STXiMotion

MOT SERVO MOTORS

MOT-HM

Wheel Hub Gear Motor

User Manual

ORIGINAL DOCUMENT
Manual Revision 1.2

Revision History

Manual Rev.	Date	Notes
Rev.1.2	23 Feb. 2026	Updated brake specifications (sections 6.4 and 9.2) Added trademark logos.
Rev.1.1	30 July 2025	Updated table General Brake Characteristics.
Rev.1.0	17 July 2025	Initial release

Copyright Notice

Disclaimer

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Contents

1 Introduction

1.1 About This Manual

This manual provides essential information for the safe operation of the MOT-HM wheel hub gear motor. If this manual is accompanied by an addendum (e.g., for special applications), the information in the addendum takes precedence. 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-HM wheel hub gear motor have read and fully understood this manual. Keep the manual accessible near the gear 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:

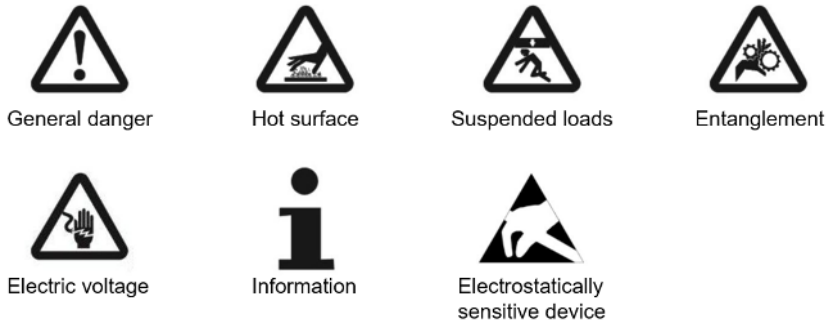


Figure 1-1. Safety Symbols

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-HM.

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-HM wheel hub gear motor has been developed in accordance with current technological standards and recognized safety regulations.

To prevent injury and equipment damage, the MOT-HM 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-HM, 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-HM wheel hub gear motor
- Unauthorized modifications or conversions without prior written approval from STXI Motion.

2.4 Personnel

The MOT-HM wheel hub gear 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-HM wheel hub gear motor is designed to be installed in or connected to:

- Movable industrial machines that are not intended for road use and are designed for professional (industrial) applications.

The following conditions must be fulfilled:

- The MOT-HM wheel hub gear 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-HM wheel hub gear motor that deviates from the specifications and instructions provided in this operating manual, the product datasheet, or applicable legal requirements 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 MOT-HM Wheel Hub Gear Motor Overview

3.1 System Composition

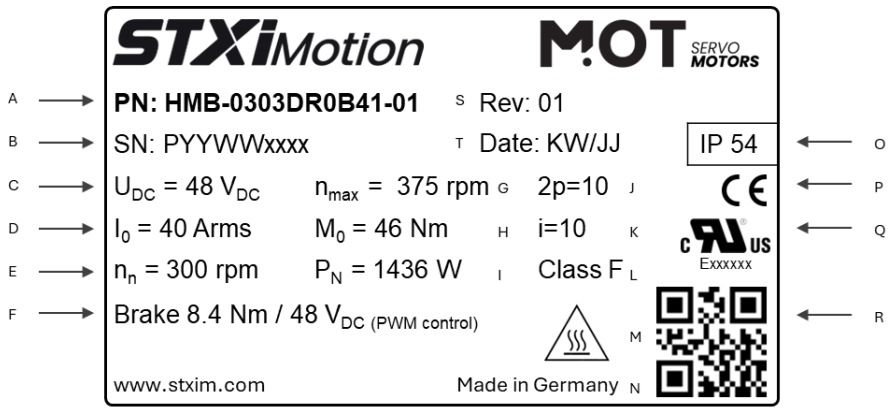
The MOT-HM wheel hub gear motor combines a low-backlash planetary gearbox, a synchronous servo motor, an integrated brake, and an encoder into a compact unit.

