



# SoftMove

## Cartesian Soft Servo

### Robot compliance in one Cartesian direction

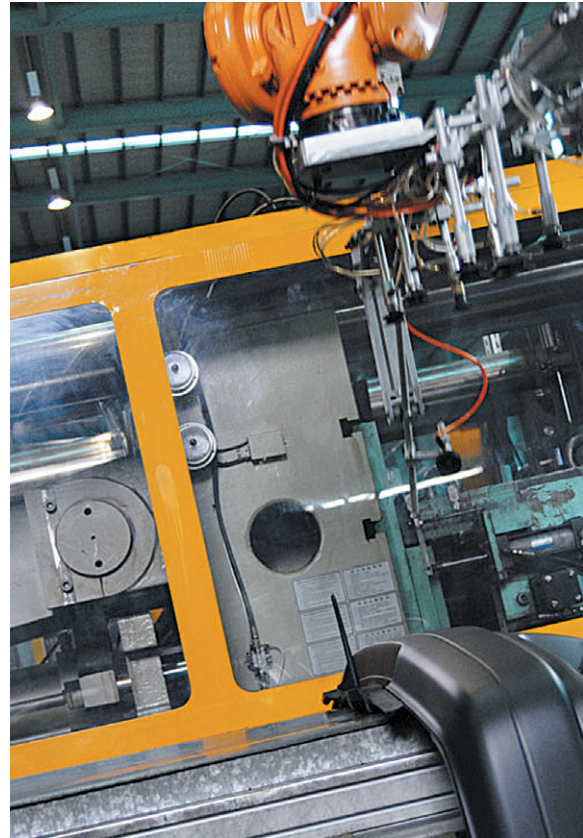
Efficient interaction between robot and machine SoftMove is a software option that allows the robot to be compliant or floating in order to adjust to external forces or variations in work objects. This can be used in a typical machine tending application where the machine, e.g. an injection moulding machine or die casting machine, ejects a part. With SoftMove, the robot is compliant in one direction only, which facilitates high accuracy and reliability. The option reduces robot programming time and enables efficient interaction between robot and machine, which reduces cycle time.

### Robot compliance in one direction

The robot can be set to be compliant in one Cartesian direction, either during a programmed movement or while standing still. The robot can either be floating or acting like a spring, which facilitates flexibility and multiple application possibilities. When the robot is in floating mode it will be “free floating” in the specified direction and the position can be changed by external forces. In spring mode the robot will act like a spring in the specified direction and the force needed to push it away increases with the distance from the start point. The compliance shortens programming time and improves productivity and quality during production.

### Easy to program

SoftMove is a true Cartesian soft servo that considerably reduces programming time compared with conventional soft servo functionality. As the robot can be set to be soft in any Cartesian direction, the programmer does not need to know which axes move in a linear movement. Tuning is simple and semi-automatic with only minor requirements of operator interaction. SoftMove can also be used to handle variations in work objects, which is why programmers need to spend less time on applications that normally require elaborate programming. SoftMove is also advantageous to use in simple



assembly applications where some compliance in the robot is needed.

### Compliance gives flexibility

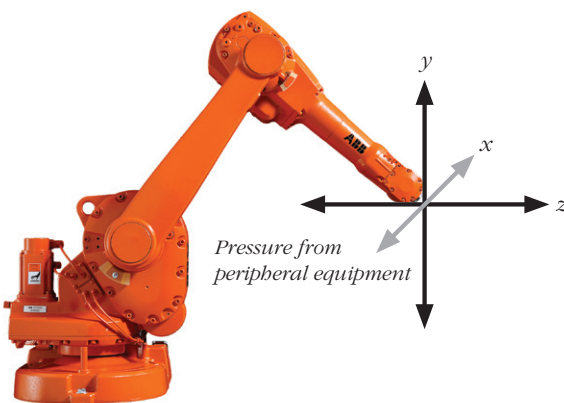
The flexibility of SoftMove makes it suitable for any application where the robot needs to be compliant in order to accommodate changes and tolerances created by, for example, tools, machines and fixtures. The use of SoftMove should be considered in all applications where the robot positioning needs to be adjusted because of variations in work objects, inaccurate fixtures or machines, or when the process requires compliance to be more productive and reliable.

### Increased productivity - lower investment cost

SoftMove can reduce the cycle time as the robot movement can be directly linked to the movement of an ejector mechanism of a machine or other external forces. The transition from soft mode to position control mode is very smooth, which results in a very robust and secure movement. This gives increased quality of ejected parts and less scrap. Traditionally, compliance has been solved with a mechanical compliance mechanism between the tooling and the robot's mounting flange. SoftMove reduces the need for mechanical solutions, high-accuracy fixtures and advanced programming, which means that the investment cost is significantly reduced and the reliability increased. The flexibility also allows smooth and inexpensive changeovers when introducing new parts.

### Reducing risk of collision

With SoftMove activated, the robot will be soft in a specified direction and follow any peripheral equipment without damaging the part, the tool or the fixture. It will act as protection from large reaction forces that may apply to the robot. When SoftMove is enabled, the robot will not collide or stop the program. Instead, the robot will stop the movement at the surface and either float at the position or act like a spring pushing against the surface.



Robot compliance in one cartesian direction

### Features

Lowers the stiffness of the robot in a specified Cartesian direction while mainly maintaining the original behavior in other directions

- Robot can be “free floating” in a specified direction
- Robot can have a spring function in a specified direction
- Stiffness and damping parameters controlling the compliance
- Gravity compensation - The stiffness can also be lowered in a vertical direction

### Benefits

- Compliance in only one direction

### Main applications

Machine tending of different machines, e.g. die casting machines, injection moulding machines, machine tools, etc.

- Extraction of parts from machine
- Insertion of parts into the machine – robot holds or pushes
- Placing/picking a work object in a tool
- Placing a part in a fixture
- Tool exchanging on peripheral machines
- Absorbing of shocks and vibrations

### Assembly functions

- Framing - a robot holds and presses a part towards the car body while another process attaches the part to the body
- Simple assembly functions not requiring searching or fitting

### Welding

- Hold-and-Weld
- Hotplate welding

### Press tending

- Follow movement of press

### Polishing/Grinding

- Simple polishing and grinding applications with low process forces not requiring process feedback