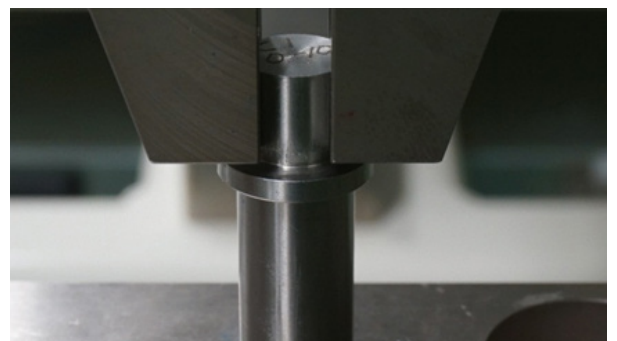
## Precise screw tightening

Even the smallest screws can be tightened precisely with Epson force/torque sensors. There's no need for extensive teaching as the robots are able to intuitively examine the force applied during the application.



## Installation of components with reduced backlash

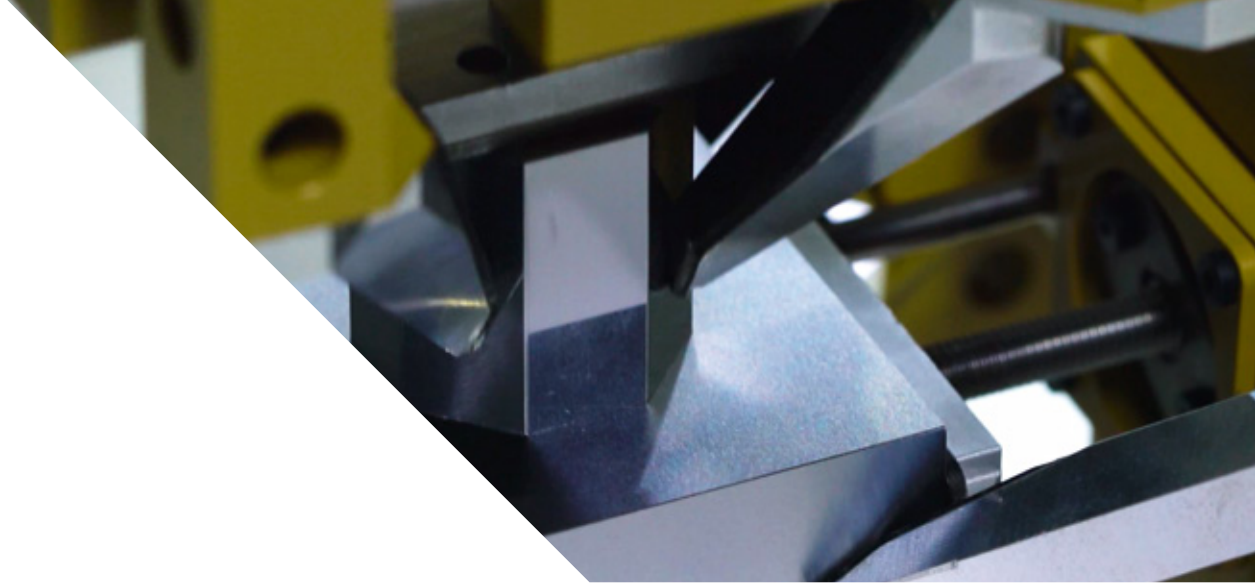
The installation of parts with low backlash, such as insertion of pins or transmission components, can now be automated. Due to the highly sensitive response of the Epson sensor, problems with tilted workpieces or jammed parts can be eliminated.



## Inserting connectors

With Epson Sensors, insertion of connectors in various configurations can be automated. In the process the sensors detect misalignment between connector and socket by force effort and provide feedback to correct the alignment. The sensor's high sensitivity allows the connector to be inserted in the socket with no damage.





### Inserting electronic components with flexible wires

Our Force Sensors are ideally suited to the insertion of workpieces with unusual outer contours. One example is inserting electronic components with lead wires. Using the sensor, they can precisely locate the hole of the lead wire, and then route it without bending or damaging.



### Polishing tasks

Even tasks such as polishing can be automated with consistency and accuracy, reproducing the desired force using the sensor.

