Press-fit Machine

Control Flow

1. Feed material to the machine.
2. Operate in position control before pressing.
3. Switch to Tightening & Press-fit control during pressing.
4. Switch back to position control after pressing.
5. Proceed to the next workpiece.

System Example

1. Pressing of the material with less shock to a machine
2. Monitoring of the machine movement

**Issues at production sites**

Issue 1: Pressing of the material with less shock to a machine
Issue 2: Monitoring of the machine movement

**Application**

- Bonding
- Pressing
- Clamping
- Cap tightening

**Mitsubishi solution**

Motion CPU: Q172DSCPU
PLC CPU: Q06UDEHCPU
Safety signal module: Q173DSXY
Servo amplifier: MR-J4-B
Servo motor: HG-SR
GOT: GOT 1000 series
Main base unit: Q35DB
I/O module: QX40, QY40P

**Setup Procedure**

Step 1: Speed/Torque Control Data Setting
Step 2: Program Creation
**Solution 1: Tightening & Press-fit Control**

Achieving Shorter Tact Time with Quick Switching, and Less Shock with Smooth Movement

The system switches the control mode smoothly from position to Tightening & press-fit control without a stop. The current position is being stored in the system during the Tightening & press-fit control to perform a quick positioning after switching back to the position control. Thus shorter tact time is achieved.

**Solution 2: Safety Signal Comparison Function**

A safety system that monitors multiple safety signals (light curtains, forced stop buttons, etc.) can be created.

**Motion Controller and Servo Amplifier (MR-J4_-B)**

Ensuring Your Safety with the Safety Observation Function, Equipped as Standard

- A smooth torque causes less shock to the machine when switching control modes.

- Sudden acceleration causes shock to the machine when switching control modes.

- Smooth switching

- Torque control
  - Sudden acceleration causes shock to the machine when switching control modes.
  - (1) Switching to torque control, where specified torque(%) is forcibly generated, causes sudden motor acceleration, giving shock to the machine.
  - (2) System is forced into speed control when passing the speed limit, causing sudden deceleration.
  - (3) The system is switched to the torque control after the speed is below the required limit.

- Tightening & press-fit control
  - A smooth torque causes less shock to the machine when switching control modes.
  - (1) In Tightening & press-fit control, the motor keeps decelerating until passing the speed limit.
  - (2) The mode is switched to torque control when the speed passes the limit.
  - (3) The torque increases constantly to the specified value (%).
**Setup Procedure**

**Step 1**

**Speed/Torque Control Data Setting**

After completing the System Structure, set the speed/torque data in Servo Data screen.

**Servodata**

<table>
<thead>
<tr>
<th>Device</th>
<th>Set the data only when the speed/torque ranges...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Servo</td>
<td></td>
</tr>
<tr>
<td>Mode</td>
<td></td>
</tr>
<tr>
<td>Switching Demand</td>
<td>1 (ON)</td>
</tr>
<tr>
<td>Command</td>
<td>Speed/Torque Control</td>
</tr>
</tbody>
</table>

**Step 2**

**Program Creation**

Create the Motion SFC program and servo program.

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**Double click** Moves above a workpiece.

**Goes back** to its waiting position.

**Detects** 5mm above the workpiece.

**Di(⪱)** erence between the command current and the motor current is within 1.0%.

**Switches to** Tightening & press-fit control while moving.

**Easy switching to** the Tightening & press-fit control.

**Position control**

**Just select a control mode and turn ON the mode switching flag.**

**After pressing, switches back to** position control.

**Moves above a workpiece.**

**Detects** 5mm above the workpiece.

**Switches to** Tightening & press-fit control while moving.

**Difference between** the command current and the motor current is within 1.0%.

**After pressing, switches back to** position control.

**Goes back** to its waiting position.
MELSERVO-J4 series servo amplifiers have integrated STO (Safe Torque Off) and SS1* (Safe Stop 1) functions. Safety system is easily configured in the machine. (SIL 2)

- Turning off the control power of servo amplifier is not required, cutting out the time for restart. Additionally, home position return is not required.
- Magnetic contactor for preventing unexpected motor start is not required.*

*1. Safety equipment (MR-J3-D05, etc.) is required.
*2. Two magnetic contactors are not required when STO function is used. However, in this diagram, one magnetic contactor is used to shut off the power at alarm occurrence.

### Easy to Use
MR Configurator2, the User-friendly Software for Easy Setup, Tuning and Operation

### Graph Function
The number of measurement channels is increased to 7 channels for analog, and 8 channels for digital. Display various servo statuses in the waveform at one measurement, supporting setting and adjustment. Convenient functions such as [Over write] for overwriting multiple data and [Graph history] for displaying graph history are available. Waveform measurement for the connected axes is simultaneously performed via Motion controller communication.

### Machine Analyzer Function
Input random torque to the servo motor automatically and analyze frequency characteristics (0.1 kHz to 4.5 kHz) of a machine system just by clicking the [Start] button. This function supports setting of machine resonance suppression filter, etc.

### Maintenance Function
Powerful Maintenance Support with Machine Diagnosis Function

This function detects changes of machine parts (ball screw, guide, bearing, belt, etc.) by analyzing machine friction, load moment of inertia, unbalanced torque, and changes in vibration component from the data inside the servo amplifier, supporting timely maintenance of the driving parts.