STXiMotion

mobiGM

Servo Gearmotor

User Manual

ORIGINAL DOCUMENT
Manual Revision 1.0

Revision History

Manual Rev.	Date	Notes
1.0	7 Oct. 2021	Initial release.

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Disclaimer

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1 About This Manual

1.1 Manual Overview

This documentation describes the mobiGM servo gearmotor.

It provides the information required for installation, configuration and basic operation of the mobiGM.

This documentation is intended for persons who are qualified to assemble, commission, and maintain the equipment described herein.

Before you install the mobiGM, review the instructions in this manual. Pay particular attention to all safety instructions and warnings. Failure to follow the safety instructions may result in personal injury or equipment damage.

1.2 Safety Symbols

The following safety symbols are used on the gearmotor and in this manual.

Table 1-1. Safety Symbols

Symbol	Meaning	Description
	Caution	Indicates a hazardous situation, which, if not avoided, could result in injury or equipment damage.
	Caution, hot surface	Indicates the marked item can be hot, and should not be touched without taking care.

1.3 Installation Overview

To install the mobiGM, perform the following steps.

1. Mechanical installation.
2. Electrical installation:
   Make all wiring and cable connections, as required by your application:
   - Motor feedback (**C2** connector)
   - Motor U-V-W (**P3** connector)
   - Motor brake (**P1** connector)

2 Introduction

2.1 Product Description

The mobiGM is a comprehensive gearmotor system for AGV and AMR manufacturers. It includes a high torque density brushless servo motor, a planetary gearbox, a spring-loaded brake, and an encoder.

This compact and integrated design allows saving space and simplifies the cabling and mechanical design of the mobile vehicle. Strong output bearings and a shock and vibration proof servo system ensure a powerful wheel traction and high durability. A low current consumption servo motor minimizes the recharging cycles and increases the mobility range.

2.2 Product Label

The product label is attached to the side of the mobiGM.

Figure 2-1. Product label

Table 2-1. Product Label Codes

Item	Description
PN	Model: xx = Gearbox yy = Motor code zz = Wheel code Refer to the Product Options table for details.
FA	Product serial number
PD	Production date

2.3 mobiGM Product Ordering Options

The following table shows the ordering options that comprise the various model numbers in the mobiGM product line.

Table 2-2. Product Options

		GM	-	01	02	20
	Gearmotor					
	Gearbox					
01	Planetary gearbox ratio 22.5:1 radial mounting					
02	Planetary gearbox ratio 22.5:1 axial mounting					
	Motor					
01	Servo motor – 500W 24VDC, frame 80 mm, with mating connector					
02	Servo motor – 500W 24VDC, frame 80 mm, with flying leads					
03	Servo motor – 900W, 48VDC, frame 80 mm, with mating connector					
04	Servo motor – 900W, 48VDC, frame 80 mm, with flying leads					
	Wheel					
00	No wheel					
16	∅165 mm wheel (not available as standalone item)					
20	∅200 mm, width 50 mm, NDIIThane®					

3 Technical Specifications

3.1 Gearmotor Specifications

Table 3-1. Gearmotor specifications

Feature	Units	GM-0101xx GM-0102xx	GM-0103xx GM-0104xx
Gear nom. torque	Nm	28.15	36.65
Gear max. torque	Nm	84.44	119.48
Gear level of efficiency		0.95	0.95
Gearbox ratio		1:22.5	1:22.5
Gear rated speed	rpm	151	191
Gear rated speed ∅200 mm wheel	m/sec (km/h)	1.58 (5.7)	2.0 (7.2)
Gear rated speed ∅165 mm wheel	m/sec (km/h)	1.26 (4.5)	1.6 (5.7)
Gear type		spur and pinion	spur and pinion
Gear brake static torque	Nm	78.75	78.75
Gear max. radial force	N	25000	25000
Gear max. axial force	N	450	450
Gear lifespan at nominal torque	hr	30,000	30,000
Max. load per ∅165/200 mm wheel @1.1 m/sec (4 km/h)	kg	900	900
Max. load per ∅165/200 mm wheel @2.8 m/sec (10 km/h)	kg	600	600
Emergency stop torque	Nm	200	200
Weight	kg	4.5	5.2
Operating temperature	°C	-15° – 55°	-15° – 55°
Protection class		IP40	IP40