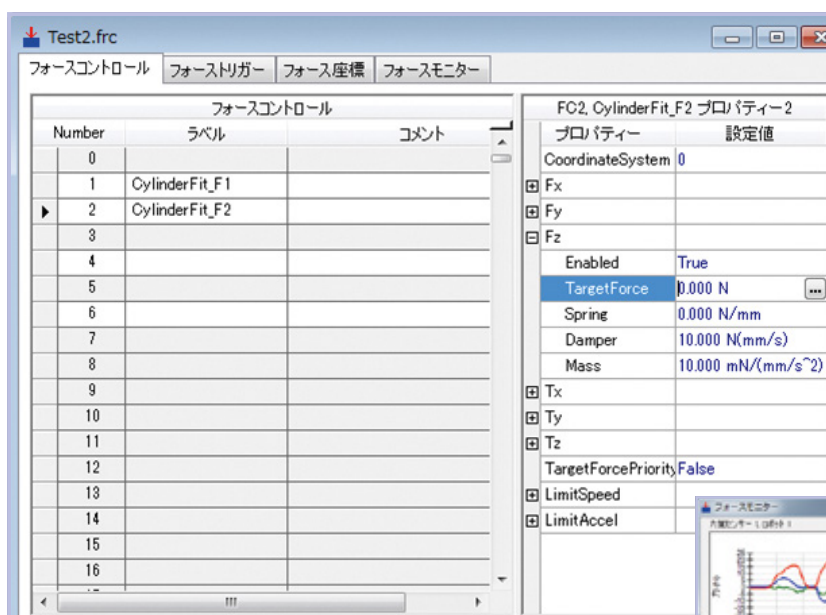


# Simple programming, real-time monitoring

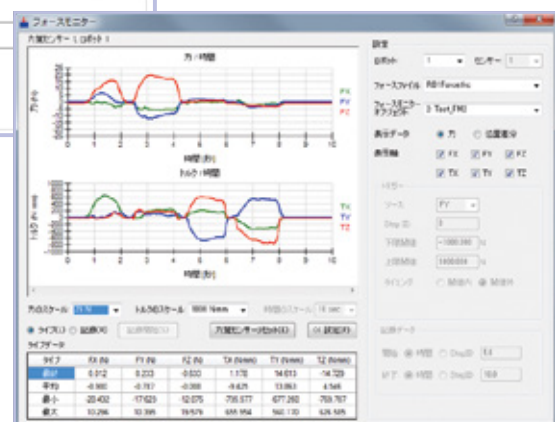
The Epson RC+ 7.0 project management and development environment is ideal for the simple programming of your applications. Its intuitive Windows interface, open structure and integrated image processing and sensor control allow you to fully simulate the robot program and visualise robot movements in a 3D graphical environment.

## Full Integration: Epson Force Editor and Force Monitor

The Force Sensors can be operated with ease via the Epson Force Editor and Force Monitor. The Epson SPEL+ robot language has robot commands that makes programming of robots and Force Sensors in the same environment seamless and convenient.



Simple force sensor parameters configuration

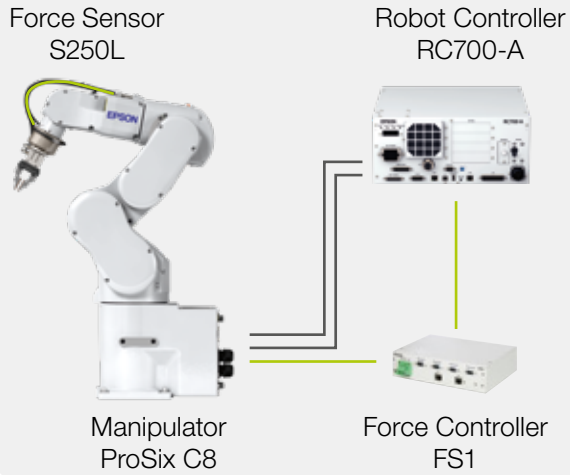


Force display and monitoring in real time

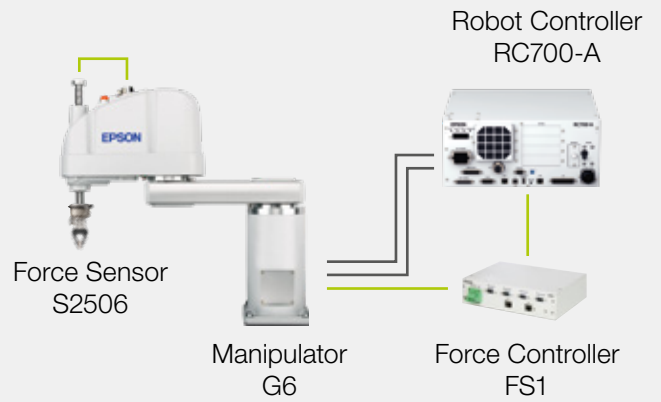


## System configuration examples

Epson ProSix C8 series six-axis robot



Epson SCARA G series robot



Force Sensor cable  
Robot M/C cable

Even direct teaching of the Epson six-axis robot is possible using the force/torque sensor or Teach Pendant (TP2). With minimal force effort, the robot arm can be moved manually in any direction within its working area using the gripper, allowing for fast and accurate results when teaching in a new application.

### Epson RC+ 7.0 features & benefits:

Can run in Microsoft Windows XP, Windows Vista, Windows 7, Windows 8 and Windows 10

Integrated project management system allows fast project development

Communicates with the controller or multiple controllers via USB or Ethernet

Powerful and easy to learn SPEL+ programming language

Epson image processing and Epson Force Sensor are fully integrated in the user interface

Wide-ranging port connection: Ethernet I/O, Profibus, DeviceNet, ProfiNet, serial port, TCP/IP, I/O Handshake direct or available as an option

