Sumitomo Drive Technologies

BEIER Variator® BEIER-CYCLO Variator®

A Type

B Type

D Type (ND Series)



«CAUTION»

- This product should be handled by only those who have been trained for the work. Carefully read the maintenance manual before use.
- Deliver this manual to the customer who will actually use the product.
- This maintenance manual should be kept by the user for future reference.



Sumitomo Heavy Industries, Ltd. Maintenance Manual No. BM2001E-8

- Carefully read this maintenance manual and all accompanying documents before use (installation, operation, maintenance, inspection, etc.) and use the machine correctly. Use the product after throughly 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.



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



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



- 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, please contact the nearest authorized maintenance shop.
- When using the equipment in conjunction with **explosion proof motor**, a technician with understanding about the principle and mechanism of explosion proof motor (such as explosion-proof structures, construction of electrical facility, and relating laws) should conduct the transport, installation, plumbing, wiring, operation, maintenance and inspection of the equipment; otherwise, explosion, ignition, electric shock, personal injury, fire or damage to the equipment may result.
- When the unit is to be used in a system for human transport, a protecting device for human safety should be installed to prevent accidents resulting in personal injury, death, or damage to the equipment due to running out of control or falling.
- When the unit is to be used for an elevator or lifter, install a safety protecting device on the elevator side to prevent falling; otherwise, personal injury, death, or damage to the equipment may result.



- Please install a loss prevention device such as oil pan to machines particularly vulnerable to oil such especially (machine for food processing, machine for clean room, and so on) in case oil or grease leaks; otherwise, the product may fail because of oil leakage.

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

This maintenance manual is common for "Motor Directly Connected" and "Reducer Type".

For handling of the motor brake and the speed setter, refer to the motor maintenance manual (No.MM1001E) and the speed setter maintenance manual (No.BM2301E).

The symbols shown below appear in the upper right or left corner of each page to indicate the classification. Please read the applicable pages.

On Common pages, regarding only specific specification, symbols are applied to indicate the contents about it.

Specifications	Specifications Common to All Specifications		Reducer Type	
Mark	Common	-@=	-1	

Contents

Introduction: Safety Precautions	1
Introduction: How to Refer to the Maintenance Manual, Table of Contents	2
1. Receiving Inspection	3
2. Storage	7
3. Transport	8
4. Installation	9
5. Coupling with Other Machines	10
6. Wiring and Piping	12
7. Operation	18
8. Daily Inspection and Maintenance	22
9. Troubleshooting	36
10. Construction Drawings	37
11. Warranty	41

- Unpack the unit after verifying that it is positioned correct 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, contact our 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 us, please provide [1] BEIER Variator or BEIER-CYCLO Variator nomenclature, [2] Reduction ratio (for BEIER-CYCLO Variator), and [3] Serial number.

(1) For BEIER Variator



(Motor Unit Nameplate)

Figure 1-1 BEIER Variator Nameplate

Common 1. Receiving Inspection

(2) For BEIER-CYCLO Variator



(Motor Unit Nameplate)

📀 Sumitomo Heavy Industries, Ltd.

Figure 1-2 BEIER-CYCLO Variator Nameplate

MS478WW

1-2 Checking Lubrication Method

Refer to "8-2 Checking Lubrication Method" (P24) to confirm the lubrication method.

Oil lubricated machines are shipped without oil. Before operating, be sure to feed the recommended lubricating oil or specified lubricating oil. (See P26–31)

1-3 BEIER Variator and BEIER-CYCLO Variator Nomenclature

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



(2) BEIER Variator (With Gear Reducer Mechanism)



(3) BEIER-CYCLO Variator



Common

1. Receiving Inspection

Table 1-1 BEIER Variator Frame Size

	Frame Size	
A Type	В Туре	D Type
N02A	N02B	N05D
N05A	N05B	N1D
N1A	N1B	N2D
N2A	N2B	N3D
N3A	N3B	N5D
N5A	N5B	N8D
N8A	N8B	N10D
N10A	10B	
15A	15B	
20A	20B	
30A	30B	
40A	50B	
50A	75B	
75A	100B	
100A	150B	
150A		
200A		

Table 1-2 BEIER Variator Gear Reducer Mechanism Frame Size

Trame Size	
G10	
G20	
G30	
G40	
G50	
G60	
G70	
G80	
G81	

Table 1-3 CYCLO Drive Frame Size

Frame Size				
Single	Double Reduction			
Reduction				
6075	6125DB			
6095	613 🗌 DB 613 🗌 DC			
6105	616 🗌 DA 616 🗌 DB 616 🗌 DC			
6125	617 🗌 DB 617 🗌 DC			
6135	618 🗌 DA 🛛 618 🗌 DB			
6145	619 🗌 DA 🛛 619 🗌 DB			
6165	6205DA 6205DB			
6175	6215DA 6215DB			
6185	6225DA 6225DB			
6195	6235DA 6235DB			
6215	6245DA 6245DB			
6225	6255DA 6255DB			
6235	6265DA			
6245	6275DA			
6255				
6265				
6275				

1-4 Motor Nomenclature

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

When using another manufacturer's motor, refer to the operation manual for that motor.

(Motors with a motor capacity of 37kW or more are made by other manufacturers. Also, depending on the motor specification, some motors are made by other manufacturers.)



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

2-1 Storage Location

Store the product in a clean and dry indoor.

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

2-2 Storage Time

- The storage time should be within the rust prevention time shown below.
- Standard rust prevention specifications
 - External rust prevention Rust prevention oil is applied when shipping from the factory. Check the rust conditions to see if any rust is forming on the machined surface every six months after shipment. Reapply the rust prevention oil or any other rust prevention process if necessary.

Internal rust prevention

lubrication	Grease Lubricated Machines	Oil Lubricated Machines
Rust prevention time	One year	Six months
Storage conditions	Store the product in a general factory or warehouse in an environment free of moisture, dust, extreme temperature changes, corrosive gases, etc.	

- If the product is for export, or if the storage time is longer than one year (grease lubricated) or six months (oil lubricated), adherence to special rust prevention specifications is required. Please consult with us.
- If the storage time is longer than one year, run the product for a few minutes under no load once every two to three months. Measure (see P13) and check the insulation resistance of the motor at that time.

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 it before operation, and replace any degraded seals with new seals.
- When the storage period is 2 years or longer, replace the oil seals and the grease before starting operation.
- At the start of operation, make sure there is no abnormal noise, vibration, heat, etc. If any abnormalities are found, immediately contact the nearest authorized maintenance shop.

Common 3. Transport

\land DANGER

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

- Be careful not to drop the unit.
- When hanging bolts or holes are provided, be sure to use them. After mounting the unit to a machine, do not hoist the entire machine by using the hanging bolts or holes; otherwise, personal injury or damage to the equipment and/or lifting device may result due to falling of the machine or failure of hanging metal fitting.
- Before hoisting, refer to the nameplate, crate, outline drawing, catalog, etc. for the weight of the unit. Never hoist the unit that exceeds the rating of the crane or other lifting mechanism used to lift it. Otherwise, personal injury or damage to the equipment and/or lifting device may result.
- When the product is lifted, use suitable lifting parts, and confirm that eye bolts and nuts are not loose.
- Before mounting, moving, or transporting the machine, be sure to remove the lubricating oil.
- Moving the machine with lubricating oil in may cause oil to escape to outside from the air vent, etc.

- Do not use a standard unit in an explosive atmosphere. Under such conditions, an explosion proof motor should be used; otherwise, electric shock, personal injury, explosion, fire, or damage to the equipment may result.
- For explosion proof motor, use a motor with specifications suited for dangerous locations (a location where gas or volatile vapor is present); otherwise, electric shock, personal injury, explosion, fire, or damage to the equipment may result.
- For flameproof motor driven by an inverter, install an inverter in a place free from explosive gas since the inverter itself is not explosion proof; otherwise, electric shock, personal injury, explosion, fire, or damage to the equipment may result.

- Do not use the unit for a purpose other than that indicated on the nameplate or in the manufacturing specifications; otherwise, electric shock, injury or damage to the equipment may result.
- Do not place flammable objects around the products; otherwise, fire may result.
- Do not place any object that may hinder ventilation around the gearmotor or reducer. Insufficient ventilation can cause excessive heat that may result in burns or fire.
- Do not step on or hang from the gearmotor or reducer; otherwise injury may result.
- Do not touch the shaft end of the product, inside key ways, or the edge of cooling fan of the motor with bare hands; otherwise, injury may result.
- Please install a loss prevention device such as oil pan to machines particularly vulnerable to oil especially (machine for food processing, machine for clean room, and so on) in case oil or grease leaks; otherwise, oil or grease leakage may cause failure of the unit.
- Before mounting, moving, or transporting the machine, be sure to remove the lubricating oil. Moving machine with lubricating oil in may cause oil to discharge from the air vent, etc.

4-1 Installation Location

Ambient temperature:	-10 to +40°C
Ambient humidity:	85%RH or less with no condensation
Altitude:	Maximum 1,000m
Atmosphere:	No corrosive or volatile gases, no steam
	Dust-free, well-ventilated area.
Installation location:	Indoor type: Indoors (area with minimal dust, no contact with water)
	Outdoor type: Indoors or outdoors (place where are got wet with common rainwater but not direct heavy
	wind and rain)
	Vibration: Maximum 1G

- Mounting in conditions other than the above requires adherence to optional specifications. Please consult with us.

- Drives built according to special specifications, such as explosion proofing, 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 smooth operation, such as inspection and maintenance.
- Mount on a sufficiently rigid base.

