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# SV660F Series Servo Drive

## Maintenance Guide

Industrial Automation | Intelligent Elevator | New Energy Vehicle | Industrial Robot | Rail Transit

Data code 19012105 A00

# Preface

## Introduction

The SV660F series high performance AC servo drive provides a power range from 0.05 kW to 7.5 kW. It supports Profinet communication protocol and carries Ethernet communication interfaces to work with the host controller for a networked operation of multiple servo drives.

The SV660N series servo drive supports stiffness level setting, inertia auto-tuning and vibration suppression to simplify the operation process. It allows a quiet and stable operation through cooperating with the MS1 series medium-to-small inertia high-response servo motors configured with a 23-bit multi-turn absolute encoder.

It is suitable for lithium battery PACK, printing and packaging, logistics, automobile manufacturing, tobacco and other industries to achieve fast and accurate collaborative control.

This guide provides instructions on maintenance and repair of the equipment.

## More Documents

| Name | Data Code | Description |
|---|---|---|
| SV660F Series Servo Drive Selection Guide | 19011667 | Provides instructions on product selection, including the list of supporting components, technical data on the drive and motor, and the selection guide of cables. |
| SV660F Series Servo Drive Hardware Guide | 19011666 | Presents electrical design guidance of the equipment, description of terminals, required certificates and standards and solutions to common EMC problems. |
| SV660F Series Servo Drive Commissioning Guide | 19011668 | Presents servo commissioning, parameter descriptions, including the operating panel, commissioning software, commissioning procedure and a parameter list. |
| SV660F Series Servo Drive Communication Guide | 19011670 | Presents functions and parameters of the servo drive, including Profinet communication configuration, parameter description, and communication application cases. |
| SV660P Series Servo Drive Function Guide | 19011669 | Presents functions and parameters, including function overview, basic servo functions, adjustment and parameter list. |
| SV660F Series Servo Drive installation Guide | 19012103 | Presents installation of the servo drive, including installation steps, , mechanical installation, and electrical installation. |

| Name | Data Code | Description |
| --- | --- | --- |
| SV660F Series Servo Drive Troubleshooting Guide | 19012104 | Introduces faults and fault levels, the troubleshooting process, warning codes and fault codes. |
| SV660F Series Servo Drive Maintenance Guide | 19012105 | Provides instructions on maintenance and repair of the equipment. |
| SV660F Series Servo Drive Safety Guide | 19012110 | Presents the safety function and related certifications and standards, wiring, commissioning process, troubleshooting, and functions. |
| SV660F Series Servo Drive Manual Package | PS00005951 | Provides information on selection, installation, commissioning, function, troubleshooting and parameters of the equipment. |

## Revision History

| Date of Revision | Version | Description |
| --- | --- | --- |
| 2022-07 | A00 | First release. |

## Document Acquisition

This manual is not delivered with the product. You can obtain the PDF version by visiting:

- http://www.inovance.com.
- Scan the QR code on the equipment to acquire more.

## Warranty

Inovance provides warranty service within the warranty period (as specified in your order) for any fault or damage that is not caused by improper operation of the user. You will be charged for any repair work after the warranty period expires.

Within the warranty period, you will be charged if the product is damaged due to the following causes.

- Failure to operate this product as specified in this guide.
- Fire, flood, or abnormal voltage.
- Unintended use of the product.
- Operation beyond the product's ratings.
- Force majeure (natural disaster, earthquake, and lightning strike).

The maintenance fee is charged according to the latest Price List of Inovance. If otherwise agreed upon, the terms and conditions in the agreement shall prevail.

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# General Safety Instructions

## Safety Precautions

- This section explains the safety precautions that need to be observed to use this product correctly. Before using this product, please read the instruction manual and correctly understand the relevant information of safety precautions. Failure to comply with the safety precautions may result in death, serious injury, or equipment damage.
- "CAUTION", "WARNING", and "DANGER" items in the guide only indicate some of the precautions that need to be followed; they just supplement the safety precautions.
- Use this equipment according to the designated environment requirements. Damage caused by improper use is not covered by warranty.
- Inovance shall take no responsibility for any personal injuries or property damage caused by improper use.