3.2 Motor Specifications

Table 3-2. Motor specifications

Feature	Units	SM01-L80A23404ABxx	SM01-L80A44304Abxx
Motor rated power	W	500	900
Motor voltage	VDC	24	48
Resistance	ohm	0.038 ±10%	0.049 ±10%
Inductance	mH	0.14 ±10%	0.20 ±10%
Motor rated speed	rpm	3400	4300
Motor rated current	Arms	23	22
Motor peak current	Arms	69	103
Motor rated torque	Nm	1.39	2.0
Motor peak torque	Nm	4.17	9.0
Rotor inertia	kg×mm2	60.2	114.3
Number of poles		10	10
Motor cables, length	m	0.5	0.5
Weight	kg	2.3	3.0
Motor feedback		AB quad, index, Halls, RS422	AB quad,, index, Halls, RS422
Motor temperature sensor		PTC (NXP KTY84-150)	PTC (NXP KTY84-150)
Operating temperature	°C	-20° – 55°	-20° – 55°
Insulation class		B (130°C)	B (130°C)
Protection class		IP40	IP40
Lifespan at rated condition	hr	20,000	20,000

3.3 Brake Specifications

Note The power supply voltage for the brake must be controlled within ±10% of the rated voltage; otherwise, brake performance will be affected.

Table 3-3. Brake specifications

Feature	Units	
Rated voltage	VDC	24 ±10%
Power	W	13.5
Static torque	Nm	≥ 4.0
Holding torque	Nm	4
Insulation resistance		100 MΩ @ 500 VDC
Rotor inertia	kg·m2	3.68 · 10-6
Speed	rpm	0 – 6000
Release voltage	V	>1.2
Release time	ms	30
Pull-in voltage	V	≤14.4
Pull-in time	ms	60
Backlash	degree	<0.5
Winding resistance (20°C)	ohm	42.7 ±7%
Noise	dB	<60
Operating temperature	°C	-10° – 40°
Insulation class		B (130°C)
Number of switching cycles B10 @ 0 rpm		500.000
Lifespan at rated condition	hr	20,000