4-2 Mounting Angle

Install the product so that the output shaft becomes horizontal or vertical. (Depends on nomenclature. See P5. Please consult with us for inclined mounting). For machines built for specified mounting angle, only use the specified mounting angle.

Do not remove the motor's eye-bolt. When it is removed, insert a bolt or other appropriate material into the screw hole to prevent water or other substances from entering the motor through the screw hole.

4-3 When Load Condition Is Intense

In cases of extreme vibration or frequent startup, it is recommended to install dowel pin for the foot unit, and use a mounting bolt of at least class 8.8 (JIS B 1051) strength.

Common

- Confirm the rotation direction before coupling the unit with the driven machine. Incorrect rotation direction may cause personal injury or damage to the equipment.
- When operating the product alone (uncoupled), remove the key that is temporarily attached to the output shaft; otherwise the key could fly off, and injury may result.
- Install a cover or other appropriate protection items over the rotating parts to prevent human contact; otherwise, injury may result.
- When coupling the product with another machine, check that the centering, the belt tension and parallelism of the pulleys are within the specified limits. When the unit is directly coupled with another machine, check that the direct coupling accuracy is within the specified limits. When a belt is used for coupling the unit with another machine, check the belt tension. Correctly tighten bolts on the pulley and coupling before operation; otherwise there is a risk of injury due to scattering the broken pieces or of damage to the products.

5-1 Checking Rotational Direction

Note that depending on the model, the rotation direction of the output shaft differs.

(1) For Motor Directly Connected

Table 5-1 shows the direction of output shaft rotation when wiring is performed as shown on P14.

Table 5-1 Output Shaft Rotation Direction (Motor Directly Connected)

When wiring is performed as shown on P14, the motor shaft rotates to the right as seen from the anti-load side. The arrows in the following diagrams show the direction of output shaft rotation in this case. BEIER Variator (Basic Type) **BEIER-CYCLO Variator BEIER Variator BEIER-CYCLO** Variator Type (With Gear Reducer Mechanism) (1 Stage) (2 Stage) А Type and B Type Output shaft rotation direction (Seen from load side) D Type

Note: To make reverse rotation, reverse R and T.



Table 5-2 Output Shaft Rotation Direction (Reducer Type)

Туре		BEIER Variator (Basic Type)	BEIER Variator	BEIER-CYCLO Variator (1 Stage)	
		BEIER-CYCLO Variator (2 Stage)	(With Gear Reducer Mechanism)		
Output shaft	A Type and B Type	Rotates in opposite direction to the direction of input shaft.	Rotates in opposite direction to the direction of input shaft.	Rotates in the same direction as the direction of input shaft.	
rotation direction	D Type	Rotates in the same direction as the direction of input shaft.	_	Rotates in opposite direction to the direction of input shaft.	

5-2 Mounting Connector

- When mounting Connector, do not apply impact or excessive axial load to the shaft. The bearing could be damaged, or the collar could come off.
- Shrinkage fit is recommend.

(1) When Using a Coupling

The alignment accuracy (A, B, X) in Figure 5-1 should be no greater than that shown in Table 5-3.





Table 5-3 Alignment Precision for Flexible Coupling

Allowable Dimensional Error for A	0.1mm or manufacturer-specified value	
Allowable Dimensional Error for B	0.1mm or manufacturer-specified value	
Dimension for X	manufacturer-specified value	

(2) When Using Chains, Sprockets, or Gears

- When using a chain, attach it so that the chain tension angle is perpendicular to the shaft.
- Refer to the chain catalog or other reference for chain tension.
- The pitch circle diameter of the sprocket and gear shall be three times or more of the shaft diameter.
- The load point of the sprocket or gear should be nearer to the product than to center of the shaft. (See Figure 5-2)

(3) When Using a V Belt

- Over-tightening the V belt will damage the shaft and bearing. Refer to the V belt catalog or other reference for V belt tension.
- The parallelism, eccentricity β between the two pulleys should be within 20[']. (See Figure 5-3)
- When using multiple V belts, use the same V belts having the same circumferential length.



Figure 5-2



Figure 5-3

6. Wiring and Piping

When using another manufacturer's motor, refer to the operation manual for that motor.

(Motors with a motor capacity of 37kW or more are made by other manufacturers. Also, depending on the motor specification, some motors are made by other manufacturers.)

This manual shows wiring for motors with Japanese standard specifications. Please consult with us for motors with overseas specifications.

- 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.
- Connect a power cable to the unit according to the diagram shown inside the terminal box or the maintenance manual; otherwise, electric shock or fire may result.
- Do not forcibly bend, pull, clamp or push the power cable and lead wires; otherwise, electric shock or fire may result.
- Correctly ground the grounding terminal; otherwise, electric shock may result.
- For explosion proof motor, the lead-in condition shall conform to the facility's regulations, electrical codes, and explosion proofing standard, as well as the maintenance manual. Otherwise, electric shock, personal injury, explosion, fire, or damage to the equipment may result.

- When wiring, follow the domestic laws and standards; otherwise, burning, electric shock, injury, or fire may result.
- The motor is not equipped with a protection device. However, it is compulsory to install an overload protector according to the laws and standards. It is also recommended to install other protecting devices (earth leakage breaker, etc.), in addition to an over current protecting device; otherwise, burning, electric shock, injury, or fire may result.
- Do not touch the terminals when measuring insulation resistance; otherwise, electric shock may result.
- When using a star-delta starter, select one with an electromagnetic switch on the primary side (3-contact point type); otherwise, fire may result.
- When measuring the insulation resistance of explosion proof motor, confirm that there is no gas or explosive vapor in the vicinity. Otherwise, explosion or ignition may result.
- If ambient temperature exceeds 60°C, place the rectifier in a location where the temperature is 60°C or less. In this case, always protect the entire rectifier with a cover. However, ambient temperature conditions for standard units with and without brakes must be –10 to 40°C. (Manufacture with special specification is required for operation in an environment where ambient temperature exceeds 40°C.)
- Long cables cause large voltage drops. Select cables with appropriate diameter so that the voltage drop will be no greater than 2%.
- After wiring outdoor types and explosion proof types, check that terminal box mounting bolts are not loose, and correctly attach the terminal box cover.

6-1 Removing and Attaching the Resin Terminal Box Cover

3-phase motor 4P: 0.2-0.4kW

(1) Removal

As shown in Figure 6-1, to remove the cover, grab the sides of the terminal box, and pull it toward you.

(2) Attachment

Push the terminal box cover from above the terminal box case until it snaps shut.



6-2 Measuring Insulation Resistance

When measuring insulation resistance, always disconnect the control board and measure the motor alone.

Measure insulation resistance before wiring. Insulation resistance (R) is changed by a number of factors, including motor output, voltage, type of insulation, winding temperature, moisture, degree of fouling, time used, and amount of time test voltage is applied. However, normally, it must be above the values in Table 6-1.

Table 6-1 Values for Insulation Resistance

Motor Voltage	Ohmmeter Voltage	Insulation Resistance (R)
Low-voltage electric motors of 600V or less	500V	Minimum 1MΩ



Low insulation resistance is a sign that there is an insulation failure. Do not apply power. Consult an accredited maintenance shop.

6-3 Coordination of System Protection

- Use a wiring breaker for short circuit proofing.
- Use an over current protection device which operates when the currents exceed the rated current on the nameplate.
- For increased safety motor, use an over current protection device which operates in the locked rotor current on the nameplate within the allowable locking time.

6-4 Connecting the Power Cable

Connect the power cable and motor lead wire by joining pressure connection terminals as shown in figure 6-2.

Figure 6-2

6-5 Motor Wiring

In this section, motor wiring, standard specification for terminals, and symbols of lead wires are shown.

Without Brake 3-Phase Power Source





MC: Electromagnetic contactor OLR: Over current protection device or thermal relay

Customer needs to prepare.

- This diagram shows cases for motors with standard Japanese domestic specifications. Please consult with us for motors with overseas specifications.

For wiring for a motor with brake, refer to the motor maintenance manual (No.MM1001E).

6-6 Wiring for Electric Trochoid Pump Motor

CAUTION Â

- For models with lubrication method using a electric trochoid pump, always start the motorized trochoid pump before starting the main motor. Abnormal temperature rise, seizure, or other damage to the device may result.
- (1) Models using electric trochoid pump for lubrication use the independent lubrication. Therefore the pump needs a separate power source.

(See Table 6-2, Table 6-3, and Figure 6-3)

- (2) For electric trochoid pump wiring, see Figure 6-4. Wire R-U, S-V, T-W. The pump motor rotates in the specified direction. (For Japanese domestic standard specifications. Consult with us for special specifications, such as overseas specifications and motors not manufactured by Sumitomo.)
- (3) Between the motor for electric trochoid pump and the main motor, install an interlock mechanism that satisfies the following two functions. (See Figure 6-4)
 - [1] Start time: When the electric trochoid pump is not activated, the main motor is not activated.

[2] While running: When for any reason the electric trochoid pump stops, the main motor stops.

