Sumitomo Drive Technologies

smartris

smartris Gearmotor

<Note>

- This product should be handled by only those who have been trained for the work.
  Please read this manual carefully before use.
- Deliver this manual to the customer who will actually use the product.
- This instruction manual should be carefully stored.

Sumitomo Heavy Industries, Ltd. Maintenance Manual No.DM1801E-1

Introduction: Safety Precautions

- Carefully read this maintenance manual and all accompanying documents before use (installation, operation, maintenance, inspection, etc.). Please use this unit after thoroughly understanding the machine, information about safety, and all precautions for correct operation.
  After reading, retain this manual for future reference.
- Pay close attention to the "DANGER" and "CAUTION" warnings regarding safety and proper use.

DANGER Improper handling may result in physical damage, serious personal injury and / or death.

CAUTION Improper handling may result in physical damage and/ or personal injury.

Matters described in CAUTION may lead to serious danger depending on the situation.
Be sure to observe important matters described herein.

DANGER

- Transport, installation, plumbing, wiring, operation, maintenance, and inspections should be performed by trained technicians; otherwise, electric shock, injury, fire, or damage to the equipment may result.
- In the case of maintenance with disassembly of this device, contact the nearest authorized maintenance shop.
- When the unit is to be used for an elevator or lifter, install a safety protecting device on the elevator side to prevent it from falling; otherwise, personal injury or damage to the equipment due to falling of hoisting equipment may occur.

Introduction: How to Refer to the Maintenance Manual, Table of Contents

This is the maintenance manual for the smartris gearmotor unit.
For servo drive unit maintenance, see the smartris Servo Drive Unit Maintenance Manual (No. DM1802E).

Contents

⚠CAUTION

- Unpack the unit after verifying that it is positioned right side up; otherwise, injury may result.
- Verify that the unit received is the one you ordered. Installing the wrong unit may result In personal injury or equipment damage.
- Do not remove the nameplate.

Verify the items listed below upon receiving the product. If a nonconformity or problem is found, please contact with your nearest agent, distributor, or sales office.

[1] Does the information on the nameplate conform to what you ordered?

[2] Was any part broken during transport?

[3] Are all bolts and nuts tightened firmly?

1-1 Reading the Nameplates

When contacting the company, please provide [1]. Gearmotor nomenclature, [2]. Reduction ratio, and [3]. Serial number.

