

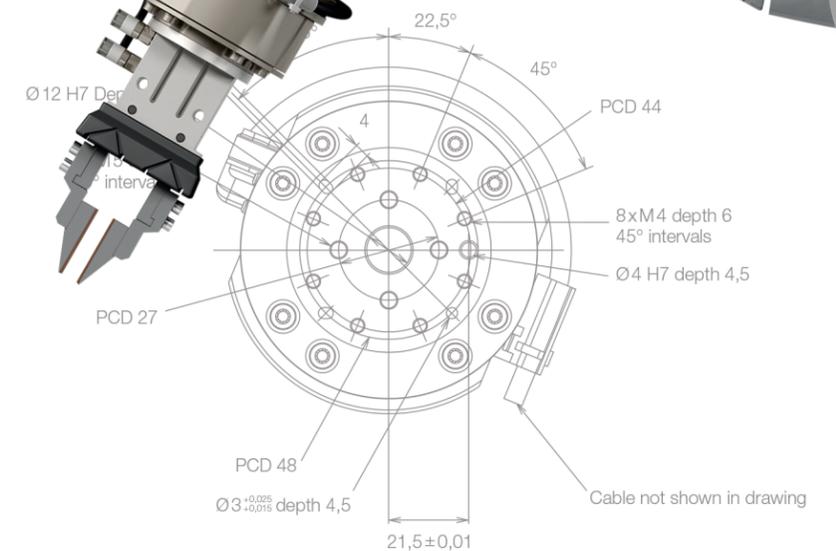


## Epson Business Solutions

Epson is a leading provider of innovative technology solutions that help businesses succeed. We partner with you to best meet your specific needs, focusing on:

- Improved productivity
- World-class customer service and support
- Cost-effective, high-quality solutions
- A commitment to the environment

Discover how Epson can help you work toward the future. [www.epson.com/forbusiness](http://www.epson.com/forbusiness)



# Intuitive Robot Force Guidance for High-precision Performance

Powered by proprietary Epson® Quartz Technology, Force Guide enables Epson robots to detect six axes of force with precision down to 0.1 N. Driven by real-time servo system integration, Force Guide delivers fast, tactile feedback to guide robots for high-precision parts placement. Easy to set up, Force Guide features a point-and-click interface with pre-configured solutions and built-in objects, helping to reduce the development time for precision applications.



## New Possibilities

Force Guide features three linear and three rotational measurement axes for extraordinary precision and remarkable rigidity — the perfect solution for advanced robot automation.

## Epson Force Guide



## Take Automation to the Next Level with Force Guide

**Powerful performance** — integrated force control system driven by proprietary Quartz Technology from Epson

**Ultra precise** — detects force and adjusts motion with amazing precision — down to 0.1 N

**Superior rigidity** — durable sensor built to withstand excessive force

**Fast robot/force guidance response** — internal sensor with real-time servo system integration

**Point-and-click setup** — easy-to-use interface with graphical wizards, charts and more

**Fast, easy implementation** — helps reduce the amount of coding with decision-based flowcharts and intelligent object tools

**Multi-axis force/torque sensor** — includes three linear and three rotational measurement axes

# Industry Solutions

Force Guide is the perfect automation tool for a wide variety of manufacturing industries. Our customers range from large Fortune 100 companies to small manufacturing facilities.

- Automotive
- Medical Devices
- Medical Lab Automation
- Consumer Electronics
- Electronic Components
- Industrial

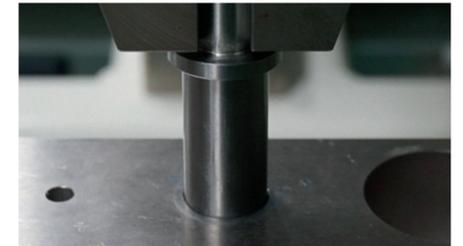


# Force Guide Applications

**Force and torque sensors are an increasingly significant component** for material testing, assembly, development and quality assurance. More and more companies around the world are using them because of their accuracy, versatility and reliability. Force Guide provides a wide range of automation possibilities:

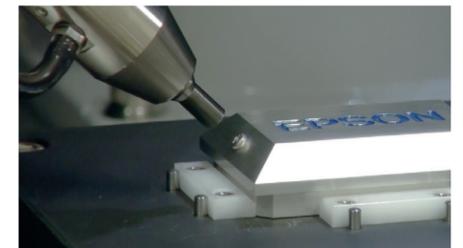
## Parts and Connector Insertion

With Force Guide, parts and connector insertion can be easily automated, for everything from pin-in-socket insertion to high-precision valve assembly. Epson sensors detect misalignment. And, because of their high sensitivity, the part or connector is easily inserted, helping to reduce the potential for damage.



