MOT

Servo Motor

User Manual

ORIGINAL DOCUMENT
Manual Revision 1.0

Revision History

Manual Rev.	Date	Notes
Rev.1.0	6 Nov. 2025	Initial release

Copyright Notice

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Contents

1 Introduction

1.1 About This Manual

This manual provides essential information for the safe operation of the MOT servo motors and rotary actuators. It also covers electromagnetic actuators, such as motor-gear combinations. For simplicity, all products will hereafter be referred to as **motors**.

If this manual is accompanied by an addendum (e.g., for special applications), the information in the addendum takes precedence. In the event of any conflict between this general user manual and the article-specific documentation, the article-specific documentation shall prevail. Any conflicting statements in this manual are therefore invalid.

It is the responsibility of the owner to ensure that all personnel assigned to install, operate, or maintain the MOT motors have read and fully understood this manual. Keep the manual accessible near the motor at all times.

Make sure to inform any colleagues working in the vicinity of the machine about the safety instructions and warnings to prevent accidents or injuries.

1.2 Scope of Delivery

Check the completeness of the delivery against the delivery note.

1.3 Signal Words

In this manual, safety messages are identified by standardized signal words.
These signal words indicate the severity and likelihood of potential hazards:

Signal Word	Color	Meaning
Danger	Red	Indicates an imminent hazard that will result in serious injury or death if not avoided.
Warning	Orange	Indicates a potential hazard that could result in serious injury or death if not avoided.
Caution	Yellow	Indicates a potential hazard that could result in minor or moderate injury if not avoided.
Notice	Blue	Indicates a situation that may lead to property damage, but does not pose a risk of injury.

Always follow the instructions associated with each signal word to ensure safe and reliable operation.

1.4 Safety Symbols

The following safety symbols are used to indicate hazards, things that are forbidden and important information:

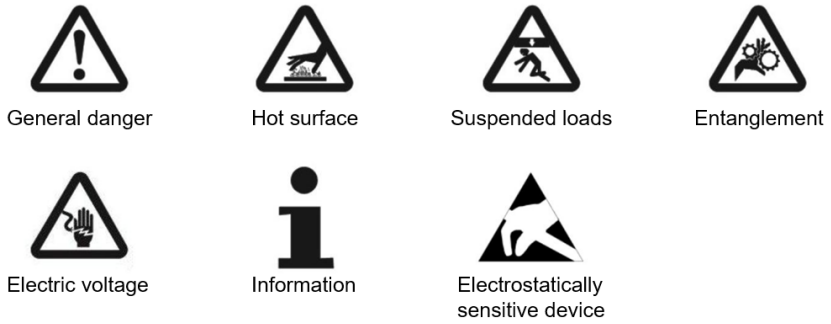


Figure 1-1. Safety Symbols

2 Safety

This operating manual—including all safety instructions—and any site-specific regulations must be observed by all personnel working with or on the MOT.

In addition to the safety information provided here, all applicable environmental protection and accident prevention regulations must be followed (e.g., use of personal protective equipment, PPE).

2.1 Hazards

The MOT servo motor has been developed in accordance with current technological standards and recognized safety regulations.

To prevent injury and equipment damage, the MOT may only be operated:

- For its intended purpose. Refer to the section Intended Use in this manual.
- In a technically sound and safe condition.

Before performing any work on the MOT, be sure to read the section General Safety Instructions in this manual.

2.2 General Safety Instructions

Danger – Electric Shock

Improper electrical installation or the use of unapproved live components may result in serious injury or death.

- All electrical connections must be made only by qualified electricians.
- Work on electrical components must be carried out only in dry conditions using appropriate tools.

Danger – Rotating Parts

Rotating components can entangle body parts, causing serious injuries or death.

- Ensure all machine-side safety equipment is installed and compliant with applicable standards before startup.

Warning – Risk of Projectiles

Loose objects or tools may be ejected by rotating components, leading to injury.

- Remove all tools and foreign objects from the drive actuator before operation.

Caution – Hot Surfaces

The motor housing can become hot during operation, posing a risk of burns.

- Prevent contact with hot surfaces using protective enclosures.
- If direct contact cannot be avoided, apply appropriate warning labels indicating hot surfaces.

2.3 Guarantee and Liability

Warranty (or guarantee) and liability claims are excluded in cases of personal injury or property damage resulting from:

- Disregarding transport or storage instructions,
- Improper use or misuse,
- Neglected or incorrect maintenance and repair work,
- Improper assembly or disassembly,
- Test runs without secure mounting,
- Operation with defective or missing safety equipment,
- Operation of a heavily contaminated MOT servo motor
- Unauthorized modifications or conversions without prior written approval from STXI Motion.