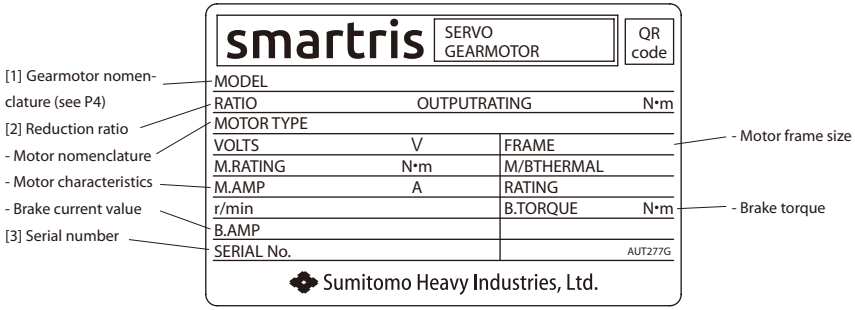


Figure 1-1 Nameplate

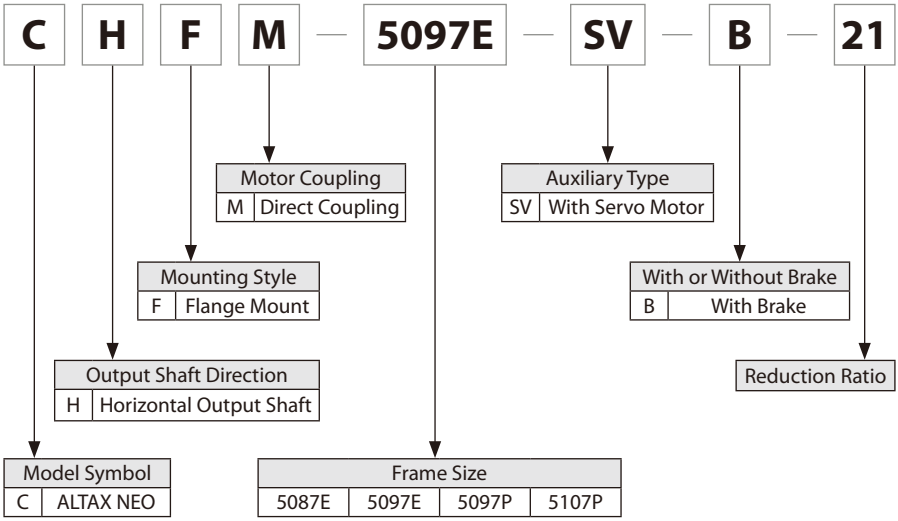
1-2 Lubrication Method

All smartris models use grease lubrication, which is included when the product is shipped from the factory. Please use this product as-is.

1. Receiving Inspection

1-3 Gearmotor Nomenclature

Symbol meanings are shown below. Please confirm that the nomenclature matches the order.



2. Storage

If this product is not for immediate use, note the following points when storing it.

2-1 Storage Location

Store the product in the clean and dry indoor.

Do not store outdoors. Store in a location that is free of moisture, dust, extreme temperature changes, corrosive gases, etc.

2-2 Storage Period

- The storage period should be less than one year.
- If the equipment is to be exported or stored for at least one year, special rust prevention measures must be taken.
- Exported items require rust prevention measures, so please contact us.
- Standard rust prevention specifications

External rust prevention	Rust prevention oil is applied before shipping from the factory. Confirm rust prevention conditions every six months after delivery and reapply rust prevention measures as needed.
Internal rust prevention	Store in a general factory or warehouse in an environment free of moisture, dust, extreme temperature changes, corrosive gases, etc.

2-3 Using after Storage

- Oil seals are affected by temperature, ultraviolet light and other ambient conditions and can easily degrade. After long storage periods, inspect before operation, and replace any degraded seals with new seals.
- At startup, check whether there are not unusual noises, vibrations, temperature rises, or other symptoms. For motor, confirm that brake works properly. If any abnormalities are found, immediately contact the nearest authorized maintenance shop.

3. Transport

⚠DANGER

- Do not step under the unit suspended by a crane or other machines for transport; otherwise, injury or death may result.

⚠CAUTION

- Be careful not to drop the product during transport.
- Before hoisting, check the weight with the nameplate, crate, outline drawing, catalog, etc. Never hoist the product that exceeds load capacity of the crane or other mechanism being used to lift it; otherwise, injury or damage to the equipment and/or lifting device may occur.
- Use a suitable hoisting attachment, check to ensure that the eye bolts and nuts are not loose, and then hoist the product.

⚠DANGER

- Do not use the unit in an explosive atmosphere; otherwise, explosion, ignition, an electric shock, injury, a fire, or damage to the equipment may occur.

⚠CAUTION

- Do not use the products for purposes other than those shown on the nameplate or in the manufacturing specifications; otherwise, electric shock, personal injury, or damage to the equipment may result.
- Do not place inflammables around the product; otherwise, a fire may occur.
- Do not place any objects that hinder ventilation around the product; otherwise, cooling effects may be reduced, leading to a fire hazard due to excessive heating.
- Do not step on or hang from the product; otherwise, injury or damage to the equipment may result.
- When the unit is used in equipment that is sensitive to oil contamination, install an oil pan or other such device to prevent grease leakage due to failure or wear; otherwise, grease leakage may damage products.
- This product is driving device for automated guided vehicles (AGVs). It cannot be used in other applications, such as driving device for elevators.

4-1 Location of Installation

Ambient temperature: –10 to +40°C

Ambient humidity: 85% max.

Altitude: 1000m max.

Ambient atmosphere	- There should be no corrosive gas, explosive gas, or steam. - The location should be well ventilated and free from dust.
Installation locations	- Indoor areas with little dust (IP54 protection class, dust and splash proof) - Vibration: 1G max.

- Mounting In conditions other than above requires optional specifications. Please consult with us.
- Drives fabricated according to special specifications, such as outdoor use types, can be used in the specified mounting environments. However, concerning the connector to the machine used, implement measures based on the Mounting environment.
- Mount In a location that enables easy operation, such as inspection and maintenance.
- Mount in a sufficiently rigid casing.

