Flex Finishing
Force Control for Machining Applications
The traditional way a user programs a robot is to define the path and the speed. These will be constant – independent of the process forces. If the path does not coincide with the surface and dimensions of the part, you will instantly have quality problems and potential damage to the tooling.

**Force Control (FC)**

This is a known fact in the robotized finishing process. Users have spent a lot of time trying to correct these deficiencies and additional flexible toolings and servo axes were often needed. Three new functions add a new dimension to the use of robots in machining operations:

**FC Graphical Programming Interface**

The robot will be made “soft” and the operator will be able to move the robot by hand to some reference positions defining the path. The manually taught paths will be used as the basis for Automatic Path Learning. The robot will run FC Pressure functionality and follows the surface/edge and at the same time the robot records the accurate path.

**FC Pressure**

Will make sure that the robot will always follow the surface as the tool travels along the programmed path. The path can be linear or circular. The robot position perpendicular to the path direction will be changed continuously in order to maintain the force (contact pressure the toe surface).

**FC SpeedChange**

Will keep the process forces constant by changing the robot speed when the burr along a part line changes. This will keep the material removal rate below a maximum value when the depth of cut is increasing.
Function Package (FC) for Machining Applications

Function Packages as a starting kit for those customers who would like to integrate the application/process themselves. The offer includes mounting of the sensor, testing and verification, as well as having the cable package integrated on the robot.

The basic Function Package includes

- RW Machining FC
- Graphical User Interface (GUI)
- Axis Board plus
- DAQ Board
- Force/Torque sensor
- Cable package
- Assembled, tested and verified

The investment will lead to advantages, enabling the customer to focus on the application/process during integration. Setting up the system is a generic technique, independent of the process. Buying this option will eliminate the basic setup of the system that has a large risk of being costly in terms of time and resources, affecting the final result if not done properly. The Function Package Force Control is available for: IRB 140, IRB 2400, IRB 2600, IRB 4400, IRB 4600, IRB 66xx (IRB 6640, IRB 6650, IRB 6660) and IRB 7600.

The benefits of Force Control are ...

<table>
<thead>
<tr>
<th>Ease of use – shorter programming-</th>
<th>Quality improvement minimized risk of damage</th>
</tr>
</thead>
<tbody>
<tr>
<td>fast integration: tuning- and cycle times</td>
<td>in production: to work piece, tools and robot</td>
</tr>
<tr>
<td>Improved minimized injury and health risks</td>
<td>working conditions: for personnel</td>
</tr>
<tr>
<td>Lower costs: predictable tool wear and extended tool lifetime</td>
<td>Higher productivity: ability to handle variations in location of burrs and flashes</td>
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<tr>
<td>Better the ability to control the</td>
<td>Better process results: process force, not the positions</td>
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Conventional result, Position controlled

New result, Force controlled
Flex Finishing Cell
ABB Robotics has developed an innovation called Flex Finishing Cell, a complete package which includes:

- IRB 140F industrial robot
- Function Package FC Machining
- Manual 2 station turntable
- 2 meters high, 2 meters wide base plate including cell housing
- A spindle
- Tool buffer for up to 5 tools
- Graphical User Interface (GUI)
- Human Machine Interface (HMI)

The Flex Finishing Cell represents a standardized, verified robot solution in the form of a robotized cell, which can be programmed for different tools and adapted to different components and work objects.

<table>
<thead>
<tr>
<th>Typical materials</th>
<th>Typical production processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel</td>
<td>e.g. to cut secondary flashes</td>
</tr>
<tr>
<td>Stainless steel</td>
<td>Grinding or polishing of edges</td>
</tr>
<tr>
<td>Aluminium, Magnesium</td>
<td>Deflashing after die casting</td>
</tr>
<tr>
<td>Wood</td>
<td>Grinding &amp; milling of wooden parts</td>
</tr>
<tr>
<td>Plastic</td>
<td>Deflashing, grinding and polishing</td>
</tr>
<tr>
<td>Glass</td>
<td>For rounding of sharp edges</td>
</tr>
</tbody>
</table>

Main Cell Data
- Weight: 2000 kg
- Supply connections: 400V/50 Hz, 6 bar (oilfree, dry)
- Spindle Power: 3.3 kW
- Revolutions (max.): 50,000 rpm
- Toolchanger: SKI 11.5
Take the robot by the hand and with just a few clicks, arrive at a new dimension of robot intelligence for the finishing process.
Contact us

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