2.4 Personnel

The MOT servo motor may only be installed, operated, maintained, or serviced by persons who meet all of the following criteria:

- They have received appropriate technical training and are familiar with the relevant safety standards, accident prevention regulations, and applicable local laws.
- They have read and understood this operating manual and all related documentation.
- They are authorized by the system or machine manufacturer to perform the respective tasks.

Important Note

Electrical installation and servicing must only be carried out by personnel with appropriate electrotechnical qualifications (e.g. qualified electrician or electrically skilled person) in accordance with national and regional safety regulations (e.g. in Germany: Elektrofachkraft according to DGUV Regulation 3).

The responsibility for assigning and qualifying personnel lies with the operator or system integrator. Improper handling can lead to personal injury, damage to the product, or loss of warranty.

2.5 Intended Use

The MOT servo motors are designed for integration into industrial systems and machines for professional applications. They are intended for stationary or movable equipment within industrial environments and are not designed for road vehicles or consumer products.

The following conditions must be fulfilled:

- The MOT servo motor must be operated via a compatible servo drive.
- It must not be used in special environments (e.g., vacuum, explosive atmospheres, food processing, cleanrooms, or radiation).
- All machine safety devices must be present, correctly installed, and fully functional. Bypassing, disabling, or removing safety equipment is prohibited.

Note The integrated brake is designed only for emergency stop situations. It must not be used for continuous braking operations.

2.6 Reasonably Foreseeable Misuse

Any use of the MOT servo motor that deviates from the specifications and instructions provided in this operating manual, the product datasheet, or applicable legal requirements and safety requirments is considered misuse and is strictly prohibited.

The following actions are particularly classified as foreseeable **misuse**:

- Use outside the specified mechanical, electrical, thermal, or environmental parameters (e.g., speed, torque, temperature, humidity, vibration, duty cycle).
- Operation without ensuring proper mechanical and electrical integration into a compatible system or machine.
- Use in systems that do not comply with applicable safety regulations, such as the Machinery Directive 2006/42/EC or the upcoming Machinery Regulation (EU) 2023/1230.
- Use of incompatible or non-qualified motor controllers (servo drives), particularly devices without appropriate product approvals (e.g., CE, UL) or lacking verified compatibility with the motor’s electrical parameters.
- Operation in explosive, corrosive, or otherwise unsuitable environments, unless explicitly approved.
- Use in a defective, damaged, or improperly maintained state.
- Installation or commissioning without prior review of this operating manual and all project-specific documentation.
- Operation without implementing adequate system-level warning and safety measures, where required.

- Use of unauthorized lubricants, cleaning agents, or mechanical modifications.
- Assembly, wiring, or maintenance by personnel who do not meet the qualification criteria defined in **the section** Personnel.

Note Any non-compliance with these provisions may lead to malfunction, personal injury, or damage to equipment. The responsibility for proper system integration and safe operation lies with the system manufacturer or operator.

3 Description of the MOT Servo Motors

3.1 General Information

The MOT servo motor are designed for industrial applications and provide reliable, precise motion control. These products are available in various configurations, including motors and motors with integrated gearboxes.

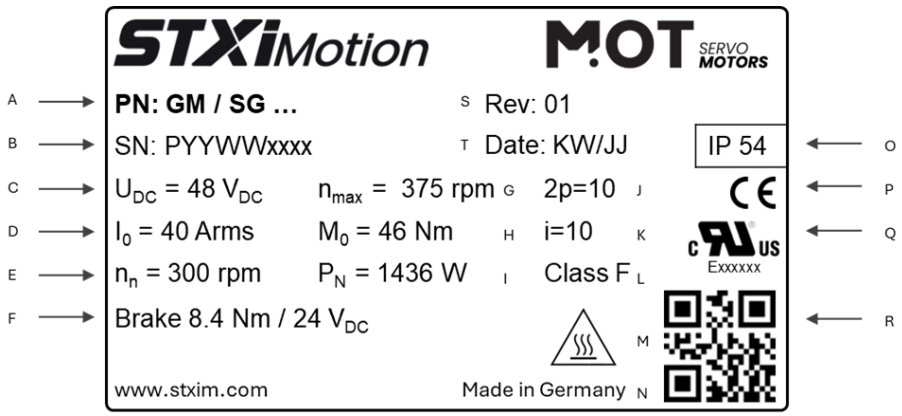
The models combine an optional low-backlash planetary gearbox, a synchronous motor, an optional integrated brake, and an encoder into a compact unit, providing a complete motion solution in a single assembly.

