

For your all production needs

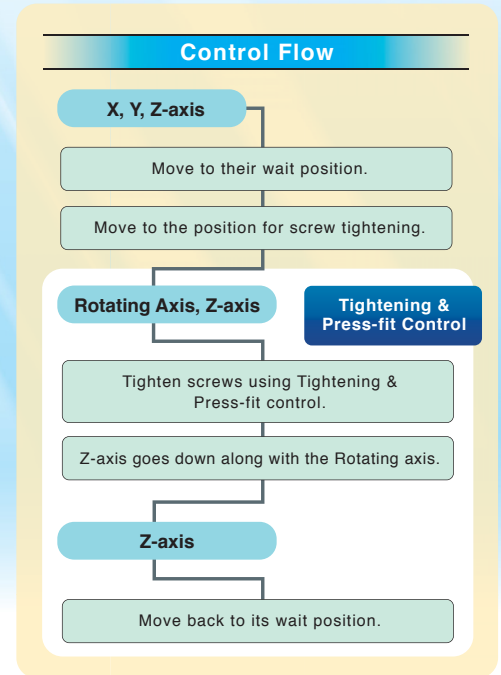
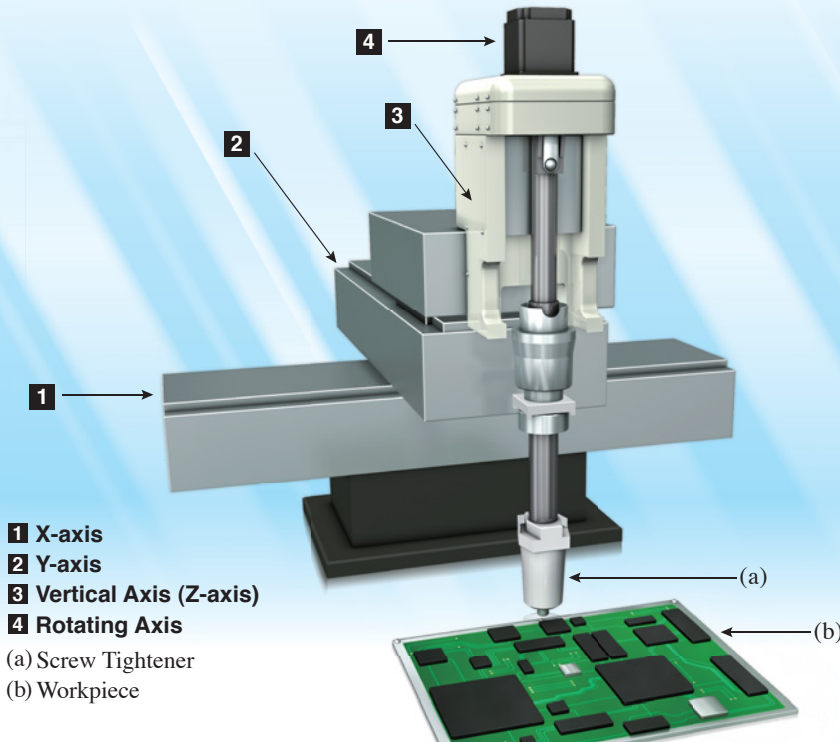
MELSERVO-J4 Solutions

MITSUBISHI SERVO AMPLIFIERS & MOTORS
MELSERVO-

J4

vol.10

Screw Tightening Machine



Issues at production sites

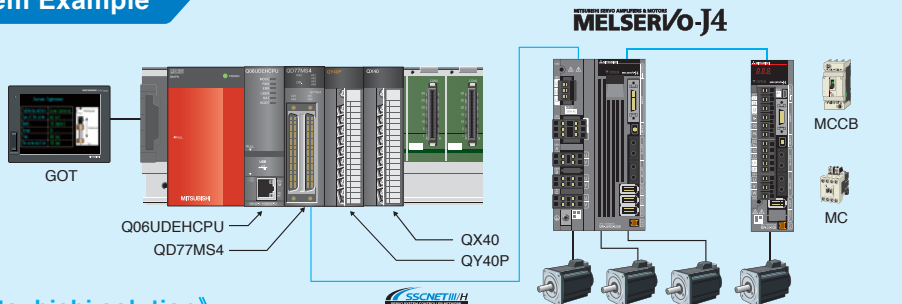
Issue 1 Tightening screws without using a torque sensor

➔ Tightening & Press-fit Control

Issue 2 Repeated accuracy in screw tightening operation

➔ Reduced Torque Ripple During Conduction

System Example



《Mitsubishi solution》

PLC CPU : Q06UDEHCPU
GOT : GOT 1000 series
Main base unit : Q35DB

Simple Motion: QD77MS4
I/O module : QX40, QY40P

Servo amplifier: MR-J4(W3)-B
Servo motor : HG-SR, HG-KR

《Application》

- Cap tightening
- Tightening machine for cylinder head
- Tightening machine for clutch tightening
- Press-fit machine
- Clamping