(4) To ensure good lubricating conditions, start the electric trochoid pump (priming) before the main motor starts. (See P19 for priming time guideline)

Table 6-2 Electric Trochoid Pump Specifications (Beier unit)

Frame Size		Horizontal type		Vertical type	
	R Type	Pump type	Pump	Pumptype	Pump
лтуре	втуре	r unip type	motor	i unp type	motor
N10A	N8B	-	_	TOP-13AK	0.2kW 4P
15A	10B	-	-	TOP-208HBM-SU	0.4kW 4P
20A	15B	-	-	TOP-212HBM-SU	0.4kW 4P
30A	20B				
40A	30B	_	_		0.75KW 4P
50A	50R				
75A		TOP-212HBM-SU	0.75kW 4P	TOP-N330H	2.2kW 6P
100A	700				
150A	100B	TOP-N350HVB-7		TOP-N350HVB-7	
200A	150B	with relief valve	2.2KW 0P	with relief valve	2.2KW 0P

Note: Models in gray area come with a lubricating oil cooling device. (See P16)

Table 6-3 Electric Trochoid Pump Specifications (Cyclo unit)

Eramo Sizo	Vertical type					
Frame Size	Pump type	Pump motor				
6275	TOP-216HBVB-3					
0275	with relief valve	0.75600 4P				
627504	TOP-204HBVB-3	0.4141/40				
02/5DA	with relief valve	0.4KVV 4P				







MC1: Electromagnetic contactor (main motor)

- MC2: Electromagnetic contactor
- (Electric trochoid pump motor)
- PB1 : Push button switch (Start)
- PB2 : Push button switch (Stop)

Т : Timer (30 seconds or more)

Figure 6-4 Electric Trochoid Pump Circuit Diagram





Figure 6-3 Construction Drawing of Machine With Electric Trochoid Pump

6-7 Lubricating Oil Cooling Device

BEIER frame sizes 50A–200A, and 50B–150B come with a lubricating oil cooling device.

Install it together with the electric trochoid pump.

(1) Piping

- [1] Install the lubricating oil cooling device horizontally.
- [2] The piping distance between cooling device and the Beier unit should be within the length shown in Table 6-4. Minimize the number of bending locations of the pipe.

Table 6-4 Piping Distance

Direction	Length
Upper side in vertical direction	0.5m or less
Lower side in vertical direction	1.5m or less
Horizontal direction	3m or less

- [3] Check the lubricating oil inlet and outlet of the Beier unit and the lubricating oil cooling device on the manufacturing specifications, and perform piping work with gas pipes for the dashed line parts as shown in Figure 6-5.
- [4] For the lubricating oil outlet of the Beier unit, use a gas pipe with 1 1/2B–2B in size. For the inlet, use a gas pipe with 1B in size. The customer needs to prepare pipe materials and joints.

- Install the lubricating oil cooling device as close to the Beier unit as possible. Installing it too far from the Beier unit may cause a suction failure of the oil pump, resulting in abnormal sound, temperature rise, or insufficient lubrication.

- If the air is sucked from the middle of the pipe on the suction side of the oil pump, the oil supply amount decreases due to suction failure, and abnormal sound is generated from the oil pump. Therefore ensure complete airtightness.



Figure 6-5 Piping Diagram for Lubricating Oil Cooling Device

(2) Coolant

- Use general drinking water or general industrial water as a coolant for the cooling device.
- Table 6-5 shows the guideline of coolant supply amount. Adjust the amount according to the ambient temperature and operating status so that the surface temperature of the Beier unit case is approx. 60°C or less.

Erama Siza	Supply Amount (L/min)					
Fidilie Size	Horizontal	Vertical				
50A, 75A, 100A	6.0	10 15				
50B, 75B	0-0	10-15				
150A, 200A	15	20				
100B, 150B	15–20					

Table 6-5 Coolant Supply Amount

6-8 Electric Remote Control Device (RC)

BEIER frame sizes 150A, 200A, 100B, and 150B come with an electric remote control device (RC) (This is an option for other frame sizes). Connect the pilot motor (PM) to the power source.

(1) Pilot Motor (PM) Wiring



NFB	: Auto breaker	PB3	: Speed reduction button switch
MC1	: Electromagnetic switch (main motor)	PB4	: Speed acceleration button switch
MC2D	: Electromagnetic contactor (PM speed reduction side)	PB5	: Emergency stop button switch
MC2U	: Electromagnetic contactor (PM speed acceleration side)	М	: Main motor
PB1	: Start button switch	PM	: Pilot motor
PB2	: Stop button switch	THR	: Thermal relay



- Take the power supply for the pilot motor (PM) from the secondary power source for the main motor, and wire R-U, S-V, T-W.
- Confirm that pressing the speed acceleration button switch (PB4) increases the output shaft speed, and pressing the speed reduction button switch (PB3) decreases the output shaft speed.
- If the pilot motor keeps rotating even after the variable speed reaches the highest speed and the lowest speed, excessive force is applied. Because of this, idling the clutch allows the force of the pilot motor (PM) rotation to escape. Check if the clutch is idled when the speed reaches the highest speed and the lowest speed.

Never stop the main motor during variable speed operation. Never attempt to perform variable speed operation while stopped. Excessive force may be applied to the internal parts, resulting in damage to the disc, etc.

Common

7. Operation

- Do not approach or touch the 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; otherwise, restoration of power may cause electric shock, personal injury, or damage to the equipment.
- Do not operate the unit with the terminal box cover removed. Return the terminal box cover to the original position after maintenance in order to prevent electric shock.

- 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 products becomes very hot during operation. Be careful not to touch with hands or body; otherwise, burns may result.
- Do not loosen the oil filler plug during operation; otherwise, hot, splashing lubricant may cause burns.
- If any abnormality occurs during operation, stop operation immediately; otherwise, electric shock, injury, or fire may result.
- Do not operate the products beyond the rated load; otherwise, personal 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 driven machine?
- Are mounting bolts tightened firmly?
- Is the direction of rotation as required?
- For oil-lubricated models, is the oil level at the center of the oil gauge or at the upper red line when the unit is at rest?

After confirming these items, operate without a load and gradually apply a load. Check the items shown in Table 7-1.

- Oil-lubricated models are shipped without oil. Before operating, make certain to feed the recommended or specified lubricating oil (See P26–31). For BEIER-CYCLO Variator, the Beier unit and Cyclo unit need to be lubricated separately because of their independence of lubrication.
- Never stop the main motor during variable speed operation. Never attempt to perform variable speed operation while stopped. Excessive force may be applied to the internal parts, resulting in damage to the disc, etc.
- It is recommended to start the operation on the low speed side. When starting operation at full load or starting a model with a large load moment of inertia, be sure to start the operation on the low speed side.
- In the case where the load moment of inertia is particularly large, soft-start may be required. Please consult with us.

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 driven machine? - Is the vibration of the driven machine transmitted to the gearmotor or reducer?
Is the surface temperature abnormally high?	 Does the voltage rise or drop substantially? Is the ambient temperature too high? Does the current value to the gearmotor exceed the rated current shown on the nameplate?
ls the oil signal active? (When the lubrication is of the plunger pump type)	If the ball in the oil signal is not moving up or down, there may be a lubrication problem.

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

7-3 Electric Trochoid Pump

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- For models with lubrication method using a electric trochoid pump, always start the electric trochoid pump before starting the main motor. Abnormal temperature rise, seizure, or other damage to the device may result.
- For models with a lubricating method using electric trochoid pump, see P15.
- To ensure good lubricating conditions, start the electric trochoid pump before the main motor starts. See Table 7-2 for priming time guideline

Table 7-2 Priming Guideline

	Frame Size	Priming Guideline				
	N10A-40A, N8B-30B	At least before 30 seconds or more				
Beier unit	50A-200A, 50B-150B	At least before 60 seconds or more				
	(Models with a lubricating oil cooling device)	At least before ou seconds of more				
Cyclo unit	6275, 6275DA	At least before 30 seconds or more				

- For models with a lubricating oil cooling device, be sure to start the oil pump of the lubricating oil cooling device before starting the main motor, and check the oil feeding state.
- The time for the lubricating oil to circulate the entire machine differs depending on the piping distance, piping diameter, surrounding environment, etc. Circulate the lubricating oil sufficiently before starting the main motor.
- When the ambient temperature is low such as in winter, the electric trochoid pump may cause vibration or noise in rare cases. This phenomenon will disappear as the oil temperature rises with operation, so this is not a problem.
- The pressure gauge is used to check the circulation of the lubricating oil. The pressure gauge may point around the upper limit or lower limit of the scale when the ambient temperature is high or low such as in summer or winter.
- To protect the pressure gauge, close the valve on the lower side of the pressure gauge when starting the electric trochoid pump. After starting the pump, open the valve.

7-4 Variable Speed Operation/Manual Speed Change

Variable speed operation is performed by rotating the operation handle manually. An electric remote control device is installed for the BEIER frame sizes 150A, 200A, 100B, and 150B as standard specification. See P20–21 as well.

Never stop the main motor during variable speed operation. Never attempt to perform variable speed operation while stopped. Excessive force may be applied to the internal parts, resulting in damage to the disc, etc.

(1) Indicator Plate Method

- The operation handle can be attached to either right side or left side.
- When seen from the output shaft side, if the indicator moves from left to right by rotating the operation handle, the output shaft speed increases. If it moves from right to left, the output shaft speed decreases.
- Calculate the output rotation frequency from the scale (speed ratio) indicated by the indicator.

Operation handle Rotation Frequency





Figure 7-1 Indicator Plate

(2) With Variable Speed Indicator (Vertical BEIER Frame Sizes 50A–200A, and 50B–150B)

- The scale is attached on the opposite side to the handle.
- Calculate the output rotation frequency from the scale (speed ratio) indicated by the pointer.



Figure 7-2 Variable Speed Indicator

7-5 Variable Speed Operation/Electric Remote Control Device (RC)

BEIER frame sizes 150A, 200A, 100B, and 150B come with an electric remote control device (RC) (This is an option for other frame sizes).

