Integrated Force Control
Adaptive motion technology

Integrated Force Control is one of the key technologies driving the uptake of industrial robots. ABB's Integrated Force Control function facilitates the ease-of-use for robots in applications requiring real-time adaptive motion control.


Tactile sensing makes intelligent robots

ABB Integrated Force Control automates complex tasks which once required skilled personnel and advanced fixed automation. The robot is equipped with tactile sensing which save installation costs, shortens programming time, reduces process cycle time and improves quality.

The adaptive functionality of Integrated Force Control can be used in many applications, including assembly, product testing and machining. The technology includes powerful functionality that allows the robot to maintain a constant force between itself and the objects it is working with, which is invaluable in both machining and testing applications. The technology also can be used to adapt the robot's speed upon input from the force sensor. This allows it to follow edges and other contours efficiently, such as in deburring of complex shapes. The tactile functionality of Integrated Force Control can also be used in assembly to search for correct positions using advanced search patterns.

How does it work?

Normally robots are position controlled with a predefined path and speed. With ABB Integrated Force Control, the robot reacts to its surroundings and deviates from the programmed path or speed based on feedback from the force sensor. The adapted movement of the robot is determined by constraints that are specified to suit the particular application.
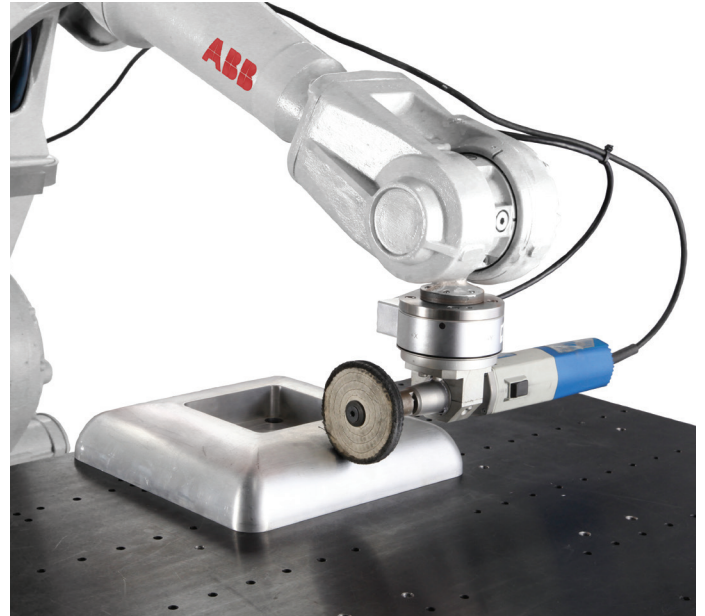
Assembly applications

With Integrated Force Control automated assembly tasks are now possible using traditional robot automation. Compared with expensive hard automation, robotic solutions offer a lower cost investment and greater degree of flexibility.

Assembly is a very demanding application in which parts with small tolerance's must fit together. With ABB's Integrated Force Control technology parts with very small tolerances can be assembled repeatability without requiring highly accurate and expensive fixtures. Integrated Force Control significantly reduces the risk of assembly failures which may result in production problems or damaged parts. A force controlled robot can be programmed to mimic the movements of a human arm, applying search patterns to find the correct position to assemble the part.

Machining applications

Force Control can be use to improve robotic machining applications such as grinding, polishing, deburring and deflashing. One of the software's features, FC Pressure, allows a robot to grind, polish or buff parts whilst maintaining a constant force between the tool and the work piece. Another feature, FC SpeedChange, enables a robot to deburr or deflash partlines and surfaces of parts at a controlled speed, thereby slowing down when encountering excessive burrs or casting flash. This functionality reduces programming time and cycle times in demanding machining applications, and can also considerably increase tool life.

Power and productivity
for a better world™

ABB

Integrated Force Control

Product testing applications

Product testing is another application area where tactile sensing has advantages. It can be used for test products, for example car seats, steering wheels, hatches, glowe compartments and other similar parts. A robot equipped with force control can perform repetitive tasks with pre-defined forces and movement patterns. Because the forces and movements can be recorded, highly secure traceability is possible. ABB Integrated Force Control technology provides for flexible robot automation for testing tasks that was once only possible with expensive hard automation.

Other applications

There are many other applications areas where Force Control is being used to solve complex automation problems with simple and effective solutions. The ability to equip robots with tactile sensing, and combine it with other sensors, like cameras or scanners, gives unlimited possibilities to automate complex tasks which today required skilled personnel.

Software features

– Advanced software for force control technology
– Force Control RAPID instructions supporting machining, assembly, testing, etc
– Sensor calibration, load identification, gravity compensation
– Recovery functions
– Configuration of conditions and constraints
– Supervision
– Process feedback from Force Sensor
– Support any 6 degree of freedom force torque sensors
– Support any 1 degree of freedom force sensor
– Functionality to use analogue voltage signal (e.g. spindle voltage output) instead of force sensor for FC Speed Change functionality

ABB Integrated Force Sensors

ABB offers a package that contains all the necessary hardware and software to run force control functionality. The package contains;
– Force sensor, measures all six components of force and torque
– Adapter plate
– Shielded high-flex cable
– Voltage measurement board, measurement interface to IRC5 controller
– Force control software

The force sensor is fully integrated into ABB's hardware and software. The force sensor has a robust design offering high overload & IP65 protection, and is EMC tested. The compact and lightweight design makes it suitable for high precision robotic applications.

Specification	Sensor 165	Sensor 660	Sensor 2500
Capacity			
Fx, Fy	165 N	660 N	2500 N
Fz	495 N	1980 N	6250 N
Mx, My, Mz	15 Nm	60 Nm	400 Nm

ATI Force Sensors

In addition, ABB Force Control can also be used with ATI Force/Torque sensors – models Delta, Theta and Omega – with IP60 or IP65 protection and Viton seals for aggressive environments.

Power and productivity
for a better world™

ABB