## Safety Levels and Definitions

| | |
|---|---|
| | Indicates that failure to comply with the notice will result in death or severe personal injuries. |
| | Indicates that failure to comply with the notice may result in death or severe personal injuries. |
| | Indicates that failure to comply with the notice may result in minor or moderate personal injuries or equipment damage. |

## General Safety Instructions

- Drawings in the selection guide are sometimes shown without covers or protective guards. Remember to install the covers or protective guards as specified first, and then perform operations in accordance with the instructions. Install the covers or protective guards as specified, and use the equipment in accordance with the instructions described in the user guide.
- The drawings in the guide are shown for illustration only and may be different from the product you purchased.

**Unpacking**

- Do not install the equipment if you find damage, rust, or signs of use on the equipment or accessories upon unpacking.
- Do not install the equipment if you find water seepage or missing or damaged components upon unpacking.
- Do not install the equipment if you find the packing list does not conform to the equipment you received.

- Check whether the packing is intact and whether there is damage, water seepage, dampness, and deformation before unpacking.
- Unpack the package by following the unpacking sequence. Do not strike the package violently.
- Check whether there is damage, rust, or injuries on the surface of the equipment and equipment accessories before unpacking.
- Check whether the package contents are consistent with the packing list before unpacking.

**Storage and Transportation**

- Large-scale or heavy equipment must be transported by qualified professionals using specialized hoisting equipment. Failure to comply may result in personal injuries or equipment damage.
- Before hoisting the equipment, ensure the equipment components such as the front cover and terminal blocks are secured firmly with screws. Loosely-connected components may fall off and result in personal injuries or equipment damage.
- Never stand or stay below the equipment when the equipment is being hoisted by the hoisting equipment.
- When hoisting the equipment with a steel rope, ensure the equipment is hoisted at a constant speed without suffering from vibration or shock. Do not turn the equipment over or let the equipment stay hanging in the air. Failure to comply may result in personal injuries or equipment damage.

- Handle the equipment with care during transportation and mind your steps to prevent personal injuries or equipment damage.
- When carrying the equipment with bare hands, hold the equipment casing firmly with care to prevent parts from falling. Failure to comply may result in personal injuries.
- Store and transport the equipment based on the storage and transportation requirements. Failure to comply will result in equipment damage.
- Avoid storing or transporting the equipment in environments with water splash, rain, direct sunlight, strong electric field, strong magnetic field, and strong vibration.
- Avoid storing the equipment for more than three months. Long-term storage requires stricter protection and necessary inspections.
- Pack the equipment strictly before transportation. Use a sealed box for long-distance transportation.
- Never transport the equipment with other equipment or materials that may harm or have negative impacts on this equipment.

**Installation**

- The equipment can be operated by well-trained and qualified professionals only. Non-professionals are not allowed.

- Read through the guide and safety instructions before installation.
- Do not install this equipment in places with strong electric or magnetic fields.
- Before installation, check that the mechanical strength of the installation site can bear the weight of the equipment. Failure to comply will result in mechanical hazards.
- Do not wear loose clothes or accessories during installation. Failure to comply may result in an electric shock.
- When installing the equipment in a closed environment (such as a cabinet or casing), use a cooling device (such as a fan or air conditioner) to cool the environment down to the required temperature. Failure to comply may result in equipment over-temperature or a fire.
- Do not retrofit the equipment.
- Do not fiddle with the bolts used to fix equipment components or the bolts marked in red.
- When the equipment is installed in a cabinet or final assembly, a fireproof enclosure providing both electrical and mechanical protections must be provided. The IP rating must meet IEC standards and local laws and regulations.
- Before installing devices with strong electromagnetic interference, such as a transformer, install a shielding device for the equipment to prevent malfunction.
- Install the equipment onto an incombustible object such as a metal. Keep the equipment away from combustible objects. Failure to comply will result in a fire.