3.4 Dimensions

Gearmotor GM-010100 / GM-010200

Nom./Max. torque 28/84 Nm

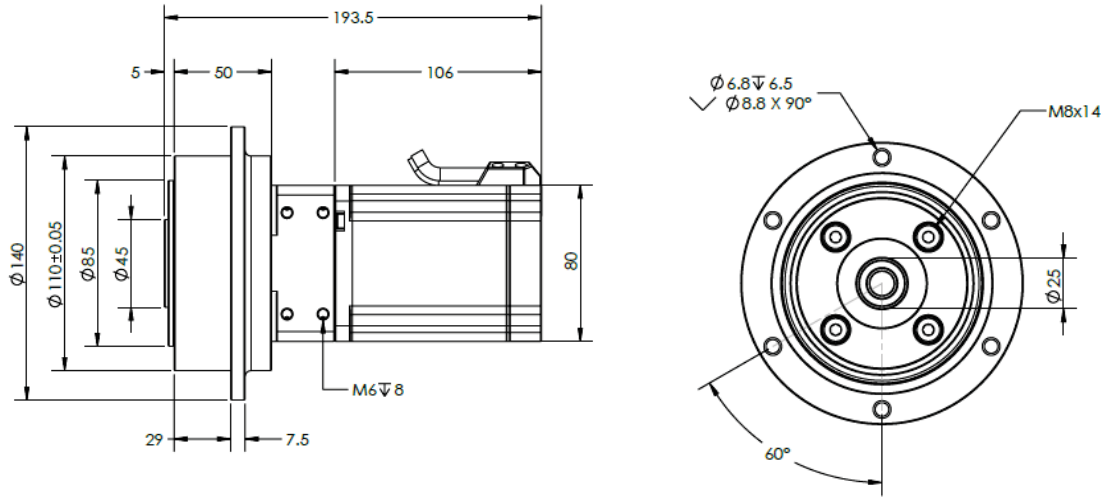

Figure 3-1. Dimensions – gearmotor GM-010100 / GM-010200

Gearmotor GM-010300 / GM-010400

Nom./Max. torque 36/119 Nm

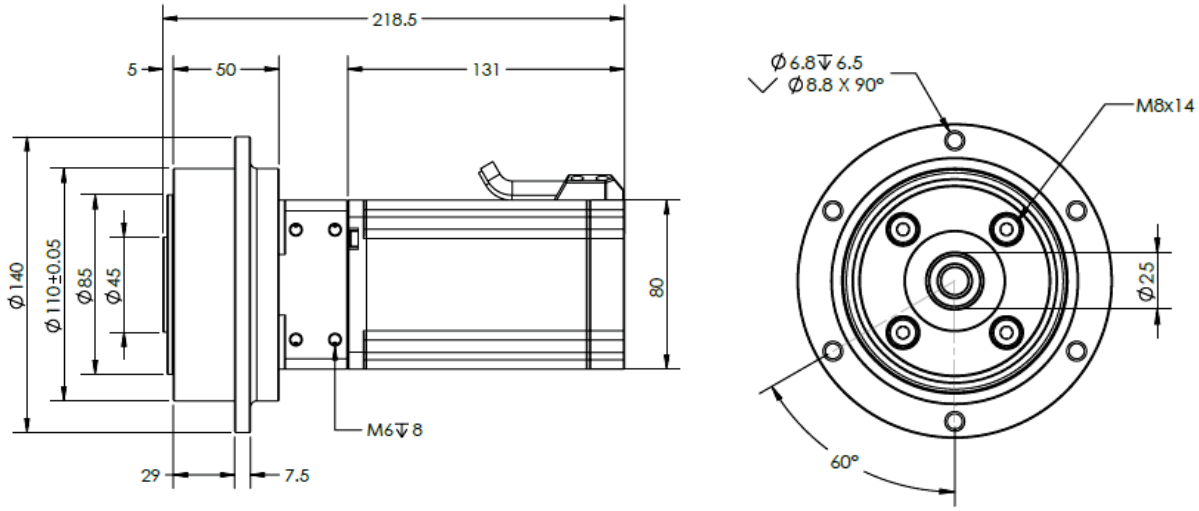

Figure 3-2. Dimensions – gearmotor GM-010300 / GM-010400

Gearbox GB01-PL02H22505000 Radial mounting

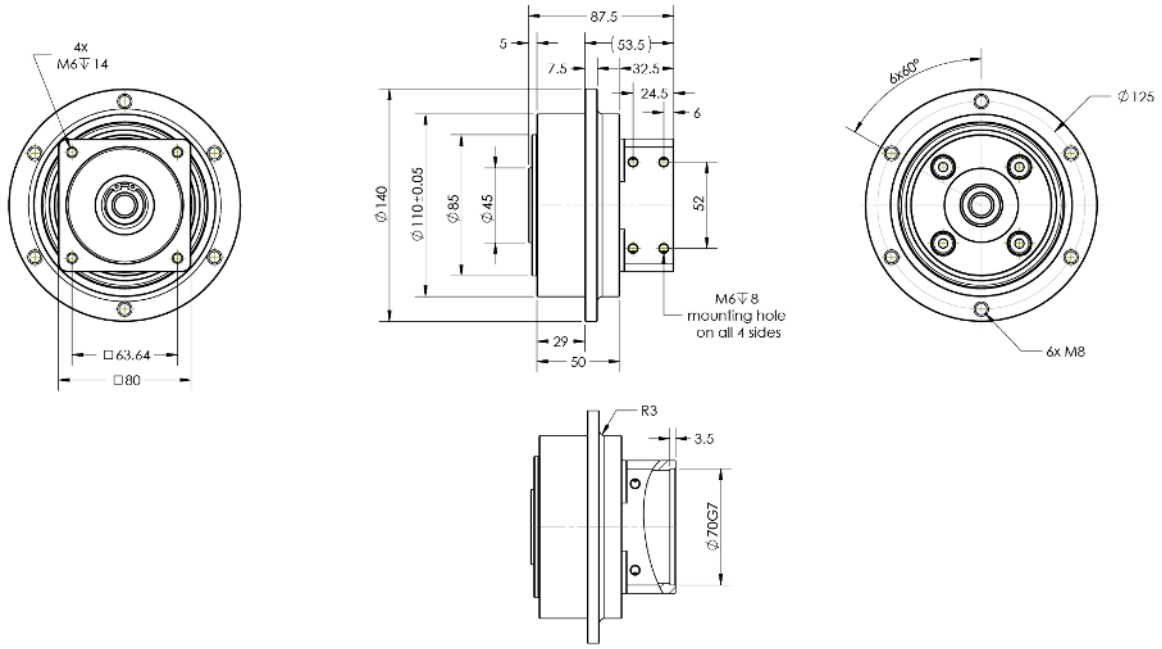

