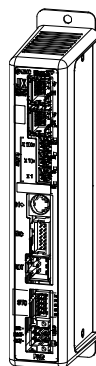




Instruction Manual

Step Motor Controller – EtherCAT
(24 VDC Servo) with STO Sub-function
Series JXCEF#



IMPORTANT

When supplied in the European Union or the United Kingdom this document does not contain the necessary safety instructions as required by the Machinery Directive 2006/42/EC or the UK Machinery Safety Regulations 2008.

It is mandatory to refer to the Operation Manual, Document No. JXC#-OMY0009 supplied with the product by your local SMC subsidiary for such safety instructions before using this product.

The EU or UKCA Declaration of Conformity is supplied by your local subsidiary with the product.

For other territories the Operation Manual and Declaration of Conformity may be downloaded from the SMC website (URL <https://www.smcworld.com>).

The intended use of the step motor controller is to control the movement of an electrical actuator whilst connected to the EtherCAT protocol.

1 Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of "Caution," "Warning" or "Danger." They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC)*1, and other safety regulations.

IEC 60204-1: Safety of machinery - Electrical equipment of machines. (Part 1: General requirements)
ISO 10218-1: Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots.

- Refer to product catalogue, Operation Manual and Handling Precautions for SMC Products for additional information.
- Keep this manual in a safe place for future reference.

| | |
|----------------|--|
| Caution | Caution indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury. |
| Warning | Warning indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury. |
| Danger | Danger indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury. |

Warning

- Always ensure compliance with relevant safety laws and standards.**
All work must be carried out in a safe manner by a qualified person in compliance with applicable national regulations.

- Special products (-X) might have specifications different from those shown in the specifications section. Contact SMC for specific drawings.

2 Specifications

2.1 General specifications

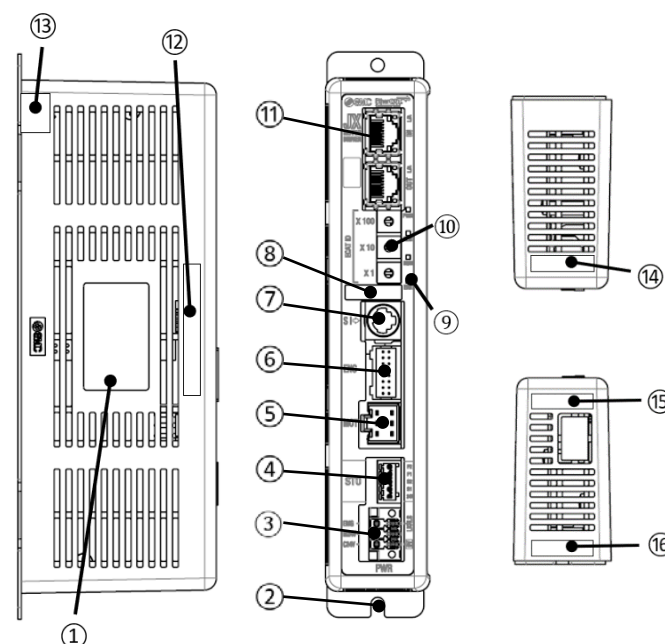
| Item | Specifications |
|---------------------------|--|
| Compatible motor | Step motor (servo 24 VDC) |
| Power supply (M24V, C24V) | Power supply voltage: 24 VDC +/-10% (certified SELV / PELV power supply). |
| Current consumption | 200 mA or less (controller) Refer to the actuator specifications for total power consumption. |
| Compatible encoder | Incremental A/B phase (800 pulses / rotation) Battery-less absolute A/B phase (4096 pulse/rotation) |
| Memory | EEPROM |
| Lock control | Forced lock release terminal |
| Cable length | Power supply cable: 30 m max. Actuator cable: 20 m max. |
| Cooling method | Natural air-cooling |
| Operating temperature | 0°C to 55°C (no freezing). |
| Storage temperature | -10°C to 60°C (no freezing) |
| Humidity range | 90% RH or less (No condensation) |
| Insulation resistance | 50 MΩ (500 VDC) between the external terminals and case |
| Weight | 250 g (Direct mounting type) 270 g (DIN rail mounting type) |

2.2 EtherCAT specifications

| Item | Specifications |
|----------------------|--|
| Protocol | EtherCAT (Conformance Test Record V1.2.8) |
| Communication speed | 100 Mbps |
| Communication method | Full duplex / Half duplex (automatic negotiation) |
| Communication cable | Standard Ethernet cable (STP, CAT5 or higher, 100BASE-TX) |
| Occupied area | Input 20 byte / Output 36 byte |
| Connectable nodes | 65,535 nodes maximum |
| Vendor ID | 0114h (276) |
| Network topology | Refer to the EtherCAT topology |
| Setup file | ESI file: SMC JXCE_V10.xml |

The ESI set up file can be downloaded from the SMC website (URL: <https://www.smcworld.com>).