Detailed dimensional and performance data can be found in the dimensional drawing and the corresponding datasheet.

These documents are available on the STXI Motion website, or can be obtained from the STXI Motion Sales department.

3.2 Product Identification Label

The nameplate is affixed to the housing of the MOT servo motor and provides key identification and specification details. The illustrated nameplate contains sample values for reference.



A	Part Number
B	Serial number
C	DC bus voltage
D	Continuous stall current
E	Nominal speed
F	Brake info *(optional)*
G	No-load speed
H	Continuous stall torque
I	Rated power
J	Number of poles
K	Ratio *(optional)*
L	Insulation class
M	Hot surface
N	Country of manufacturer
O	Protection class
P	CE conformity
Q	UL conformity & Style
R	Identification code (QR or DMC)
S	Revision
T	Date of manufacture (Week/Year)

3.3 Ordering Information

The ordering code of the MOT servo motors is composed as follow.

SM2 Servo Motor

	SM2	–	60	006	4	30	0	5	AB	0	M
SM2 Servo Motor											
Frame Size											
40	40 mm										
60	60 mm										
80	80 mm										
11	110 mm										
13	130 mm										
Torque											
001	0.16 Nm (40mm, 50W)										
003	0.32 Nm (40mm, 100W)										
006	0.64 Nm (60mm, 200W)										
013	1.27 Nm (60mm, 400W)										
015	1.53 Nm (80mm, 480W)										
025	2.55 Nm (80mm, 800W)										
035	3.50 Nm (80mm, 1.1kW)										
042	4.20 Nm (110mm, 1,4kW)										
060	6.00 Nm (130mm, 2 kW)										
095	9.55 Nm (130mm, 3 kW)										
DC Bus Voltage											
2	24 VDC (optional)										
4	48 VDC										
Rated Speed											
30	3000 rpm										
32	3200 rpm (2 + 3 kW)										
Shaft											
0	Smooth										
2	Keyway										
IP Rating											
4	IP40										
5	IP54										
Feedback											
AB	Incremental encoder AqB, Res.4096 ppr + Halls										
Brake											
0	No brake										
B	With brake										
Connector											
F	0.35 m cable with flying leads										
M	0.35 m cable with connector for ZED-drive, Power+Feedback+Brake										

SM01 Servo Motor

		SM01	–	L	80	A	2	34	0	4	AB	B	M
	SM01 Servo Motor												
	Inertia												
L	Low inertia												
M	Medium inertia												
H	High inertia												
	Frame Size												
80	80 mm												
	Length												
A	Shortest												
B													
	AC Bus Voltage												
2	24 VDC												
4	48 VDC												
	Rated Speed												
34	3400 rpm												
43	4300 rpm												
	Shaft & Oil seal												
0	Smooth (length 20,5 mm)												
1	Helical toothed shaft												
2	Smooth (length 35 mm)												
3	Straight toothed shaft												
4	Key way Ø 8mm (custom shaft)												
	IP Rating												
4	IP40												
5	IP54												
	Feedback Device												
AB	Incremental encoder AB quadrature, index, Halls, RS422												
	Brake												
0	No brake												
B	With brake												
	Connector												
M	0.35-meter w mating connector to SD01	Power Feedback	Brake										
N	0.55-meter w mating connector to SD01	Power Feedback	Brake										
R	0.35-meter w mating connector to SD01	Power Feedback, 90°	Brake										
F	0.35 meter flying leads												
T	0.18-meter w connectors Brake Power: TE con. DT04-08PA Feedback: M12 17pin												
Z	0.50-meter w mating connector to mi-control drive	Power Feedback	Brake										

3.4 Performance Data

For reliable operation, STXI Motion recommends adhering to the specifications provided in the technical datasheet.

If required, contact STXI Motion for assistance with the optimal dimensioning of the complete system.

3.5 Temperature Monitoring

MOT motors and rotary actuators may be equipped with integrated temperature sensors to prevent overheating. These sensors can trigger protective measures if the permissible temperature limit is approached.

- Tripping devices or detection circuits must be connected to the motor drive to prevent the motor from exceeding its permissible temperature limit.
- Ensure that the motor is properly dimensioned for the application so that the permissible operating temperature is not exceeded, even under the most demanding conditions.

⚠ **NOTICE:** If the temperature limit is exceeded, the motor may be damaged. Always select a motor that meets the thermal requirements of the system and adhere to the temperature specifications provided in the datasheet.

Note Correct installation and integration of the temperature monitoring system are essential for reliable operation. Refer to the product datasheet for temperature limits and sensor details.