Figure 3-3. Dimensions – gearbox GB01-PL02H22505000 radial mounting

Gearbox GB01-PL02H22505001 Axial mounting

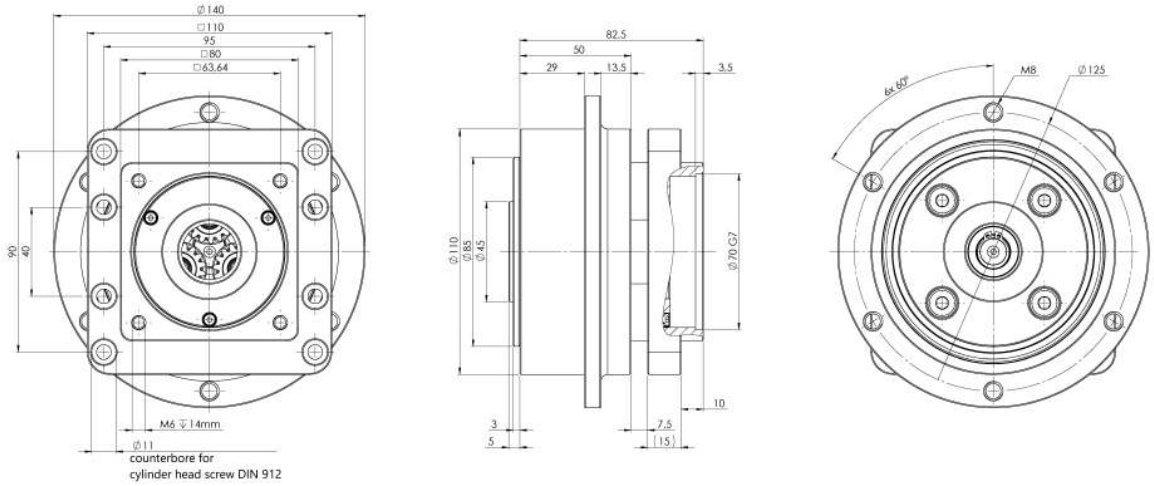

Figure 3-4. Dimensions – gearbox GB01-PL02H22505001 axial mounting

3.5 Wheel Specifications (optional)

STXI Motion offers an optional 200 mm diameter wheel for use with the mobiGM gearmotor.

Table 3-4. Wheel specifications

Feature	Units	WH01-200MM050NDI00
Diameter	mm	∅200
Width	mm	50
Tire		NDIIThane 92 Shore A