Programming languages available in German, English, French, Japanese and Chinese

Background tasks for complete system control

Comprehensive Multi-Manipulator commands

Integration of DLL functions

Complete 3D simulator with import interface for 3D CAD files

# Technical data overview

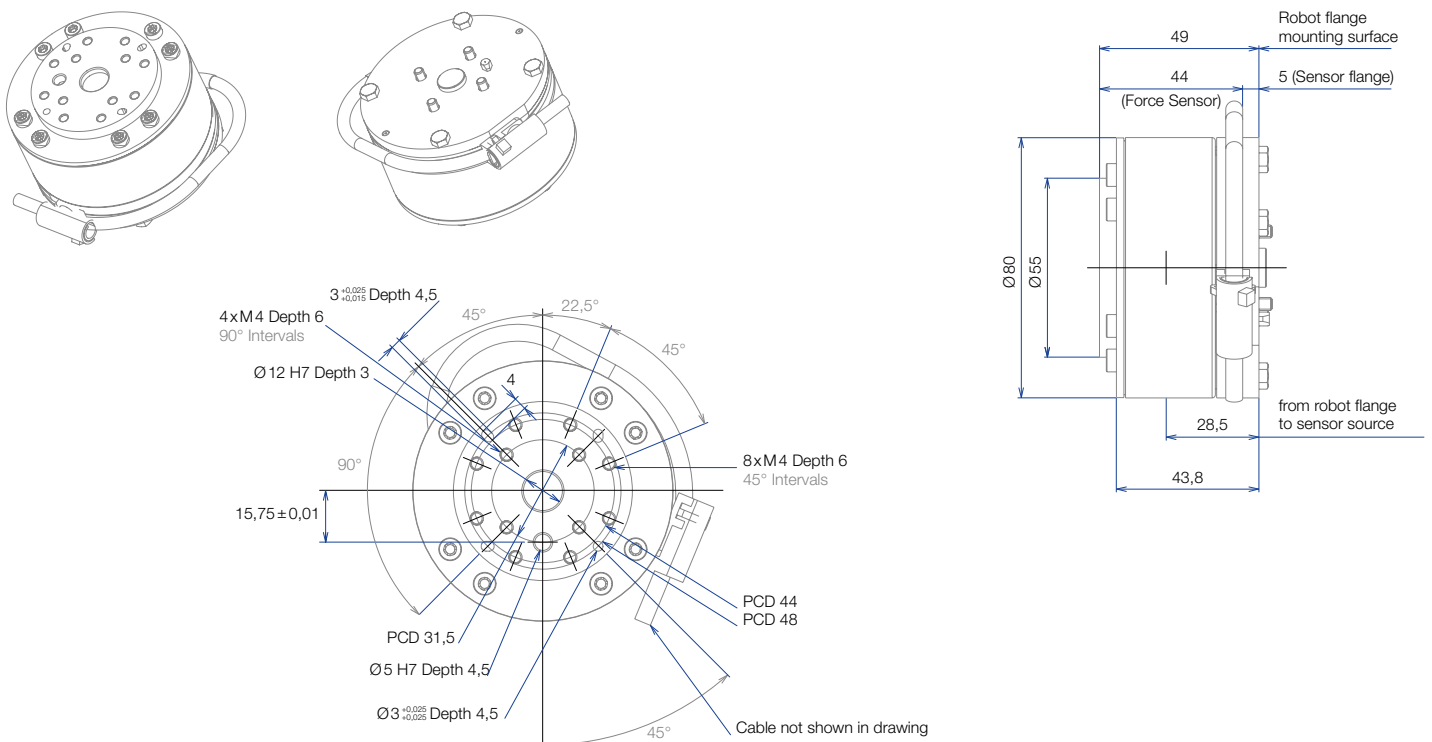
Model	S250N	S250L	S250P	S250H	S2503, S2506, S25010
Compatible robots	C4-Series	C8-Series Standard/ cleanroom/ESD* <sup>1</sup> Protection class (IP67)		N2-series	G-series* <sup>2</sup> RS-series
Dimensions (mm)	Ø 80 x 49(H)	Ø 88 x 49(H)	Ø 88 x 66(H)	Ø 80 x 49(H)	Ø 80 x 52(H)
Weight * <sup>3</sup>	460g	520g	680g	460g	640g
Compatible robot controller	RC700-A				
Measurement degrees of freedom	six-axis: three force components (Fx, Fy, Fz) and three torque components (Tx, Ty, Tz)				
Rated load	Fx, Fy, Fz: 250N Tx, Ty, Tz: 18Nm				
Maximum permissible static load	Fx, Fy, Fz: 1000N Tx, Ty, Tz: 36Nm				
Measurement resolution	Fx, Fy, Fz: ±0, 1N or better Tx, Ty, Tz: ±0,003 Nm				
Measurement accuracy	± 5 % RO or better				
Operating environment temperature, air humidity	-10°C to 40°C 10% to 80% relative humidity, non-condensing				
Protection class	IP67 (S250P), IP20 (S250N, S250L, S250H, S2503, S2506, S25010)				
Accessories included in delivery	Force Controller FS1, communication cable, robot mounting flange				

\*1. Cabling parts (user cables) not included.

\*2. Not compatible with protected model or G1 models.

\*3. Force sensor and mounting flange weight. Without cable.

