User Manual

Transportation – Delivery – Installation
Maintenance – Servicing – Warranty

STARDUCT

EI Fire Damper

Potential Issues During Delivery, Transportation, Receipt, and Lifting

1. Issues During Transportation and Delivery

📌 **Damage due to impact and vibration**
• **Cause:** Insufficient packaging protection, lack of shock absorption in transport vehicles, rough road conditions.
• **Effect:** The damper may be dented, deformed, or damaged in its frame or shaft structure.
• **Recommended Solutions (If necessary according to the supplier's requirements):**
✅ Use protective foam, wooden padding, or rubber cushioning to minimize impact.
✅ Choose a transport vehicle with good shock absorption to reduce vibration.
✅ Ensure the damper is securely positioned in the container or on the truck.

📌 **Impact of weather and environment**
• **Cause:** Transporting with uncovered vehicles, exposure to rain, sun, and high humidity.
• **Effect:** Corrosion on the surface, degradation of the insulation layer, and rusting of metal components.
• **Solution:**
✅ Use shrink wrap, waterproof plastic, or tarpaulin covers.
✅ Apply anti-oxidation coatings on metal surfaces before transportation.

📌 **Errors in inventory check**
• **Cause:** Incorrect quantity recorded, model mismatch, missing accessories.
• **Effect:** Delays in installation, requiring extra time to correct mistakes.
• **Solution:**
✅ Confirm the quantity, product code, and accessories with the manufacturer before shipment.
✅ Use a clear inventory checklist and cross-check each shipment package.

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2. Issues During Receipt of Goods

📌 **Lack of delivery inspection report**
• **Cause:** No record of goods receipt or no actual inspection before signing the receipt.
• **Effect:** If the goods are defective or missing, it will be difficult to assign responsibility.
• **Solution:**
✅ Prepare a goods receipt inspection report with signatures and photographic evidence.
✅ Carefully check the condition of the goods before signing the receipt.

3. Issues During Lifting and Handling of Goods

📌 **Using inappropriate lifting equipment**
• **Cause:** Using an overloaded forklift or unsuitable lifting devices.
• **Effect:** The damper may tilt, fall, causing damage or deformation of its structure, posing a danger to operators.
• **Solution:**
✅ Use safety straps and lifting equipment appropriate to the damper's size and weight.
✅ Assign skilled personnel for lifting and handling.

📌 **Incorrect lifting approach**
• **Cause:** Lifting at the wrong center of gravity, causing tilting or collision with surrounding objects.
• **Effect:** Deformation of the damper frame, bending, and damage to the transmission structure.
• **Solution:**
✅ Identify a safe lifting point and mark the center of gravity before moving.
✅ Ensure the surrounding space is clear of obstacles and potential hazards.

📌 **Failure to check safety before operation**
• **Cause:** Lifting equipment, cables, and hooks are not inspected before use.
• **Effect:** The cable may break, causing the damper to fall, resulting in damage or work accidents.
• **Solution:**
✅ Check forklift load capacity, hoisting cables, and hook conditions before operation.
✅ Use safety measures such as protective straps throughout the lifting process.

✅ **Summary:** To ensure safe delivery, transportation, receipt, and lifting, it is necessary to:
• Ensure proper packaging protection and thorough inspection before and after transport.
• Use transport and lifting equipment that meet safety standards.
• Conduct careful inventory checks to avoid errors.
• Maintain workplace safety procedures during handling operations.

Safety Regulations for Storing Fire Dampers Before Installation

To ensure **quality, durability, and safety** of EI fire dampers before installation, the following storage regulations must be observed:

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1. Storage Location Requirements

📌 **The storage facility must meet appropriate conditions:**
• The storage area must be **dry, clean, and free from mold** to prevent material degradation.
• Dampers must **not be stored in direct sunlight or areas without a roof**.

📌 **The storage surface must be stable and secure:**
• **Do not place dampers directly on the ground or concrete floor** with high humidity. Instead, use **wooden pallets or shelves** to keep them at least **10 cm above the ground**.
• Avoid placing dampers on **uneven surfaces** that may **cause frame warping or blade deformation**.