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-HM wheel hub gear 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
G	No-load speed
H	Continuous stall torque
I	Rated power
J	Number of poles
K	Ratio
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-HM wheel hub gear motor is composed as follows:

		HMx	-	0303	DR	0	B	4	1	-	0	0
	Wheel Hub Gear Motor											
	Size											
0303	Size 3 – 1400W											
	Encoder											
DR	Dual redundant motor feedback (DRMF) (two signal) SSI											
	Wheel											
0	None											
1	Wheel with outer diameter 190 mm (for size 03xx)											
	Cable length											
A	0.5 m											
B	1.15 m											
	Voltage											
4	48 VDC											
	Brake											
1	BRKSPR0948P (for size 03xx)											
	digit 1											
0	Standard											
	digit 2											
0	Standard											
1	Version with clip for power cable											

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 Product Weight

The following table provides an overview of the typical weights for the MOT-HM wheel hub gear motor.

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

MOT-HM without wheel	HMx-0303DR0x41-00	10 kg
Wheel assembly		3 kg

4 Transport and storage

4.1 Packaging

The MOT-HM wheel hub gear 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-HM wheel hub gear motor**

Hard impacts (e.g. from falling, tipping over, or improper setting down) may lead to **permanent damage** of the MOT-HM wheel hub gear 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-HM wheel hub gear 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-HM wheel hub gear 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 in this manual.

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/m³
- 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-HM wheel hub gear 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-HM wheel hub gear 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-HM wheel hub gear 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-HM wheel hub gear motor and compromise its functionality.

Do not clean the MOT-HM wheel hub gear 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

The MOT-HM wheel hub gear motor is designed for **horizontal installation**. The quantity of lubricant inside the system is optimized for this mounting orientation.

- Mount the MOT-HM only in the specified orientation using the recommended screw dimensions and property classes.
- Observe the safety and handling instructions provided for the threadlocker used.

5.2.1 Installation Envelope

The following figure shows the external dimensions of the MOT-HM wheel hub gear motor.

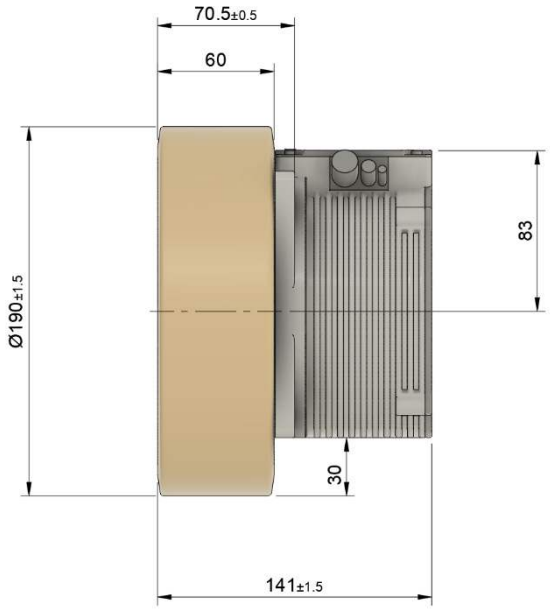


Figure 5-1. MOT-HM External Dimensions

Note	Diameter, width, and the wheel tread material may vary depending on the configuration.

5.2.2 Mounting Instructions

To fasten the MOT-HM wheel hub gear motor in the application, follow these recommendations:

- Use 6 screws, property class 10.9, at the maximum permissible screw-in depth.
- Refer to the dimensional drawing for the exact thread depths.
- Ensure the maximum payload does not exceed 660 kg. Depending on the wheel configuration, the permissible load may be lower.