## S250N for Epson ProSix C4 series six-axis robot

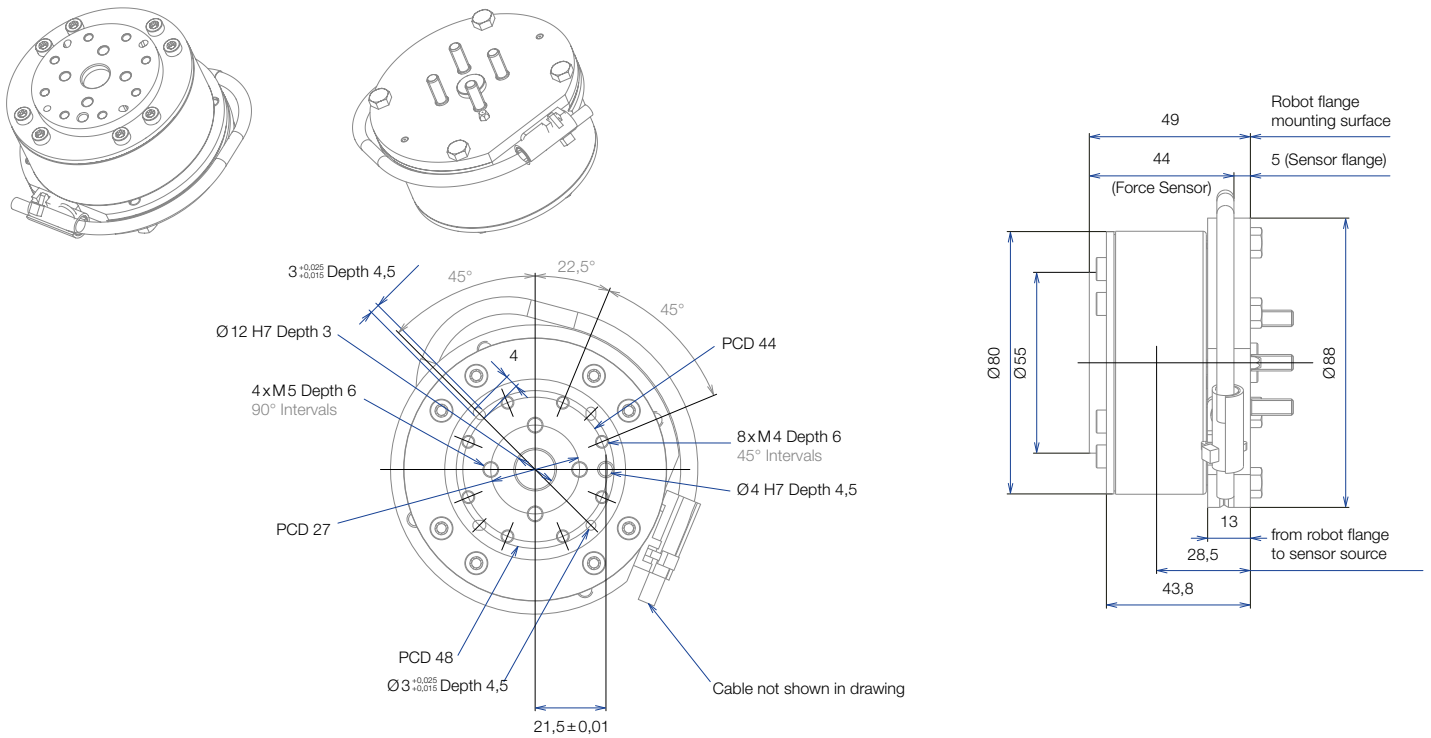


Force Controller FS1