3 Name and function of individual parts



3 Name and function of parts (continued)

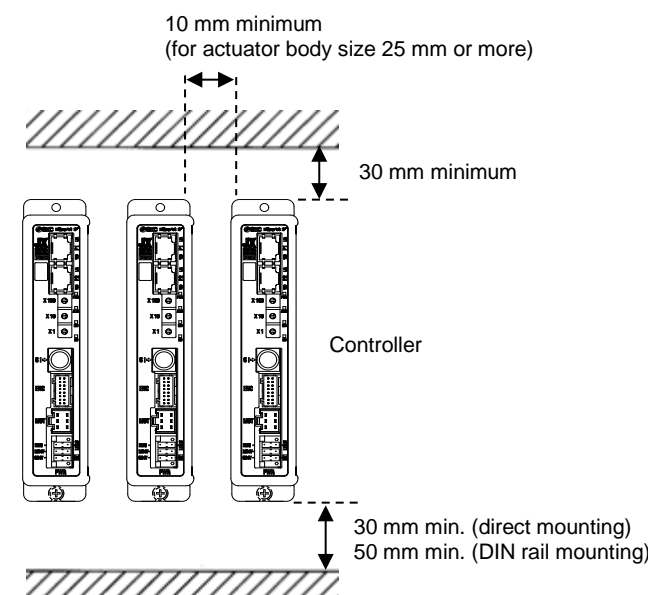
| No. | Name | Description |
|-----|---|---|
| 1 | Controller label | Label indicating the controller model number. |
| 2 | FE | Functional Earth. (when the controller is mounted, tighten screws and connect the grounding cable). |
| 3 | PWR | Power supply connector (5 pin). Connector for controller power supply (24 VDC) using the power supply plug. |
| 4 | STO | STO Connector (5 pin). Connector for controller responsible for STO sub-function control. |
| 5 | MOT | Motor drive connector (6 pin). Connector for actuator cable. |
| 6 | ENC | Encoder connector (16 pin). Connector for actuator cable. |
| 7 | SI | Serial I/O connector (8 pin). Connector for teaching box (LEC-T1) or controller communication cable (JXC-W2A-C). |
| 8 | Applicable electric actuator model number label | Label indicating the electric actuator part number which can be connected to the controller. |
| 9 | LED display | LED's to indicate the controller status. |
| 10 | Rotary switch | Switches to set the EtherCAT communication IP address. |
| 11 | Communication connector | Connector for EtherCAT network. |
| 12 | MAC address label | Not applicable to EtherCAT product. |
| 13 | Security label | Label to prevent tampering of product. |
| 14 | Safety HW version label | Label indicating the safety HW version. |
| 15 | Non- safety version label | Label indicating the Non-safety version. |
| 16 | Serial number label | Label indicating the serial number. |

4 Installation

4.1 Installation

Warning

- Do not install the product unless the safety instructions have been read and understood.
- Design the installation so that the temperature surrounding the controller is 55°C max. Leave enough space between the controllers so that the operating temperature of the controllers remains within the specification range.
- Mount the controller vertically with 30 mm minimum space on the top and bottom of the controller as shown below.
- Allow 60 mm minimum space between the front of the controller and a door (lid) so that the connectors can be connected and disconnected.



4 Installation (continued)

4.2 Mounting

- The controller can be direct mounted (model JXCEF7#) using screws or mounted on a DIN rail (model JXCEF8#).
- When using DIN rail mounting, hook the controller on the DIN rail and press the lever down to lock it.

Caution

If the mounting surface for the controller is not flat or is uneven, excessive stress may be applied to the enclosure, which can cause failure. Be sure to mount on a flat surface.

4.3 Environment

Warning

- Do not use in an environment where corrosive gases, chemicals, salt water or steam are present.
- Do not use in an explosive atmosphere.
- Do not expose to direct sunlight. Use a suitable protective cover.
- Do not install in a location subject to vibration or impact in excess of the product's specifications.
- Do not mount in a location exposed to radiant heat that would result in temperatures in excess of the product's specifications.
- Avoid mounting the controller near a vibration source, such as a large electromagnetic contactor or circuit breaker on the same panel.
- Do not use in an environment with strong magnetic fields present.