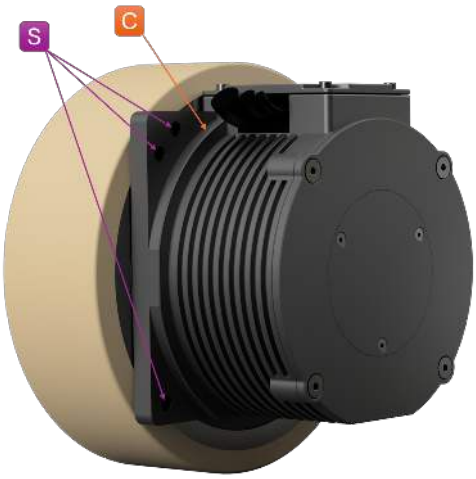


Figure 5-2. MOT-HM Mounting Guide

Mounting Procedure

1. Apply threadlocker (e.g. Loctite® 243) to all fastening screws.
2. Attach the MOT-HM to the vehicle frame using the 6 threaded holes (**S**).
3. Make sure to use the full depth of the threaded holes wherever possible.
4. Support the radial load via the centering diameter (**C**) to avoid overloading the screws.
5. Position the drive so that the nameplate remains clearly visible after installation.

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

The interface on the vehicle frame is designed as shown in the figure below:

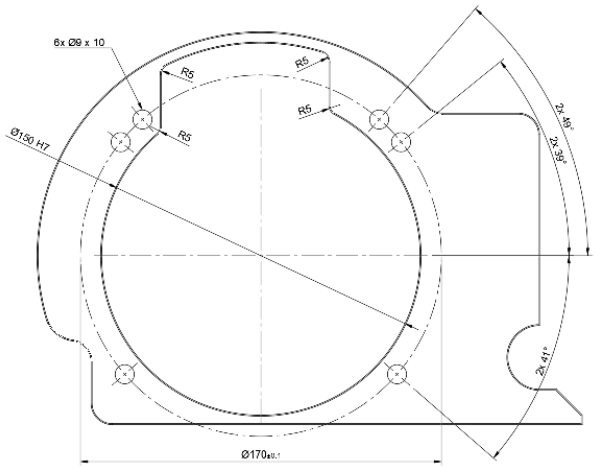


Figure 5-3. MOT-HM Mounting Interface

5.3 Mounting and Removal of the Wheel

Notice – Risk of damage to the MOT-HM wheel hub gear motor!

Mechanical distortions during installation or removal can cause irreparable damage to the MOT-HM.

- Never use force or hammering when mounting or dismounting the wheel.
- Always mount and remove the wheel gently and in alignment with the output flange.
- Use only suitable tools and proper handling equipment for the assembly and removal process.

Information on required screw sizes and tightening torques can be found in chapter 9.1.

If the wheel is stuck on the MOT-HM, the provided extraction threads in the wheel can be used to detach it safely.

Mounting the Wheel

1. Clean and degrease all contact surfaces on the MOT-HM wheel hub gear motor and the wheel using a clean, lint-free cloth and a non-aggressive, grease-dissolving cleaning agent.
2. Dry all fitting surfaces to ensure proper friction conditions for the screw connections.
3. Check the contact surfaces for damage, wear, or contamination.
4. Apply a suitable threadlocker (e.g., Loctite® 243) to the screws, or use screws with a pre-applied thread coating.
5. Insert the screws and tighten them crosswise with the specified torque. Refer to the section Mounting Interfaces in this manual.

Removing and Remounting the Wheel

1. Loosen and remove the fastening screws.
2. If the wheel is jammed:
3. Use the designated extraction threads in the wheel to release it without applying force to the housing.
4. Clean the screw holes and remove any residual threadlocker.
5. Degrease the screws and apply new threadlocker.
6. Reinstall the screws, tightening crosswise with the specified tightening torque.

Tightening Torque and Screw Specification

Refer to the section Mounting Interfaces for the exact values and screw types required for mounting the wheel.

5.4 Mounting a Third-Party Wheel

Notice – **Impairment of functional capability!**

The use of third-party wheels can significantly affect the function and performance of the MOT-HM wheel hub gear motor.

If a third-party wheel is to be installed on the MOT-HM — or if the pre-assembled drive wheel is to be replaced — the following must be observed:

Technical and Functional Considerations

- Wheel geometries and contours directly influence the functionality and operating behavior of the MOT-HM.
- Changed force and torque conditions may occur, which can overload bearings, gear stages, or the motor.
- Different surface materials or profiles lead to varying friction coefficients, which may alter traction, wear, and dynamic response.
- Material and structural properties of the wheel affect the permissible load capacity. If these limits are exceeded, the load capability of the entire drive unit may be compromised.