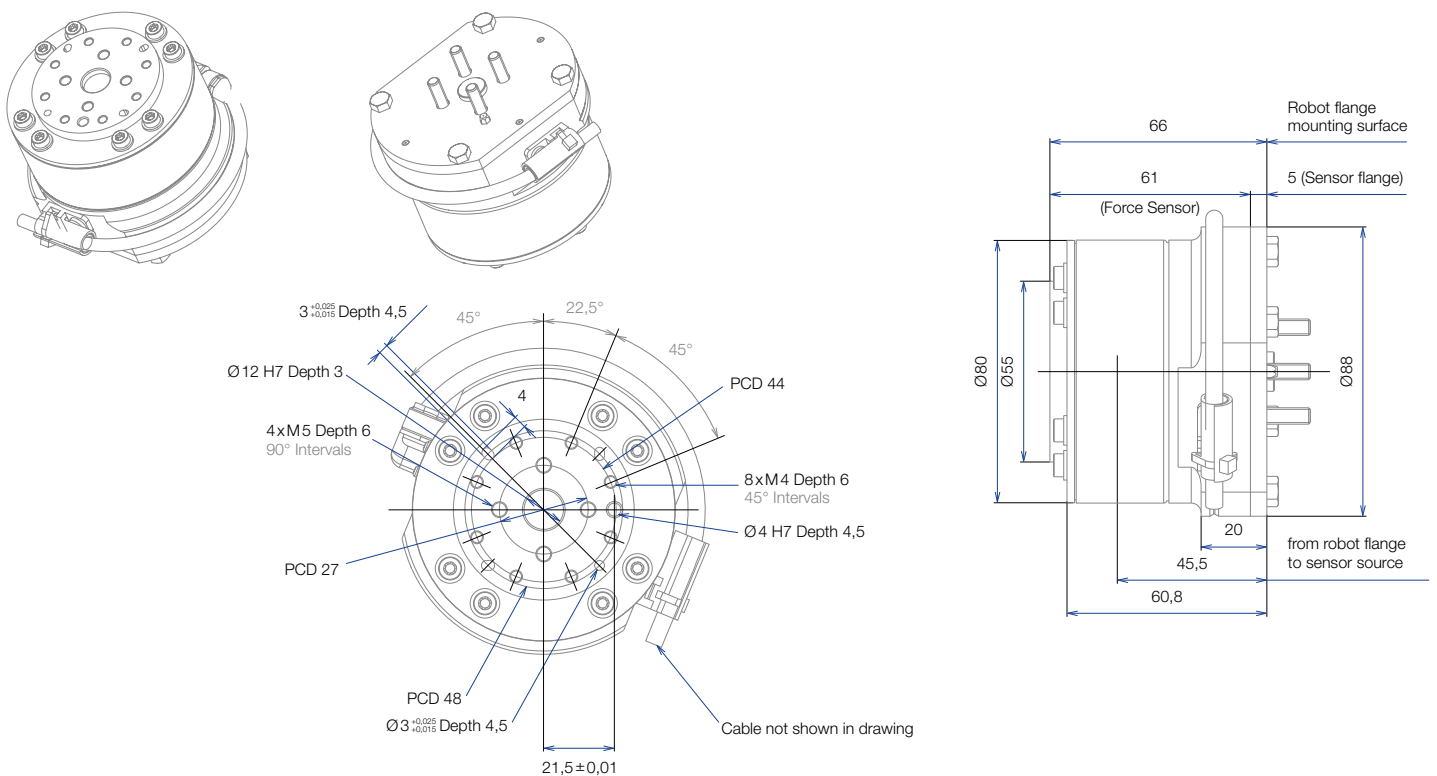
Dimensions	232 mm x 70 mm x 175 mm
Weight	1.360 g
Power supply	DC 24 V (±10%)