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2. Stacking and Storage Regulations

📌 **Proper stacking principles:**
• When stacking multiple dampers, ensure that **weight is evenly distributed** to avoid pressure on the frame or blades.
• **Do not stack more than three layers**, especially for large dampers, to prevent the risk of tipping over.

📌 **Secure dampers to prevent movement:**
• During storage, **secure the dampers with racks or soft straps** to prevent shifting due to external vibrations.
• **Do not use hard materials such as steel wires or screws** to secure the dampers, as they can damage the surface.

📌 **Avoid placing heavy objects on the dampers:**
• **Do not place heavy items** such as metal boxes or machinery on top of the dampers.
• If multiple layers must be stacked, **use protective padding** between the dampers.

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3. Environmental Control

📌 **Control temperature and humidity:**
• The storage area's humidity **must not exceed 75%** to prevent oxidation and corrosion of metal components.
• If stored in **high-humidity areas**, use **dehumidifiers or ventilation fans**.

📌 **Avoid dust and corrosive chemicals:**
• **Do not store dampers near areas containing corrosive chemicals, solvents, acids, or industrial gases**, as they can damage protective coatings.
• **Cover dampers with dust-proof plastic or soft fabric** to prevent dust buildup on moving parts.

📌 **Protect actuators and electronic components (if applicable):**
• If the damper has a **motorized actuator**, ensure it is **wrapped with moisture-proof and dust-proof protection**.
• Ensure **electrical cables and connectors are not bent, twisted, or compressed by heavy objects**.

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4. Periodic Inspection Regulations

📌 **Inspect stored goods at least once a month:**
• Check **external conditions** to ensure there are **no signs of rust, warping, or deformation**.
• Examine **rubber seals and protective coatings** to detect **early signs of deterioration**.

📌 **Create a report when damage is detected:**
• If a damper is found to be **defective, damaged, or dented**, report it **immediately to the technical department or manufacturer** for prompt handling.
• **Do not attempt unauthorized repairs** or structural modifications unless explicitly instructed by the manufacturer.

✅ **Summary:** Proper storage **preserves damper quality, prevents damage, and maintains operational performance** before installation. **Periodic inspection, protection from humidity, and secure placement** will ensure that the dampers meet operational standards when deployed.

Important Notes for Pre-Installation Inspection of EI Fire Dampers

Before installing an **EI fire damper**, thoroughly inspect the following factors to ensure **safety, performance, and durability** of the equipment:

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1. Visual Inspection of the Damper

📌 **Exterior condition:**
• Check the **surface of the damper** for **cracks, scratches, or deformations**.
• Ensure **no corrosion or rust** on the frame or mechanical components.

📌 **Frame and blade structure:**
• Ensure the **damper frame is not bent, warped, or deformed** from external impacts.
• Check that **blades open and close smoothly**, without jamming or obstruction.

📌 **Fire-resistant gaskets and sealing components:**
• Verify that **rubber seals or fire-resistant materials** are **not torn, compressed, or losing elasticity**.
• Ensure **sealing components are intact**, with no damage from transport or storage.

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2. Inspection of the Installation Environment

📌 **Proper installation space:**
• Ensure **the installation size matches the technical drawing** to prevent misalignment or obstruction of airflow.
• The installation area must have **sufficient space for maintenance and inspection** after installation.

📌 **Check environmental conditions:**
• Temperature and humidity at the installation site **must comply with the damper's technical specifications**.
• **Avoid installation in areas with corrosive chemicals or excessive dust buildup**.

📌 **Inspection of mounting system and suspension brackets:**
• If the damper is installed **on a wall, ceiling, or suspended system**, the **support structure must be secure and free of excessive vibration**.
• **Do not use screws or bolts that penetrate the damper body**, as this may affect the opening/closing mechanism.