4-2 Mounting Angle

Possible mounting angle for this product is only horizontal output shaft direction. Please do not use this drive at any other shaft mounting angle.

Note, however, that if the product is manufactured according to your designated mounting angle, do not use it at any other mounting angle.

5. Coupling with Other Machines

⚠CAUTION

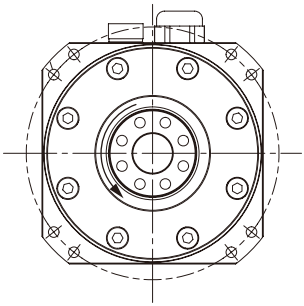
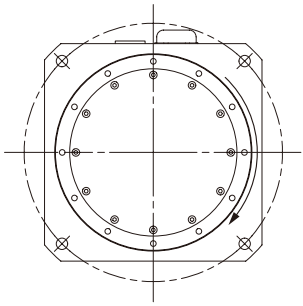
- Confirm the rotation direction before coupling with the AGV main unit. Difference in the rotation direction may cause injury or damage to the equipment.
- Pay attention to the direct coupling accuracy when the unit is directly coupled with the AGV main unit. Securely fasten tightening bolts before operation; otherwise, injury or damage to the equipment may result due to scattering fragments.

5-1 Confirming Rotation Direction

When connecting output power supply (U, V, W) for the servo drive unit to the servo motor terminals (U, V, W), the motor shaft rotates counterclockwise as seen from the anti-load side. (Reverse rotation of general motors for Japan's domestic market.)
Note that changing the phase sequence of the U, V, W wiring will prevent this product from operating and may cause malfunctions. Always perform wiring in the designated phase sequence.

The output rotation direction should be in the direction of the arrow in the figure below.
The rotational direction may differ in the case of special specifications, so confirm the manufacturing specifications.

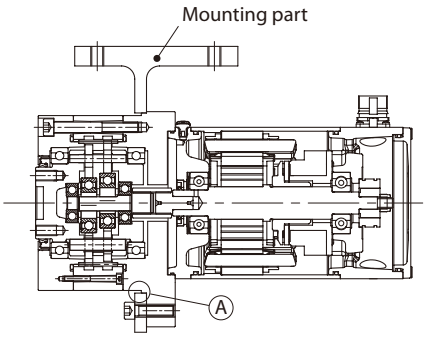
Table 5-1 Output Shaft Rotation Direction

Type	ECO (Gear Output Shaft Rotation)	PRO (Ring Gear Housing Rotation)
Size	S, M	M, L
Frame Size	5087E, 5097E	5097P, 5107P
Output shaft rotation direction (as seen from the load side)	 Reverse rotation with respect to the input rotational direction.	 Same rotation with respect to the input rotational direction.

5-2 Installation Procedure

■ ECO Type

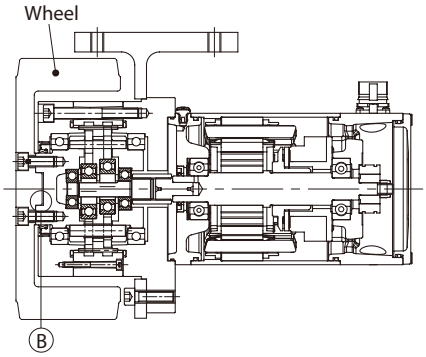
[1] Mounting Gearmotor



- Fasten the bolt on the AGV main unit (or mounting part). (Spigot Ⓐ)

Size		S	M
Frame Size		5087E	5097E
Spigot A		Ø110 f8	Ø138 f8
Tightening Bolt	Q'ty	4	8
	Size	M8	M8
	Strengthening Classification	8.8	8.8
	Tightening Torque N・m	18.5	18.5

[2] Mounting Wheel



- Apply molybdenum disulfide grease (an anti-fretting agent) to spigot Ⓑ.
- Fix the wheel with a bolt. (Spigot Ⓑ)

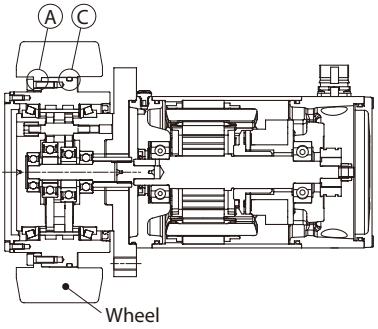
Size		S	M
Frame Size		5087E	5097E
Spigot B		Ø25H7	Ø25H7
Tightening Bolt	Q'ty	10	8
	Size	M6	M8
	Strengthening Classification	12.9	12.9
	Tightening Torque N・m	17.0	41.5