3.6 Product Weight

The weight of each motor varies depending on size, configuration, and integrated options (gearbox, brake, sensors, etc.).

Refer to the product datasheet for exact values.

Due to component tolerances and configuration options, actual weight may vary by up to ±10%.

4 Transport and storage

4.1 Packaging

The MOT servo motor is delivered packed in foil and cardboard boxes.

- Dispose of the packaging materials at the recycling sites intended for this purpose.
- Please observe the valid national regulations for waste disposal.

4.2 Transport

Danger – **Risk from suspended loads!**

Suspended loads may fall unexpectedly and can cause **serious injuries or even death**.

- Never stand under suspended loads.
- Ensure that **no person** is located in the hazard zone during lifting or lowering operations.
- Always use suitable and approved lifting equipment operated by trained personnel.

Notice – **Risk of damage to the MOT servo motor**

Hard impacts (e.g. from falling, tipping over, or improper setting down) may lead to **permanent damage** of the MOT servo motor or internal components.

Observe the following transport and handling instructions:

- Always use hoisting equipment and lifting accessories (e.g. straps, eye bolts, lifting lugs) with sufficient load-bearing capacity.
- Ensure that the maximum permissible load of any lifting or transport device is not exceeded.
- Secure the load against slipping or tipping before lifting.
- Lift and lower the MOT servo motor slowly and evenly to avoid shock loading.
- Protect the gear unit and motor housing from collisions and vibration during transport.

Transport Recommendations

- Use original packaging or equivalent shock-absorbing transport containers for shipment or storage.
- Avoid direct contact with hard surfaces. Use padding as necessary.
- Store and transport the unit in a horizontal position (as intended for operation), unless otherwise specified.

4.3 Storage

Store the MOT servo motor in its original packaging in a horizontal position, in a dry environment, and at a temperature between 0 °C and +30 °C.

- Maximum storage duration: 5 years
- We recommend following the “first in – first out” principle in storage logistics.

4.3.1 Short Period of Storage

Short-term storage refers to periods from a few minutes up to 12 months.

Requirements:

- Horizontal storage in original packaging
- Ambient temperature: +5 °C to +40 °C
- Environment: dry, dust-free, vibration-free, low humidity and minimal temperature fluctuation to prevent condensation
- Protection from aggressive media such as vehicle exhaust, gases, mists, and aerosols containing acids, alkalis, or salts

For further environmental conditions, refer to the section Operating Conditions.

4.3.2 Long-Term Storage

Long-term storage requires special precautions. Before putting the motor into operation, it must undergo a defined **running-in procedure** (refer to the section Running-In After Long-Term Storage). Failure to do so will void the warranty (refer to section General Safety Instructions).

Storage conditions:

- Closed, dry, and dust-free room
- No vibrations
- No aggressive or biologically active environmental influences
- No direct sunlight (max. solar irradiance: 50 W/m^2)
- Temperature: +5 °C to +25 °C
- Relative humidity: max. 65%
- Absolute humidity: max. 10 g/m^3
- Temperature variation: max. 0.1 °C/min
- Air pressure: 70–106 kPa

Monitoring:

- Use a data logger with measurement intervals ≤ 1 hour
- At least two measuring points: the highest and lowest position near an outer wall

4.4 Running-In After Long-Term Storage

After storage exceeding 12 months, the MOT servo motor must be run in before regular use. The procedure must be performed using speed-controlled drive electronics without load, with the motor mounted horizontally and adequately secured. Active cooling is not required.

Running-In Sequence:

Step	Direction	Speed [% of n_{max}]	Duration
1	Clockwise	10%	10 min
2	Counterclockwise	10%	10 min
3	Clockwise	25%	6 min
4	Counterclockwise	25%	6 min
5	Clockwise	50%	3 min
6	Counterclockwise	50%	3 min
7	Clockwise	90%	3 min
8	Counterclockwise	90%	3 min

5 Assembly Guidelines

Before starting any work, be sure to read the section General Safety Instructions in this manual.

5.1 Preparations

Before beginning assembly, ensure the work area is clean, well-lit, and equipped with the required tools and personal protective equipment.

Surface Preparation

- Clean and degrease the connection flange of the MOT servo motor with a clean, lint-free cloth and a suitable, non-aggressive grease-dissolving cleaning agent.
- Dry all fitting surfaces to ensure proper friction conditions for the screw connections.
- Inspect all contact surfaces for damage, wear or contamination.