3. Inspection of Electrical System and Actuator (If Applicable)

📌 **Check the power supply:**
• Verify that the **voltage and current match the actuator's technical specifications** (typically **24V AC/DC or 220V AC**).
• Ensure that the **power supply is stable**, with no **fluctuations, surges, or noise** that could affect the actuator.

📌 **Check control signal wiring:**
• Ensure **wiring is correctly connected according to the technical diagram**, avoiding reversed polarity or loose connections.
• If the damper is integrated with a **Building Management System (BMS)**, verify **input/output signals are functioning correctly**.

📌 **Test actuator operation:**
• **Manually test opening/closing** using the actuator or an external power source to verify smooth operation.
• Check that the **actuator's torque is sufficient to fully close the damper** without issues.

4. Inspection of the Opening/Closing Mechanism

📌 **Manual opening/closing test:**
• Verify that the **damper blades move freely** when manually operated.
• If the damper has a **spring return mechanism**, check the **elasticity and self-closing capability**.

📌 **Control signal opening/closing test:**
• If using an **automated control system**, test the **response time and reliability of the actuator signal**.
• Ensure that the **damper responds quickly**, with no delays or failures when receiving commands.

5. Inspection of Ductwork Connection

📌 **Check installation dimensions:**
• Ensure that the **air duct matches the damper size** to prevent **misalignment or air leakage**.
• If the damper connects to a **flexible duct**, inspect the **connection points for tightness**.

📌 **Minimize vibration from the duct system:**
• If the **fan or duct system generates strong vibrations**, install **expansion joints or**

vibration dampeners to **protect the damper**.
• Ensure that the **air duct does not obstruct the damper's movement range**.

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6. Safety Checks Before Installation

📌 **Assign trained personnel for installation:**
• The installation process **must be carried out by experienced technicians** to **ensure compliance with technical standards**.
• If working at **elevated positions**, use **scaffolding, safety harnesses, and protective equipment**.

📌 **Check tools and support equipment:**
• **Prepare all necessary tools**, including **bolts, wrenches, pressure gauges, and multimeters** for testing.
• Ensure **the installation area is free of hazards or obstructions**.

📌 **Create a pre-installation inspection report:**
• If any **defects or technical issues** are found, **document them in a report before proceeding with installation**.
• If issues arise from **transportation damage**, contact the **supplier for guidance on resolution** before using the damper.

✅ **Summary:** Before installing an EI fire damper, it is crucial to inspect **the exterior, electrical system, environmental conditions, opening/closing mechanism, mounting supports, and safety requirements**. **Thorough pre-installation checks ensure the damper operates accurately, safely, and efficiently** once in use.

Important Safety Notes for Transporting EI Fire Dampers

1. Packaging and Protection During Transport

📌 **Use protective packaging materials**
• Dampers must be **fully wrapped** using **foam, rubber padding, or shock-absorbing materials** to prevent impacts.
• If multiple dampers are transported, **use separators between them** to prevent friction and surface damage.

📌 **Ensure stable positioning during transport**
• Do **not allow dampers to shift or tilt** during transit—**secure them with straps inside the truck or container**.
• **Avoid placing heavy objects on top of dampers** during transportation.

📌 **Moisture and water protection for dampers**
• Wrap dampers using **shrink film or moisture-resistant covers** to protect them from the weather.
• In **high-humidity conditions**, use **moisture absorbers inside packaging** to prevent rust.

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2. Safety Checks Before Lifting and Handling Dampers

📌 **Use appropriate lifting equipment**
• **Do not drag the damper across the ground**, as this can damage the surface and frame.
• When lifting, use **soft straps or specialized hoisting devices** rather than **direct metal cables**.

📌 **Avoid excessive force on the damper**
• **Do not strike or impact damper edges or corners**, as this may damage **fire seals**.
• Inspect **joints and bolts** before moving to ensure **no loose connections**.

Important Notes on Power Supply Inspection Before Connecting the Damper

1. Ensuring Power Quality

📌 **Verify the damper's rated voltage**
• Confirm whether the damper requires **24V AC/DC or 220V AC** to prevent incorrect wiring.
• Use a **multimeter to check voltage stability before connecting the damper**.

