Integrated Force Control
Robotic real-time tactile feedback
Fully integrated force control technology
Integrated Force Control
Robotic tactile feedback

- Force controlled robots
- Creates precision without the expense of being precise
- Manage geometrical differences
- Improved process quality
- Reduces cycle time
- Saves programming time
- Increases life of process tools
- ABB Integrated Force Control
- Fully integrated hardware and software reduces complexity and cost
- One stop shop for advanced force control functionality
Integrated Force Control
Application usage

Machining applications
- Grinding / Polishing
- Deburring / Deflashing

Automotive assembly
- Assembly of torque converter, clutch, pistons, etc

Other assembly tasks
Product testing
Automated fastening

Force control technology opens up new robot applications
ABB Force Control Technology
Assembly applications

- Fixed path
- Fixed speed
- Uncontrolled contact force
- Potential part damage
- Potential tool damage
- Potential assembly failure

+ Adaptive path
+ Adaptive speed
+ Controlled contact force
+ Eliminate part damage
+ Increase tool life
+ Reduce assembly failure
Torque converter assembly

- Cylinder fit in a hole
- Four steps of searching
- Double gearbox alignment

Clutch assembly

- Toothed hub must be inserted through five identical toothed rings
- Rings can move in horizontal plane and rotate about vertical axis

Benefits

- Cycle time typically reduced by 50% versus manual assembly
Position control

- Fixed path
- Fixed speed
- Uncontrolled contact force
- Potential part damage
- Potential tool damage
- Potential bad quality

Force Control “Pressure”

- Adaptive path
- Constant speed
- Controlled contact force
- Eliminate part damage
- Increase tool life
- In-built process quality

Force Control “SpeedChange”

- Fixed path
- Variable speed
- Controlled contact force
- Eliminate part damage
- Increase tool life
- In-built process quality
Target:
- Achieve a consistent grinding result.
- Make the system easy to program

- Force control is used to maintain a constant force on the part during the process.
- Benefits: the part surface is ground equally on the whole surface. Increased quality versus manual operation.
Integrated Force Control
Fully integrated hardware and software

Contains all required components to use ABB’s proven force control technology

**ABB Force sensor**

- Measures all six components of force and torque
- Robot mounted or room fixed
- Adapter plate
- Shielded high-flex cables
- Voltage measurement board
  - Measurement interface to IRC5 controller
- Force control software
ABB Force Sensor
Fully integrated for high precision robotic applications

- Fully integrated into ABB’s hardware and software reduces complexity and cost
- One stop shop for advanced force control functionality
- Robust
  - High overload protection – 10 times nominal load
  - EMC tested
  - IP65 rating
- Compact and lightweight
- High precision for robotic applications
  - Assembly
  - Grinding & Polishing
  - Testing & Weighting
- Flexibility – can be used both mounted on robot or stationary
ABB Force sensor
Sensor specification

<table>
<thead>
<tr>
<th>Specification</th>
<th>Sensor 165</th>
<th>Sensor 660</th>
<th>Sensor 2500</th>
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<td><strong>Capacity</strong></td>
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<td>Fx, Fy</td>
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<td>660 N</td>
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<td>IRB 4400</td>
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<td></td>
<td>IRB 1600</td>
<td>IRB 2600</td>
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## ABB Force sensor
### Adapter specification

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ABB force control technology can be used with other force sensors from other suppliers

ABB also uses ATI Force/Torque sensors

Models Delta, Theta and Omega

IP60 or IP65 protection

Delivered with

- Adapter plate
- Cabling
- Calibration information for IRC5 integration
Force control software
The brain of robotic tactile sense

- Advanced software for the force control technology
- Fully integrated and pre-configured for ABB force sensor
- High performance real-time path correction based on sensor feedback
  - Very fast response time
- Specific set of RAPID instructions for force control applications
- Process feedback from force sensor
- Functions for
  - Sensor calibration, load identification, gravity compensation
  - Conditions and reference values
  - Recovery and supervision
Force controlled robots

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