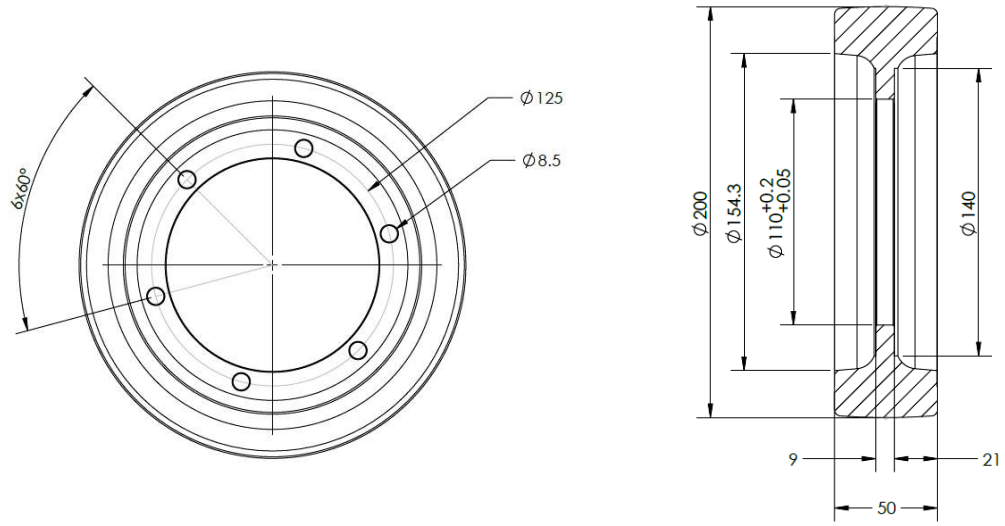

Figure 3-5 Dimensions – wheel WH01-200MM050NDI00

3.6 Speed/Torque Curves

500W Motor

Models: GM-0101xx / GM-0102xx / GM-0201xx / GM-0202xx

Gear output nom./max. torque: 28/84 Nm

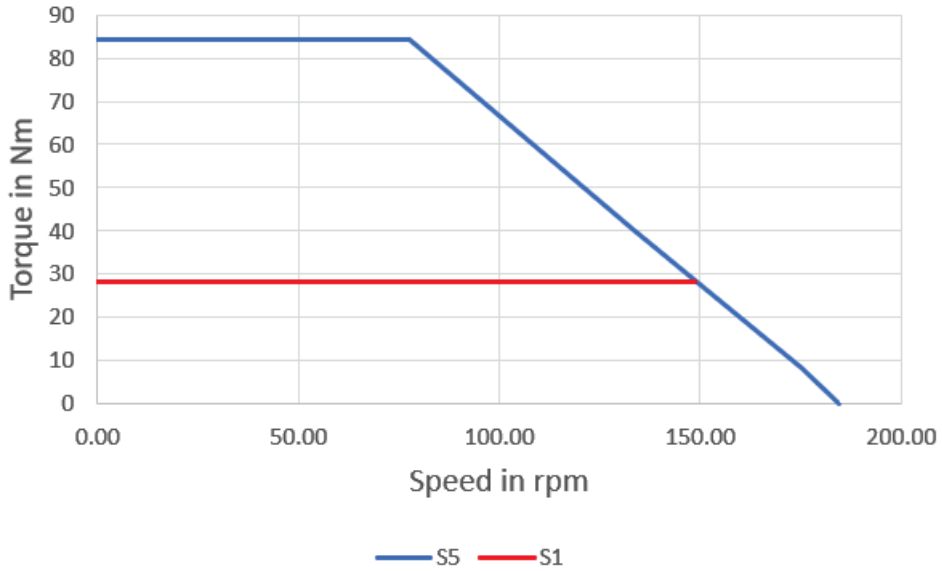

Figure 3-6 Gear output nom./max. torque: 28/84 Nm

900W Motor

Models: GM-0103xx / GM-0104xx / GM-0203xx / GM-0204xx (

Gear output nom./max. torque: 36/119 Nm

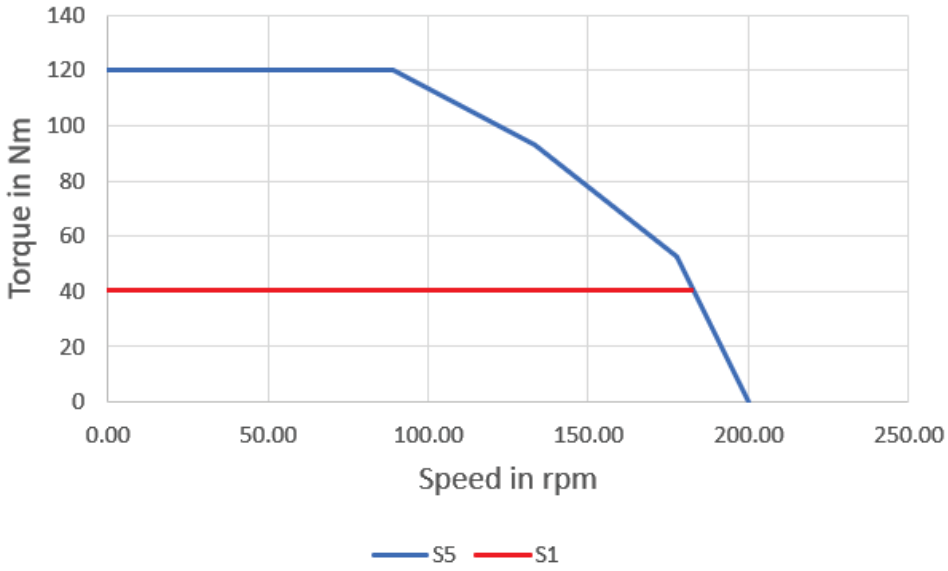

Figure 3-7 Gear output nom./max. torque: 36/119 Nm

4 Safety

Only qualified personnel may perform installation, operation, service and maintenance procedures. These persons must have sufficient technical training and knowledge to foresee and recognize potential hazards that may occur when using the product, modifying settings, and operating the mechanical, electrical and electronic components of the entire machine system.