Notes: 1. The tightening bolt is not included and must be provided by the customer.
2. Please ensure that the tightening bolt is tightened with the designated tightening torque. To prevent loosening, apply an adhesive to bolts (Loctite 262, etc.) or use a Belleville washer (JIS B 1251, class 2).
3. ECO and PRO types use different materials for mounting on the AGV main unit. Please note the strengthening classification and tightening torque for used bolts.

5. Coupling with Other Machines

■ PRO Type

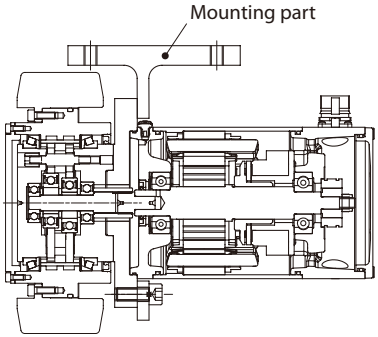
[1] Mounting Wheel



- Apply an appropriate amount of molybdenum disulfide (an anti-fretting agent) to the circumference of spigot Ⓐ (there is no need for application to the end face).
- Mount an O-ring at O-ring groove Ⓒ. (The O-ring is attached to prevent molybdenum disulfide applied to the spigot part from leaking outside through any gaps.)
- Fix the wheel with a bolt. (Spigot Ⓐ)

Size		M	L
Frame Size		5097P	5107P
Spigot A		Ø145 h7	Ø182 h7
Tightening Bolt	Q'ty	12	12
	Size	M5	M6
	Strengthening Classification	10.9	10.9
	Tightening Torque N・m	8.0	13.6
O-ring (nitrile rubber)	Designation	AS568-261	G-140
	Thickness × Inner diameter	3.53×171.04	3.1×139.4

[2] Mounting Gearmotor



- Fasten the bolt on the AGV main unit (or mounting part).

Size		M	L
Frame Size		5097P	5107P
Tightening Bolt	Q'ty	4	4
	Size	M10	M12
	Strengthening Classification	8.8	8.8
	Tightening Torque N・m	46.0	79.0

Notes: 1. The tightening bolt and O-ring are not included and must be provided by the customer.
2. Please ensure that the tightening bolt is tightened with the designated tightening torque. To prevent loosening, apply an adhesive to bolts (Loctite 262, etc.) or use a Belleville washer (JIS B1251, class 2).
3. ECO and PRO types use different materials for mounting on the AGV main unit. Please note the strengthening classification and tightening torque for used bolts.

6. Wiring

For wiring details, see the smartris Servo Drive Unit Maintenance Manual (No. DM1802E).

⚠DANGER

- Do not handle the unit when cables are energized. Be sure to turn off the power when working on the unit; otherwise, electric shock may result.
- Follow instructions in the Maintenance Manual when connecting power cables; otherwise, electric shock or fire may result.
- Do not forcibly bend, pull, or clamp the power cable and lead wires; otherwise, electric shock or fire may result.
- Correctly ground the grounding bolt; otherwise, electric shock may result.

⚠CAUTION

- When wiring, follow the facility's regulations and electrical codes, in order to prevent burning, electric shock, injury, and fire.
- The motor is not equipped with a protection device. However, it is compulsory to install an overload protector according to facility electrical codes. It is recommended to install other protective devices (earth leakage breaker, etc.), in addition to an overload protector to prevent burning, electric shock, injury, and fire.
- Do not touch the terminals when measuring insulation resistance; otherwise, electric shock may result.
- Changing the phase sequence of the U, V, W wiring will prevent this product from operating and may cause malfunctions. Always perform wiring in the designated phase sequence.
- For motor, do not energize the brake coil when the motor is stopped. Otherwise coil burnout fire may result. Also, mistaken wiring could damage the rectifier.
- Long cables cause large voltage drops. Select cables with appropriate diameter so that the voltage drop will not be greater than 2%.