- Cover the top of the equipment with a piece of cloth or paper during installation. This is to prevent unwanted objects such as metal chippings, oil, and water from falling into the equipment and causing faults. After installation, remove the cloth or paper on the top of the equipment to prevent over-temperature caused by poor ventilation due to blocked ventilation holes.
- Resonance may occur when the equipment operating at a constant speed executes variable speed operations. In this case, install the vibration-proof rubber under the motor frame or use the vibration suppression function to reduce resonance.

**Wiring**

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Before wiring, cut off power connections with all equipment. Residual voltage exists after power cut-off. Therefore, wait at least the time designated on the equipment warning label before further operations. Measure the DC voltage of the main circuit and make sure it is below the safe voltage, otherwise there will be the danger of electric shock.
- Do not perform wiring, remove the equipment cover, or touch the circuit board with power ON. Failure to comply will result in an electric shock.
- Check that the equipment is grounded properly. Failure to comply will result in an electric shock.

- Do not connect the input power supply to the output end of the equipment. Failure to comply will result in equipment damage or even a fire.
- When connecting a drive to the motor, check that the phase sequences of the drive and motor terminals are consistent to prevent reverse motor rotation.
- Cables used for wiring must meet cross sectional area and shielding requirements. The shield of the cable must be reliably grounded at one end.
- Fix the terminal screws with the tightening torque specified in the user guide. Improper tightening torque may overheat or damage the connecting part, resulting in a fire.
- After wiring is done, check that all cables are connected properly and no screws, washers or exposed cables are left inside the equipment. Failure to comply may result in an electric shock or equipment damage.

- During wiring, follow the proper electrostatic discharge (ESD) procedure, and wear an antistatic wrist strap. Failure to comply will damage the equipment or the internal circuits of the equipment.
- Use shielded twisted pairs for the control circuit. Connect the shield to the grounding terminal of the equipment for grounding purpose. Failure to comply will result in equipment malfunction.

**Power-on**

- Before power-on, check that the equipment is installed properly with reliable wiring and the motor can be restarted.
- Check that the power supply meets equipment requirements before power-on to prevent equipment damage or a fire.
- After power-on, do not open the cabinet door or protective cover of the equipment, touch any terminal, or disassemble any unit or component of the equipment. Failure to comply will result in an electric shock.

- Perform a trial run after wiring and parameter setting to ensure the equipment operates safely. Failure to comply may result in personal injuries or equipment damage.
- Before power-on, make sure that the rated voltage of the equipment is consistent with that of the power supply. Failure to comply may resulting in a fire. Failure to comply may result in a fire.
- Before power-on, check that no one is near the equipment, motor, or machine. Failure to comply may result in death or personal injuries.

**Operation**

- The equipment must be operated only by professionals. Failure to comply will result in death or personal injuries.
- Do not touch any connecting terminals or disassemble any unit or component of the equipment during operation. Failure to comply will result in an electric shock.

- Do not touch the equipment casing, fan, or resistor with bare hands to feel the temperature. Failure to comply may result in personal injuries.
- Prevent metal or other objects from falling into the equipment during operation. Failure to comply may result in a fire or equipment damage.

**Maintenance**

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Do not maintain the equipment with power ON. Failure to comply will result in an electric shock.
- Before maintenance, cut off all the power supplies of the equipment and wait for at least the time designated on the equipment warning label.
- In case of a permanent magnet motor, do not touch the motor terminals immediately after power-off because the motor terminals will generate induced voltage during rotation even after the equipment power supply is off. Failure to comply will result in an electric shock.

- Perform routine and periodic inspection and maintenance on the equipment according to maintenance requirements and keep a maintenance record.

**Repair**

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Do not repair the equipment with power ON. Failure to comply will result in an electric shock.
- Before inspection and repair, cut off all the power supplies of the equipment and wait for at least the time designated on the equipment warning label.