## Screw Driving

Thanks to real-time force/torque feedback, the smallest of screws can be easily tightened, even when there is deviation in angle or location. By detecting the force, the robot can successfully execute the task, while preventing any stripping of the threads.



## Delicate Parts Handling

Because of its tight integration with the servo system, Force Guide makes it easy to handle glass and other delicate materials. Our quartz-based sensors allow for soft placement in applications that could otherwise result in breakage of glass or other fragile materials.



## Grinding/Polishing

Deburring and grinding of parts to accurately remove excess flash is possible with Force Guide, despite deviations in casting or dimensions. The tool remains on its path, due to real-time force feedback. Similarly, polishing can be automated so as to keep the tool pressing with constant and precise force to the part.



## Gear Meshing

On assembly operations, Force Guide provides the robot with the tools and data necessary to align and match the faces of various components, including multiple gears.

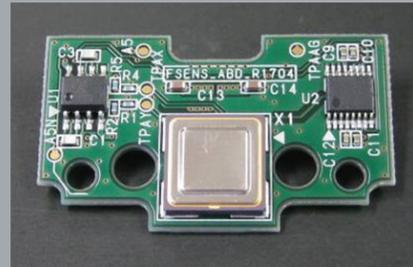


# Advantage Epson

**Drawing on our global expertise in robotic solutions,** Epson created Force Guide as a tool to improve productivity in automated manufacturing processes. Force Guide features proprietary Quartz Technology which provides remarkable rigidity and powerful performance, allowing customers to complete automation tasks that previously may not have been possible.

## Epson Quartz Technology

**Because of its proprietary Quartz Technology,** Force Guide offers exceptionally high sensitivity. At just 0.035 N, the digital noise in Epson sensors is extremely low. This results in a measurement resolution of just 0.1 N. This value level enables force measurements to be captured with superior sensitivity.



## High Rigidity

**Epson Force Sensors are incredibly robust and durable,** with exceptional resistance to both shock and external forces. Even with significant force and torque applied, you can still get precise results. Epson Force Sensors are built to withstand forces of up to 1,000 N.



## Powerful Performance

**Driven by real-time servo system integration,** Force Guide delivers fast, tactile feedback to guide robots with remarkable precision. This allows for a whole new level of performance for applications including parts insertion, handling of delicate components and more.

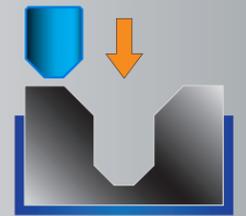
# Force Guide Tools

**Pre-configured force guidance** object tools provide a simple method for creating robot force-based motions and applications.

## 1 CONTACT

### Find the object

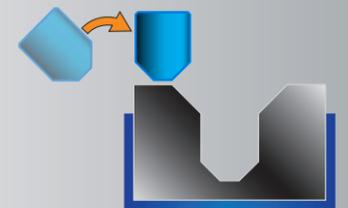
- Move to the object
- Detect the force based on touch
- Use soft touch so as to prevent damage



## 2 ALIGN

### Align the object, as needed

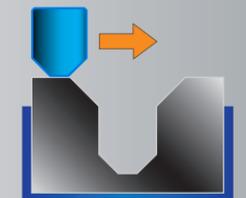
- Align the part to the placement surface
- Detect when the part and the surface are parallel or aligned
- Align the objects, whatever the orientation



## 3 PROBE

### Find the holes or steps needed

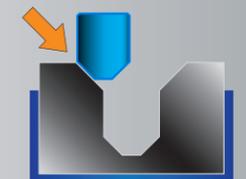
- Slide across the surface while pressing downward
- Detect downward force changes
- Utilize the preset probing patterns available (clover, spiral, etc.)



## 4 FOLLOW

### Move the robot based on the force detected

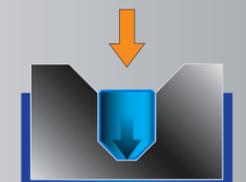
- Detect the direction and value of force
- Calculate the difference vs. the target force
- Move the robot so the force becomes zero



## 5 PRESS

### Continue to apply the necessary force to the object to complete placement of the part

- Detect the value of the pressing force
- Calculate the difference between that and the target force
- Move the components until the target force is reached