📌 **Ensure a stable power supply**
• Voltage must **not exceed or fall below the rated value**, as this could damage the actuator.
• If voltage fluctuations are detected, use a **voltage stabilizer** to protect the damper's motor.

📌 **Inspect wiring and control system**
• Ensure there are **no loose or faulty connections** in the wiring.
• If the damper is connected to a **BMS (Building Management System)**, verify that **the control signals and network connections are functioning correctly**.

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2. Checking Power Supply Performance

📌 **Verify power supply capacity**
• Ensure that the **power source has adequate capacity** to support the damper's energy needs.
• If multiple dampers share the same power source, verify that the **load does not exceed allowable limits**.

📌 **Check for electrical noise and interference**
• If **harmonics or electrical noise** are present in the power system, use an **EMI filter (Electromagnetic Interference Filter)** to prevent performance issues.

✅ **Summary:**
• Securely position dampers during transport to **prevent impact, moisture exposure, or shifting**.
• Verify **power quality, ensure correct voltage, and inspect control wiring** before

connecting the damper.
• **Check system wiring to prevent incorrect polarity or signal failures**.

Common Mechanical Issues When Installing EI Fire Dampers

During the installation of an **EI fire damper**, several **mechanical issues** may arise due to **improper installation, technical errors, or unsuitable environmental conditions**. Below are common issues and solutions:

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1. Damper Frame Warping or Deformation During Installation

📌 **Causes:**
• **Incorrect transport**, impact damage, or improper lifting techniques.
• **Excessive tightening of mounting bolts**, causing deformation.
• **Improper leveling during installation**, leading to damper misalignment.

✅ **Solutions:**
• Before installation, **inspect the damper frame** for any **signs of deformation**.
• **Adjust alignment** to ensure even mounting pressure.
• **Do not overtighten bolts**, ensuring **proper sealing without distorting the frame**.

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2. Damper Blades Do Not Fully Open or Close

📌 **Causes:**
• **Misalignment** of the damper during installation, causing blade movement obstruction.
• **Faulty spring mechanism or hinges**, reducing blade movement.
• **Foreign objects obstructing blade travel**, such as dust, wiring, or support brackets.

✅ **Solutions:**
• Ensure **precise damper positioning** according to installation drawings.
• **Inspect spring and hinge mechanisms**, lubricating them if necessary.
• **Remove any obstructions** in the damper's path.

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3. Expanding Fire Seals Are Deformed or Damaged

📌 **Causes:**
• **Overcompression during installation**, reducing seal effectiveness.
• **Seal tearing or deterioration** due to transport impacts.
• **Exposure to corrosive chemicals** at the installation site, accelerating degradation.

✅ **Solutions:**
• Before installation, **check seals for elasticity and damage**.
• If seals are damaged, **replace them to maintain airtight performance**.
• **Avoid installing dampers in chemically corrosive environments**.

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4. Damper Vibrates Excessively When System is Operational

📌 **Causes:**
• **Loose mounting or inadequate support** on installation brackets.
• **Vibration transmission from the air duct system**, causing damper movement.
• **Loosening of bolts over time**, resulting in movement when closing/opening.

✅ **Solutions:**
• Reinforce **mounting brackets and supports** to ensure a **stable installation**.
• If excessive vibration is present, **install expansion joints or vibration dampeners**.
• Periodically **tighten bolts and inspect for looseness**.

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5. Poor Sealing Between Damper and Duct System

📌 **Causes:**
• **Improper installation**, leaving **gaps between the damper and air duct**.
• **Damaged or missing sealing tape**, allowing air leakage.
• **Duct system vibrations**, causing the connection between the damper and duct to loosen.

✅ **Solutions:**
• **Inspect and secure the duct connection**, ensuring there are **no air gaps**.
• Use **specialized sealing tape** to improve airtightness.
• If high vibrations occur, **reinforce the mounting brackets or use flexible duct connectors**.