- Pressing the speed acceleration button switch increases the output shaft speed, and pressing the speed reduction button switch decreases the output shaft speed. As long as the button switch is pressed, the pilot motor (PM) rotates and the speed is changed. When the button switch is released, constant speed rotation is performed.
- Be sure to confirm that the pilot motor (PM) is stopped before changing from acceleration to deceleration, or deceleration to acceleration.
- If the pilot motor keeps rotating even after the variable speed reaches the highest speed and the lowest speed, excessive force is applied. Because of this, idling the clutch allows the force of the pilot motor (PM) rotation to escape. If the clutch keeps idling for 30 seconds or more, a failure may occur. As soon as the variable speed operation is completed, release the button switch quickly to stop the pilot motor (PM).
- If the clutch remains idled due to the specification of the variable speed control after the slowest speed or the fastest speed is reached, assemble a circuit that stops the pilot motor (PM) by the limit switch (option).

Never stop the main motor during variable speed operation. Never attempt to perform variable speed operation while stopped. Excessive force may be applied to the internal parts, resulting in damage to the disc, etc.

A	Frame Size	N02A	N05A	N1A	N2A	N3A	N5A	N8A	N10A	15A	20A	30A	40A	50A	75A	100A	150A	200A
Туре	50Hz		33		3	0	4	0	34	68	60	7	2		77		6	7
	60Hz		28		2	25	3	3	29	57	50	6	1		64		5	6

В Туре	Frame Size	N02B	N05B	N1B	N2B	N3B	N5B	N8B	10B	15B	20B	30B	50B	75B	100B	150B
	50Hz	33		30		40		34	68	60	72		77		6	7
	60Hz	28		2	5	33		29	57	50	61		6	4	5	6

D	Frame Size N05D	N05D	N1D	N2D	N3D	N5D	N8D	N10D
Туре	50Hz	33		4	2	3	42	
	60Hz	2	8	3	5	3	35	

Table 7-3 Time required for speed change from the fastest speed to the slowest speed (s)

7-6 Pilot Motor (PM) Specifications

The pilot motor (PM) applies the Warm Gear method and the CYCLO Drive method depending on the Beier frame size.

Table	7-4	Pilot	Motor	Method
lable	/-4	FIIOL	IVIOLOI	methou

Method	Frame Size						
Method	А Туре	B Type	D Type				
Warm Gear	N02A-N10A	N02B-N8B	N05D-N10D				
CYCLO Drive	15A-200A	10B-150B	-				

(1) Warm Gear Method

- A ball clutch is incorporated as a safety device.
- If manual speed change is necessary, turn off the power of the pilot motor, and then rotate the hexagon socket head bolt (M6) at Section A in Figure 7-3 using a hexagonal wrench (nominal dimension 5mm) to change the speed



Figure 7-3 Construction Drawing for Pilot Motor in Warm Gear method

- (2) CYCLO Drive Method
 - A slip clutch is incorporated as a safety device.
 - The slip clutch does not require adjustment because the torque has been set at the time of shipment, however, if the torque adjustment is necessary due to wear, etc., make adjustment according to the following steps.
 Screw the adjustment nut [7] fully to the free length of the disc spring [5], and set the lock plug [6].
 Next, screw the adjustment bolt [10] to the adjustment nut [7] completely.
 If fine adjustment is necessary, move the adjustment nut [7] position forward or backward to make adjustment.
 - If manual speed change is necessary, turn off the power of the pilot motor. When loosening the grip [2] and pulling the handle [1] forward, the claw clutch [8] comes off from the slip clutch [4]. Then the handle can be rotated by hand.
 - Since the slip clutch is designed to be used in dry state, do not subject it to water or oil.
 - If the grip [2] is over-loosened, the grip [2] and handle [1] come off from the main unit. Be careful not to drop or lose them.



Figure 7-4 Construction Drawing for Pilot Motor in CYCLO Drive method

Table 7-5 Main Parts of Pilot Motor in CYCLO Drive Method

Part Number	Parts Name	Qty.	Part Number	Parts Name	Qty.	Part Number	Parts Name	Qty.	Part Number	Parts Name	Qty.
1	Handle	1	6	Lock plug	2	11	Insertion bush	2	16	Operation nut	1
2	Grip	1	7	Adjustment nut	1	12	Distance	2	17	Support plate	1
3	Spring pin	1	8	Claw clutch (Spring pin)	2	13	Pointer window	1	18	Gasket	2
4	Slip clutch	1	9	Chain wheel	1	14	Gasket	1	19	Oil seal	2
5	Disc spring	1–2	10	Adjustment bolt	3	15	Pointer	1	20	Socket	1

- 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 touch the rotating parts (output shaft etc.) during maintenance and inspection while operating the unit; otherwise, loose clothing may become caught in these rotating parts and cause serious injury or death.
- For explosion proof motor, customers must not disassemble or modify the product by themselves; otherwise, electric shock, personal injury, explosion, fire, or damage to the equipment may result.
- For explosion proof motor, lead in external conducting shall conform to the facility's regulations, electrical codes, and explosion proofing standard, as well as the maintenance manual. Additionally, do not open the terminal box cover while operating; otherwise, explosion, ignition, electric shock, or damage to the equipment may result.

- 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 products becomes very hot during operation. Touching the unit with bare hands may result in serious burns.
- Do not touch the terminals when measuring insulation resistance; otherwise, electric shock may result.
- Do not operate the product without a safety cover (removed during inspection); otherwise, loose clothing may become caught in these rotating parts and cause serious injury or death.
- When any abnormality happens, observe the condition based on maintenance manual. Do not operate the unit until the cause is detected and repaired.
- Change lubricant according to the maintenance manual instructions. Be sure to use the type of lubricant that we recommend.
- Before mounting, moving, or transporting the machine, be sure to remove the lubricating oil. Moving machine with lubricating oil in may cause oil to discharge from the air vent, etc.
- Do not change lubricant during operation or immediately after stopping operation; otherwise, burns may result.
- Do not operate a damaged gearmotors or reducers; 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 products lubricant as general industrial waste.
- When measuring the insulation resistance of explosion proof motor, confirm that there is no gas or other vaporized explosive substance around the unit in order to prevent explosion or ignition.

8-1. Daily Inspection

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

Table 8-1 Daily Inspection

Inspecti	ion Item	Inspection Detail					
Current valu	ie -<u>¶</u>=1	Is the current no greater than the rated value shown on the nameplate?					
No	ise	Are there unusual noises, or are there extreme changes in the noises?					
Vibra	ation	Is there abnormally large vibration? Are there extreme changes?					
		Is surface temperature unusually high? Is there a sudden rise? There is no problem if the fluctuation is small with the following temperatures as upper limit	ts.				
Surface	Beier unit	Without lubricating oil cooling device: Approx. 50°C in difference between surface tempera ambient temperature With lubricating oil cooling device: Surface temperature of approx. 60°C	ture and				
temperature	Cyclo unit	Frame size 6125 and smaller: Approx. 40°C in difference between surface tempera ambient temperature Frame size 6130 and above: Approx. 60°C in difference between surface tempera ambient temperature	ture and ture and				
	While stopped	Is the oil level below the center point or upper red line of the oil gauge when the machine is stopped? If the oil level is below the center point or upper red line when the machine is stopped, reple lubricating oil to the center point or upper red line. Do not add the oil while the machine is a	enish running.				
Oil level (Oil lubricated machines)	While running	Is the oil level significantly different compared to the level when the lubrication state is stab The lower red line is an auxiliary mark serving as a guideline to check oil level while the mac running.	le? hine is				
	In the case of Trochoid pump method	Are the oil signal and flow gauge working properly? Not working properly is a sign of improper reducer lubrication, due to factors including insu oil, pump damage and plugged pipes. In this case, immediately stop the machine and inspe	ifficient ect it.				
Lubricant co	ntamination	Is the lubricating oil contaminated? Oil contamination can be checked by extracting oil while the machine is stopped or by using the oil gauge. If the oil gauge is contaminated, promptly change it.					
Oil, grea	ise leaks	Are oil or grease leaking from the gear unit? Are the oil seal sliding surfaces corroded?					
Electric trochoid pump (Beier unit)		The oil filter (See Figure 8-1) is attached to the pipe. A clogged oil filter may cause insufficient oil supply to the Beier unit due to suction failure of oil pump, resulting in a malfunction of the oil pump or seizure of the Beier unit. Rotate the upper end handle one revolution or more sometimes, and remove the clogging. Especially in early days of operation, the oil filter tends to be clogged, so clean it off once a day. Drain sludge from the drain plug at the lower end while the machine is stopped. Handle Handle The total supply Handle The total supply Handle Hand					
Lubricating oil cooling device		Is the coolant flowing normally?					
(Beier unit)		Is the lubricating oil circulating?					
Mounti	ng bolts	Are the mounting bolts loose?					
Chain, V-belt		Are the chain or V-belt loose?					

- If any abnormality is discovered during the daily inspection, take measures in accordance with "9.Troubleshooting" (P36). If these actions do not solve the issue, immediately contact the nearest authorized maintenance shop.

8-2 Checking Lubrication Method

Please look for the relevant items and make certain to do maintenance. Lack of maintenance is a source of trouble.

(1) Standard Lubrication Method (When Driven at Standard Input Speed Shown in Table 8-6)

- Check Table 8-2 through 8-5 for the lubrication method for the model used by the customer.