7. Operation

⚠DANGER

- Do not approach or touch rotating parts (output shaft, etc.) during operation; otherwise loose clothing may become caught in these rotating parts and cause serious injury or death.
- When the power supply is interrupted, be sure to turn off the power switch. Unexpected resumption of power may cause electric shock, personal injury, or damage to the equipment.

⚠CAUTION

- Do not put fingers or foreign objects into the opening of the product; otherwise, electric shock, injury, fire, or damage to the equipment may result.
- The product becomes very hot during operation. Be careful not to touch with hands or body. Otherwise, burns may result.
- If any abnormality occurs during operation, stop operation immediately; otherwise, electric shock, personal injury, or fire may result.
- Do not operate the unit in excess of the load rating; otherwise, injury or damage to the equipment may result.

7-1 Items to Check Before Operation

After installation and wiring are completed, check the following items before operating.

- Is the wiring correct?
- Is the unit properly coupled with the AGV main unit?
- Are Mounting bolts tightened firmly?
- Is the rotation direction as required?

Upon completing the above checks, run the motor under no load, and gradually apply a load to it. At this time, check the items in Table 7-1.

7-2 Items to Check During Operation

Table 7-1 Items to Check During Operation

Does abnormal sound or vibration generate?	- Is the housing deformed because the installation surface is not flat? - Is Insufficient rigidity of the installation base generating resonance? - Is the shaft center-aligned with the AGV main unit? - Is vibration from the AGV main unit transmitted to this product?
Is the surface temperature abnormally high?	- Does the voltage rise or drop substantially? - Is the ambient temperature too high? - Does the current flowing to the product exceed the rated current shown on the nameplate?

If any abnormalities are found, immediately stop operation and contact the nearest authorized maintenance shop.

7-3 Brake

This product has a built-in precision retention brake (PM brake or spring brake) for use when parking. The brake is assembled in an appropriate state at the time of shipping from the factory; never disassemble it.

The brake is for maintaining location when parking. Never externally rotate or move the carriage while braking action or with brake applied; otherwise, the brake may be damaged.

8. Daily Inspection and Maintenance

⚠DANGER

- Do not handle the unit when cables are energized. Be sure to turn off the power when working on the unit; otherwise, electric shock may result.
- Do not approach or touch any rotating parts (output shaft, etc.) while conducting maintenance with operation or the inspection of the unit, loose clothing may become caught in these rotating parts and cause serious injury or death.

⚠CAUTION

- Do not put fingers or foreign objects into the opening of the product; otherwise, electric shock, injury, fire, or damage to the equipment may result.
- The product becomes very hot during operation. Do not touch the product with bare hands. Otherwise, burns may result.
- Do not touch the terminals when measuring insulation resistance; otherwise, electric shock may result.
- Do not operate the unit without a safety cover (removed during inspection) to shield rotating parts; otherwise loose clothing may became caught in these rotating parts and cause serious injury or death.
- Promptly observe and repair any abnormalities during operation according to instructions in this maintenance manual. Do not operate until the cause of the abnormality is understood, and the abnormality is repaired.
- Do not operate damaged product; otherwise, injury, fire, or damage to the equipment may result.
- We cannot assume any responsibility for damage or injury resulting from an unauthorized modification by a customer, as it is outside the scope of the warranty.
- Dispose of the product or lubricating oil as general industrial waste.
- This product has a built-in precision retention brake (PM brake or spring brake) for use when parking. The brake is assembled in an appropriate state at the time of shipping from the factory; never disassemble it.

8. Daily Inspection and Maintenance

8-1 Daily Inspection

Make certain to carry out daily inspection in accordance with Table 8-1. Lack of inspections is a source of trouble.

Table 8-1 Daily Inspection

Inspection Item	Inspection Detail
Current value	Is the current no greater than the rated value shown on the nameplate?
Noise	Are there unusual noises, or are there extreme changes in the noises?
Vibration	Is there abnormally large vibration? Are there extreme changes?
Surface temperature	Is surface temperature unusually high? Are there extreme changes? (Temperature rises during operation will differ according to model and type. However, in case the difference between the gear unit surface temperature and the environment temperature is approximately 40°C, there is no particular trouble if fluctuation is slight.)
Grease leaks	Is grease leaking from the gear unit? Are the oil seal sliding surfaces corroded?
Mounting bolts	Are the mounting bolts loose?