- Submit the repair request according to the warranty agreement.
- When the fuse is blown or the circuit breaker or earth leakage current breaker (ELCB) trips, wait for at least the time designated on the equipment warning label before power-on or further operations. Failure to comply may result in death, personal injuries or equipment damage.
- When the equipment is faulty or damaged, the troubleshooting and repair work must be performed by professionals that follow the repair instructions, with repair records kept properly.
- Replace quick-wear parts of the equipment according to the replacement instructions.
- Do not use damaged equipment. Failure to comply may result in death, personal injuries, or severe equipment damage.
- After the equipment is replaced, check the wiring and set parameters again.

**Disposal**

- Dispose of retired equipment in accordance with local regulations and standards. Failure to comply may result in property damage, personal injuries, or even death.
- Recycle retired equipment by observing industry waste disposal standards to avoid environmental pollution.

## Additional Precautions

### Cautions for the dynamic brake

- Dynamic braking can only be used for emergency stop in case of failure and sudden power failure. Do not trigger failure or power failure frequently.
- Ensure that the dynamic braking function has an operation interval of more than 5 minutes at high speed, otherwise the internal dynamic braking circuit may be damaged.

- Dynamic braking is common in rotating mechanical structures. For example, when a motor has stopped running, it keeps rotating due to the inertia of its load. In this case, this motor is in the regenerative state and short-circuit current passes through the dynamic brake. If this situation continues, the drive, and even the motor, may be burned.

## Safety Label

For safe equipment operation and maintenance, comply with the safety labels on the equipment. Do not damage or remove the safety labels. See the following table for descriptions of the safety labels.

| Safety Label | Description |
|---|---|
| | • Never fail to connect the protective earth (PE) terminal. Read through the guide and follow the safety instructions before use.<br>• Never fail to connect Protective Earth (PE) terminal. Read the manual and follow the safety instructions before use.<br>• Do not touch terminals within 15 minutes after disconnecting the power supply to prevent the risk of electric shock.<br>• Do not touch terminals with 15 minutes after Disconnect the power. Risk of electrical shock.<br>• Do not touch the heatsink with power ON to prevent the risk of burn.<br>• Do not touch heatsink when power is ON. Risk of burn. |

# 1 Maintenance

## 1.1 Routine Maintenance Items

Standard operating conditions:

Average annual ambient temperature: 30°C Average load rate: ＜ 80% Daily operating time: ＜ 20 h

### 1.1.1 Routine Checklist

Check the following items during routine inspection.

Table 1–1 Routine checklist

| No. | Routine Checklist | Checked |
|---|---|---|
| 1 | The ambient temperature and humidity are normal. There is no dust or unwanted objects in the servo drive. | ☐ |
| 2 | There is no abnormal vibration or noise. | ☐ |
| 3 | The voltage of the power supply is normal. | ☐ |
| 4 | There is no strange smell. | ☐ |
| 5 | There are no fibers adhered to the air inlet. | ☐ |
| 6 | There is no intrusion of unwanted object on the load end. | ☐ |

### 1.1.2 Routine Cleaning List

Check the following items during routine cleaning.

Table 1–2 Routine cleaning list

| No. | Routine Cleaning List | Checked |
|---|---|---|
| 1 | Clean the dust on the equipment surface, especially the metallic dust. | ☐ |
| 2 | Keep the front end of the servo drive and the connectors clean. | ☐ |

## *Note*

- Cut off the power supply before cleaning. Clean the equipment with an air gun or a piece of dry cloth.
- Do not use the gasoline, diluent, alcohol, acidic or alkaline detergent during cleaning to prevent enclosure discoloration or damage.