**S250L for Epson ProSix C8 series six-axis robot (standard / cleanroom / ESD models)**

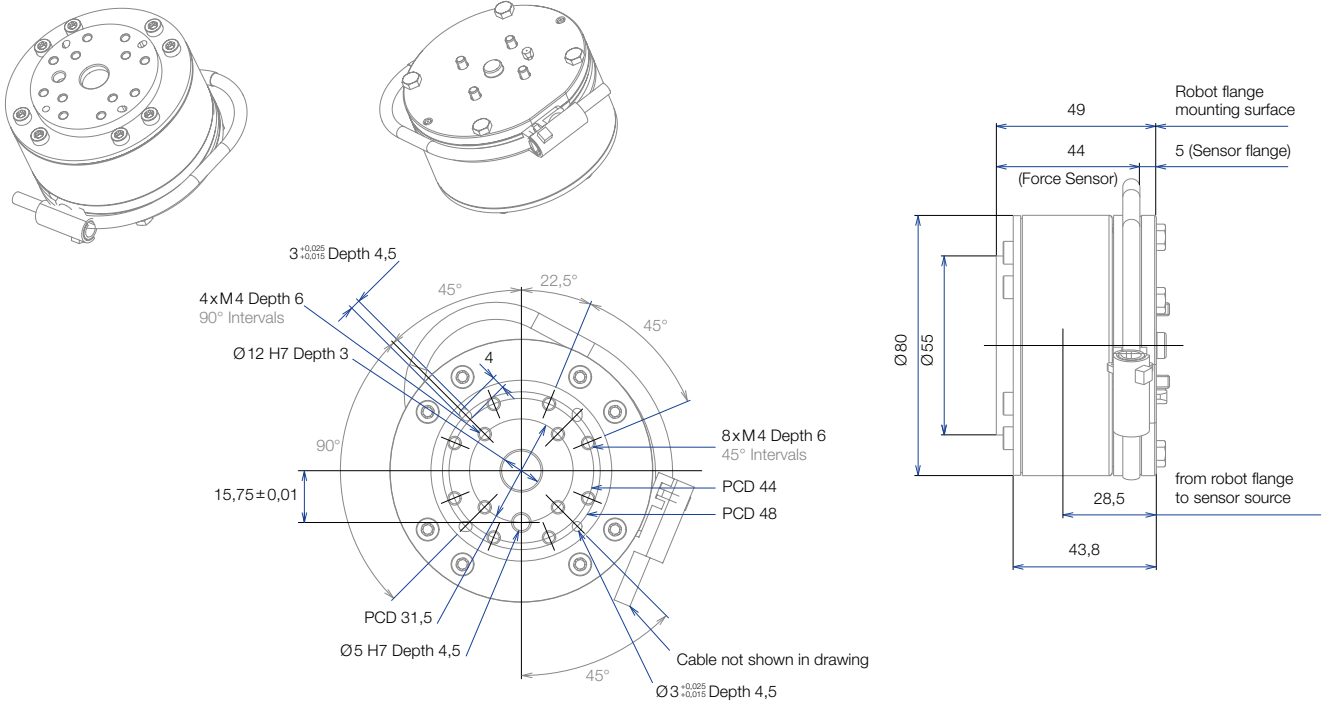


**S250P for Epson ProSix C8 series six-axis robot (IP67 