Notice – **Impairment due to electrostatic discharge (ESD)!**

Many electronic components inside or attached to the MOT servo motor are sensitive to electrostatic discharge. Damage caused by ESD may not be immediately visible but can lead to premature failure.

Observe the following precautions when working with or near ESD-sensitive components (e.g. encoders, sensors, electronics):

- Work exclusively at ESD-compliant workstations.
- Always wear a tested anti-static wristband, an ESD protective coat, and ESD-safe shoes or overshoes.
- Never touch electronic components by their connectors or feed lines.
- Avoid the use of plastic tools or plastic-based component holders.

Notice – **Risk of damage due to compressed air!**

Using compressed air for cleaning can damage the seals of the MOT servo motor and compromise its functionality.

Do not clean the MOT servo motor using compressed air.

Instead, clean sensitive areas manually using suitable non-aggressive agents and soft, lint-free cloths.

Once all preparations are complete, proceed to the section Basic Mounting Guidelines.

5.2 Basic Mounting Guidelines

Caution – Risk of Crush Injuries

Mechanical assembly of the motor to the application, as well as subsequent maintenance work, may result in handling errors leading to serious crush injuries and/or damage to the motor or the application.

- All mechanical assembly and maintenance work must be carried out only by trained personnel.
- Always use suitable tools for assembly and maintenance tasks.
- Observe the safety and processing instructions of the threadlocker used.

General Assembly Requirements

- Use fastening screws of property class 10.9 at the maximum permissible screw-in depth.
- For motors with an aluminium flange, use washers of hardness class 300 HV. The contact pressure must not exceed 230 N/mm².
- For motors or gearboxes with a stainless steel flange, do not use washers.
- Refer to the dimensional drawing for the exact thread depths and mounting dimensions.

Mounting Procedure

1. Apply threadlocker (e.g. Loctite® 243) to all fastening screws.
2. Attach the MOT motor to the application/machine:
   a. either via the through-holes of the application/machine,
   b. or via the through-holes of the motor.
3. Make sure to use the full depth of the threaded holes wherever possible.
4. Position the motor so that the nameplate remains clearly visible after installation.

Components Mounted to the Output Side

Caution – Risk of Crush Injuries

Mechanical assembly of components (e.g. couplings, gears, pulleys, tools) to the motor output side may result in handling errors leading to serious injuries and/or damage to the motor or application.

- Perform all assembly and maintenance work only with trained personnel.
- Use suitable tools only.

Notice – Risk of damage due to to Incorrect Assembly

Tensions or excessive force during the assembly process may damage the motor.

- Do not use force when mounting components or attachments.
- Never attempt assembly by hammering or similar methods.
- Tighten screws only up to their maximum permissible depth.
- Always use suitable, calibrated tools.

5.3 Installing the Electrical Connections

Danger – Danger to life due to electric shock!

Contact with live components can lead to severe injuries or death.

Before starting any electrical installation work, strictly observe the five safety rules of electrical engineering:

1. Disconnect the system from the power supply.
2. Secure it against being switched on again.
3. Verify the absence of voltage.
4. Ground and short-circuit the system.
5. Protect adjacent live parts with covers or barriers.

Danger – Risk of electric shock due to moisture!

Electrical work in damp environments is strictly prohibited. Perform all work only in dry and clean conditions.

Before Connecting

- Ensure that all plugs are equipped with protective caps.
- If caps are missing, inspect connectors carefully for dirt, corrosion, or mechanical damage.
- Check for proper mechanical fit and alignment of the plug connectors before mating.

Cable Handling

- Route all cables in compliance with the minimum bending radius specified in the datasheet.
- Avoid torsional loads and ensure strain relief is properly implemented to prevent mechanical stress on the connectors.
- Keep cables away from sharp edges, moving parts, and heat sources.

- Maintain proper electrostatic protection (ESD precautions) when handling electronic connections, especially for encoder and brake cables.

Electrical Connection

- Ensure correct phase assignment between the MOT servo motor and the motor controller.

  When looking at the output shaft, the motor (including optional gearbox) must rotate counterclockwise with phase sequence U – V – W.
- Make sure all connectors (power, encoder, brake) are fully and securely inserted.
- **Shielding and grounding**: All cable shields (if applicable) must be connected to the designated ground points to ensure EMC compliance.

Note For further details on cable types, connectors, and pin assignments, refer to the product-specific datasheet.
The cables may be twisted no more than ± 30° on a length of 1m.

6 Commissioning and Operation

6.1 Operating Conditions

Before commissioning or operating the MOT , be sure to read the section General Safety Instructions in this manual.

Notice – Risk of damage to the MOT servo motor!