- If any problems are found in a daily inspection, follow "9. Troubleshooting" (on P16 and 17) to take appropriate actions. If these actions do not solve the issue, immediately contact the nearest authorized maintenance shop.

8-2 Main Unit Maintenance

- Because the gear unit is filled with long-lasting grease, it can be used for long time without replenishing the grease, but maintenance with disassembly after usage for approximately 20,000 hours or 3 to 5 years will further extend the product lifetime.
  Contact the nearest authorized maintenance shop regarding maintenance with disassembly.
- Oil seals have a lifetime. During long use, natural degradation and frictional wear will reduce effectiveness. Product operating conditions and ambient environment will cause lifetime to widely vary. Given normal operation (uniform load, running 10 hours per day, normal temperature) as a guideline, it is recommended to change them every 1 to 3 years. If the sliding surfaces of oil seals show signs of wear or corrosion, replace them with new ones. The sliding surface of an oil seal is made of carbon steel, so in order to prevent rust forming on it, if there are parts of the oil seal that are exposed to the outside, periodically take steps to prevent rusting by coating the oil seal with rust preventive oil.
  Contact the nearest authorized maintenance shop regarding oil seal replacements.
- If stop and start are frequent, mounting bolts (or nuts) may come loose. Periodically check for looseness as this is a source of miss-alignment, grease leakages, and load unbalance.

9. Troubleshooting

If any abnormal condition occurs, refer to Table 9-1, 9-2 and promptly take appropriate measures. If these actions do not solve the issue, immediately contact the nearest authorized maintenance shop.

Table 9-1 Troubleshooting

Problem			Cause	Correction
The motor will not operate under no load			Power failure	Confirm battery and other power supplies.
			Defective electric circuit	Check the circuit.
			Blown fuse	Replace the fuse.
			Protective device operates	Fix the problem and re-operate.
			Load locking	Check the load and safety device.
			Poor switch contact	Adjust the contact unit.
			Motor stator coil disconnect	Confer with authorized maintenance shop.
			Bearing damage	Confer with authorized maintenance shop.
The motor rotates with no load, but the output shaft and frame do not rotate			Damage to gear unit due to overloading of gears, etc.	Confer with authorized maintenance shop.
The slow speed shaft rotates with no load	When a load is applied	The switch overheats	Insufficient switch capacity	Replace with a specified switch.
			Overload	Decrease the load to the specified value.
		Fuse tripping	Insufficient fuse capacity	Replace with a specified switch.
			Overload	Decrease the load to the specified value.
		The speed will not increase and the motor is overheating.	Voltage drop	Confirm battery and other power supplies.
			Overload	Decrease the load to the specified value.
			Short-circuited motor stator coil	Confer with authorized maintenance shop.
		It stops.	Bearing burnout	Confer with authorized maintenance shop.
			Poor adjustment of protection device	Adjust the protection device.
	The motor runs in the reverse direction.		Wiring error	Change the connection.
	Fuse tripping		The lead wire is short-circuited	Confer with authorized maintenance shop.
			Poor contact between motor and starter	Make complete connection.
Excessive temperature rise			Overload	Decrease the load to the specified value.
			Voltage drop or rise	Confirm battery and other power supplies.
			The ambient temperature is high	Improve the ventilation method.
			Damaged bearing	Confer with authorized maintenance shop.
			Abnormal wear of reducer parts due to overload. etc.	Confer with authorized maintenance shop.
Grease leakage	Oil and fat blot or drip from the oil seal.		Grease applied to the oil seal seeps out at first.	Wipe off around the oil seal, and observe.
	Grease leaks from the oil seal.		Damaged oil seal or damaged output shaft (or frame)	Confer with authorized maintenance shop.
	Leakage of grease from the mating faces of the frame, cover, etc.		Loose fastener bolts	Tighten fastener bolts correctly.
	Grease leaks into motor.		Damaged oil seal	Confer with authorized maintenance shop.
Abnormal sound Excessive vibration			Dust and foreign matter in bearings, or damaged bearings	Confer with authorized maintenance shop.
			Reducer parts grinding on foreign matter	Confer with authorized maintenance shop.
			Reducer parts are damaged	Confer with authorized maintenance shop.
			Warping of casing because the installation surface is not flat	Make the installation base flat or make adjustment by using liners, etc.
			Resonance due to insufficient rigidity of the installation base	Reinforce the installation base to increase rigidity.
			Nonalignment of the shaft center with the AGV main unit	Align the center of axle.
			Transmission of vibration from the AGV main unit	Individually operate the product to check the source of the sound.