- Table 8-7 on P24 lists the maintenance method by lubrication method.

Table 8-2 A Type Beier Unit and B Type Beier Unit

	A	Frame Size	N02A	N05A	N1A	N2A	N3A	N5A	N8A	N10A	15A	20A	30A	40A	50A	75A	100A	150A	200A
B	آکړ (Horizontal						Oil b	ath						Ele	ctric tro	choid pu	mp met	hod
eiei) ě	Vertical	-			Oil I	bath			Eleo	ctric troc	hoid pur	np meth	od	Ele	ctric tro	choid pu	mp met	hod
, E	B	Frame Size	N02B	N05B	N1B	N2B	N3B	N5B	N8B	10B	15B	20B	30B	50B	75B	100B	150B		
≓	Ϋ́Γ	Horizontal			Oil bath						Electr				tric trochoid pump method				
	ě	Vertical	-			Oil I	bath			Electric trochoid pump method Electri			Electric	trochoid	d pump	method			

Table 8-3 Cyclo Unit of A Type BEIER-CYCLO Variator and B Type BEIER-CYCLO Variator

	S	Frame Size	6075	6095	6105	6125	6135	6145	6165	6175	6185	6195	6215	6225	6235	6245	6255	6265	6275
	ingl	Horizontal		Long-lif	e grease			Oil bath											
0	e Reduction	Vertical	-	- Long-life grease			Oil I	Oil bath Plunger pump method (forced lubrication)							Electric trochoid pump method				
Cyclo		Frame Size	6125DB	613□DB	613□DC	616□DA	616□DC	617□DC	618□DB	619□DA	6205DA 6205DB	6215DA 6215DB	6225DA 6225DB	6235DA 6235DB	6245DA 6245DB	6255DA 6255DB	6265DA	6275DA	
unit	Dout lo unit	Horizontal	Horizontal Long-life Grease Grease			Oil bath													
	ole Rec	Reduction		~165	~195	~273	~473				~559								
	uct	Long-life					F	Plunger p	ump me	thod (fo	rced lub	ication)				Electric trochoid			
	ion	Reduction ratio	grease	Gredse			195~	231~	319~	559~				649~				pump method	
						Grease													

Table 8-4 D Type (ND Series) Beier Unit

Be	D	Frame Size	N05D	N1D	N2D	N3D	N5D	N8D	N10D	
ier u	Ϋ́	Horizontal	Oil bath							
≓	м М	Vertical	-			oath				

Table 8-5 Cyclo Unit of D Type (ND Series) BEIER-CYCLO Variator

	S	Frame Si	ze	6095	6105	6125	6135	6145	6165	6175	6185	6195							
	ngl	Horizont	al	Lor	ng-life gre	ease			Oil I	bath]						
	e Reduction	Vertica	I	Long-life grease			Oil I	bath	Plunger pump method (forced lubrication)										
Cyclo		Frame Si	ze	6125DB	613□DC	616□DB	617□DB	618□DA	618□DB	619□DA	619□DB	6205DA 6205DB	6215DA 6215DB	6225DA 6225DB	6235DA 6235DB	6245DA 6245DB	6255DA	6265DA	6275DA
unit	 Dout	Horizont	al	Long-life grease		Grease							C	Dil bath					
	le Rec	Reduct	tion ว						104	-	~165	~319		~3	77		~473	~559	
	uct	Vert	Long-life Crosse				Plung	ger pump	metho	d (forced	lubricat	ion)	•		Electric trochoid				
	ion	Reduct	tion ว	grease		Grease			121~	104~	195~	377~		47	3~		64	9~	pump method
						-				Grease									

Note: 1. Models in gray area come with a lubricating oil cooling device

2. The symbol \Box in frame size can be "0" or "5".

3. If the input speed differs from the standard input speed, consult with us.

8. Daily Inspection and Maintenance Common

Table 8-6 Standard Input Speed

AT	уре	ВТ	уре	D Type		
BEIER Frame Size	Standard Input Speed (r/min)	BEIER Frame Size	Standard Input Speed (r/min)	BEIER Frame Size	Standard Input Speed (r/min)	
N02A~15A	1450/1750	N02B~10B	1450/1750		(,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
20A~40A	980/1165	15B~30B	980/1165	N05D~N10D	1450/1750	
50A~200A	720/870	50B~150B	720/870			

Note: If the input speed differs from the standard input speed, consult with us.

Table 8-7 Maintenance Manual Pages that can be Referenced Regarding Lubrication Maintenance

					Location of Infor	mation on Mainte	nance Technique	
		Lubrication Me	ethod	Oiling, Greasing at Time of Purchase, Prior to Operation	Replacement and Replenishment Intervals of Oil and Grease	Recommended Lubricating Oil Specified Lubricating Oil Recommended Grease	Oil Fill Quantity Grease Supply Quantity	Oil Fill and Drain Procedures Grease Supply and Discharge Procedures
Beie	Oil lubi	Oil bath	Self-lubricating	Descrived	8-3	8-3	8-3	8-3
unit	rication	Electric trochoid pump method	Independent lubrication	Required	P26	(2) P26	(3) P27	(4), (5) P27, 28
	Oil	Oil bath	Self-lubricating					
	lubricat	Plunger pump method	Forced lubrication	Required	8-4 (1) P29	8-4 (2) P29	8-4 (3) P30	8-4 (4), (5) P30, 31
Cyclo ι	ion	Electric trochoid pump method	Independent Iubrication					
Init	Grease lu	Long-life grease	Colf lubricating	Not required	8-5	8-5	8-5	8-5
	brication	Other than long- life grease	Self-lubricating	Not required	P32	(2) P32	(3) P32	(4) P33
Beier unit bearing	Grease lubrication	_	Self-lubricating	Not required	8-7 (1) P34	8-7 (2) P34	8-7 (3) P34	8-7 (4) P34

8-3 Oil Supply and Oil Change for Beier unit

(1) Oil Change Interval

Table 8-8 Lubricating Oil Inspection and Change Intervals for A Type and B Type Beier unit

		Change Interval	Operating Condition
Oil supply		Time of purchase	-
	First time	After 500 hours or 6 months, whichever comes first.	-
0.1	and and	Every 5,000 hours, or every year, whichever comes first.	Indoors, etc. at 0 to 35°C
change	2nd and subsequent	Every 2,500 hours, or every 6 months, whichever comes	Outdoors or hot locations, etc., where
chunge		first	temperatures are not maintained between
			0 and 35°C.

- Oil degrades more rapidly when ambient temperature is high or changes radically, and when corrosive gases are present. In such cases, confer with the lubricating oil manufacturer.

Table 8-9 Lubricating Oil Inspection and Change Intervals for D Type (ND Series) Beier Unit

	Change Interval	Operating Condition
Oil supply	Time of purchase	-
Oil change	Change the oil every 20,000 hours or 3–5 years.	In the case of severe operating conditions, shorten the change interval.

(2) Recommended Lubricating Oil and Specified Lubricating Oil

Always use lubricating oils recommended or specified by Sumitomo Heavy Industries as shown in Table 8-10 and Table 8-11.

Ambient Temperature °C	COSMO	ENEOS	IDEMITSU	Shell	Mobil
-10 to 5	COSMO ALLPUS 46, 68	SUPER-HIGHLAND 46 ,68	DAPHNE SUPERHYDRO-A 46, 68	Shell Tellus S2 M 46, 68	Mobil DTE Oil 25, 26 (ISO VG 46, 68)
0 to 35	COSMO ALLPUS 100, 150	FBK Oil RO 100, 150	DAPHNE MECHANIC OIL 100, 150	Shell Tellus S2 M 100 Shell Morlina S2 B 150	Mobil DTE Oil Heavy (ISO VG 100) Mobil Vacuoline 528 (ISO VG 150)
30 to 50	COSMO ALLPUS 220, 320	FBK Oil RO 220, 320	DAPHNE MECHANIC OIL 220, 320	Shell Morlina S2 B 220	Mobil Vacuoline 533, 537 (ISO VG 220, 320)

Table 8-10 Recommended Lubricating Oil for A Type and B Type Beier unit

Table 8-11 Specified Lubricating Oil (Traction Oil) for D Type (ND Series) Beier Unit

Ambient Temperature °C	ENEOS	IDEMITSU
-10~40	TD Oil 150	DAPHNE ALPHA DRIVE-P 150

Note: 1. D Type (ND series: with N in frame size) and former D Type (without N in frame size) differ in lubricating oil to be used. 2. In the case of D Type BEIER-CYCLO Variator, the Cyclo unit and Beier unit differ in lubricating oil to be used.

[1] When using in winter or where the ambient temperature is relatively low, use an oil with low viscosity shown in the table below. In the case of forced lubricated models, if the plunger pump or electric trochoid pump causes cavitation, required quantity of oil cannot be fed, and the product may incur fire damage.

[2] For N02A and N02B, use oil with low viscosity shown in the table below.

[3] For allowable lubricating oil viscosity, see Table 8-12. Use within this required viscosity range.

Table 8-12 Allowable Oil Lubricant Viscosity

Minimum Allowable Viscosity	For oil temperature minimum	e during operation, 20mm ² /S.	Viscosity that will obtain required film strength under load.
Maximum Allowable	Oil bath lubricated models	Maximum 4,300mm ² /S	Viscosity at which BEIER Variator and BEIER-CYCLO Variator can start
Viscosity	Forced lubricated models	Maximum 2,200mm ² /S	Viscosity at which the plunger pump and electric trochoid pump can start

[4] For a smooth startup, use oil with a pour point at least 5°C below ambient temperature.

