THE FACTORY AUTOMATION COMPANY

FANUC

Force Sensor

Tactile intelligence

Assembling
Contouring
Measuring

Automated craftsmanship for assembly, contouring and measuring applications

FANUC's range of force sensors opens up a whole new realm of possibilities for intelligent automation solutions. That's because force sensors equip robots with an almost human-like sense of touch, enabling them to detect force and torque applied to the end effecter in 6 degrees of freedom. With craftsman-like precision, robots fitted with this technology can perform assembly, contouring and measuring tasks across a vast number of industries. Four different sensor sizes are suitable for 6-axis robots to support payload classes up to 250 kg.

More productivity

- complete integration into the robot for faster processing
- supports practice-proven standard functions
- robust hardware and intelligent software for reduced cycle times – all 100% FANUC
- combines Force Control and *i*RVision for unique functionality

Faster setups and maximum uptime

- fast setups thanks to complete integration into the robot (no interface to external devices)
- ready to use software library of addition features
- seamless integration with FANUC vision systems
- fewer parts and FANUC's reliability for maximum uptime

Quality control

- complete production data tracking and logging
- high precision on assembly and contouring applications
- automated force operation ensures consistent quality for process
- full range of measurement options

Opening up your options

- assembling – high-precision face matching, positioning, fitting, feeding, insertion up to clearance H7
- contouring – accurate deburring, grinding, sanding and polishing
- measuring – versatile mass measurement, weight and gravity centre calculation

Discover a large range of precision applications

Worldwide FANUC service & support

See: www.fanuc.eu/uk/en/lifetime-management

Deburring and grinding

Deburr and grind parts precisely by compensating for dimensional deviations in castings and ensuring the tool remains on the contour despite changes to the effective path.

Polishing

Polish metal parts by measuring the force applied and controlling the robot's motion path in real time to keep the tool pressing with constant force to the part.

Assembling

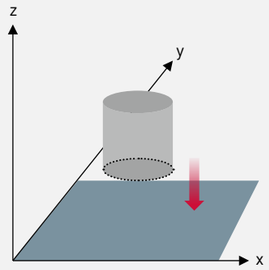
Assemble gearboxes and other mechanical devices using coordinated robots to hold the base unit and phase match cogs and bearings.

Fitting and inserting

Fit parts and insert workpieces vertically or horizontally into a chuck or tool holder to very exact tolerances without jamming.

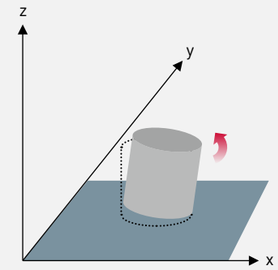
Contact us to find the perfect solution for your industry: **www.fanuc.eu**

Intelligent features for better performance



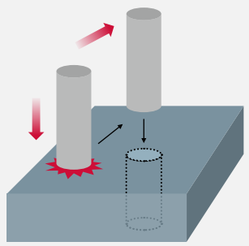
Constant Push

This enables the robot to push with constant force in one direction. After it reaches a predefined "Contact Force Threshold", the robot starts to push with "Pushing Force" for a specified time.



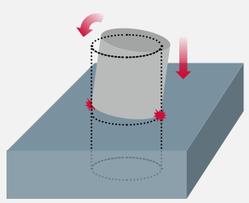
Face Match

On assembly and contouring operations, this provides the robot with the ability to align and match the faces of components or workpieces.



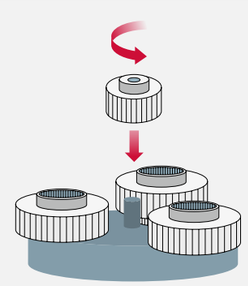
Hole Search

Enables the robot to search for a hole by moving the shaft or object to be inserted at right angles to the hole. This can then be followed by an insertion.



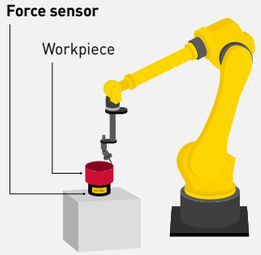
Shaft insert

Allows loose fitting by aligning the angle and position of a shaft with a hole before insertion.



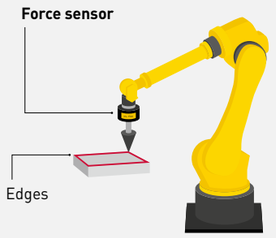
Phase match

This function performs phase matching of teeth, such as key shaft insertion and gear engagement. It aligns gears or key shafts by rotating and meshing them before final insertion is executed.



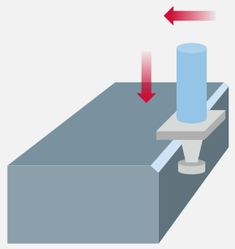
Fixture Mount Force Sensor

Ideally suited to precise fitting, phase matching and contouring operations, this allows the force sensor to be mounted on a table. Table mounting the sensor also reduces the weight of the end effector and enables the robot to carry different tools.



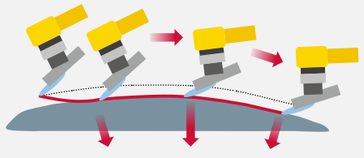
TP Program Auto Generation

On processes requiring accurate contoured edges, this feature records the path of the workpiece and automatically generates a TP program.