Table 9-2 Troubleshooting

Problem		Cause	Correction
Abnormal motor sounds		Foreign objects have entered	Confer with authorized maintenance shop.
		Bearing damage	Confer with authorized maintenance shop.
Servo tripping	Overcurrent shut-off	Sudden speed changes	Increase the time for speed changes.
		Extreme load fluctuation	Decrease load fluctuation.
	Overcurrent due to ground fault	Ground fault on output side	Take measures to prevent ground fault.
	Direct current overcurrent	Short on output side	Take measures to prevent short. Inspect wiring.
	Regenerative overvoltage shut-off	Sudden speed reduction	Increase the time for speed reduction. Decrease brake frequency.
	Thermal operation	Overload	Decrease the load to the specified value.

10. Construction Drawings

10-1 Construction Drawing (ECO Type)

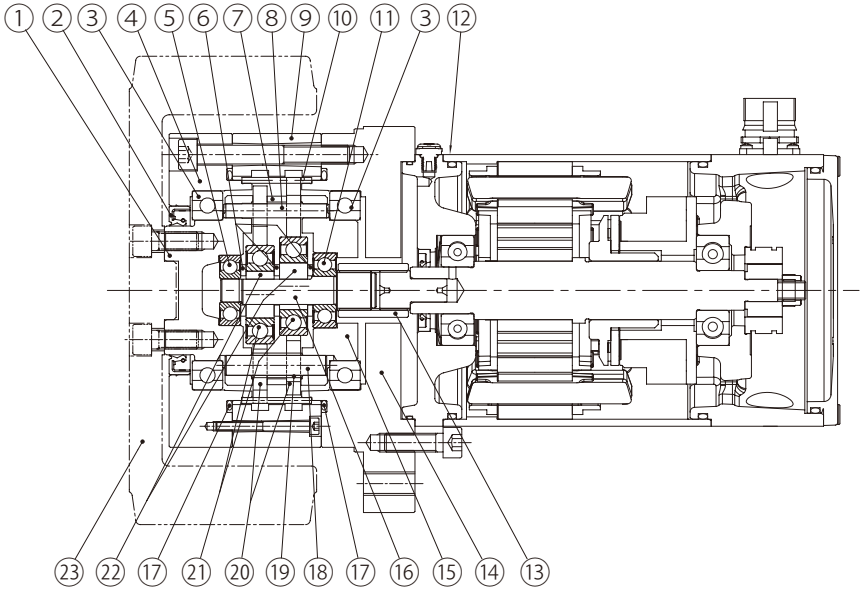


Figure 10-1 ECO Type (E.g.: CHFM-5097E-SV-B-21)

Table 10-1 Gear Motor Principal Parts

Part Number	Part Name	Part Number	Part Name	Part Number	Part Name	Part Number	Part Name
1	Output Shaft	7	Spacer Ring	13	Joint Spline	19	Carrier Pin Pipe
2	Oil Seal	8	Slow Speed Shaft Pin	14	Intermediary Flange	20	Cycloid Disc
3	Bearing	9	Frame	15	Carrier	21	Bearing
4	Cover	10	Ring Gear Housing Pin	16	Central Shaft	22	Eccentric
5	Bearing	11	Bearing	17	O-ring	23	(Wheel)
6	Distancing Piece	12	Motor	18	Carrier Pin		

Note: Wheel supplied by customer.