[5] If operating temperature changes widely, use a high viscosity index oil that meets requirements [3] and [4].

[6] If regularly operating outside the ambient temperature range of 0 to 40°C, some parts of the mechanism may need to be changed, or lubricating oil might need to be preheated, or cooled. Please consult with us.

(3) Oil Fill Quantity

Table 8-13 provides approximate oil fill quantities. There are individual differences in actual quantities due to difference in each structure. Make sure to check that the oil level reaches the center point or the upper red line on the oil gauge, because the oil quantity may be more or less than requirement even if the oil is replenished according to Table 8-13.

		Frame Size	N02A	N05A	N1A	N2A	N3A	N5A	N8A	N10A	15A	20A	30A	40A	50A	75A	100A	150A	200A
	Horizontal	Basic type		0.7			.8	3.	.7	4.3	11	10	2	0		56		85	95
A Type Bei		With gear reducer mechanism		1.1		2	.3	5.	.2	7.5	13	20	3	8		98		-	-
		BEIER-CYCLO	0.7			1	.8	3.	.7	4.3	11	10	2	0		56		-	-
erc		Basic type	-	1.	5	4	.1	7.	.6	6.5	12	13	2	3		56		85	95
unit	Vertical	With gear reducer mechanism	-	2.	6	7	.4	1	5	10	20	24	3	8		108		-	-
		BEIER-CYCLO	-	1.	5	4	.1	7.	.6	6.5	12	13	2	3		56		-	-

Table 8-13 Approximate Oil Fill Quantity for Beier Unit (L)

		N02B	N05B	N1B	N2B	N3B	N5B	N8B	10B	15B	20B	30B	50B	75B	100B	150B	
	Horizontal	Basic type	0.7		1	.8	3	.7	4.3	11	10	2	0	5	6	85	95
В Туре		With gear reducer mechanism	1.	1.1		.3	5.2		7.5	13	20	38		98		-	-
Be		BEIER-CYCLO	0.7		1	.8	3	.7	4.3	11	10	2	0	5	6	-	-
er		Basic type	-	1.5	4	.1	7	.6	6.5	12	13	2	3	5	6	85	95
unit	Vertical	With gear reducer mechanism	-	- 2.6		.4	1	5	10	20	24	3	8	10)8	-	-
	F	BEIEB-CYCLO	-	15	4	1	7	6	65	12	13	2	2	5	6	-	

р Тур	Frame Size	N05D	N1D	N2D	N3D	N5D	N8D	N10D
e Beie	Horizontal	1	.2	2	.4	4	.8	8.7
r unit	Vertical	-	2.6	5	.5	13	8.5	19.5

Note: 50A-200A, and 50B-150B do not include oil quantity of lubricating oil cooling device and pipe.

The oil fill quantities for lubricating oil cooling device alone are approx. 3.2L for 50A, 75A, 100A, 50B and 75B, approx. 6.7L for 150A and 100B, and approx. 13.5L for 200A and 150B.

(4) Oil Fill Procedure

Oil Fill Procedure for Horizontal Type

- [1] Remove the filler plug.
- [2] Pour oil into the oil filler port, keeping an eye on the oil gauge to check the oil level.
- [3] Confirm that the oil level is at the specified position on the oil gauge.
- [4] Attach the filler plug.





Oil Fill Procedure for Vertical Type

- [1] Remove the filler plug.
- [2] Pour oil into the oil filler port, keeping an eye on the oil gauge to check the oil level.
- [3] Confirm that the oil level is at the specified position on the oil gauge.
- [4] Attach the filler plug.





- Only fill oil when the machine is stopped.
- It will take some time for high-viscosity oil to reach a uniform level. Be careful not to fill with too much oil. (If oil is replenished above the center point or the upper red line, churning heat may raise the temperature.)
- Use the lower red line of the oil gauge as a guideline for the oil level while the machine is running. (The oil level may drop below the lower red line immediately after the machine starts. It will return when oil viscosity drops as the machine runs. Therefore, this is not a problem.)
- For daily oil level management, see Table 8-1 on P23.

(5) Draining Procedures

Before draining oil, remove the drain plug.



Figure 8-4 Draining Oil

(6) Long Term Inactivity

Table 8-14 Long Term Inactivity

Period of	Approximately 1 month	Before resting the machine, change to new oil and run the machine for a few minutes.
mactivity	1 month or more	Before resting the machine, flush, fill with rust preventing oil and run for a few minutes under no load.
When resum	ning operation after	a long period of inactivity, change to new oil because the existing oil may degrade.

8-4 Oil Supply and Oil Change for Oil Lubricated Cyclo Unit

(1) Oil Change Interval

Table 8-15 Lubricating Oil Inspection and Change Intervals for Cyclo unit

		Change Interval	Operating Condition
Oil supply		Time of purchase	-
	First time	After 500 hours or 6 months, whichever comes first.	_
	2nd and subsequent times	Every 5,000 hours, or every year, whichever comes first.	Indoors, etc. at 0 to 35°C
Oil change		Every 2 E00 hours or every 6 months which ever comes	Outdoors or hot locations, etc., where
		Every 2,500 hours, of every o months, whichever comes	temperatures are not maintained between
		11151.	0 and 35°C.

- Oil degrades more rapidly when ambient temperature is high or changes radically, and when corrosive gases are present. In such cases, consult with confer with the lubricating oil manufacturer.

(2) Recommended Lubricating Oil

- Always use lubricating oils recommended by Sumitomo Heavy Industries as shown in Table 8-16.
- In the case of A Type and B Type BEIER-CYCLO Variator, the recommended lubricating oils are the same for the Beier unit and the Cyclo unit.
- In the case of D Type (ND series) BEIER-CYCLO Variator, use the specified lubricating oil (traction oil) in Table 8-11 on P26 for the Beier unit, and recommended lubricating oils in Table 8-16 for the Cyclo unit.
- Do not mix the lubricating oil for D Type Beier unit and lubricating oil for Cyclo unit, or replenish wrong lubricating oils for them. Doing so will significantly affect their performance and lifespan.

Ambient Temperature °C	ient COSMO ENEOS		IDEMITSU	Shell	Mobil
-10 to 5	COSMO ALLPUS 46, 68	SUPER-HIGHLAND 46 ,68	DAPHNE SUPERHYDRO-A 46, 68	Shell Tellus S2 M 46, 68	Mobil DTE Oil 25, 26 (ISO VG 46, 68)
0 to 35	COSMO ALLPUS 100, 150	FBK Oil RO 100, 150	DAPHNE MECHANIC OIL 100, 150	Shell Tellus S2 M 100 Shell Morlina S2 B 150	Mobil DTE Oil Heavy (ISO VG 100) Mobil Vacuoline 528 (ISO VG 150)
30 to 50	COSMO ALLPUS 220, 320	FBK Oil RO 220, 320	DAPHNE MECHANIC OIL 220, 320	Shell Morlina S2 B 220	Mobil Vacuoline 533, 537 (ISO VG 220, 320)

Table 8-16 Recommended Lubricating Oil for Cyclo unit

[1] When using in winter or where the ambient temperature is relatively low, use an oil with low viscosity shown in the table below.[2] For allowable lubricating oil viscosity, see Table 8-17. Use within this required viscosity range.

Table 8-17 Allowable Oil Lubricant Viscosity

Minimum Allowable Viscosity	For oil temperature minimum	e during operation, 15mm2/S.	Viscosity that will obtain required film strength under load.					
Maximum	Oil bath lubricated models	Maximum 4,300mm ² /S	Viscosity at which BEIER-CYCLO Variator can start					
Viscosity	Forced lubricated models	Maximum 2,200mm ² /S	Viscosity at which the plunger pump and electric trochoid pump can start					

[3] For a smooth startup, use oil with a pour point at least 5°C below ambient temperature.

[4] If operating temperature changes widely, use a high viscosity index oil that meets requirements [2] and [3].

[5] If regularly operating outside the ambient temperature range of 0 to 40°C, some parts of the mechanism may need to be changed, or lubricating oil might need to be preheated or cooled. Please consult with us.

(3) Oil Fill Quantity

Table 8-18 provides approximate oil fill quantities. Make sure that the oil level is up to the upper red line on the oil gauge.

Singl	Frame Size	6135	6145	6165	6175	6185	6195	6215	6225	6235	6245	6255	6265	6275
e Re	Horizontal	0.7	0.7	1.4	1.9	2.5	4.0	8.5	10	15	16	21	29	56
eduction	Vertical	1.1	1.1	1.0	1.9	2.0	2.7	7.5	10	12	15	35	43	(60)
Dou	Frame Size	616□DC	617□DC	618□DB	619□DA	619□DB	6205DA 6205DB	6215DA 6215DB	6225DA 6225DB	6235DA 6235DB	6245DA 6245DB	6255DA 6255DB	6265DA	6275DA
ble f	Horizontal	1.5	2.4	3.5	5.8	6.0	6.0	10	11	17	18	23	32	60
Reduction	Vertical	1.0	1.9	2.0	2.7	2.7	11	14	18	23	29	42	51	(60)

Table 8-18 Approximate Oil Fill Quantity for Cyclo Unit (L)

Note: 1. The symbol
in frame size can be "0" or "5".

2. Depending on the reduction ratio, vertical type with 2 stage reduction will require grease lubrication.

3. () is for a electric trochoid pump.

(4) Oil Fill Procedure

Oil Fill Procedure for Horizontal Type

As standard, the oil gauge of the horizontal type is attached on the right side when viewed from the low speed shaft side (output shaft side), however, it can be attached on either the right side or left side. You can select the side that is easy to view.