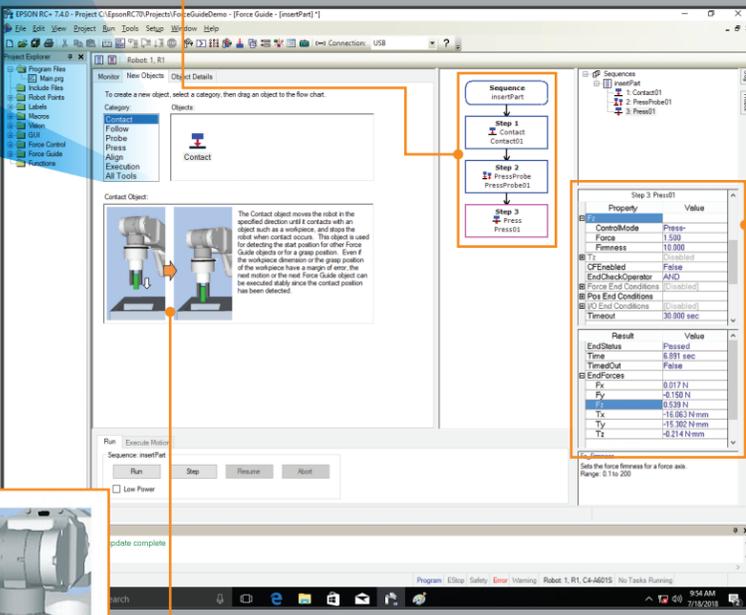
# Intuitive Interface

Fully integrated in the Epson RC+® development environment, Force Guide applications can be created and tested in an easy-to-use point-and-click fashion.

- Category:
- Contact
  - Follow
  - Probe
  - Press
  - Align
  - Execution
  - All Tools

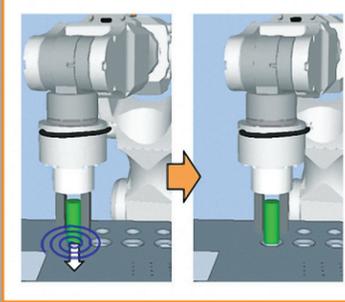
### Force Guide Sequence

The force guide sequence flowchart provides a simple drag-and-drop mechanism for defining the force guidance operational flow (ordering of steps). This reduces the amount of programming required for force guide applications.



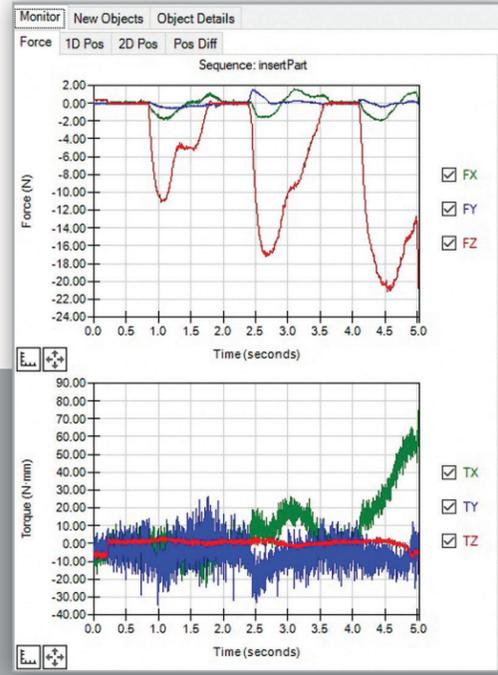
### Object Properties and Results

Users can input and adjust force and torque data. The software automatically generates associated results based on input parameters.



### Object Function Preview

A graphical representation is shown to illustrate the robot motions associated with specific force guide tools.



## Real-time Force Guide Monitoring

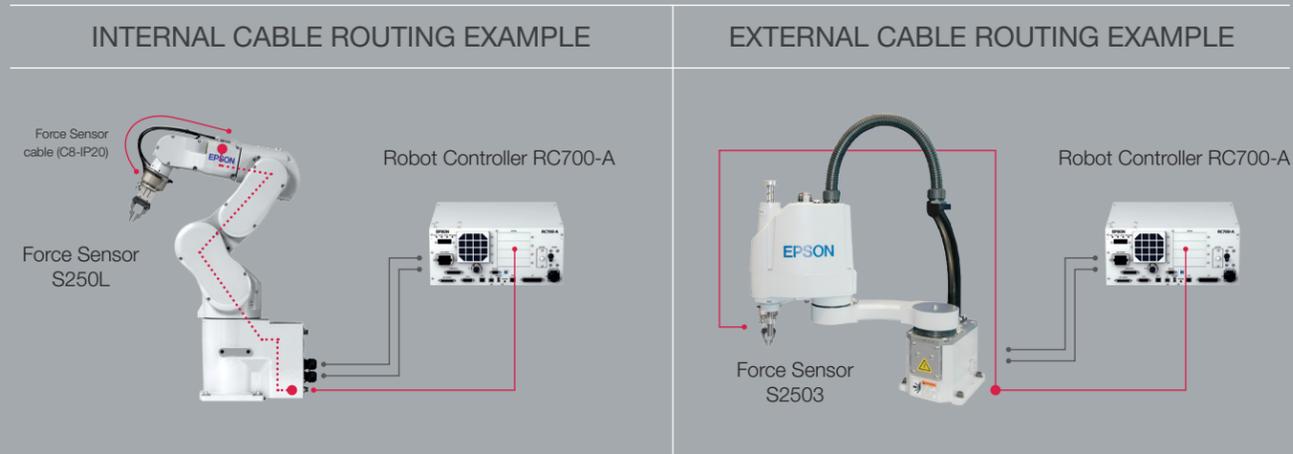
Force Guide provides real-time graphical representations of both force and torque, allowing users to see and adjust force guidance based on object parameters. Force Guide also provides visual feedback, and records and displays data logs to ensure operational reliability.