10-2 Construction (PRO Type)

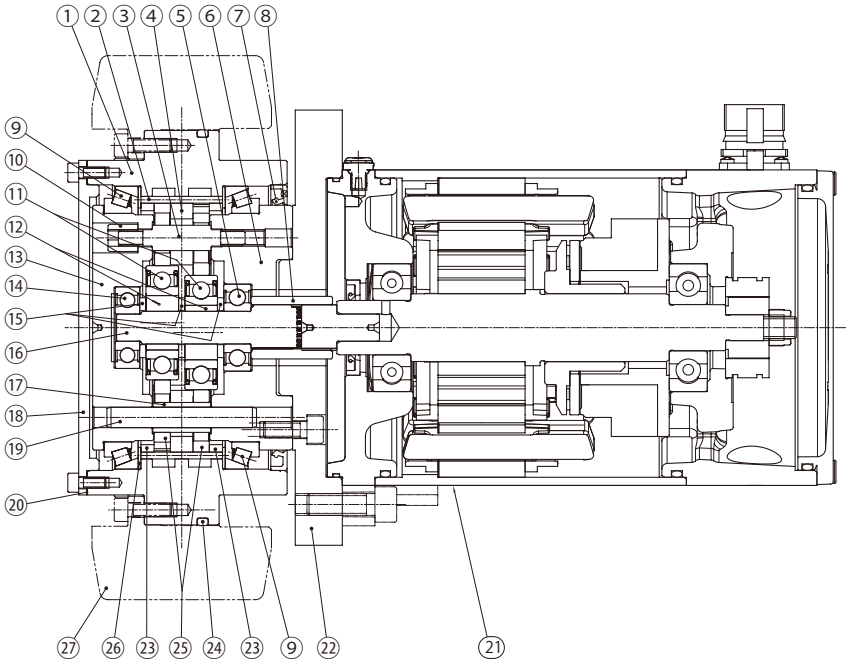


Figure 10-2 PRO Type (E.g.: CHFM-5097P-SV-B-21)

Table 10-2 Gear Motor Principal Parts

Part Number	Part Name	Part Number	Part Name	Part Number	Part Name	Part Number	Part Name
1	Frame	8	Joint Spline	15	Distancing Piece	22	Adapter
2	Ring Gear Housing Pin	9	Bearing	16	Central Shaft	23	Spacer Ring
3	Carrier Bolt	10	Carrier Nut	17	Slow Speed Shaft Roller	24	O-ring
4	Spacer Ring	11	Bearing	18	Cover	25	Cycloid Disc
5	Bearing	12	Eccentric	19	Slow Speed Shaft Pin	26	Ring Gear Housing Pin Retainer
6	Input-side Carrier	13	Output-side Carrier	20	Paper Gasket	27	(Wheel)
7	Oil Seal	14	Bearing	21	Motor		

Note: Wheel supplied by customer.

11. Warranty

The scope of warranty of our delivered products is limited only to what we manufactured.
Warranty (period and description)

Period	The warranty period applies only to new products and represents 18 months after the shipment or 12 months after the actual operation, whichever is shorter.
Description	If the product failed within the warranty period, in the case where mounting is done properly, connection and maintenance & administration are followed according to the maintenance manual, and the product is properly run based on the specification on the catalog or under conditions agreed between us, we will repair or provide an alternative product at our discretion for free of charge. However, as far as the product is connected with customers' other devices, we will not indemnify those expenses on dismounting from/mounting on the devices, etc. and other associated construction expenses, transportation expenses and opportunity loss and operation loss the customers suffered from, and other indirect damages.
Exclusion from the warranty	The following items will be excluded from the warranty: 1. A breakdown resulting from defects in the mounting of the product and connection with other devices, etc. 2. A breakdown resulting from insufficient maintenance & administration and improper handling of the product, including a case that the product is not stored according to our defined storage manual. 3. A breakdown resulting from operation which does not fall within our specification and other operation conditions and use status we hardly can know or a failure caused by the use of lubricant which we do not recommend. 4. A breakdown resulting from defects, special specification, etc. of device prepared and connected by customer. 5. A breakdown resulting from modification or reconstruction of the product. 6. A breakdown resulting from defects in parts supplied or specified by customers. 7. A breakdown caused by inevitable force including earthquake, fire, flood disaster, salt damage, gas damage, and lightning strike, etc. 8. Warranty of natural wear and tear, abrasion, and deterioration of consumable parts such as bearing and oil seal, etc. under normal usage. 9. A breakdown caused for reasons not attributable to each of the above item.

Worldwide Locations

U.S.A

Sumitomo Machinery Corporation of America (SMA)
4200 Holland Blvd. Chesapeake, VA 23323, U.S.A.
TEL (1)757-485-3355 FAX (1)757-485-7490

Canada

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