protected models)**

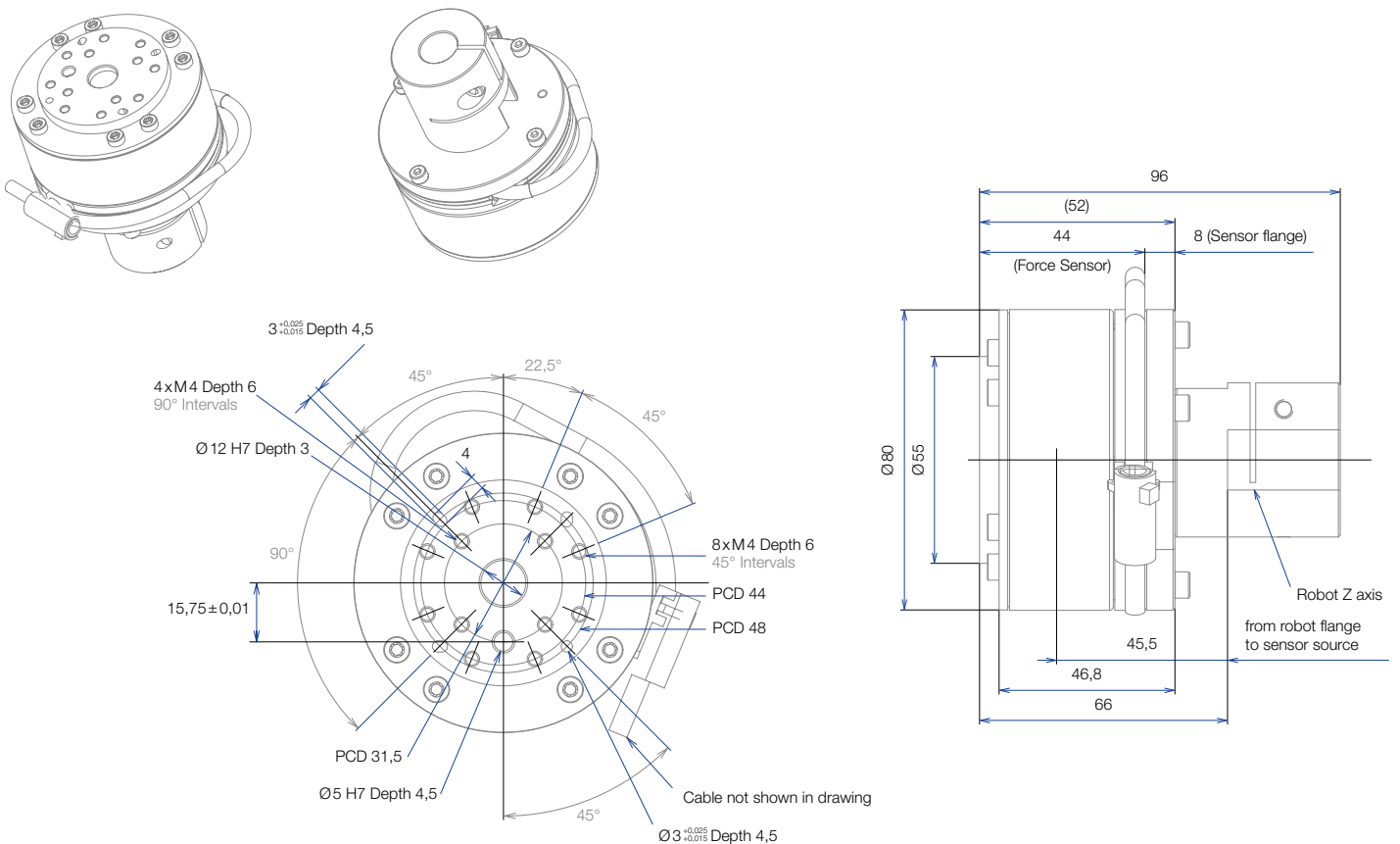


# Technical data overview

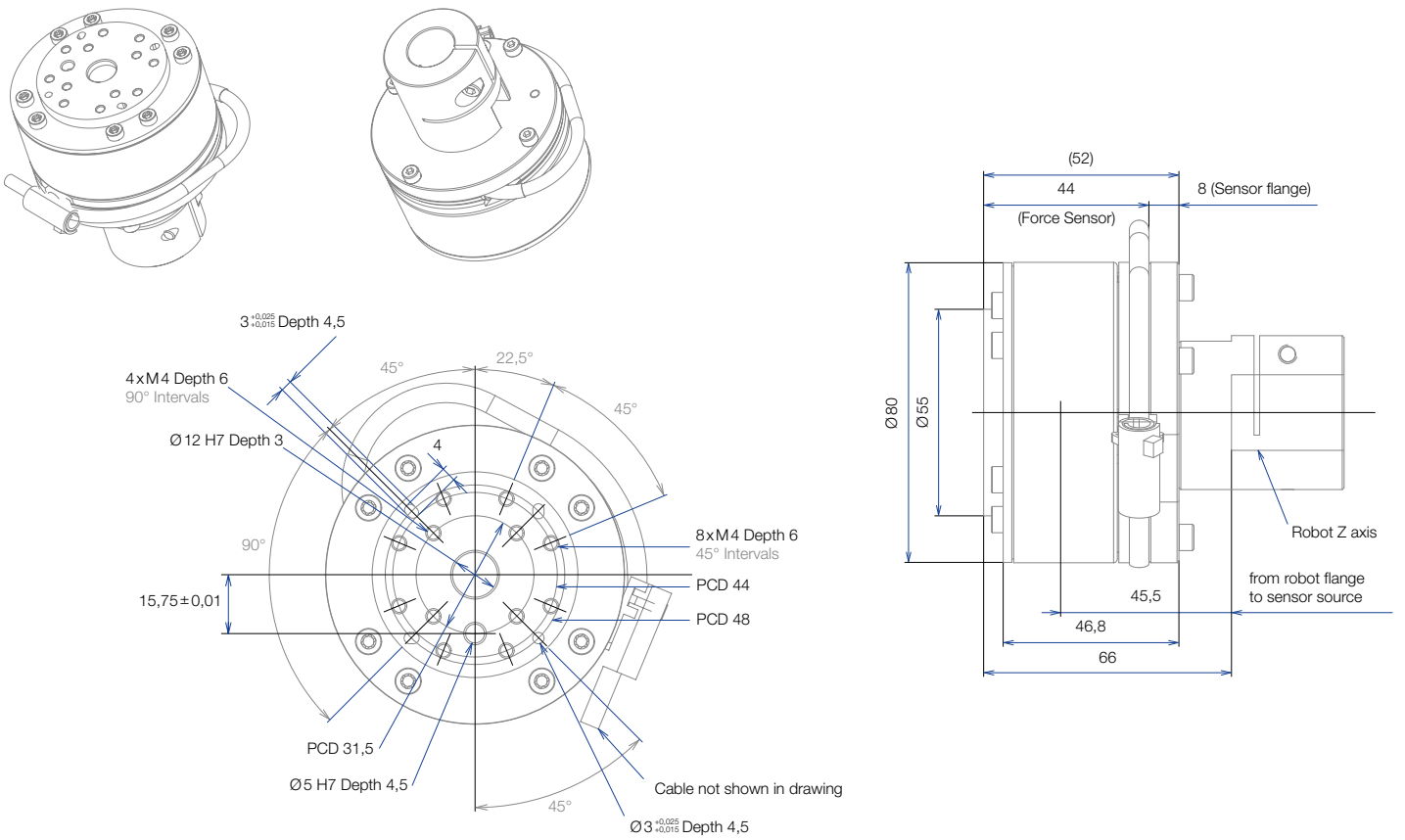
## S250H for Epson ProSix N2 series six-axis robot