## Simple Teaching Through Manual Guidance

With manual guidance, users can reduce the time and complexity involved in teaching robot positions. Soft Servo Mode, soft motion assist and hand-eye guidance all play a part in minimizing jogging and creating a more efficient teaching process. Users simply move the robot by hand to the desired positions and record those positions on the touch-screen teach pendant.



# Force Guide Works with Both Epson 6-Axis and SCARA Robots



**Note:** Some robots come with internal cabling configurations, while others require external cabling for Force Guide connection. See table below for more details.

Model No.	S250N	S250L	S250P	SH250LH	S250H	S2503	S2506	S25010	
Compatible Robots <sup>1</sup>	C4-Series	C8-Series	C8-Series (Protected)	N6	N2	RS-Series	G3	G6	G10 G20
Cabling Routing	External	Internal	Internal	Internal	Internal	Internal	External	Internal	Internal
Dimensions (diameter x height)	80 x 49 mm	88 x 49 mm	88 x 66 mm	85 x 48 mm	80 x 49 mm	80 x 52 mm	80 x 52 mm	80 x 52 mm	
Weight <sup>2</sup>	460 g	520 g	680 g	460 g	460 g	620 g	620 g	640 g	
Compatible Robot Controller <sup>3</sup>	RC700-A								
Measured Degrees of Freedom	6-axis: 3 force components (Fx, Fy, Fz) and 3 torque components (Tx, Ty, Tz)								
Rated Load	Force (Fx, Fy, Fz)					250 N			
	Torque (Tx, Ty, Tz)					18 Nm			
Maximum Allowable Static Load	Force (Fx, Fy, Fz)					1,000 N			
	Torque (Tx, Ty, Tz)					36 Nm			
Measured Resolution <sup>4</sup>	Force (Fx, Fy, Fz)					± 0.1 N or less (5 sec, 25 °C)			
	Torque (Tx, Ty, Tz)					± 0.003 Nm or less (5 sec, 25 °C)			
Measurement Accuracy <sup>5</sup>	± 5 % RO or less								
Operating Environment	Temperature								
	Humidity								
Protection Class	IP20	IP20	IP67	IP20	IP20	IP20	IP20	IP20	IP20
What's in the Box	Force Sensor, Force Control Board or I/F Box, Cables, Mounting Flange								
Safety Standards	CE Mark, EMC Directive, KC Mark								
Support	Customer Service		(562) 290-5920	service@robots.epson.com					
	Applications Support		(562) 290-5930	applications@robots.epson.com					
	Sales Inquiries		(562) 290-5997	info@robots.epson.com					

1 Robots not supported: G1, LS-Series, T-Series, EZ Modules  
 2 Weight includes force sensor and mounting flange; does not include control board and cables.  
 3 Controllers not supported: RC180 and RC90  
 4 The measurement resolution including the noise level and time drift (25 °C), when the measurement time is 5 seconds.  
 5 The measurement accuracy when the measurement time is 6 minutes.

# Why Epson Robots?

As precision automation specialists, the Epson Robots team has been building automation products for over 35 years. Leading the industry in small-parts assembly applications, we've introduced many firsts. As a result, our innovative products are hard at work in thousands of manufacturing facilities throughout the world.

## Leading Epson Technology

- ▶ Epson is the #1 SCARA robot manufacturer in the world
- ▶ We introduced the world's first folding-arm 6-Axis robot
- ▶ Many of our robots contain integrated motion sensors to reduce vibration and increase performance

## What You Need, When You Need it

- ▶ The Epson lineup features 6-Axis and SCARA robots with payloads up to 20 kg and a reach ranging from 175 to 1,480 mm
- ▶ We offer a wide range of integrated options including Vision Guide, Force Guide and more

## Intuitive Programming Software

- ▶ Epson RC+ software is extremely user friendly, making automation setup fast and easy

## Reliability You Can Count On

- ▶ Our team is dedicated to helping you find the best solution for your automation needs
- ▶ Epson robots are designed to last a long time with little maintenance