Improper operating conditions can lead to overheating, performance degradation or permanent damage.

Observe the following operating requirements:

- Ambient temperature: 0 °C to +40 °C.
- Maximum permitted housing surface temperature: +90 °C.
- For deviations from these values, contact STXI Motion Sales department.
- Operate the MOT servo motor only within its specified performance limits. Refer to sections Basic Mounting Guidelines and **Error! Reference source not found.**.

Ensure the operating environment complies with the following conditions:

- Clean
- Dry
- Dust-free
- Free from condensation
- The MOT is firmly mounted in the intended installation position during operation.
- There is sufficient thermal coupling of the mounting surface to keep thermal resistance low and prevent overheating.

Electrical and Functional Checks

- Before startup, measure the insulation resistance of the motor:
  - ≥ 50 MΩ for new motors
  - ≥ 20 MΩ for motors after use
- For motors with grease-lubricated bearings (standard version):

  If the motor has not been operated for more than 1 year, perform a grease distribution run.

  Operate the motor at 50 % of rated speed for 60 s in both rotation directions.
- If the motor is equipped with a holding brake, follow the instructions in chapter 6.3 Holding Brake.

Mechanical Loads

- Humidity/temperature classification: Continuous operation according to IEC / DIN EN 60721-3-3:1995, class 3K4.
- Vibration load: According to DIN EN 60721-3-3:1995 and DIN EN 60068-2-6:2007.
- Shock load: According to DIN EN 60721-3-3:1995 and DIN EN 60068-2-27:2009.

Note Since this operating manual applies to a wide range of motors, increased vibration or shock loads may be permissible in specific cases. For clarification, please contact the sales department and provide the motor designation and serial number.

6.2 Electrical Commissioning Data

Notice – **Risk of damage to the motor or servo controller!**

Servo drives from different manufacturers often require specific and proprietary configuration parameters.

To avoid malfunction or damage, observe the following:

- Use only the specified electrical parameters for commissioning.
- Verify the unit types (e.g. mA, V, rpm, Nm) match those expected by the servo controller.
- Where unit formats differ, convert values accordingly to ensure compatibility.
- Some servo drives have interdependent parameters (e.g. encoder settings, current limits, temperature monitoring).
- Incorrect configuration can cause serious malfunctions.

Note Contact STXI Motion for assistance in in determining the correct parameter settings for your controller.

Voltage Gradient Requirements

Unless otherwise agreed, the voltage gradient of the pulsed voltage at the motor power terminals must be limited to a maximum of 8 kV/µs.

- Excessive voltage gradients can cause premature failure of the motor winding insulation system.
- If in doubt, consult the supplier of your power electronics to verify compliance.

6.3 Holding Brake

The MOT can be equipped with an integrated spring-applied single-disc holding brake.

This brake is intended for static holding of the motor shaft at standstill.

Important Note

- The holding brake is not a safety brake as defined in DIN EN 13849-1 and must not be used for personal protection or as a dynamic braking system.
- The brake engages in a currentless state. It must be reliably released before motor operation.
- Brake control and monitoring are the responsibility of the customer's servo controller.
- For detailed brake specifications, refer to the product-specific Technical Specifications.

Commissioning and Testing

Note The brake must be tested during commissioning to ensure proper holding torque and safe operation.

If your servo controller supports integrated brake testing:

- Use the manufacturer's built-in function for verifying brake torque during controlled low-speed movement.
- Follow the instructions from the servo controller manufacturer exactly.

If no such function is available, proceed as follows:

1. Limit the permitted movement range and speed in the servo controller to ensure no danger to people or equipment.
2. Calculate the minimum required current (IM_4Pmin) to achieve the brake holding torque, using the motor's torque constant.
3. Set the maximum motor current limit in the servo controller to I_{M4Pmin}.
4. Apply current to the motor while the brake is engaged:
   - Slowly increase current up to IM_4Pmin.
   - The motor must not move.
   - Observe the permissible current-on time at IM_4Pmin.
5. If movement occurs:
   - Ideally, the system should automatically interrupt current to prevent uncontrolled motion.

6. If brake torque M_4Pmin is not reached, perform a brake running-in procedure, as detailed in the section Running-In After Long-Term Storage in this manual.
7. Repeat brake torque measurement after running-in.

After the running-in procedure, if the specified brake torque is still not reached, repeat the running-in process up to two more times.

If the required torque is still not achieved after three total attempts, the brake must be considered non-functional. Do not operate the MOT servo motor. Contact STXI Motion Sales department with the order code and serial number for further support.