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6. Misalignment During Installation of Motorized Dampers

📌 **Causes:**
• **Incorrect mounting direction**, preventing proper motor operation.
• **Incorrect wiring**, causing actuator failure or damage.
• **Unstable power supply**, leading to insufficient torque for operation.

✅ **Solutions:**
• Ensure **proper actuator alignment** based on **manufacturer specifications**.
• Before applying power, **verify correct polarity** to prevent motor damage.
• Maintain a **stable and interference-free power supply**.

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7. Failure to Perform Functional Tests After Installation

📌 **Causes:**
• No **post-installation testing** before system activation.
• **Failure to simulate real operating conditions**, leading to undetected faults.

✅ **Solutions:**
• After installation, **inspect all joints and actuation mechanisms**.
• **Manually test the damper's movement** and **confirm control signal responsiveness**.
• If using remote control systems, **verify damper response to commands**.

✅ **Summary:** When installing an EI fire damper, ensure **proper alignment, functional blade movement, correct actuator installation, secure duct connections, and periodic testing**. Conducting **preliminary functional tests** before system activation will **prevent operational failures**.

Negative Effects of Poor Power Quality on Fire Damper Actuators and Solutions

1. Negative Impacts of Poor Power Supply on Fire Damper Actuators

📌 1.1. Undervoltage (Under Voltage) or Overvoltage (Over Voltage)

🔷 **Causes:**

• Unstable electrical system, with power supply **not matching rated voltage**.
• Shared power supply with **multiple high-power devices**, leading to overload.
• **Long power cable runs or undersized wiring**, causing voltage drop.

🔷 **Effects:**

• **Reduced actuator torque**, resulting in weak movement or failure to reach desired speed.
• If **voltage exceeds rated limits**, the actuator may **overheat, burn motor windings, or damage electronic circuits**.
• **Shortened lifespan** and increased risk of **burnout or failure**.

🔷 **Solutions:**

✅ **Measure input voltage** and install a **voltage stabilizer** if necessary.
✅ **Use wiring with appropriate cross-section** to minimize voltage loss.
✅ If multiple dampers share the same power supply, **separate the power source or balance the load**.

📌 1.2. Harmonic Distortion and Electromagnetic Interference (EMI)

🔷 **Causes:**

• The electrical system includes **VFDs (Variable Frequency Drives), UPS systems, and large electronic devices**, which distort voltage waveforms.
• Actuators operate in an **environment with high electromagnetic interference** from welding machines, transformers, or industrial motors.

🔷 **Effects:**

• **Reduced actuator efficiency**, causing **unusual noise and vibrations**.
• **Interference with control circuits**, leading to **command failures or erratic actuator behavior**.
• **Excessive heating**, leading to **insulation breakdown and damage to actuator components**.

🔷 **Solutions:**

✅ Install **harmonic filters (Harmonic Filters) or EMI filters** in the power system.

✅ Choose **VFDs with built-in output filters** to minimize electrical noise.
✅ Use **shielded cables** when connecting actuators to the control panel.

📌 1.3. Phase Loss or Phase Imbalance (For Three-Phase Systems)

🔷 **Causes:**

• **One phase in the power system is disconnected, has poor contact, or is unloaded**.
• **Voltage imbalance across phases**, leading to **unequal current draw** in the actuator.
• **Incorrect wiring configuration** for VFD or soft starters.

🔷 **Effects:**

• **Reduced actuator torque**, causing **jerky or weak operation**.
• **Excessive current draw in one phase**, leading to **motor overheating and insulation failure**.
• If phase loss continues, the actuator may **completely stop or burn out**.

🔷 **Solutions:**

✅ **Measure phase voltages** using a multimeter to detect imbalance.
✅ If using a **VFD**, ensure **correct voltage input settings**.
✅ Install a **phase loss protection relay** to disconnect power during faults.