Mounting Interface Requirements

The **mounting interface** of the third-party wheel must match the MOT-HM wheel hub gear motor in:

- Bolt circle diameter
- Center bore
- Fastening screw size and depth
- Support via centering diameter

The total mass and dynamic balance of the third-party wheel must comply with the original specifications.

Responsibility and Risk

- The validation of compatibility (mechanical, thermal, and functional) lies with the operator or system integrator.
- STXI Motion assumes no liability for damage or malfunctions caused by third-party components unless explicitly approved.

5.5 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-HM wheel hub gear motor and the motor controller.

  When looking at the output shaft, the motor (including gearbox) must rotate counterclockwise with phase sequence U – V – W.

- Make sure all connectors (power, encoder, brake) are fully and securely inserted.

- When using the STXI Motion **ZED 65** drive, ensure all connections are made according to the recommended wiring scheme, as shown in the following figure.

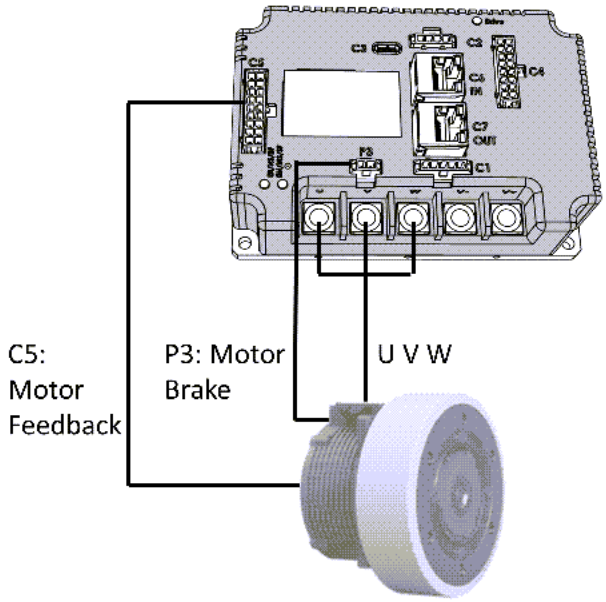


Figure 5-4. Electrical wiring of MOT-HM wheel hub gear motor with ZED 65 drive

This figure shows the correct electrical connection between the MOT-HM wheel hub gear motor and the ZED 65 drive:

- **Power connection (PWR)**: Routed to the motor's power input (U, V, W).
- **Brake connection (BRK)**: Connected to the controller's brake output.
- **Encoder connection (ENC)**: Connect the encoder cable to the designated encoder port.
- **Shielding and grounding**: All cable shields 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 electrical interface description in the section Technical Specifications or the product-specific datasheet.

6 Commissioning and Operation

6.1 Operating Conditions

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

Notice – Risk of damage to the MOT-HM wheel hub gear 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-HM wheel hub gear motor only within its specified performance limits. Refer to sections Basic Mounting Guidelines and Technical Specifications.

Ensure the operating environment complies with the following conditions:

- Clean
- Dry
- Dust-free
- Free from condensation
- The MOT-HM 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.

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.

6.3 Initial Brake Commissioning and Functional Test

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-HM wheel hub gear motor. Contact STXI Motion Sales department with the order code and serial number for further support.

6.4 Brake Operation

The integrated spring-applied single-disc brake ensures safe holding and emergency stopping of the drive system. To guarantee proper and reliable function, the following instructions must be observed—depending on the controller used.

6.4.1 General Brake Characteristics

Parameter	Value
Nominal resistance (20°C)	39.5 – 43 Ω
Nominal power	14 W
Brake opening time (t_O) *	≤50 ms
Brake closing time (t_{c1}) **	≤10 ms

Notes:

* Opening time: time it takes for the spring-applied brake to open mechanically after power has been turned on (beginning of power rise).

** Closing time: time it takes for the spring-applied brake to close mechanically after power has been turned off (beginning of power drop)

The brake is designed to open quickly through an initial 48 V overexcitation. After opening, the voltage should be reduced to a lower holding level to minimize energy consumption and limit heat development.