5 Wiring

Caution

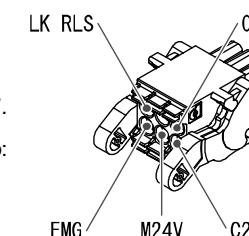
- Do not perform wiring while the power is ON.
- Confirm proper insulation of wiring.
- Do not route wires and cables together with power or high voltage cables.
- Keep wiring as short as possible to prevent interference from electromagnetic noise and surge voltage.
- Do not use an inrush current limited type of power supply for the controller.

- Do not connect multiple wires to one connector terminal.

Power Supply Connector

Wire the power supply cable to the power supply plug connector, then insert it into connector PWR on the controller.

- Use special screwdriver (Phoenix Contact No. SZS0.4x2.0) to open / close lever and insert the wire into the connector terminal.



Power supply connector.
SMC Part No. JXC-CPW.

Phoenix Contact Part No:
DFMC1, 5/3-ST-LR

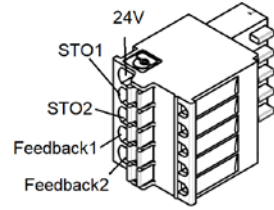
| Pin No. | Terminal | Function | Description |
|---------|----------|------------------|--|
| 1 | C24V | Power supply (+) | Positive control power. |
| 2 | M24V | Motor power (+) | Positive power for the actuator motor supplied via the controller. |
| 3 | EMG | Stop (+) | Positive power for emergency stop signal |
| 4 | 0V | Common power (-) | Negative common power for M24V, C24V, EMG and LK RLS. |
| 5 | - | NC | N/A |
| 6 | LK RLS | Unlocking (+) | Positive power for lock release. |

Applicable wire size: AWG20 (0.5 mm²). Wire O/D to be ø2.5 mm max. Stripped wire length – 8 mm.

5 Wiring (continued)

5.1 STO Sub-function Connector

Wire the cable for the STO function to the STO plug connector, then insert it into connector STO on the controller.



| Pin No. | Signal | Type | Description |
|---------|------------|--------|--|
| 1 | 24V | Output | Power supply output (internally connected to C24V). |
| 2 | STO1 | Input | IEC 61131-2 Type 3 input to control STO demand on Channel 1. |
| 3 | STO2 | Input | IEC 61131-2 Type 3 input to control STO demand on Channel 2. |
| 4 | Feedback 1 | Output | Channel 1 feedback signal. |
| 5 | Feedback 2 | Output | Channel 2 feedback signal. |

5.2 Ground connection

- Place a ground cable with crimped terminal under one of the M4 mounting screws with a shakeproof washer and tighten the screw.

Caution

The M4 screw, cable with crimped terminal and shakeproof washer must be prepared by the user.

The controller must be connected to Ground to reduce noise. If higher noise resistance is required, ground the 0 V (signal ground). When grounding the 0 V, avoid flowing noise from ground to 0 V.

- A dedicated Ground connection must be used. Grounding should be to a D-class ground (ground resistance of 100 Ω maximum).
- The cross-sectional area of the ground cable shall be 2 mm² minimum.

- The Grounding point should be as near as possible to the controller. Keep the grounding cable as short as possible.

6 Setting

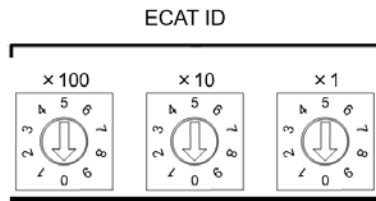
6.1 Switch setting

- Turn off the power supply while setting the switch.
- The rotary switch should be set with a small flat blade screwdriver.

The EtherCAT ID of the controller is set using the rotary switches. When the switches are set to "000", the EtherCAT ID of the controller can be set by the EtherCAT master device.

To set the EtherCAT ID through the EtherCAT master device, refer to the manual of the EtherCAT master device.

(The initial value of the EtherCAT ID is "0", when "000" is set by the rotary switches).



EtherCAT ID setting

| Switch setting | | | EtherCAT ID |
|----------------|-----|----|--|
| x100 | x10 | x1 | |
| 0 | 0 | 0 | Value that allows setting by EtherCAT master device (Initial value: "0") |
| 0 | 0 | 1 | 1 |
| 0 | 0 | 3 | 3 (Default) |
| 0 | : | : | : |
| 0 | 6 | 4 | 64 |
| : | : | : | : |
| 9 | 9 | 9 | 999 |