📌 1.4. Sudden Voltage Spikes and Fluctuations

🔷 **Causes:**

• Large electrical loads such as **welding machines or high-power transformers** cause **voltage surges**.
• **Nearby lightning strikes**, leading to **instantaneous overvoltage**.
• **Grid power supply issues** or transmission line fluctuations.

🔷 **Effects:**

• The actuator may experience **temporary shutdown or erratic movement**.
• Sensitive **electronic components inside the actuator control board may be damaged**.
• **Degraded motor windings** and **capacitor failures** over time.

🔷 **Solutions:**

✅ Install a **surge protector (SPD) or voltage suppression device** in the actuator circuit.
✅ Use **lightning protection systems and proper grounding** in high-risk areas.
✅ Check **electrical contacts** to **minimize power interruptions** from large loads switching on/off.

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2. Common Issues and Solutions

📌 **Issue 1: Actuator Fails to Start or Starts Weakly**
🔷 **Causes:** Insufficient input voltage, weak starting capacitor, or damaged motor winding.
🔷 **Solutions:**
✅ **Measure input voltage**, replace starting capacitor if needed.
✅ **Test motor windings** using an insulation resistance tester.

📌 **Issue 2: Actuator Runs but Fails to Generate Sufficient Torque**
🔷 **Causes:** Voltage drop, electrical noise, or incorrect VFD settings.
🔷 **Solutions:**
✅ **Adjust voltage supply** to match specifications.
✅ **Check and fine-tune frequency settings** on VFD (if applicable).
✅ Install **harmonic filters** if necessary.

📌 **Issue 3: Actuator Overheats or Stops Suddenly During Operation**
🔷 **Causes:** Overload, phase loss, electrical interference, or cooling fan failure.
🔷 **Solutions:**
✅ **Ensure proper heat dissipation**, and check actuator shaft for movement restrictions.
✅ **Verify system load**, reduce excess torque if needed.
✅ **Measure power supply stability** and install a **thermal overload relay**.

📌 **Issue 4: Actuator Makes Unusual Noise or Vibrates Strongly**
🔷 **Causes:** Unbalanced voltage, excessive voltage, or damaged bearings.
🔷 **Solutions:**
✅ **Balance input voltage levels** and check supply voltage.
✅ **Inspect actuator shaft and bearings**, apply lubrication if needed.

✅ **Summary:**
Poor power quality can **reduce actuator torque, cause overheating, damage electronic components, and shorten lifespan**. To ensure reliable operation, conduct **power quality checks, install protection against overvoltage, phase loss, and electrical noise**, and maintain **proper grounding and surge protection**.

What Contractors Must Do Before Contacting the Manufacturer's Warranty Team

Before contacting the **manufacturer's warranty team**, contractors must **conduct inspections and prepare relevant information** to **ensure a fast and effective warranty process** while avoiding delays.

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1. Inspect the Issue and Identify the Root Cause

📌 **Thoroughly examine the reported issue**
• **Clearly identify the fault** (e.g., damper not opening/closing, actuator malfunction, control failure).
• Determine whether the issue **occurred immediately after installation or developed over time**.
• If the issue is **power-related**, check the **power supply and control system** before requesting a warranty.

📌 **Perform basic troubleshooting**
• **For EI fire dampers**: Check **seal tightness, installation system, and duct connections**.
• **For actuator issues**: Verify **power supply, wiring connections, and control signals**.
• If possible, **test the equipment manually or with an alternate power source** to see if it can be restored.

📌 **Document all troubleshooting steps**
• **Record all tests performed and their results** to assist the warranty team.
• If minor repairs or component replacements have been made, **document the changes**.

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2. Prepare Necessary Product Information

📌 **Identify product details**
• **Model number, product code, and serial number** from the equipment label.
• **Purchase date and supplier details** to determine warranty eligibility.

📌 **Gather technical documentation and installation records**
• **Installation drawings, wiring schematics, and user manuals**.
• If connected to a **BMS**, ensure **system diagrams and configurations are available**.

📌 **Record real-world operating conditions**
• **Temperature, pressure, and frequency of use** at the time of failure.
• If **power issues are suspected**, measure and record **voltage and current levels**.