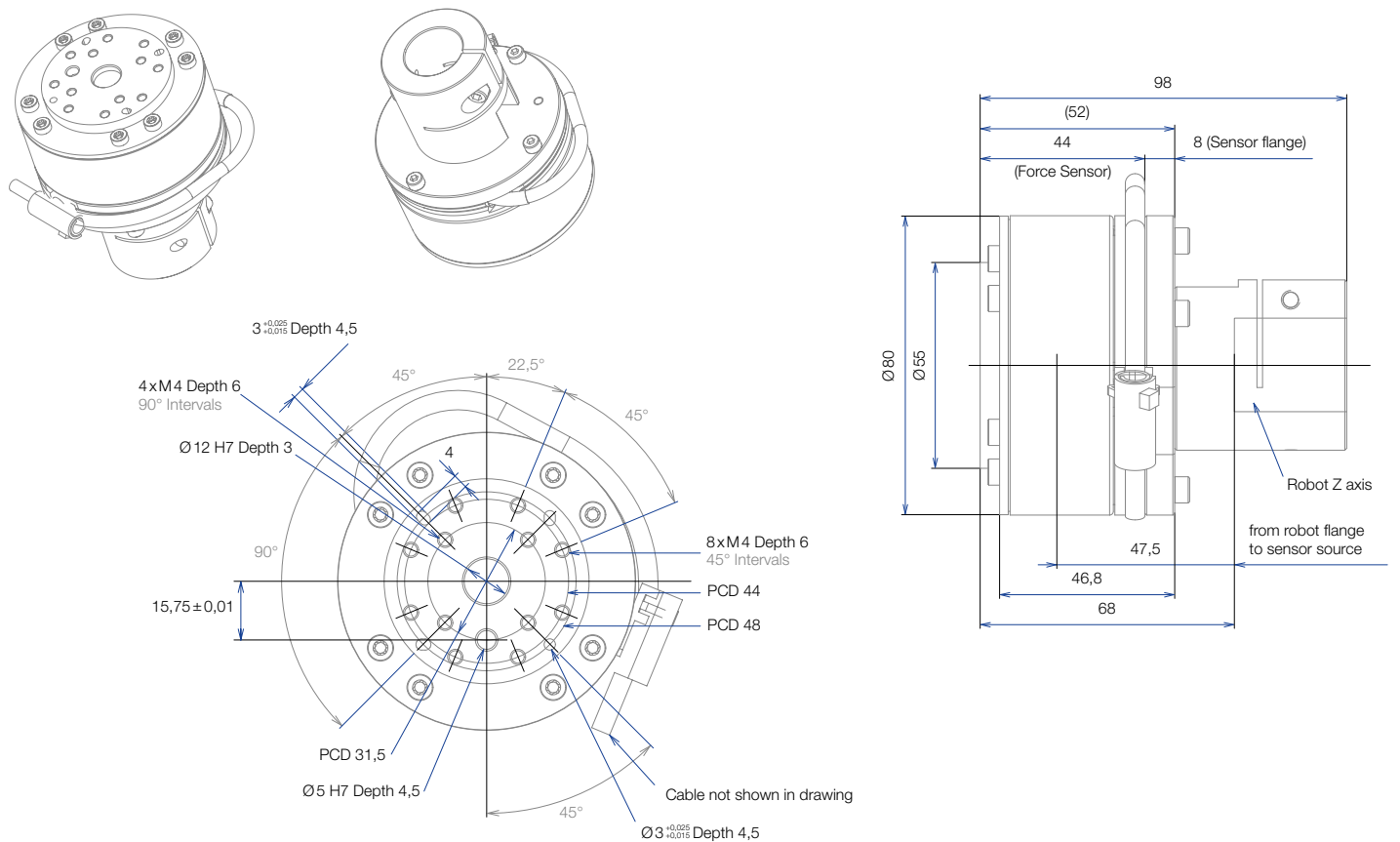
## S2503 for Epson SCARA G3, RS3 and RS4 robots



## S2506 for Epson SCARA G6 robots



## S25010 for Epson SCARA G10 and G20 robots



# About Epson

## **Epson robot systems. Accurate, fast and reliable**

Our robots palletise, saw, mill, drill, grind, install, assemble and build together. They work with precision and at breathtaking speeds across a wide range of applications, often up to 24 hours a day.

Our product range includes one of the most comprehensive SCARA model ranges worldwide; six-axis robots, controls and software.

## **Realise the full potential of your Epson Robot systems**

We offer a comprehensive pre- and after-sales support programme as part of our service. This includes:

Feasibility studies for maximum planning and project security

Support during planning and implementation

Introductory seminars, programming/maintenance courses and operator training

Inspection and customised maintenance designs

Customer service telephone service and on-site repair service

Central spare part stocking



## **Epson Spider robot**

The cost effective miracle. Due to its unique construction, the Epson Spider reaches every corner of its working area at unprecedented cycle times.



## **Epson SCARA robots**

Available in over 400 versions, Epson SCARA robots are compact and powerful, delivering precise work even at high speeds.

Epson Robotic Solutions is one of the leading suppliers of high tech robot systems that are renowned worldwide for their reliability. The product range includes six-axis robots, SCARA robots, the SCARA entry-level LS and T models, the special Epson-developed Spider and N2 robots types, as well as the pioneering Dual Arm robot. Added to this are image processing controls and the Epson Force Sensor for force-controlled applications.

### Technological pioneer

#### 1982

Epson SCARA robots freely available in Japan for the first time

#### 1986

First class 1 cleanroom robot

#### 1997

First PC-based controller

#### 2008

Inventor of the right or left arm-optimised G3 SCARA robot

#### 2009

Inventor of the spider – a unique SCARA robot with no dead zones

#### 2013

First application of Epson QMEMS® sensors in robotics, reducing six-axis kinematics vibrations

#### 2014

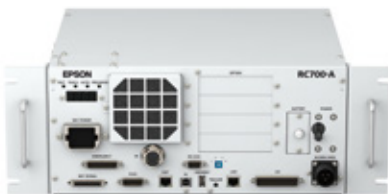
Epson Compact Vision CV2: Epson's own ultra-fast image processing computer

#### 2016

Epson N2 series: World's first six-axis robot with folding arm - extremely compact and space-saving

#### 2017

Epson Dual Arm robot with an arm geometry inspired by human physiology, as well as integrated sensors such as cameras, Force Sensors, and accelerometers



### Epson controls

Maximum performance in the smallest of spaces. The Epson controllers are based on a robust, integrated system, and can control manipulators and peripheral devices.



### Epson six-axis robot

Flexibility through rotary-designed axes. Thanks to unprecedented point and path accuracy, complex work processes can be achieved with precision.

# Epson Industrial Solutions Center – find your solution



Experience all our Epson robots in action. Build, simulate and improve your automation application in a workshop cell, with help from our experts. The cell can be controlled and networked using all conventional fieldbus systems. In addition, we can supply you with modern peripherals such as a vision and conveyor tracking system.

## Make an appointment

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