[1] Remove the filler plug.

[2] Pour oil into the oil filler port, keeping an eye on the oil gauge to check the oil level.

[3] Confirm that the oil level is up to the upper red line on the oil gauge.

[4] Attach the filler plug.



Figure 8-5 Horizontal Type

- Oil Fill Procedure for Vertical Type
- [1] Remove the filler plug. For models other than frame size 6255, 6265, remove the air vent plug to release air.

[2] Pour oil into the oil filler port, keeping an eye on the oil gauge to check the oil level.

- [3] Confirm that the oil level is up to the upper red line on the oil gauge.
- [4] For models other than frame size 6255, 6265, wrap the air vent plug with sealing tape and install it.
- [5] Attach the filler plug.



Figure 8-6 Vertical Type

- Only fill oil when the machine is stopped.
- It will take some time for high-viscosity oil to reach a uniform level. Be careful not to fill with too much oil. (If oil is replenished above the upper red line, churning heat may raise the temperature.)
- Use the lower red line of the oil gauge as a guideline for the oil level while the machine is running. (The oil level may drop below the lower red line immediately after the machine starts. It will return when oil viscosity drops as the machine runs. Therefore, this is not a problem.)
- For daily oil level management, see Table 8-1 on P23.

(5) Draining Procedures

To drain the oil, remove the drain plug or the plug at the bottom of the oil gauge.

Horizontal

Vertical



Figure 8-7 Draining Oil

(6) Long Term Inactivity

Table 8-19 Long Term Inactivity

Period of	Approximately 1 month	Before resting the machine, change to new oil and run the machine for a few minutes.									
mactivity	1 month or more	Before resting the machine, flush, fill with rust preventing oil and run for a few minutes under no load.									
When resu	When resuming operation after a long period of inactivity, change to new oil because the existing oil may degrade.										

8-5 Grease Replenishment for Grease Cyclo Unit Models

(1) Grease Replenishment Intervals

Table 8-20 Grease Replenishment Intervals for Cyclo Unit

Туре	Grease Replenishment and Change Intervals
Long-life grease lubricated models	Although these models use long-life grease and can run for a long time without replenishment, maintenance with disassembly after approximately 20,000 hours or 3 to 5 years will increase lifetime.
Models that are not lubricated with long-life grease	Replenish as shown in Table 8-21. Maintenance with disassembly after approximately 20,000 hours or 3 to 5 years will increase lifetime.

Table 8-21 Grease Replenishment Intervals for Cyclo Unit (Except Long-Life Grease Lubricated Models)

Operation Time	Replenishment Interval	Remarks
Less than 10 hours per day	Once every 3 – 6 months	Shorten the replenishment interval when the operating conditions are
10 – 24 hours per day	Once every 500 – 1,000 hours	severe or the frame size is large.

(2) Recommended Grease (Grease Used When Shipped)

Table 8-22 Recommended Grease for Cyclo Unit (Grease Used When Shipped)

Туре	Manufacturer	Description	Ambient Temperature °C
Long-life grease lubricated models	NIPPECO	BEN10-No.2	
Models that are not lubricated with long-life grease	COSMO	COSMO GREASE DYNAMAX SH No.2	-10~50

- Only use grease listed in Table 8-22.

- For order placement of grease, contact us (Local offices in back cover).

- When regularly used in an ambient temperature outside the 0 to 40°C range, some specifications will differ. Please consult with us.

(3) Grease Replenishment Quantity

The following tables show grease replenishment quantities. Replenish by using the value in the tables as a guideline.

Table 8-23 Grease Replenishment Quantity for Cyclo Unit (Guidelines)

Single Reduction

6075	6095	6105	6125
Long-life grease lubricated models. Replenishment is not required.			not required.

Double Reduction

	6125	DB				
Long-life greas	e lubricated models	s. Replenishment is	not required.			
613 🗌 DB	613 🗌 DC	616 🗌 DA	616 🗌 DB	616 🗌 DC		
20~30	40~60	20~30	40~60	85~125		
617 🗌 DB	617 🗌 DC	618 🗌 DA	618 🗌 DB	619 🗌 DA	619 🗌 DB	
40~60	85~125	40~60	150~225	110~165	150~225	
6205DA	6205DB	6215DA	6215DB	6225DA	6225DB	
110~165	150~225	150~225	250~375	150~225	335~500	
6235DA	6235DB	6245DA	6245DB	6255DA	6255DB	6265DA
250~375	370~550	250~375	370~550	335~500	500~750	500~750

- The symbol 🗌 in frame size can be "0" or "5".

- When changing grease, consult with us for filling quantity for each unit.

(4) Procedures for Filling and Discharging

Grease replenishment procedure for grease lubricated models (excluding long-life grease lubricated models)

- [1] Remove the grease discharge plug from the casing.
- [2] Use a grease gun to replenish the grease from the grease fitting on the internal cover, referring to the quantity of grease shown in Table 8-23 on P32 as guidelines. If a grease fitting has a metal cap, remove the cap before replenishing. After replenishing, attach the metal cap.
- [3] Replace the grease discharge plug.





Figure 8-8 Location of Grease Fill and Discharge Port (Example: Horizontal Type BEIER-CYCLO Variator 2 Stage Reduction)



- Replenish grease while the machine is running to improve grease distribution.
- In addition to being used for discharging grease, the grease discharge plug also functions as a pressure vent when replenishing grease. Make certain to remove when replenishing.
- Replenish grease slowly.
- Replenishing more than the quantity shown in Table 8-23 on P32 may cause agitation heat, which raises the temperature, and may cause grease to leak into the Beier unit.
- Grease may leak out of the grease fitting after starting the machine. In such a case, replace the grease fitting with one that has a metal cap.
- Be careful when handling the metal cap for the grease fitting as dropping it from a high place is dangerous.
- Contact the nearest authorized maintenance shop concerning changing all of the grease in a grease lubricated model.

8-6 Main Unit Maintenance

- Although it will depend on operation conditions, maintenance with disassembly after approximately 20,000 hours or 3 to 5 years will increase 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. Depending on the
 operating conditions and ambient environment for this product, the lifetime of seals greatly varies. Given normal operation, (uniform
 load, running 10 hours per day, normal temperature) it is recommended to change them every 1 to 3 years. If the sliding surfaces of oil
 seals or V-rings show signs of wear or corrosion, replace them with new ones. Because sliding surfaces for oil seals are made of carbon
 steel, take periodic rust prevention measures not to spread rust on them by applying rustproof oil and so on, if there are exposed
 surfaces of steel.
- Please consult with the nearest maintenance shop for the replacement of oil seal or V-ring.
- If the unit stops and starts frequently, mounting bolts (or nuts) and ring gear housing fastening bolts (or nuts) may come loose. Periodically check for looseness as this is a source of misalignment, oil leakages, and load unbalance.

8-7 Maintenance for Beier Unit Bearing

Vertical type BEIER frame sizes N10A–200A, and N8B–150B adopt the open bearing and grease lubrication method, requiring

maintenance of the bearing. Replenish grease periodically.

(1) Grease Replenishment Intervals

Table 8-24 Grease Replenishment Intervals for Beier Unit Bearing

Operation Time	Replenishment Interval	Remarks
Less than 10 hours per day	Once every 3 – 6 months	Shorten the replenishment interval when the operating conditions are
10 – 24 hours per day	Once every 500 – 1,000 hours	severe or the frame size is large.

(2) Recommended Grease (Grease Used When Shipped)

Table 8-25 Recommended Grease for Beier Unit Bearing (Grease Used when Shipped)

	Manufacturer	Description	Ambient Temperature °C	
	COSMO	COSMO GREASE	-10~50	
		DYNAMAX SH No.2		

(3) Grease Replenishment Quantity

The following tables show grease replenishment quantities. Replenish by using the value in the tables as a guideline.

Table 8-26 Grease Replenishment Quantity for Beier Unit Bearing Replenishment Quantity (g						ntity (g)						
Vertical A Type Beier unit	Frame Size		N10A	15A	20A	30A	40A	50A	75A	100A	150A	200A
	Basic typ	e	5	20	35	2	5	35		10	00	
	With gear reducer	Input shaft side	-	30	40	55 -		-				
	mechanism	Output shaft side	-	45	55	70		-				
	BEIER-CYC		5	20	35	2	5	35		10	00	
	Frame Size		N8B	10B	15B	20B	30B	50B	75B	100B	150B	
	Basic type		5	20	35	2	5	35 100				
Vertical B Type Beier unit	With gear reducer	Input shaft side	-	30	40	55		-				
	mechanism	Output shaft side	-	45	55	70 -						
	BEIER-CYC	LO	5	20	35	2	5	3	5	10	00	

- Only use grease listed in Table 8-26.
- Replenishment quantity is the quantity of grease to refill the bearing with at each interval.
- Even in the case of intermittent operation, replenish grease at least every 3 years.
- If the machine is rested for a long time, replenish grease immediately after resuming operation.

(4) Replenishment Procedure

Replenish new grease from the grease fitting (See Figure 10-2 on P37) during operation. (Grease change will be incomplete if replenishing is done while the machine is stopped.)

- Overfilling could cause the bearing to overheat, grease to leak and other problems. Be careful.
- Do not think that it is allowable to replenish with a large quantity to extend the replenishment interval.
- Please maintain the machine properly. Neglecting replenishment when resuming operation, or periodic replenishment when the machine is operating could lead to abnormal wear, bearing noise, bearing burnout, and other problems.