📌 **Capture photos and videos of the fault**
• **Take clear images/videos** to provide visual evidence of the issue.
• If error codes appear on the actuator **control panel**, take a screenshot or write them down.

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3. Verify Product Warranty Eligibility

📌 **Check warranty validity**
• **Compare the purchase date with the manufacturer's warranty policy**.
• If the warranty period has expired, inquire about **post-warranty service options**.

📌 **Ensure no unauthorized modifications have been made**
• If the product has been **disassembled or modified outside manufacturer guidelines**, the warranty may be void.
• If the failure results from **incorrect operation**, free warranty service may not be provided.

📌 **Prepare a warranty claim report if the issue is manufacturer-related**
• If the issue **occurred immediately after installation**, ensure a **delivery and acceptance report** documents the fault.
• If the issue stems from **transportation damage**, provide **photos of the product upon delivery**.

☑ **Summary:**
Before contacting **the manufacturer's warranty team**, contractors should **thoroughly inspect the issue, document troubleshooting steps, gather product details, and verify warranty eligibility**. If possible, they should **contact the supplier first for remote troubleshooting** before initiating an official warranty request.

Manufacturer's Warranty Methods

The manufacturer provides warranty services through two primary methods, depending on the specific case and cost-effectiveness.

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1. On-Site Technical Support

📌 **Manufacturer's direct on-site warranty service**
• The manufacturer will dispatch **a specialized technician** directly to the project site to **inspect, repair, or replace defective products**.
• This method applies when:
✅ The project is located **within a reasonable distance** from the manufacturer or authorized service centers.
✅ The cost of sending a technician is **lower than or comparable to replacing the product**.
✅ The issue is **complex and requires on-site troubleshooting**, rather than being resolved remotely.

📌 **Coordination with the contractor**
• The technical team will work **alongside the contractor's personnel** to assist in troubleshooting and ensure **proper reinstallation** after repair or replacement.
• If necessary, the contractor must provide **access to the installation site, support personnel, and the necessary tools, equipment, and means for basic inspection**.

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2. Remote Replacement Warranty

📌 **Shipping new products or components for replacement**
• If the cost of sending a technician **exceeds the value of the replacement product**, the manufacturer may **send new products or components** directly to the project site for the contractor to carry out the replacement.
• This method applies when:
✅ The project is located **in a remote area**, making on-site warranty service impractical.
✅ The **product or component is severely damaged, beyond repair, or would take longer to fix than to replace**.
✅ The **logistics and labor costs for on-site repairs exceed the cost of replacing the product or component**.

📌 **Handling defective products**
• Depending on the case, the manufacturer may:
✅ Request the **contractor to return the defective product** for further inspection and analysis.

✅ Instruct the **contractor to dispose of the defective product** if it cannot be repaired.
• The manufacturer will coordinate with **logistics partners or the contractor** to facilitate the product exchange.

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3. Criteria for Selecting the Warranty Method

📌 **Warranty method selection is based on:**
• **Geographical distance** between the manufacturer and the project site.
• **Cost comparison** between on-site repair and product replacement.
• **Severity of the issue**—whether a technician's on-site inspection is necessary or if replacement alone is sufficient.

📌 **Manufacturer's role in the warranty decision-making process**
• The manufacturer will evaluate each case individually and determine the most optimal warranty approach based on:
✅ **Cost-effectiveness and logistics feasibility**.
✅ **The extent of damage and ability to resolve the issue**.
✅ **Availability of replacement products**.

✅ **Summary:**
The manufacturer provides warranty services **either through direct on-site repairs or by shipping replacement products**, depending on **geographical location, cost comparison, and issue severity**. The **contractor and manufacturer will coordinate to ensure an efficient and cost-effective warranty solution**.

📌 **Note:** The selection of the warranty method is based on the **principle of optimizing costs and service time**, regardless of **which party is responsible for the costs or whether the warranty service is free or paid**. This applies **whether the product is within the warranty period or has already expired**.