Setup Procedure

Step1

System Configuration Settings

Step2

Servo Parameter settings

Step3

Creation of a Sequence Program for Tightening & Press-fit Control

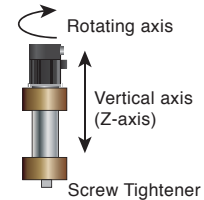
Solution 1

Tightening & Press-fit Control

Open-Loop Control for Screw Tightening

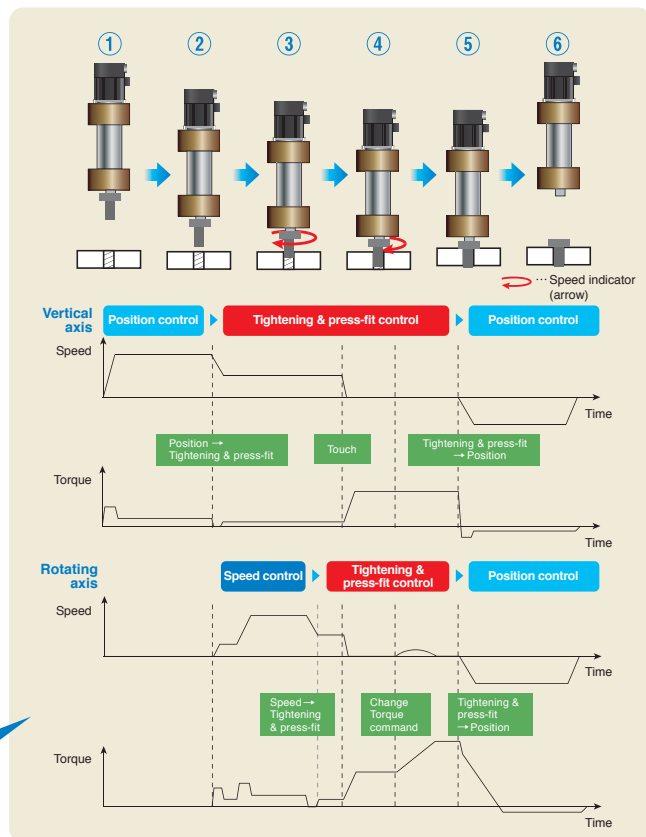
The vertical (Z-axis) and rotating axis can be used to tighten screws by switching the control mode to "Tightening & press-fit control" which does not require a torque sensor.

"Tightening & Press-fit control" is a control mode where the motor does not have to stop when the system switches to this control mode from speed or positioning control.



<Operation Sequence>

- | | |
|-----|--|
| ①→② | Vertical axis : Moves from its wait position to above the workpiece.
Rotating axis : No movement (Servo ON) |
| ② | Vertical axis : Switches to Tightening & press-fit control.
Rotating axis : Switches to speed control and starts operation at low speed |
| ②→③ | Vertical axis : Starts pushing down the screw.
Rotating axis : Starts tightening after switching to mid-range speed operation. |
| ③→④ | Vertical axis : Pushes down the screw with a constant torque.
Rotating axis : Switches to Tightening & press-fit control and tightens the screw. |
| ④→⑤ | Vertical axis : Pushes the screw to its final position with a constant torque.
Rotating axis : Tightens the screw fully with a specified torque. |
| ⑤→⑥ | Vertical axis : Switches back to position control and goes back to its wait position.
Rotating axis : Switches back to position control and goes back to its wait position. |



<Tightening screws without a torque sensor>
Screws can be tightened without using a torque sensor (open-loop control), controlling the speed and torque of the rotating axis according to its operation sequence.

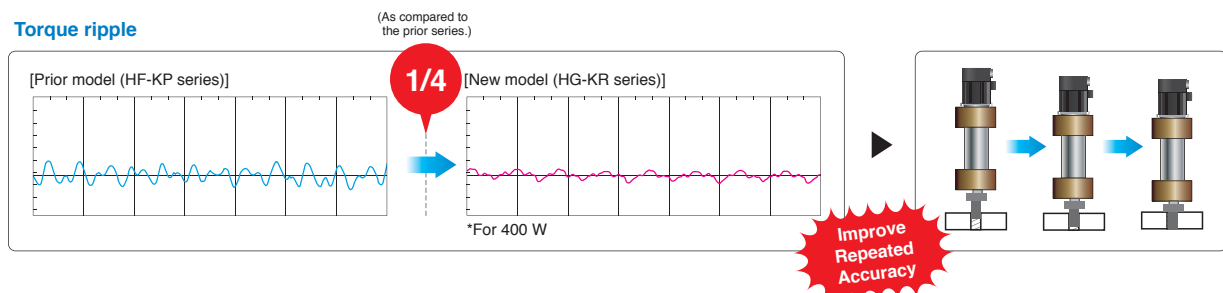
Solution 2

Reduced Torque Ripple During Conduction

Great Improvement in Repeated Accuracy of Screw Tightening

By optimizing the combination of the number of motor poles and the number of slots, torque ripple during conduction is greatly reduced, which helps improve the accuracy of repeated operation of tightening screws.

Torque ripple



Setup Procedure

Step 1

System Configuration Settings

Set the servo amplifier in the System Structure.