8-8 Motor Bearing Maintenance

- Standard motors manufactured by Sumitomo use sealed bearings (without grease filling and discharging structure).
- When using another manufacturer's motor, refer to the operation manual for that motor.
 (Motors with a motor capacity of 37kW or more are made by other manufacturers. Also, depending on the motor specification, some motors are made by other manufacturers.)
- Although it will depend on operation conditions, maintenance with disassembly after approximately 20,000 hours or 3 to 5 years will increase lifetime.
- Contact the nearest authorized maintenance shop regarding maintenance with disassembly.

8-9 Inspection and Cleaning for Oil Cooling Component

Inspect and clean the oil cooling component of the lubricating oil cooling device for BEIER frame sizes 50A–200A, and 50B–150B periodically.

- Although the inspection timing varies depending on the degree of lubricant contamination and water quality of coolant, be sure to perform inspection every 3 to 6 months.
- Check the internal water contamination state by removing the hood on the U-turn side. Check the degree of lubricant contamination by discharging the oil from the drain plug.
- Be sure to check the anticorrosive zinc bars (3 locations) during inspection. If the bars have been reduced to half or less, replace them. Depending on the water quality, the replacement may be required in 3 to 6 months.
- When operation is stopped in an environment where the coolant freezes in winter, be sure to discharge the coolant. When the surface temperature of the Beier unit case can be kept at approx. 40–45°C in ambient temperature at which the coolant freezes, reduce the coolant water supply or stop the lubricating oil cooling device.



Figure 8-10 Oil Cooling Component

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		Problem	Cause	Correction
			Power failure	Contact the electric power company.
			Defective electric circuit	Check the circuit.
			Blown fuse	Replace the fuse.
			Protective device is operating	Fix the problem and recover.
			Load locking	Check the load and safety device.
The	mot	or will not operate under no load	Poor switch contact	Adjust the contact unit.
			Motor stator coil disconnect	Confer with authorized maintenance shop.
			Bearing damage	Confer with authorized maintenance shop.
			3-phase is functioning as single-phase	Check the power supply with a voltmeter. Check the motor, transformer coil, contactor, fuse, etc. and repair or replace them.
The out	mot put s	or rotates without a load but the haft does not rotate	Damage to the Beier unit disc or gear unit due to overload, etc.	Confer with authorized maintenance shop.
		The quitch quarkants	Insufficient switch capacity	Replace with specified fuse.
	_	The switch overheats	Overload	Decrease the load to the specified value.
heo	Nhe	Free trianian	Insufficient fuse capacity	Replace with specified fuse.
utp	n a	Fuse tripping	Overload	Decrease the load to the specified value.
ut	loa		Voltage drop	Contact the electric power company.
shaf	d is	The speed will not increase and the motor is overheating	Overload	Decrease the load to the specified value.
tt	app	the motor is overheating	Short-circuited motor stator coil	Confer with authorized maintenance shop.
Irns	olie		The key is not inserted	Insert key.
≤iŧ	<u>م</u>	It stops	Bearing burnout	Confer with authorized maintenance shop.
hou			Poor adjustment of protection device	Adjust the protection device.
ut a loa	The dire	motor runs in the reverse	Wiring error	Change the connection.
ď	E.u.e		The lead wire is short circuited.	Confer with authorized maintenance shop.
	Fus	etripping	Poor contact between motor and starter	Make good connection.
			Overload	Decrease the load to the specified value.
			Voltage drop or rise	Contact the electric power company.
Fvc	occiv	e temperature rice	The ambient temperature is high	Improve the ventilation method.
	C2214	etemperature iise	Damaged bearing	Confer with authorized maintenance shop.
			Abnormal wear of the Beier unit disc or gear unit parts due to overload, etc.	Confer with authorized maintenance shop.
	Oil a sect	and fat blot or drip from the seal tion of input/output shaft	Grease applied to the oil seal seeps out at an early stage	Wipe off around the oil seal, and observe.
Oil le	Lea or c	kage of oil or grease from input output shaft section	Damaged oil seal or possibly damaged shaft (or collar)	Confer with authorized maintenance shop.
akage	Lea con casi	kage of oil or grease from the tact surfaces of the case, frame, ing, etc.	Loose fastener bolts	Tighten fastener bolts correctly.
		kage of oil/groace into motor	Damage to oil seals, or slinger collar	Confer with authorized maintenance shop.
	Lea	kage of on/grease into motor	Excessive oil supply	Remove oil.
			Dust and foreign matter in bearings, or damaged bearings	Confer with authorized maintenance shop.
			Foreign objects are caught in the Beier unit disc or gear unit parts	Confer with authorized maintenance shop.
			Damage to the Beier unit disc or gear unit parts has occurred	Confer with authorized maintenance shop.
Abr Exc	norm essiv	al sound e vibration	Warping of housing because the installation surface is not flat	Make the installation base flat or make adjustment using liners, etc.
			Resonance due to insufficient rigidity of installation base	Reinforce the installation base to increase rigidity.
			Misalignment of shaft with driven machine	Align the shaft centers.
			Transmission of vibration from the driven machine	Individually operate the products to check the source of the sound.
			Foreign objects have entered	Confer with authorized maintenance shop.
Abnormal motor sounds		ai motor sounds	Bearing damage	Confer with authorized maintenance shop.

10-1 Construction Drawings for BEIER Variator



Figure 10-1 A Type and B Type BEIER Variator (Horizontal, Basic Type)



Figure 10-2 A Type and B Type BEIER Variator (Vertical, Basic Type)

Note: See P34 for frame sizes with grease fitting A .

10-2 Construction Drawings for BEIER-CYCLO Variator



Figure 10-3 A Type and B Type BEIER-CYCLO Variator (Horizontal Type)

Table 1	0-1 Mai	n Parts
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Part Number	Parts Name	Part Number	Parts Name	Part Number	Parts Name	Part Number	Parts Name
1	Case	10	Face cam 1	A	Grease fitting	C-4	Slow speed shaft pin
2	Cover (Motor flange bracket in Figure 10-3)	11	Face cam 2	D-1	Flange disc	C-5	Ring gear pin
3	Pointer window	12	Oscillating shaft	D-3	Cone disc	C-6	Ring gear housing
4	Oil filler plug	13	Arm	G-1	Input shaft gear	C-7	Cycloid disc
5	Oil gauge	14	Spline shaft	G-2	Oscillation center gear	C-8	Slow speed shaft bearing A
6	Oil drain plug	15	Operation handle	G-3	Spline shaft gear	C-9	Slow speed shaft bearing B
7	Input shaft	16	Operation shaft	C-1	Slow speed shaft	C-10	Intermediate shaft bearing A
8	Output shaft (High speed shaft in Figure 10-3)			C-2	Casing	C-11	Intermediate shaft bearing B
9	Spring			C-3	Eccentric (Eccentric bearing)	C-12	Intermediate shaft

10-3 Construction Drawings for BEIER Variator



Figure 10-4 D Type BEIER Variator (Horizontal, Basic Type)



Figure 10-5 D Type BEIER Variator (Vertical, Basic Type)

Table 10-2 Main Parts

Part Number	Parts Name	Part Number	Parts Name	Part Number	Parts Name	Part Number	Parts Name
1	Case	6	Oil gauge	11	Face cam 1	16	Operation handle
2	Base	7	Oil drain plug	12	Face cam 2	17	Operation shaft
3	Cover	8	Input shaft	13	Oscillating shaft	D-1	Flange disc
4	Pointer window	9	Output shaft	14	Arm	D-3	Cone disc
5	Oil filler plug	10	Spring	15	Spline shaft		

- <u>10</u>. Construction Drawings

10-4 Construction Drawings for Motor Unit (BEIER Variator and BEIER-CYCLO Variator Direct Connection)



Figure 10-6 Configuration Example for Frames 80–112M



Figure 10-7 Configuration Example for Frames 180 or more

Table10-3 Principal Parts of Motor

Part	Parts Name	Part	Parts Name	Part	Parts Name
Number		Number		Number	
1	Bearing cover	7	Rotor core	13	Load side motor shaft bearing
2	Anti-load side motor shaft bearing	8	Stator core	14	Slinger collar (oil seal)
3	Fan	9	Frame	15	Motor shaft
4	Fan cover	10	Stator windings	16	Terminal box
5	Anti-load side cover	11	Eye-bolt	17	Bearing cover
6	Rotor conductor	12	Motor flange bracket		

11. Warranty Common

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

Warranty 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, during which despite a proper mounting, 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 separately, we will repair or provide an alternative product at our discretion for free of charge, except the exclusions below. 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 installation of the product and coupling 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 disassembly, parts replacement, and modification conducted by the customer (excluding disassembly for inspection and adjustment of the brake gap, for manual release of the brake, and for other purposes guided in the maintenance manual) 5. A breakdown resulting from disassembly, parts replacement, and modification conducted by the customer (excluding disassembly for inspection and adjustment of the brake gap, for manual release of the brake, and for other purposes guided in the maintenance manual) 5. A breakdown resulting from disassembly, parts replacement, and modification conducted by the customer (excluding disassembly for inspection and adjustment of the brake gap, for manual release of the brake, and for other purposes guided in the maintenance manual). 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. Natural wear and tear, abrasion, and deterioration of such relevant consumable parts as a bearing and oil seal, etc. under normal usage. 9. A breakdown caused for reasons not attributable to each of the above item.

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Specifications, dimensions, and other items are subject to change without prior notice.

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