Operating Conditions

- The brake must always be released before motor operation.
- The brake is designed for static holding torque (M_4).
- In case of an emergency stop, the brake acts with dynamic friction torque, which is lower than the specified static torque.
- If emergency stop functionality is required, ensure the axis design (load torque, inertia, stopping distance, energy dissipation) is suitable. Frequent emergency stops will cause accelerated brake

Notice – Risk of overvoltage damage!

When using an external servo controller, a protective circuit for the brake power supply may be required.

- Check the documentation of the servo controller manufacturer regarding brake supply protection.
- Missing or inadequate protective circuits may result in damage to the motor and/or drive.

Always verify proper brake function under worst-case conditions (e.g., high temperature, vibration, shock) to ensure safe disengagement during operation.

Note For detailed brake specifications, refer to the product-specific Technical Specifications.

7 Maintenance and Disposal

Before starting any maintenance work, be sure to read the section General Safety Instructions in this manual.

Warning – **Hazard Due to Magnetic Fields**

The permanent magnets of the rotor generate a strong magnetic field, which becomes active during disassembly of the MOT servo motor.

- Follow all general safety instructions for working near strong magnetic fields (e.g. for pacemaker users).

7.1 Maintenance

Disassembling the MOT servo motor partially or completely into its individual components is not permitted.

- In the event of a malfunction or failure, contact STXI Motion Customer Service.
- **Exception:** Replacing the brake may be permitted in coordination with STXI Motion Customer Service. In this case, request the detailed step-by-step brake replacement instructions from Customer Service.

7.1.1 Running-In of the Brake After Maintenance

The holding torque of the brake can vary by up to ±40% due to influencing factors, such as:

- Oxidation
- Flattening of friction surfaces
- Changes in the air gap

To achieve stable brake performance, the brake must be applied regularly.

If your drive cycle does not include regular brake applications (e.g. only in emergency stop), STXI Motion recommends a brake refreshment cycle every 4 weeks.

Recommended brake refreshment cycle:

- Slipping speed: 300 min^{-1}
- Brake de-energized: 1 s
- Brake energized: 3 s
- Number of clockwise cycles: 8
- Number of counterclockwise cycles: 8

7.1.2 Visual inspection

Perform regular visual inspections:

- Check the entire MOT servo motor and cables for external damage.
- Inspect the radial shaft seals for signs of leakage.
- Ensure that all safety labels (refer to Safety Symbols) and the product identification label (refer to Product Identification Label) are in place and legible.

Checking the Tightening Torques

Check all screw connections between:

- MOT servo motor and application
- MOT servo motor and components on output shaft

For specified tightening torques, refer to the section Mounting Interfaces in this manual.

If a screw is found to be loose, follow the procedure below:

Remounting a Screw

1. Loosen the screw completely.
2. Remove old threadlocker residue from the screw and threaded hole.
3. Degrease the screw.
4. Apply fresh threadlocker (e.g. Loctite® 243).
5. Reinsert and tighten the screw to the specified torque.

7.1.3 Cleaning

Caution – Damage from compressed air!

Never clean the MOT servo motor using compressed air – this may damage the seals.

- Clean the housing with a clean, lint-free cloth.
- If necessary, use a grease-dissolving, non-aggressive cleaner.

7.1.4 Startup After Maintenance

Before resuming operation:

1. Clean the exterior of the MOT servo motor.
2. Ensure that all safety devices are properly mounted.
3. Perform a test run to verify correct function.

7.2 Maintenance Schedule

Maintenance	Scope of the Work	At Startup	Every 4 Weeks	After Operating 500 Hours or 3 Months	Regularly
Visual inspection and cleaning	Check for damage, contamination or anomalies on the MOT	X		X	
Checking the tightening torques	Check all screw connections between actuator, frame and wheel.	X		X	
Brake refreshment with function check	Refresh brake function: 300 min^{-1} slipping speed, 1 s de-energized, 3 s energized, 8 cycles CW + 8 cycles CCW. Refer to Running-In of the Brake After Maintenance		X[1]		
Brake function check	Open and close brake e.g. by switching motor off.				At least twice daily
Inspection of the brake torque	Measure brake torque or inspect functionality.				At least once daily

7.3 Lubricant

The gearbox and bearings are lubricated for life at the factory.

No oil change is required for this version of the MOT servo motor.

7.4 Disposal

Dispose of components in compliance with all national and local waste disposal regulations.

Dispose of components at officially designated recycling stations.

Consult STXI Motion Customer Service for additional instructions on decommissioning, disassembly, and proper disposal.

8 Malfunctions / Troubleshooting

Danger – Damage to the MOT servo motor!

