



# RobotWare Assembly FC

## Force Control for Assembly



## Revolutionary new world of automated assembly

RW Assembly FC (Force Control) is a new robot option that will greatly facilitate the use of robots for assembly tasks.

### Tactile sense makes the robot smart

Now it's possible to automate assembly tasks which earlier required skilled personnel. Force Control adds sensor feedback to the robot's positioning and allows the robot to search for the correct assembly position. Force Control adds advanced search patterns and also different options in order to indicate when the job is done.

Assembly is a very demanding application in which parts with small tolerances must fit together, e.g shafts into gear wheels. Since tolerances are in the size of robot repeatability, this normally requires high accuracy fixtures and still the risk for position failure or stuck/damaged parts is very high.

With Force Control the robot is equipped with "tactile" sense and can therefore handle the parts like a human worker, i.e. search along a predefined pattern and try pushing until the parts slip into position with only small contact forces used. This will save not only installation costs and programming time but also reduce the process cycle time.

The "tactile" robot control will be very useful also for product testing.

### Functional description

Normally robots are position controlled, which means that the robot is forced to move to a certain ordered position. If the robot is prevented in reaching the target, the servo will increase power until maximum torque or collision is detected.

With RW Assembly FC it will be possible to let the robot search along a surface while keeping a predefined contact force. Once the mounting hole is found, the part will "fall" into place and the robot will push the part into the opening until the correct position is reached.

A typical assembly task will be, for example, the mounting of the axis and wheels in a clutch. Such a task includes several different movements to find the correct location and insert the axis and has until now not been possible to automate using traditional robots. For any assembly task it will be possible to tailor the optimum search pattern/movement and choose between a number of criteria for accepting/ending the operation.

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## Examples of target applications within power train assembly

- Bearing installation
- Bearing liner insertion
- Gear pump assembly
- Piston assembly
- Spark plug assembly
- Valve insertion
- Reverse servo installation
- Clutch assembly
- Splined shaft insertion
- Sun gear assembly
- Torque converter assembly
- Transmission assembly

## Examples of other applications

- Hold and weld
- Framing
- Press break tending
- Tool exchange
- Automatic search operations
- Die cast extraction

## Examples of product testing

*The tactile sensing will be very useful for different kinds of product testing like:*

- Seats
- Steering wheels
- Glow compartments
- Switches
- Drawers
- Hatches / lids
- Levers
- Buttons

## Features

- Sensor calibration and load identification
- Activation and deactivation of Force Control
- Defining reference values (desired force, torque and/or search pattern)
- End conditions (how long to apply the force, torque and search)
- Supervision
- Reading data about loads, forces or process status
- Up to four robots can be controlled independently in a MultiMove cell

## Product

*RW Assembly FC is based on the following:*

- Advanced software for force control including a specific set of RAPID instructions for assembly
- High performance axis computer prepared with force control sensor interface

## Force sensor

The ABB approved sensors are ATI Force/Torque sensors - models Delta, Theta and Omega - with Ip60, IP65 or IP65V protection and Viton seals for aggressive environments\*

The following items need to be ordered from ATI to complete the RobotWare Assembly FC installation:

- Sensor including adapter plate for ABB robot
- DAQ (Data acquisition) board
- ABB data disk
- Connection cable



\*See <http://ati-ia.com>