Notice – Brake torque variation!

The effective brake torque is not a constant value. Brake torque may vary due to:

- Manufacturing tolerances
- Wear
- Environmental influences (e.g., temperature, vibration, shock)
- The condition of the friction surfaces and recent brake actuation history (e.g., depending on previous brake applications)

Depending on these factors, brake torque values may fluctuate and may also temporarily exceed the nominal value.

The technical specifications of the brake are provided in the section Technical Specifications in this manual.

6.4.2 Use with External (Third-Party) Drives

When operating the brake with an external servo controller:

- Apply a voltage of $\geq U_1$ (typically $\geq 24\,V$) to release the brake.
- A short-term overexcitation of 48 V is recommended for quick disengagement.
- After the brake opens, reduce the voltage to $\geq U_4$ (typically $\geq 21.6\,V$) to hold it open.
- The brake closes again when the voltage falls below $\leq U_3$ (typically $\leq 2\,V$).

Note The voltage range between U_4 and U_3 may vary depending on **temperature, wear, and tolerances**.

Make sure voltage control is stable and precise to prevent unintended brake engagement.

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.

6.4.3 Use with STXI Motion Drive

If the MOT-HM wheel hub gear motor is operated with an STXI Motion Drive (ZED) including brake control firmware:

- The brake current is **actively regulated in a closed loop**, automatically compensating voltage fluctuations of ±10% on the 48 V supply.
- The drive uses an internal overexcitation phase to ensure fast brake release.
- The holding current is controlled via the Brake Hold Factor (BHF).

Parameter	Value/Recommendation
Default BHF	1.00
Recommended BHF range	0.30 – 0.40 (depending on environment & dynamics)

Example – Brake Hold Factor Calculation:

If the minimum expected supply voltage is **43.2 V** (48 V – 10%):

$BHF = \frac{14\,V}{43.2\,V} \approx 0.324 \Rightarrow$ Recommended setting: BHF = 0.33

If the BHF is set too low, the brake may re-engage unintentionally.

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

Note For the technical specifications of the brake, refer to the section Technical Specifications in this manual.

6.5 Brake Release in a Defective Vehicle

In the event of a vehicle failure (e.g. battery discharged), the brake must be released to allow towing or repositioning.

To manually release the brake:

1. Disconnect the brake connector.
2. Connect a DC voltage source with at least 24 V to the brake pins.
3. Refer to the datasheet for the correct pin assignment.

⚠ Ensure proper electrical connection to avoid damage and unintended behavior.

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-HM wheel hub gear motor.

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

7.1 Maintenance

Disassembling the MOT-HM wheel hub gear 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-HM wheel hub gear 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.
- Visually inspect the drive wheel for:
  - Cracks
  - Ruptures
  - Wear
  - Deformation
  - Swelling

Checking the Tightening Torques

Check all screw connections between:

- MOT-HM wheel hub gear motor and vehicle/frame interfaces
- MOT-HM wheel hub gear motor and drive wheel

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-HM wheel hub gear 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-HM wheel hub gear 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-HM	X		X	
Checking the tightening torques	Check all screw connections between actuator, frame and wheel.	X		X	
Visual inspection of the wheel	Inspect the wheel for cracks, wear, deformation or other defects.	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-HM wheel hub gear 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-HM wheel hub gear motor!**

Changed operating behavior may indicate damage to the MOT-HM 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-HM.
	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-HM.
	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 Technical Data

9.1 Mounting Interfaces

Mounting on AGV/AMR/Vehicle/Application

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

Size	Thread x lead	Quantity x thread x depth	Tightening torque [Nm] for screw strength class 10.9 recommended for safety
0303	M8 x 1.25	6 x M8 x 10	31.9

Mounting of the Wheel

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

Size	Hole circle Ø [mm]	Quantity x thread x depth	Tightening torque [Nm] for screw strength class 12.9 recommended for safety
0303	139	6 x M6 x 20	15.4

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

For all screw connections, appropriate screw locking measures (e.g., threadlocker, locking washers) must be applied as specified in the relevant assembly instructions.