Changed operating behavior may indicate damage to the MOT or may cause damage if operation continues.

Do not resume operation until the cause of the malfunction has been identified and eliminated.

Notice – Only specially trained technicians may perform troubleshooting

For optimization of the servo drive settings, STXI Motion recommends:

- Recording the motor current over a full cycle (via servo drive functionality).
- Making this data file available for analysis.

8.1 Faults

Fault	Possible Cause	Remedy
Increased operating temperature	Selected sizing too weak / nominal range exceeded	Check the technical data.
	Motor heats up due to servo drive settings	Check the settings of the servo drive.
	Ambient temperature too high	Ensure adequate cooling.
Increased operating noise	Damaged bearings	Contact Customer Service.
	Gear damage (toothing)	Contact Customer Service.
Loss of lubricant	Seals not tight	Contact Customer Service.
Wrong direction of rotation	Incorrect setpoint specification to servo controller	Check the servo controller
	Incorrect polarity or configuration	Check the setpoint specification and signal polarity.
Motor does not start	Power supply interrupted	Check all electrical connections.
	Incorrect wiring of motor phases and/or encoder	Verify motor and encoder wiring.
	Incorrect servo drive parameters	Verify that parameters match the MOT.
	Motor protection triggered	Identify the cause. Check if the motor protection settings are correct.

Fault	Possible Cause	Remedy
Motor is droning and has high power draw	Motor mechanically blocked	Check the drive system for mechanical obstructions.
	Encoder line error	Inspect encoder wiring and signals.
	Incorrect servo drive parameters	Verify that parameters match the MOT.
	Brake does not release	Refer to fault **Brake does not release**, below.
Changed operating behavior	Existing damage to the drive	Contact Customer Service.
Brake does not release or does not release completely	Voltage drop along the feed line > 10%	Ensure that the supply voltage is correct. Check the cable cross-section.
	Incorrect brake connection	Check the connection for correct polarity and voltage.
	Short circuit in the coil or at body of brake coil.	Contact Customer Service.
	Friction partners are adhering due to long downtimes and high temperatures	Contact Customer Service.
	Brake worn	Contact Customer Service.
Acceleration times are not met	Load is too high	Check the dimensioning.
	Power limiting active	Check the servo drive parameters.
Position error	Shielding of the encoder line insufficient	Inspect the shielding of the connection cables.
	Disturbing pulse fdrom the brake, protective circuit of the brake missing or defective.	Check the protective circuit (e.g., varistor) of the brake on the converter.

9 Appendix

9.1 Mounting Interfaces

This section provides general information on tightening torques and the correct use of screw connections when mounting the MOT and its interfaces.

Tightening torques for common thread sizes in general mechanical engineering

The specified tightening torques for set screws and nuts are calculated reference values and are based on the following conditions:

- Calculation in accordance with VDI 2230
- Friction coefficient for thread and contact surfaces: μ = 0.10
- Utilization of the yield stress: 90%
- Torque tools: Type II, classes A and D in accordance with ISO 6789
- Values rounded to commercially available tool scale settings

Always use the exact values provided in the tightening torque table when setting your torque tools.

For a reliable and safe screw connection, it is recommended to use the full thread depth whenever possible.

Notice – **Use of screw locking required!**

- For all screw connections, appropriate screw locking measures (e.g., threadlocker, locking washers) must be applied.
- Select the locking method according to the relevant assembly instructions and the application's operating conditions.
- Proper screw locking ensures long-term mechanical integrity and prevents loosening due to vibration or dynamic loads.

For further mounting guidance, refer to section Basic Mounting Guidelines.

Thread Size	Strength Class 8.8	Strength Class 10.9	Strength Class 12.9
M2	0.4 Nm	0.5 Nm	0.6 Nm
M2.5	0.8 Nm	1.0 Nm	1.2 Nm
M3	1.5 Nm	2.0 Nm	2.3 Nm
M4	3.5 Nm	4.9 Nm	5.7 Nm
M5	6.9 Nm	9.8 Nm	11.5 Nm
M6	11.8 Nm	16.6 Nm	19.6 Nm

Thread Size	Strength Class 8.8	Strength Class 10.9	Strength Class 12.9
M8	28.8 Nm	40.5 Nm	47.0 Nm
M10	57 Nm	81 Nm	94 Nm
M12	99 Nm	140 Nm	163 Nm
M14	157 Nm	223 Nm	260 Nm
M16	242 Nm	344 Nm	400 Nm
M18	336 Nm	477 Nm	555 Nm

Note Use only calibrated torque tools (ISO 6789, Type II, classes A and D).