All persons working on and with the product must be fully familiar with all applicable standards, directives, and accident prevention regulations when performing such work.

5 Handling and Storage

5.1 Transport and Storage

Transport the gearmotor in its original packaging materials.

Avoid transporting the gearmotor in conditions which may cause strong vibrations of the gearmotor, or collisions with other objects.

Avoid hard impacts, such as dropping or setting down forcefully, which can damage the gearmotor.

Store the gearmotor in a horizontal position and in the original packaging.

Store the gearmotor in a dry environment at a temperature of 0°C to 25°C for up to three (3) years.

5.2 Packing/Unpacking

The package contains the mobiGM gearmotor only.

Upon receipt, open the package and remove all packing materials.

Check to ensure there is no visible damage to the mobiGM. If damage is detected, notify the carrier immediately.

After unpacking, check the part number label on the product. Make sure it matches the product your ordered, and that the voltage meets your specific requirements.

Save the original box and packing materials in case you need to pack and return the product to the manufacturer.

6 Installation

Be sure to comply with the following guidelines during and after installation.

- Maintain electrostatic protection when making wiring connections.
- Do not tug on the brake wires.
- Make sure all gearmotor and encoder wiring connections are secure.
- Make sure the fixing screws for motor are securely tightened.
- Make sure conditions will prevent the gearmotor from overheating.

6.1 Gearmotor Wiring

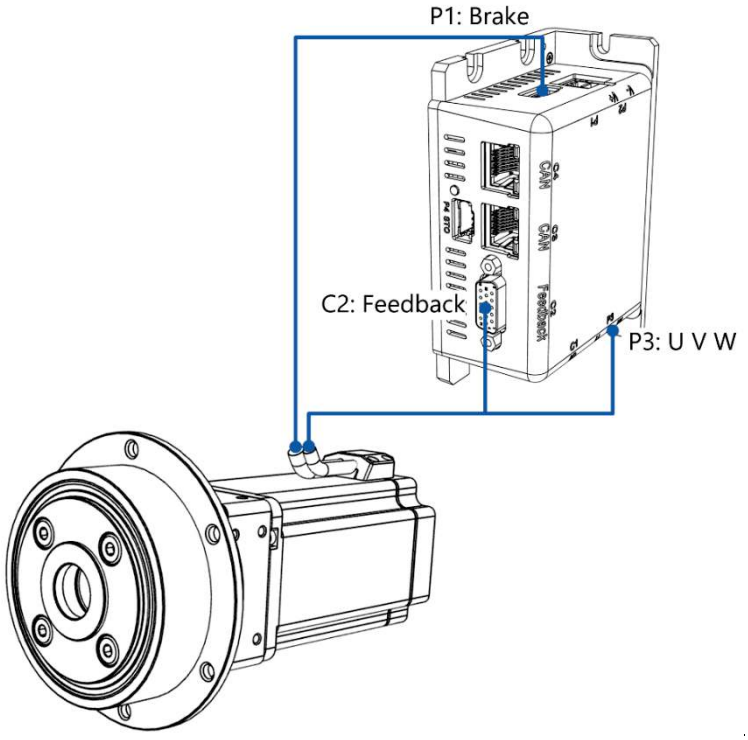

Figure 6-1 mobiGM connections to servSD drive

6.2 Connectors

Motor

Figure 6-2 Motor connector

Table 6-1. Motor connector

Pin #	Label	Signal Description
1	U	Motor phase U
2	V	Motor phase V
3	W	Motor phase W

Brake

Figure 6-3 Brake connector

Table 6-2. Brake connector

Pin #	Label	Signal Description
1		Motor Brake Wire
2		Motor Brake Wire

Feedback

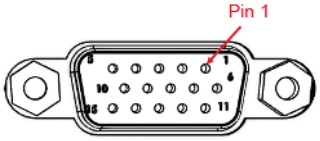

Figure 6-4 Motor feedback and temperature connector

Table 6-3. Motor feedback and temperature connector

Pin #	Signal Description Incremental Encoder
1	Encoder channel A+
2	Encoder channel B-
3	Hall 1 (U+)
4	VCC_Out_5V
5	Motor temperature sensor -
6	Encoder channel A-
7	Index+
8	Hall 2 (V+)
9	Ground
10	
11	Encoder channel B+
12	Index-
13	Hall 3 (W+)
14	Motor temperature sensor +
15	

7 Maintenance and Care

Note

Do not disassemble the gearmotor.