Be sure to follow the guidance provided in the section Mounting and Removal of the Wheel to ensure long-term mechanical integrity and prevent loosening due to vibration or dynamic loads.

9.2 Technical Specifications

Size 0303

Type	Units	Values
Rated power	W	1,400 W
Voltage	VDC	48
Gearbox ratio		10
Number of stages		1
Rated speed	rpm	300
Rated current	A (RMS)	40
Rated torque	Nm	45.7
Max. speed	rpm	375
Peak current	A (RMS)	130
Peak Torque	Nm	141
Maximum acceptable radial force	N	13,500
Nominal acceptable radial force	N	4,570
Service life (*Note 1*)	h	>30,000
Backlash (gearbox)	arcmin	≤60
Encoder		DRMF: dual redundant motor feedback. Two signal SSI, absolute single turn,
Encoder resolution		14 Bit (primary) 12 Bit (secondary)
Encoder accuracy		0.2° (primary) 0.26° (secondary)
Nominal brake torque M4N	Nm	84
Brake input voltage (*Note 2*)	VDC	48 (PWM controlled)
Brake power (@24Vdc & 20°C)	W	14
Brake resistance (@ 20°C)	Ω	39.5 - 43
Brake inductance	H	1.1
Brake switching voltages U_1 U_3 U_4	V	 ≤ 24 ≥ 2 ≤ 21.6
Brake switching times t_o t_{c1}	ms	 ≤ 50 ≤ 10
Protection class		IP54

Type	Units	Values
Ambient temperature (*Note 3*)	°C	0-40
Resistance ph-ph (*Note 4*)	Ω	0.06
Inductance ph-ph (*Note 4*)	mH	0.15
Motor Ke (*Note 4*)	Vrms / krpm	8.5
Motor K_T (*Note 4*)	Nm / A	0.141
Number of poles		10
Motor insulating material class		F
Bending Radius power cable		Static: 5 x d (13.5 mm) Dynamic: 8 x d (13.5 mm)
Bending Radius brake cable		Static: 8 x d (4.3 mm) Dynamic: 12 x d (4.3 mm)
Bending Radius encoder cable		Static: 8 x d (7.5 mm) Dynamic: 12 x d (7.5 mm)
Power cable specification (*Note 5*)		10AWGX3C+F+PA AVLV2/8 Style 21924 + CAS I A
Brake cable specification		24AWGX2C+AB AVLV2/8 Style 21924 + CAS I A
Encoder cable specification		24AWGX5PR+F+AB+PA AVLV2/8 Style 21924 + CAS I A

Notes

(1) Contact STXI Motion to discuss application-specific service lifetimes.

(2) The operating behavior of the brake is optimized using PWM control. The brake's release behavior is increased by brief over-excitation. After the overexcitation phase, the voltage is reduced. This significantly reduces the power loss and thus the temperature and saves energy.

(3) Operation outside the specified ambient temperature range (0 °C to 40 °C) requires an application-specific evaluation. Contact STXI Motion for guidance.

(4)The values for winding resistance (phase-to-phase), inductance (phase-to-phase), voltage constant, and torque constant refer to the cold state of the motor; that is, measured at 20 °C.

(5) The power cable is dimensioned according to DIN VDE 0298-4, installation method C.
If a different installation method is used, the cable sizing must be individually assessed to ensure safe operation.