## 1.2 Periodic maintenance

### 1.2.1 Periodic Checklist

Table 1–3 Periodic checklist

| No. | Item | Checked |
|---|---|---|
| 1 | The screws used to fix the couplings between devices are in place. | ☐ |
| 2 | There is no sign of overheating. | ☐ |
| 3 | Terminal blocks are in good condition without any sign of damage. | ☐ |
| 4 | The clamping units of terminal blocks are in place. | ☐ |

### 1.2.2 Periodic Maintenance List

The electrical and electronic parts inside the servo drive may be mechanically worn out and degraded. To keep the servo drive and servo motor in good condition, perform parts replacement based on the replacement cycles listed in the following table. Contact Inovance or Inovance agent before replacement to double check whether the part needs to be replaced.

| Equipment | Components | Standard Replacement Interval | Remarks |
|---|---|---|---|
| Servo drive | Bus filter capacitor | About five years | The standard replacement interval is for reference only. If any device/ component works improperly within the replacement interval, replace it immediately. |
| | Cooling fan | 2 to 3 years (10000 h to 30000 h) | |
| | Aluminum electrolytic capacitor on the PCB | About five years | |
| | Pre-charge relay | 100,000 operations (depending on the operating conditions) | |
| | Pre-charge resistor | 20,000 operations (depending on the operating conditions) | |
| Motor | Bearing | 3 to 5 years (20,000 h to 30,000 h) | |
| | Oil seal | 5000 h | |
| | Encoder | 3 to 5 years (20,000 h to 30,000 h) | |
| | Absolute encoder battery | Depends on the operating condition. See the operation instructions for the encoder battery for details. | |

# 2 Instructions for parts replacement

## 2.1 Replacing the Motor Flat Key

**Caution**

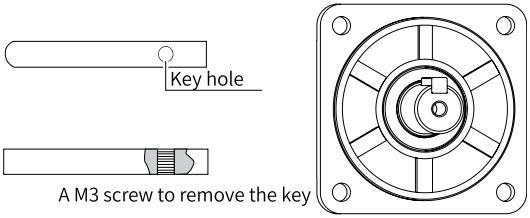
- Observe all the requirements presented in this chapter. Failure to comply may result in equipment fault or damage.
- Violent disassembly is not allowed. Take enough care during disassembly to prevent personal injury.

Standard MS1 series motors in flange sizes 60, 80, and 130 adopt C-type flat key that carries the disassembly hole. To disassemble the flat key, select a proper disassembly bolt (inner hexagon bolt recommended) based on the following table.

| Specification of the key disassembly bolt | | |
|---|---|---|
| Motor Size | Dimensions of the Flat Key | Specifications of the Disassembly Bolt (Inner Hexagon Bolt) |
| Size 40 | Type-A flat key—A3×3×14 | No disassembly hole |
| Size 60 | Type-C flat key—C5×5×16.5 | M3 x 10 and above |
| Size 80 | Type-C flat key—C6×6×25 | M3 x 15 and above |
| Size 100 | Type-C flat key—C8×7×35 | M3 x 20 and above |
| Size 130 | Type-C flat key—C8×7×35 | M3 x 20 and above |
| Size 180 | Type-C flat key—C10×8×64 | M3 x 20 and above |

- Tool needed: an Allen wrench
- Disassembly procedure:

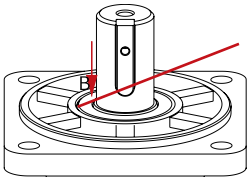
1. Select a proper disassembly bolt (inner hexagon bolt recommended) based on the motor model.
2. Use an Allen wrench to screw down the screw until the A-A end of the flat key is detached from the keyway, as shown below. See the following figure.



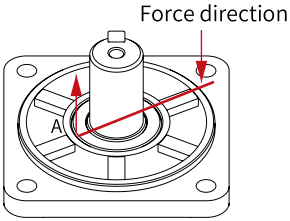

## 2.2 Removing the Motor Oil Seal

- Tools needed: a pair of needle-nose pliers, a pair of slip-proof gloves, and a piece of cotton cloth.
- Disassembly procedure:

1. Put the cotton cloth onto the supporting point B to avoid the end cover from being scratched during disassembly.
2. Secure the motor and use the needle-nose pliers to hold point A of the oil seal lip.
3. Pry the oil seal out gradually against the supporting point B.




(Support point B is at the step of the extension)




(Support point A is at the outer lip of the oil seal)

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