7 Setting

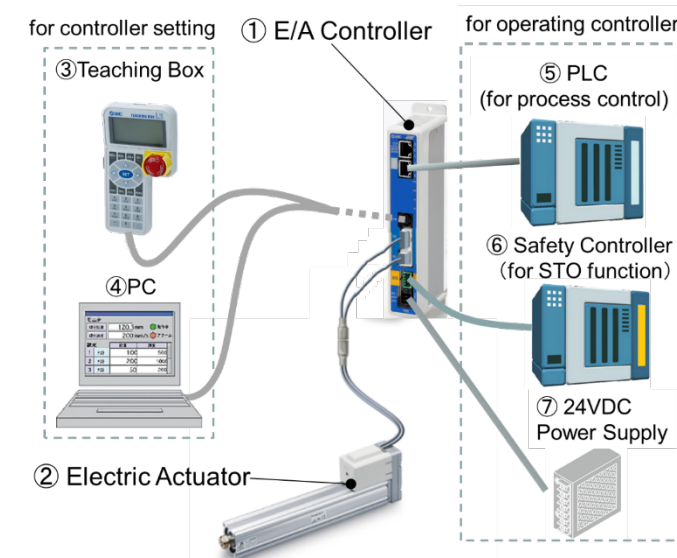
Hardware Configuration

ESI file (XML file) is required to configure the controller. ESI file (XML file) can be downloaded from the URL given below. The ESI set up file can be downloaded from the SMC website (URL: <https://www.smcworld.com>).

Caution

Do not turn OFF the power supply for the controller or connect / disconnect the cable while data is being written to EEPROM (PWR LED (green) is flashing). This is to avoid the possibility of incorrect / corrupt data (step data, parameter).

8 Product configuration



9 LED Display

Refer to the table below for details of the LED status.

| | LED | Description |
|-------|------------------------------|---|
| PWR | OFF | Power is not supplied |
| | Green LED is ON | Power is supplied |
| ALM | OFF | Normal operation |
| | Red LED is ON | Alarm generated |
| RUN | OFF | INIT state |
| | Green LED is flashing | Pre-Operational state |
| | Green LED is single flashing | Safe-Operational state |
| | Green LED is ON | Operational state |
| ERR | OFF | No error in EtherCAT communication |
| | Red LED is flashing | Error in the setting of EtherCAT communication |
| | Red LED is double flashing | Error in the setting of EtherCAT communication (application watch dog timeout). |
| L/A 1 | OFF | "IN" port: No Link, No Activity |
| | Green LED is ON | "IN" port: Link, No Activity |
| | Green LED is flashing | "IN" port: Link, Activity |
| L/A 2 | OFF | "OUT" port: No Link, No Activity |
| | Green LED is ON | "OUT" port: Link, No Activity |
| | Green LED is flashing | "OUT" port: Link, Activity |

10 How to Order

Refer to the catalogue on the SMC website (URL: <https://www.smcworld.com>) for the How to Order information.

11 Outline Dimensions (mm)

Refer to the drawings / operation manual on the SMC website (URL: <https://www.smcworld.com>) for outline dimensions.

12 Maintenance

12.1 General Maintenance

Caution

- Not following proper maintenance procedures could cause the product to malfunction and lead to equipment damage.
- Before performing maintenance, turn off the power supply. Check the voltage with a tester 5 minutes after the power supply is turned OFF.
- If any electrical connections are disturbed during maintenance, ensure they are reconnected correctly and safety checks are carried out as required to ensure continued compliance with applicable national regulations.
- Do not make any modification to the product.
- Do not disassemble the product, unless required by installation or maintenance instructions.

Caution

- Maintenance should be performed according to the procedure indicated in the Operation Manual.
- When equipment is serviced, first confirm that measures are in place to prevent dropping of work pieces and run-away of equipment, etc, then cut the power supply to the system. When machinery is restarted, check that operation is normal with actuators in the correct position.

Warning

- Perform maintenance checks periodically.
- Confirm wiring and screws are not loose. Loose screws or wires may

cause unexpected malfunction.

- Conduct an appropriate functional inspection and test after completing maintenance. In case of any abnormalities (if the actuator does not move, etc.), stop the operation of the system. Otherwise, an unexpected malfunction may occur and it will become impossible to ensure safety. Operate an emergency stop instruction to confirm safety.
- Do not put anything conductive or flammable inside of the controller.
- Ensure sufficient space around the controller for maintenance.

13 Limitations of Use

13.1 Limited warranty and Disclaimer/Compliance Requirements

Refer to Handling Precautions for SMC Products.

14 Product disposal

This product shall not be disposed of as municipal waste. Check your local regulations and guidelines to dispose of this product correctly, in order to reduce the impact on human health and the environment.

15 Contacts

Refer to www.smcworld.com or www.smc.eu for your local distributor / importer.

SMC Corporation

URL: <https://www.smcworld.com> (Global) <https://www.smc.eu> (Europe)
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