9.3 Mechanical Drawing

Size 0303

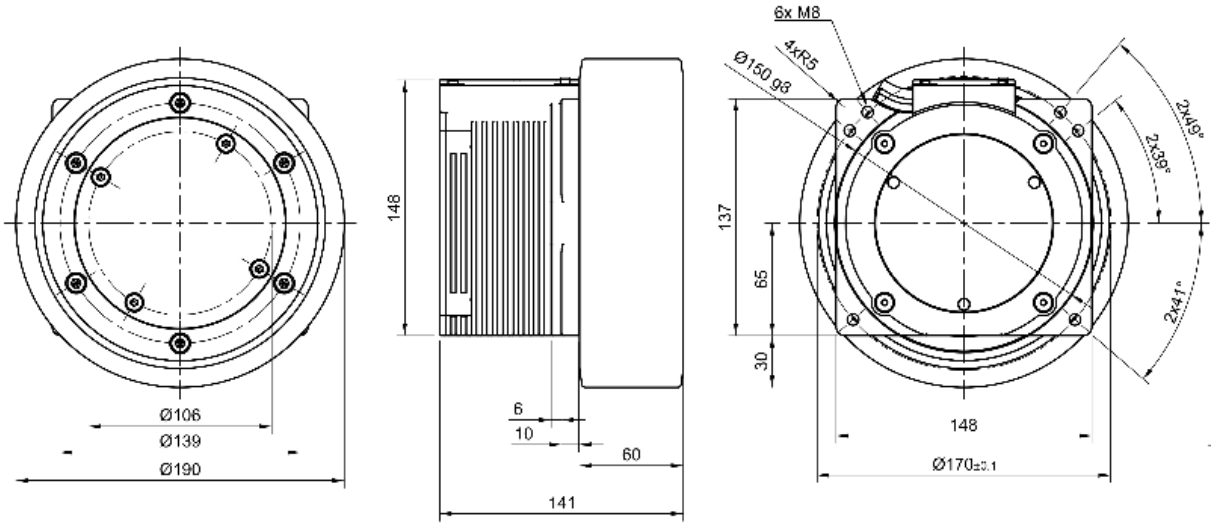
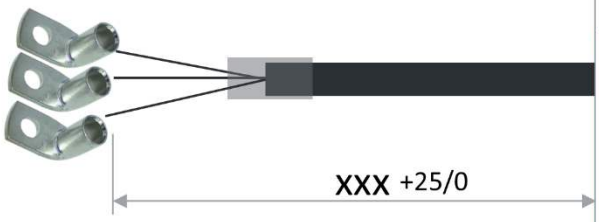


Figure 9-1. MOT-HM 0303 Dimensions

9.4 Signals

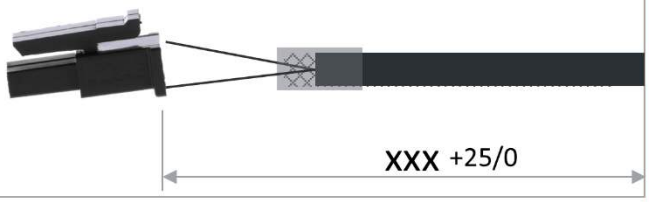
Power 90° angled tube cable lug terminal, M6

Signal	Color
U	Green
V	White
W	Black



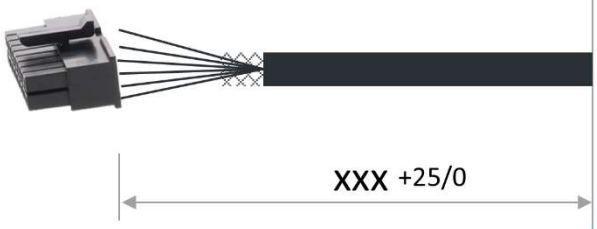
Brake Housing: Micro-Fit 3.0 Receptacle Housing, Single Row, 2 Circuits, UL 94V-0
Pin: Micro-Fit 3.0 Crimp Terminal

Signal	Pin	color
Brake1	1	Red
Brake2	2	Black



Feedback Housing: Micro-Fit 3.0 Receptacle Housing, Dual Row, 18 Circuits, UL 94V-0
Pin: Micro-Fit 3.0 Crimp Terminal

Signal	Pin	Color
GND	3	Blue
+5V	18	Green
E1 DATA+	11	Red
E1 DATA-	2	Orange
E1 CLK+	10	Yellow
E1 CLK-	1	Black
E2 DATA+	13	Violet
E2 DATA-	4	Gray
E2 CLK+	14	Brown
E2 CLK-	5	White



Motor

DRMF
2 SSI signals

Note: The cable length (XXX) is defined in the ordering code.