System Structure

External I/O Connector Setting

Buffer Memory Device Name	Setting Value
MAN-PLS Input Logic Selection	Negative Logic
MAN-PLS Input	Voltage
MAN-PLS/Encoder (ENC) Input	A-phase/B-phase (4 Multiply)
Forced Stop Input	Valid

Module Setting

External I/O Connector Setting : SSCNET Setting

Set each signal functions of external I/O connectors.

Input Signal Logic Selection

MAN-PLS Input :

MAN-PLS/Synchronous Encoder (ENC) Input Signal

Input Type :

MAN-PLS Input Selection :

Forced Stop Input Signal

Valid/Invalid :

OK Cancel

Set the External I/O connector and SSCNET Setting, as necessary.

Step 2

Servo Parameter Settings

Set the servo amplifier of each axis. The parameters are easily set following the assistant function, including those set for the first time.

Servo Parameter

<Servo Assistant>

- Assistant List
- Amplifier Setting
- Test Run
- Servo Adjustment
- Maintenance
- Troubleshooting

MR Configurator2 Help

Shows the instructions for servo parameter settings. You can set the parameters without manuals.

BRAKE OUTPUT

Set the electromagnetic brake sequence output.

Select the "Use magnetic brake interlock (MBR)" checkbox to perform setting. This enables to input the electromagnetic brake sequence output.

Step 3

Creation of a Sequence Program for Tightening & Press-fit Control

Create a sequence program for control using Function Block (FB), such as a program for control mode switching.

Project

Double click

Program

FB for Tightening & press-fit control

The mode is switched to Tightening & press-fit control, and target torque can be set.

FB for speed control

The mode is switched to speed control, and speed value can be set.

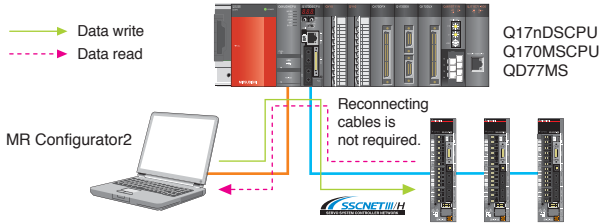
MELSERVO-J4
Features

The High Accuracy and Response Have Changed the "Standard" of Machine Operation

SSCNET III/H Advanced Drive Control is Possible with Higher Speed Communication

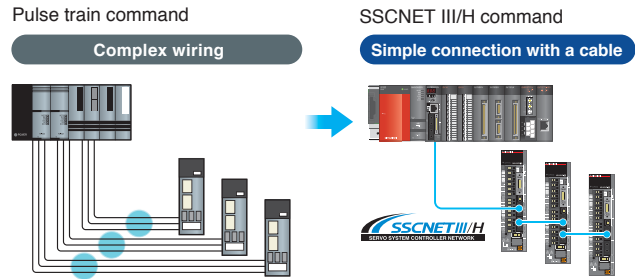
Central Control with Network

Large amounts of servo data are exchanged in real-time between the controller and the servo amplifier. Using MR Configurator2 on a personal computer that is connected to Q17nDSCPU/ Q170MSCPU Motion controller, or QD77MS simple Motion module helps consolidate information such as parameter settings and monitoring for the multiple servo amplifiers, etc.



Dramatically Reduced Wiring

Simple connections with dedicated cables reduce both wiring time and chances of wiring errors. No more complicated wiring.



Space-saving Designed to Reduce the Number of Wirings and Devices

The number of wirings and devices is greatly reduced by using MR-J4 series 2-axis/3-axis servo amplifiers. For example, 3-axis servo amplifier MR-J4W3-B requires 30% less installation space than three units of MR-J4-B.

<Space-saving>

MR-J4-B × 3 units

<Number of devices>

- Servo amplifier ×3
- Servo motor ×3
- Molded-case circuit breaker (MCCB) ×3
- Magnetic contactor (MC) ×3

Installation space reduced by **30%**

MR-J4W3-B (3-axis type) × 1 unit

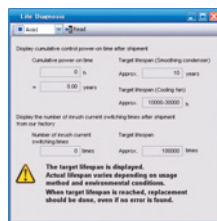
<Number of devices>

- Servo amplifier ×1
- Servo motor ×3
- Molded-case circuit breaker (MCCB) ×1
- Magnetic contactor (MC) ×1

Maintenance Support the Preventive Maintenance for Safety Operation

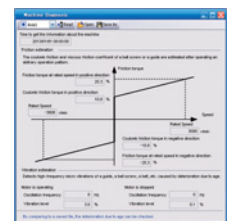
Servo Amplifier Life Diagnosis Function

Check cumulative operation time and on/off times of inrush relay. This function provides an indication of replacement time for servo amplifier parts such as capacitor and relays.



Machine Diagnosis Function

This function estimates and displays machine friction and vibration in normal operation without any special measurement. Comparing the data of the first operation and after years of operation helps to find out the aging deterioration of machine and is beneficial for preventive maintenance.



Man, machine and environment in perfect harmony

Solution



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