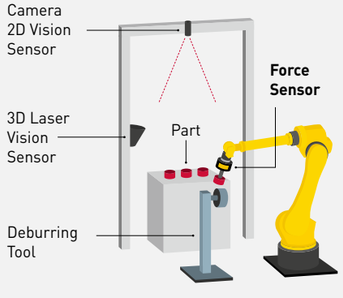
Two-Direction Push

On deburring and contouring operations this enables the robot to push down and in different directions at the same time.



Contouring

On sanding, grinding and polishing operations involving uneven or irregular surfaces, this feature measures the force applied to the tool and surface of a workpiece and applies constant force. The robot follows the uneven surface even if it differs from the surface it has been taught to follow.

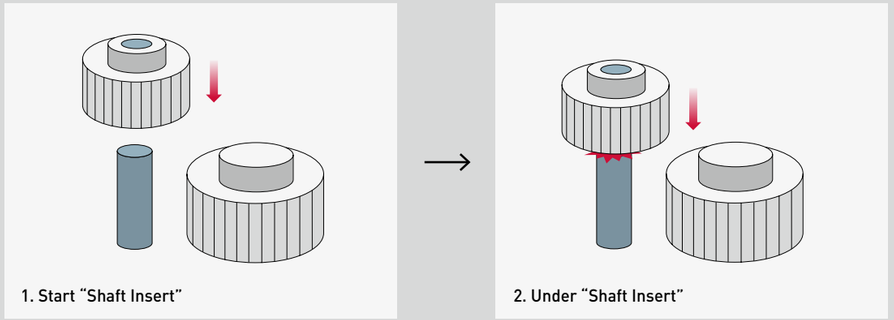


Deburring Path Auto Generation using *i*RVision

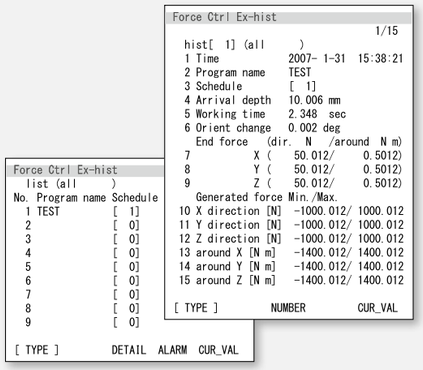
Automatically generates a TP program using positional information acquired with FANUC *i*RVision's Image to Points feature. With absolutely no need to teach, deburring can now be carried out using the optional Force Control Contouring function.

Combining features for more versatility

Force control commands are connected on a master/slave basis for easy execution



Complete quality control



Execution History Screen

To provide a complete overview of your processes, the Execution History Screen displays both key and detailed data on different screens. Parameters such as insertion depth, duration of insertion and force applied can all be checked and recorded.

Data Viewer

In order to provide a process archive and make adjusting and fine tuning Force Control easy, this function logs force sensor data and allows you to output it graphically.

Force Control features

- 5 different types of sensors available: 15, 40, 100 and 250 kg
- Easy to use predefined force functionalities:
  - · Insert functions (insert shafts, bearings etc. for almost every conceivable part)
  - · Contouring function (follow a contour and apply defined force to the surface)
  - · Search functions (find holes, grooves or clutch disks)
  - · Match function (match gripper/tool to surface orientation)
  - · Push function (for adhesive bonding of retainers in an airplane body for example)
- Data logging with visualisation as Force graph
- Tool weight and centre of gravity calculation
- TP auto generation by tracing path when contouring
- The sensor can be used in 2 ways:
  - · robot attached (as in this brochure pictures)
  - · fix mounted (on table or jig)

Technical overview grid

	DOF	Dim Ø [mm]	Weight [kg]	Rated load		Static overload tolerance		Resolution		Accuracy [%]
				Fx, Fy, Fz [N / kgf]	Mx, My, Mz [Nm / kgfcm]	Fx, Fy, Fz [N / kgf]	Mx, My, Mz [Nm / kgfcm]	Fx, Fy, Fz [N / kgf]	Mx, My, Mz [Nm / kgfcm]	
FS-15*i*Ae										
	3 axis	90 x 36	0.31	147 / 15	11.8 / 120	1570 / 160	125 / 1280	0.39 / 40	0.016 / 0.16	less than 3
FS-15*i*A										
	6 axis	94 x 43	0.57	147 / 15	11.8 / 120	1570 / 160	125 / 1280	0.39 / 0.04	0.016 / 0.16	less than 2
FS-40*i*A										
	6 axis	105 x 47	0.87	392 / 40	39.2 / 400	3920 / 400	392 / 4000	1.0 / 0.1	0.029 / 0.29	less than 2
FS-100*i*A										
	6 axis	155 x 59	3.2	980 / 100	156 / 1600	9800 / 1000	1560 / 16000	2.0 / 0.2	0.08 / 0.8	less than 2
FS-250*i*A										
	6 axis	198 x 85	6.9	2500 / 255	500 / 5100	25000 / 2550	5000 / 51000	4.9 / 0.5	0.25 / 2.5	less than 2

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