- Partial or complete disassembly of the gearmotor for maintenance or repair purposes is strictly prohibited.
- The brake is mounted within the gearmotor, and cannot be accessed or serviced by users.
- In case of malfunction or defect, contact STXI Motion (contact@stxim.com).

7.1 Maintenance Schedule

Table 7-1. Maintenance Plan

Maintenance work	Scope of work	Frequency
Visual inspection and cleaning	Check for damage, heavy soiling, or other signs of significant wear and tear.	▪ During commissioning ▪ After operating 500 hours or 3 months ▪ Annually
Checking the tightening torques	Check all screw connections.	▪ During commissioning ▪ After operating 500 hours or 3 months ▪ Annually

7.2 Visual Inspection

Check the entire gearmotor for external damage.

The sealing washers are wearing parts. Lubricants that remain on the sealing washers for extended periods may leak into the gearmotor. Therefore, check the gearmotor for leaks (lubricant leakage) during every visual inspection.

Make sure the vehicle in which the gearmotor is installed is not standing or operating in puddles of water or wet environments.

7.3 Tightening Torques

Table 7-2. Tightening torques on gear housing (material: aluminum)

Screws Strength class	Tightening torque (Nm) for thread	
	M6	M8
8.8	9	16

Table 7-3. Tightening torques on wheel hub (material: steel)

Screws Strength class	Tightening torque (Nm) for thread	
	M6	M8
8.8	10	24
10.9	15	35

Based on maximum tightening torques at 90% utilization of the yield strength at a coefficient of friction of μ=0.12

Calculation according to VDI 2230, 2015 edition

7.4 Cleaning

Note

Do not attempt to open the gearmotor or clean internal parts.
Clean external surfaces only.

Remove dust and oil from the motor surface after use, and ensure the motor remains dry and clean.

Do not use compressed air or high-pressure cleaning tools for cleaning the gearmotor, as these can cause damage to the bearing seals. Use a clean and lint-free piece of cloth for cleaning.

Do not use harsh cleaning agents on the gearmotor.

7.5 Lubrication

The gearmotor is designed for horizontal mounting position, and is lubricated accordingly.

It is not necessary to change the lubricant. The gearmotor has been provided with lubricant for its entire service life.

7.6 Startup After Maintenance

Make sure safety devices are fully functional.

Before resuming operation, perform a test run of the gearmotor.

7.7 Troubleshooting

A change in the operating behavior may be an indication of gearmotor damage, or cause damage to the gearmotor. Do not put the gearmotor back into operation until the cause of the fault has been eliminated.

Troubleshooting may be performed only by qualified personnel.

Table 7-4. Troubleshooting

Problem	Possible Cause	Remedy
Increased operating noise	▪ Bearing damage. ▪ Gear damage.	Contact STXI Motion.
Loss of lubricant	▪ Excessive lubricant ▪ Leakage of lubricant.	Wipe off the lubricant, and continue to observe the gearmotor. If the lubricant leakage continues, stop operation, and contact STXI Motion.
Motor hums and has a high current consumption	Gearmotor is blocked.	Check the gearmotor for obstructions. Check the brake. If it is enabled, release it.

7.8 Warranty and Liability

The product warranty will be voided, and STXI Motion will bear no liability for personal injury or property damage, in the event of any of the following:

- Improper transportation or storage of the gearmotor.
- Improper handling of the gearmotor.
- Incorrectly performed maintenance or repair of the gearmotor.
- Incorrect wiring connections.
- Improper operation of the gearmotor.
- Operation of the gearmotor with defective safety or protection devices.
- Operation of the gearmotor without lubricant.
- Use of a heavily contaminated gearmotor.
- Modifications made to the gearmotor without the written consent of STXI Motion.

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User Manual